



**CHERISH Report No.**  
CH-RCAHMMW 10

# **Puffin Island / Ynys Seiriol: Archaeological investigation for the CHERISH Project, 2017-18**

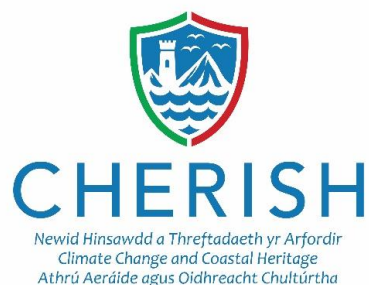
## **Landowner's Site Assessment Survey legacy, climate change priorities & recommendations**



**CHERISH**  
Newid Hinsawdd a Threftadaeth yr Arfordir  
Climate Change and Coastal Heritage  
Athrú Aeráide agus Oidhrecht Chultúrtha



**Comisiwn Brenhinol  
Henebion Cymru  
Royal Commission on the Ancient  
and Historical Monuments of Wales**



## Puffin Island / Ynys Seiriol

<b>County:</b>	Isle of Anglesey
<b>Community:</b>	Llangoed
<b>NGR:</b>	SH6582
<b>NPRNs:</b>	424034, 527, 424033
<b>Scheduled Monument No:</b>	<b>ANo64 (Church &amp; monastic settlement)</b>
<b>Listed Building No:</b>	<b>5538 (Church &amp; monastic settlement)</b> <b>5529 (Telegraph station, Grade II)</b>
<b>Date of Investigation:</b>	2017 & 2018
<b>Report No.</b>	<b>CH/RCAHMW 10</b>
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<b>Date of Report:</b>	2023

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**OGL**

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Frontispiece. Ynys Seiriol or Puffin Island: the church from the south, 17 March 1929, photographed during the Royal Commission's survey for the 1937 Anglesey Inventory (Crown Copyright RCAHMW, DI2011\_3908).



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Royal Commission on the Ancient  
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## SUMMARY

This report describes new remote sensing, terrestrial and marine investigation undertaken on Puffin Island or Ynys Seiriol during 2017 (remote sensing collection and desk-based analysis) & 2018 (field survey and maritime survey) by the Royal Commission on the Ancient and Historical Monuments of Wales ('Royal Commission') and the Geological Survey of Ireland (GSI) as part of the EU-funded CHERISH Project.

Two visits were made to the island for fieldwork, on 21<sup>st</sup> June 2018 for laser scanning and photographic survey of the church and telegraph station and on 26<sup>th</sup> November 2018 for an Unmanned Aerial Vehicle (UAV) or drone survey of the church. The authors are grateful to the landowner, Sir Richard Williams-Bulkeley, for granting permission to access and survey the island on both occasions.

The new surveys have generated state-of-the-art 3D records of the medieval priory church and associated structures, allowing any future adverse change to be measured to within a few millimetres. The airborne laser scanning survey of the heavily vegetated island has allowed the woodland and undergrowth to be 'stripped away' revealing a previously hidden archaeological landscape of ridge and furrow cultivation, field boundaries, a newly-recorded promontory enclosure and new detail of the monastic settlement. The marine survey has precisely mapped the seabed around Puffin Island providing an up to date assessment of inshore shipwrecks whilst allowing a seamless onshore/offshore 3D map to be made of Puffin Island for the first time.

Based on this new survey work, a list of archaeological management recommendations has been provided at the end of the document with assistance from Cadw. The maritime survey produced recommendations for improvements to maritime charts in the form of Hydrographic Note H.102.



## CHERISH PROJECT BACKGROUND

CHERISH (Climate, Heritage and Environments of Reefs, Islands and Headlands) is a European-funded project led by the [Royal Commission](#) on the Ancient and Historical Monuments of Wales, in partnership with the [Discovery Programme: Centre for Archaeology and Innovation Ireland](#), [Aberystwyth University: Department of Geography and Earth Sciences](#) and [Geological Survey, Ireland](#).

The project commenced 1st January 2017 and will run for 6 years to June 2023; it will receive more than €5.9 million of European Union (EU) funds through the [Ireland – Wales Co-operation Programme 2014-2020](#), Priority Axis 2 – Adaptation of the Irish Sea and Coastal Communities to Climate Change.

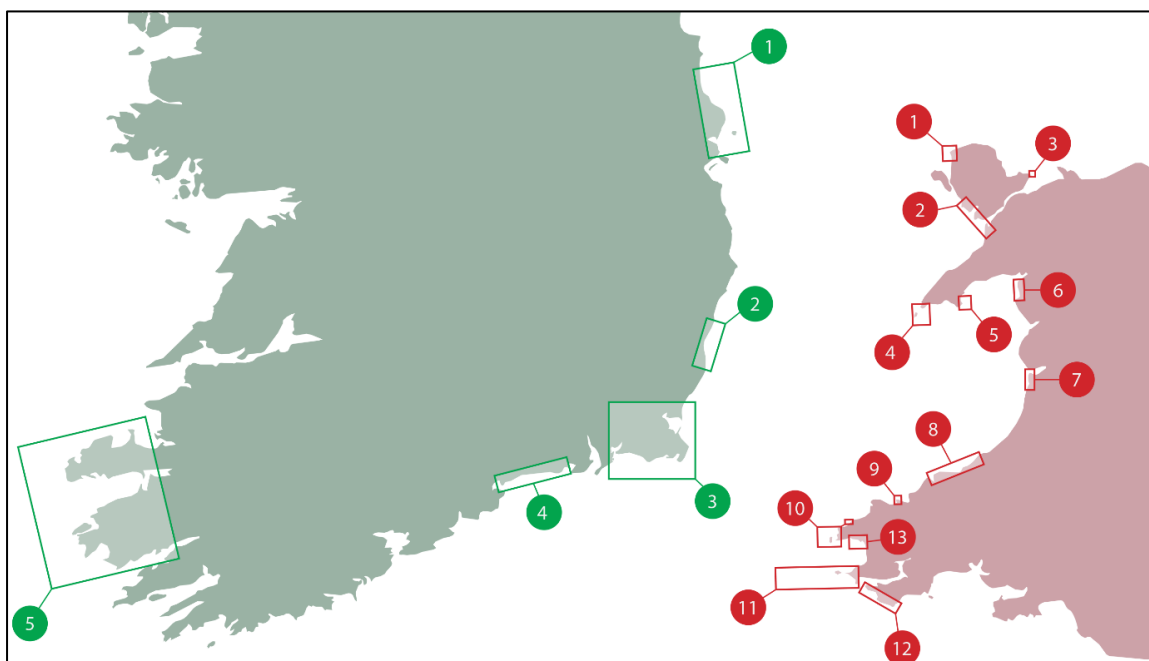


Figure 1: Map of Ireland and Wales showing the 17 principal project areas in both nations. Puffin Island is located in Wales, Area 3. (© CHERISH Project).

The key objective of CHERISH is to increase knowledge and understanding of the impacts (past, present and near-future) of climate change, increased storminess and extreme weather events on the cultural heritage of reefs, islands and headlands of Wales and Ireland. The project seeks to fill gaps in both data and knowledge for the coastal regions of Ireland and Wales, to develop a greater understanding of climate change impacts on fragile coastal heritage sites and to establish new metrical precision for the rural, coastal landscapes under study.

## INTRODUCTION

This report focuses on the archaeological survey of Puffin Island, principally the monastic settlement and remains of the Augustinian priory church, but including mapping of the wider landscape and inshore waters during 2017-2018 by the CHERISH survey team based at the Royal Commission and the Geological Survey of Ireland.

The report is in two halves. The first half summarises the archaeological background to the island, while the second details the new results of the CHERISH Project survey. With airborne, terrestrial and marine survey and mapping carried out, the project offered a unique opportunity to study the island using a multi-disciplinary approach.

Survey techniques used and covered in this report:

- Level 1 photographic survey of buildings
- Level 2 airborne laser scanning or LiDAR of the entire island
- Level 2 GIS-based mapping from LiDAR and historic aerial and map sources of the entire island
- Level 3 survey utilising terrestrial laser scanning and UAV photogrammetry of the monastic settlement and church
- Level 2 marine mapping of the inshore waters around Puffin Island.

### Fieldwork Aims and Objectives

The ruins of the church were selected for survey as a designated baseline study site for the EU-funded CHERISH Project (2017-2021) due to their general inaccessibility, their protected status and for the purposes of monitoring any change to the structures following conservation works to the tower circa. 2009 utilising accurate survey and remote sensing methodologies. The key aim of this investigation and survey at Puffin Island was to:

- Compile accurate new baseline surveys of the entire island including detailed baseline surveys of the masonry buildings of the monastic structures and church, to allow future condition and erosion/change monitoring.

The main objectives were to:

- To establish highly detailed and accurate datasets for sites and landscapes at immediate threat from erosion and that will benefit from repeat monitoring during and after the project;
- To identify the discrete types of erosional threats at an individual site level
- To provide some site management recommendations to site owners and managers based on findings;

- To provide recommendations for further survey at **Level 4** based on threats and significance of site.

## Acknowledgements

CHERISH would like to thank the landowner, Sir Richard Williams-Bulkeley Bt., for kindly granting access for two visits to the island, to John Ratcliffe at Natural Resources Wales for granting consent to work on the island and Dave Thorpe, NRW, for providing ground photographs of the church in winter 2018 prior to our visit, to Ian Halfpenney, Cadw, for granting scheduled monument consent for the survey and Jeff Spencer, Cadw, to Dr Jonathan Green of the School of Environmental Sciences, Liverpool University and part of the Puffin Island Seabird Research partnership who kindly assisted with our first field visit and other practical matters, to the staff of STARIDA boat charter for getting us to and from the island safely and to Jean Williamson for alerting us to the photo survey of the church of 1992. Thanks are due to the Cambrian Archaeological Association for permission to reproduce illustrations from Harold Hughes' 1901 article about Puffin Island from *Archaeologia Cambrensis*.

Laser scanning and fieldwork was carried out by CHERISH personnel from the Royal Commission on the Ancient and Historical Monument of Wales (RCAHMW), assisted by Jeff Spencer from Cadw, on 21 June 2019. A further visit to undertake a UAV survey for photogrammetry was carried out on 20<sup>th</sup> November 2018. The marine mapping was carried out by CHERISH personnel from the Geological Survey of Ireland in the summer of 2018, with permission from the Marine Policy Unit of the Foreign and Commonwealth Office.



Figure 2 CHERISH Team members Louise Barker (L) and Dan Hunt (R) with Jeff Spencer from Cadw (centre), 21 June 2019, approaching the southern cliffs of Puffin Island (© CHERISH Project: CH2019\_086\_002).

## SITE BACKGROUND

### Site Location

Puffin Island lies 780m off the mainland of Anglesey in north Wales, separated from Penmon Point by a fierce tidal race through Puffin Sound dominated by Penmon or Trwyn Du lighthouse and a buoy on Perch Rock. The strongest currents through the Sound are associated with northerly winds or swell (NRW 2015, 4). The narrow, elongated island, orientated south-west/north-east, is composed of Carboniferous Limestone rising to 58m. Cliffs form its south-eastern margin, sloping gradually to the north-western side of the island, with lower, isolated cliffs located. There is a tidal pebble beach at the south-west point, West Spit, facing the mainland which was used as the landing point for recent fieldwork, and where the only accessible paths give access to the high ground of the interior.

Puffin Island is home to the monastery of Priestholm, thought to have been an early medieval foundation of which the listed and scheduled tower of the Augustinian priory church is the most visible element. Wider structures of the monastic settlement surveyed in the early decades of the twentieth century are now heavily overgrown. The remains were surveyed in detail and described by the Royal Commission in 1937, building on earlier antiquarian surveys and excavations. Only in 2017 has the new LiDAR survey of the entire island highlighted some of the problems and inaccuracies with this 1937 survey. The only other substantial building on the island is the listed ruin of a 19th century Telegraph station at the north-east point.



Figure 3 'Puffin Island off Anglesey' by William Daniell. This view seems to show the north cliffs (also seen in Figure 4) looking east towards Great Orme's Head (1815. © Crown Estate 2013; reproduced in Natural Resources Wales 2015, 3).

Puffin island is a [Special Protected Area \(SPA\) and also a Site of Special Scientific Interest \(SSSI\) for its Cormorants](#). It is home to at least 10 species of seabird including Puffins, Guillemots, Razorbills, Cormorant, Kittiwakes, Herring Gulls, Great and Lesser black-backed gulls, Fulmars and shags. Since 2009 seabird research on the island has been coordinated through the SCAN ringing group working with the Universities of Liverpool, Roehampton and Bangor and the RSPB ([www.puffinidland.org.uk](http://www.puffinidland.org.uk)). There is no public landing allowed without the prior permission of the landowner.



Figure 4 Seabirds on the north-western cliffs of Puffin Island, 21 June 2018 - CH2019\_086\_011

## ARCHAEOLOGICAL CONTEXT

### The monastery of Priestholm: NPRN 527, PRN 5017

The monastery on Puffin Island or Priestholm was associated with Penmon Priory on the nearby mainland of Anglesey (NPRN 95543), itself an Augustinian house when it was granted to the Prior and Cannons of Priestholm in 1237. Following this the Prior of Priestholm shifted to Penmon. There are remains of a church, notably the twelfth century tower predated by the remains of an earlier shrine on the east side, and other contemporary and earlier monastic buildings, ranged within and about a walled enclosure. New airborne laser scanning of the island (described below) has revealed a wider system of fields and ridge and furrow cultivation associated with the monastic settlement.

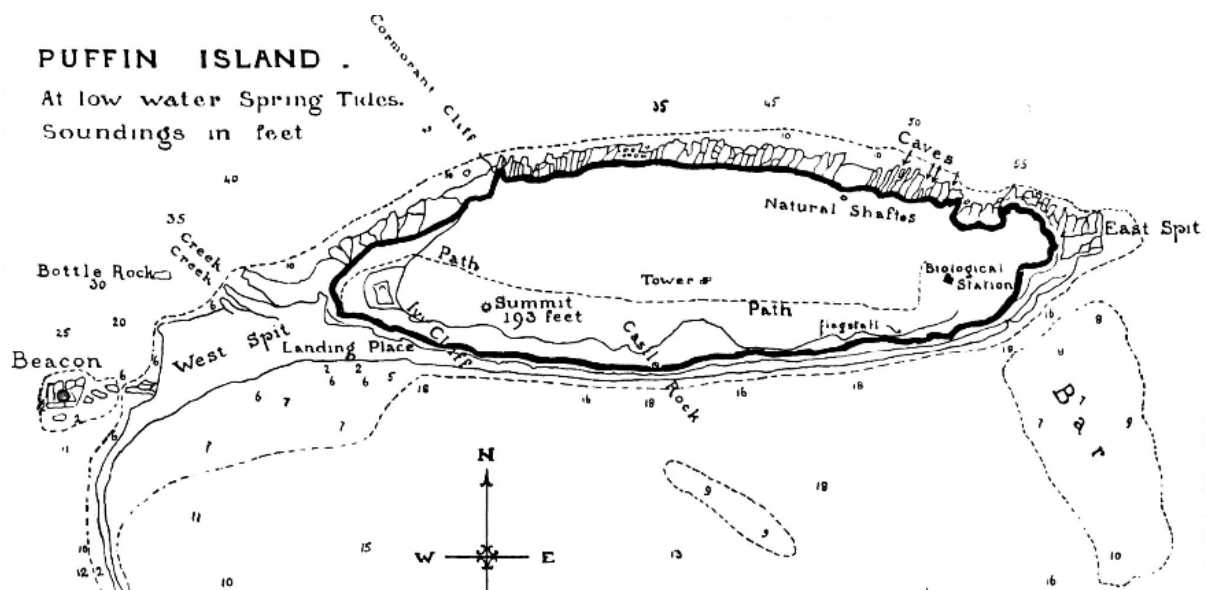


Figure 5 Map of Puffin Island by Harold Hughes 1901, used as a frontispiece in his article. Note the 'flagstaff' marked on the south-east cliff line near the Telegraph station (reproduced with permission of the Cambrian Archaeological Association).

Burton and Stober (2015) note the alternative name of Ynys Lannog (Priest's Island) for the island, and that the Augustinian Priory was dedicated to St Seiriol in the diocese of Bangor. Harold Hughes (1901, 86-7) reviewed the early historical literature. He notes one of the earliest references that in 629 Cadwallon, during a war with Edwin of Northumbria, was blockaded on the island, and a record that the priory was sacked by Danes in 968. The Gwynedd Archaeological Trust (PRN 5017) note that; 'The monastic site... was first mentioned by Giraldus Cambrensis in 1188'. Among the limited historical records for the priory reviewed by Burton and Stober are a number of charters issued by Llywelyn ab Iorwerth, prince of Gwynedd in the 1220s and 1230s recording donations of land to the canons of Ynys Lannog, these being the earliest reference to canons at Puffin Island.

The church and monastic enclosure and buildings were initially surveyed – almost at a schematic level - by Herford Hopps in the summer of 1868. Hopps (1869, 168) clearly had problems with summer vegetation, noting that some foundations west of the church were '... too indistinct to be measured with any degree of accuracy, owing chiefly to the luxuriant growth of nettles.'

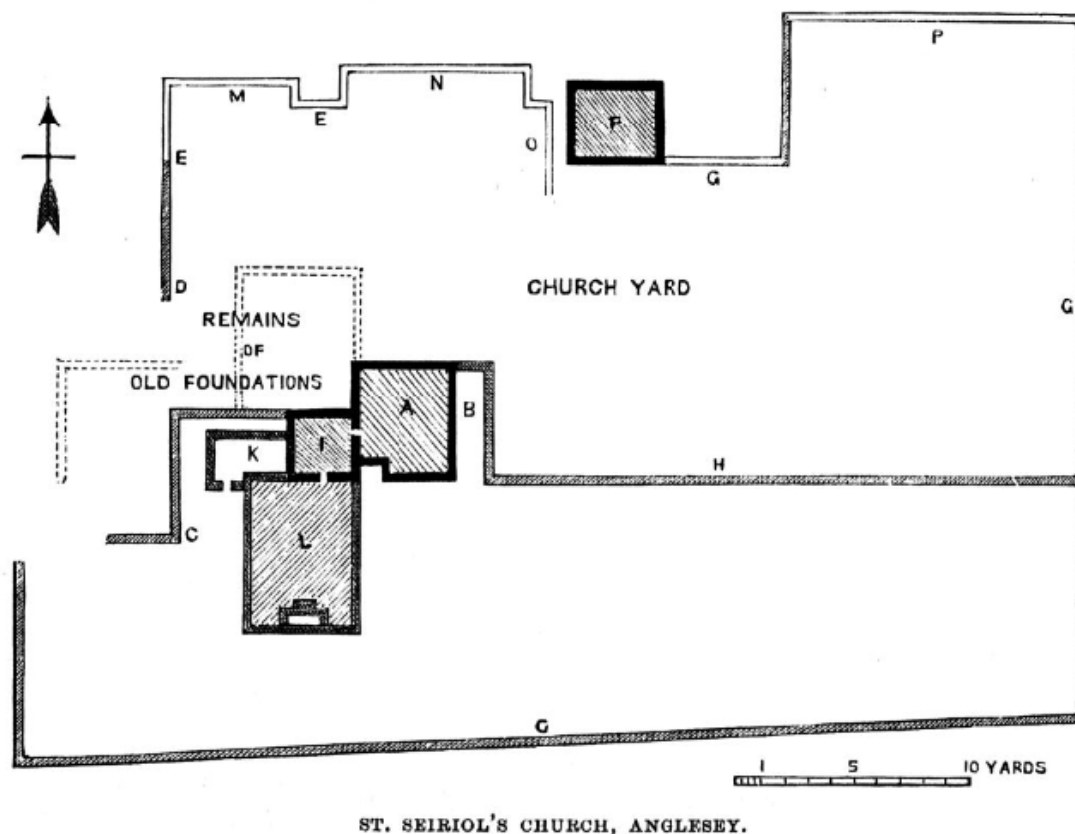


Figure 6 Schematic plan of church and monastic enclosures by Herford E. Hopps 1869. Note the 'church yard' where remains of skeletons were unearthed (reproduced with permission of the Cambrian Archaeological Association).

The church was re-surveyed by Harold Hughes for his 1901 article, which included elevation drawings of the tower and architectural details as well as an excavation of the eastern Chancel (described below). While the church was not revisited in any detail for the Royal Commission's 1937 Anglesey Inventory, the wider remains of the monastic enclosure and stone cells were surveyed, and still stand as the best detailed survey of the monastic settlement. It would be impossible to re-survey the same structures on the ground today as they are heavily overgrown with alder woodland, ivy and scrub vegetation. That said even in 1937 the remains were described as being in a 'dilapidated condition' (p. 142) with the outer wall of the oval monastic enclosure surviving as a 'collapsed boundary.. now nowhere more than 1ft high'. The new 2017 LiDAR survey has been able to 'see through' the dense vegetation to provide the most up to date overview of the island's structures since 1937, and confirms and adds to much of the detail while allowing us to revise the spatial accuracy of the plan (see below).

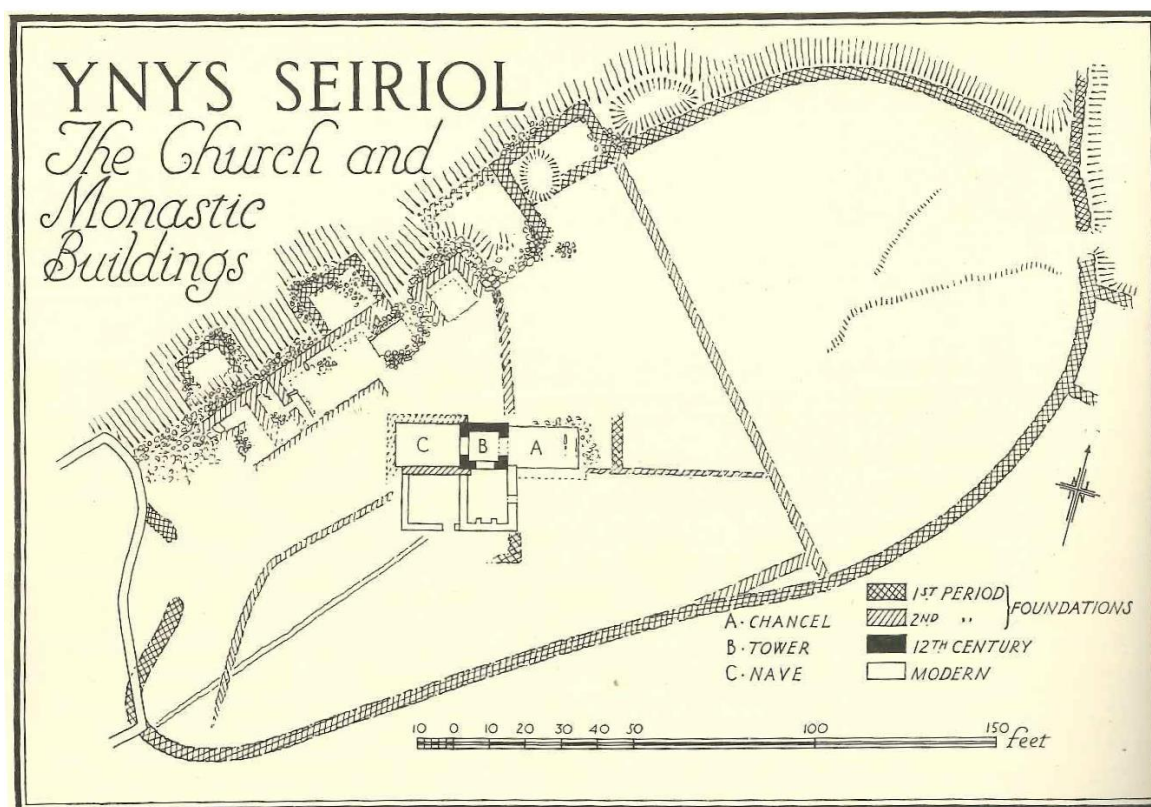


Figure 7 The main oval monastic enclosure as surveyed by the Royal Commission in 1937 (Crown Copyright RCAHMW).

The Royal Commission (*ibid.*, 142-3) describe the church and monastic buildings surviving within a roughly oval enclosure or 'cashel' enclosing around  $\frac{3}{4}$  acre (0.3 hectare). The earliest parts of the enclosure 'distinguished by the small size of the stones employed... [and] apparently built without mortar' were assumed to be 'certainly older than the 12<sup>th</sup> century and... possibly as early as the 7<sup>th</sup> century'. The boundary wall is generally oval with a clearly inturned entrance on the west side and a simple gate on the east side.

Along the north-western side of the enclosure, said to follow the crest of a steeper slope, are a series of square and rectangular building foundations. The Royal Commission identifies three or four rectangular cells about 12ft wide and varying in length between 10-25ft, assumed to be of earlier character. These are slighted in places by the remains of 'irregular huts'. Later remains comprise 'a series of more elaborately built rooms about 12-15ft wide... along the inner side of the northern wall of the main enclosure and partly superimposed on the earlier buildings'. The Royal Commission note these are 'very ruined' but are built of larger, mortared stones and preserve details like a series of covered drains.



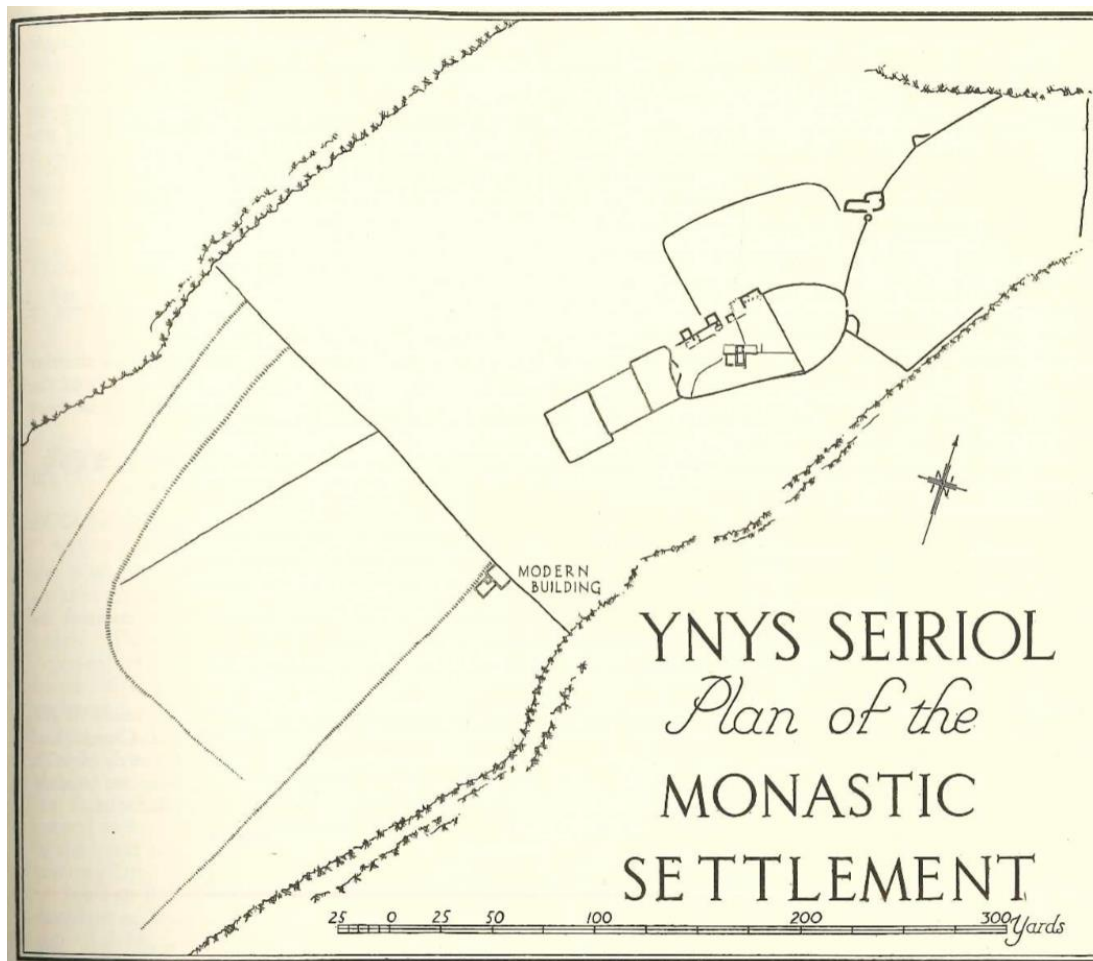


Figure 8 The wider remains of fields and enclosures associated with the monastic settlement as surveyed by the Royal Commission in 1937. Compare with the new LiDAR survey in Figure 34 (Crown Copyright RCAHMW).

This oval monastic enclosure, of at least two phases, is dominated by the medieval church at its centre, and was later subdivided; a main NW/SE wall ‘formed of two rows of upright stones’ (RCAHMW) bisects the enclosure towards its east end with the church constructed in the western half, from which three further smaller walls radiate forming distinct enclosures. The Royal Commission ([. 143) describes the northeastern one as likely to be the cemetery ‘since many human bones are said to have been found there’. This probably refers to Hopps’ (1869, 169-170) description of many ‘bits of bone’ being brought to the surface in the area by rabbits. His observation clearly led to a wider informal excavation discovering bones ‘at about eighteen inches from the surface’, with leg bones, jaw bones and vertebrae unearthed. He notes no sign of ‘kist or coffin’ but the skeletons were covered by small pebbles and limpets, and capped with flat slabs. Together with Hughes’ excavation of burials in the chancel there is clearly potential for future survey or geophysics here if sufficient vegetation clearance could be carried out.

Connected to the main oval enclosure are a series of wider enclosures comprising three conjoined square field enclosures to the west considered to be contemporary with the monastic settlement by the Royal Commission, and a larger polygonal enclosure to the north with an additional building in its eastern corner.

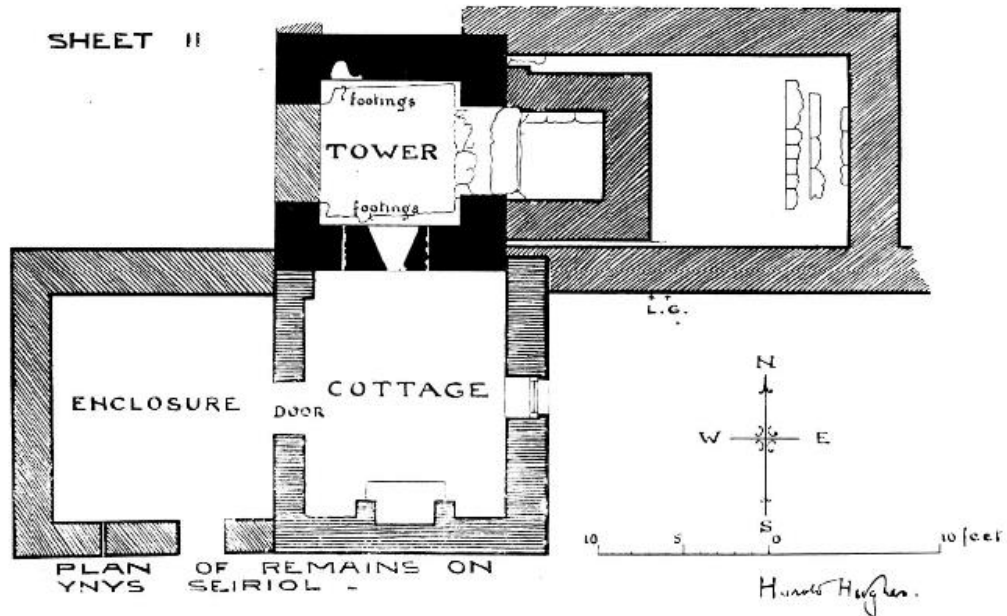


Figure 9 Plan of church by Harold Hughes 1901, 90-91. (Reproduced with permission of the Cambrian Archaeological Association).

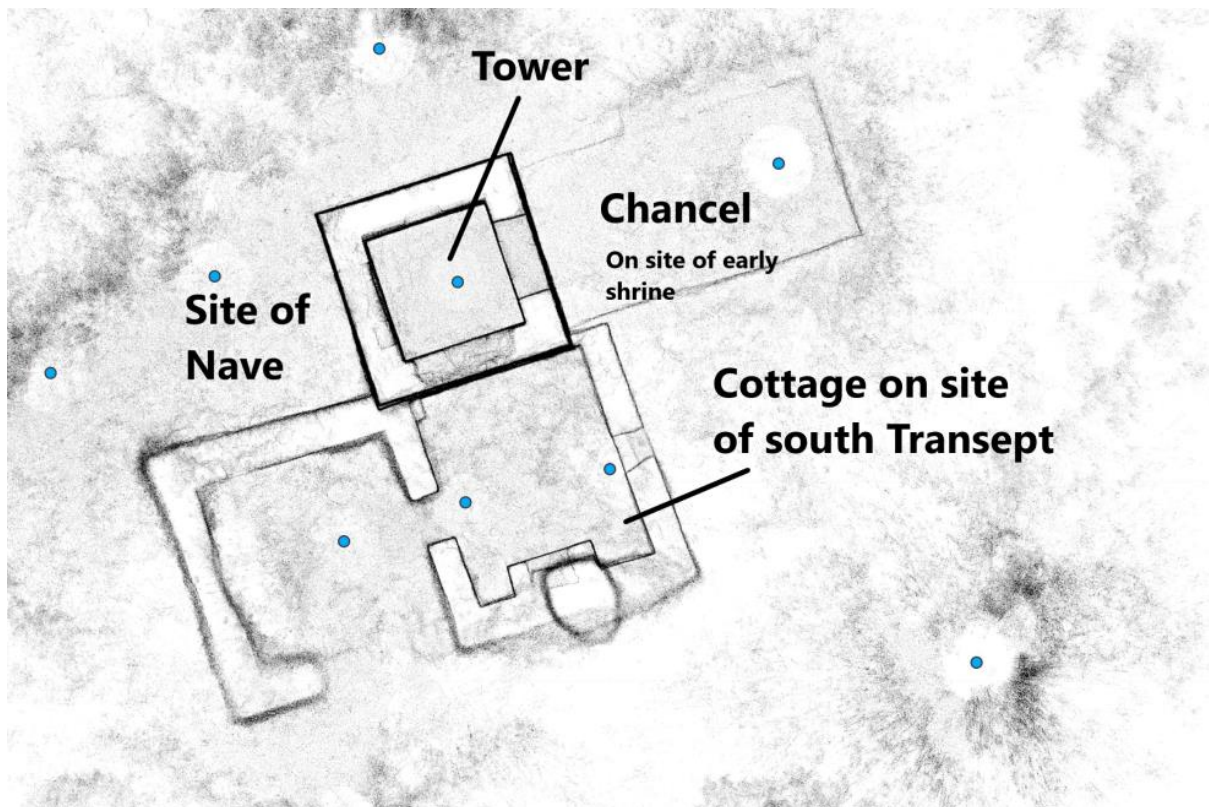


Figure 10 Labelled plan of Priory Church based on 2018 laser scanning survey (CHERISH Project).

### The priory church: NPRN 424033

The church stands within the western half of the subdivided monastic enclosure. The Romanesque tower (Gwynedd Archaeological Trust (GAT), PRN 7310) is a notable landmark on the otherwise featureless island. While the Royal Commission (1937) considered the tower to be of 13<sup>th</sup> century date, GAT (in PRN 5017) cite Edwards (1984) and note: 'The church tower, the principal remaining structure, is probably of mid 12th century date'; it is likely it superseded an early church of which a small chancel or shrine with a vaulted roof is the only survivor.

Burton and Stober (2015, 170) describe it as a '.. a striking sight, standing on elevated ground on this otherwise bare island', although the use of the term 'bare' perhaps belies the lack of a modern site visit to the severely overgrown remains. The tower's role as a 'seamark' in coastal trade is described by Redknap (2019) who notes; 'Church towers and chapels also acted as sailing marks, sometimes operated by monks. The medieval chapel on Ynys Seiriol, Anglesey, at the northern entrance to the Menai Strait, may have functioned as such'.

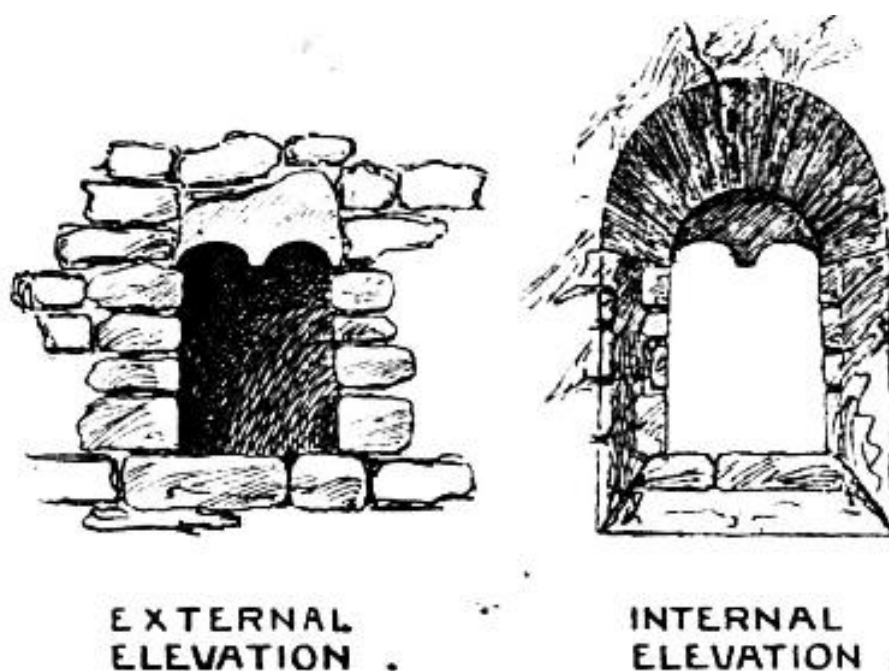


Figure 11 Ynys Seiriol. Belfry light in the upper south wall of tower (detail); external and internal drawings by Harold Hughes (1901, 93) obtained by scaling the tower using a rope. Only half of the decorative stone lintel now survives, supported by a metal frame inserted during recent conservation works (Reproduced with permission of the Cambrian Archaeological Association).

The most comprehensive survey of the church in pre-war times was carried out by Harold Hughes in the final years of the nineteenth century and published in his 1901 article. He produced a plan and elevations of the church, drew architectural details of the tower and carried out excavations in the chancel to the east of the tower revealing burials. His architectural observations both from within and outside the tower, obtained by climbing up the southern elevation using a rope (*ibid.*, 92) still stand as a useful record (see Fig below).

The church comprises a central tower (B on the 1937 Royal Commission plan) which rises through two stages to a squat low pyramidal stone roof. The crossing has plain round headed arches in the east and west walls both built of rubble with chamfered imposts. Above the centre of the east arch is a Roman box tile built into the wall. The Royal Commission planned the footings of the Nave on the west side in 1937 but this could not now be traced with any certainty on the ground. The site of the south transept was occupied by a later cottage, habitable in 1896 and roofed in 1937 but now ruinous.

### **The eastern chancel: burials and a ‘cella memoriae’ or shrine**

Excavations in 1896 by Harold Hughes (1901) uncovered a small early chancel on the east side buried under 2ft 7incs of debris (*ibid.*, 94) which the Royal Commission (1937) suggested could pre-date the tower which appears to bear the scar of its vaulted roof.

Lower down in the excavation inhumation burials were discovered. Longley and Richards (2000, 27) summarise the importance of these early structures for the monastery on Preistholm:

‘The early structures in the sequence of buildings which stood to the east of the surviving twelfth century tower [have].. an intriguing quality to them. The small square masonry structure [Hughes’ early chancel] appears to have been built as a chancel to a church pre-dating the Romanesque tower, although it stood for long enough to be incorporated in it. Excavations in 1896 identified a single burial inserted into a rock cut depression... within this chancel. There was barely enough room and knees had to be bent to fit.

Six further burials were recorded immediately to the east... The alignment of the grave in the chancel was east-west in line with the structure; those outside were aligned west-south-west/east-north-east. The early chancel is very small indeed and has the look of a shrine. A later, extended chancel replaced it, while the Romanesque tower remained in use.’

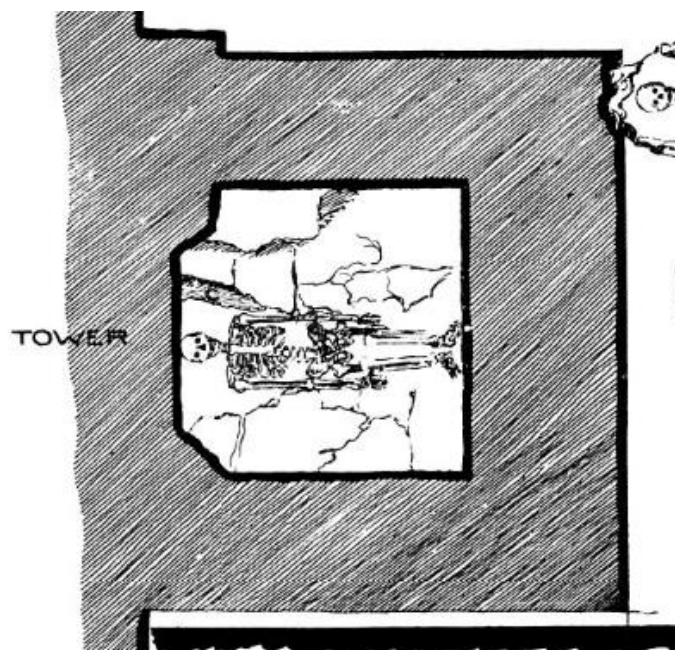


Figure 12 The eastern chancel. Detail of the small early chancel or shrine excavated by Hughes in 1896 containing the single east-west burial with its knees bent to fit the small space. Compare with Figures 13 & 14 below (Hughes 1901, 96-7; Reproduced with permission of the Cambrian Archaeological Association).

The Gwynedd Archaeological Trust (PRN 5017; Thompson 1986; Davidson *et al.* 2002; Davidson 2004) visited the church in 1986 and summarised the structural sequence as well as commenting on the structural condition:



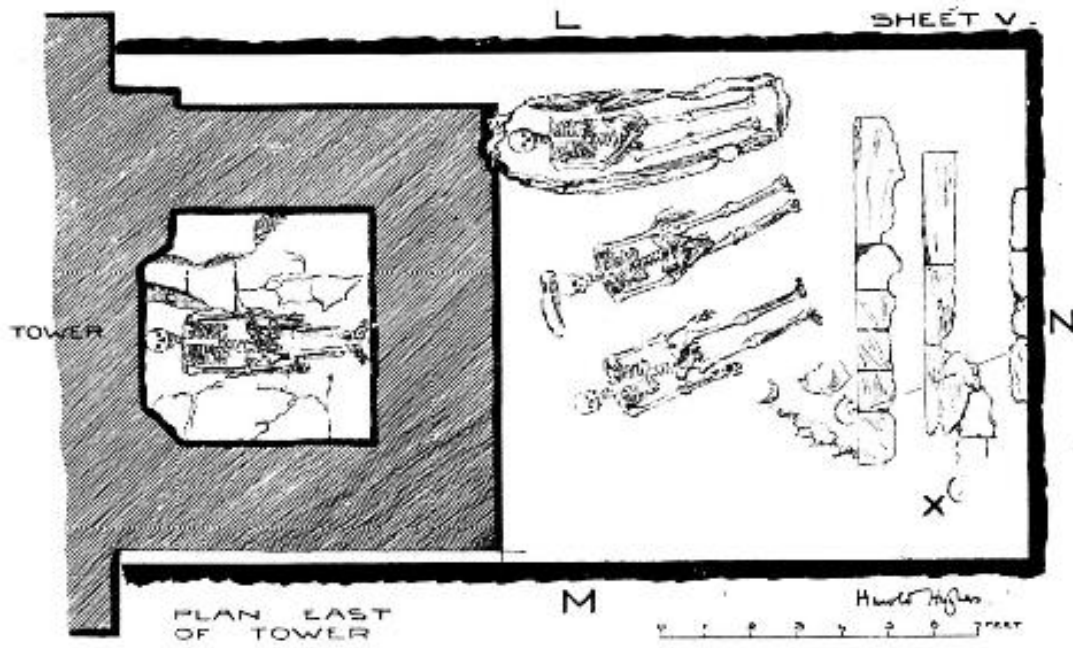


Figure 14 The eastern chancel. Lower level excavation plan showing burials (Hughes 1901, 96-7; (Reproduced with permission of the Cambrian Archaeological Association).

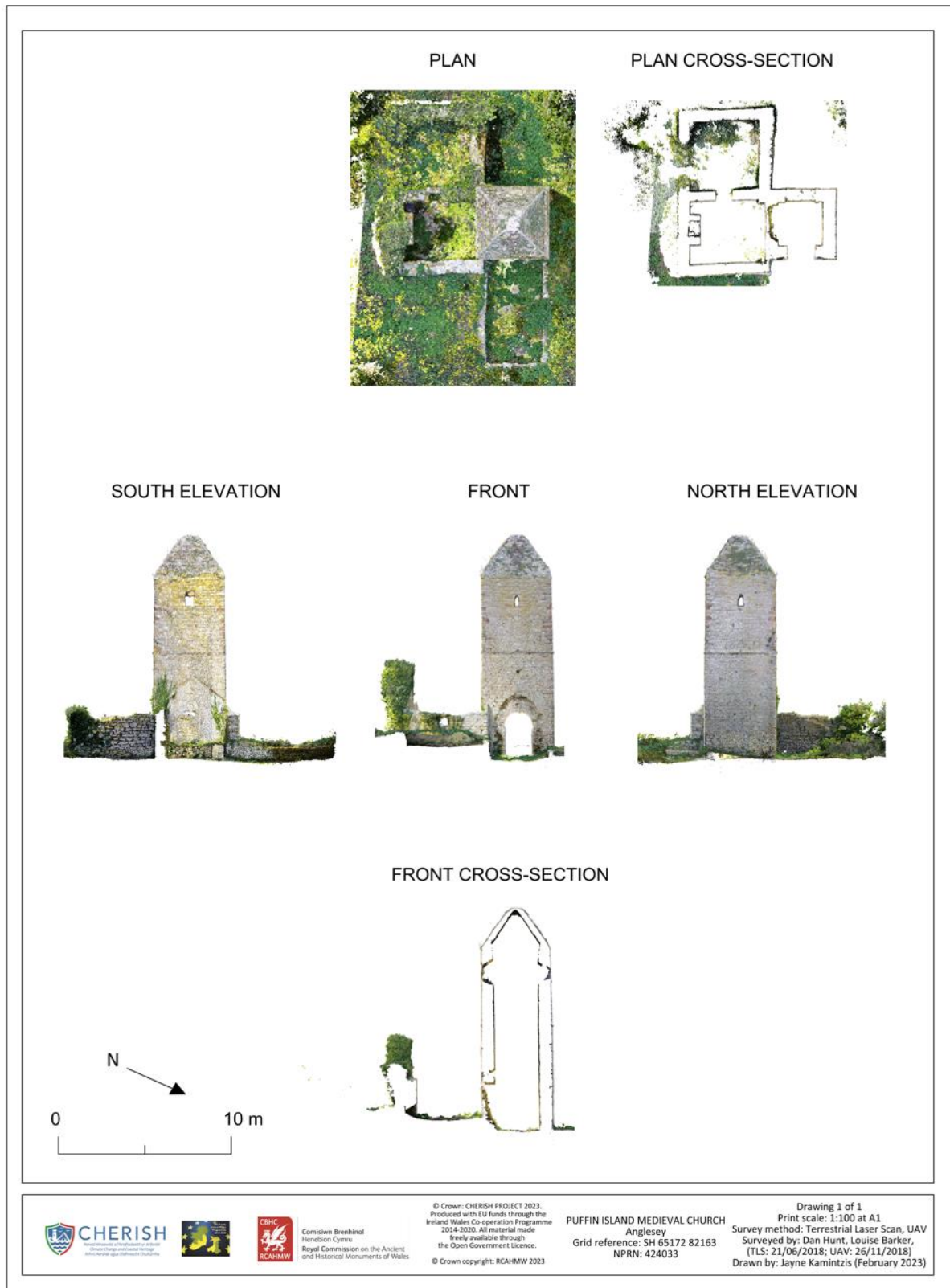


Figure 15 Digital plans, elevations and section of the church tower produced by combining terrestrial laser scan data with drone photogrammetry data. (RCCS22\_3\_01 Drawn by Jayne Kamintzis 2023).



## The island in post medieval times: rabbits and tourists

Hughes (1901, 89) reviews the literature for the post medieval history of the island, noting that the island may have been inhabited until the dissolution. The island then remained in the hands of the Crown, though leased out, until it was passed to J. Moore by way of purchase on 29 April 1564. The proximity of the island to the mainland, and the visibility of the church tower from afar, has long made the location popular for tourists, naturalists and antiquarians. By 1775 the island appears to be deserted but was ‘... much frequented in summer, as having great plenty of sea-fowls and rabbits, objects always agreeable to the sportsman.’ (*ibid.*). Hughes’ excavations in the chancel on the east side of the tower produced ample evidence for the church tower remaining a focus for visitors through the ages. In the upper levels he found; ‘... fragments of modern pottery and bottles, numerous oyster shells, a large number of clay smoking pipes, dating from the reign of Elizabeth to modern times..’ (*ibid.*, 95).

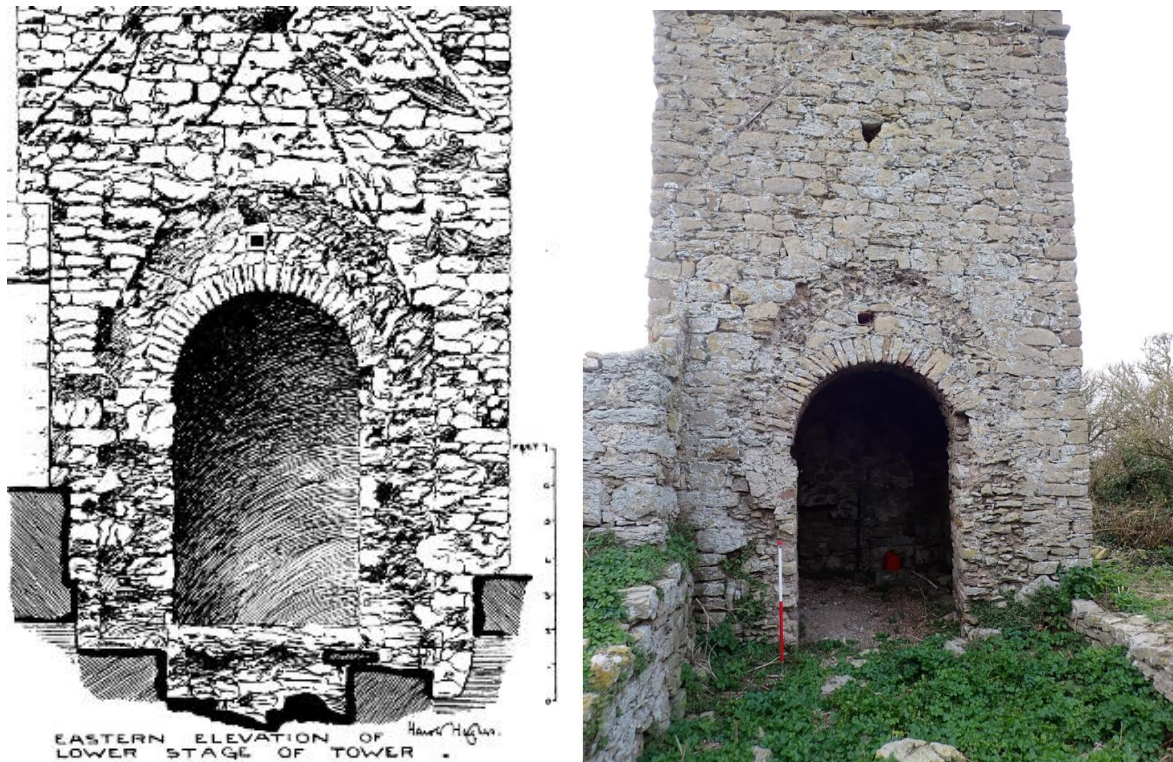


Figure 16 (L) Elevation of the east wall of the tower showing lower courses revealed by Hughes’ excavations, depicting the previous imprint of the vaulted roof of the earlier eastern chancel, predating the medieval tower; (R) the same view in November 2018 (Hughes 1901, 97; Reproduced with permission of the Cambrian Archaeological Association; © CHERISH Project CH2019\_106\_001).



Figure 17 [The church tower in November 2018](#) rising above the local vegetation. (© CHERISH Project. Archive no. 6522905)



Figure 18 Two contrasting views show Puffin Island in two different seasons, 3 years apart; The church tower remains a prominent feature of the island from the air in this view from the south-west on 21<sup>st</sup> June 2019 (© CHERISH Project, CHE\_21\_06\_2019\_168)



Figure 19 Two contrasting views show Puffin Island in two different seasons, 3 years apart; from the south-west on 11<sup>th</sup> Feb 2016 (© Crown Copyright RCAHMW, AP\_2016\_0199).



Figure 20 The steady deterioration of the cottage standing on the site of the south chancel can be seen in these three contrasting views of the church from the east (L, 1929; C, 1960s) and southeast (R, 2018). (Crown Copyright RCAHMW (views 1 & 2); View 3 supplied by Dave Thorpe, NRW, copyright reserved).

## The Telegraph Station: NPRN 23477

### Cadw's listing description; Asset 5529, designated 1968

A former Telegraph Station, built in 1841, and one of the original stations on the Holyhead to Liverpool Telegraph which first operated in 1827. The Census Returns for the parish in 1841 record that James Adams, a signalman from Cornwall, lived at the station, along with his wife and 2 young children. The Adams family occupied the station until the 1860s; the Census Returns for 1871 records the 'Puffin Island House' as unoccupied. In 1887 the station was converted from a Dock Board Observatory to a Biological Station. The building is now derelict. **Additional note:** Hughes (1901, 86) notes the former Telegraph station had by then been converted to a 'biological station' under the directorship of Professor of Zoology Dr P.J. White at the University College of North Wales. His frontispiece map (see Figure 5 above) also notes a 'flagstaff' to the south-west of the station, the position of which has not been located in modern times.



Figure 21 Aerial photographs of the ruins of the Telegraph Station above East Spit, 11<sup>th</sup> Feb 2016 (Crown Copyright RCAHMW, AP\_2016\_0202 (L) and 0203 (R)).

### Photographic Survey of the Telegraph Station, 21<sup>st</sup> June 2018

The ruins were visited by Royal Commission survey staff for the EU-funded CHERISH Project on 21 June 2018 accompanied by Jeff Spencer from Cadw. The 1841 remains comprise a square, roofless brick building with four rooms arranged around a central chimney, and fireplaces serving each room. The building is entered by doors on the east and north sides, with steps descending into the ruin on the north side. Extending from the north-west corner of the building is a long observation/signalling room culminating in a panoramic curving window now represented by the rusting remains of vertical frames.

Set externally on the south wall is a dressed stone engraved plaque pronouncing; 'PUFFIN ISLAND TELEGRAPH, Built in 1841 by the TRUSTEES of the LIVERPOOL DOCKS'.

A low stone structure (Figure 24) of rougher stone construction is sited some 10m to the north-east of the telegraph building (NPRN 000, NEW TO THE RECORD). It may be an ancillary structure or store, or the remains of an earlier farm building. See Large (1998).



Figure 22 The Telegraph Station: interior view of ruin, June 2018, showing vegetation and elder/buddleia taking hold, and collapsed brickwork (© CHERISH Project: CH2019\_098\_002)

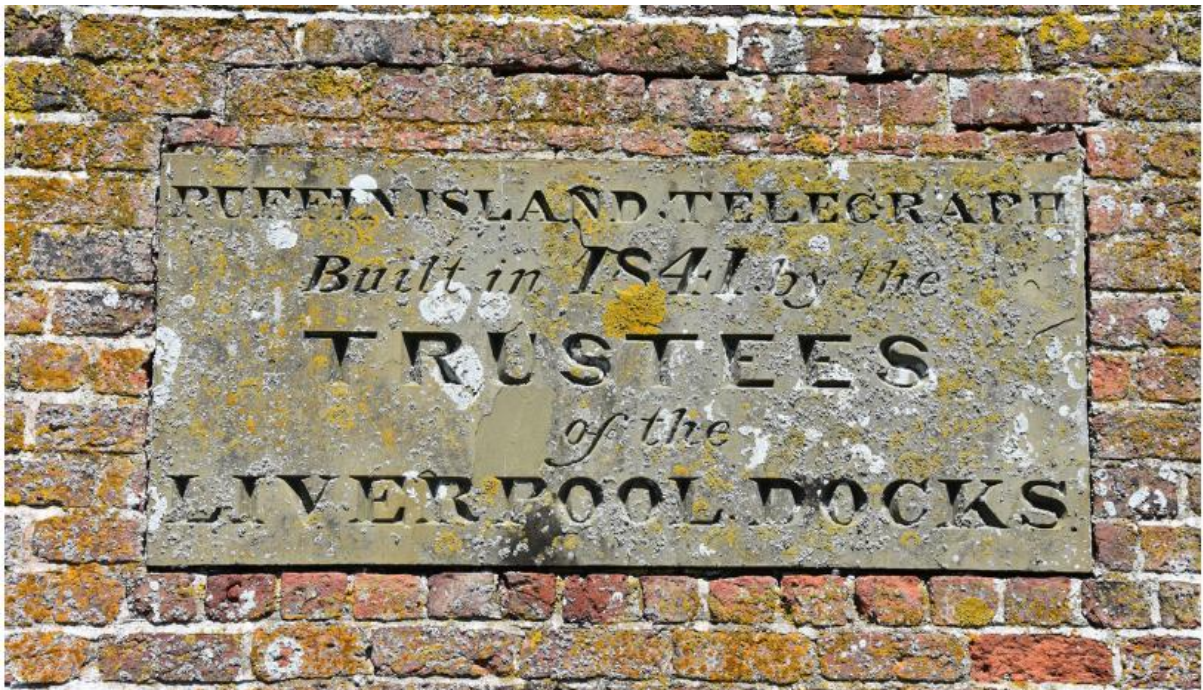


Figure 23 External stone plaque on the south wall, 21 June 2018 (© CHERISH Project: CH2019\_100\_001)

## GEOMORPHOLOGICAL CONTEXT

Puffin Island is composed of Carboniferous Limestone, rising to 58m OD Newlyn. Cliffs form its south-eastern margin, sloping gradually to the north-western side of the island, with lower, isolated cliffs located. There is a tidal pebble beach in the south-west. The island is a strongly recognisable coastal landform, lying almost exactly opposite Great Orme, sitting between Colwyn and Red Wharf Bays (NRW 2015, 3). The seabed is... complex; defined by a combination of mudstone and sandstone, interrupted by thick, staggered bands of Carboniferous limestone linking Great Orme's Head with Puffin Island.. (*Ibid.*).

## PREVIOUS WORK

Herford E Hopps published a plan in 1869 of the monastic enclosure and church, also reporting on informal excavations on the churchyard within the north-east quadrant of the enclosure. He introduced his article by noting a rich antiquarian tradition of descriptions for Ynys Seiriol, saying; 'The church... has been so frequently described by various antiquaries...' Subsequently Harold Hughes (1901, 86) described how he and his colleague Dr White had been 'engaged since 1896 in examining and excavating the ancient remains, at intervals, as opportunity permitted..'. The Cadw Historic Assets Database (HAD) note part-excavations in 1894 and 1896. Hughes published a comprehensive account in 1901 of the development and architecture of the medieval church including numerous plans and elevations which have stood the test of time.

The National Monuments Record of Wales has an archive of Royal Commission investigator's photographs of the church tower taken on 17 March 1929 while the Cadw HAD notes a full survey by the Royal Commission of the church and monastery in 1930, both contributing to the published account in the 1937 RCAHM *Anglesey Inventory*.

In the post-war period the church tower and telegraph station were both listed on 30<sup>th</sup> January 1968, suggesting an initial inspector's visit by the Ministry of Works during the later 1960s. The Cadw Historic Assets Database (HAD) records Field Monument Warden visits to AN064 on: 5 Aug 1986, 29 May 1992, 6 July 2010 when the Countryside Council for Wales cut a path to the site, and 21 June 2018, with the CHERISH Survey Team.

In terms of survey and conservation, GAT carried out a part survey in 1986 noting '... tower had deteriorated since the 1930s' (described above) while in June 1992, photographers Jean Williamson and Mick Sharp were contracted by Cadw to provide rectified photography of the inside and outside of the tower before conservation work began.. The Cadw HAD describe an additional Inspector's visit on 31 Aug 1995, probably in connection with recording/conservation work underway at that time including the repointing of the tower. Further conservation work was carried out circa 2009.

## Designations and Scheduling

Puffin Island is an SPA for its large populations of puffin and breeding cormorant, and also a SSSI. The church & monastic settlement are scheduled as ANo64 and is also a Grade II Listed Building No: 5538. The Telegraph station is Grade II Listed Building No: 5529.



Figure 24 Designated assets on Puffin Island: scheduled monument (red polygon) and listed buildings (blue points). (Cadw: Cof Cymru accessed 30-03-20; Crown Copyright).



Figure 25 Puffin Island Telegraph Station, 21 June 2018: low stone structure 10m north-east of the station building, of uncertain function. It may be an ancillary structure or earlier farm building. Scale 1m (CHERISH Project CH2019\_097\_005).



## CHERISH PROJECT SURVEY

### Methodology: Aerial Survey

Comprehensive aerial surveys of Puffin Island were carried out in a Cessna 172 light aircraft for the CHERISH Project on 11<sup>th</sup> February 2016 (detailed winter sortie in low light, building evidence for the forthcoming project), 4<sup>th</sup> July 2018 (during intense drought) and on 21<sup>st</sup> June 2019 (for landscape views) to review and identify archaeological features in different seasonal and lighting conditions.



Figure 26 Puffin Island at the height of the 2018 drought on 4<sup>th</sup> July 2018 (CHERISH Project, AP\_2018\_2293).



Figure 27 The heavily vegetated surroundings of the church, seen in winter conditions on 11<sup>th</sup> February 2016 (© Crown Copyright RCAHMW, AP\_2016\_0205).



Figure 28 Pleasure boat below the Carboniferous Limestone cliffs of Puffin Island, 21<sup>st</sup> June 2019  
(© CHERISH Project, CHE\_21\_06\_2019\_171).

## Methodology: LiDAR capture and processing.

At the start of the project, existing LiDAR coverage for the Welsh coastline and islands was poor. Significant stretches of coast lacked any LiDAR data more accurate than 2m resolution, and data better than 0.5m resolution required for archaeological interpretation and mapping was absent for substantial stretches of the Welsh coast. No LiDAR existed for the principal Welsh islands including Skerries, Bardsey, the St Tudwals Islands, Ramsey and Grassholm; the 0.5m LiDAR covering Skomer and Skokholm was itself purchased for archaeological purposes by the Royal Commission in 2011 (Barker *et al.* 2012) and the western part of Puffin Island was crossed by an incomplete swathe of 2m LiDAR data associated with survey of the adjacent mainland.

In early February 2017 the Royal Commission tasked Bluesky International LTD to fly 0.25m ‘leaves off’ and ‘leaves on’ LiDAR data for the six Welsh islands at low tide (Driver and Hunt 2018). The survey was carried out during the winter on 24th February 2017 when vegetation was at its lowest. The timing of the survey was also coincided with the low tides of the day to ensure maximum data of the island’s landmasses was captured.

The resulting LiDAR offered new and unparalleled views of the archaeological landscapes of these key Welsh islands and has provided an absolute fix (within the accuracy tolerances) on the topography and eroding coastlines of these islands for the purposes of future monitoring of climate change impacts and the modelling of sea-level rise scenarios. The technique had a particularly significant impact for Puffin Island where dense vegetation obscures all the significant archaeology around the monastic settlement; the Digital Terrain Model (DTM) which effectively ‘strips away’ vegetation was able to offer a view of the Puffin Island landscape and its archaeology, without woodland or dense vegetation, for the first time in decades.

Eight visualisations for each of the six Welsh islands were created from the LiDAR data using the Relief Visualization Toolbox (RVT), developed by the Institute of Anthropological and Spatial Studies of the Research Centre of the Slovenian Academy of Sciences and Arts (ZRCSAZU) funded through the Slovenian Research Agency and ArchaeoLandscapes Europe project (Kokalj, *et al.* 2013). The following visualisations were created:

- 16 band multi directional hillshade
- Open positive
- Open negative
- Slope
- Simple local relief model
- Sky view factor
- Local Dominance

Each visualisation retained its original positional data, which meant they could be imported into programs such as ArcGIS as geo-referenced rasters for further processing and interpretation.

As well as viewing the LiDAR visualisations in ArcGIS other software was used to assist in the interpretation of features which were not clear on the 2d visualisations. For this, Applied Imagery's free Quick Terrain Viewer soft used which can be found here: <http://appliedimagery.com/download/>. Using this software enabled a virtual light source to be moved around the model in real-time to illuminate it from different heights and angles. This meant that extra details not clearly visible on the 2d visualisations could be assessed in closer detail and more confident interpretations could be made.

## **Transcribing from aerial sources including LiDAR**

All archaeological features were transcribed using established conventions adapted by CHERISH from Historic England's standard mapping conventions used for their National Mapping Programme (NMP) project (Winton, 2010). Ditches and depressions were mapped as green polygons, raised banks as red polygons and structures as purple polygons. Existing records for archaeological features were updated and new records were created for newly discovered features. The relevant Monument Numbers were attached to each feature in ArcGIS via an attribute table.

ASCII data collected during the LiDAR survey of the islands was utilised to compensate for changeable height in terrain at the site and imported into ArcGIS for interpretation and transcription. In the event georeferenced historic aerial photographs were not used for the transcription due to the strength of the LiDAR sources and the restricted nature of the archaeological remains across the summit plateau of the island.

Transcriptions of all features were produced using Esri's ArcGIS Desktop 10.5.1 by importing geo-rectified aerial photographs and lidar visualisations. Monument records were updated and created in National Record for the Historical Environment for Wales (NRHE) database. These are available online via the Coflein website (<http://www.coflein.gov.uk/>).

## Results of the new LiDAR survey

The 0.25m resolution of the 2017 LiDAR survey had a huge impact on our understanding of the spatial layout and survival of the overgrown archaeological sites of Puffin Island, together with providing the first metrically accurate model of the island, its cliffs, paths and areas of vegetation for conservation and management purposes.

### Vegetation and woodland

The Digital Surface Model (DSM) provides the first metrically accurate survey of woodland and vegetation across the island. In Figures 28 & 32 the medieval church stands out in a clearing in the alder woodland, but the majority of other archaeological features are completely obscured. Nevertheless the vegetation, grass and undergrowth have an important role in the life of nesting seabirds on the island. LiDAR Geotiffs for GIS use were provided by CHERISH to Liverpool University for their ongoing seabird research in 2018.

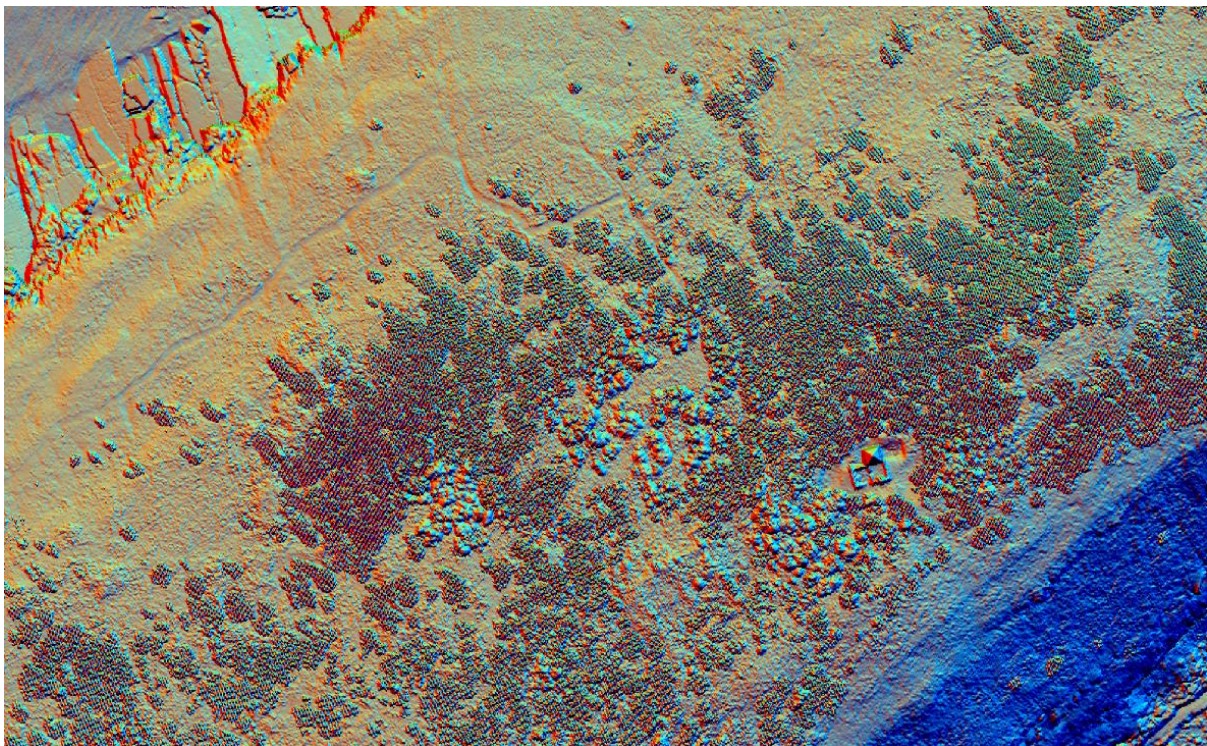


Figure 29 Ynys Seiriol or Puffin Island. 2017 LiDAR DSM view showing extent of modern vegetation on the higher part of the island, the extant church tower (lower right) and modern paths – cut in 2010 by CCW - through the vegetation approaching left and upper centre. Different types of vegetation among the alder woodland are discernible in this view (© CHERISH Project: flown by Bluesky International, 24th February 2017).

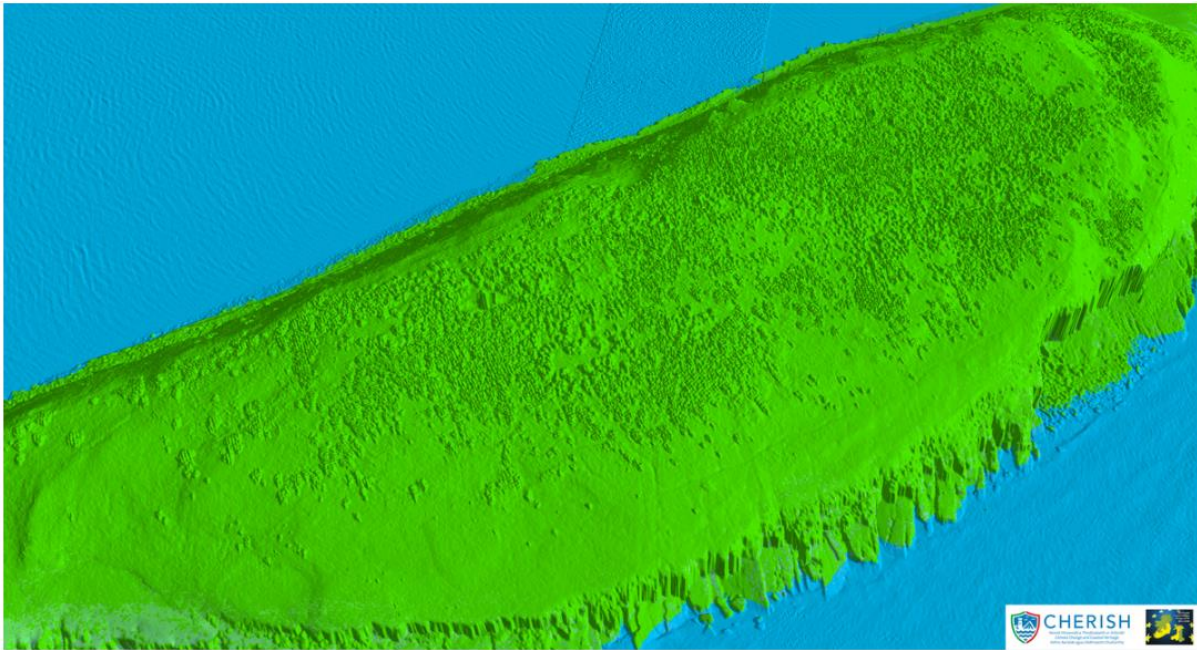


Figure 30 Ynys Seiriol or Puffin Island. **With vegetation:** 3D ArcScene DSM view from the north-west showing the archaeological landscape largely obscured by scrub woodland, undergrowth and long grass (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference: CHR\_04\_04\_02\_05)

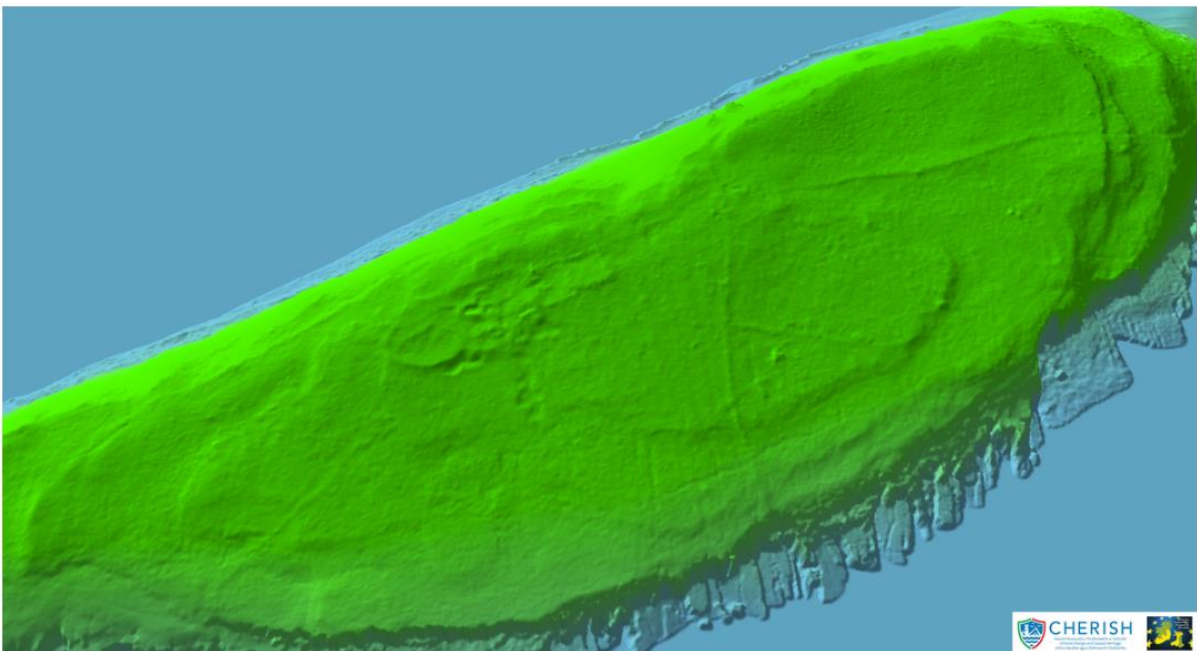


Figure 31 Ynys Seiriol or Puffin Island. **Without vegetation:** 3D ArcScene DTM view from the north-west showing the archaeological landscape cleared scrub woodland, revealing the buildings and earthworks of the monastic settlement (centre), ephemeral traces of ridge and furrow cultivation and medieval field boundaries (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference: CHR\_04\_04\_02\_07).

## The archaeological landscape revealed

The vegetation-stripped LiDAR DTM offers the first clear view of the archaeological landscape of Puffin Island, clarifying the plan and position of previously-mapped features with new accuracy while also revealing new features.

**NPRN 527: CELL OF PENMON PRIORY ON PREISTHOLM ISLAND.** The position and shape of the **monastic settlement enclosure** is clarified, allowing critical appraisal of the Royal Commission's 1937 survey (see comparison in Figure 34). However the most dense vegetation at the heart of the complex means that individual cells and buildings on the LiDAR DTM still remain unclear as the airborne laser was unable to fully penetrate even the winter canopy. A newly-identified median boundary subdivides the north-eastern end of the enclosure beyond the church (NPRN 424033), while on the south-west side adjoining the monastic enclosure only two square field enclosures of an original three can be mapped with any clarity.

A series of ragged surface stone quarries, ostensibly dug to provide stone for the original buildings, are revealed on the LiDAR immediately to the north-west of the enclosure.

**NPRN 710524: ANCILLARY BUILDINGS OR ENCLOSURES NE OF MONASTIC SETTLEMENT.** Beyond the enclosure on the east side field boundaries and small buildings mapped by the Royal Commission in the 1930s can also be seen (Figures 8 & 34). The Royal Commission mapped the larger of these, a rectangular enclosure orientated east-west, with a linked smaller annexe on the north, at the junction of the polygonal field north of the monastery and the eastward boundary running out towards the Telegraph station. An agricultural role seems likely. LiDAR suggests only indistinct footings survive now under the vegetation, but with a slightly different plan than that mapped by the Royal Commission. The polygonal field immediately north of the monastic enclosure on the 1937 plan cannot be recognised as an artificial boundary; instead the sharp edge of the natural rock plateau appears to define the field.

**NPRN 710517: RIDGE AND FURROW CULTIVATION.** To the north-west of the monastic settlement a narrow band of **ridge and furrow cultivation** is evident running north-west from the highest part of the island down to the sea cliffs on the north side. The cultivation is bounded on the west side by a field boundary but is unenclosed to the east. Given its character and the width of the furrows this cultivation must be considered to be contemporary with the medieval, or even the early-medieval, settlement. Today the ridge and furrow is entirely obscured from view, even from the air in winter light, under a thick cover of woodland and bracken; this shows the power of LiDAR to reveal the most ephemeral history of Puffin Island.



**NPRN 710522: ESCARPMENT BOUNDARY OR TRACKWAY.** An **escarpment boundary** or trackway runs between the monastic enclosure and sheer cliffs on the southern side, striking north-east along the southern cliff line towards the modern Telegraph Station.

**NPRN 710518: PUFFIN ISLAND; CENTRAL AND WESTERN FIELD SYSTEM.** The **field system** in the central and western part of the island was recognised and mapped by the Royal Commission in the 1930s but, as the LiDAR shows, only at a schematic level. It is not clear how one explains the discrepancies in the 1937 survey when compared to the LiDAR plot. Given the remote nature of the island, and the lack of availability of aerial photographs in the 1930s, it is conceivable that the publication plans were drawn up months later from inconsistent or incomplete field measurements. Two main field boundaries define the enclosures here, with a **building or small farm (New to record, NPRN 710523)**, sited at their southern junction. One boundary strikes north to the northern sea cliffs, bounding the ridge and furrow on its east side; the other strikes west towards the south-west tip of the island, partly continuing down the limestone terraces of the western cliffs.

**NPRN 710519: PUFFIN ISLAND; D-SHAPED PROMONTORY ENCLOSURE ABOVE WEST SPIT.** A **D-shaped promontory enclosure** occupies a sunken position on the limestone terrace above coastal slopes on the south-west tip of the island, backed by high 'landward' cliffs and overlooking the landing point. Hughes (1901, Frontispiece) seems to indicate an enclosure at this point on his sketch map; today the ledge here is heavily overgrown and the enclosure invisible. There are questions about the origin and function of the site. It may well be a functional field enclosure sited on a well-defined and bounded ledge to enable stock to be separated or kept at this location, perhaps on the way to and from embarkation from the island's beach. However there is also the possibility that it represents a simple defended settlement sited in a protected position with easy access to the coast. It may therefore be a prehistoric enclosure, or an early medieval structure.

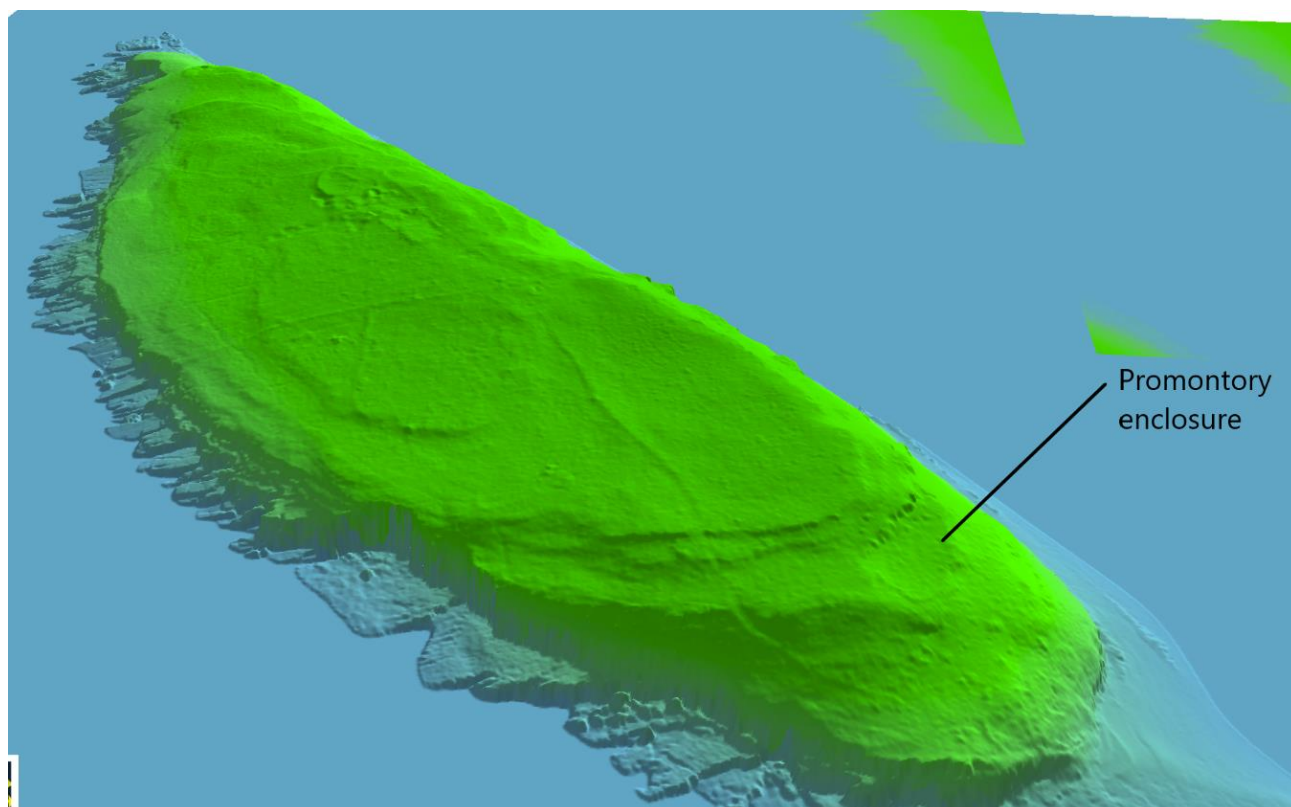


Figure 32 Ynys Seiriol or Puffin Island. Digital Terrain Model (DTM) from the north-west showing the position of promontory enclosure and other earthwork features in relief (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference CHR\_04\_04\_02\_08)

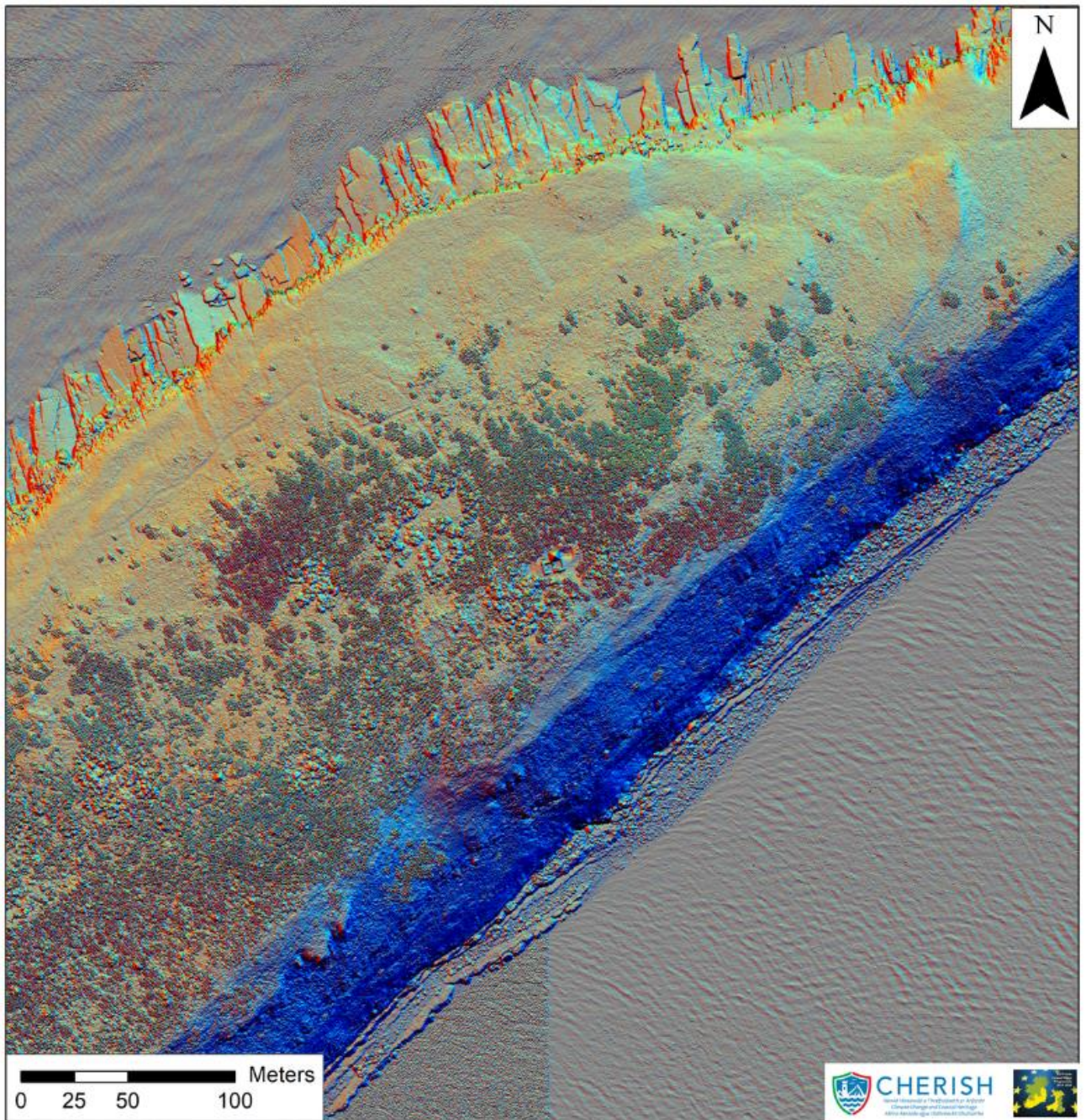


Figure 33 Ynys Seiriol or Puffin Island. Digital Surface Model (DSM) showing the vegetation patterns across the island, picked out with multi hill shading. (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference CHR\_04\_04\_02\_11)

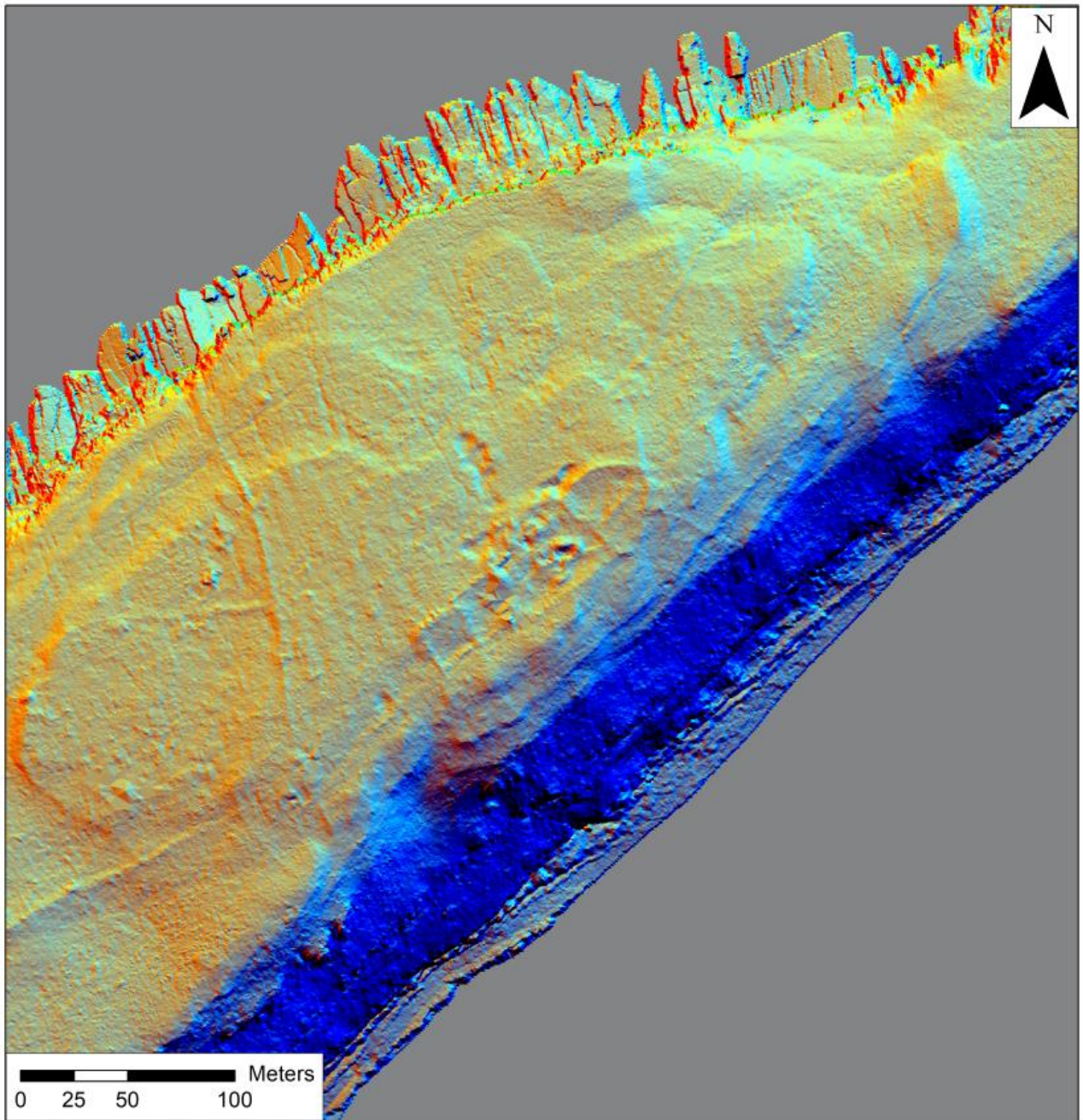


Figure 34 Ynys Seiriol or Puffin Island. 2017 LiDAR DTM view of the central part of the island rendered with a 16-point hillshade, revealing a range of new features and providing a more accurate spatial plan of the monastic enclosures surveyed in 1937 (© CHERISH Project: flown by Bluesky International, 24th February 2017).

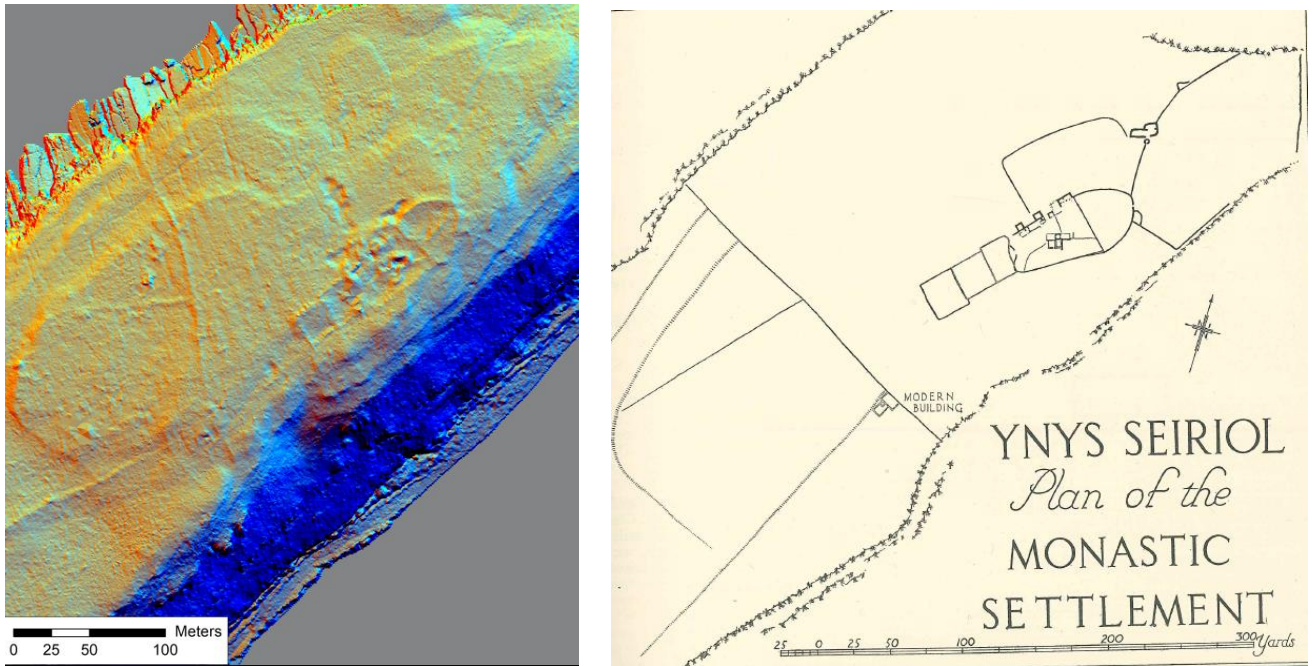


Figure 35 Comparison of 2017 LiDAR DTM survey (left, with vegetation ‘stripped’) and 1937 Royal Commission survey (right) highlighting inaccuracies in the original survey, particularly evident with the field enclosures mapped to the west of the monastic settlement associated with the ‘modern building’. Note also the tabular character of the bedrock ‘shelves’ to the north and east of the monastic settlement revealed on the LiDAR plot, providing naturally scarp -bounded areas for cultivation across the island’s summit. (© CHERISH Project: flown by Bluesky International, 24th February 2017)

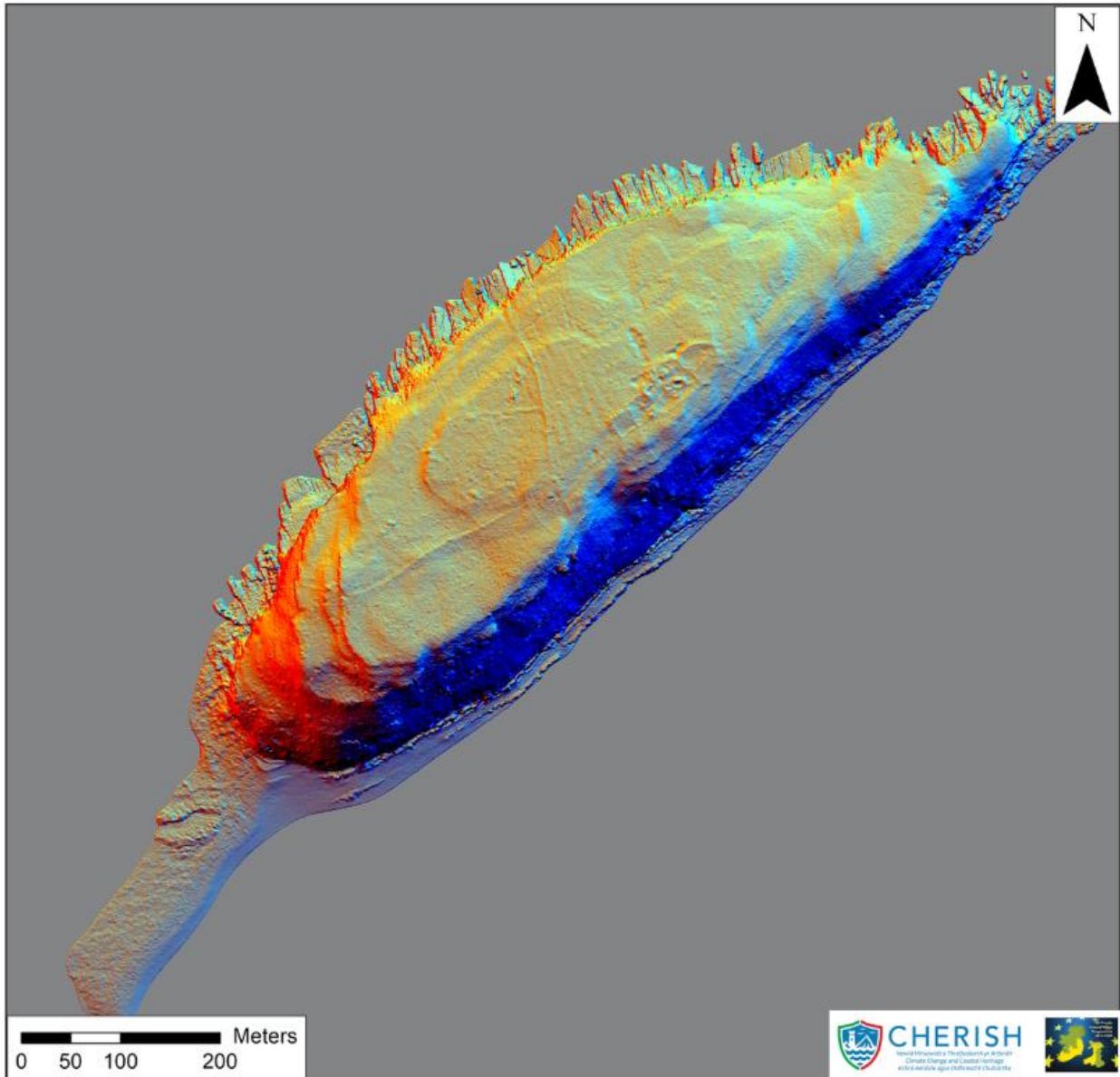


Figure 36 Ynys Seiriol or Puffin Island. Digital Terrain Model (DTM) showing whole of the island with multi hill shading, showing also the tidal beach and landing point at West Spit. (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference CHR\_04\_04\_02\_14)

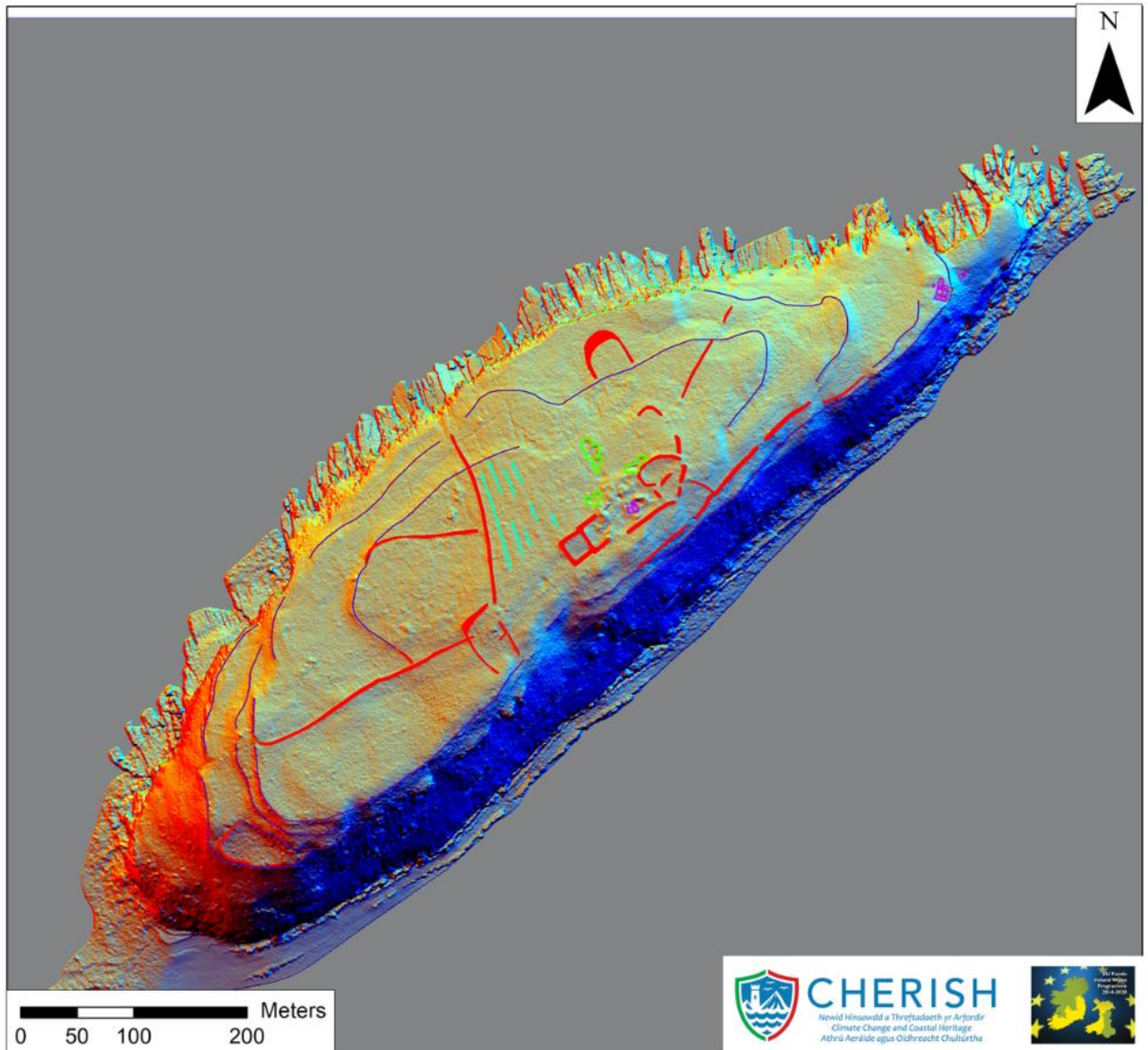


Figure 37 Ynys Seiriol or Puffin Island. Digital Terrain Model (DTM) showing whole of the island with multi hill shading and transcription of archaeological features (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference CHR\_04\_04\_02\_15)

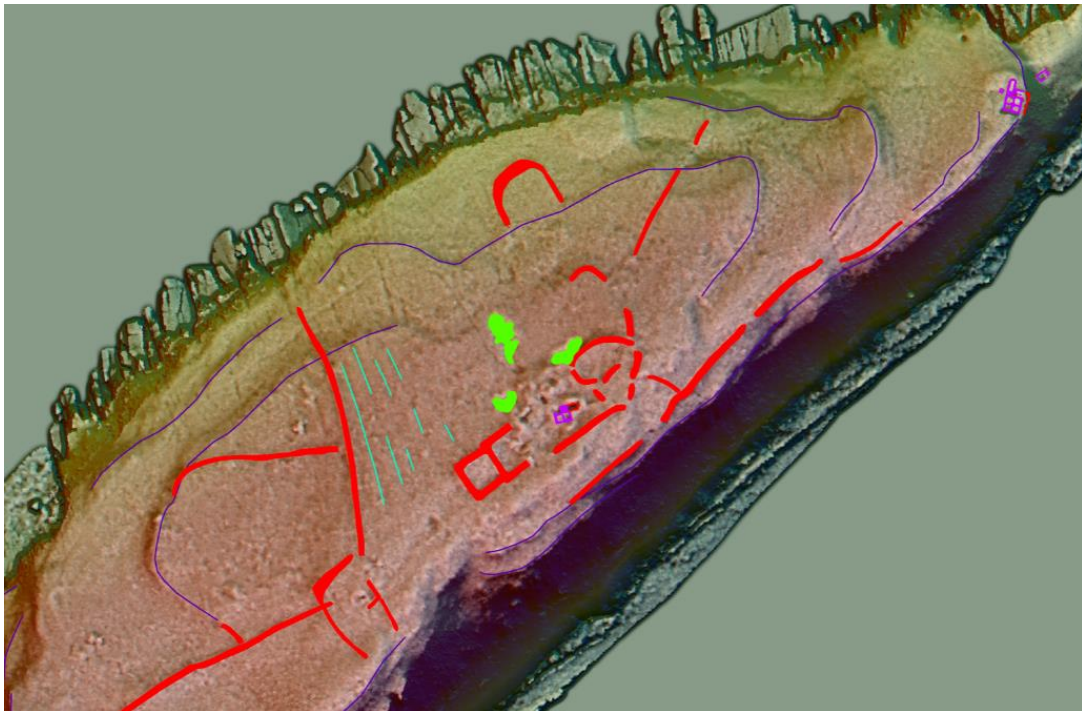


Figure 38 Ynys Seiriol or Puffin Island. Detail of the Digital Terrain Model (DTM) with multi hill shading and transcription of archaeological features (© CHERISH Project: flown by Bluesky International, 24th February 2017. Reference CHR\_04\_04\_02\_15)

### Survey of the medieval church, NPRN 424033

Two visits were carried out for the EU-funded CHERISH Project by staff from the Royal Commission; on 21<sup>st</sup> June accompanied by Jeff Spencer, Cadw, for laser scanning (described below) and on 26th November 2018 to undertake drone photogrammetry of the top of the tower and other upper surfaces of the ruins which were inaccessible to the earlier ground-based laser scanning. The November 2018 completed the baseline monitoring survey for the standing structures and included a rapid written record, below.

#### Building condition description 2018

**Description from 1937 Royal Commission Anglesey Inventory (p. 142):** 'The Tower (8 3/4 ft square) is one of two stages with a squat pyramidal stone roof. On the E wall is visible the roof line of the early chancel with that of the 13th century above. The crossing has original round arches in the E and W walls both built of rubble with chamfered imposts. Above the centre of the E arch a Roman box tile is built in. In the S wall is an opening with a roughly-constructed semi-circular arch cutting through the reveals of a narrow round-headed window; the arch was inserted at a later date to give access to a transept, the site of which is now occupied by a modern cottage. The upper stage is marked by a plain projecting string course and has original round-headed windows in each wall, those to the S and W of two lights with the shafts missing. The floors have disappeared.'





Figure 39 St Seiriol's church from the east. On 17 March 1929 (© Crown Copyright RCAHMW, DL2011\_3905) and on 21 June 2018 (© CHERISH Project, CH2019\_088\_009).



Figure 40 Careful clearance of summer vegetation from the eastern chancel prior to laser scanning, with the permission of NRW and under supervision from the Cadw FMW (© CHERISH Project, CH2019\_090\_005).

**Condition of the church in 2018:** The church tower and associated buildings stand in a clearing in dense alder woodland. The approaches are overgrown, largely obscuring the wider remains of the monastic enclosure and walls planned by Royal Commission for the 1937 Anglesey Inventory when the island vegetation was open, grazed pasture. The church stands in a clearing due to a previous campaign of clearance, but the stumps had still sprouted waist-high vegetation which was cut and cleared (with permission) on arrival. The walls of the church and cottage on the west and south sides are covered with ivy.

Tower: East Wall; East arch: 2.73m high x 1.55m. Possible Roman box flue tile in wall above arch. Traces of pitched roof fitting above showing roof line of early chancel. Wall footings of the chancel on the E side of the tower. Walls standing 6-8 courses high, generally surviving 0.6m - 0.7m high. Infilled with tumbled rubble. Vegetation cleared here during summer 2018 visit with obvious benefits to the visibility of the standing structures. North wall; No arch. Small window in upper storey. Protruding masonry low down on NW corner suggesting intention to link to additional wall or structure. West wall; Arch, 2.5m high x 1.76m wide. Blocked. Small putlog hole midway up wall below pitched roof fitting. Inside tower: Arch in south wall roughly blocked with masonry, preserving smaller narrow inner door 1.14m wide within blocking. Arch in W wall neatly blocked with slight recess. A small pile of numbered, dressed stone has been stored in the inner NW angle of the tower. South wall: blocked archway into tower on south wall, with small Romanesque arch above. Plaster line high up on tower of shows line of former pitched roof line.

Ruined cottage (south side of tower, site of transept): East and West cottage walls standing 1.8m-1.9m high but heavily grown with ivy with much loose stone at upper levels. East wall has simple central window. The south wall of the cottage preserves a fireplace and chimney breast. The fireplace opening measures 0.83m x 0.90m with a large lintel stone of contrasting red sandstone. Floor littered with tumbled masonry and roof slates. Room adjoining on west side of cottage, accessed through door in west wall. Walls heavily ivy grown, standing internally c. 2m high. Floors infilled with rubble throughout.

**Cadw condition note from visit, 21st June 2018:** A visit in partnership with staff from the CHERISH project at RCAHMW who were conducting a laser scan survey of the church.

‘A narrow path winds uphill and around the island, through dense brambles, nettles and elder to reach the site. On our way to the church we crossed a stony bank and traces of the monastic buildings to the NW of the church. The monastic enclosure was heavily overgrown and was only visible where it was crossed by the path.

The low walls of the ruined nave and chancel were visible amongst low vegetation; the church was much less overgrown than the surrounding enclosure due to a previous campaign of clearance. Elder which had previously been cut had sprouted again from the

stumps, but was cut back again on this occasion. More clearance was undertaken by the CHERISH team to facilitate the laser scanning. There was no vegetation growth to be concerned about on the walls of the church. Ivy was present on the W wall of the cottage but I believe this was also cut through.



Figure 41 [Vertical UAV view](#) of the tower's roof showing vegetation and weeds taking hold on the pyramidal sides and loose, mortarless stones becoming fragmented at the apex. A small drain hole can be seen in the apex (© CHERISH Project, 26 November 2018. Puffin\_Island\_UAV\_26112018\_0120.TIF).



Figure 42 [Oblique UAV view](#) of the tower's roof showing vegetation and weeds taking hold on the pyramidal sides and loose, mortarless stones becoming fragmented at the apex. A small drain hole can be seen in the apex (© CHERISH Project, 26 November 2018. Puffin\_Island\_UAV\_26112018\_0183).

The stonework of the church, tower and former cottage was generally in good condition and appeared little changed since the previous monitoring visit. There was one area of tumble in the chancel and the stonework around the cottage window in the wall of the nave is in need of consolidation.

**Condition of the tower roof, from the 2018 UAV survey (Figures 40 & 41):** while the tower structure is in good condition, the UAV survey from November 2018 showed that the very top of the tower is beginning to fragment with loose, mortarless stones visible at its apex; the corbelled sides of the pyramidal roof have vegetation taking hold in the mortared stone, which it would be good to kill or remove in due course.



Figure 43 Dan Hunt operating a UAV to the south of the church on 26<sup>th</sup> November 2018, illustrating the wider vegetation in the vicinity of the monastic settlement (© CHERISH Project CH2019\_108\_003).



Figure 44 View inside the twelfth century tower; note the small drain hole at the apex of the roof (© CHERISH Project, 21 June 2018 - CH2019\_093\_005).

## Methodology: Terrestrial laser scanning

The CHERISH Team carried out terrestrial laser scanning of the church on 21<sup>st</sup> June 2018, following limited clearance of summer vegetation from the eastern chancel and on the standing walls, with permission from NRW and with supervision from Cadw.

The survey was carried out using a Faro Focus 3D laser scanner, with 10 scan stations around the church (Figure 46). Scans were registered using universal spheres and the data fixed to National Grid Coordinates by georeferencing spheres with Global Navigation Satellite System (GNSS) survey. The scans have been registered to within a mean distance error of 1.4mm, mean horizontal error of 0.8mm and a mean vertical error of 1.0mm. The registered scans are currently in the process of being processed ready for further interrogation. The scan data has been used to generate initial plans and elevations of the church buildings and stands as a permanent record of the condition of the masonry. However the limitations of terrestrial scanning meant that the top of the church roof remained unscanned. This required infilling with UAV photogrammetry from above, which was completed in November 2018.



Figure 45 The constraints of working on Puffin Island; a pair of young gull chicks on the cottage wall seem oblivious to the universal reference spheres mounted for laser scanning (© CHERISH Project, CH2019\_092\_009).



Figure 46 Laser scan of the church tower and surrounding buildings, with summer vegetation. 3D view of the point cloud from the south-west with drone data combined to show tower top ([CHERISH Project: visualisation by Jayne Kamintzis. 2023-03-08\\_5874](#)).

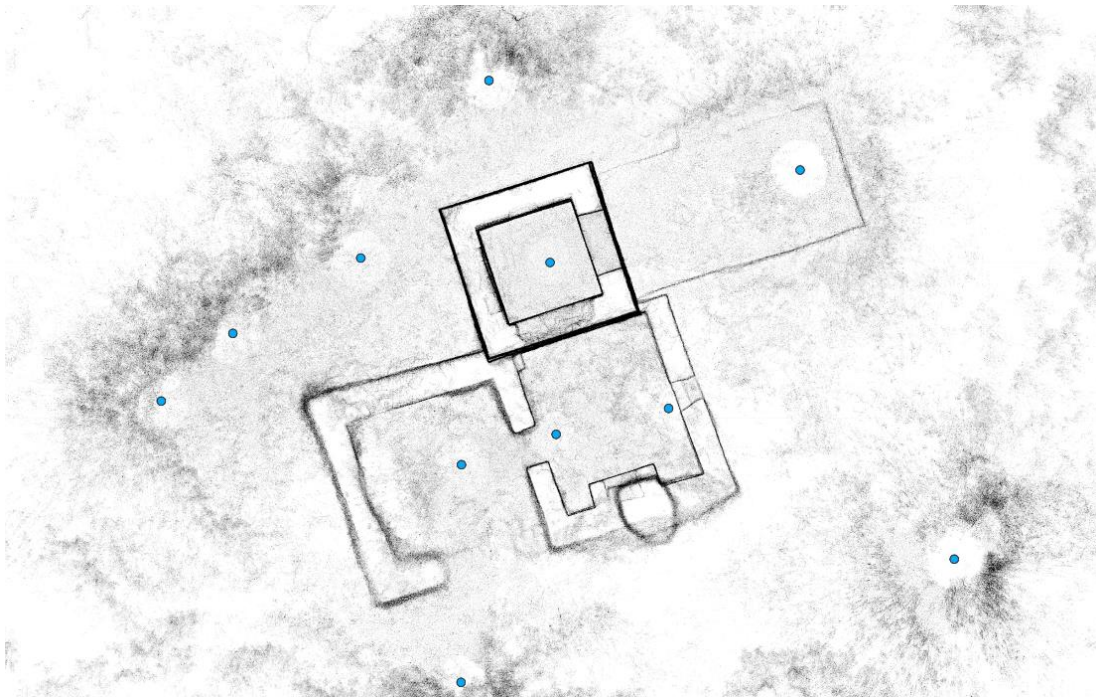


Figure 47 Plan view of the medieval church showing the positions of the 10 scan stations in a clearing around the ruin (© CHERISH Project).



## Methodology: Unmanned Aerial Vehicle or UAV survey

A UAV survey was carried out at the Monastery on Puffin Island 26<sup>th</sup> November 2018 by the CHERISH project to record the church tower for monitoring purposes. The primary purpose of this work was to collect detailed 3D data for the top of the church tower and wall tops to supplement laser scanning data collected 21<sup>st</sup> June 2018. Further data capture by UAV was required to fill data gaps at locations that the laser scanner was able to record. The survey is recorded in a detailed CHERISH UAV Monitoring Event Report (Hunt 2020).

Carrying out a photogrammetric UAV survey is time and cost-effective and provides highly detailed three-dimensional datasets capable of being used in conjunction with terrestrial laser scan data for erosion monitoring and the creation of outreach tools such as three-dimensional models (digital and physical).

The UAV was used to capture overlapping imagery of the church and associated structure through 186 images and georeferenced using ground control points (GCPs) surveyed in using a Leica GS16 used in RTK mode using Leica SmartNet. The imagery was processed using Structure from Motion (SfM) software Agisoft Metashape. Processed derived data comprises an xyz pointcloud, a Digital Elevation Model (DEM) and an orthophoto. The geolocated dense point cloud (Figures 47 & 50) was accurate to 1.09 cms.



Figure 48 Location of Ground Control Points used during the UAV survey. Points were referenced using ground targets surveyed in using a Leica GS16 in RTK mode (© CHERISH Project; see Hunt 2020).

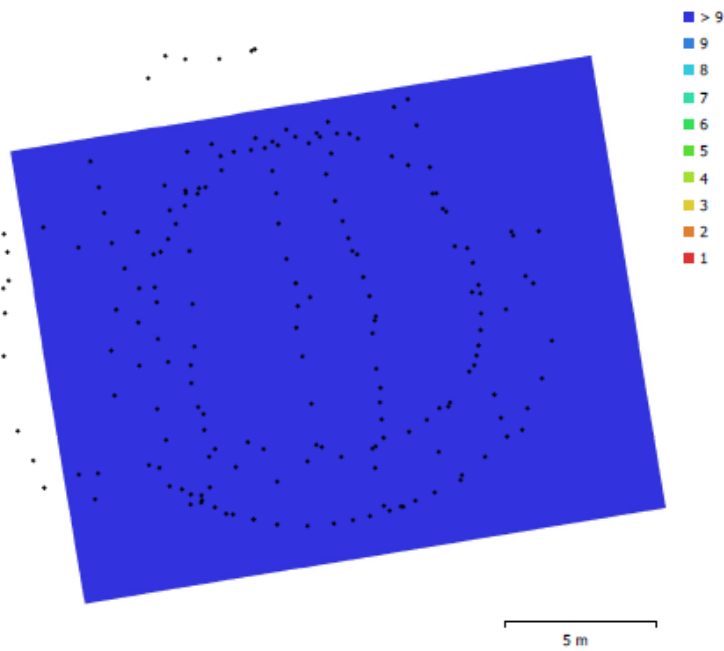


Figure 49 Puffin Island UAV survey: Camera locations for the 186 images flown, and amount of image overlap generated using Agisoft Metashape (CHERISH Project)

Fig. 1. Camera locations and image overlap.

Number of images:	186	Camera stations:	186
Flying altitude:	10.3 m	Tie points:	953,587
Ground resolution:	2.98 mm/pix	Projections:	4,471,167
Coverage area:	290 m <sup>2</sup>	Reprojection error:	0.379 pix

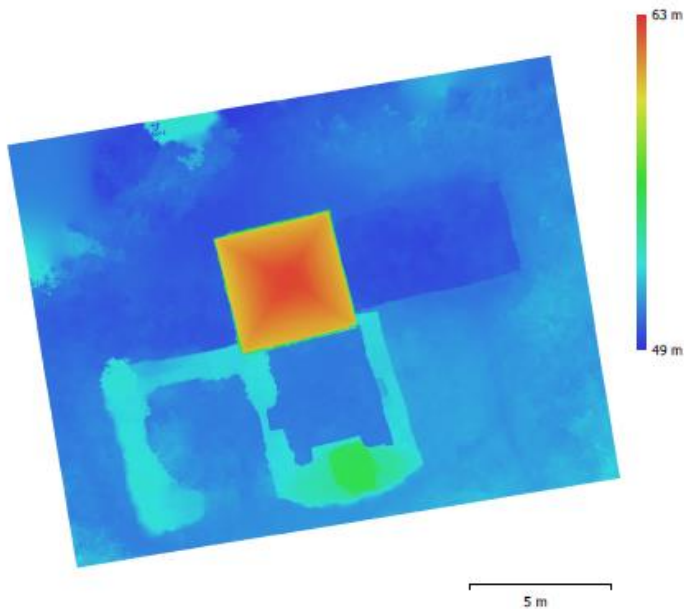


Fig. 4. Reconstructed digital elevation model.

Resolution:	2.98 mm/pix
Point density:	11.2 points/cm <sup>2</sup>

Figure 50 Digital elevation model reconstructed from photogrammetric survey (© CHERISH Project)



Comisiwn Brenhinol  
Henebion Cymru  
Royal Commission on the Ancient  
and Historical Monuments of Wales

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PUFFIN ISLAND MEDIEVAL CHURCH  
Anglesey  
Grid reference: SH 65172 82163  
NPRN: 424033

Drawing 2 of 3  
Print scale: 1:100 at A2  
Survey method: Terrestrial Laser Scan, UAV  
Surveyed by: Dan Hunt, Louise Barker,  
(TLS: 21/06/2018; UAV: 26/11/2018)  
Drawn by: Jayne Kamintzis (February 2023)

Figure 51 Digital elevations of the church tower produced by combining terrestrial laser scan data with drone photogrammetry data. (© CHERISH Project: RCCS22\_3\_01 Drawn by Jayne Kamintzis 2023).

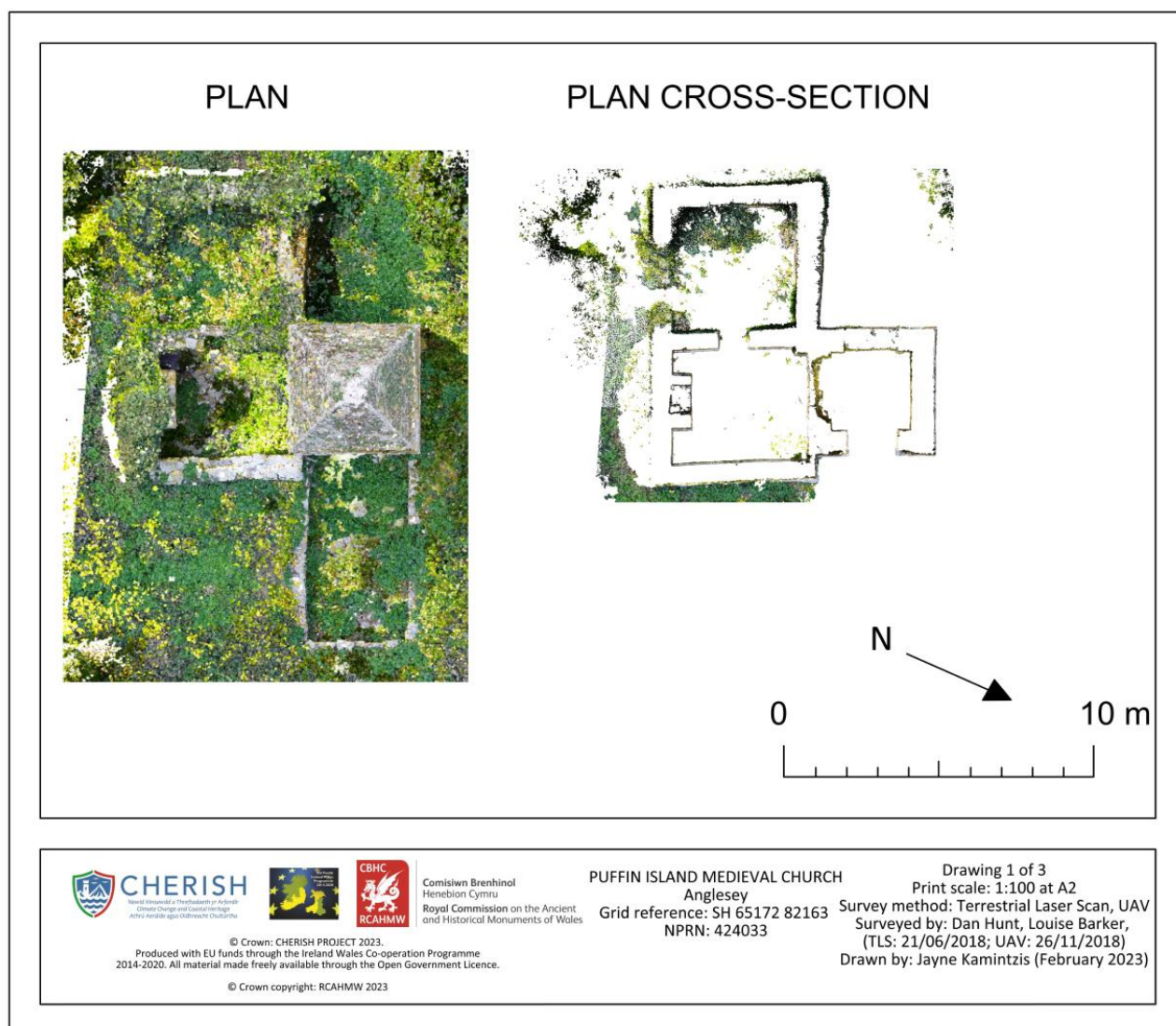


Figure 52 Digital plans of the church tower produced by combining terrestrial laser scan data with drone photogrammetry data. (© CHERISH Project: RCCS22\_3\_01 Drawn by Jayne Kamintzis 2023).

## Methodology: Maritime Survey

In August 2018, the RV Keary maritime survey vessel of the Geological Survey of Ireland travelled to Wales to survey 12 km<sup>2</sup> of the seabed off the east coast of Anglesey for the CHERISH Project, with permission from the Marine Policy Unit of the Foreign and Commonwealth Office (full report: [Craven and Barry 2018](#)). The CHERISH project identified a number of sites around Anglesey for which the project required detailed bathymetric surveys. Two main type of sites were targeted; islands and shipwrecks. Islands that were identified for survey were Dulas and Puffin in the north east of Anglesey and Skerries on the north west. The objectives of targeting these islands were to both further understand their evolution and to join bathymetric data with existing LIDAR data for analyses. A number of shipwrecks were also targeted. These shipwrecks

were located in proximity to the islands and also at the south west entrance of the Menai Strait.

Results include an almost seamless onshore-offshore map of Puffin Island (Figures 55 & 56) which combines the 2017 LiDAR with the 2018 bathymetry. Little remained of the shipwreck targets surveyed (Figure 54), with only the SEAHOW identifiable as a vessel (see Figure 53), the granite setts cargo of the WERN visible, and a debris field where the River Loyne had existed. The other shipwrecks were not discovered and pose questions as to whether they are now buried by sediment, completely destroyed by marine processes, or not at/have been transported from their recorded positions.

Multibeam surveying was carried out in depths <50m using the Geological Survey research vessel Keary which is equipped with a Kongsberg EM 2040 D multibeam echosounder between the 8th and 23rd of August 2018. Sub-bottom profiling using an Edgetech CHIRP 3200 was conducted along all survey lines.

The purpose of this survey was to create an integrated bathymetric and geophysical dataset for CHERISH areas off the Isle of Anglesey, using a range of platforms and sonar equipment. Bathymetry was acquired to IHO S-44 Order 1a Standard. One GSI vessel was mobilised for the survey by the Geological Survey of Ireland (R.V. Keary). Full survey results are presented in the final section of this Craven and Barry 2018.

### **Survey Platforms: R.V. Keary**

The Irish state research vessel R.V. Keary is an aluminium catamaran designed for near shore survey work. She is ideally suited in this role due to her stable twin hull construction, shallow draft, retractable equipment pod and hydraulically operated A-Frame and winch. The R.V. Keary is typically crewed by a team of 3 individuals. Table 7 provides information on her design specifications and survey equipment on board.

### **Bathymetry**

The GSI acquired high resolution bathymetry using MBES mapping systems with the R.V. Keary in from four locations around Anglesey Wales from 05/08/2018 to 22/08/2018: Dulas Island, Puffin Island, Northeast Menai Strait, Southwest Menai Strait (Craven and Barry 2018). The resulting datasets were acquired to IHO Order 1a standard or higher. Figures illustrating the resultant bathymetry coverage and corresponding track-lines are provided in the report, with relevant figures for Puffin Island reproduced below.

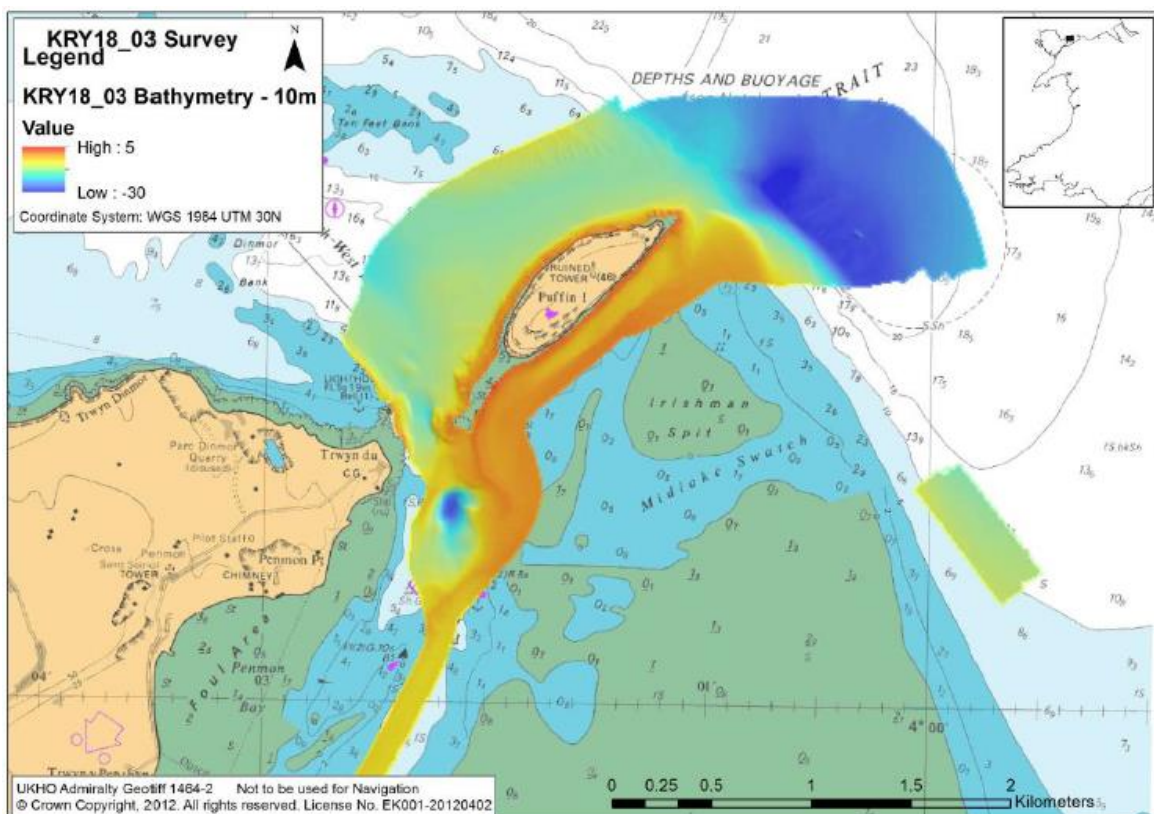


Figure 53 Bathymetry coverage for Puffin Island, August 2018 (© Geological Survey of Ireland for the CHERISH Project; Craven & Barry 2018, Figure 12)

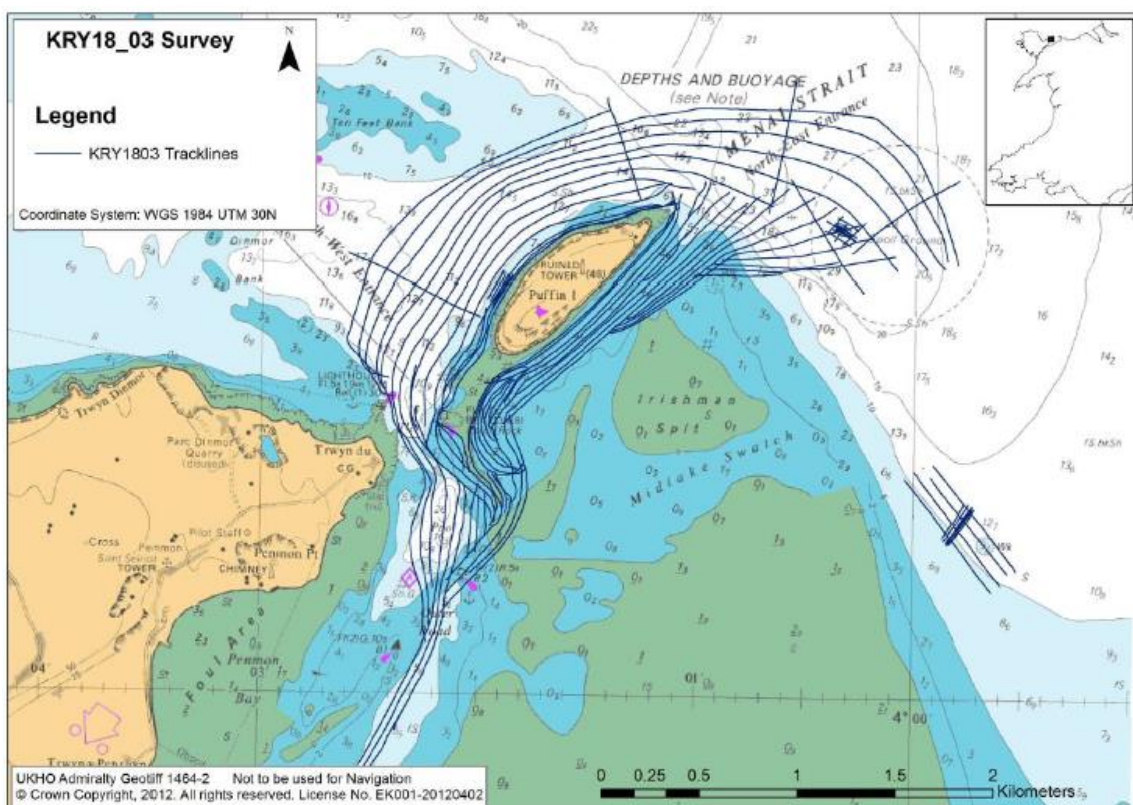


Figure 54 Vessel tracklines for Puffin Island, August 2018 (© Geological Survey of Ireland for the CHERISH Project; Craven & Barry 2018, Figure 16)

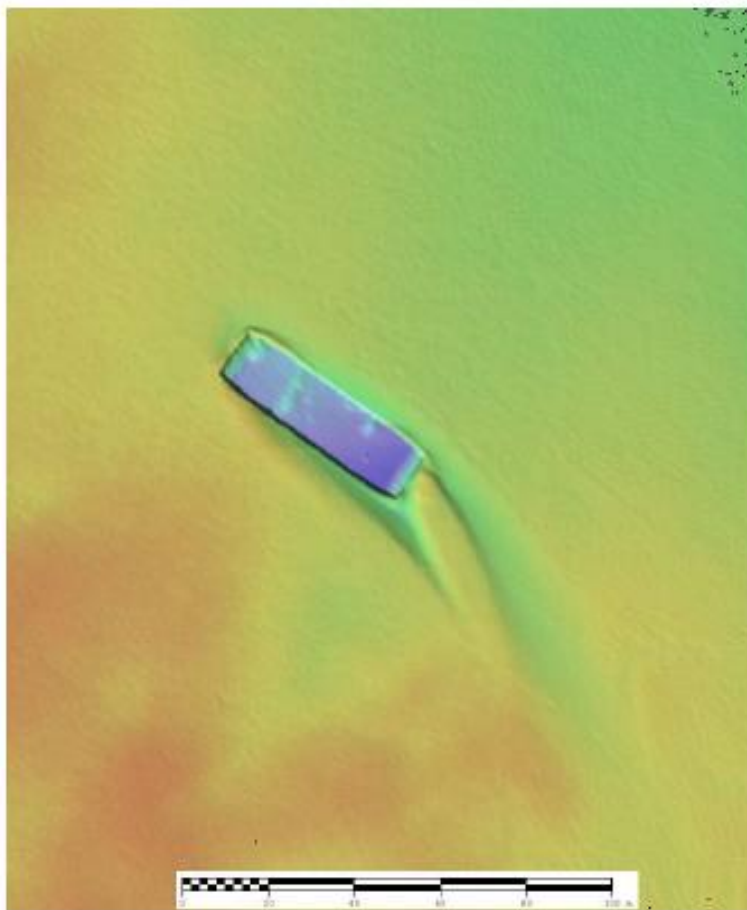
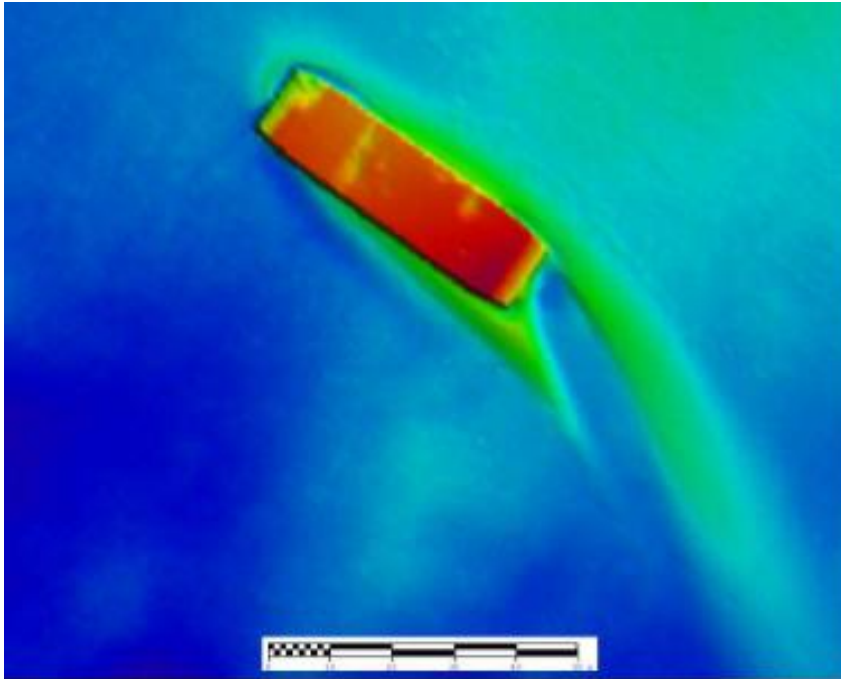


Figure 55 Wreck of the Seahow, lying to the east of Puffin Island, surveyed on 20/08/18. The main structure of the wreck is clearly visible. The wreck is orientated 135/315 with no distinguishing features indicating the bow from the stern. The wreck lies on a sandy bottom and there are some sand waves building from the south-eastern end of the wreck. (© Geological Survey of Ireland for the CHERISH Project; Detailed in Annex 2 of Craven & Barry 2018).

**Table 25: Wrecks near Puffin Island**

<b>Wreck</b>	<b>Northing</b>	<b>Easting</b>	<b>Result</b>
Pioneer	53° 19.128'	-4° 1.926'	No remaining debris found
Unnamed wreck	53° 18.899'	-4° 1.873'	Too shallow for R.V. Keary
River Loyne	53° 18.424'	-3° 59.665'	Possible Debris Field surveyed
Seahow	53° 19.275'	-4° 00.348'	Surveyed

Figure 56 Wrecks near Puffin Island (© Geological Survey of Ireland for the CHERISH Project; Craven & Barry 2018, Table 25).

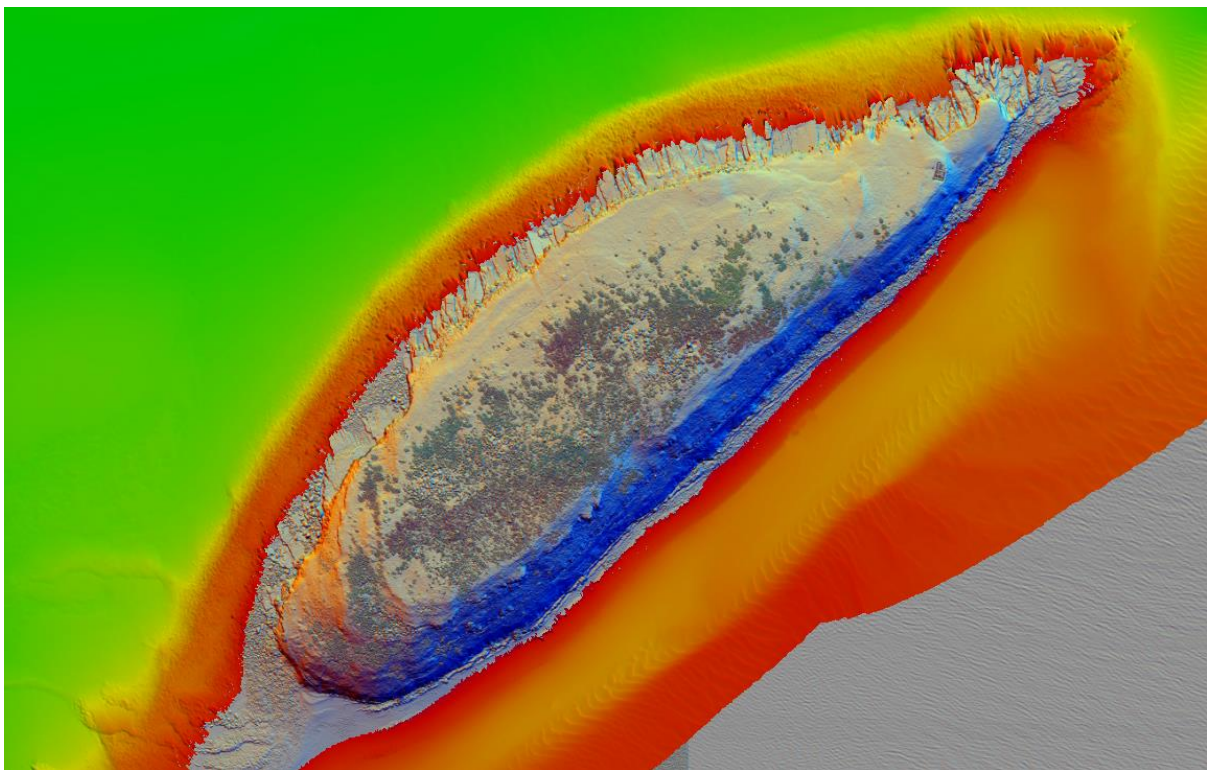


Figure 57 A seamless onshore/offshore map of Puffin Island. Detail, showing KRY1803 Bathymetry (2m resolution to LAT Datum) aligned with the Royal Commission procured LiDAR survey (0.25m resolution to British National Grid Datum; © Geological Survey of Ireland for the CHERISH Project).



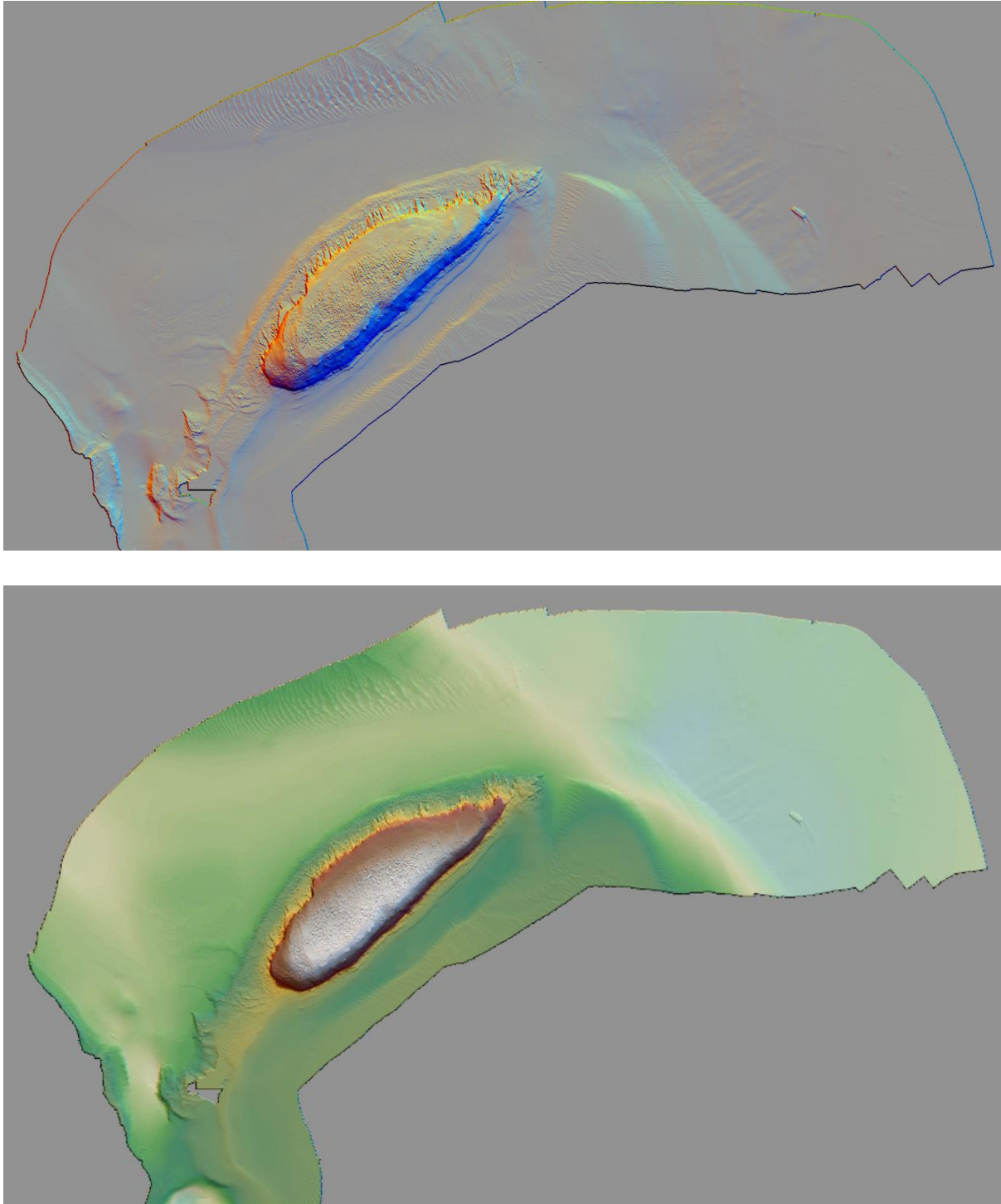


Figure 58 Seamless onshore/offshore maps of Puffin Island. Detail, showing KRY1803 Bathymetry (2m resolution to LAT Datum) aligned with the Royal Commission procured LiDAR survey. The wreck of the SEAHOW is visible in both maps as an anomaly on the seabed to the east of Puffin Island (0.25m resolution to British National Grid Datum; © Geological Survey of Ireland for the CHERISH Project).

## SUMMARY OF RESULTS OF NEW AND ENHANCED SITE RECORDS

The summary of sites below includes both updated and newly created records compiled through both aerial and ground survey. Feature descriptions for monuments that had existing National Primary Record Numbers (NPRNs) at the time of survey have been derived from these records, however, in some instances changes have been made as a result of new information available from newly acquired CHERISH project data.

At the time of the completion of this report [323 archives](#) had been made publicly available online relating to new CHERISH Project fieldwork on Puffin Island.

### Existing site records including those enhanced by CHERISH fieldwork

NPRN	Site name and record link
527	<a href="#">CELL OF PENMON PRIORY ON PRIESTHOLM ISLAND, PUFFIN ISLAND OR YNYS SEIRIOL, THE MONASTIC SETTLEMENT</a>
519193	<a href="#">ANCHOR FIND, PUFFIN ISLAND</a>
240785	<a href="#">CANNON FIND, PUFFIN ISLAND</a>
525590	<a href="#">LANDING PLACE, PUFFIN ISLAND</a>
518936	<a href="#">PUFFIN ISLAND LIGHTHOUSE (FORMER, NO LONGER EXTANT)</a>
240503	<a href="#">PUFFIN ISLAND MARITIME NAMED LOCATION</a>
23477	<a href="#">PUFFIN ISLAND TELEGRAPH STATION</a>
507229	<a href="#">SLATES FIND, PUFFIN ISLAND</a>

### New site records created following CHERISH fieldwork

424033	<a href="#">PUFFIN ISLAND OR YNYS SEIRIOL MEDIEVAL CHURCH</a>
424034	<a href="#">PUFFIN ISLAND OR YNYS SEIRIOL ISLAND LANDSCAPE</a>
710517	<a href="#">PUFFIN ISLAND, RIDGE AND FURROW CULTIVATION</a>
710518	<a href="#">PUFFIN ISLAND, CENTRAL AND WESTERN FIELD SYSTEM</a>
710519	<a href="#">PUFFIN ISLAND, D-SHAPED PROMONTORY ENCLOSURE ABOVE WEST SPIT</a>

- 710520 [PUFFIN ISLAND, FLAGSTAFF NEAR TELEGRAPH STATION](#)
- 710521 [PUFFIN ISLAND, ANCILLARY BUILDING NORTH-EAST OF TELEGRAPH STATION](#)
- 710522 [PUFFIN ISLAND, ESCARPMENT BOUNDARY](#)
- 710523 [PUFFIN ISLAND, BUILDING, SOUTH-WEST OF MONASTIC SETTLEMENT](#)
- 710524 [PUFFIN ISLAND, ANCILLARY BUILDINGS OR ENCLOSURES NE OF MONASTIC SETTLEMENT.](#)

## RECOMMENDATIONS FOR FURTHER WORK

ISSUE	RECOMMENDATIONS:
<p><b>Thick, impenetrable vegetation and woodland on and around the scheduled monument</b></p>	<p><b>All subject to permission of the landowner, and to consent from government agencies.</b></p> <p>Works would need to comply with <a href="#">SSSI procedures</a> in relation to the notifiable operations and observe timing or access protocol to minimise disturbance to breeding seabirds</p> <p>Consider clearance of scrub woodland and vegetation on and around scheduled monument.</p> <p>Consider limited weed killing or vegetation clearance around church.</p> <p>Consider cutting and removing ivy in a two-phase approach – first, by cutting and herbicide treatment of the cut stumps with an appropriate, approved herbicide; then, by return visit to remove the withered vegetation (at least two months after initial treatment). An alternative that may be considered desirable is to treat the ivy with overall foliar application of an appropriate, approved herbicide to which has been added a compatible surfactant or wetting agent to enable the herbicide to penetrate the ‘waxy’ coating of the ivy leaves. This would substitute for phase 1 above. Neither approach can be expected to achieve full control of the ivy growth.</p> <p>Rabbits were recently re-introduced and their presence is being encouraged in the hopes it may reduce the vegetation on the island.</p> <p>Continue regular (2-4 yearly) monitoring of church and scheduled monastic settlement with UAV/drone.</p>
<p><b>Deteriorating condition of masonry within scheduled area</b></p>	<p>Assess future need for repointing of loose masonry – currently (2018) loose stones on the tower apex, an area of tumble in the chancel and stonework around the cottage window in the wall of the nave are in need of consolidation.</p> <p>Consider weed prevention on church roof.</p> <p>Continue regular monitoring of church tower and roof with UAV.</p>

<b>Difficulties in accessing archaeology</b>	Re-cut path from landing place to church ruins to allow monitoring access for archaeologists and other staff
<b>Lack of knowledge about condition of below-ground archaeology of monastic settlement</b>	Consider future geophysical survey or evaluation excavation and scientific dating in and around the church if vegetation growth allows
<b>Telegraph Station</b>	Monitor vegetation at ruin; consider clearance and weedkilling  Monitor brick walls for risk of future collapse (Figure 21)
<b>Need to characterise new discoveries</b>	CHERISH Project to schedule re-visit to newly-identified promontory enclosure in 2021  Locate and document 'flagstaff' to west of Telegraph Station
<b>General</b>	Consider new 'No Landing' sign on West Spit beach, as current sign illegible.




Figure 59 The survey team on site during laser scanning, 21<sup>st</sup> June 2018; (L-R) Toby Driver (RCAHMW/CHERISH), Jeff Spencer (Cadw), Louise Barker & Daniel Hunt (RCAHMW/CHERISH; © CHERISH Project CH2019\_089\_005).

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