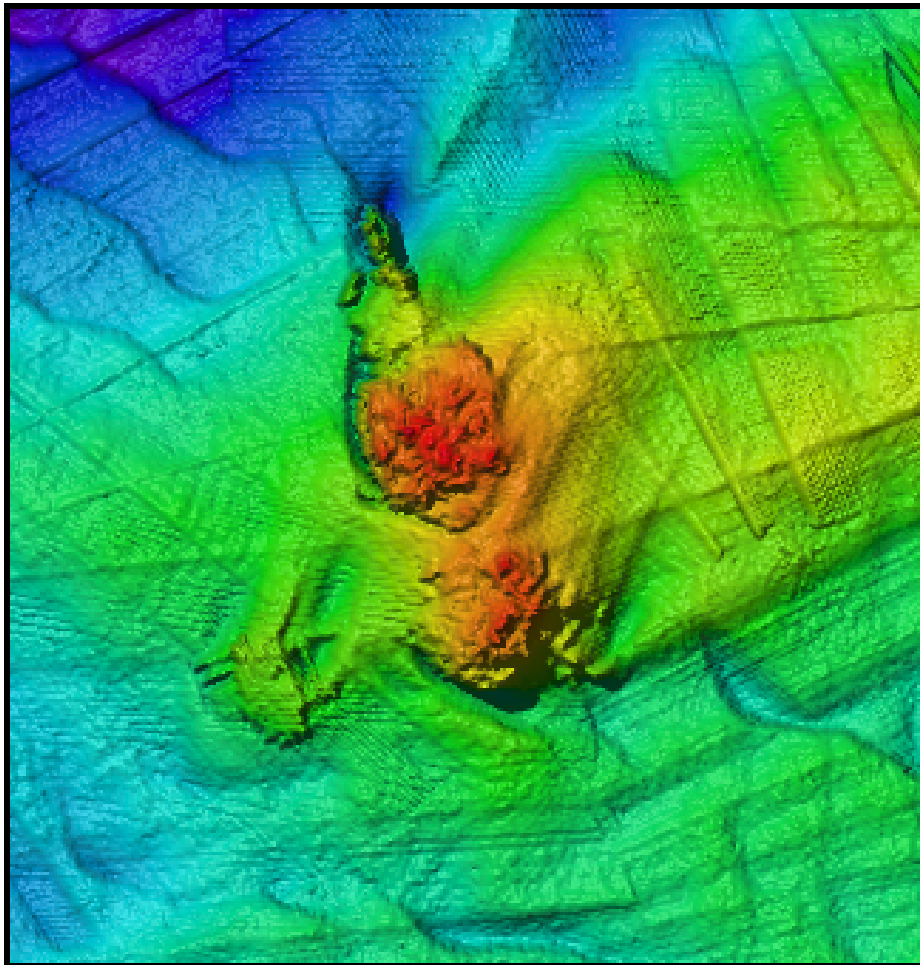


**MULTI-BEAM SURVEYS OF THE DESIGNATED WRECKS ON THE  
GOODWIN SANDS AND THE DOWNS**

**PROJECT REPORT  
2018**



PASCOE ARCHAEOLOGY

**MULTI-BEAM SURVEYS OF THE DESIGNATED WRECKS ON THE  
GOODWIN SANDS AND THE DOWNS**

**PROJECT REPORT**

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## MULTI-BEAM SURVEYS OF THE DESIGNATED WRECKS ON THE GOODWIN SANDS AND THE DOWNS

### Summary

In 2018 Pascoe Archaeology was commissioned by Historic England to conduct a multi-beam echo sounder survey (MBES) over six designated sites and one un-designated site in the Goodwin Sands and The Downs region. The six designated sites were the *Northumberland*, *Stirling Castle*, *Restoration*, *Rooswijk*, and *Admiral Gardner* on the Goodwin Sands and GAD 8 in The Downs. Gad 23, also known as the 'Bowsprit Wreck', was the un-designated site in the Goodwin Sands. This was a repeat survey of the previous survey of the wrecks in 2017, which was also commissioned by Historic England. The 2017 surveys recorded noticeable changes occurring on several of the wrecks and highlighted the need for a repeat survey to enhance our understanding of the changes.

The surveys were conducted between the 10 – 13 April 2018 by a collaborative team including Pascoe Archaeology, MSDS Marine and Swathe Services. The survey vessel, *Predator*, was provided by Predator Charters Marine Ltd, skippered and crewed by Daniel Poppy and Vince Bushby. High resolution MBES data was collected over each site except for the *Admiral Gardner*. It was not possible to conduct a survey over the *Admiral Gardner* because of the lack of water over the site.

The MBES datasets have identified some notable, and in some cases dramatic, changes over the sites of the *Stirling Castle*, *Northumberland*, *Restoration* and *Rooswijk* which highlights the dynamics of the Goodwin Sands. In short: the *Stirling Castle* has now become completely buried by a large bank of sand encroaching from the east; the *Northumberland* is continuing to uncover with additional anomalies appearing to the north of the main wreck mound; the *Restoration*, which was not visible on the 2017 data, is now emerging from the sands with several lumps of exposed features, extending over an area of 20m long; the *Rooswijk's* West site (main site) is more exposed but the East site has entirely been covered by a sand wave. There have been minor changes that have occurred on GAD 8 and GAD 23 but GAD 23 still represents a wreck very much on the decline.

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The fieldwork was carried out by Mark James of MSDS Marine, Mark Gray and Matthew King of Swathe Services, and supervised by Dan Pascoe of Pascoe Archaeology. The survey vessel, *Predator* of Predator Marine was skippered by Daniel Poppy and crewed by Vince Bushby. The results of the survey were processed by Mark James of MSDS Marine and Swathe Services. The results were interpreted, and this report has been written by Dan Pascoe and illustration produced by Mark James. Pascoe Archaeology would also like to thank the assistance of students from the University of Southampton: Felix Pedrotti and Robyn Pelling.

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## 1. INTRODUCTION

- 1.1.1. This report has been prepared by Pascoe Archaeology (PA) for Historic England (HE). It constitutes a Project Report for the multi-beam echo sounder survey (MBES) of six designated sites and one un-designated site in the Goodwin Sands and Downs region. It is designed to be read in conjunction with the previous 2017 report (PA 2017).
- 1.1.2. The programme of work was conducted in accordance with the Project Design agreed by HE. MBES work took place over four days between 10-13 April 2018. The MBES were conducted by MSDS Marine and Swath Services (SS) while PA supervised and oversaw survey operations.
- 1.1.3. Following the fieldwork MSDS Marine and SS processed the results of the data collected. PA used the processed data to interpret the archaeological remains exposed on the seabed for each of the sites that form the basis of this report.
- 1.1.4. In addition, PA has used first-hand knowledge of several of the sites to identify exposed archaeological features visible on the current MBES. Also, comparisons have been made with previous MBES conducted by the Archaeological Diving Unit Survey (ADUS) and TrenDive.

## 2. PROJECT AIMS AND OBJECTIVES

### 2.1. PROJECT AIM

- 2.1.1. To conduct a high resolution MBES of all six designated wreck sites within the Goodwin Sands and the Downs (*Northumberland, Stirling Castle, Restoration, Admiral Gardner, Rooswijk and GAD 8*) and one un-designated site (GAD 23). These surveys aim to provide the most up-to-date bathymetric data to help define the current extent of each of the sites, which will be a benefit to future management strategies. The surveys will aim to inform HE's Heritage at Risk assessment for 2018 and subsequent responses which might allow the sites to stay off the register.

### 2.2. PROJECT OBJECTIVES

- 2.2.1. The following objectives of the project are as follows:
  - To acquire and interpret high-resolution MBES data over the designated wrecks of the *Northumberland, Stirling Castle, Resolution, Rooswijk, Admiral Gardner, GAD 8*;
  - To acquire and interpret high-resolution MBES data over the un-designated site of GAD 23;
  - Where possible compare datasets from different years in order to identify changes occurring over the sites.
  - Where possible use first-hand knowledge of the site to help identify exposed archaeological features visible in the current MBES survey data;
  - Establish the current extent and exposure of each of the sites to ensure the correct areas are protected;

- Provide accurate, georeferenced bathymetric maps of the surface remains of each of the sites.
- This survey affords HE the opportunity to attain a consistent level of quality and reliable survey data, which may become useful to assess broader changes in sedimentary processes in this region. This in turn may well demonstrate, through subsequent and consistent monitoring, where sands are considered to be growing and working in an anti-clockwise direction, in line with two main principle interpretations of sediment transport processes for the sand bank areas (Cloet 1954; Kenyon and Cooper 2005).
- The bathymetric maps of the sites can all potentially be used for future visualisation wreck tours thus providing the building blocks for a virtual tour, which will open access to the sites to more than just the diving community.

### **3. METHODOLOGY**

#### **3.1. POSITIONING AND MOTION**

3.1.1. Positioning and motion for the MBES was controlled using an Applanix POS MV WaveMaster with real time RTK corrections. The Applanix system with RTK corrections produces positional accuracy of >0.1m, roll and pitch to 0.02°, heading to 0.03° and heave to 2cm or 2%. Where required, the position data was post-processed in POSpac to improve absolute accuracy.

#### **3.2. MULTI-BEAM ECHO-SOUNDER SURVEY**

3.2.1. An R2Sonic 2024 with Ultra High Resolution (UHR) mode MBES was used for the collection of multi-beam bathymetry data. The 2024 offered an excellent combination of resolution, ease of use and size and weight, making it an ideal system for short, high resolution surveys undertaken on vessels of opportunity.

3.2.2. At 450 kHz the 2024 has a beam width of 0.9° x 0.45° reducing to 0.6° x 0.3° when in 700 kHz UHR mode. The 2024 has a real time user selectable swath sector of 10° to 160° and a range resolution of up to 1.25cm. These features ensure high resolution, high density data collection the parameters of which can be adjusted in real time to ensure optimum sonification of the seabed and any features of potential archaeological interest.

3.2.3. The MBES was mobilised onto the survey vessel with the use of rigid metal frame incorporating the Inertial Measurement Unit (IMU) and the antennae. By mounting the MBES, the IMU and the antennae on the same rigid frame, common errors associated with vessels of opportunity, such as offset errors and hull flex, are reduced to a minimum. Prior to data collection a patch test was undertaken to determine any offsets between the MBES, the IMU and heading sensor. Offset corrections were then applied to the dataset to ensure minimal errors in the positioning and overlap of the data. MBES data was collected by running predetermined lines based on the depth of water to achieve a data overlap of 50%. The deeper the water, the wider the coverage at a fixed swath sector; although beam footprint will increase and data density will decrease. The data recorded was displayed in real time, as such online quality control (QC) took place and lines were re-run or filled in where required.

- 3.2.4. Sound velocity was recorded continuously at the MBES head with a Valeport Mini Sound Velocity Sensor (SVS) and at intervals through the water column with a Valeport Sound Velocity Profiler (SVP). Sound velocity measurements are required, and applied to the MBES data, in order to correct errors that may be created due to variations in the speed of sound through the water column. All line planning and MBES data collection will be undertaken in HyPack HySweep or QPS Qinsy. Following data collection, patch test and tide corrections were applied within HyPack HySweep or QPS Qinsy and the data exported as individual lines in XYZ format. The lines of data were cleaned in various programs - including HySweep, Fledermaus and Cloud Compare - to remove noise, data artefact and unwanted features such as fish.
- 3.2.5. Once the data was cleaned the lines were imported into software, including Fledermaus and Cloud Compare, where the data was visualised and effects such as shading applied to help highlight potential anthropogenic features.

## **4. PROJECT RESULTS**

### **4.1. INTRODUCTION**

- 4.1.1. The Goodwin Sands are made up of a complex and dynamic system of banks. These banks are formed by a deep ebb and flood channels. The banks are overlaid by sand waves, with notable sandwave fields at the northern ends (UKHO 2015, 2).
- 4.1.2. Four days of MBES surveys were conducted over five designated sites and one un-designated site on the Goodwin Sands and The Downs from the 10-13 April 2018. These sites included the *Northumberland*, *Stirling Castle*, *Restoration*, *Rooswijk* and GAD 23 on the Goodwin Sands and GAD 8 in The Downs. There was insufficient depth of water to conduct a survey over the *Admiral Gardner*, meaning the site is totally buried under several metres of sand.

### **4.2. THE ROOSWIJK**

- 4.2.1. The *Rooswijk* is the wreck of a Dutch East Indiaman lost in January 1740. She lies on the Goodwin Sands southeast of the North Sands Head and northeast of the Kellet Gut. The exact position is 51°16.443'N 001°34.537'E with a designated area with a 225m radius (WA 2012).
- 4.2.2. The 2017 multi-beam bathymetry data identified several gun-like anomalies in close proximity but outside the designated area of the *Rooswijk*. This led to diver ground-truthing during the *Rooswijk* 1740 excavations which confirmed they were in fact guns with the potential to be associated with the *Rooswijk*. This has led to the designated area to be increased to a radius of 225m to incorporate those guns. This new area of the site will be referred to below as the gun site.
- 4.2.3. The *Rooswijk* lies in an area of the Goodwin Sands with sediment transport coming from the north under both ambient and storm conditions (Dix *et al* 2008). This can be observed through the orientation and movement of the bedforms, especially the large subaqueous dune, which has been passing over the East site from the north, in a southerly direction.

- 4.2.4. Within the designated area of the *Rooswijk* there are two main types of bedforms present: large subaqueous dunes and medium subaqueous dunes (Ashley 1990 classification). The medium subaqueous dunes lie on top of the larger subaqueous dunes.
- 4.2.5. The medium subaqueous dunes range in wave length from 5-10m with a height ranging from 0.2-0.8m and as mentioned above they are orientated in a southerly direction. It is these medium subaqueous dunes that are impacting the Main site and the Gun site. The large subaqueous dunes range in wave length from 30-50m with a height difference >4m. It is a large subaqueous dune that has impacted the East site.
- 4.2.6. The *Rooswijk* lies just to the west of an area surveyed by the UKHO. This survey area is known Area GS3 and is a small section of the eastern edge of the Goodwin Sands. It includes a sand ridge which is gradually migrating eastwards leaving deeper water to the west (UKHO 2015, 2). The *Rooswijk* lies in that deeper water to the west of Area GS3.
- 4.2.7. The MBES survey was conducted over the wreck of the *Rooswijk* on the Goodwin Sands on 11<sup>th</sup> April during a period of neap tides. The survey started at 1610 on a rising tide, 27 minutes after low water at Dover.

### **4.3. THE MAIN SITE**

- 4.3.1. The 2018 MBES survey has identified a significant change to the overall character of the main site. There has been noticeable bed level loss on and around the wreck mound, which has exposed many more archaeological features. The overall extent of exposed material has shown that the main site consists of a much larger scatter of material. Exposed material extends 69m on a NE/SW axis and 40m on a NW/SE axis (Figure 1-3).
- 4.3.2. There has been noteworthy bed level loss at the southern end of the site. This has revealed numerous rectangular anomalies covering an area of 12 x 6m. These anomalies are highly likely to be the stone cut blocks that have been recorded on the East site, as well as seen on other areas of the Main site (Figure 2).
- 4.3.3. Three metres southeast of these anomalies is an anchor, which is significantly more exposed than observed in the 2017 data. The length of the anchor from the crown to the end of the exposed shank is approximately 3.65m and the width across the flukes is approximately 2.7m (Figure 2).
- 4.3.4. Scour has occurred in the area east of the two anchors (one anchor on top of the other known from diving the site) at the southeast end of the wreck mound. This has revealed a 5 x 4m area of exposed features (Figure 2).
- 4.3.5. The area immediately northwest of the anchors is significantly exposed and from the excavation of this area (trench1) in 2017 it is known to contain boxes of cargo and cut stone blocks (Figure 2).
- 4.3.6. At the western end of trench 1 was a large timber, possibly a keelson. This timber shows up clearly on the 2018 multi-beam bathymetry data. Immediately northwest of this timber is a high point of the wreck mound, identified as strip iron. This area

appears to be more pronounced suggesting it is more exposed than observed from the 2017 multi-beam bathymetry data (Figure 2).

- 4.3.7. Moving north from the strip iron is the location of the 2017 trench 2. The two crossed guns (guns 3 and 4) are visible, as are the two guns (guns 5 and 6) 4.5m further to the north. This area had almost completely filled in, covering those guns by the time of the last dive on the site in 2017. Their current exposure demonstrates the mobility of the seabed (Figure 2).
- 4.3.8. There are three linear features outside the main wreck mound to the west. There is a high potential that these could represent partially exposed guns (Figure 2).
- 4.3.9. There is another anomaly approximately 24m southwest of the main wreck mound. It is roughly 2.4 x 1.4m with a distinct scour all around it. (Figure 2)
- 4.3.10. To the east of guns 5 and 6 is another area of distinct exposed material. This was excavated in 2017 and consisted of an area of concretion and disarticulated timbers. There are three distinct areas of exposed features to the north and northeast of this.
- 4.3.11. Ten metres to the north is a 2.4m linear feature, possibly a gun. Fifteen metres to the northeast are three rectangular features, possibly stone cut blocks. Twenty metres to the NNE are two rectangular features, possibly stone cut blocks and a 2.8m linear feature aligned north/south (Figure 3).
- 4.3.12. On the eastern edge of the main wreck mound is a section of structure that has been identified as a gunport structure (PA 2017). This was covered in a sheet of teram at the end of the 2017 excavation. However, this area is visible on the 2018 data suggesting it may have come off due to the reduction of surface sediments in this area of the site (Figure 2).

#### **4.4. THE EAST SITE**

- 4.4.1. The East site has now been completely covered by the southern migration of a large subaqueous dune. The direction of this dune has been tracked since 2015. It has moved approximately 24m between March 2017 and April 2018 (Figure 1).

#### **4.5. THE NORTHERN SITE**

- 4.5.1. The Northern site, which consists of a scatter of concreted barrels, has not changed since the 2017 survey. The extent and number of exposed features is the same as seen previously (Figure 4).

#### **4.6. THE GUN SITE**

- 4.6.1. The Gun site is approximately 270m from the centre of the main site. The 2017 multi-beam bathymetry data revealed possibly nine guns, which was confirmed by diver ground-truthing during the *Rooswijk* 1740 excavation project. This area of the site appears more pronounced in the 2018 data with possibly up to 11 guns now exposed (Figure 5).
- 4.6.2. There is a main cluster of eight guns with two 21m further to the north and one potential gun 24m to the southwest of the centre of the cluster (Figure 5).

- 4.6.3. The increase in the number of guns and the fact all of the features are more pronounced suggests there has been bed level loss in this area of the site (Figure 5).

#### **4.7. THE *NORTHUMBERLAND***

- 4.7.1. The *Northumberland* was a third-rate Man of war of 70 guns built in 1679 in Bristol. She was lost on the 27<sup>th</sup> November 1703 during the Great Storm. The wreck lies at a chartered depth of 14m 9.5km southeast of Ramsgate on the Goodwin Sands at the southwest end of the Goodwin Knoll. The exact position is 51°15.4802'N 001°30.0161'E WGS 84 with a designated area with a 300m radius.
- 4.7.2. The MBES survey was conducted over the wreck of the *Northumberland* on the Goodwin Sands on 10<sup>th</sup> April during a period of neap tides. The survey started at 1300 on a falling tide, 1 hour and 36 minutes before low water at Dover.
- 4.7.3. The multi-beam bathymetry data shows the presence of bedforms providing the evidence of the local bedload transport. These are an indicator of the local seabed conditions around the site. There are two main types of bedforms present in the region of the *Northumberland* (Ashley 1990 classification): several large subaqueous dunes and medium subaqueous dunes, the latter found on top of the large dunes. The larger dunes appear to sprout from the southwest end of the Goodwin Knoll sand bank. The large dunes are between 40-70m in length and have a height of up to approximately 4m. The medium dunes are between 5-10m in length and have a height of 0.20-0.8m. Both bedforms are migrating in an NNE direction along the margin of the sand bank to the east.
- 4.7.4. The multi-beam bathymetry data shows that the edge of the sand bank to the north of the wreck has migrated 120m northeast. The result has been bed level loss revealing a scatter of anomalies north of the site within the designated area (Figure 6). The migration of this sand bank has also exposed the nearby *Restoration*, which was completely buried during the 2017 survey (PA 2017).
- 4.7.5. The seabed margin to the west of the site, which is orientated NNE/SSW, is now 35m from the most northwest extent of the site. The seabed immediately to the west of the margin is deeper. The boundary of that deeper seabed has advanced 5m east towards the site and therefore poses a threat to the site if the margin continues to migrate east (Figure 6).
- 4.7.6. The current exposed features within the main wreck-mound cover an extent of 37m long by 20m wide. The mound is orientated northwest-southeast. The site lies directly within medium subaqueous dunes that are moving in an NNE direction. A comparison with the 2017 survey data (PA 2017) shows the overall length of the site has increased by 4m x 2m. This shows that there are areas which were previously buried that are now starting to reveal archaeological features (Figure 7 and 8). Survey data from ADUS in 2005 recorded a wreck-mound extending 50m in length (Pascoe *et al* 2015, 134), so it is clear there is further material that could be potentially exposed.
- 4.7.7. The 2018 multi-beam bathymetry data shows that archaeological features are more pronounced than compared with the 2017 data. This is demonstrating a general bed level loss on the main wreck-mound. The height of exposed features is also causing



localised scouring. This is evident to the southeast and north of the large upstanding feature (the highest point of the wreck), at the southeast end of the site. Within the scour to the north of the highest point of the wreck it appears that a linear object, most probably a gun, has become exposed. Another gun has also appeared within a shallower scour on top of the middle area of the wreck-mound (Figures 7 and 8).

- 4.7.8. The wreck-mound rises quite steeply from the southern side and then levels out along the northern side. There is obviously greater erosion occurring on the southern side than the north side, as it is possible to identify many more exposed features. Along the southern side and immediately south of the highest point of the wreck it is now possible to make out the outline of a known structural feature (Figures 7 and 8). This is the location of a section of the lower hull consisting of the keel, frames and inner and outer planking (Pascoe *et al* 2015, 135-136 and WA 2009, 7-9). There is a slight scour appearing directly to the south which also indicates this section of structure is exposing once more. This area was selected for excavation in 2011, (Seadive PD 2011) and an excavation license granted by English Heritage (2011), prior to the site covering over and is therefore deemed an important area for recording structural information.
- 4.7.9. As mentioned above, the extent of exposed wreck material within the main mound has increased. This is most evident at the northwest end of the site where the deepening of the seabed is beginning to reveal edges of other features (Figures 7 and 8). This again shows the potential for further buried material to be become uncovered if the level of the seabed continues to drop.
- 4.7.10. There are three very distinct linear features at the northwest end of the site. At first glance these could conceivably be exposed guns. However, the length of two of these features are over 3.5m in length. It is therefore possible that these are edges of structure being exposed as opposed to guns. Only through diver investigations can this be confirmed.
- 4.7.11. To the north of the main wreck a large area of the seabed within the designated area has experienced bed level loss. This appears to have been caused by the migration of the sand bank in a northeasterly direction. The result has been the exposure of a scatter of debris consisting of several potential guns. The scatter of debris covers a length of 95 m by 55m and is between 105 and 200m from the northwest end of the site (Figures 9-11).
- 4.7.12. There are two main clusters of debris with linear anomalies, suspiciously gun-like, and a single linear anomaly further to the north, which could also be another possible gun. Figure 9 shows the extent of the area of debris. Figure 10 shows the two main clusters and Figure 11 includes the most northerly anomaly. The most southerly cluster has a linear feature approximately 2.8m in length. To the northwest are possibly three exposed and partially exposed guns, 2.8m, 2.9m and 2m in length. The anomaly furthest to the north is 2.6m in length. Some of the longer features are close to the lengths of several of the guns recorded on the site (Pascoe *et al* 2015, 139).

#### **4.8. *THE STIRLING CASTLE***

- 4.8.1. The *Stirling Castle* was a third-rate Man of War of 70 guns built at Deptford in 1679. She was wrecked on the 27<sup>th</sup> November 1703 during the Great Storm. The wreck lies

at a chartered depth of 18m, 8.5km southeast of Ramsgate at the south end of the Goodwin Knoll. The exact position is 51°16.4561'N 001°30.4121'E WGS 84 and the wreck has a designated area with a 300m radius (WA 2009).

- 4.8.2. The MBES survey was conducted over the wreck of the *Stirling Castle* on the Goodwin Sands on 11<sup>th</sup> April during a period of neap tides. The survey started at 1145 on a falling tide, 3 hour and 58 minutes before low water at Dover.
- 4.8.3. The 2017 MBES survey identified that sedimentation was increasing, and this was most probably due to a large bank of sand advancing from the east in a westerly direction (PA 2017,13). The 2018 MBES survey has revealed that the advancement of the sand bank has continued in a westerly direction and has completely engulfed the site. The lower margin of the sand bank has moved over 60m in the space of one year and now nearly 50 per cent of the designated area is too shallow to access via a survey vessel. There are no longer any visible remains of the *Stirling Castle*. The current depth of the seabed on the site is between 10-12m (Figure 12). When the site was greatly exposed the seabed was at a depth of 18m and the wreck mound and exposed features were up to 4m above the seafloor level (WA 2009,10). This demonstrates the quantity of sand that now covers the site and if the current trend continues sedimentation over the site will increase.

**Additional sites within the designated area.**

- 4.8.4. A site 120m west of the bow end of the *Stirling Castle* was identified in the 2017 multi-beam bathymetry data (PA 2017,13). This is still very much visible on the current 2018 multi-beam bathymetry data (Figure 13).
- 4.8.5. The site is located within a seabed made up of small to medium subaqueous dunes (according to Ashley 1990 classification). These dunes are aligned in a northeasterly direction and range in length from 3-6m and 0.2-0.5m in height.
- 4.8.6. This site is currently 19m long by 5m wide, orientated NNW/SSE and is distinctly vessel shaped (Figure 13). This was first detected during a side-scan sonar survey by the ADU in 2001(ADU 01/12). It was dived by the Licensee of the *Stirling Castle*, Robert Peacock, shortly after the survey and before becoming re-buried. Robert Peacock described finding a clinker constructed vessel, its size and construction suggesting a possible medieval date (ADU 01/12). Following recent conversation with Robert he also observed at least two iron guns at the northern end of the site with the muzzle ends putting north. This suggests a forward-facing firing position alluding to possible bow chasers as opposed to guns on the broadsides facing out (pers. comm. Peacock 2018).
- 4.8.7. As mentioned above the site is clearly discernable and vessel shaped. The northern end is pointed with what appears to be two distinct sides heading back in a southeast direction, where they meet after 19m in a bluff end. Between the two ends the sides are wider at the centre of the wreck mound. There is a distinct wreck mound with many exposed features contained within the sides of this wreck (Figure 13).
- 4.8.8. There is localised scouring occurring at the northern and southern end of the site with deposition occurring on the east and west sides of the wreck mound but to a greater extent on the east side. Despite the deposition on the flanks of the wreck there is a significant height of exposed material between the sides of the mound (Figure 13).

- 4.8.9. Three metres to the west of the southern end of the site is a section of structure. It is 4.5m x 5m and appears to consist of a section of hull with planking and frames. The frames are orientated roughly WSW/ENE and the planking is orientated NW/SE (Figure 13).

#### **4.9. THE RESTORATION**

- 4.9.1. The *Restoration* was a third-rate Man of War of 70 guns built in 1678 at Harwich. She wrecked on the 27<sup>th</sup> November 1703 during the Great Storm. The wreck lies at a chart depth of 14m, 9.5km southeast of Ramsgate on the Goodwin Sands at the southwest end of the Goodwin Knoll and 280 m north of the *Northumberland*. The exact position is 51°15.6302'N 01°30.0262'E WGS84 with a designated area with a 300m radius (WA 2006).
- 4.9.2. The MBES survey was conducted over the wreck of the *Restoration* on the Goodwin Sands on 10<sup>th</sup> April during a period of neap tides. The survey started at 1300 on a falling tide, 1 hour and 36 minutes before low water at Dover. This was conducted simultaneously with the survey of the *Northumberland* as the designated areas of the two sites overlap.
- 4.9.3. The current 2018 multi-beam bathymetry data has revealed that the south mound of the site has become exposed and a very small anomaly is present at the north mound, 113m to the NNE (Figure 14). This is in contrast to the 2017 multi-beam bathymetry data which recorded no exposed features on the seabed.
- 4.9.4. The 2018 multi-beam bathymetry data demonstrated that the seabed immediately surrounding the south mound is flat. However, 20m to the east the seabed is made up of medium subaqueous dunes (Ashley 1990 classification). These dunes have wave lengths 5-10m long and 0.2- 0.5m in height and their orientation identifies NNE transport direction. Fifty-one metres to the east these medium subaqueous dunes lie on top of a very large subaqueous dune (Ashley 1990 classification). This very large dune has a wave length of 140m and a height difference of at least 4m. The northeast face of that dune has migrated 160m in a northeast direction and as a result has led to the bed level loss and exposure of parts of the *Restoration's* south mound. The anomaly located within the area of the known north mound is within medium subaqueous dunes, also flowing in an NNE direction (Figure 14).

#### **The South Mound (close to the centre of the designated area)**

- 4.9.5. The south mound consists of a several exposed features over an area 19m long by 6.5m wide, on an NNW/SSE axis (Figure 15). It is unclear from the multi-beam bathymetry data alone what these features could be. Previous underwater inspections by the ADU and WA have described finding concretion lumps, concreted cannon and some isolated timbers (ADU 1989, WA 2003). The majority of the currently exposed features do look more concretion-like as opposed to coherent sections of timber.
- 4.9.6. There is a triangle formation of features at the southern end of the mound with a distinct high spot approximately 1.8 x 2.2m and 0.5m above the seabed. There are two smaller less defined features a few metres to the northeast and south east. These appear consistent with areas of concretion as opposed to timber structures (Figure 15).

- 4.9.7. There is a further feature 10.3m to the north of the centre of the highest point of the wreck. It is possible to make-out a linear anomaly within this approximately 1.5m long, which could possibly be a section of an exposed gun (Figure 15).

#### **The North Mound**

- 4.9.8. There is a small anomaly 113m NNE of the high point of the south mound. This distance and bearing is consistent with the area of the north mound (WA 2003,7). When it was last inspected in 2006 by WA the exposed features consisted of an area of galley bricks and concretions, one iron gun and a timber covered with copper sheathing (WA 2006, 8).
- 4.9.9. The anomaly is too small to identify but its appearance in the area of the north mound alongside the movement of the sand bank suggests the seabed is deepening. Should this trend continue then further anomalies and features will become exposed.

#### **4.10. THE ADMIRAL GARDNER**

- 4.10.1. The *Admiral Gardner* was an 813-ton English East Indiaman built at Blackwall in 1797 and wrecked on the 25<sup>th</sup> January 1809. She lies 15km SSE of Ramsgate on the Goodwin Sands, on the east side of South Sand Head. The exact position is 51°12.0305'N 001°30.4563'E WGS 84. The site has a designated area with a radius of 300m.
- 4.10.2. The *Admiral Gardner* is located in an area of the south Goodwins regularly surveyed by the UKHO. This area is known as Area GS4A on the South Calliper (UKHO 2015). The *Admiral Gardner* lies at the centre of the northern margin of this survey area between the western and eastern slopes of the South Calliper. The western slope migrated 150m east but the eastern edge has not moved between 2012 and 2015 (UKHO 2015, 3).
- 4.10.3. It was not possible to undertake a MBES survey because there was insufficient water to travel over the site. This demonstrates the site is buried under several metres of sand.

#### **4.11. GAD 8**

- 4.11.1. The site is currently unidentified, but it appears to be the wreck of an armed wooden sailing vessel dated to between 1650 and 1750. Previous site investigations have identified seven cast iron guns, a central concretion mound and a section of coherent ship's structure exposed on the seabed (WA 2011). The wreck lies at a charted depth of 11m, 10km south of Ramsgate in 'The Downs'. The exact position is 51°13.9716'N 001°26.0090'E WGS84 and has a designated area with a 50m radius.
- 4.11.2. The MBES survey was conducted over the site of GAD 8 in 'The Downs' on 12<sup>th</sup> April during a period of neap tides. The survey started at 1100 on a falling tide, 1 hour and 23 minutes after high water at Dover.
- 4.11.3. The 2018 multi-beam survey has identified some changes to the site and surrounding seabed but nothing too alarming. In general, the site appears to be situated on a fairly flat and stable seabed, but the 2018 data does provide evidence there is some mobility in surface sediments causing both localised deposition and erosion around archaeological features (Figures 16 and 17).

- 4.11.4. There are still at least four guns partially visible (Figure 17) on the site. Gun 1 at the southeast end of the site appears less pronounced, which may suggest there has been some slight deposition in this area. Immediately south of Gun 2 there are more features showing up with a subtle scour beneath the southern edge. This seems to suggest there are further archaeological remains around and beneath Gun 2. Immediately northwest of Gun 2 is a scour with edges of exposed features present. A slight mound is present between the scour and Gun 3. Gun 4 towards the north end is very much as it was observed in the 2017 data with a scour around the southern and eastern edges (Figures 16 and 17).
- 4.11.5. The upstanding feature in the centre of the site, interpreted as a shot mound (WA 2011), is still the prominent feature of the site. It is 0.75m above the seabed and approximately 2.5 x 2.5m wide with a shallow scour around the entire feature (Figures 16 and 17).
- 4.11.6. Ten metres north of the site is the start of a scour which extends 60m north and is a maximum of 22m wide. There do not appear to be any exposed features within this scour. This scour has not impacted on the main wreck at present and does not appear to have advanced since 2017 (Figures 16 and 17).
- 4.11.7. There are five anomalies present outside the main wreck mound which are conceivably related to the site. There is a linear anomaly 1.7m long 50m north east of the north end of the site that could be a partially exposed gun. The second anomaly is 46m west of the main wreck mound, it is small with no discernible shape and has slight scouring around it. The third anomaly is 31.5m south of the centre of the wreck mound and is approximately 1.4m long and could represent a partially exposed gun. There is another small anomaly 53m SSW of the centre of the main wreck mound but again it is not discernible. Finally, there is a possible linear feature 64m southwest of the centre line of the main wreck mound. This is approximately 2.4m long and could possibly be a partially exposed gun (Figures 16).

#### **4.12. GAD 23**

- 4.12.1. GAD 23 is also known as the Bowsprit Wreck due to the fact that when it was first surveyed it was very intact, still with its bowsprit attached. It lies at a charted depth of 18m, 8.5km southeast of Ramsgate on the Goodwin Sands, southwest of the south end of the Goodwin Knoll. The exact position is 51° 16.113'N 001° 29.583'E WGS84.
- 4.12.2. At present, it is still unidentified but previous archaeological investigations revealed that it is the remains of a merchant wooden sailing vessel carrying a cargo of coal. Ship's equipment present, along with its design and construction, suggest that it dates to around the 19<sup>th</sup> century (WA 2012).
- 4.12.3. The MBES survey was conducted over the site of GAD 23 on the Goodwin Sands on 10<sup>th</sup> April during a period of neap tides. The survey started at 1100 on a falling tide, 2 hour and 36 minutes before low water at Dover.
- 4.12.4. The 2018 multi-beam bathymetry data shows that the site is currently very much exposed. The layout of the wreck is still clearly discernible with the bow pointing to

the west and the port and starboard sides clearly visible extending all the way to the stern at the east end (Figures 18 and 19).

- 4.12.5. With such an exposed wooden wreck its condition is always going to be on a downward trend while exposed. This is apparent from the 2018 data where unsupported structures between amidships and the bow have shifted towards the starboard side (Figure). This structure is composed of three deck beams orientated N/S with the remains of a 5m long section of deck structure on top, orientated W/E. The structure on top of the deck beams has shifted towards the starboard side by 1.2 – 1.8m (Figures 18 and 19).
- 4.12.6. In the 2017 multi-beam bathymetry data at the port side end of the two forward deck beams was what appeared to be the surviving section of the side of the hull. The 2018 data shows this has now been lost (Figure 19).
- 4.12.7. Just aft of the section of deck structure and deck beams is what would appear to be an anchor. It is lying horizontally across the wreck with the flukes and crown facing the starboard side and the shank orientated N/S. The length of the anchor from the end of the shank to the crown is 3.2m and the width across the exposed flukes is 1.5m (Figure 19).
- 4.12.8. Apart from the collapse of the structures between amidships and the remains of the bow the site has not changed significantly since the 2017 survey. There are still scours around the bow and stern with deposition around the amidships area of the starboard side and to a lesser extent on the port side. Contained within the wreck are discernible structural features such as the deck beams running across the wreck N/S with the remains of upstanding deck features and machinery. Beneath all of this the cargo of coal is spilling out through the collapsed hull structures (Figure 19).
- 4.12.9. The seabed surrounding the wreck is, on the most part, deeper than the wreck mound itself and is therefore unlikely to become buried in the near future (Figure 18).

#### **4.13. DISCUSSION**

- 4.13.1. The benefits of regular MBES surveys on the Goodwin Sands and The Downs have again been clearly demonstrated by the most recent 2018 surveys. These latest surveys and their comparisons with previous surveys have recorded the movement and migration of the sands both on the wrecks and within their larger designated areas. As a result, our understanding of which wrecks are under threat through exposure, and those which are stabilizing through reburial, has been greatly enhanced.
- 4.13.2. The consecutive surveys by PA (PA 2017 and 2018) and the 2015 survey by TrenDive (Trendive 2016) have recorded the migration of the sand bank to the east of the *Stirling Castle*. This sand bank would appear to be part of the southwest end of the Goodwin Knoll. Between each survey it has been migrating westwards decametres towards the *Stirling Castle*. The current survey has identified that the site is now completely buried. The UKHO undertook surveys in 2009 and 2015 in an area along the Gull Stream and the North Sand Head. The Gull Stream is a channel that lies 2.3km to the west of the *Stirling Castle* and the North Sand Head lies approximately 4.3km to the northeast. Although the surveys by the UKHO do not

cover the site of the *Stirling Castle* they have identified the westerly migration of sand into the Gull stream, which corresponds with the direction of movement in the area of the *Stirling Castle*.

*'Gull Stream has seen no significant change in depth on the Western side of the channel. However migrating sediment is indicated on the Eastern side encroaching further towards the centre of the channel, with the 5m contour, at NW Goodwin buoy, moving into Gull Stream 155 metres and shoaling by a maximum of 9.6 metres since 2009, with a shoalest depth of 0.2 metres, previously 9.9 metres in the same location in 2009, shown in Profile E-F at Annex D and the selected soundings in the colour banded depth plot at Annex E and F. Goodwin Knoll is also encroaching further into Gull Stream, with the 5 metre and the 10 metre contours moving 120 metres further into Gull Stream.'* (UKHO 2015, 3).

Both the UKHO surveys of the Gull Stream and PA surveys of the *Stirling Castle* on the western edge of the Goodwin Knoll have demonstrated that the sands in this area of the Goodwin Sands are moving in a westerly direction.

- 4.13.3. The same cannot be said for the sites of the *Restoration* and the *Northumberland*, which lie approximately 1.8km to the south of the *Stirling Castle*. In this area of the Goodwin Sands the sands appear to be migrating in a northeasterly direction with the deepest margin creeping east. Should this migration continue then both sites will continue to uncover and continue to be under threat from biological and physical decay.
- 4.13.4. The movement of the sands in the area of the *Stirling Castle* is consistent with the anti-clockwise seasonal rotation described by Cloet in the 1950s, as well as studies conducted during the MACHU project (Dix *et al* 2008). The MACHU project also found that the sites of the *Northumberland* and the *Restoration* were in a zone of slight accumulation and close to a bank margin with the potential for a westerly migration, therefore tying-in with Cloet's anti-clockwise rotation (Dix *et al* 2008). The current survey data shows that the local bedforms are still migrating in a northeasterly direction, but the deepest margin of the sand bank is creeping east. This is now placing the sites in a zone of erosion.
- 4.13.5. Regarding the site of the *Rooswijk*, further noteworthy changes have occurred since the 2017 survey. The main site has opened up around the southeast parameters of the wreck mound exposing a large spread of material related to its cargo. Looking at the shapes of these materials it is likely to be the cargo of cut stone blocks. Bearing in mind the variety of the vessel's cargo, however, it is also highly likely to contain other artefacts amongst it. Features within the main wreck mound are, in general, more prominent. These observations would suggest the main site has experienced a significant loss of seabed sediments.
- 4.13.6. Scatters of material can also be observed to the northeast and west of the wreck mound. This demonstrates a general reduction in the seabed surrounding the main wreck mound site as well.
- 4.13.7. Reductions in seabed sediments appears to extend at least as far as the gun site, 270m to the northeast of the main site. This general reduction within the designated area, with the exception of the East site, is consistent with the UKHO survey data of Area

GS3, which has recorded the migration of a sand ridge in an easterly direction and leaving deeper water to the west (UKHO 2015, 2). The *Rooswijk* is situated in the area to the west and, should this trend continue, it is likely to remain exposed and therefore under threat.

- 4.13.8. The exception to this is the large sand wave that is impacting the East site. This has continued to migrate southwards and now covers the whole of the East site. This sand wave had moved 24.5m between the surveys conducted between 2016 and 2017 (PA 2017, 9) and has advanced a further 24m between the 2017 and 2018 survey. This sand bank is approximately 50m wide. If this rate of migration continues then the East site will be exposed again within two years.
- 4.13.9. The *Admiral Gardner* remains buried with no archaeological features exposed. It is situated within the South Calliper GS4A UKHO survey area. Within the UKHO 2015 report on this area the UKHO have observed a lack of lateral migration of the bank and the reduction in its size. They suggest the survey interval for this area should be increased from three years to six years with the next survey to be conducted in 2021 (UKHO 2015, 3). From this it would appear that the UKHO does not anticipate a great deal of change in this area and therefore the site of the *Admiral Gardner* should remain buried. However, this does not take into consideration the current plans for dredging to occur to the west of the western side of the South Calliper, for the Port of Dover. On the 25<sup>th</sup> July 2018 the MMO has determined that it is appropriate to grant a marine license (page 4 of the online report [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/729601/20180725\\_EIA\\_Consent\\_Decision\\_and\\_Decision\\_Report.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729601/20180725_EIA_Consent_Decision_and_Decision_Report.pdf) link verified on 03/08/2018). Should dredging go ahead then this may have an impact on the dynamics of the South Calliper.
- 4.13.10. GAD 8 is in an area of 'The Downs' where seabed movements are less dynamic. Although minor changes to the overall topography of the site have been observed it is still in a relatively stable condition.
- 4.13.11. The un-designated site of GAD 23 is still exposed with signs of further deterioration between the time of the 2017 and 2018 surveys. The depth of the surrounding seabed suggests the site will remain in an exposed state rather than have the potential for reburial.

#### **4.14. RECOMMENDATIONS**

- 4.14.1. There are significant changes occurring on the west side of the Goodwin Sands between the western entrance of the Kellert Gut and North Sand Head on the Goodwin Knoll. This is impacting the sites of the *Stirling Castle*, *Northumberland* and the *Restoration*. In the case of the *Stirling Castle* the western edge of the Goodwin Knoll has migrated west towards the site and buried it, but the reverse is occurring on the *Restoration* and the *Northumberland*; in the past all three sites have been within a zone of accumulation (Dix *et al* 2008). Why the *Restoration* and the *Northumberland* are currently situated in a zone of erosion is yet not entirely understood. Should this trend continue, however, then they will expose further. To record the rate and extent of the exposure PA recommends a repeat MBES survey of these two sites in 2019. In addition, PA recommends the survey of the wider area around these sites to try and determine the seabed dynamics of the southern end of



the Goodwin Knoll. This will potentially enhance our understanding of how this part of the Goodwin Sands is moving and whether it is changing the direction of the flow of currents, which in turn is causing the region around the *Restoration* and *Northumberland* to uncover.

- 4.14.2. Depending on the results of the recommended 2019 MBES survey of the *Restoration* PA would recommend a diving assessment of the site to identify the exposed remains and its condition.
- 4.14.3. Now that the site of the *Stirling Castle* is buried and no longer under threat through exposure to the physical and biological environment, this may be an opportune time to investigate the nearby exposed wreck site, which lies 120m to the west of the *Stirling Castle*. Considering the observation made by the previous licensee that this is a clinker-built vessel, and which was described within a 2001 ADU report, this is potentially a site of great rarity and importance from the medieval period, which is currently poorly represented in the UK archaeological record. As there is currently a clearly discernible wreck with considerable exposed and vulnerable remains to investigate, PA recommends undertaking an underwater archaeological assessment of the site.
- 4.14.4. The current multi-beam bathymetry data of the site of GAD 8 has identified at least two anomalies outside the designated area. It is possible that these anomalies could be associated with the wreck. PA recommends diver ground-truthing these anomalies to determine whether they relate to the site. This will assist HE in making a decision of whether to increase the current designated area to protect these new potential features of the site.

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6. APPENDIX I: THE *ROOSWIJK*

Wreck/Site Name	<i>Rooswijk</i>														
NHLE Entry No.	EH Region	Restricted Area					Principal Land Use								
1000085	Southeast	150m					Coastland 1								
Latitude (WGS84)	51°16.443'N														
Longitude	001°34.537'E														
Class Listing	Period					Status									
Dutch East Indiaman	Post medieval					Protection of Wrecks Act 1973									
Licensee	Nominated Archaeologist					Principal Ownership Category									
Yes	Yes					The Dutch Government									
Seabed Owner	Navigational Administrative Responsibility														
The Crown Estate	Nil														
Environmental Designations															
Nil															
Seabed Sediment					Energy										
Slightly sandy gravel					High										
Survival															
Good															
Overall Condition				Condition Trend					Principal Vulnerability						
Extensive significant problems				Declining					Mechanical degradation Biological decay Seabed erosion						
Amenity Value: visibility															
Substantial above bed structural remains which are highly visible and 'legible' without further information															
Amenity Value: physical accessibility							Amenity Value: intellectual accessibility								
Restricted (C)															
Management Action		An excavation has been agreed													
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
														X	
Notes:															
<p>The <i>Rooswijk</i> is the wreck of a Dutch East Indiaman lost in January 1740. She lies on the Goodwin Sands southeast of the North Sands Head and northeast of the Kellet Gut.</p> <p>The 2018 MBES survey has identified a significant change to the overall character of the main site. There has been noticeable bed level loss on and around the wreck mound, which has exposed many more archaeological features. The overall extent of exposed material has shown that the main site consists of a much larger scatter of material. Exposed material extends 69m on a NE/SW axis and 40m on a NW/SE axis.</p> <p>The East site has been completely covered by a large sand wave which has been migrating progressively from the north. The East site is therefore currently in a stable condition, but this will change within the next two years if the sand wave continues to migrate south.</p> <p>The Northern site, which consists of a scatter of concreted barrels, has not changed since the 2017 survey. The extent and number of exposed features is the same as seen previously. Therefore, the exposed remains are still under threat from the physical and biological</p>															

environment.

The Gun site is approximately 270m from the centre of the main site. The 2017 multi-beam bathymetry data revealed possibly nine guns, which was confirmed by diver ground-truthing during the *Rooswijk* 1740 excavation project. This area of the site appears more pronounced in the 2018 data with possibly up to 11 guns now exposed. This increase in the number of guns and archaeological features has identified bed level loss in this area.

Due to the extent and variety of exposed material across the main, east and gun sites within the designated area risk is assessed as **High**

Data Source	2018 MBES	Date & Initials	14/08/2018
Date of previous assessment:	Has an ecological survey been undertaken? No		

## 7. APPENDIX II: THE NORTHUMBERLAND

Wreck/Site Name	<i>Northumberland</i>														
NHLE Entry No.	EH Region	Restricted Area		Principal Land Use											
1000058	Southeast	300m		Coastland 1											
Latitude (WGS84)	51°15.4802'N														
Longitude	001°30.0161'E														
Class Listing	Period					Status									
Third-rate Man of War	Post Medieval					Protection of Wrecks Act 1973									
Licensee	Nominated Archaeologist					Principal Ownership Category									
Yes	Yes					MOD									
Seabed Owner	Navigational Administrative Responsibility														
The Crown Estate	Nil														
Environmental Designations															
Nil															
Seabed Sediment					Energy										
Slightly gravely sand					High										
Survival															
Good															
Overall Condition				Condition Trend					Principal Vulnerability						
Generally unsatisfactory				Declining					Mechanical degradation Seabed erosion Biological decay						
Amenity Value: visibility															
Substantial above-bed structural remains which are highly visible and 'legible' without further information.															
Amenity Value: physical accessibility							Amenity Value: intellectual accessibility								
Restricted (C)							Developed interpretative scheme at the Ramsgate Maritime Museum.								
Management Action		action identified / agreed but not implemented													
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
		X	X	X					X			X	X		
Notes:															
<p>The <i>Northumberland</i> was a third-rate Man of war of 70 guns built in 1679 in Bristol. She was lost on the 27<sup>th</sup> November 1703 during the Great Storm. The wreck lies at a chartered depth of 14m 9.5km southeast of Ramsgate on the Goodwin Sands between North Sands and South Sands Head.</p> <p>Since 2011 up until relatively recently the wreck has been buried beneath a large sand bank. The 2017 multi-beam bathymetry data identified that this sand bank had moved dramatically exposing the wreck once again. Exposed material covers an area currently 33m long by 18m wide.</p> <p>The 2018 multi-beam bathymetry data shows that the edge of the sand bank to the north of the wreck has migrated 120m northeast. The result has been bed level loss revealing a scatter of anomalies north of the site within the designated area.</p>															

The seabed margin to the west of the site, which is orientated NNE/SSW, is now 35m from the most northwest extent of the site. The seabed immediately to the west of the margin is deeper. The boundary of that deeper seabed has advanced 5m east towards the site and therefore poses a threat to the site if the margin continues to migrate east.

The current exposed features within the main wreck-mound cover an extent of 37m long by 20m wide. The mound is orientated northwest-southeast. The site lies directly within medium subaqueous dunes that are moving in an NNE direction. A comparison with the 2017 survey data shows the overall length of the site has increased by 4m and 2m wide. This shows that there are areas which were previously buried that are now starting to reveal archaeological features.

There is currently no management plan for the site, but a plan has been implemented as part of the current Pascoe Archaeology project 7700.

Due to the fact the *Northumberland* is continuing to experience a period of seabed erosion via the migration of a sand bank away from the site and as a result archaeological material is vulnerable to biological and physical decay risk is assessed as: **High**

Data Source	2018 MBES	Date & Initials	15/08/2018 DP
Date of previous assessment:	Has an ecological survey been undertaken? No		

8. APPENDIX III: THE *STIRLING CASTLE*

Wreck/Site Name	<i>Stirling Castle</i>														
NHLE Entry No.	EH Region	Restricted Area					Principal Land Use								
1000056	Southeast	300m					Coastland 1								
Latitude (WGS84)	50°16.4561'N														
Longitude	001°30.4121'E														
Class Listing	Period					Status									
Third-rate Man of War	Post Medieval					Protection of Wrecks Act 1973									
Licensee	Nominated Archaeologist					Principal Ownership Category									
Yes	Yes					Private (Trust)									
Seabed Owner	Navigational Administrative Responsibility														
Crown Estate	Nil														
Environmental Designations															
Nil															
Seabed Sediment					Energy										
Slightly gravelly sand					High										
Survival															
Good															
Overall Condition				Condition Trend					Principal Vulnerability						
Optimal ie the best we can realistically expect to achieve: there is very little or no erosion, deterioration or other damage (CURRENTLY)				Stable: the monument shows no sign of active deterioration either recent or midterm. (CURRENTLY)					Seabed erosion.						
Amenity Value: visibility															
Not visible: only buried remains survive															
Amenity Value: physical accessibility					Amenity Value: intellectual accessibility										
Restricted (C)					Developed interpretative scheme										
Management Action		Action to be identified/agreed													
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
		X							X						X
Notes:															
<p>The <i>Stirling Castle</i> was a third-rate Man of War of 70 guns built at Deptford in 1679. She was wrecked on the 27<sup>th</sup> November 1703 during the Great Storm. The wreck lies at a chartered depth of 18m, 8.5km southeast of Ramsgate at the south end of the Goodwin Knoll.</p> <p>The 2017 MBES survey demonstrated that sedimentation was increasing, most probably due to a large bank of sand advancing from the east in a westerly direction (PA 2017,13). The 2018 MBES survey has revealed that the advancement of the sand bank has continued in a westerly direction and has completely engulfed the site. The lower margin of the sand bank has moved over 60m in the space of one year and now nearly 50 per cent of the designated area is too shallow to access via a survey vessel. There are no longer any visible remains of the <i>Stirling Castle</i>.</p> <p>As the site is currently completely buried it is in a stable condition. Risk is assessed as <b>Low</b>.</p>															
Data Source	2018 MBES					Date & Initials				15/08/2018 DP					

Date of previous assessment:	Has an ecological survey been undertaken? No
------------------------------	--

## 9. APPENDIX IV: THE RESTORATION

Wreck/Site Name	<i>Restoration</i>														
NHLE Entry No.	EH Region	Restricted Area					Principal Land Use								
1000057	Southeast	300m radius					Coastline 1								
Latitude (WGS84)	51°15.6302'N														
Longitude	01°30.0262'E														
Class Listing	Period					Status									
Third-rate Man of War	Post medieval					Protection of Wrecks Act 1973									
Licensee	Nominated Archaeologist					Principal Ownership Category									
Yes	Yes					The MOD									
Seabed Owner	Navigational Administrative Responsibility														
The Crown Estate	Nil														
Environmental Designations															
Nil															
Seabed Sediment					Energy										
Slightly sandy gravel					High										
Survival															
No fully understood															
Overall Condition				Condition Trend					Principal Vulnerability						
Generally satisfactory but with significant localised problems: more significant damage is apparent. The damage is localised but may affect up to 25% of the monument				Declining: the condition of the monument is deteriorating as a result of ongoing damage, causing loss of fabric which might be gradual or rapid					Seabed erosion						
Amenity Value: visibility															
limited above-bed structural remains and finds scatter with limited visibility and only 'legible' with further interpretative information.															
Amenity Value: physical accessibility							Amenity Value: intellectual accessibility								
Restricted (C)							Limited interpretation at the Ramsgate Maritime museum								
Management Action		action to be identified / agreed													
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
				C					X			K			
Notes:															
<p>The <i>Restoration</i> was a third-rate Man of War of 70 guns built in 1678 at Harwich. She wrecked on the 27<sup>th</sup> November 1703 during the Great Storm. The wreck lies at a chart depth of 14m, 9.5km southeast of Ramsgate on the Goodwin Sands at the southwest end of the Goodwin Knoll and 280m north of the <i>Northumberland</i>.</p> <p>The current 2018 multi-beam bathymetry data has revealed that the south mound of the site has become exposed and a very small anomaly is present at the north mound, 113m to the NNE. This is in contrast to the 2017 multi-beam bathymetry data which recorded no exposed features on the seabed. Exposure of the site has occurred due to the migration of a sand bank</p>															



to the NE away from the site.

The south mound consists of several exposed features over an area of 19m long by 6.5m wide, on an NNW/SSE axis. It is unclear from the multi-beam bathymetry data alone what these features could be. A diving assessment of the site would be recommended to identify the exposed remains and its condition.

There is a small anomaly 113m NNE of the high point of the south mound. This distant and bearing is consistent with the area of the north mound. The anomaly is too small to identify but its appearance in the area of the north mound, alongside the movement of the sand bank, suggests the seabed is deepening. Should this trend continue then further anomalies and features will become exposed.

There is no management plan for the site.

The site is currently uncovering due to the migration of a sand bank away from the site. Monitoring of the site should continue to assess the rate of exposure. Currently risk is assessed as **Medium**. However, should exposure of the site increase then the risk value will be increased to **High**.

Data Source	2018 MBES	Date & Initials	15/08/2018 DP
Date of previous assessment:	Has an ecological survey been undertaken? NO		

## 10. APPENDIX V: THE ADMIRAL GARDNER

Wreck/Site Name	<i>Admiral Gardner</i>														
NHLE Entry No.	EH Region	Restricted Area	Principal Land Use												
1000062	Southeast	300m radius													
Latitude (WGS84)	51°12.0305'N														
Longitude	001°30.4563'E														
Class Listing	Period	Status													
English East Indiaman	Post medieval	Protection of Wrecks Act 1973													
Licensee	Nominated Archaeologist	Principal Ownership Category													
Yes	Yes	British Government													
Seabed Owner	Navigational Administrative Responsibility														
Crown Estate	Nil														
Environmental Designations															
Nil															
Seabed Sediment										Energy					
Slightly sandy seabed										High					
Survival															
Good															
Overall Condition				Condition Trend				Principal Vulnerability							
optimal				Stable				Seabed erosion							
Amenity Value: visibility															
Not visible															
Amenity Value: physical accessibility								Amenity Value: intellectual accessibility							
Restricted (C)								No interpretation							
Management Action		No action required (routine monitoring by Licensee/Archaeological contractor)													
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
														X	
Notes:															
<p>The <i>Admiral Gardner</i> was an 813-ton English East Indiaman built at Blackwall in 1797 and wrecked on the 25<sup>th</sup> January 1809. She lies 15km SSE of Ramsgate on the Goodwin sands, on the east side of South Sand Head.</p> <p>The site is currently buried under many metres of sand and has been for several years. It is not possible to even travel over the site in a vessel due to insufficient depth of water.</p> <p>Due to the site being buried risk is assessed as <b>Low</b></p>															
Data Source		NA				Date & Initials				15/08/2018 DP					
Date of previous assessment:								Has an ecological survey been undertaken? No							

## 11. APPENDIX V1: GAD 8

Wreck/Site Name	GAD 8														
NHLE Entry No.	EH Region	Restricted Area				Principal Land Use									
1401982	Southeast	50m radius				Coastland 1									
Latitude (WGS84)	51°13.9716'N														
Longitude	001°26.0090'E														
Class Listing	Period					Status									
Armed wooden vessel	Post Medieval					Protection of Wrecks Act 1973									
Licensee	Nominated Archaeologist					Principal Ownership Category									
Yes	Yes					Unknown									
Seabed Owner	Navigational Administrative Responsibility														
Crown Estate	Nil														
Environmental Designations															
Nil															
Seabed Sediment					Energy										
Slightly sandy gravel					High										
Survival															
Not fully understood															
Overall Condition			Condition Trend				Principal Vulnerability								
Generally satisfactory with minor localised problems			Stable				Mechanical degradation								
Amenity Value: visibility															
Limited above bed structural remains and finds scatter with limited visibility and only 'legible' with further interpretative information															
Amenity Value: physical accessibility					Amenity Value: intellectual accessibility										
Restricted (C)					No interpretation										
Management Action		Action to be identified/agreed													
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
		X							X						
Notes:															
<p>The site is currently unidentified but it appears to be the wreck of an armed wooden sailing vessel dated to between 1650 and 1750. Previous site investigations have identified seven cast iron guns, a central concretion mound and a section of coherent ship's structure exposed on the seabed. The wreck lies at a charted depth of 11m, 10km south of Ramsgate in 'The Downs'.</p> <p>The current multi-beam survey has identified some changes to the site and surrounding seabed but nothing too alarming. In general, the site appears to be situated on a fairly flat and stable seabed, but the 2018 data does provide evidence there is some mobility in surface sediments causing both localised deposition and erosion around archaeological features.</p> <p>There is no current management plan for the site.</p> <p>Due to the reasonable stability of the site risk is assessed as <b>Low</b></p>															
Data Source		2018 MBES				Date & Initials			15/08/2018 DP						
Date of previous assessment:					Has an ecological survey been undertaken? No										

**12. APPENDIX V: GAD 23**

Wreck/Site Name	GAD 23													
NHLE Entry No.	EH Region	Restricted Area	Principal Land Use											
	Southeast	NA	Coastland 1											
Latitude (WGS84)	51° 16.113'N													
Longitude	001° 29.583'E													
Class Listing	Period	Status												
Wooden merchant sailing vessel	Post medieval	Un-designated												
Licensee	Nominated Archaeologist	Principal Ownership Category												
NA	NA	Unknown												
Seabed Owner	Navigational Administrative Responsibility													
Crown Estate	Nil													
Environmental Designations														
Nil														
Seabed Sediment	Energy													
Slightly sand gravel	High													
Survival														
Very good														
Overall Condition	Condition Trend					Principal Vulnerability								
Extensive and significant problems	Declining					Mechanical degradation Biological decay Seabed erosion								
Amenity Value: visibility														
Substantial above bed structural remains which are highly visible and 'legible' without further information														
Amenity Value: physical accessibility							Amenity Value: intellectual accessibility							
Full. No restrictions on access							No interpretation							
Management Action														
Management Prescription	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Notes:														
<p>GAD 23, also known as the Bowsprit Wreck due to when it was first surveyed it was a very intact wreck, still with its bowsprit attached. It lies at a charted depth of 18m, 8.5km southeast of Ramsgate on the Goodwin Sands, southwest of the south end of North Sand Head.</p> <p>Much of the wreck is exposed from bow to stern with the layout of the vessel clearly discernible. Much of the vessel's deck furniture and machinery is visible. The fractures in the hull and deck have exposed the vessel's cargo of coal. A comparison of the 2017 and 2018 MBES data with previous 2006 ADUS surveys and WA diving assessment have identified that the wreck has deteriorated significantly. The bow of the wreck, which was relatively intact in 2011, has collapsed and broken away. This has caused areas of the deck either to collapse or to be left hanging unsupported. A general reduction in seabed sediments over the whole site has exposed greater areas of the starboard side and the stern structures as</p>														

well as deck structures over the whole wreck.

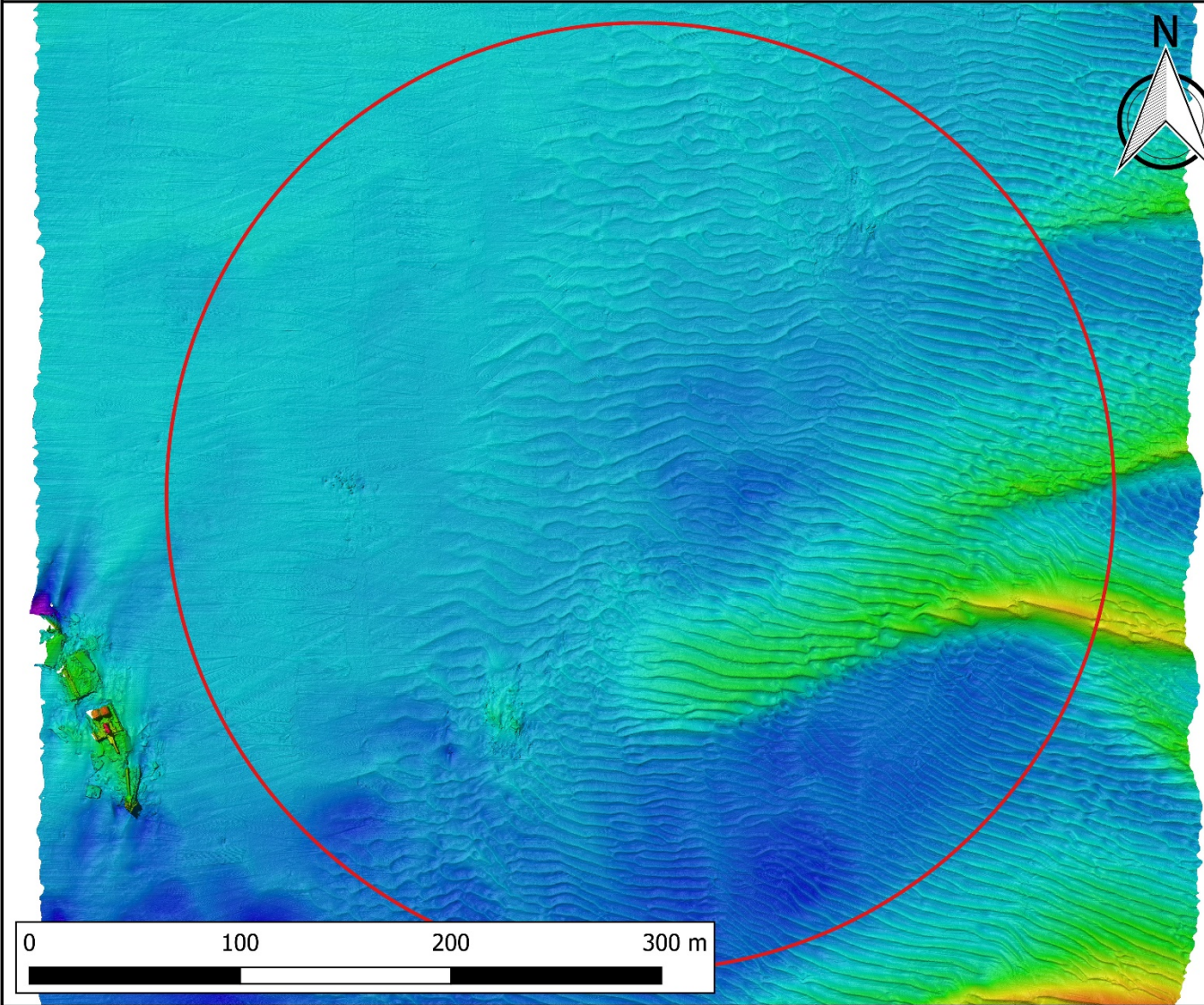
When the wreck was surveyed in 2006 by the ADUS it was relatively intact and much of the starboard side and stern area were buried. Continued exposure and further loss of seabed sediments on and around the wreck have left it extremely vulnerable to physical and biological degradation. This has been the cause of the wreck sites' deterioration.

There is no current management plan for the site

Due to the continued exposure of the wreck and loss of seabed sediments risk is assessed as **High**

Data Source	MBES 2018	Date & Initials	15/08/2018
Date of previous assessment:	Has an ecological survey been undertaken? No		

# Rooswijk



PASCOE ARCHAEOLOGY

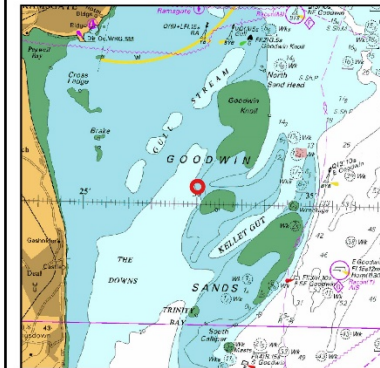
## Legend

Designated Areas

 Rooswijk



Colour scale for main map



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DATE: 15/05/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N

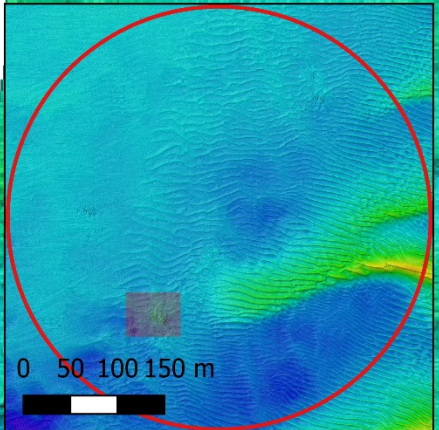
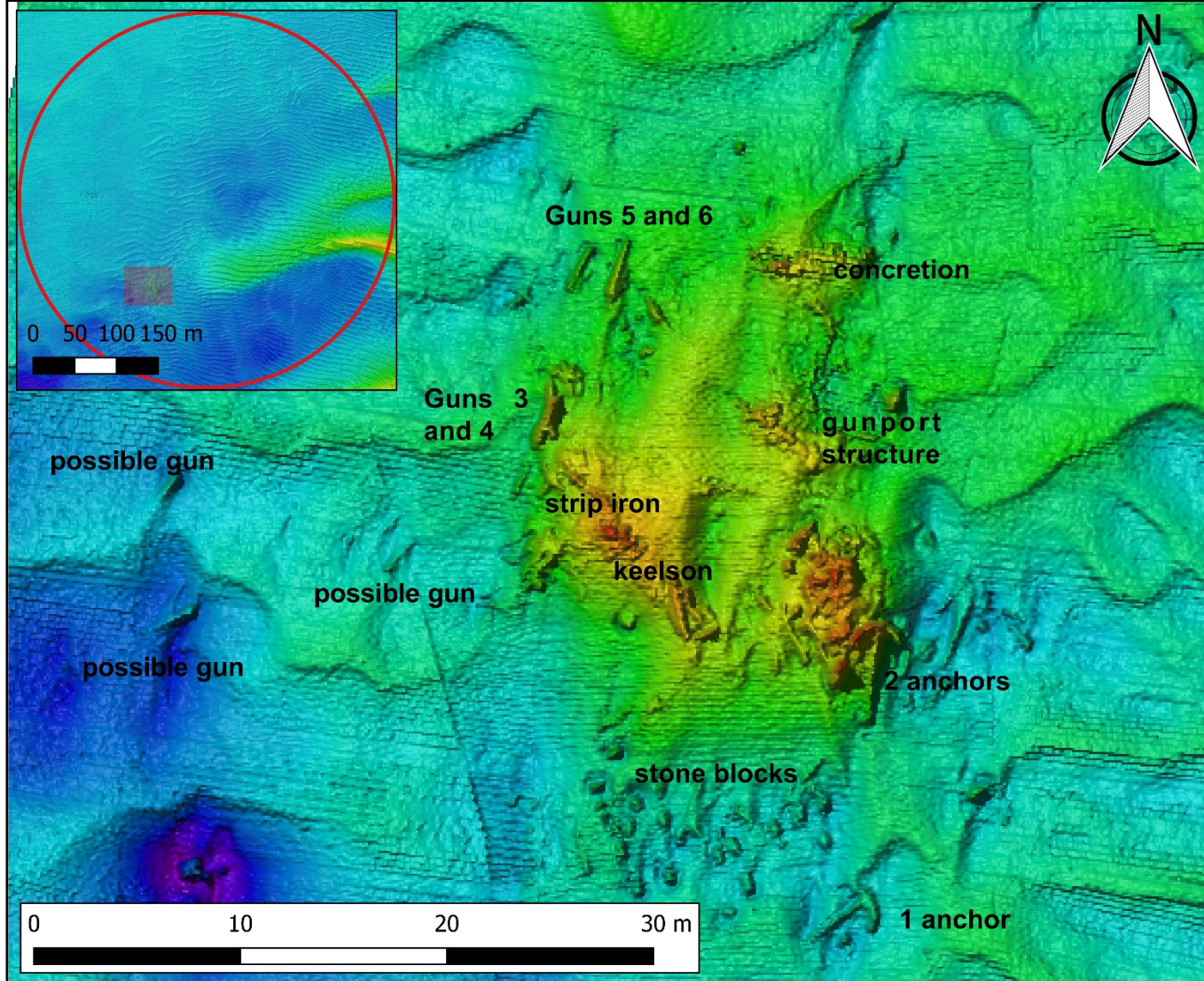


**MSDS**  
Marine

Figure 1: Rooswijk whole site and designated area.



# Rooswijk - Main Site

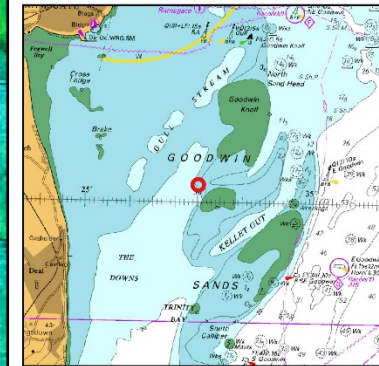
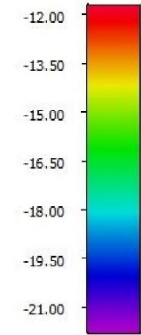


PASCOE ARCHAEOLOGY

## Legend

Designated Areas

Rooswijk



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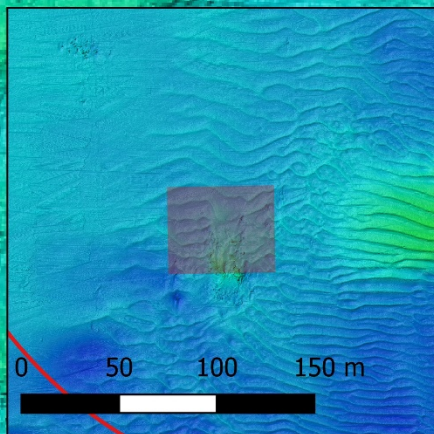
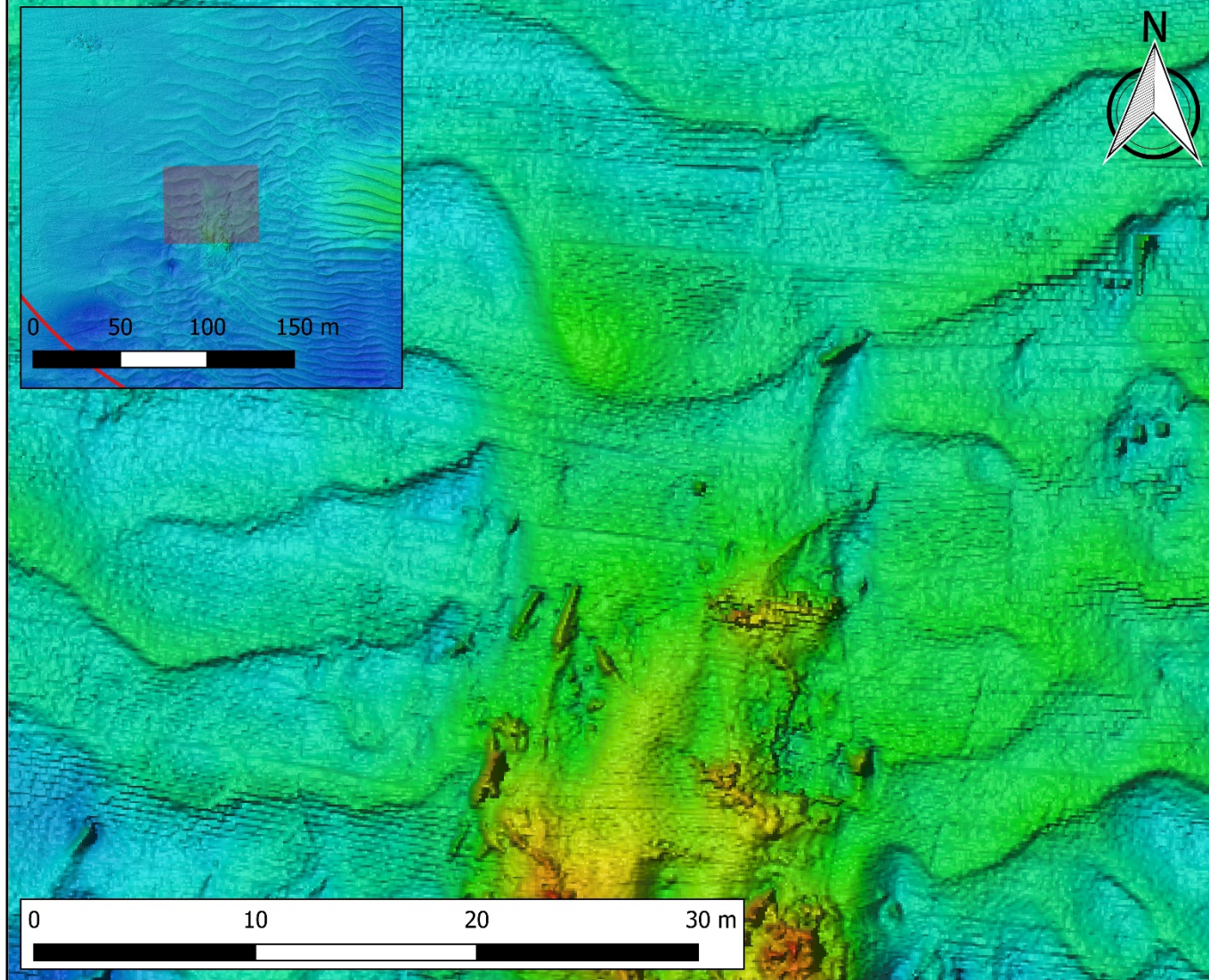
DATE:	15/05/2018
AUTHOR:	MARK JAMES
PROJECTION:	WGS84 Z31 N



Figure 2: The main site with exposed features labelled.



# Rooswijk - Main Site

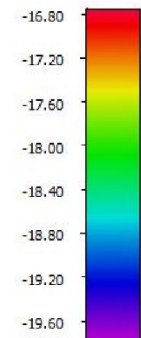


PASCOE ARCHAEOLOGY

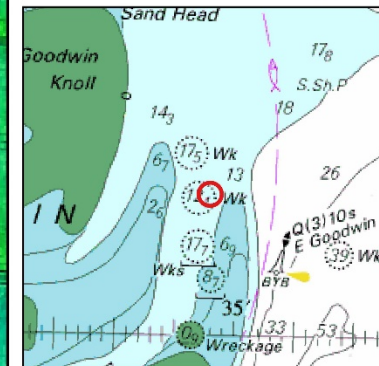
## Legend

Designated Areas

Rooswijk



Colour scale for main map



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DATE:	17/05/2018
AUTHOR:	MARK JAMES
PROJECTION:	WGS84 Z31 N



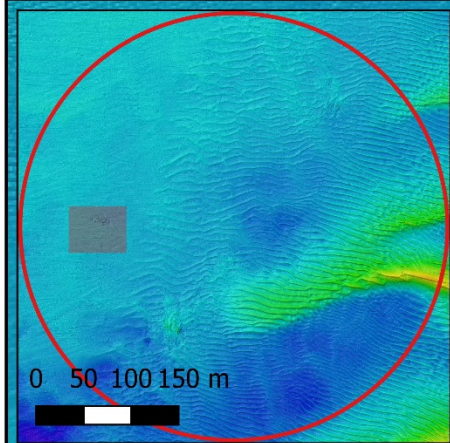
Figure 3: Anomalies NE of main wreck mound.



# Rooswijk - North Site



PASCOE ARCHAEOLOGY



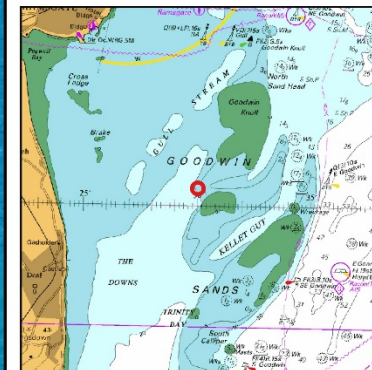
## Legend

Designated Areas

Rooswijk



Colour scale for inset map



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DATE:	15/05/2018
AUTHOR:	MARK JAMES
PROJECTION:	WGS84 Z31 N



**MSDS**  
Marine

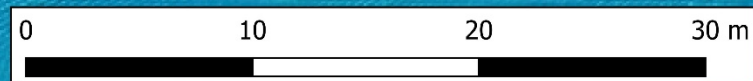
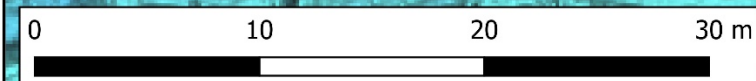
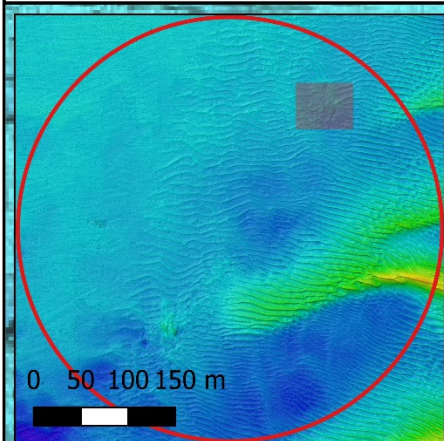


Figure 4: Exposed features on the North site.



# Rooswijk - Gun Site



PASCOE ARCHAEOLOGY

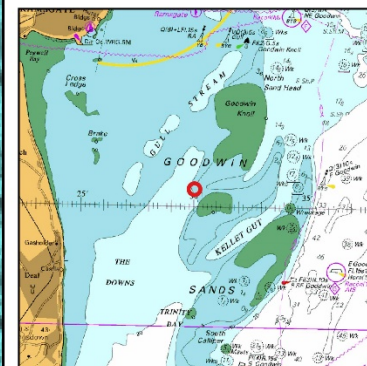
## Legend

Designated Areas

Rooswijk

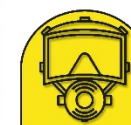


Colour scale for inset map



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DATE:	15/05/2018
AUTHOR:	MARK JAMES
PROJECTION:	WGS84 Z31 N

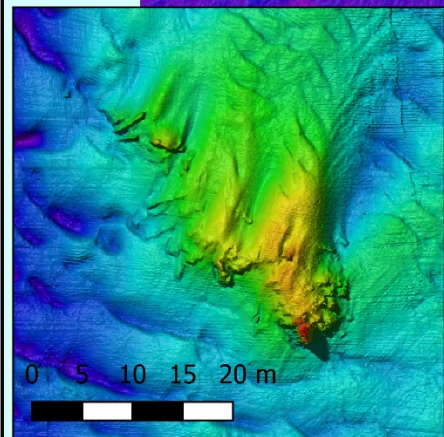


**MSDS**  
Marine

Figure 5: Exposed features on the Gun site.



# Northumberland

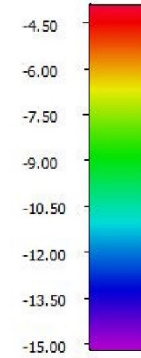


PASCOE ARCHAEOLOGY

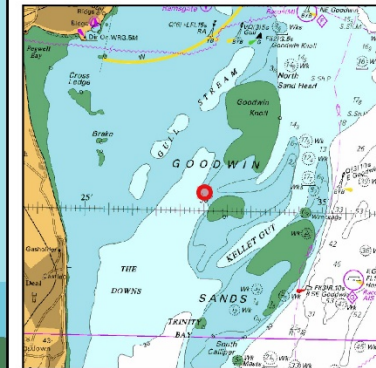
## Legend

Designated Areas

 Northumberland



Colour Scale for main map



DATE: 29/04/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



**MSDS**  
Marine

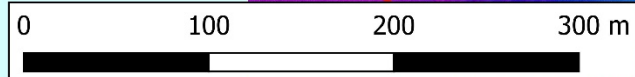


Figure 6: The Northumberland site and designated area.



# Northumberland

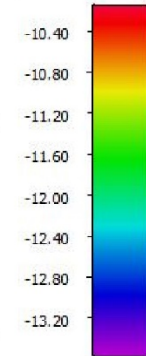


PASCOE ARCHAEOLOGY

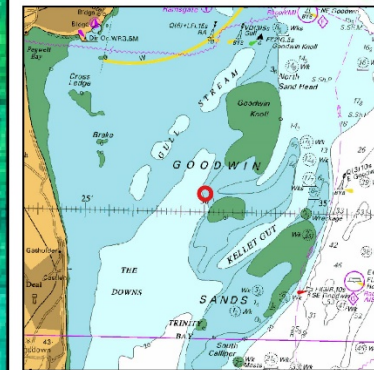
## Legend

Designated Areas

 Northumberland



Colour Scale for main map



Basemap Seazone Licence L.012017.0010

DATE: 29/04/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



**MSDS**  
Marine

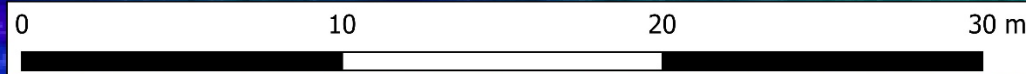


Figure 7: Close-up of the Northumberland wreck mound.



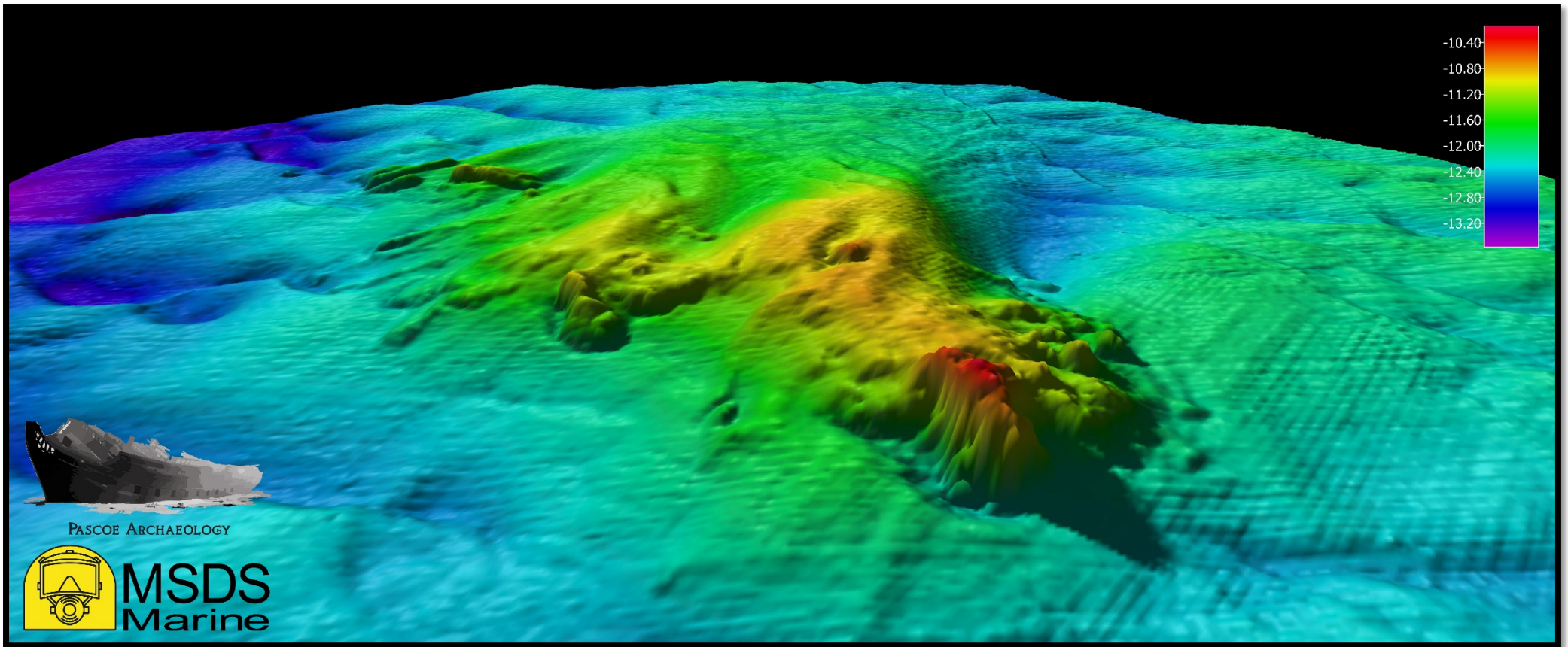
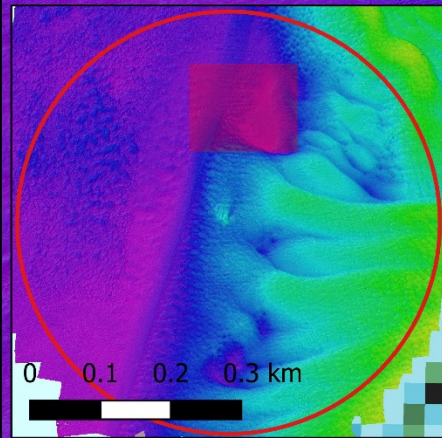


Figure 8: Side elevation of the Northumberland site looking north. Large upstanding feature in the foreground and possible guns in the middle and north of the site.



# Northumberland

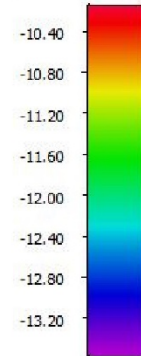


PASCOE ARCHAEOLOGY

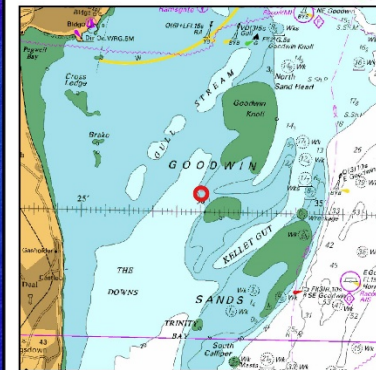
## Legend

Designated Areas

Northumberland



Colour Scale for main map



Basemap Seazone Licence L.012017.0010

DATE: 30/04/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



**MSDS**  
Marine

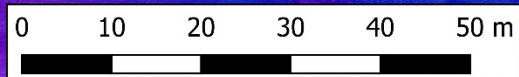
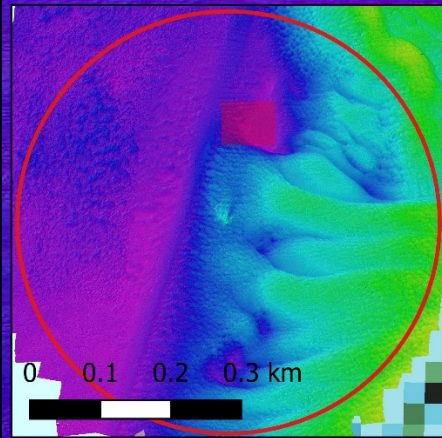


Figure 9: The scatter of anomalies to the north of the main wreck-mound.




# Northumberland

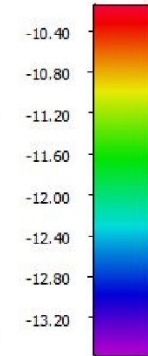


PASCOE ARCHAEOLOGY

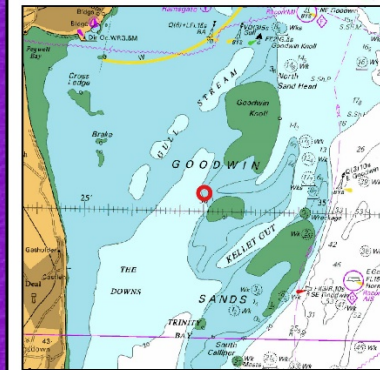
## Legend

Designated Areas

 Northumberland



Colour Scale for main map



Basemap Seazone Licence L.012017.0010

DATE: 30/04/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



**MSDS**  
Marine

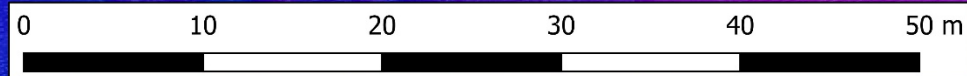
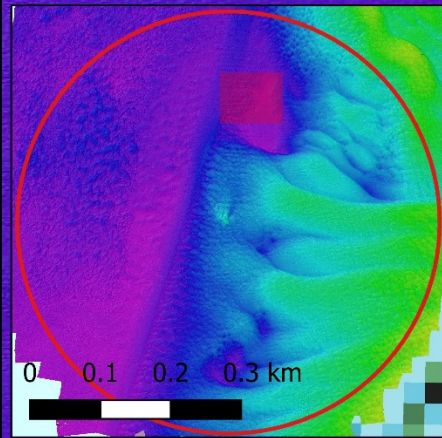


Figure 10: View of the two main scatters of anomalies showing linear features, which could be potential guns.



# Northumberland

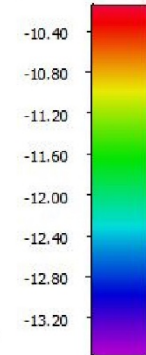


PASCOE ARCHAEOLOGY

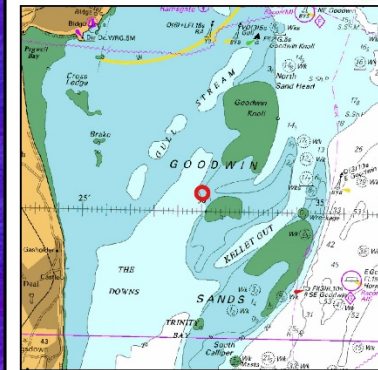
## Legend

Designated Areas

 Northumberland



Colour Scale for main map



Basemap Seazone Licence L.012017.0010

DATE: 30/04/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 231 N



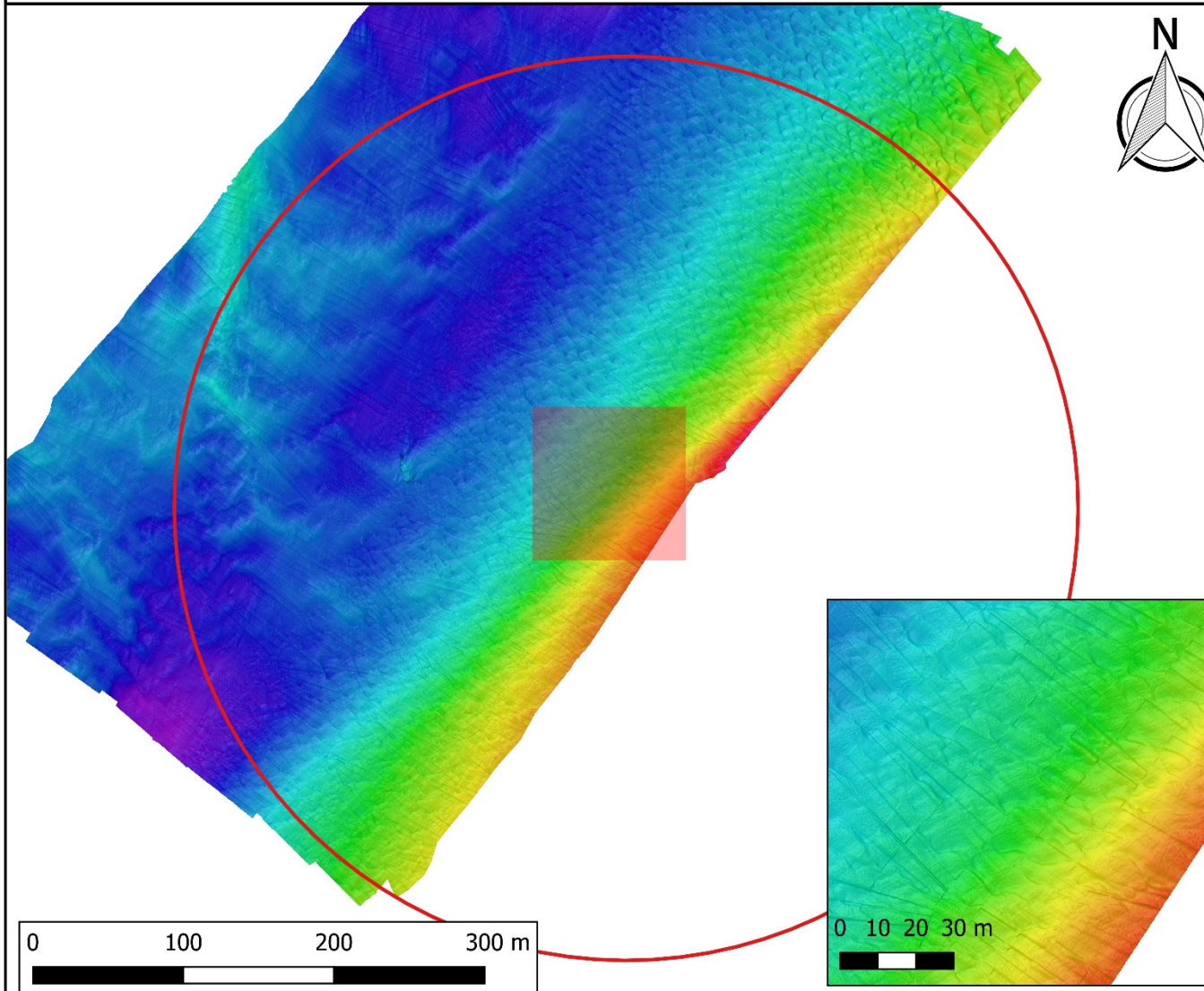
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Figure 11: View showing cluster of linear features and a single linear feature to the north, which could all be potential guns.



# Stirling Castle

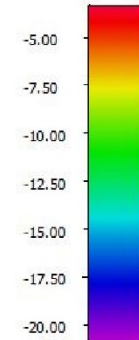


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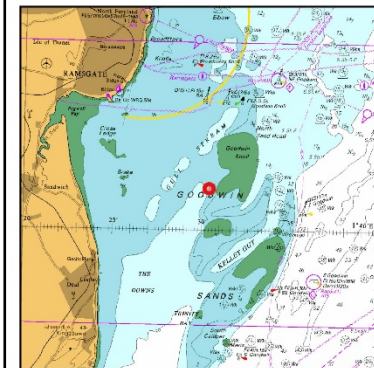
## Legend

Designated Areas

 Stirling Castle



Colour scale for main map



Basemap Seazone Licence L.012017.0010

DATE: 16/05/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N

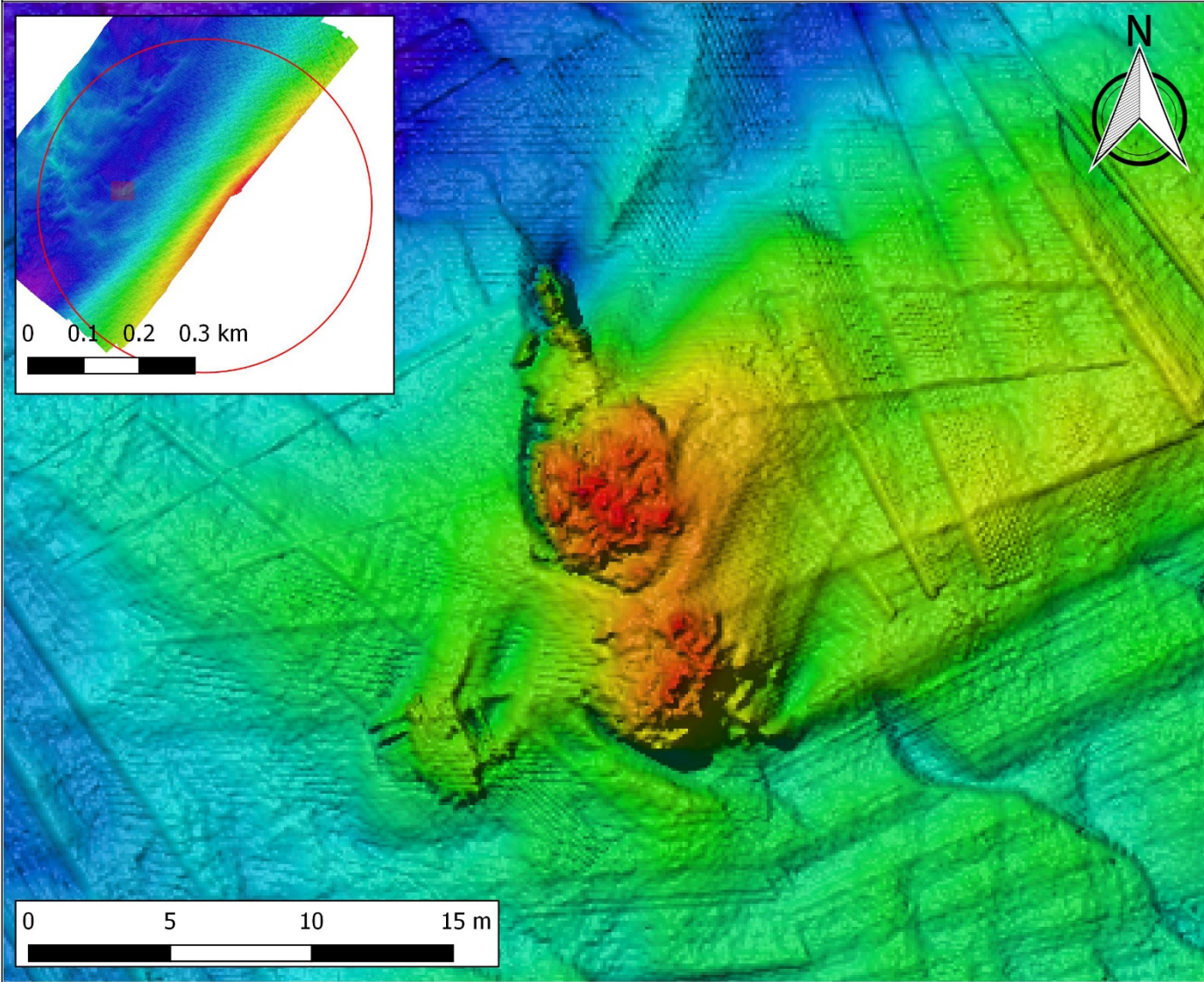
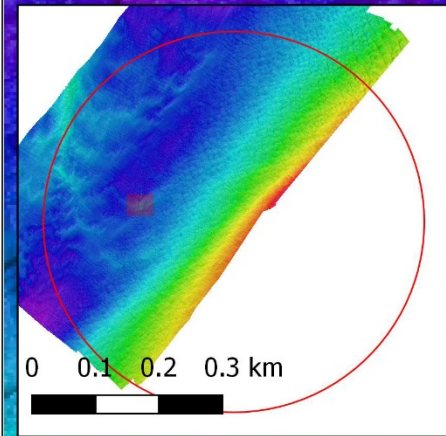


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Figure 12: The site of the Stirling Castle and the accessible side of the designated area.



# Wreck to West of Stirling Castle



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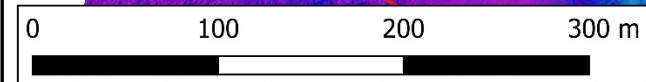
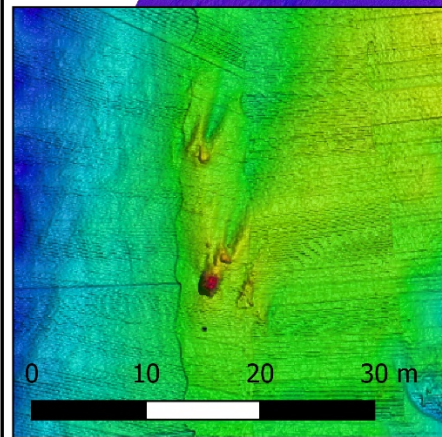
DATE:	16/08/2018
AUTHOR:	MARK JAMES
PROJECTION:	WGS84 Z31 N



Figure 13: The wreck site west 120m west of the Stirling Castle.



# Restoration

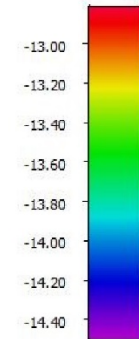


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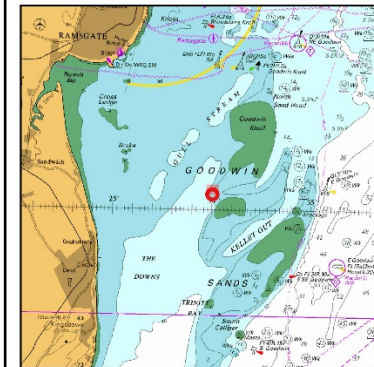
## Legend

Designated Areas

Restoration



Colour scale for main map



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DATE: 15/05/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



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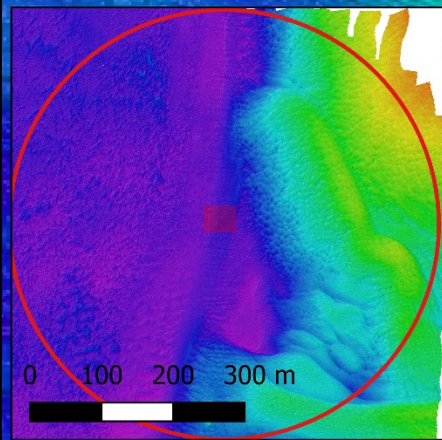
Figure 14: The site of the Restoration and the designated area.



# Restoration



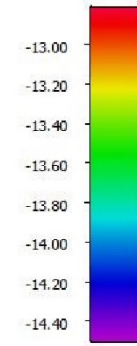
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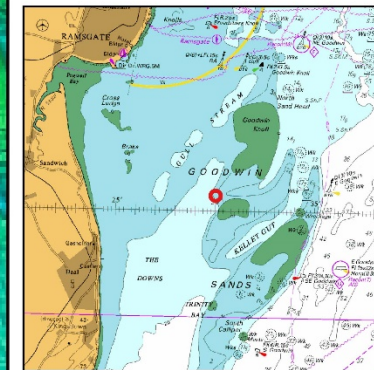
## Legend

Designated Areas

 Restoration



Colour scale for main map



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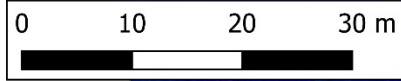
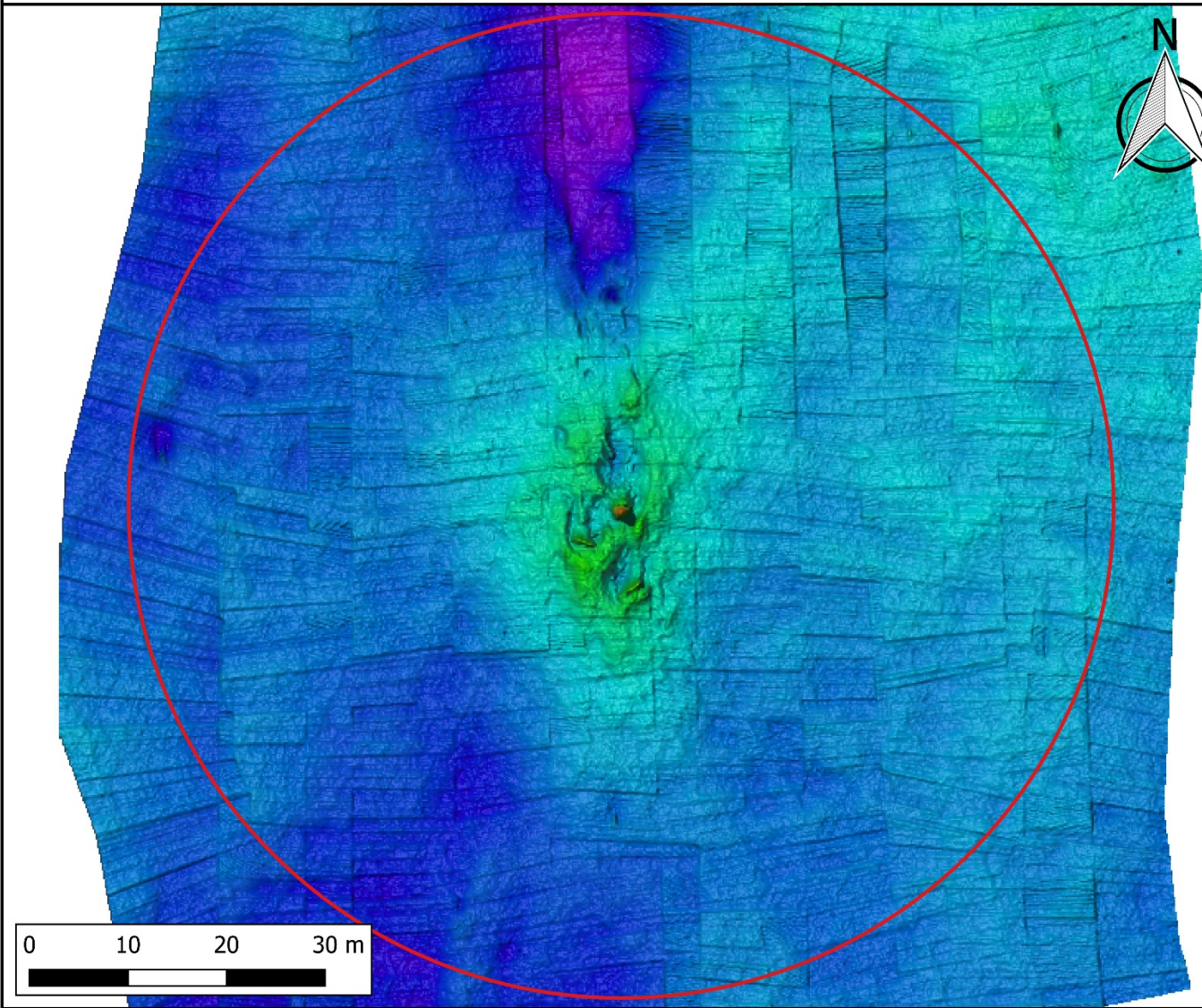
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Figure 15: A close-up of the Restoration's south mound close to the centre of the designated area.



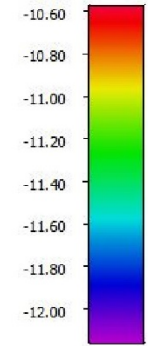
# GAD 8



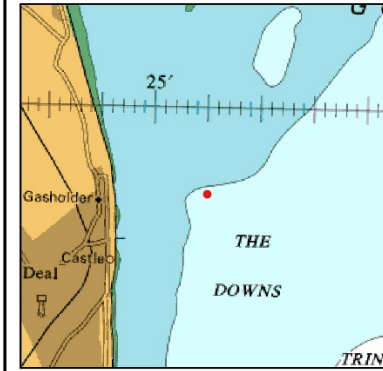
## Legend

Designated Areas

 GAD 8



Colour scale for main map



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Figure 16: The site of GAD 8 and the designated area.



# GAD 8



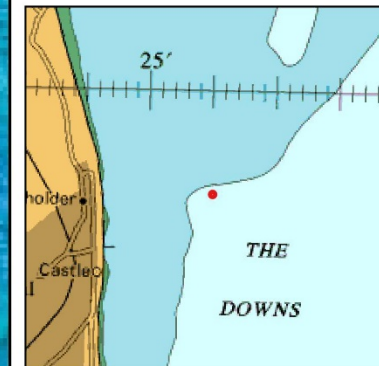
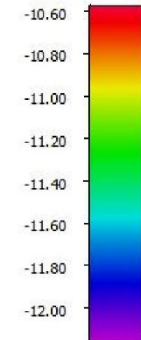
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## Legend

Designated Areas

 GAD 8



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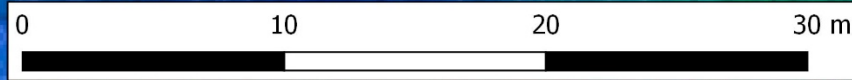
DATE: 17/05/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



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Gun 3

Gun 4

Gun 2

Gun 1

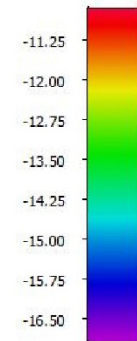
Figure 17: A close-up of the GAD 8 wreck mound.



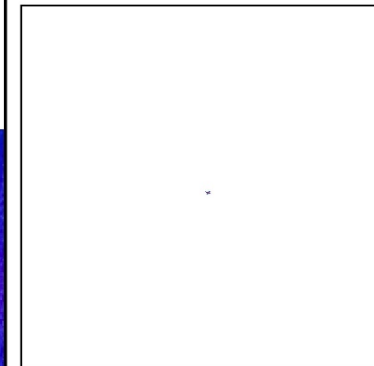
# Bowsprit Wreck - GAD 23



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Colour scale for main map

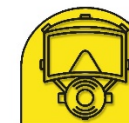


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DATE: 16/05/2018

AUTHOR: MARK JAMES

PROJECTION: WGS84 Z31 N



**MSDS**  
Marine

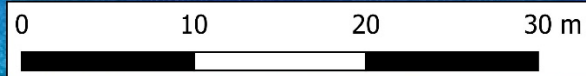
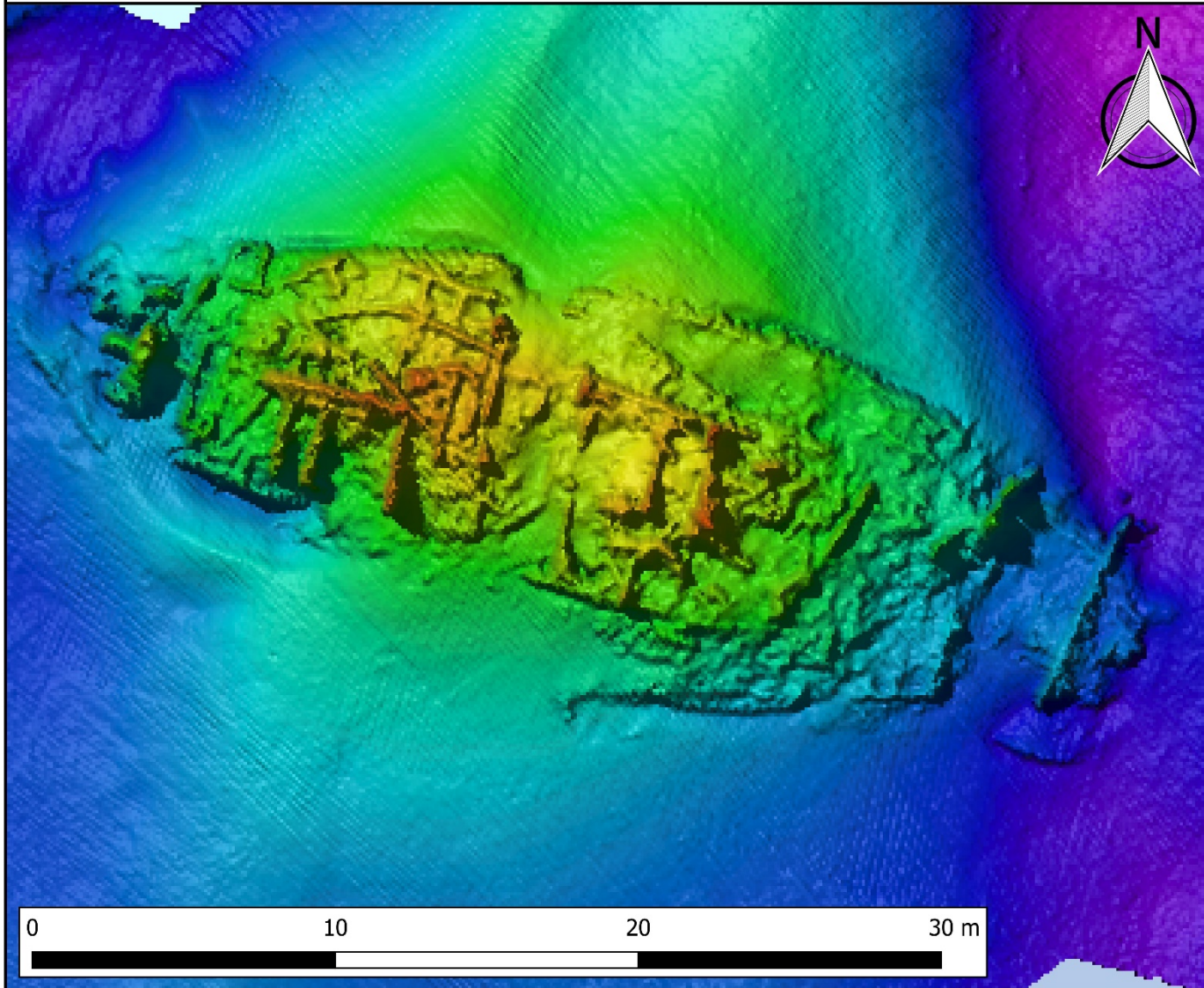


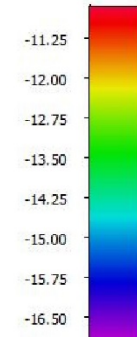
Figure 18: The site of GAD 23.



# Bowsprit Wreck - GAD 23



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Colour scale for main map



Basemap Seazone Licence L.012017.0010

DATE:	16/05/2018
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Figure 19: A close-up of GAD 23.