intertek
Total Quality. Assured.

ALCATEL SUBMARINE NETWORK

Havhingsten

Appendix E3 - Marine Archaeology Geophysical Survey

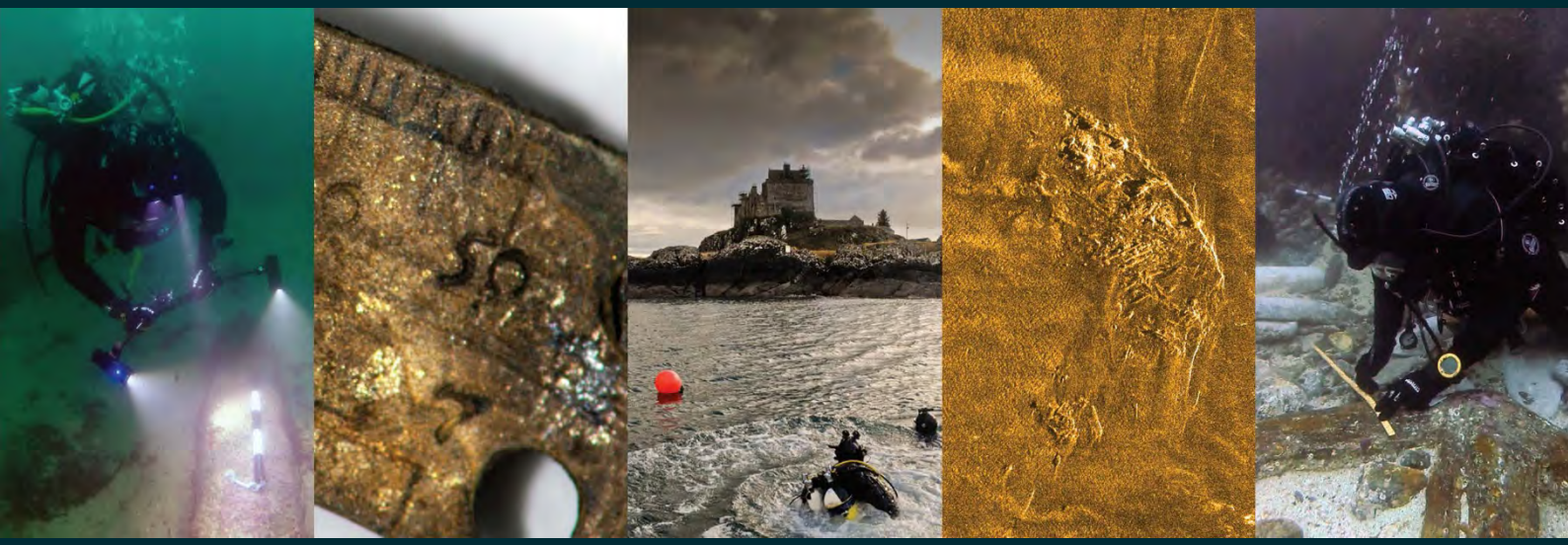
P2228_R4693_Rev4 App E3 | Nov 2019

Intertek Energy & Water Consultancy Services
Exchange House, Station Road, Liphook, Hampshire GU30 7DW, United Kingdom

Cotswold Archaeology marine

Havhingsten submarine cable system

Archaeological review of foreshore and intertidal survey data for the whole route and of marine survey data for Irish waters only



for

Fugro Germany Marine GmbH

CA Project: 770835

CA Report: 770835_02

April 2019

Havhingsten submarine cable system

Archaeological review of foreshore and intertidal survey data for the whole route and of marine survey data for Irish waters only

CA project: 770835
CA report: 770835_02

prepared by date	Michael Walsh, Senior Marine Consultant, Cotswold Archaeology Michael Grant, Senior Geophysicist, Coastal and Offshore Archaeological Research Services (COARS), University of Southampton David Harrison, Senior Geophysicist, Headland Archaeology and Rebecca Ferreira, Marine Archaeologist, Cotswold Archaeology April 2019
checked by date	Michael Walsh, Senior Marine Consultant April 2019
approved by signed date	Michael Walsh, Senior Marine Consultant April 2019
issue	1.2

Cirencester	**Milton Keynes**	**Andover**	**Exeter**	**Suffolk**
Building 11 Kemble Enterprise Park Kemble, Cirencester Gloucestershire GL7 6BQ **t.** 01285 771022 **f.** 01285 771033	Unit 8 – The IO Centre Fingle Drive Stonebridge Milton Keynes MK 13 0AT **t.** 01908 564660	Stanley House Walworth Road Andover, Hampshire SP10 5LH **t.** 01264 347630	Unit 1 Clyst Units Cofton Road Marsh Barton, Exeter EX2 8QW **t.** 01392 573970	Unit 5, Plot 11 Maitland Road Lion Barn Industrial Estate Needham Market, Suffolk IP6 8NZ **t.** 07449 900120

SUMMARY

Project name: Havhingsten submarine cable system

Cotswold Archaeology was commissioned by Fugro Germany Marine GmbH to undertake non-intrusive archaeological assessments at six proposed landfall locations at:

- Loughshinny, Co Dublin, Ireland;
- Port Erin, Isle of Man;
- Port Grenaugh, Isle of Man;
- Lytham St Anne's, west coast of England;
- Seaton Sluice, east coast of England; and
- Whitley Bay, east coast of England.

As well as an archaeological assessment of marine geophysical survey data along the potential cable route in Irish territorial waters only for a proposed fibre optic cable (Havhingsten submarine cable system) between Ireland and Denmark.

In total, the proposed cable route will run for approximately 607.7km. The cable route is proposed to run beneath the Irish Sea, with landfall locations on the east coast of Ireland, on the south-east and south-west coasts of the Isle of Man, and on the west coast of England. The proposed cable route continues beneath the North Sea, with landfall at two potential locations on the north-east coast of England. The cable route above mean high water springs (MHWS) and in English territorial waters is beyond the remit of this report.

This report includes the results from the foreshore and intertidal geophysical, hand-held metal detector and walkover surveys, as well as the archaeological assessment of near shore and offshore geophysical survey data for the route through Irish waters only. The assessment of marine data includes the identification of archaeological remains in proximity to the proposed cable route, as well as an assessment of archaeological potential.

Fugro undertook the marine geophysical surveys along the proposed route between August and November 2018. These surveys collected multibeam echo sounder (MBES), sidescan sonar (SSS), magnetometer and sub-bottom profiler (SBP) data. The archaeological assessment of marine data from Irish waters has identified 18 anomalies with archaeological potential along the proposed route. One of these anomalies represents a previously unknown cohesive wreck site. Appropriately-sized archaeological exclusion zones (AEZs) have been proposed for each of the identified anomalies.

The landfall surveys were conducted in March 2019 over the foreshore and intertidal zones at Loughshinny, Co Dublin, Ireland, Port Erin and Port Grenaugh on the Isle of Man, Lytham St Anne's, on the west coast, and Seaton Sluice and Whitley Bay on the east coast of England. The foreshore surveys comprised walk-over, hand-held metal detector and terrestrial geophysical (electrical conductivity) surveys. All find spot locations were recorded using the geodetic datum World Geodetic System (WGS) 1984 using a hand-held Global Positioning System (GPS) devices, while features of archaeological potential were recorded with digital photography.

These surveys have successfully evaluated the six potential landfall locations and have identified no anomalies of clear archaeological potential. At Port Grenaugh, however, where a possible fish trap or barrier against small vessels is recorded (Cotswold Archaeology 2019), linear anomalies detected perpendicular to the tide, may be anthropogenic in origin, perhaps resulting from buried walls or the accumulation of deposits against them. These anomalies are assessed as of low to moderate archaeological potential. No other anomalies of archaeological potential have been identified at any of the potential landfall locations. Elsewhere, four linear anomalies identified at Port Erin, and a fifth at Lytham St Anne's, indicate buried service pipes / cables. On the basis of the walkover geophysical, and metal detecting surveys, therefore, these landfall locations are assessed as of low archaeological potential, which corroborates the results of the marine archaeology desk-based assessment (Cotswold Archaeology 2019).

CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

1. INTRODUCTION

Outline

1.1. Cotswold Archaeology (CA) was commissioned by Fugro Germany Marine GmbH, at the end of November 2018, to undertake marine archaeological assessments for the proposed Havhingsten submarine cable system. These assessments included foreshore and intertidal surveys at six potential landfall locations, and the archaeological assessment of marine geophysical survey data collected along the proposed cable route corridor in Irish territorial waters only.

1.2. This report presents the results of the archaeological assessment of foreshore and intertidal archaeological survey data for all six potential landfall locations in the British Isles and of marine geophysical survey data in Irish waters only. This report includes an assessment of marine and coastal cultural assets potentially affected by this project, up to the mean high water springs (MHWS).

1.3. The Havhingsten submarine cable system (henceforth 'the project') is proposed to run beneath the Irish Sea with potential landfall locations at Loughshinny in Ireland, at Port Erin and Port Grenaugh on the Isle of Man and at Lytham St Anne's on the west coast of England. The cable will also run under the North Sea with two potential landfall locations at Seaton Sluice and at Whitley Bay on the north-east coast of England.

Project background

1.4. The proposed cable route runs for approximately 607.7km; 57.3km through Irish waters, 59.4km through Isle of Man waters and 491km through English waters (see figures 1 & 2). This report presents the results from the six potential landfall locations and from Irish territorial waters following the relevant national frameworks and guidance of each respective nation through whose waters the cable may be laid.

1.5. The foreshore, intertidal and marine assessments have been undertaken by Cotswold Archaeology in collaboration with our colleagues at Headland Archaeology, who undertook the collection and analysis of foreshore and intertidal geophysical survey data, at the six potential landfall locations, and with our colleagues at Coastal and Offshore Archaeological Research Services (COARS),

University of Southampton, who undertook the assessment of marine geophysical survey data collected by Fugro.

1.6. The purpose of these archaeological assessments is to identify known and potential sites and features of archaeological interest at the six potential landfall locations and along the proposed cable route in Irish waters that might be impacted by the project. The potential impact of the project on those sites will then be limited through the adoption of appropriate mitigation measures, such as the adoption of AEZs where necessary. Archaeological potential is evaluated through the assessment of the nature and density of known sites in the vicinity of the proposed development.

2. METHOD

2.1. All surveys were positioned using the geodetic datum WGS 1984, with projection in the appropriate Universal Transverse Mercator Zone.

Foreshore survey

2.2. The surveys were conducted during the most favourable Spring tides and extended to the low water mark in an effort to achieve overlap coverage with the offshore marine surveys.

2.3. The landfall surveys, conducted on the foreshore and in the intertidal zone, comprised walkover, hand-held metal detector, and geophysical (electro-magnetic conductivity) surveys. The aim of the surveys was to assess and map the extent of any archaeological remains along, and in proximity to, the proposed cable route.

Metal detector and walkover surveys

2.4. Hand-held metal detector and walkover surveys were conducted following 5m wide traverses to match those used for the geophysical survey. The metal detector was set to detect all metal, but the sensitivity was adjusted to compensate for the high salt content of the beach sand. All identified features and detected finds spots were recorded photographically with a brief description, if deemed necessary. Locations were recorded using a hand-held Garmin GPS and plotted into an AutoCAD base plan. As this survey was non-intrusive, no finds spots were excavated. A Minelab X-Terra 705 metal detector was used to conduct the surveys (Fig. 3).

Legend

N

- Ireland CSC
- IoM CSC
- UK west merge CSC

0 32.5km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Irish Sea cable study corridors (CSCs)

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**1**
APPROVED BY	**MTW**	*SCALE@A3*	**1:750,000**	

600000
700000
800000
900000
6300000
6200000
6100000

Legend

UK east merge

N

0 40km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

North Sea CSC

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**2**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,100,000**	

2.6. The numeric values displayed on the detector were also recorded as they can potentially assist in the identification of the type of metal detected, with higher values more likely to be indicative of non-ferrous metals (Minelab 2017:11).

Figure 3 Metal detecting on Port Erin beach

Geophysics

2.7. Geophysical survey was undertaken by a geophysicist from Headland Archaeology using a Geophex GEM-2 multi-frequency broadband electromagnetic (EM) instrument (Fig. 4) to perform a terrain electrical conductivity survey. The instrument is a non-intrusive frequency-domain electrical conductivity measuring device that records the spatial variations of apparent ground conductivity of the earth in units of milliSiemens / metre (mS/m). The 'siemen' is the international unit of measurement for volume electrical conductance and is the equivalent to an ampere/volt. Differences in deposits, principally variations in thickness between deposits with different conductivities, can produce spatial variations in conductivity readings.

2.8. The system provides two measurements:

- Quadrature (apparent conductivity); and
- In-phase data (metallic response).

2.9. The GEM-2 can acquire data over multiple frequencies, which is equivalent to measuring the earth response from multiple depths (depending upon the earth medium targeted). Five frequencies were utilised and subsequently analysed on each of the landfall locations (475 Hertz (Hz), 1525Hz, 5325Hz, 18325Hz and 63025Hz).

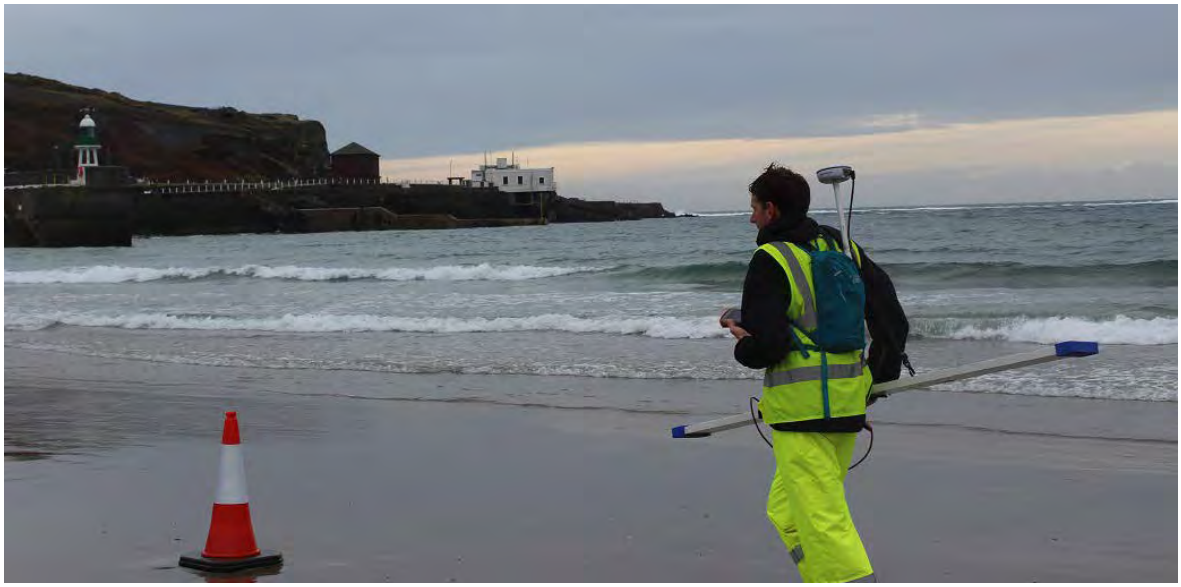


Figure 4 GEM2 in operation at Port Erin

2.10. A survey grid was set out at the required locations and subdivided into 5m transects, using a GPS system utilising WGS84 30N Universal Transverse Mercator (UTM) with an accuracy of 0.5m or greater.

2.11. The primary focus of the survey was to identify buried metal objects on the beach that might relate to heritage assets. In addition, some success was obtained in mapping variations in silting patterns in the foreshore area. Variations in response might occur where timber structures have influenced the deposition of sediments and could therefore be used to identify the presence of wooden material which could be indicative of wreck material or other wooden structures buried in the sand.

2.12. In addition, as ground conductivity is influenced by soil moisture content, an electromagnetic conductivity survey could be used to differentiate between areas of solid substrata and sand. This could help to define the former physical topography of the survey area by identifying former channels or basins in the sub-strata.

Identification of these features would help to define areas of archaeological potential within the survey area.

2.13. The data was digitally recorded and periodically downloaded to a field computer for quality assurance and preliminary interpretation.

2.14. At the conclusion of the survey, the Geophex GEM-2 data was interpreted and mapped using Terrasurveyor V3.0.32.4 software (DWConsulting), a surface mapping software that allows topographic data to be contoured and presented in a manner that enables the interpretation of sub-surface features.

2.15. The illustrations of the foreshore and intertidal geophysical survey data in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different frequencies. All graphics are displayed using the 5325Hz frequency which has been presented to most suitably display and interpret the data from each site based on the experience and knowledge of the assessors.

2.16. The geophysical survey and report were completed in accordance with relevant best practice guidance documents (see Bonsall *et al*. 2014; David *et al*. 2008; Gaffney *et al*. 2002; Schmidt *et al*. 2015).

Offshore survey

2.17. The offshore geophysical survey was undertaken by Fugro between August and November 2018 using the survey vessel MV Fugro Helmert (Fig. 5). The survey corridor was c. 500m wide, with seven survey lines spaced c. 60m apart, resulting in >100% MBES and SSS coverage.

2.18. Bathymetric data were acquired using a Kongsberg EM2040 (200-400 kHz) MBES, with positioning provided using a Seastar 3610 DGNSS receiver. The SSS survey was undertaken using an Edgetech 4200 series dual frequency (600 and 300 kHz) fish, with position provided by a Kongsberg HiPAP 501 USBL system. The magnetometer survey was undertaken using a Geometrics G882 magnetometer with positioning provided by ultra-short baseline (USBL). The SBP seismic data were acquired using an Innomar SES 2000 medium, with position provided by USBL.

2.19. Survey positions were recorded in the geodetic datum WGS84, with projection in the Universal Transverse Mercator (UTM) Zone 30 North. The vertical reference level is Lowest Astronomical Tide (LAT), with MBES elevation corrected to mLAT using the VORF vertical reference.

2.20. Geophysical assessment was undertaken utilising the programs Coda Octopus survey engine 4.3 and ArcGIS 10.6.1, following the guidelines of Plets et al. (2013). The SSS and SBP data were analysed using Coda with the positions of surface and sub-surface anomalies exported into ArcGIS as shapefiles alongside processed magnetometer data provided by Fugro. MBES was provided at a gridded resolution of 1.0m and imported into ArcGIS. The geophysical data was assessed for anomalies with archaeological potential, with selection based on the presence of multiple lines of evidence (confirming datasets).

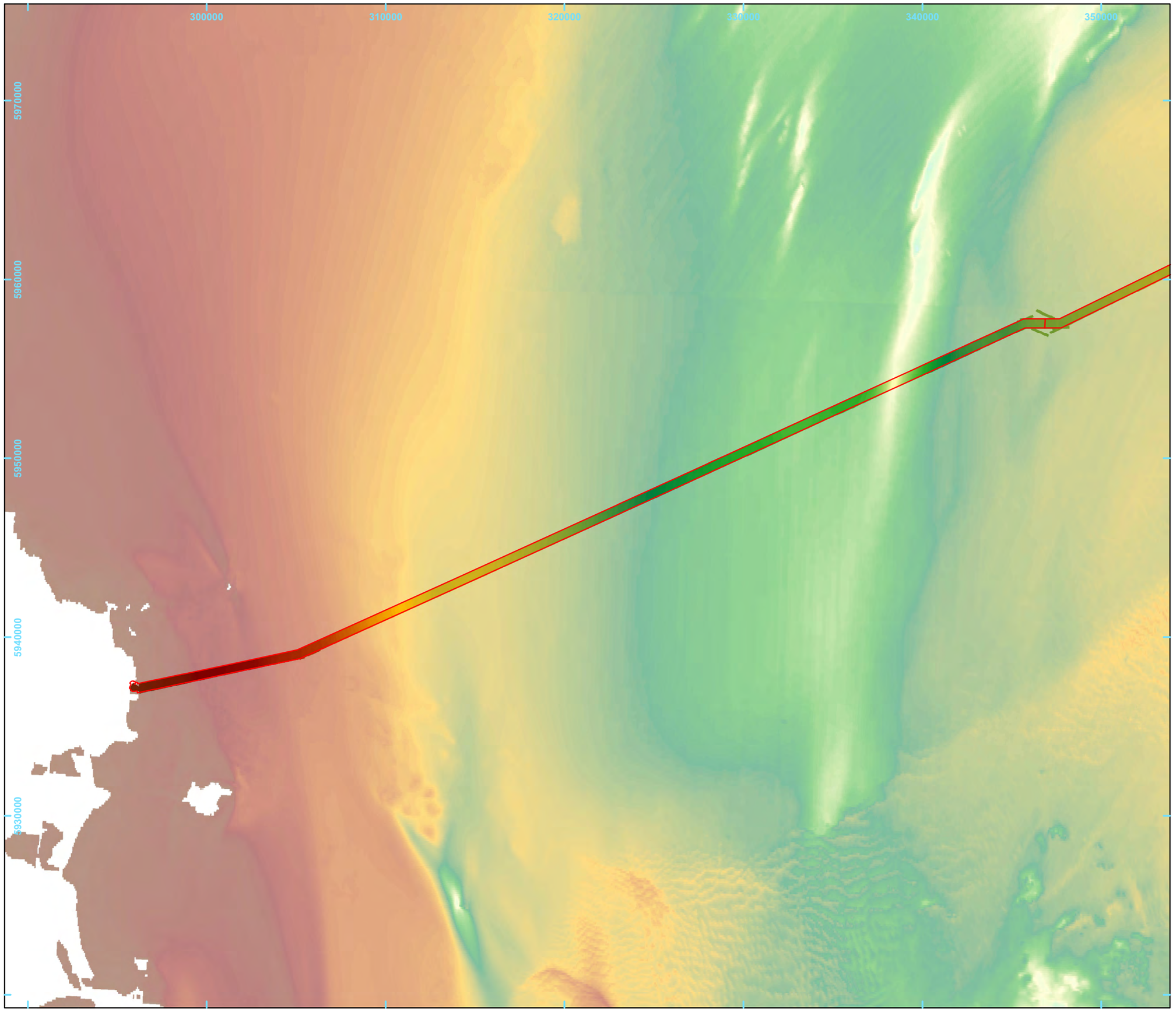
3. RESULTS

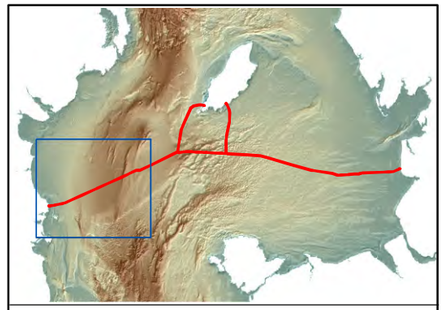
Foreshore survey

Loughshinny

3.1. Nothing of particular archaeological interest was identified in the desk-based assessment (DBA) at Loughshinny (Cotswold Archaeology 2019). Rather than emanating from a marine context, archaeological discoveries in the vicinity appear to have eroded from the promontory fort.

3.2. Complimentary quadrature (conductivity) and in-phase (magnetic susceptibility) geophysical datasets collected at Loughshinny recorded clear contrasts between high conductivity / high magnetic susceptibility in the harbour area adjacent to the wharf in the east and lower values generally in the west of the survey area (Fig. 6). This variation is probably caused by the accumulation of marine deposits behind the harbour wall where the silts are sheltered from the Irish Sea. Clearly interpretable metallic responses have been identified in the in-phase dataset (Fig. 7) as discrete anomalies with extreme values, mostly occurring towards the high-water mark at the head of the beach and within the harbour area in the east. This observation is reflected in the results from the metal-detection survey. The concentration of metal detection locations higher up the beach, to the north-west (Fig. 7), probably represents casual losses indicative of the area of the beach that is most likely favoured by bathers and walkers.





N

Legend

Route Corridor

Bathymetry (m LAT)

80

-160

0 7,500m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

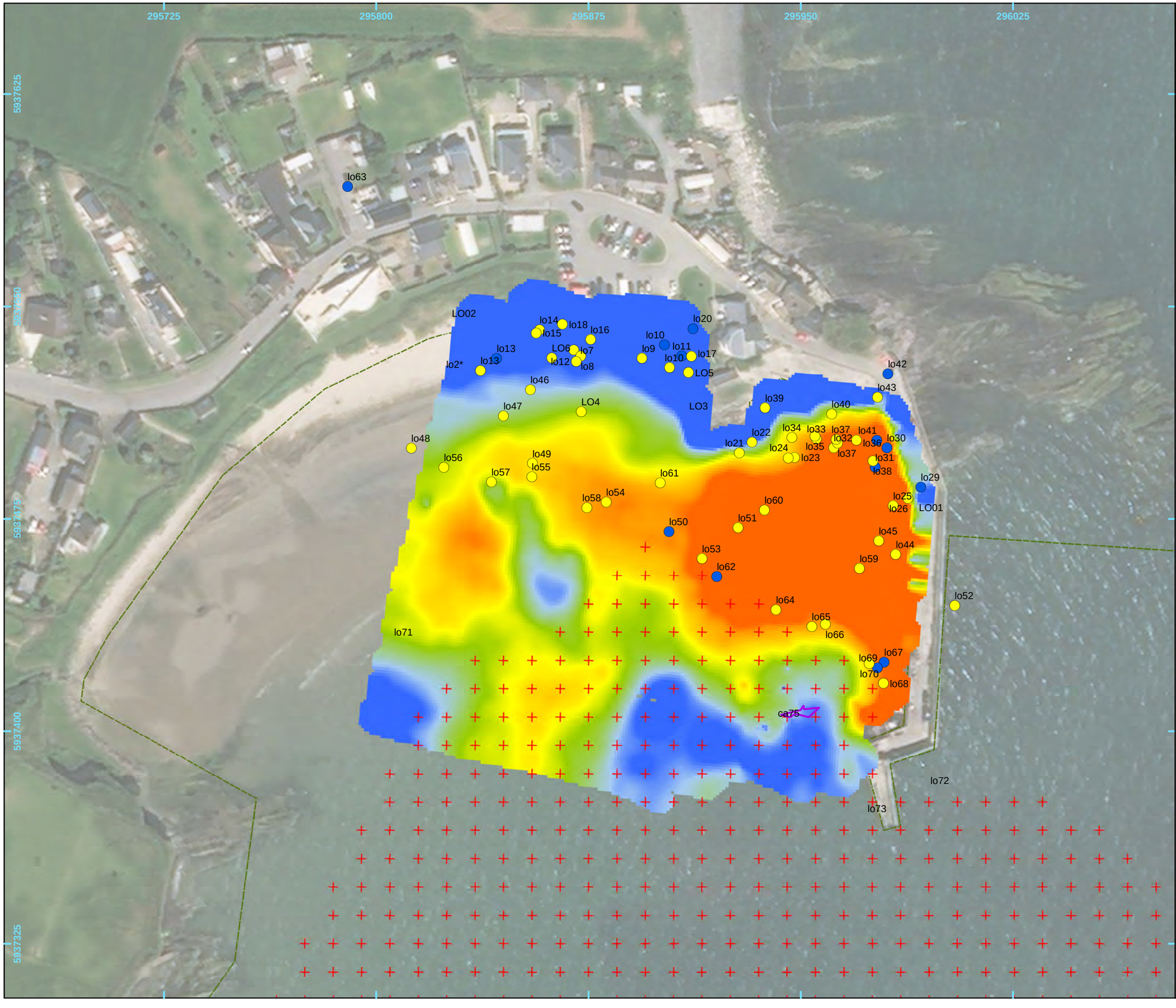
PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Proposed route and survey corridor through Irish Waters

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**5**
APPROVED BY	**MW**	*SCALE@A3*	**1:200,000**	



Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Bathymetry extent
- Ireland CSC

0 0.05km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (quadrature) results from Loughshinny with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**6**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,250**	

295725 295800 295875 295950 296025

5937550 5937475 5937400 5937325

lo63 LO02 lo14 lo18 lo15 lo16 lo7 lo20 lo10 lo11 lo13 lo9 lo17 LO6 lo12 lo8 lo10 lo2* lo13 LO5 lo46 lo42 lo43 lo39 lo40 lo47 LO4 LO3 lo48 lo22 lo34 lo33 lo37 lo36 lo41 lo30 lo21 lo24 lo23 lo35 lo37 lo32 lo31 lo56 lo49 lo55 lo38 lo57 lo61 lo29 lo58 lo54 lo25 LO01 lo60 lo26 lo50 lo51 lo45 lo44 lo53 lo59 lo62 lo52 lo64 lo65 lo66 lo71 lo67 lo69 lo70 lo68 ca75 lo72 lo73

Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Ireland CSC

0 0.05km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (in-phase) results from Loughshinny with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**7**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,102**	

Port Erin

3.3. All sites recorded in the DBA on the Isle of Man appear to be above MHWS or without the CSC (Cotswold Archaeology 2019). This was confirmed by the archaeological walkover which identified nothing of archaeological potential within the study area.

3.4. Four linear anomalies are clearly visible in the Port Erin geophysical datasets, radiating from a concrete ramp that provides access to the beach in the east of the survey area (Fig. 8). These anomalies represent buried services which were not located by the metal detector, probably because they were too deeply buried. The broad area of low conductivity / low magnetic susceptibility in the east of the dataset corresponds to the outflow from a minor watercourse and is probably due to variation in the depth and composition of the beach deposits in this area. The concentration of non-ferrous metal detections at the upper (western) end of the beach could again represent isolated finds on the more frequently used section of the beach although the linear nature of the finds, parallel to the waterline, might suggest detritus washed ashore.

Port Grenaugh

3.5. One of the sites mentioned in the DBA (Cotswold Archaeology 2019), *Cronk ny Merriu*, a presumed Iron Age defended promontory, which was later built over by a Viking longhouse, was visited during the walkover (Fig. 10) and was confirmed to be well away from the study area. The possible remains of a fish trap, or a rudimentary barrier against small vessels was also inspected at low tide but the surviving remains (Fig. 11) are difficult to interpret with any certainty.

3.6. At Port Grenaugh the geophysical survey has identified at least four parallel linear anomalies, aligned north-east / south-west, perpendicular to the tide (Fig. 12 and Fig. 13). The alignment of the anomalies corresponds to the surrounding inter-bedded siltstone / mudstone / sandstone bedrock. The anomalies probably represent an accumulation of deposits within fissures in the bedrock or by the bands of Caledonian Supersuite (metamorphic rock) which are also recorded on this alignment. Potential alignments in the metal detection survey seem to reflect those found in the geophysical survey data. This could represent items trapped in the fissures or could represent built structures. A possible fish trap or barrier against small vessels is recorded in the bay and therefore an anthropogenic origin cannot

be discounted. It is possible that the anomalies represent buried walls, or the accumulation of deposits against them.

Lytham St Anne's

3.7. None of the three sites (**CA6-8**) identified in the DBA (Cotswold Archaeology 2019) in the vicinity of the proposed landfall location at Lytham St Anne's were immediately apparent during the walkover survey, which suggests either that they are well beyond the study area or that little remains.

3.8. An east / west linear anomaly has been clearly identified in the in-phase (magnetic susceptibility) geophysical dataset (Fig. 14). The anomaly represents a buried service pipe. Towards the eastern end of the anomaly it deviates southwards, maintaining a constant distance from the sea defences which delimit the north-west corner of the survey area. Buried sea defences have also been clearly detected within this dataset as high magnetic susceptibility linear anomalies adjacent to the north-western survey limit.

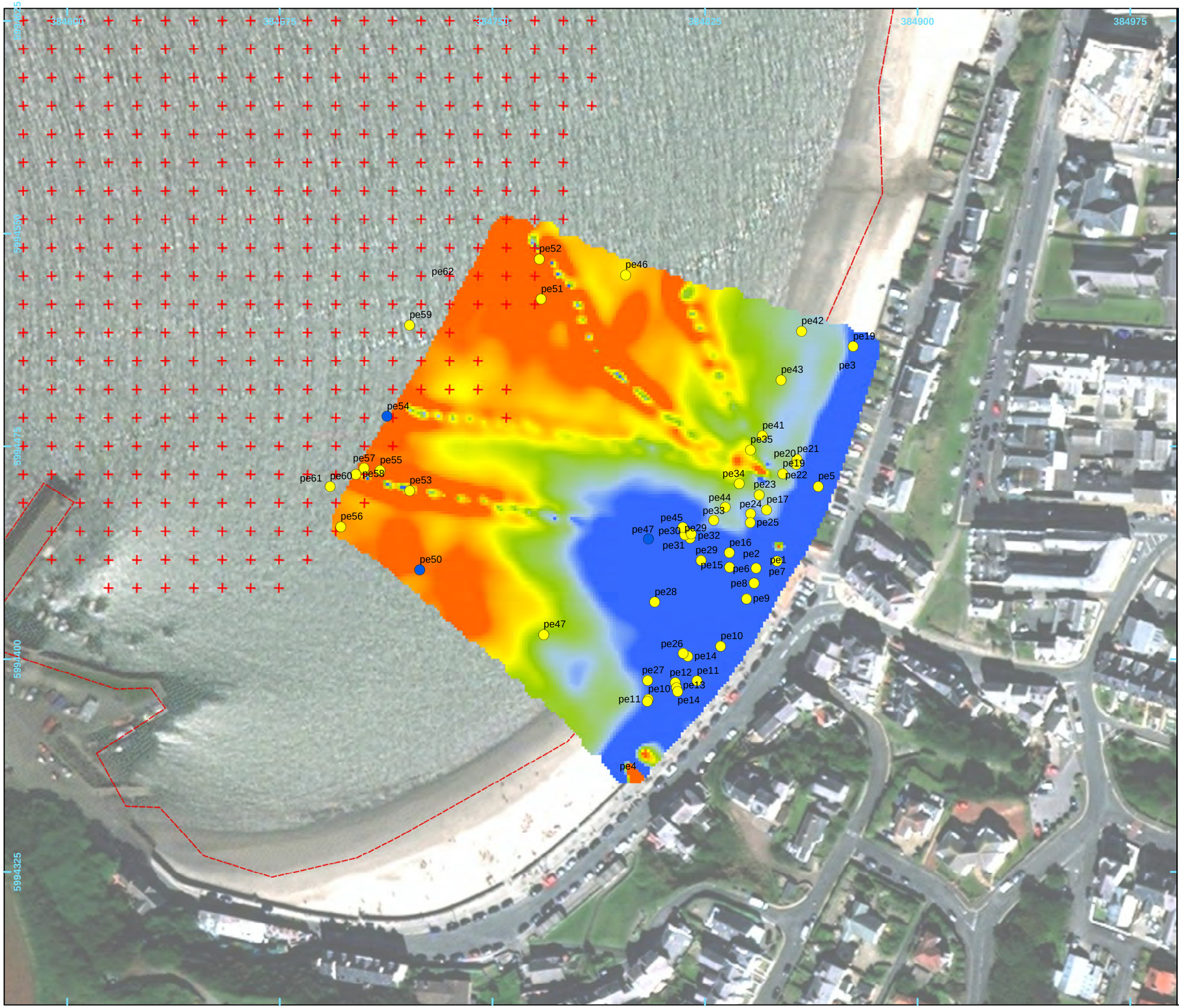
3.9. Broad and amorphous areas of electrical conductivity (Fig. 15) and magnetic susceptibility variation across the dataset are probably a result of natural silting patterns.

3.10. There is no obvious patterning in the metal detection survey; the bulk of the locations again appear to represent casual losses in the upper (eastern) section of the beach which is more frequently used by walkers and bathers.

Seaton Sluice

3.11. None of the four sites recorded in the DBA (Cotswold Archaeology 2019) in the north-east (**CA57-60**) were identified during the walkover surveys which suggests either that remains are beyond the study area, they no longer exist, or they have been buried, removed, or built over.

3.12. The geophysical data at Seaton Sluice is characterised by a broad band of low conductivity / low magnetic susceptibility along the south-western side of the dataset. This anomaly corresponds with the elevated section of the beach. The north-eastern half of the dataset contains broad and amorphous areas of variation which again are probably a result of natural silting patterns (Fig. 16 and Fig. 17).



Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Bathymetry extent
- IoM CSC

0 0.05km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

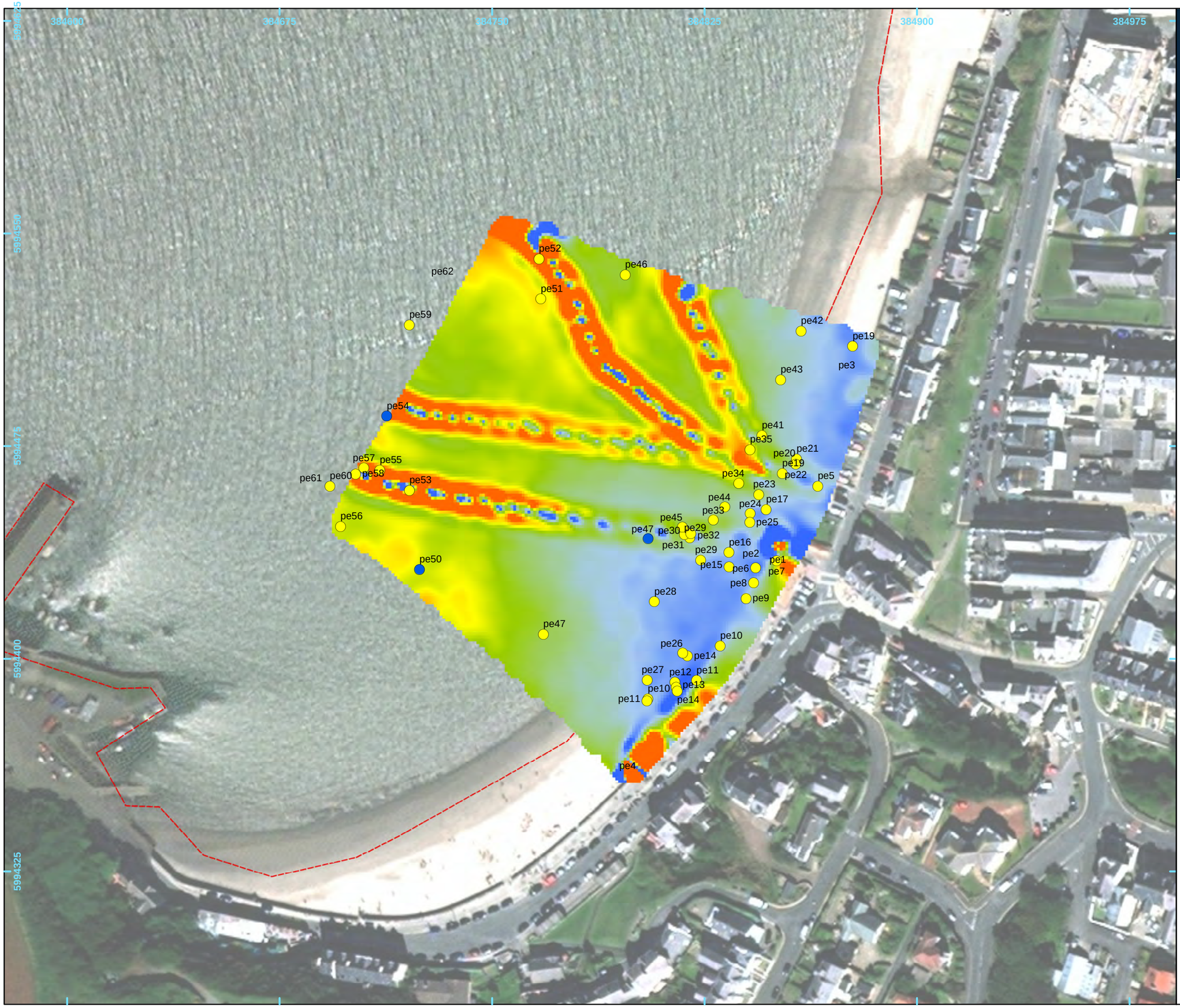
PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (quadrature) results from Port Erin with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**8**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,250**	



Legend

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- IoM CSC

N

0 0.05km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (in-phase) results from Port Erin with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*	**9**
CHECKED BY	**MTW**	*DATE*	**15/04/2019**		
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,250**		

Figure 10 *Cronk ny Merriu*, a presumed Iron Age defended promontory (background facing landward), later built over by a Viking longhouse (foreground)

Figure 11 Boulders located in the lower intertidal zone at Port Grenaugh interpreted as a possible fishtrap or barrier to small vessels

396750
396825
396900
396975
5996200
5996125
5996050
5995975

pg1 pg2 pg3 pg4 pg5 pg6 pg7 pg8 pg9 pg10 pg11 pg12 pg13 pg14 pg15 pg16 pg17 pg18 pg19 pg20 pg21 pg22 pg23 pg24 pg25 pg26 pg27 pg28 pg29 pg30 pg31 pg32 pg33 pg34 pg35 pg36 pg37 pg38 pg39 pg40 pg41 pg42 pg43 pg44 pg45 pg46 pg47 pg48 pg49 pg50 pg51 pg52 pg53 pg54 pg55 pg56 pg57 pg58 pg59 pg60 pg61 pg62 pg63 pg65 pg66 pg67 pg68 pg69 pg70 pg71 pg72 pg73 pg74 pg75 pg76 pg77

Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Bathymetry extent
- IoM CSC

0 0.0425km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (quadrature) results from Port Grenaugh with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**12**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,000**	

396750
396825
396900
396975
5996200
5996125
5996050
5995975

pg1 pg2 pg3 pg4 pg5 pg6 pg7 pg8 pg9 pg10 pg11 pg12 pg13 pg14 pg15 pg16 pg17 pg18 pg19 pg20 pg21 pg22 pg23 pg24 pg25 pg26 pg27 pg28 pg29 pg30 pg31 pg32 pg33 pg34 pg35 pg36 pg37 pg38 pg39 pg40 pg41 pg42 pg43 pg44 pg45 pg46 pg47 pg48 pg49 pg50 pg51 pg52 pg53 pg54 pg55 pg56 pg57 pg58 pg59 pg60 pg61 pg62 pg63 pg65 pg66 pg67 pg68 pg69 pg70 pg71 pg72 pg73 pg74 pg75 pg76 pg77

Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- IoM CSC

0 0.0425km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

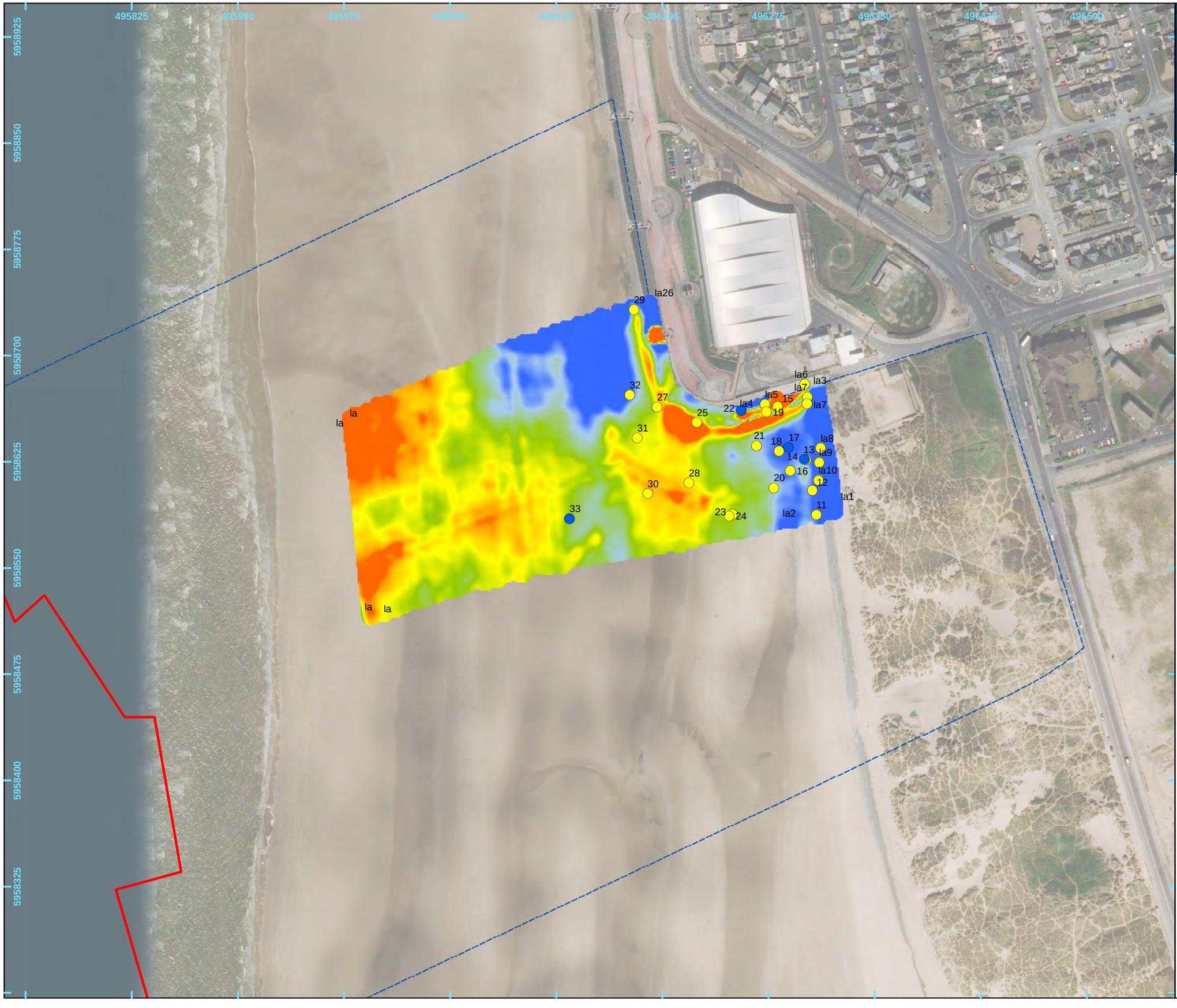
PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (in-phase) results from Port Grenaugh with metal detecting results overlain

DRAWN BY	RLF	PROJECT NO	770835	FIGURE NO.
CHECKED BY	MTW	DATE	15/04/2019	13
APPROVED BY	MTW	SCALE@A3	1:1,000	



Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Bathymetry extent
- UK west merge CSC

0 0.1km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

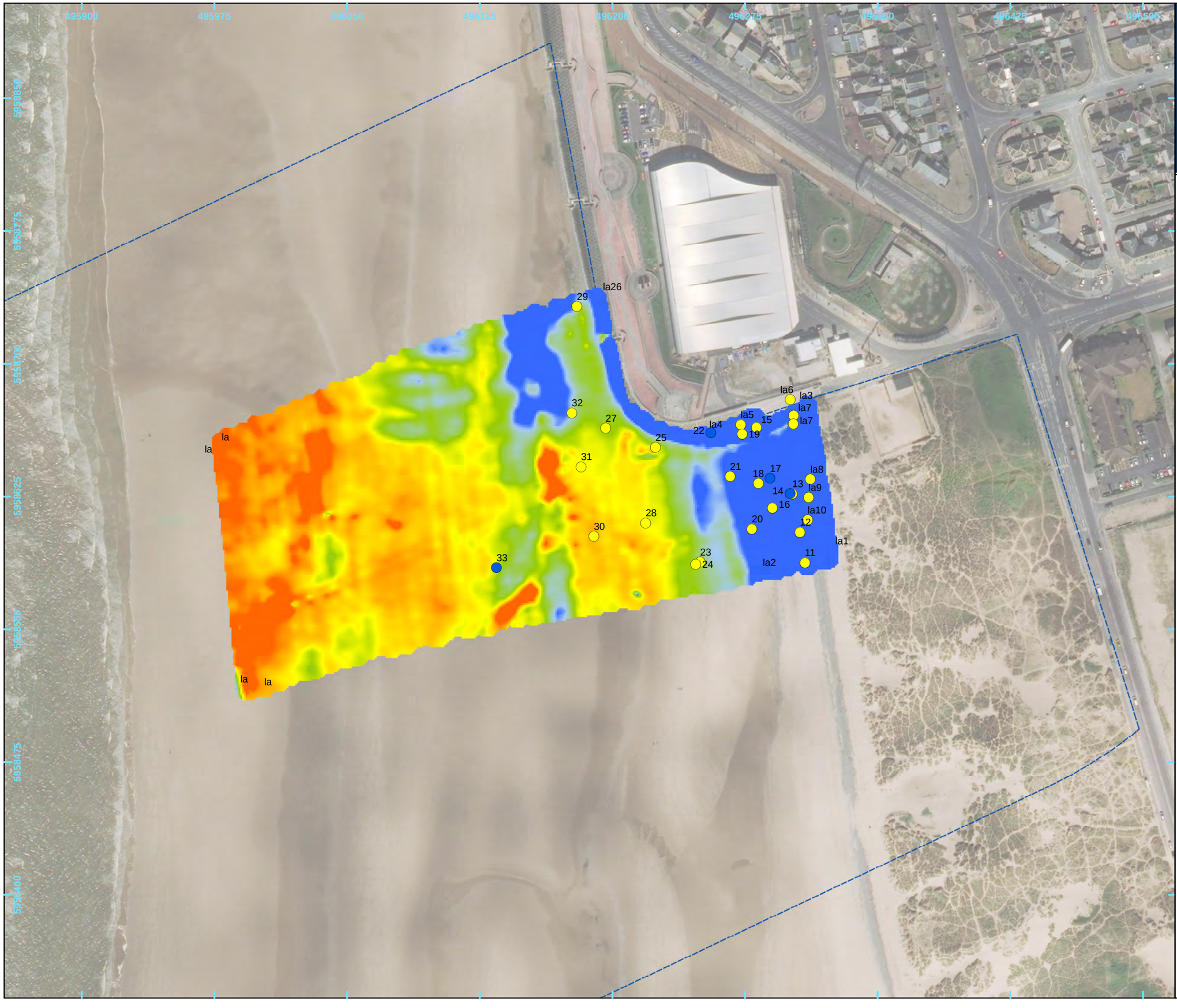
PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (in-phase) results from Lytham, St. Anne's with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**14**
APPROVED BY	**MTW**	*SCALE@A3*	**1:2,500**	



Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- UK west merge CSC

0 0.075km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

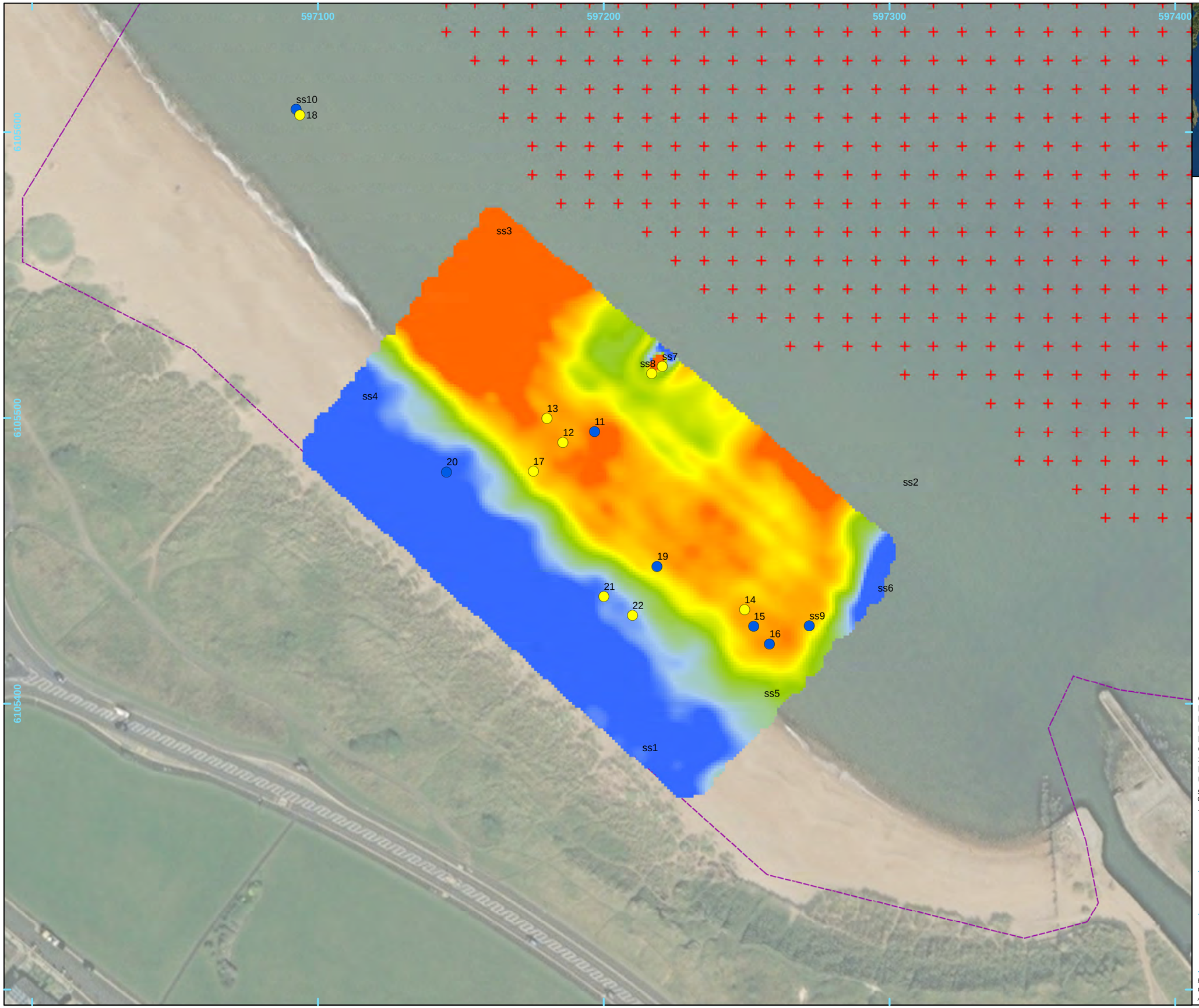
PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (quadrature) results from Lytham, St. Anne's with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**15**
APPROVED BY	**MTW**	*SCALE@A3*	**1:2,000**	



Legend

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Bathymetry extent
- UK east merge

N

0 0.05km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

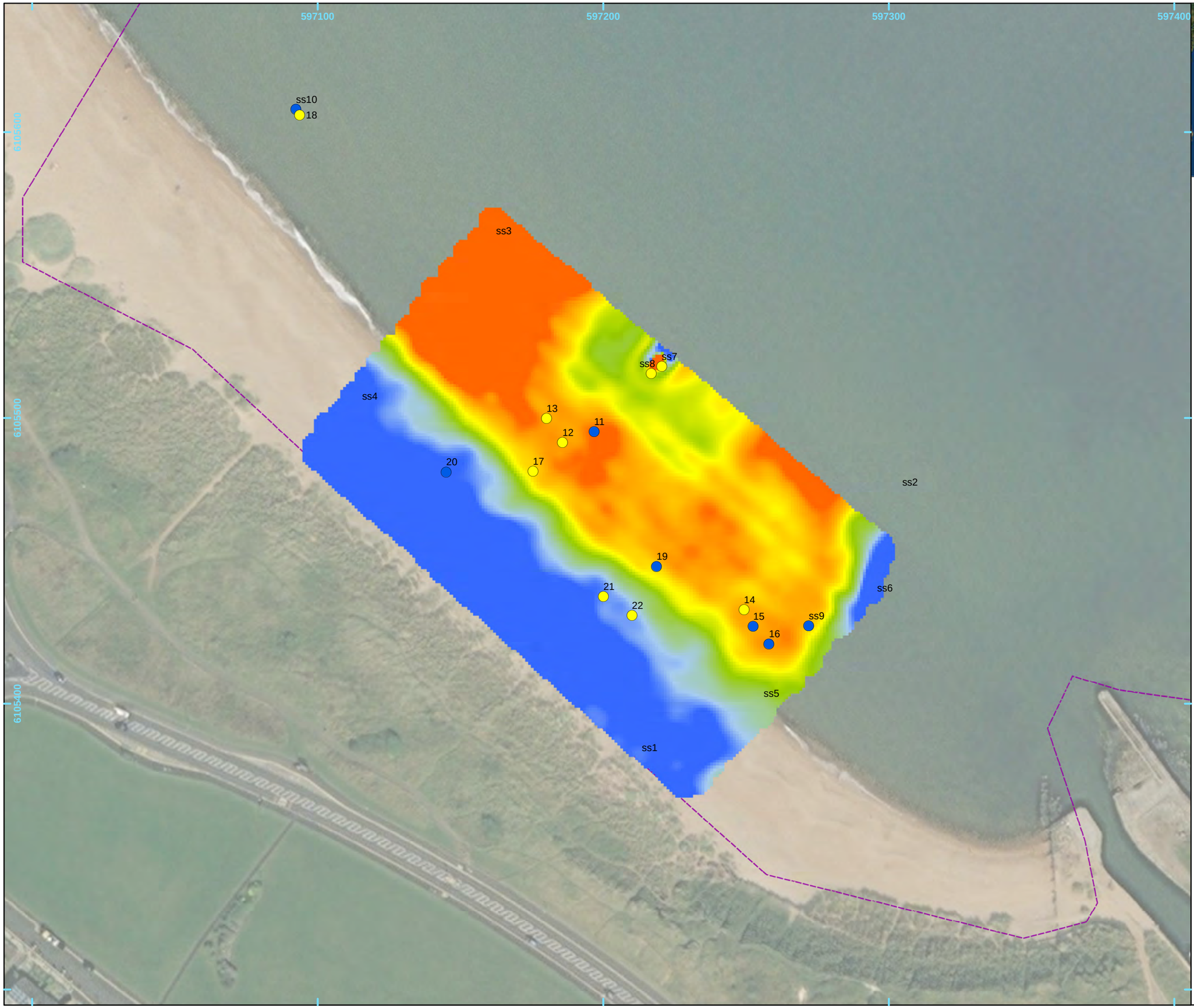
PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (quadrature) results from Seaton Sluice with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**16**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,250**	



Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- UK east merge

0 0.05km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (in-phase) results from Seaton Sluice with metal detecting results overlain

DRAWN BY	**RLF**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**MTW**	*DATE*	**15/04/2019**	**17**
APPROVED BY	**MTW**	*SCALE@A3*	**1:1,250**	

Whitley Bay

3.13. Extreme values along the south-western edge of the geophysical survey area are caused by the presence of concrete sea defences. The broad and amorphous area of low conductivity in the north of the quadrature plot corresponds to an area of outcropping bedrock. Elsewhere the variations recorded are probably again the result of natural silting patterns (Fig. 18). Highly magnetic discrete anomalies along the low water mark (the north-eastern edge of the dataset) represent buried metal objects (Fig. 19). These were not detected by the metal-detecting survey, possibly as they were buried too deeply. The lines of non-ferrous metal detections parallel to the waterline may represent detritus from the construction of the concrete sea defences detected in the geophysical data further offshore.

Offshore survey

3.14. Analysis of the marine geophysical datasets collected in Irish waters identified 18 anomalies with archaeological potential (see Figure 20 and 21 and Table 1; each anomaly with medium to high archaeological potential is illustrated in Figures 22, 23 and 24). Other geophysical anomalies identified in the survey data, notably SSS, consisted of small (<2m) boulders, sometimes with associated scour, in areas where bedrock was not exposed on the surface. These anomalies did not have associated magnetic signals so are interpreted as being natural in origin and are not listed as having archaeological potential.

Table 1 Description of geophysical anomalies identified with archaeological potential

Anomaly ID	Easting WGS84 UTM 30N	Northing WGS84 UTM 30N	Description	Archaeological Potential	Proposed AEZ Radius (m)
CA2001	295926	5937268	Side Scan Sonar Anomaly S1-1_AL_SC009 (1.9x1.0x0.4m)	Low	10
CA2002	296293	5937215	Mag Anomaly S1-1_AL_MC009 (59nT)	Low	10
CA2003	296498	5937173	Mag Anomaly S1-1_AL_MC007 (64nT) with accompanying SSS anomaly 2m NW measuring 1.8 x 1.0m	Medium	10
CA2004	297127	5937316	Small bathymetric feature 6x6m with corresponding SSS signature inc.possible angular feature immediately east.	Low	10

Anomaly ID	Easting WGS84 UTM 30N	Northing WGS84 UTM 30N	Description	Archaeological Potential	Proposed AEZ Radius (m)
CA2005	297179	5937445	Mag Anomaly S1-1_AL_MC018 (41nT). Survey notes possible natural origin	Low	10
CA2006	297310	5937512	Mag Anomaly S1-1_AL_MC020 (73nT). Survey notes possible natural origin	Low	10
CA2007	297342	5937548	Mag Anomaly S1-1_AL_MC042 (44nT). Survey notes possible natural origin	Low	10
CA2008	303428	5938831	Mag Anomaly S1-1_AL_MC037 (135nT). Survey notes possible natural origin. No sub-bottom anomaly to suggest buried cable	Low	5
CA2009	303517	5938466	Mag Anomaly S1-1_AL_MC043 (124nT). Survey notes possible natural origin. No sub-bottom anomaly to suggest buried cable	Low	5
CA2010	303483	5938768	Mag Anomaly S1-1_AL_MC041 (161nT). Survey notes possible natural origin. No sub-bottom anomaly to suggest buried cable	Low	5
CA2011	303531	5938691	Mag Anomaly S1-1_AL_MC034 (241nT). Survey notes possible natural origin. No sub-bottom anomaly to suggest buried cable	Low	5
CA2012	303565	5938632	Mag Anomaly S1-1_AL_MC045 (213nT). Survey notes possible natural origin. No sub-bottom anomaly to suggest buried cable	Low	5
CA2013	303627	5938644	Mag Anomaly S1-1_AL_MC046 (100nT). Survey notes possible natural origin. No sub-bottom anomaly to suggest buried cable	Low	5
CA2014	304248	5939073	Mag Anomaly S1-1_AL_MC035 (203nT). Survey notes possible natural origin.	Low	5
CA2015	304391	5938961	Mag Anomaly S1-1_AL_MC042 (141nT). Survey notes possible natural origin.	Low	5

Anomaly ID	Easting WGS84 UTM 30N	Northing WGS84 UTM 30N	Description	Archaeological Potential	Proposed AEZ Radius (m)
CA2016	328090	5949489	SSS Anomaly S1-1_FHE_SC0010 (24.2x8.9x4.2m) associated with distinct bathymetric feature 20 x 12m with scour at NW and SE edge. Probable wreck	High	50
CA2017	327980	5949307	SSS Anomaly S1-1_FHE_SC0009 (6.6x0.5x0.2m) – linear angular anomaly	Medium	10
CA2018	346687	5957577	Cable and trench, clearly visible in SSS and Bathymetry, with Mag Anomalies S1-1_FHE_MC003, 025, 031, 001, 020, 014 and 002 (100-6150nT). Runs between 346440 5957032 and 346927 5958086 (UTM 30N).	Low	N/A

3.15. Of the 18 anomalies identified, only one was identified as a probable wreck site (CA2016; see Figure 22) and therefore of high archaeological potential; any unidentified wrecks in Irish waters are automatically protected under Irish legislation (Section 3 of the National Monuments (Amendment) Act, 1987) until they have been further assessed. Two were deemed to have medium potential: CA2003 consisted of a pair of SSS and magnetic anomalies (Fig. 23); and CA2017 was a clearly defined linear SSS anomaly (Fig. 24) located SW of the wreck site (CA2016).

3.16. CA2018 is a clearly defined cable trench running approximately north-south perpendicular to the cable corridor, visible in all geophysical datasets; this is of low archaeological potential as it is clearly a recent infrastructure installation. The remaining 14 anomalies were identified as having low archaeological potential, either consisting of sole SSS anomalies or magnetometer anomalies with high values but questioned by the survey team as possibly being of a natural origin.

599175 599250 599325 599400 599475

6101350 6101275 6101200

wb1 wb2 wb3 wb4 wb5 wb6 wb7 wb64 wb66

65 40 39 37 41 38 50 42 43 36 51 35 34 33 44 14 52 53 32 31 30 54 29 28 27 45 26 46 55 11 12 13 25 56 47 8 23 24 15 22 21 20 19 48 9 49 18 17 16 10 61 62 57 59 58 60 63 63

Legend

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- Bathymetry extent
- UK east merge

N

0 0.0425km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Geophysics (quadrature) results from Whitley Bay with metal detecting results overlain

DRAWN BY	RLF	PROJECT NO	770835	FIGURE NO.
CHECKED BY	MTW	DATE	15/04/2019	18
APPROVED BY	MTW	SCALE@A3	1:1,000	

599176 599250 599325 599400 599475

6101425 6101350 6101275 6101200

wb1 wb2 wb3 wb4 wb5 wb6 wb7 wb64 wb66

65 65 40 38 41 39 37 50 61 62 42 43 36 51 35 34 44 33 14 52 32 53 31 30 54 57 59 29 28 27 45 58 26 46 55 60 63 63 11 12 13 25 56 8 24 47 22 15 23 21 20 19 48 9 49 18 17 16 10

Legend

N

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- UK east merge

0 0.045km

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
www.cotswoldarchaeology.co.uk
enquiries@cotswoldarchaeology.co.uk

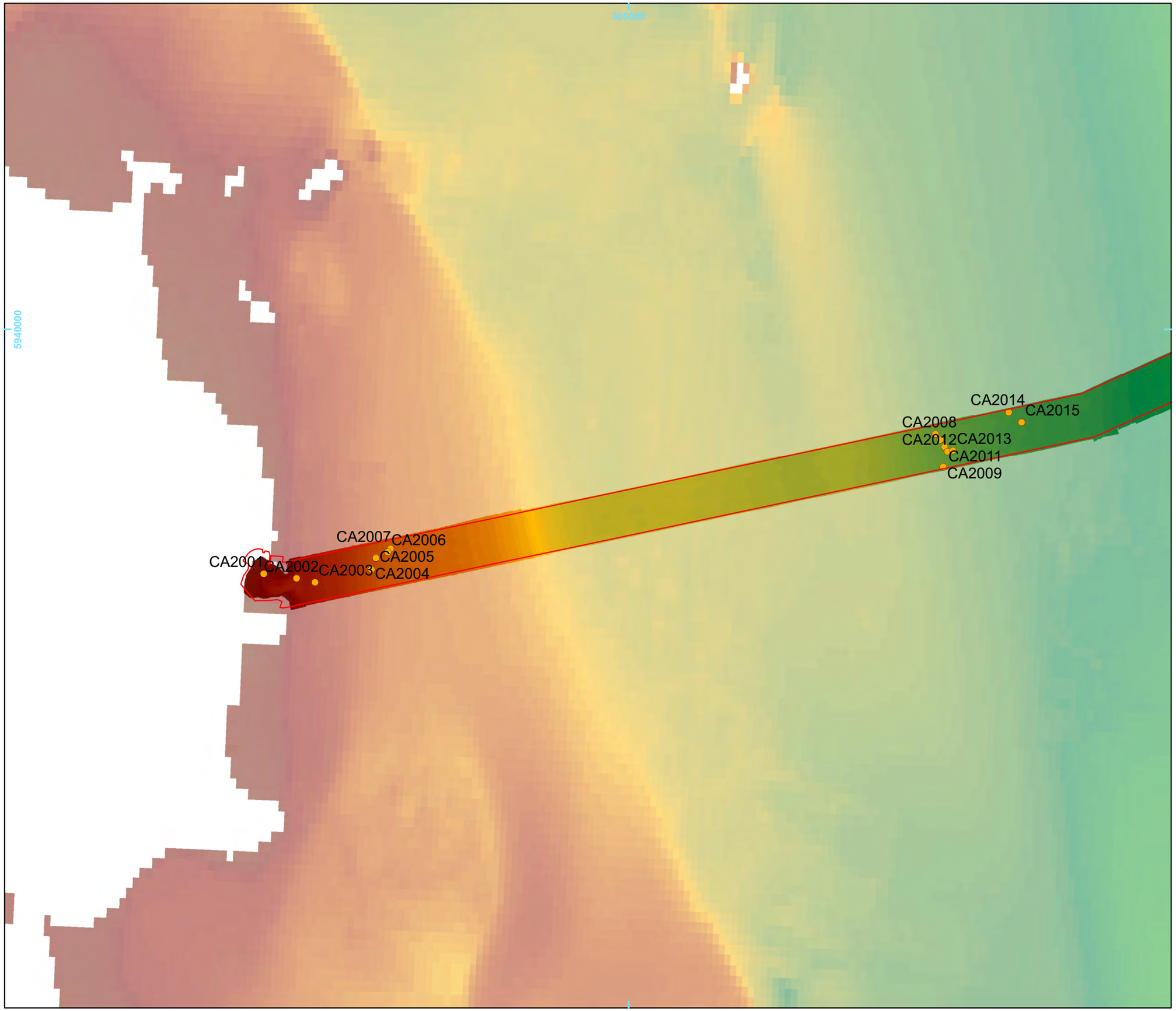
PROJECT TITLE

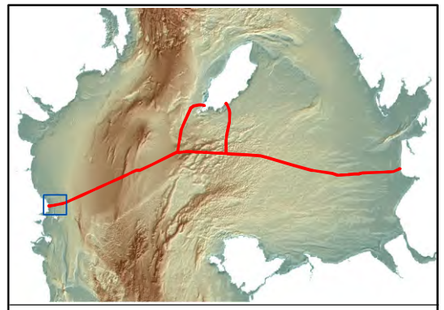
Havhingsten submarine cable system

FIGURE TITLE

Geophysics (in-phase) results from Whitley Bay with metal detecting results overlain

DRAWN BY	RLF	PROJECT NO	770835	FIGURE NO.
CHECKED BY	MTW	DATE	15/04/2019	19
APPROVED BY	MTW	SCALE@A3	1:1,048	





N

Legend

- Route Corridor
- Archaeological Anomaly

Bathymetry (m LAT)

80

-160

0 1,500m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Distribution of geophysical anomalies with archaeological potential

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**20**
APPROVED BY	**MW**	*SCALE@A3*	**1:40,000**	

330000

340000

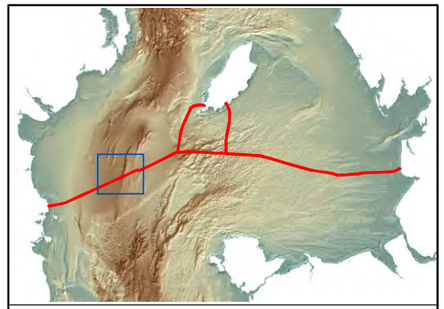
5960000

5950000

CA2018

CA2016

CA2017



N

Legend

- Route Corridor
- Archaeological Anomaly

Bathymetry (m LAT)

-60

-160

0 3,000m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

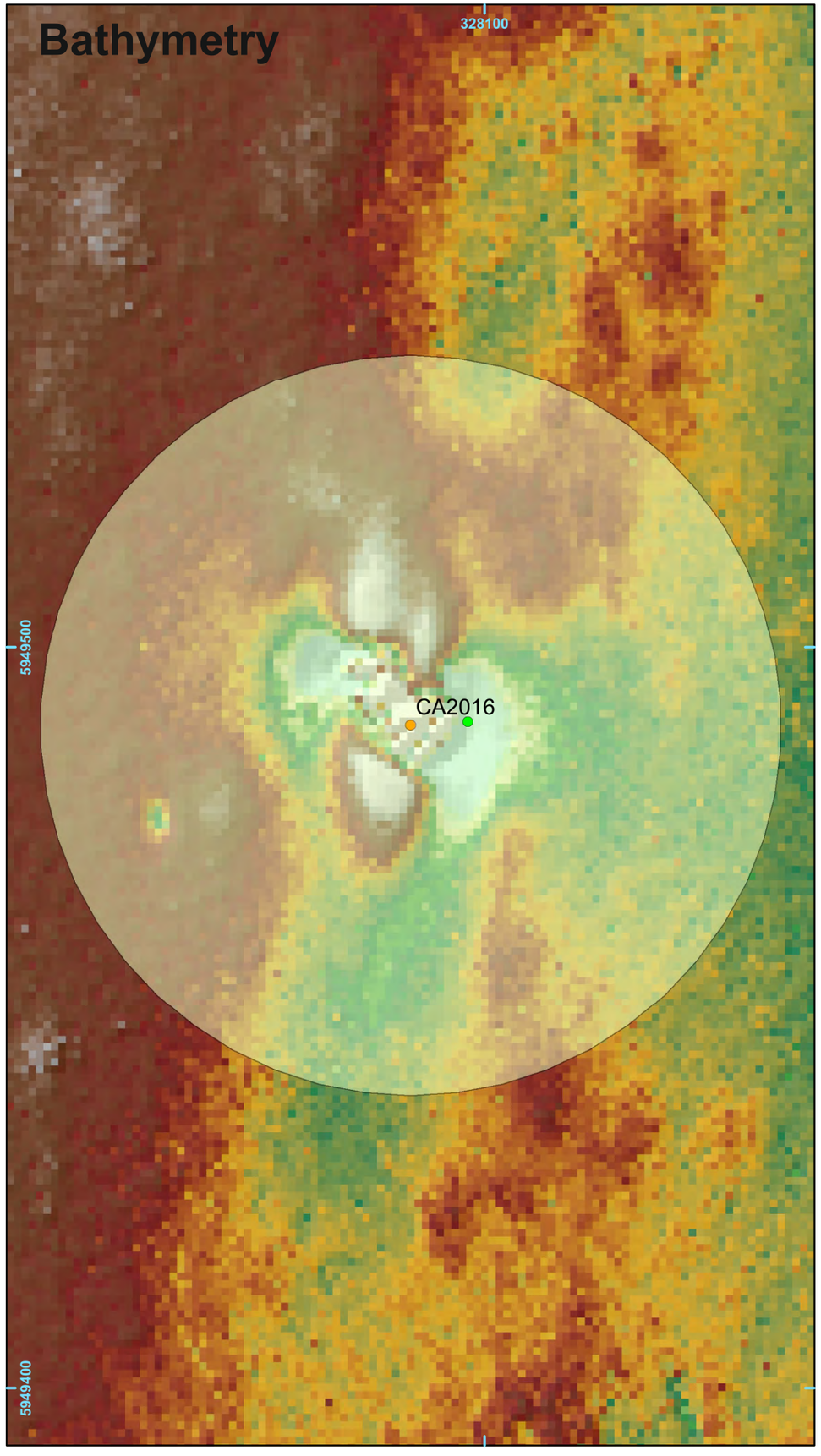
PROJECT TITLE

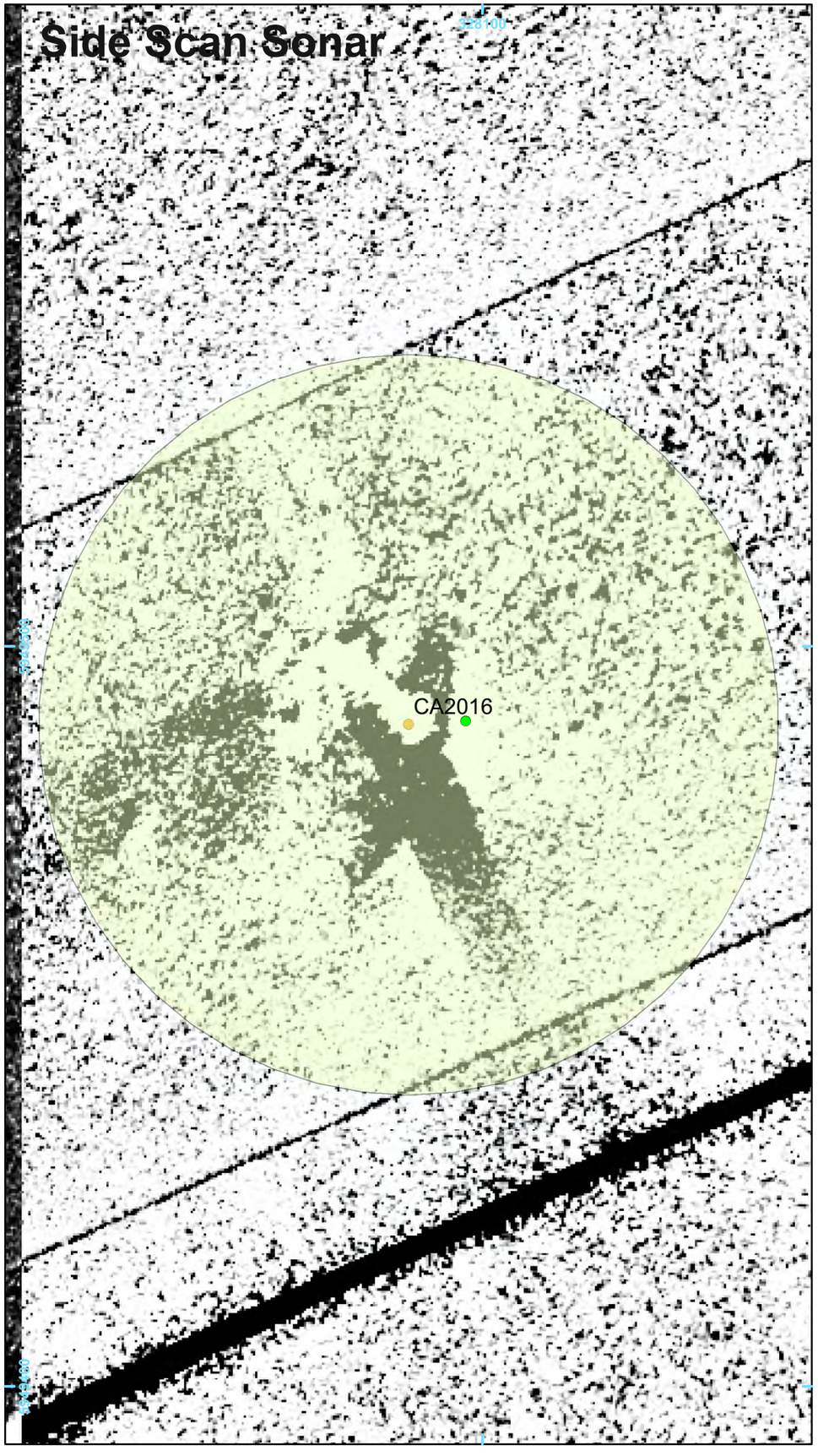
Havhingsten submarine cable system

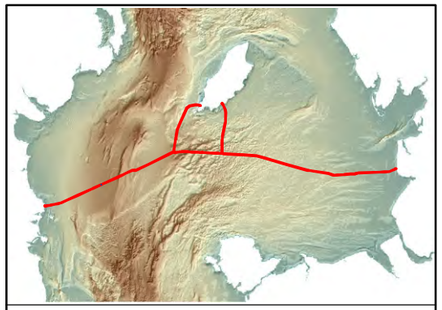
FIGURE TITLE

Distribution of geophysical anomalies with archaeological potential

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**21**
APPROVED BY	**MW**	*SCALE@A3*	**1:80,000**	







N

Legend

- Route Corridor
- Side Scan Sonar Anomaly
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- >50
- Archaeological Anomaly
- AEZ

Bathymetry (m LAT)

-95

-100

0 25m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

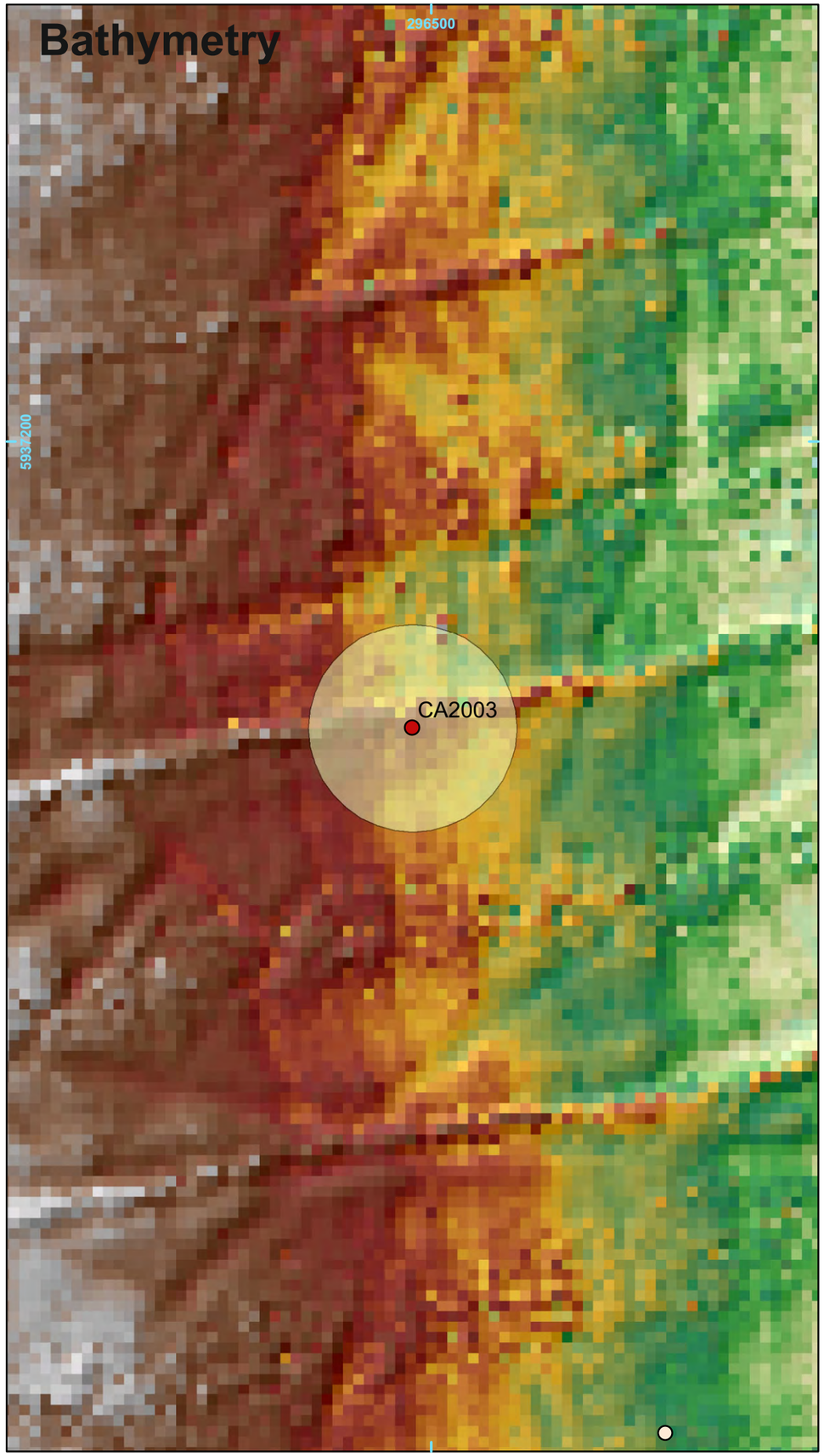
PROJECT TITLE

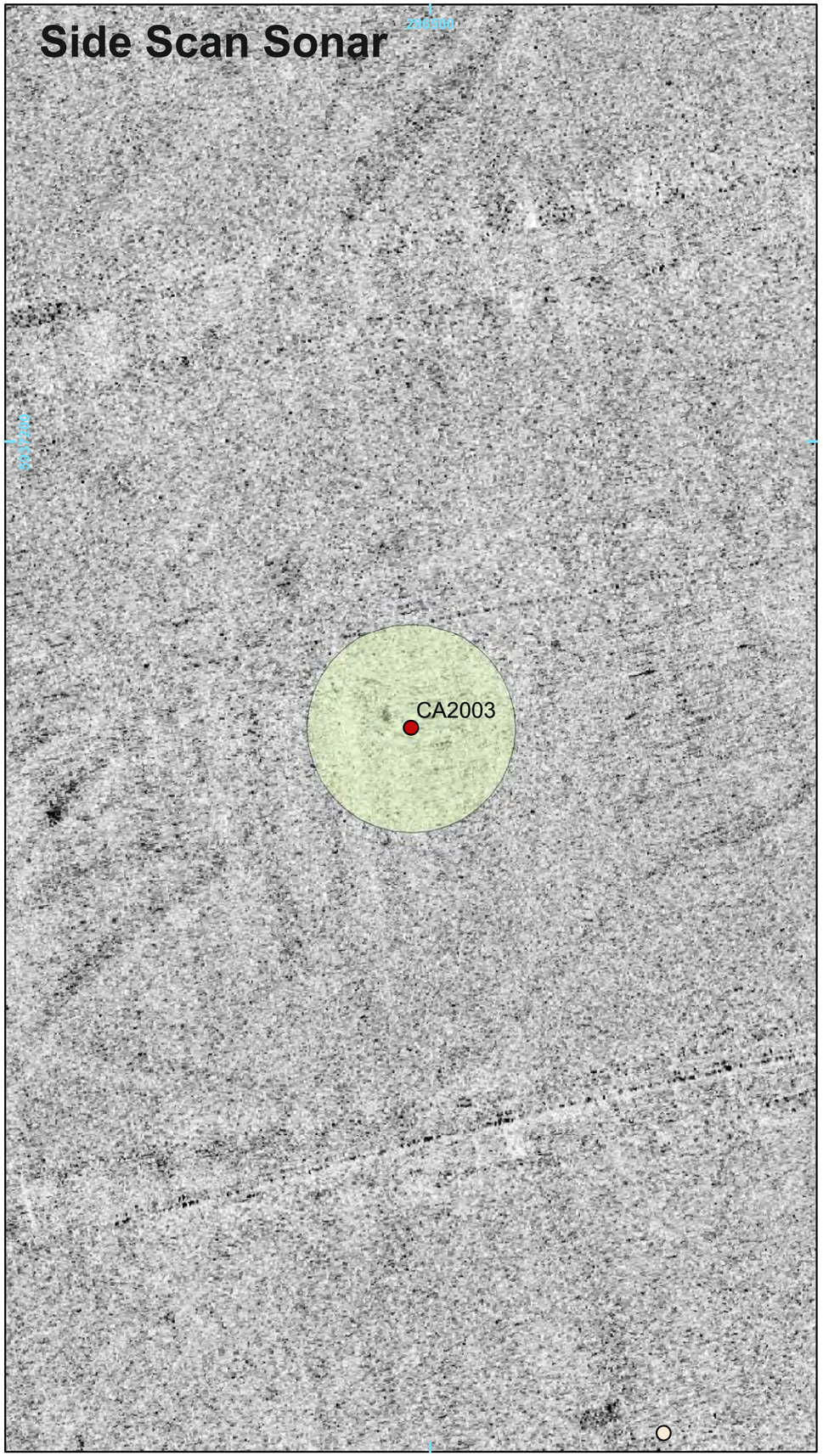
Havhingsten submarine cable system

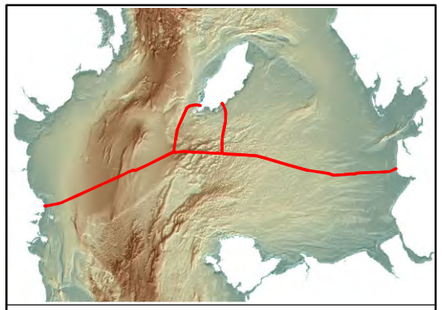
FIGURE TITLE

Sub-bottom feature CA_2016

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**22**
APPROVED BY	**MW**	*SCALE@A3*	**1:700**	







N

Legend

- Route Corridor
- Side Scan Sonar Anomaly
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- >50
- Archaeological Anomaly
- AEZ

Bathymetry (m LAT)

-4.8

-5.5

0 17.5m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

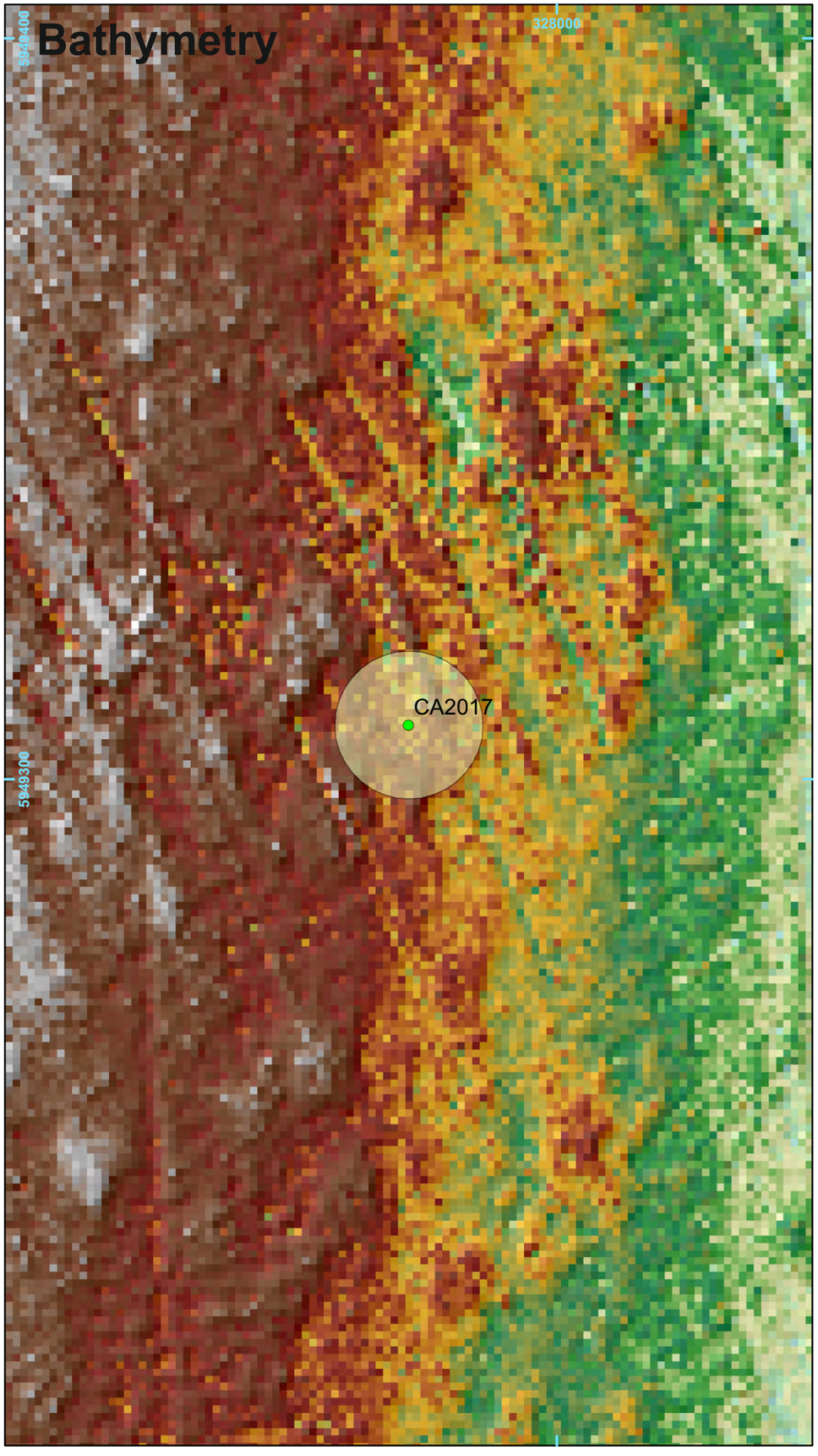
PROJECT TITLE

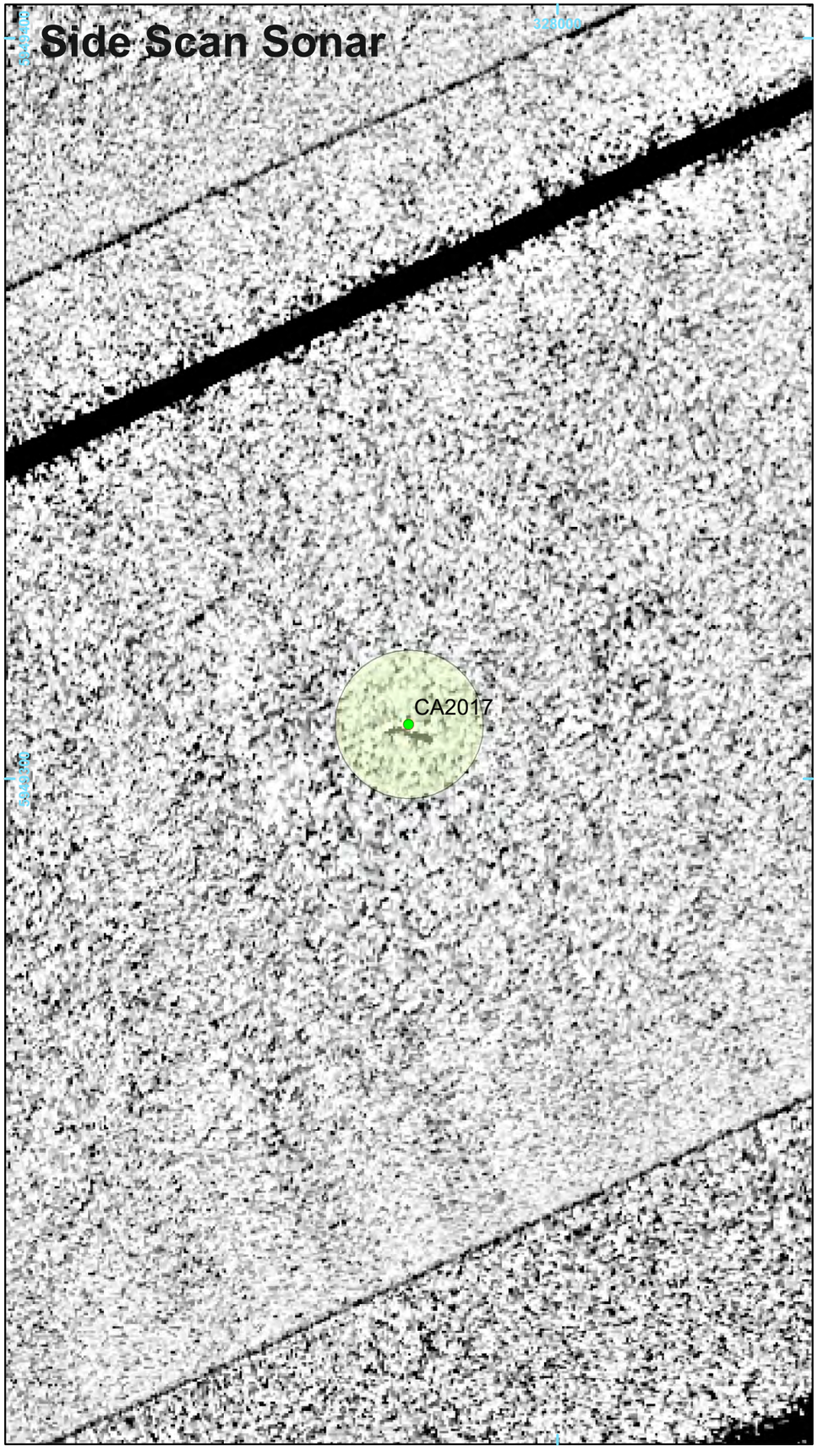
Havhingsten submarine cable system

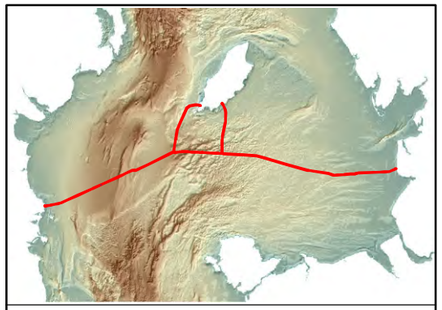
FIGURE TITLE

Sub-bottom feature CA_2003

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**23**
APPROVED BY	**MW**	*SCALE@A3*	**1:500**	







N

Legend

- Route Corridor
- Side Scan Sonar Anomaly
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- >50
- Archaeological Anomaly
- AEZ

Bathymetry (m LAT)

-98.4

-98.9

0 25m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

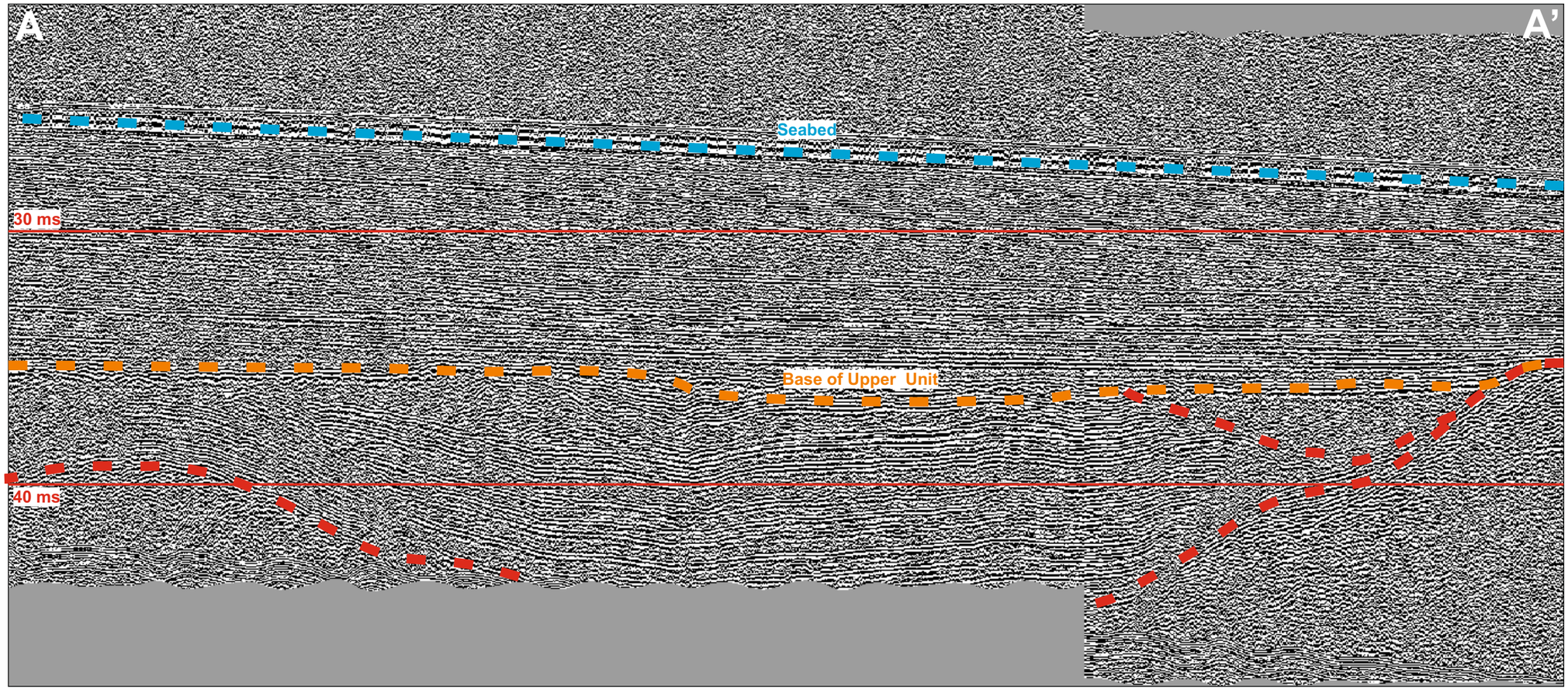
FIGURE TITLE

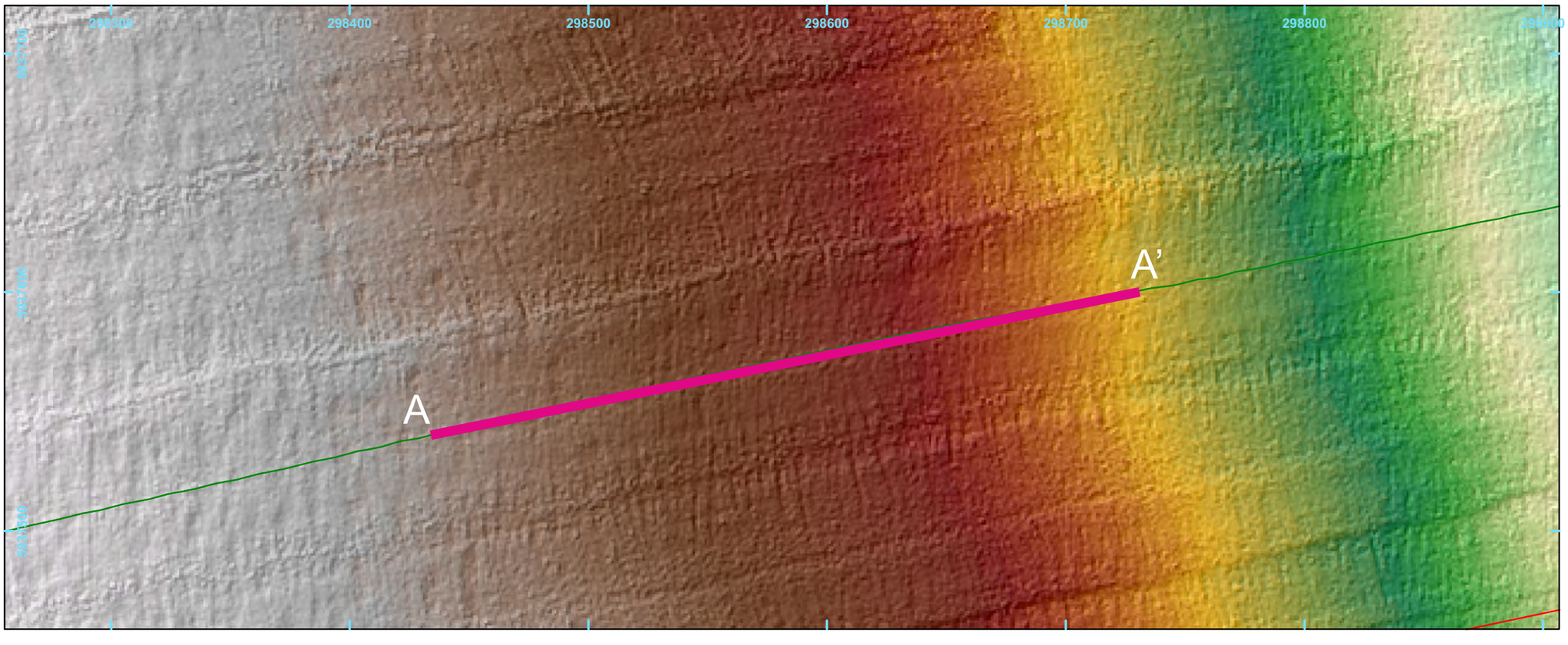
Sub-bottom feature CA_2017

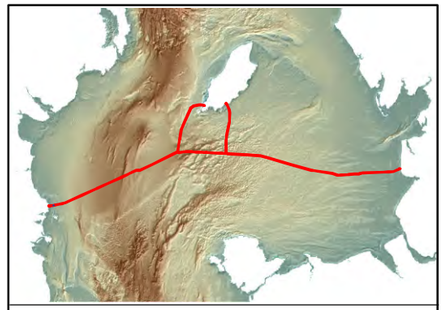
DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770835**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**24**
APPROVED BY	**MW**	*SCALE@A3*	**1:700**	

Submerged palaeo-landscape

3.17. A review of the SBP seismic survey data has identified a consistent stratigraphic sequence. Moving offshore from the Irish landfall, an upper unit consisting of horizontally bedded deposits, probably sands and muds, is present along the corridor in thicknesses up to 8-10m. This overlies earlier features, often with more chaotic seismic signatures probably reflecting coarser-grained sediments, along with some infilled channels (e.g. centred on 298592 5937574; Fig. 25), with a base c. 20m below the seabed, some showing multiple phases of channel cutting. The upper unit thins to c. 1-2m thickness in some locations where the underlying seismic reflector approaches the seabed surface (e.g. 298886 5937632 and 299969 5937856; Fig. 26), and outcrops at the surface at 304073 5938722. Between this point and c. 305325 5939124 the upper horizon is inpersistent and, when present, rarely thicker than 2m. North-east of 305325 5939124 the upper horizon again begins to thicken, typically retaining thicknesses of c.3-4m albeit with some areas reaching thicknesses of up to c. 8m. North east of c. 311835 5942072 this upper unit shows consistent thickening in excess of 12-14m, although it thins again to c. 7m east of the bathymetric depression centred on 338397 5954150 (shown in Figure 21).







N

Legend

- Route Corridor
- Sub-bottom Profile Survey Line

Bathymetry (m LAT)

-13.16

-18.13

0 50m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

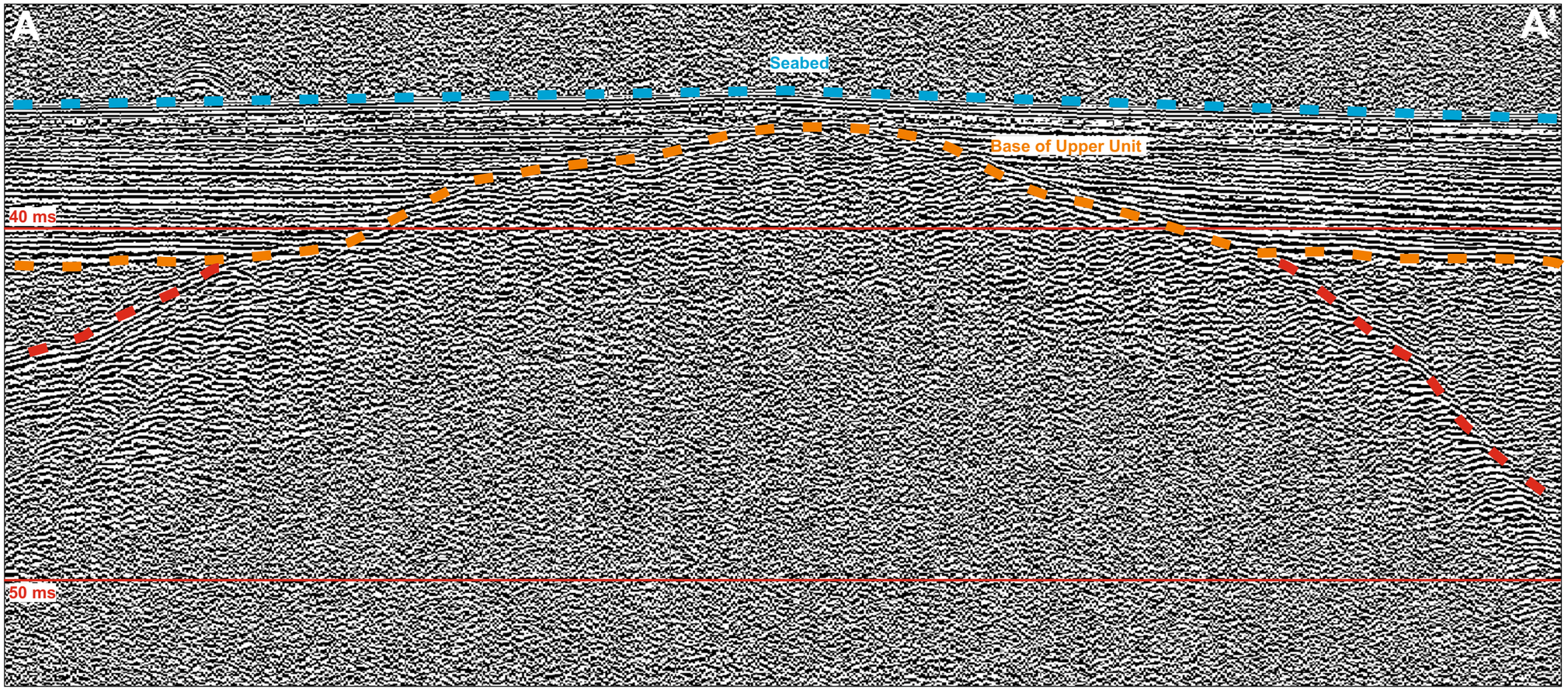
PROJECT TITLE

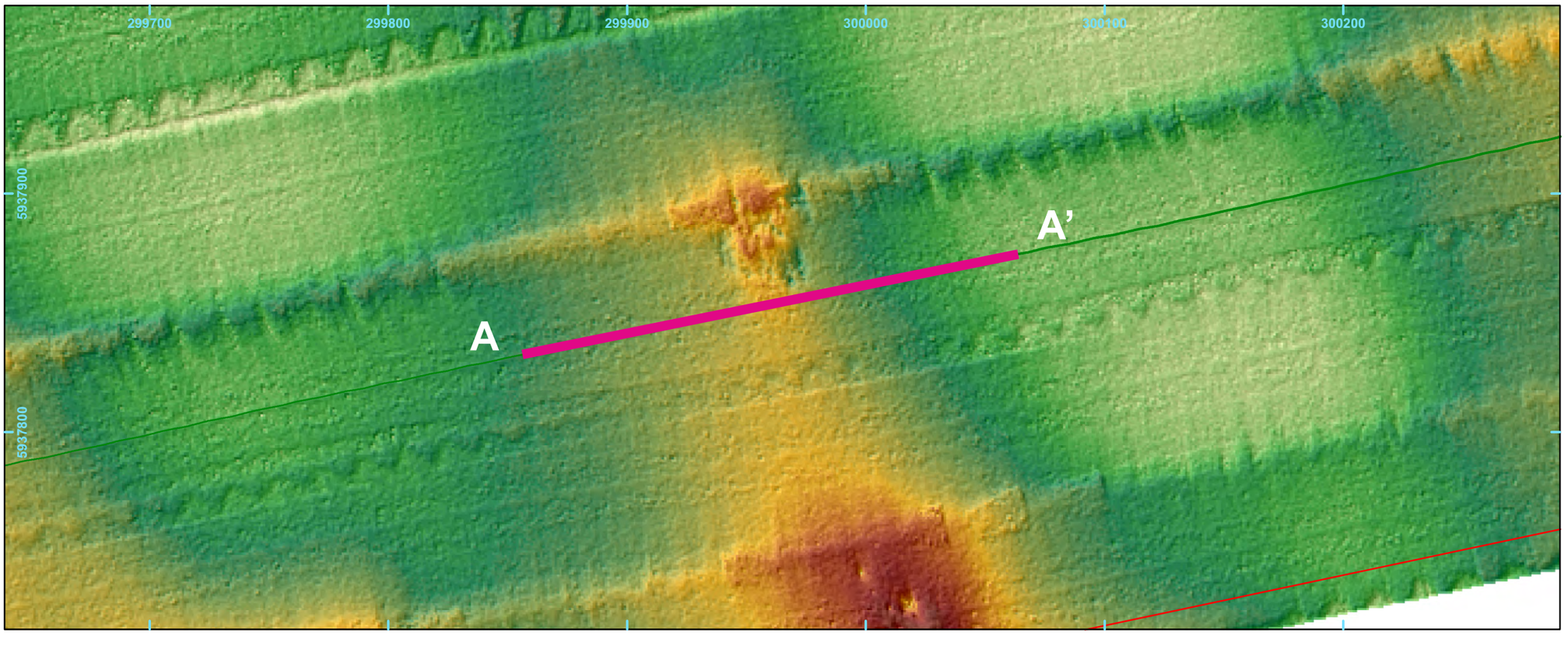
Havhingsten submarine cable system

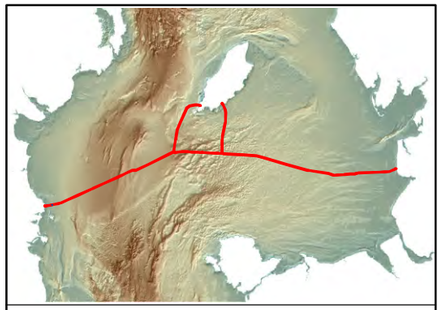
FIGURE TITLE

Sub-bottom feature CA_3001

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770800**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**25**
APPROVED BY	**MW**	*SCALE@A3*	**1:2,000**	







N

Legend

- Route Corridor
- Sub-bottom Profile Survey Line

Bathymetry (m LAT)

-22.0

-24.0

0 50m

Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Background bathymetry: EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).

Cotswold Archaeology marine

Andover 01264 347630
Cirencester 01285 771022
Exeter 01392 826185
Milton Keynes 01908 564660
w www.cotswoldarchaeology.co.uk
e enquiries@cotswoldarchaeology.co.uk

PROJECT TITLE

Havhingsten submarine cable system

FIGURE TITLE

Sub-bottom feature CA_3002

DRAWN BY	**MJG (UoS)**	*PROJECT NO*	**770800**	*FIGURE NO.*
CHECKED BY	**RK**	*DATE*	**25/09/2018**	**26**
APPROVED BY	**MW**	*SCALE@A3*	**1:2,000**	

4. DISCUSSION AND CONCLUSION

4.1. These foreshore surveys have successfully evaluated the six potential landfall locations and have identified no anomalies of clear archaeological potential. At Port Grenaugh, however, where a possible fish trap or barrier against small vessels is recorded (Cotswold Archaeology 2019), linear anomalies detected perpendicular to the tide, may be anthropogenic in origin, perhaps resulting from buried walls or the accumulation of deposits against them. These anomalies are assessed as of low to moderate archaeological potential. No other anomalies of archaeological potential have been identified at any of the potential landfall locations. Elsewhere, four linear anomalies identified at Port Erin, and a fifth at Lytham St Anne's, indicate buried service pipes / cables. On the basis of the walkover geophysical, and metal detecting surveys, therefore, these landfall locations are assessed as of low archaeological potential, which corroborates the results of the marine archaeology DBA (Cotswold Archaeology 2019).

4.2. The offshore geophysical surveys of the proposed route through Irish waters has been assessed for features containing archaeological potential. The area is covered by an upper drape of probably sandy and clayey deposits, in places over 14m in thickness. Below this are earlier features that may include a series of palaeo-channels, but these will generally be beyond the depth of impact of the proposed installation. It is probable that much of the sediment will be comprised of glacio-marine deposits, which would have low archaeological potential. Geophysical anomalies along the route corridor are of low to medium abundance, with only a single probable wreck site identified in the available data. For each of the 18 archaeological anomalies identified, AEZs have been defined.

5. REFERENCES

Bonsall, J., Gaffney, C. & Armit, I. 2014. *Preparing for the future: A reappraisal of archaeo-geophysical surveying on National Road Schemes 2001-2010*. University of Bradford report for the National Roads Authority of Ireland.

Cotswold Archaeology. 2019. Havhingsten Submarine Cable System: Marine archaeology desk-based assessment. Cotswold Archaeology report 18972.

David, A. Linford, N. & Linford, P. 2008. *Geophysical Survey in Archaeological Field Evaluation*. Second Edition, English Heritage.

Gaffney, C., Gater, J. & Ovenden, S. 2002. *The use of Geophysical Techniques in Archaeological Evaluations, IFA Paper No. 6.* Institute for Archaeologists.

Geological Survey Ireland. *Public Data Viewer Series*. Available at: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ebaf90ff2d554522b438ff313b0c197a&scale=0.

Plets, R., Dix, J. & Bates, R. 2013. *Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes*. Swindon: Historic England.

Schmidt, A., Linford, P., Linford, N., David, A., Gaffney, C., Sarris, A. & Fassbinder, J. 2015. *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider*. EAC Guidelines 2. Europae Archaeologiae Consilium, Belgium.

Online Resources

Minelab International Ltd. X-Terra 705 Instruction Manual [accessed October 2018] https://www.minelab.com/__files/f/4051/4901-0073-4%20Inst%20Manual%20X-TERRA%20705%20EN_WEB.pdf

Cotswold Archaeology

Andover Office

Stanley House
Walworth Road
Andover
Hampshire
SP10 5LH

t: 01264 347630

Cirencester Office

Building 11
Kemble Enterprise Park
Cirencester
Gloucestershire
GL7 6BQ

t: 01285 771022

Exeter Office

Unit 1, Clyst Units
Cofton Road
Marsh Barton
Exeter
EX2 8QW

t: 01392 573970

Milton Keynes Office

Unit 8 - The IO Centre
Fingle Drive, Stonebridge
Milton Keynes
Buckinghamshire
MK13 0AT

t: 01908 564660

Suffolk Office

Unit 5, Plot 11, Maitland Road
Lion Barn Industrial Estate
Needham Market
Suffolk
IP6 8NZ

t: 01449 900120

e: enquiries@cotswoldarchaeology.co.uk