



NEMOLink

Temporary Exclusion Zone
Archaeological Investigation of UXO Anomaly 6382 and 6384



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Summary

Wessex Archaeology was commissioned by J-Power Systems Corporation to undertake an archaeological assessment of geophysical survey data over a section of the NEMO Link route where a possible cannon (MAG_6382) plus wooden and metal debris (MAG_6384) were identified by a working remotely operated vehicle (ROV) clearing the proposed route for unexploded ordnance (UXO).

The geophysical data consisted of sidescan sonar, magnetometer and multibeam bathymetry acquired in 2016 by Gardline. The review included an assessment of the current data in addition to the target investigation reports and the results of the previous archaeological assessments undertaken by Wessex Archaeology and Sea Change Heritage Consultants.

Using the geophysical data (Gardline 2016a) within a 50 m radius of the as found location of magnetic anomaly MAG_6382 (7430), the two investigated anomalies were identified. Within this buffer, no areas were identified as being of high archaeological potential, based on their geophysical response. Two further small magnetic anomalies were identified with no surficial markers, indicating buried ferrous content (metal) (7428; 7429). No specific debris area indicating a concentration of material was identified within the 50 m buffer.

The recovered metal and wood debris from MAG_6384 have been recorded and identified as part of a late 19th/early 20th century vessel, probably part of a Thames Barge. This is likely unrelated to the possible cannon found at location MAG_6382[EM2][JCG3]. This is a small cannon that by its size and calibre of 3-pounder would be destined to serve as a gunwale in merchant ships before the 19th century. Completely concreted when it was found the elimination of the concrete left uncovered a number of elements associated with it: a lead apron, a cord attached to the breach and the wooden tampion with a cord attached to the muzzle. After the removal of the concrete and the Tampion from the muzzle, fragments of wood were also extracted from the interior of the Bore as well as remains of organic fibers, possibly leather, which may be the remains of a load of pouch.



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Wessex Archaeology would also like to thank Charles Trollope for his help in the identification of the cannon.

Sam Strutton carried out the geophysical assessment and compiled the report, Joaquin Callejo Gomez recorded the wooden and metal debris with quality control provided by Dr Louise Tizzard and Jack Russell. Paolo Croce carried out the assessment of the cannon. Ken Lymer prepared the illustrations and the project was managed for Wessex Archaeology by Jack Russell and Euan McNeill.



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1 INTRODUCTION

1.1 Project Background

- 1.1.1 Wessex Archaeology (WA) was commissioned by J-Power Systems Corporation to undertake an archaeological review of potential archaeological material and geophysical data acquired during an unexploded ordnance (UXO) survey of the NEMO Link route.
- 1.1.2 As part of ongoing works all working remotely operated vehicle (ROV) data collected for the UXO Clearance and Disposal survey were subject to archaeological assessment. This approach enables a representative sample of archaeological anomalies identified as part of the archaeological assessment of geophysical survey data to be subject to ground-truthing exercises. The aim of this assessment was to contribute towards a greater understanding of the nature, character and extent of the marine archaeological environment to inform appropriate mitigation strategies adopted for the scheme. This assessment of data is currently ongoing; however, this report covers a specific reported target and the surrounding area.
- 1.1.3 On the 18 June 2017, magnetic anomaly (MAG_6382), previously identified by Gardline Geosurvey Ltd (Gardline), was investigated by Dynasafe BACTEC Limited (Dynasafe BACTEC) and Bluestream. One metallic object was identified, recovered to the surface, and relocated nearby to the original location in position: 388691 E, 5686217 N (WGS84 UTM 31N). Subsequent to its relocation the possibility that the object may have been of archaeological interest was raised, and a subsequent survey report of the object was sent to WA for review. WA considered that the object was a possible cannon. As a result, a temporary exclusion zone (TEZ) of 50 m was established around the original location of the objects.
- 1.1.4 A second previously investigated magnetic anomaly (MAG_6384) was identified nearby, originally identified by Gardline Geosurvey Ltd (Gardline), and also investigated by Dynasafe BACTEC Limited and Bluestream. Both wooden and metallic debris were identified. The objects which were raised were considered to be of potential archaeological interest and a survey report of the objects were sent to WA for review.
- 1.1.5 Dynasafe BACTEC and Bluestream carried out the survey, recovery and relocation of the objects, their current findings have been reported on in the two reports listed below (Appendix 1).
- *Target Investigation Report INO 4299; Target No 064; Target ID MAG_6382 (Dynasafe BACTEC and Bluestream 2017a);*
 - *Target Investigation Report INO 4299; Target No 053; Target ID MAG_6384 (Dynasafe BACTEC and Bluestream 2017b),*



1.1.6 The wooden and metallic objects were recovered on 18th March 2017 and transferred to Wessex Archaeology, Salisbury for recording and identification.

1.1.7 A review of the 2016 geophysical survey data over a section of the NEMOLink route where the anomalies were identified was undertaken and forms the basis of this report. The 2016 geophysical data were acquired by Gardline.

1.2 Aim

1.2.1 The aim of this document is to describe the location and archaeological nature of the targets which may be subject to impact as a result of the development in the surrounding area of magnetic anomalies MAG_6382 and MAG_6384.



2 METHODOLOGY

2.1 Data sources

2.1.1 A number of data sources and additional information were utilised during this assessment. These included:

- *geophysical data acquired during geophysical and UXO survey operations by Gardline in 2016, with associated reports (Gardline 2016a; 2016b);*
- *the results of previous geophysical interpretations undertaken by WA (EIA / DBA: WA 2016);*
- *the WSI for the NEMO Link project 'NEMO-TUVSUD-CB-PRO-1000 WSI Rev2' (Sea Change 2016); and*
- *target investigation reports (Dynasafe and Bluestream 2017a; 2017b).*

2.1.2 The focus of the geophysical assessment is within 50 m of the as found position of MAG_6382 (Table 1); this area encompasses the location of MAG_6384.

Table 1: MAG_6382 and MAG_6384 locations

| | Easting (WGS84 UTM 31 N) | Northing (WGS84 UTM 31 N) | Description |
|-------------------|-------------------------------------|--------------------------------------|------------------------|
| MAG_6382 | | | |
| Survey position | 388666 | 5686228 | Metal with concretions |
| ROV position | 388668 | 5686230 | |
| New position | 388691 | 5686217 | |
| MAG_6384 | | | |
| Survey position | 388683 | 5686226 | Wood and metal debris |
| Original position | 388682 | 5686226 | |
| New position | Recovered | | |

2.2 Geophysical Data Assessment Methodology

Geophysical Data – Technical Specifications

2.2.1 Geophysical data were acquired by Gardline during 2016; data acquisition were split into two surveys undertaken by two separate vessels. The geophysical survey was completed by MV *Meriel D*, which comprised the collection of sidescan sonar (SSS), multibeam echosounder (MBES) and sub-bottom profiler (SBP) datasets, between 16 May and 18 June 2016. The unexploded ordnance (UXO) survey was undertaken by MV *Titan Discovery* between 15 April and 26 September, 2016, and comprised marine magnetometer datasets. The SBP data were not used in this review as it was deemed outside of the scope requirements for this investigation.

2.2.2 The following information has been taken from the Gardline Operations and Interpretive reports (Gardline 2016a; 2016b). It is understood that variable line spacing was planned across the different sensors for the nearshore surveys, with the sidescan sonar at a maximum of 40 m and the magnetometer array at 6 m line spacing. Infill was undertaken were as required along the route (Gardline 2016a).

2.2.3 The SSS data were acquired utilising an Edgetech 4200-FS 300/600 kHz system at a range of 50 m per channel, and were provided to WA as .xtf files. The magnetic data were acquired



in a towed array of three Geometrics G-882 magnetometers spaced 3.4 m or 2.3 m apart, depending on the bathymetry (flat or with bedforms, respectively). The data were provided as .csv files in nanotesla (nT). The MBES data were acquired utilising a Reson SeaBat 7125 SV2 system, processed data were provided as 0.5 m gridded .xyz files reduced to lowest astronomical tide (LAT).

2.2.4 All positions were recorded and expressed in WGS 1984 UTM Zone 31N coordinates.

Geophysical Data – Processing

2.2.5 Three different datasets were used to assess the study area: SSS, magnetometer/conductivity and MBES (Gardline 2016a) data. Each dataset was processed separately using the following software (Table 2).

Table 2: Software used for geophysical assessment

| Dataset | Processing Software | Interpretation and rationalisation |
|--------------|-------------------------|------------------------------------|
| SSS | CODA Survey Engine v5.5 | ArcMap v10.2.2 |
| Magnetometer | MagPick v3.25 | |
| MBES | Fledermaus v7.7.4 | |

2.2.6 The SSS data files were processed by WA using Coda Survey Engine software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies within Coda by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference.

2.2.7 A mosaic of the SSS data is created during this process to assess the quality of the sonar towfish positioning. This process allows the position of anomalies to be checked between different survey lines and for the positioning to be further refined if necessary.

2.2.8 The form, size and/or extent of an anomaly is a guide to its potential to be an anthropogenic feature and therefore of archaeological interest. A single small but prominent anomaly may be part of a much more extensive feature that is largely buried. Similarly, a scatter of minor anomalies may define the edges of a buried but intact feature, or it may be all that remains as a result of past impacts from, for example, dredging or fishing.

2.2.9 The magnetometer data were processed by WA using Geometrics MagPick software in order to identify any discrete magnetic contacts which could represent buried metallic debris or structures such as wrecks.

2.2.10 The software enables both the visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. The data were first smoothed to try and eliminate any spiking. A trend was then fitted to the resulting data, and the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal variation in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies, and individual anomalies tagged and images taken in a similar process to that undertaken for the SSS data.

2.2.11 The MBES data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The data were viewed and analysed using Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

Geophysical Data – Anomaly Grouping and Discrimination

2.2.12 The previous section describes the initial interpretation of all available geophysical datasets which were conducted independently of each other. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different datasets and apparently overstating the number of archaeological features in the study areas.

2.2.13 To address this fact, the anomalies were grouped together, allowing one ID number to be assigned to a single object for which there may be, for example, a UKHO record, a magnetic anomaly and multiple SSS anomalies. At this stage, gazetteers of anomalies created during previous phases of work undertaken by NEMOLink site were reviewed and if present were grouped with the data interpretation.

2.2.14 Once all the geophysical anomalies and desk-based information have been grouped, a discrimination flag is added to each record in order to discriminate against those not thought to be of archaeological potential. These flags are ascribed as follows (Table 3).

Table 3: Criteria discriminating relevance of anomalies to the proposed scheme

| | | |
|--------------------|----|---|
| Non-archaeological | U1 | Not of anthropogenic origin |
| | U2 | Known non-archaeological feature / Feature of non-archaeological interest |
| | U3 | Non-archaeological hazard |
| Archaeological | A1 | Anthropogenic origin of archaeological interest |
| | A2 | Uncertain origin of possible archaeological interest |
| | A3 | Historic record of possible archaeological interest with no corresponding geophysical anomaly |
| | O3 | Area subsequently cleared after data acquired |

2.2.15 The grouping and discrimination of information is based on all available information and is not definitive. It allows for all features of potential archaeological interest to be highlighted, while retaining all the information produced during the course of the geophysical interpretation and desk-based assessment, enabling further evaluation should more information become available.

2.2.16 Any sites located outside of the defined study areas, either previously recorded in known databases (e.g. UKHO) or identified during this geophysical assessment, are deemed beyond the scope of the current project and are subsequently not included in this report.

2.2.17 During grouping of the interpretation results with the results of previous phases of work, any identified anomaly that matches a previously identified feature retains the original anomaly number assigned for previous WA reports. However, positions and dimensions are updated to reflect the more recent data.



- 2.2.18 The results of ROV surveys of individual anomalies were also taken into account during the geophysical interpretation. Any identified anomalies initially interpreted but then removed have been given a new discrimination class (O3).
- 2.2.19 For the final results, the non-archaeological anomalies are removed from the gazetteer. The results from the assessment of the study area have been provided as a gazetteer in Appendix 2, are discussed in this report and illustrated in **Figures 2** and **3**. Recommendations have been made for mitigation measures should the anomalies be directly impacted by the proposed scheme.



3 THE SITE

3.1 Surficial Geology

- 3.1.1 The study area lies approximately 2 km south-west of Ramsgate Harbour on the edge of the Ramsgate Channel, north-west of Cross Ledge, at the entrance to Pegwell Bay, in the southern North Sea.
- 3.1.2 The broad geological sequence across the route, between the UK and Belgium, are summarised in Table 4, taken from the archaeological environmental impact assessment (EIA) (WA 2016).

Table 4: General geological sequence for the NEMOLink route (WA 2016)

| Unit | Description |
|------|--|
| 1 | Recent (Holocene) seabed sediments, gravelly shelly sand |
| 2 | Post-Devensian terrestrial (UK sector) and estuarine (Belgian sector) clay, silt and fine sand with organic inclusions and peat layers |
| 3 | Eocene clay (London Clay Formation) |
| 4 | Palaeocene sand and sandy clay (Thanet Formation) |
| 5 | Campanian (Upper Cretaceous) chalk |

- 3.1.3 Within the study area, the surficial sediment mainly comprises shelly gravelly sands and sandy gravels, with the presence of silt and clay; identified as recent (Holocene) seabed sediments. This was confirmed with visual ground-truthing in the images taken by Dynasafe Bactec and Bluestream, whilst recovering the items of debris with the ROV (Dynasafe BACTEC and Bluestream 2017a; 2017b).
- 3.1.4 Underlying the surficial sediments, the geology for the study area is the Thanet Formation comprising sand and sandy clay (Palaeocene; Thanetian). The various units of clay noted in Table (Unit 2, 3 and 5) do not appear in the geology in this section of the route. This is confirmed by the British Geological Survey (BGS) Solid Geology charts of the area (BGS 1989).
- 3.1.5 The geophysical data indicates that with the surficial sediments there are mobile bedforms to the east of the study area, which highlights the possibility of possible buried debris.

3.2 Results

Geophysical Assessment Results

- 3.2.1 The study area, 50 m radius from the as found location of the possible cannon (MAG_6382), was assessed using the data from the 2016 UXO survey (Gardline 2016) for the potential for further debris items.
- 3.2.2 A total of four anomalies were identified within the study area of the TEZ; all anomalies were identified as magnetic with no surficial representation. Table summarises the anomaly classes. Further information has been provided in the gazetteer (Appendix 2) and **Figure 2**.



Table 5: Classification of anomalies of archaeological potential from the geophysical data acquired in 2016 (Gardline 2016)

| Criteria classes | Interpretation | Total |
|------------------|---|----------|
| A1 | Anthropogenic origin of archaeological interest | 0 |
| A2 | Uncertain origin of possible archaeological interest | 2 |
| A3 | Historic record of possible archaeological interest with no corresponding geophysical anomaly | 0 |
| O3 | Area subsequently cleared after data acquired | 2 |
| Total | | 4 |

3.2.3 Of the four anomalies, two of the investigated targets documented in the ROV investigation reports (Dynasafe BACTEC and Bluestream 2017a; 2017b) correlate. These targets have been listed in Table 6.

Table 6: Anomaly correlation

| Investigation report (Dynasafe BACTEC and Bluestream 2017a; 2017b) | WA ID |
|--|-------|
| MAG_6382 | 7430 |
| MAG_6384 | 7431 |

3.2.4 The magnetic anomaly 7430 (MAG_6382), was identified at the location where an artefact, likely to represent a cannon, was recovered during ROV operations (Dynasafe BACTEC and Bluestream 2017a). The magnetic anomaly with a medium sized amplitude of 71 nT was recorded, indicating ferrous material. No surface representation of the magnetic anomaly was observed in the geophysical data, signifying that the anomaly was buried. Mobile bedforms were visible in the SSS and MBES data to the south of the contact, indicating that recent surficial sediments cover the area. This was confirmed during ROV operations (Dynasafe BACTEC and Bluestream 2017a; 2017b). As the material associated with anomaly 7430 has been removed and replaced to a new location, this anomaly was classified as O3. The new position of the object is 388691 m E, 5686217 m N and is provided in the gazetteer.

3.2.5 The magnetic anomaly 7431 (MAG_6384), was identified at the location where a selection of the wooden and metal debris were located during ROV operations (Dynasafe BACTEC and Bluestream 2017b). The magnetic anomaly with a medium sized amplitude of 65 nT was recorded, indicating ferrous material. No surface representation of the magnetic anomaly was observed in the geophysical data, signifying that the anomaly was buried. Mobile bedforms were visible in the SSS and MBES data to the south of the contact, indicating that recent surficial sediments cover the area. This was confirmed upon investigation by Deep Ocean (Dynasafe BACTEC and Bluestream 2017a; 2017b). As the debris associated with anomaly 7431 has been removed from the as found location, this anomaly was classified as O3.



3.2.6 A total of two further items were found within the 50 m buffer and were classified as A2, indicating that they are of uncertain origin but of possible archaeological interest. The two anomalies were small magnetic anomalies, with magnitudes of 20 nT (7429) and 34 nT (7428), not seen in the other datasets. They were therefore interpreted as possible buried ferrous debris, located within a 50 m radius of the original MAG_6382 (7430) location.

3.2.7 There is potential for these identified geophysical anomalies to be linked to further debris, however, there is no specific debris area indicating a concentration of material within the 50 m buffer. Outside of this buffer there are a number of areas of possible interest, notably a wreck (7273) approximately 280 m north-east of the original location of MAG_6382 (7430), noted in the UKHO data (13844) as foul ground.

Archaeological Assessment of Wooden and Metal debris (MAG_6384)

3.2.8 The metal and wooden debris comprised a group of 28 pieces ranging between 0.5 and 3 metres in length. There were 24 dislocated wooden timbers of different sizes and shapes with imprints of metal reinforcements fastened together by metal treenails approximately 300mm in length. These were interpreted as predominantly originating from the hull of a vessel. Some possible ceiling planking was recorded (**Plate 1**) and also part of a frame (**Plate 2**). There were also three disarticulated metal knees (**Plates 3 and 4**) that suggests that these formed part of the internal deck structure where deck beams were originally attached to the hull frames.

3.2.9 The evaluation of the different timber fragments, and their comparison with the documentary sources indicates the remains are likely to be part of a late 19th/early 20th century Thames Barge.

Archaeological Assessment of Cannon (MAG_6382)

3.2.10 The cannon was found on the 15th June 2016 in an area close to shore just outside Pegwell Bay. It was recorded as lying at coordinates 388668.03 easting 5685725.56 northing (UTM31N) at a depth of 4 m on a seabed of sand and clay (MAG_6382). The gun was brought onshore in the early hours of the 15th of July 2017 and was optimally stored in water when accessed by WA staff. At the moment of recovery the cannon was heavily concreted although the main features such as the cascabel, trunnions, and the flare of the muzzle were clearly discernible. The cannon was then taken to Wessex Archaeology's facilities where it is currently in wet storage, and undergoing conservation.

3.2.11 The removal of the layers of concretion revealed that the cannon is a smooth bore muzzle loading cannon made of cast iron (**Plates 5 and 6**).

3.2.12 The cannon is of simple design with no apparent decoration but it retains the mouldings on the breach, the vent astragals and fillets, mouldings of the first reinforce rings (ring and fore fillet and ogee), the mouldings of the second reinforce rings (identical to the first), the chase astragal and fillets, and the muzzle astragal and fillets. The cascabel is simple with a relatively large button.

3.2.13 The main measurements are in the table below.

Table 7: Cannon measurements

| Element | Length in mm/inches | Diameter in mm/inches |
|-------------|---------------------|-----------------------|
| Muzzle | 110mm/4.3" | |
| Muzzle face | * | 150mm/5.9" |
| Head | | 220mm/8.6" |



| | | |
|--------------------------|---------------|-------------|
| Muzzle neck | 118mm/4.6" | 180mm/7" |
| Bore | 1510mm/59.4" | 70mm/2.7" |
| Chase | 480mm/18.9" | - |
| Chase girdle ring | 62mm/2.4" | 204mm/8" |
| Second reinforce | 322mm/13" | - |
| First reinforce | 560mm/22" | - |
| First reinforce ring | 50mm/1.97" | 258mm/10.1" |
| First reinforce astragal | 52mm/2" | 280mm/11" |
| Vent field | 52mm/2" | - |
| Base ring | 35mm/1.3" | 310mm/12.2" |
| Breech/Cascabel | 128mm/5" | 250mm/9.8" |
| Trunnion | 95mm/3.7" | 75mm/2.9" |
| Width across trunnions | 398mm/15.6" | 90mm/3.5" |
| Overall Length | 1682mm/5ft 6" | - |

*

- 3.2.14 The dimensions of the cannon correspond with those of a 3-pounder; which are relatively small guns and were often used on board merchant shipping before the 19th century. Due to the relatively light weight they were often stored on deck.
- 3.2.15 At the breach end right on top of the vent there is a square lead apron with two retaining strings that are still attached (**Plate 7**). The presence of a lead apron covering the touch hole suggest that the gun was still in use at the time of loss. The guns were usually stored on board, charged and ready to fire.
- 3.2.16 During the deconcretion work a short string (**Plate 8**) could be observed inside the concrete around the neck. After removing the concrete, the tampion appeared - a wooden stopper used to close the muzzle of the barrel (**Plate 8**). Due to the location of the tampion in place sealing the bore, the possibility of the cannon being loaded at the moment of its loss or abandonment was contemplated. With this possibility in mind, it was decided to contact Ramora specialists in UXO detection and disposal. UXO specialists travelled to the WA facilities where they conducted to the internal analysis of the bore of the cannon by means of a portable X-ray. Because the results of the x-ray test were inconclusive and the possibility remained that the cannon was still loaded, the extraction of the tampion and the emptying of the bore were carried out in conjunction with specialist from Ramora. After removing the tampion, it was possible to verify that the gun was not loaded. From the interior of the Bore were extracted some fragments of wood located behind the tampion, fragments of organic matter (possibly leather) that could be remains of a charge pouch. Fragments of wood were also extracted from the breech. Both the tampion and the rest of the elements extracted from the bore (**Plate 8 and 9**), are kept under conservation treatment in the WA facilities. The cannon has no clear markings although possible remnants of what was once the manufacturer or furnace mark might be evident on the face of the right trunnion.
- 3.2.17 Finds Associated with Cannon.

Table 8: Finds reference

| Find ID | Object | Material | Conservation | Description |
|---------|--------|----------|--------------|---|
| 7029A | Cannon | Metal | Wet | An 18 th Century English iron 3-pounder gun of 5 Feet 6 Inches |



| | | | | |
|-------|----------------------------------|--------------------|-----|--|
| 7029B | Lead apron | Metal | Dry | Square lead apron[EM4] |
| 7029C | Mineralised cord from the muzzle | Fibre | Dry | Mineralized fibre rope that linked the tampion to the snout to the tampion. |
| 7029D | Mineralised cord from the breach | Fibre | Dry | Mineralized fibre rope that held the lead apron to the breach |
| 7029E | Tampion | Wood | Wet | Wooden cover or stopper[EM5] that seals the muzzle of the canyon to avoid the entrance of water in the bore during navigation. |
| 7029F | Wooden fragments | Wood | Wet | Unknown. Wood fragments located immediately after the tampion in the interior of the Bore |
| 7029G | Fragments of charge pouch | Organic (leather?) | Wet | Fragments of organic material that could be part of a charge pouch |
| 7029H | Wooden fragments | Wood | Wet | Unknown. Fragments of wood located inside the breach |

3.2.18 The cannon has been identified as an English iron 3-pounder gun of 5 Feet 6 Inches. The shape of the cascabel; the presence of the chase astragal and fillet; and the overall proportions suggest that it was cast to the Borgard pattern (Trollope 2005) which means this cannon is a standardized calibre cannon. It was in 1716 when the Board of Ordnance accepted the standardization of artillery and gun carriages designed by Albert Borgard which stated that the cannons would be of standardized calibre and guns became known by the weight of the round shot they fired. The round shot were standardized to the weights 4, 6, 9, 12, 18, 24, 32 and 42 pounds. These numbers were based on rounding to the



nearest pound the weight of the most common values of the round shot in use. The absence of a royal cypher or Rose and Crown and the fact that it is shortened by 6 inches in the second reinforcing ring indicate that this gun was likely employed for merchant shipping. As it was common practice to bore merchant guns up one calibre, it is possible that the bore may therefore be found to be 3.25 Inches. Given the likely identification, the cannon was cast between 1715 and 1727, which was the period when this standard was used in the casting of cannons with similar characteristics until the design modifications of the Armstrong type went into effect that would set construction standards over the subsequent decades, but it could well have been in use as late as the 1770s, as guns such as this can have an expected typical working life-span up to 50 years. In the 18th century, European countries such as Spain, France, the Netherlands, and Great Britain armed their merchant ships to avoid capture by pirates, enemy commercial assailants, and corsairs. Although the artillery most used and popular in this century to arm the merchants was the *carronade*, other types of small cannons like the one described here were used as they were easier to handle and load by inexperienced crews and lighter, for use on smaller vessels, and cheaper..

- 3.2.19 At this stage, there is no evidence that the cannon is associated with further remains, and the absence of further wreck material seems to suggest that the cannon may have been lost during a storm or jettisoned from a vessel stranded in Pegwell Bay.
- 3.2.20 Nonetheless, it is possible that the ship that may have jettisoned the cannon was in distress and may have sunk at another location not far from the cannon find spot. A search for NRHE (National Record of the Historic Environment) recorded losses in Pegwell Bay between 1715 and 1780 (via pastscape <https://www.pastscape.org.uk/> accessed on 12/09/2017) resulted in 13 records, of which eleven are French fishing vessels. Of the other two, one is a Royal Navy vessel (King of Prussia) and the other one is a French prize from Marseilles (Le Ferme). A search for recorded loss in the wider area of Ramsgate between 1715 and 1780 resulted in 38 records, mainly of British merchant ships.



4 CONCLUSION

- 4.1.1 Using the geophysical data (Gardline 2016a) within the 50 m radius of the original location of MAG_6382, within the TEZ, no areas were identified within this buffer as being of high archaeological potential, based on their geophysical response.
- 4.1.2 The two anomalies that were investigated by Dynasafe BACTEC and Bluestream were identified in the 2016 magnetometer data. Two further small magnetic anomalies were identified, with no surficial markers indicating buried ferrous material (metal) (7428 and 7429). Further ROV investigation would be required to ascertain the nature of this material.
- 4.1.3 No specific debris area indicating a concentration of material was identified within the 50 m buffer.
- 4.1.4 Outside of this buffer there are a number of areas of possible interest, notably a wreck (7273) approximately 280 m north-east of the original location of MAG_6382 (7430), noted in the UKHO data (13844) as foul ground. However, there is no direct evidence to connect the material recovered by ROV and the wreck without further investigation.
- 4.1.5 The interpretation of the recovered wooden and metal remains from MAG_6834 indicate that it comprised a small part of a vessel, probably a Thames Barge. There is no indication that any further remains of the vessel are in the vicinity, as it's construction contains significant amounts of ferrous material which would give a magnetic response. It is recommended that now that the remains have been recorded, they are discarded.
- 4.1.6 Similarly, as there are no other associated remains with similar magnetic responses to the cannon, target MAG_6832, it was recommended that the exclusion zone be removed. Obviously, after the removal of the concretion it was possible possibility to carry out additional investigations and additional scientific tests such as the possible radiocarbon dating of the wood of the Tampion, which would allow possible further investigations related to this.



5 REFERENCES

British Geological Survey (BGS) 1989 Solid Geology 1:250000 Series

Dynasafe BACTEC Limited and Bluestream 2017a Target Investigation Report INO 4299; Target No 064; Target ID MAG_6382

Dynasafe BACTEC Limited and Bluestream 2017b Target Investigation Report INO 4299; Target No 053; Target ID MAG_6384

Gardline Geoservices Limited (Gardline) 2016a FIELD/OPERATIONS REPORT for New Subsea Cable Survey: - Nemo Link Pre-Engineering and UXO Survey. Report Reference: 2016 14-233-SUB-REP-008

Gardline Geoservices Limited (Gardline) 2016b FINAL INTEGRATED INTERPRETATIVE REPORT for New Subsea Cable Survey: - Nemo Link Pre-Engineering and UXO Survey. Report Reference: J14-233-SUB-REP-012

Sea Change Heritage Consultants (Sea Change) 2017 Archaeological Written Scheme of Investigation. Rev 2. Document Reference: NEMO-TUVSUD-CB-PRO-1000 WSI Rev2

Trollope, C., 2005, The design and evolution of English cast-iron guns:1660 to 1725, in Journal of Ordnance Society, vol. 17.

Wessex Archaeology (WA) 2016 Project Nemo UK-Belgium Electrical Interconnector Richborough to West Zeebrugge Archaeological Environmental Impact Assessment Volume I: Report; Report reference: 73390.03



APPENDIX 1: TARGET INVESTIGATION REPORTS



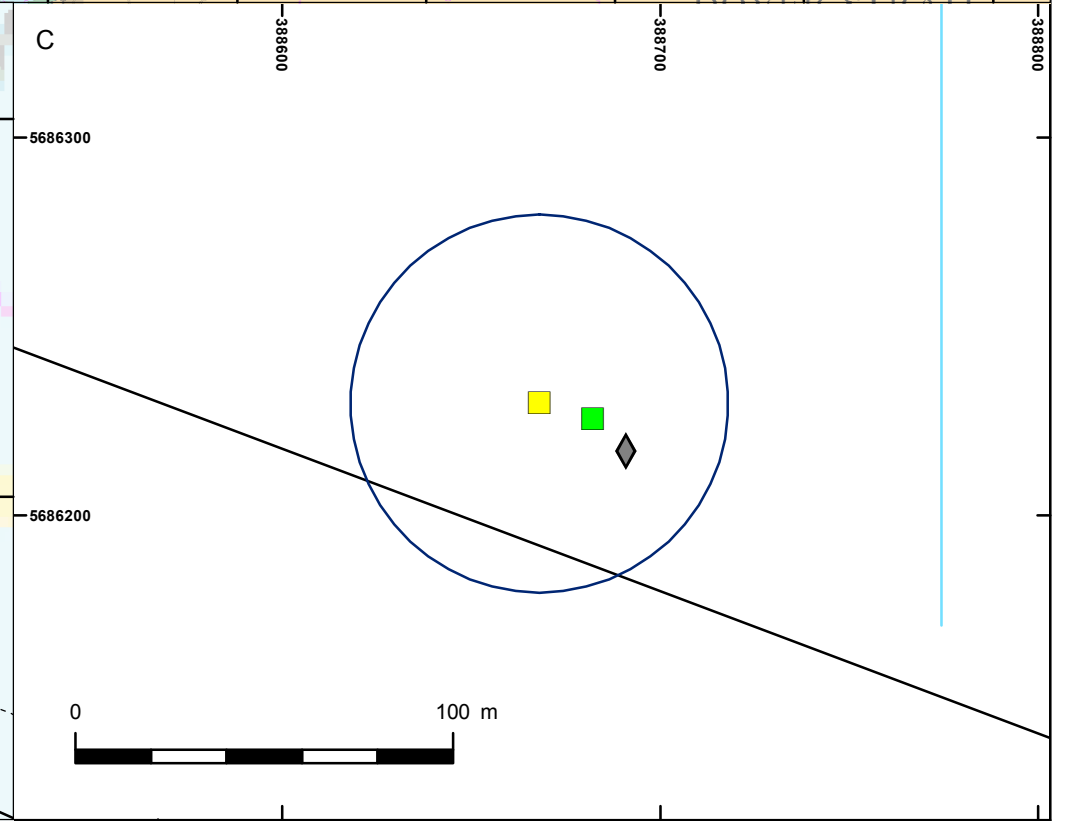
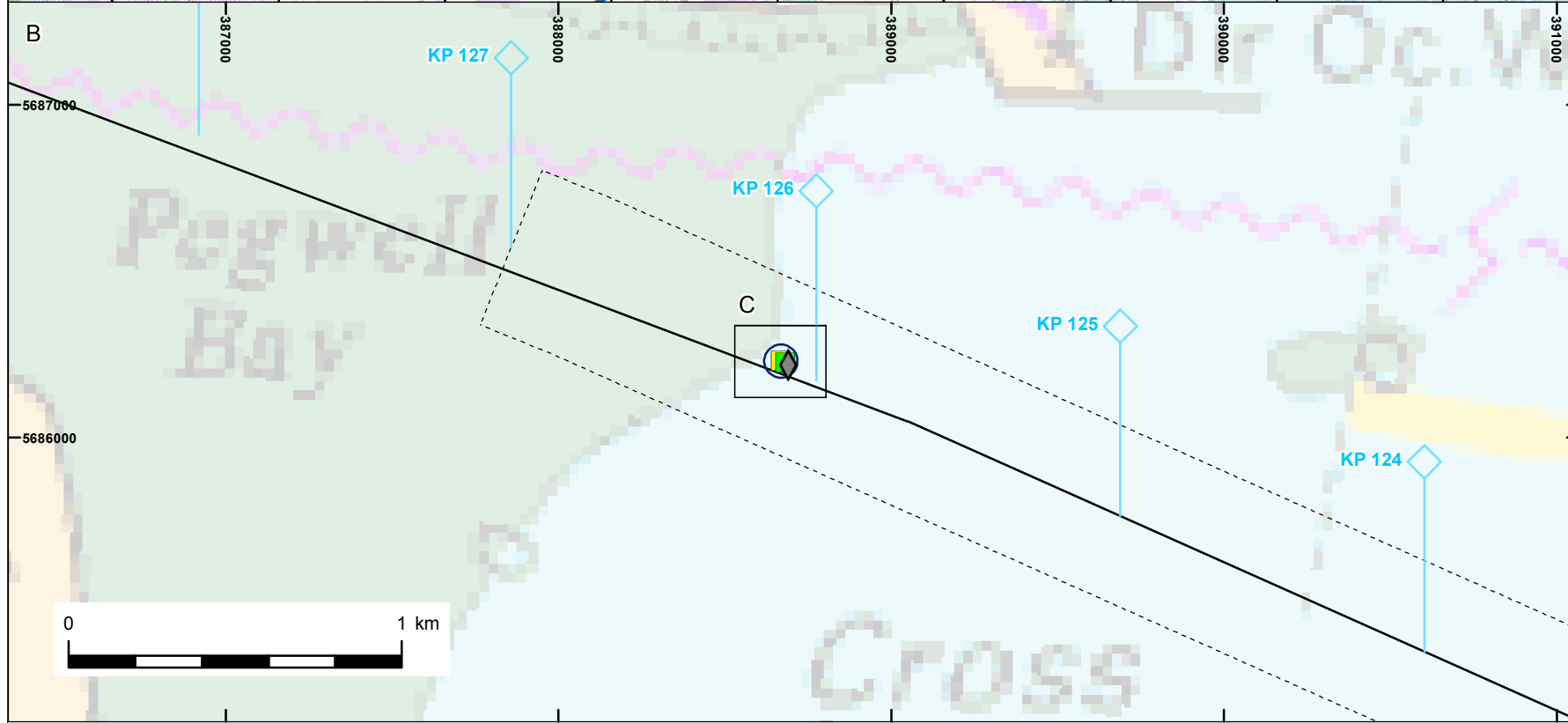
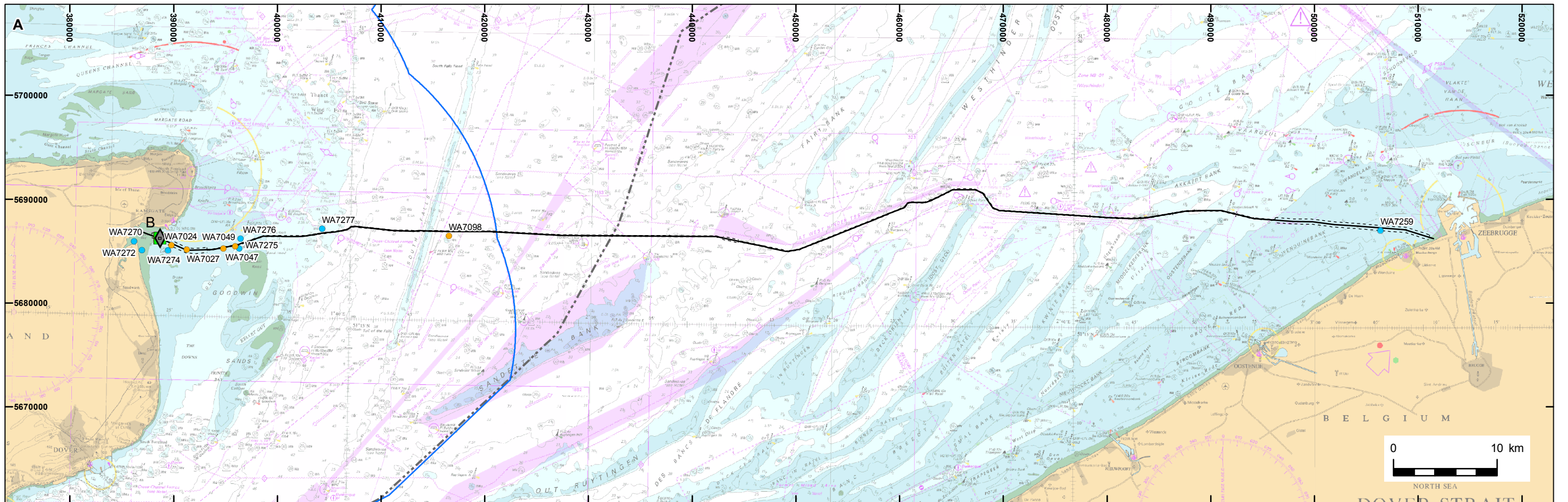
APPENDIX 2: GEOPHYSICAL GAZETTEER

| WA ID | Class | Easting (UTM31N) | Northing (UTM31N) | Archaeological Discrimination | Length (m) | Width (m) | Height (m) | Magnetic Amplitude (nT) | Description | External References |
|-------|----------|------------------|-------------------|-------------------------------|------------|-----------|------------|-------------------------|--|--|
| 7428 | Magnetic | 388631 | 5686230 | A2 | - | - | - | 34 | Small asymmetric dipole seen on the magnetic data only. Not seen in the SSS or MBES data, indicating buried ferrous debris. Near larger anomalies 7430 and 7431 - approx. 30 m away. | - |
| 7429 | Magnetic | 388703 | 5686256 | A2 | - | - | - | 20 | Small asymmetric dipole seen on the magnetic data only. Not seen in the SSS or MBES data, indicating buried ferrous debris. Approximately 46 m from 7430. | - |
| 7430 | Magnetic | 388691 | 5686217 | O3 | - | - | - | 71 | Anomaly location moved to relocated position during ROV operations. ORIGINAL LOCATION: 388667mE; 5686228mN. RELOCATED LOCATION: 388691mE; 5686217mN. Medium asymmetric dipole, seen on the magnetic data only indicating buried ferrous debris. Near to 7431. Associated with MAG_6382 (likely cannon) identified by Dynasafe BACTEC and Bluestream during ROV operations on the 2017 UXO survey of NEMOLink. | MAG_6382 (Dynasafe BACTEC and Bluestream, 2017a) |



| WA ID | Class | Easting (UTM31N) | Northing (UTM31N) | Archaeological Discrimination | Length (m) | Width (m) | Height (m) | Magnetic Amplitude (nT) | Description | External References |
|-------|----------|------------------|-------------------|-------------------------------|------------|-----------|------------|-------------------------|---|--|
| 7431 | Magnetic | 388683 | 5686226 | O3 | - | - | - | 65 | Medium asymmetric dipole, seen on the magnetic data only indicating buried ferrous debris. Located near 7430. Associated with MAG_6384 (wooden and metal debris) identified by Dynasafe BACTEC and Bluestream during ROV operations on the 2017 UXO survey of NEMOLink. Anomaly now recovered during ROV operations and not present on the seabed. | MAG_6384 (Dynasafe BACTEC and Bluestream, 2017b) |

1. Co-ordinates are in WGS84 UTM 31 N
2. Positional accuracy is estimated at ± 10



| | | | |
|-----------------------|--|--|--|
| NEMOLink Route | Regional boundaries | UK Written Scheme of Investigation Exclusion Zones (EZ) | Archaeological Investigation Study Area |
| — RPL | — UK 12 NM limit (territorial waters) | ● Archaeological EZ Locations | ■ MAG_6382 As Found |
| - - - Route corridor | - - - Mid-way boundary between UK and Europe | ● UKHO EZ Locations | ■ MAG_6384 As Found |
| — KPs | — RPL | | ◆ MAG_6382 Relocation |
| | | | □ 50 m Temporary Exclusion Zone |

Geophysical data acquired by Gardline Geosurvey Ltd in 2016.
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 Contains Ordnance Survey data © Crown copyright and database right 2017.

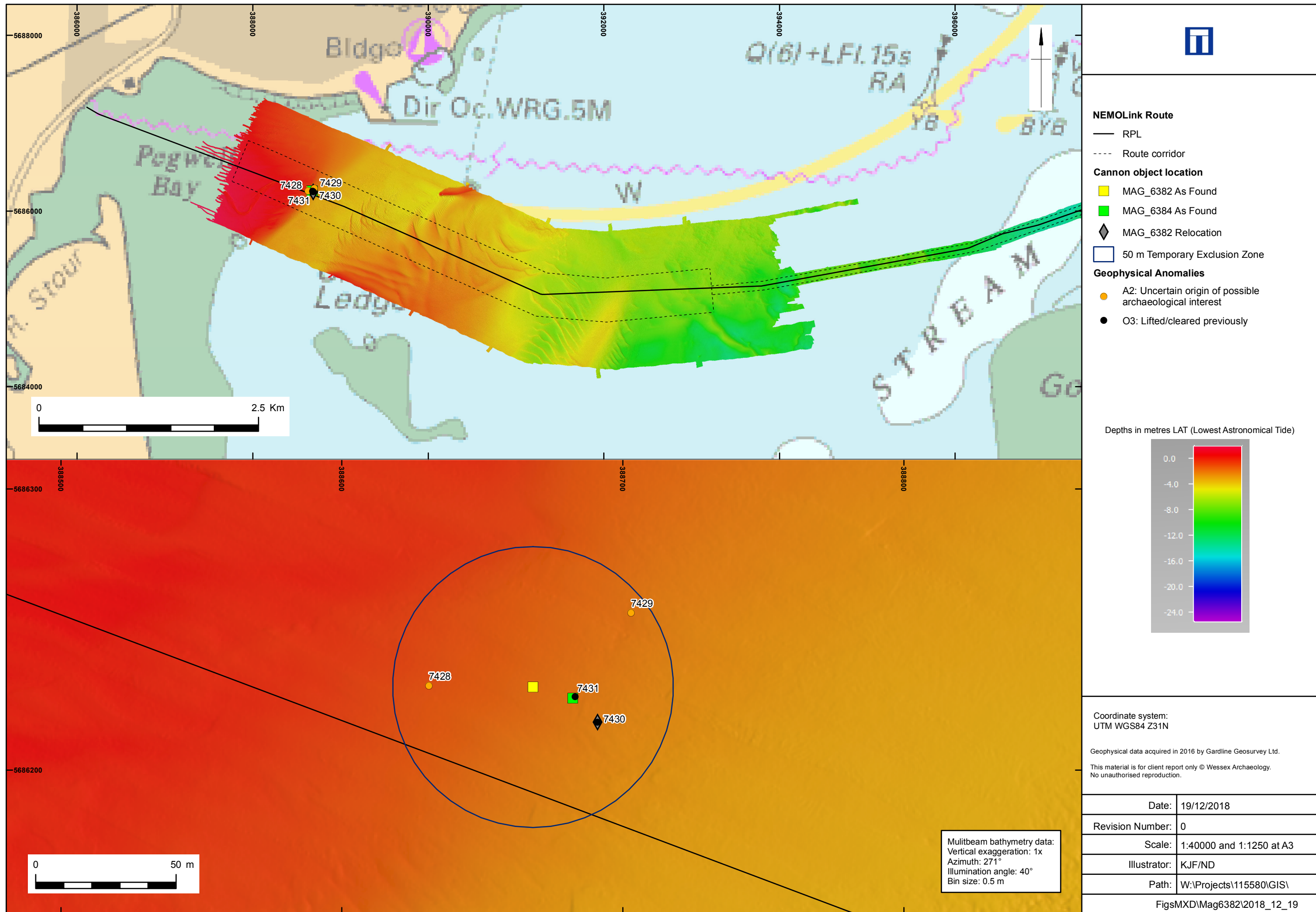
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Coordinate system:
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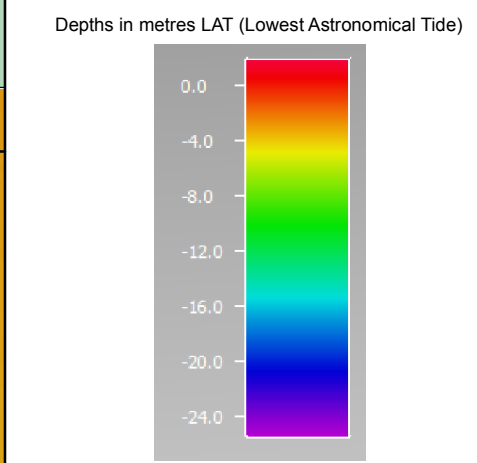
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Location map

Figure 1



- NEMOLink Route**
- RPL
 - - - Route corridor
- Cannon object location**
- MAG_6382 As Found
 - MAG_6384 As Found
 - ◆ MAG_6382 Relocation
 - 50 m Temporary Exclusion Zone
- Geophysical Anomalies**
- A2: Uncertain origin of possible archaeological interest
 - O3: Lifted/cleared previously



Coordinate system:
UTM WGS84 Z31N

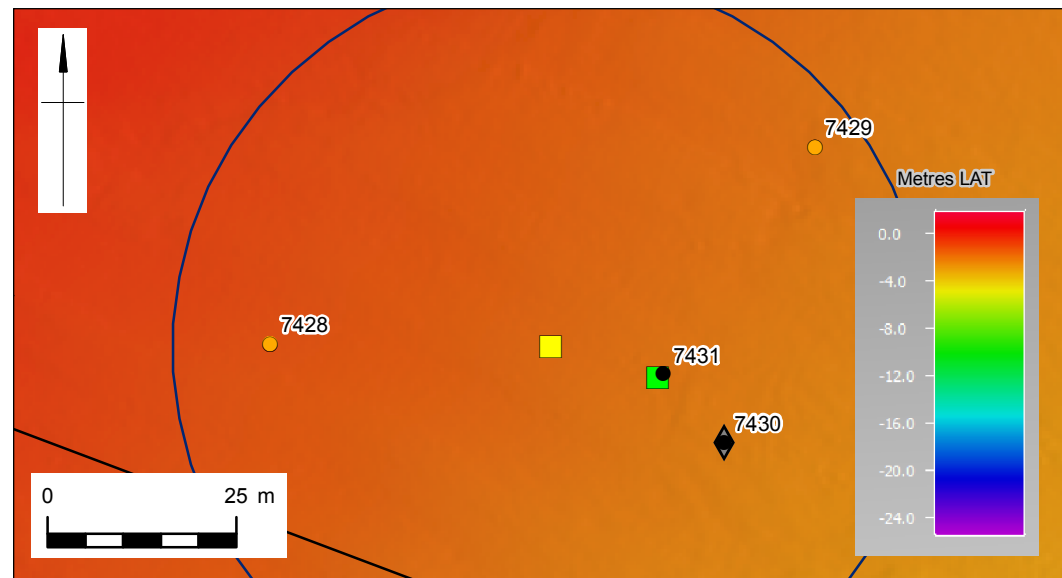
Geophysical data acquired in 2016 by Gardline Geosurvey Ltd.
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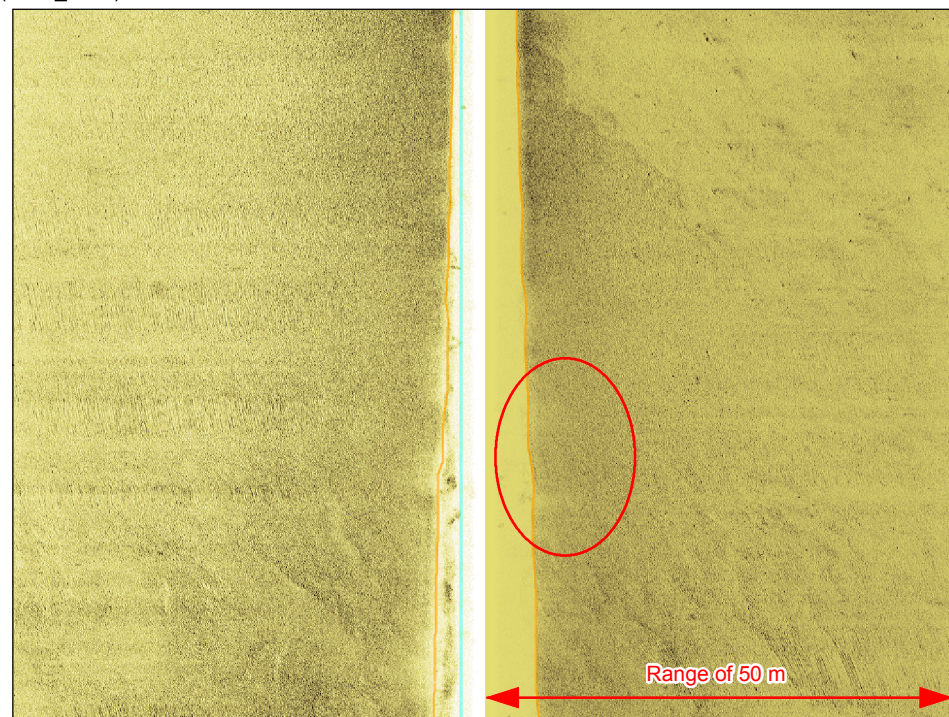
Multibeam bathymetry data:
Vertical exaggeration: 1x
Azimuth: 271°
Illumination angle: 40°
Bin size: 0.5 m

Anomalies of archaeological potential identified in 2016 geophysical data

Figure 2



Multibeam bathymetry image of the location buried ferrous debris before recovery of 7430 (MAG_6382) and 7431 (MAG_6384)



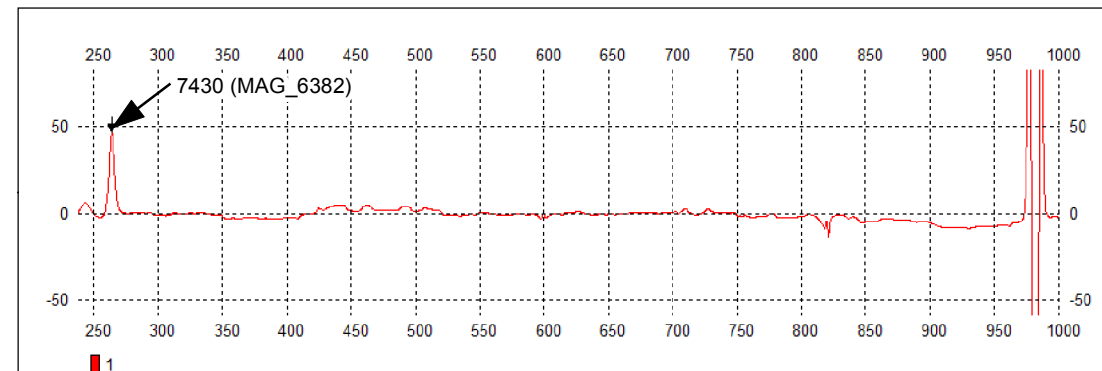
Sidescan sonar image of the location of buried ferrous debris before recovery of 7430 (MAG_6382) and 7431 (MAG_6384)



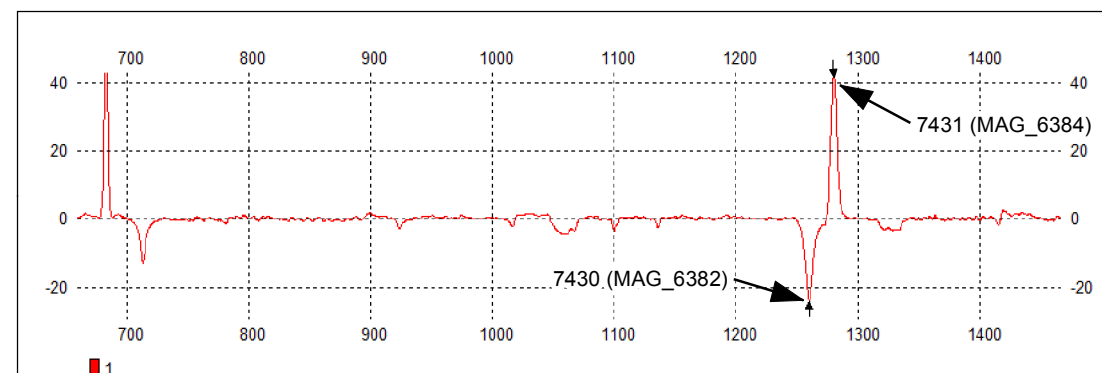
Image of the recovered possible cannon (7430 / MAG_6382)



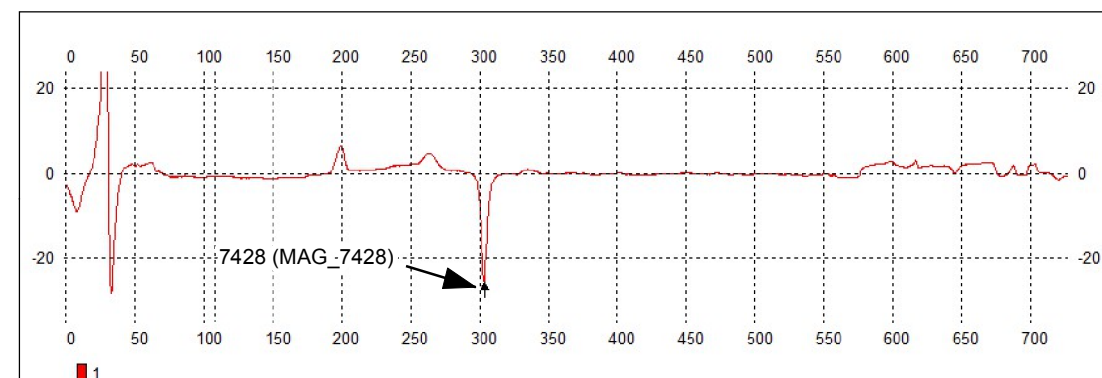
Image of the recovered wooden and metal debris (7431 / MAG_6384)



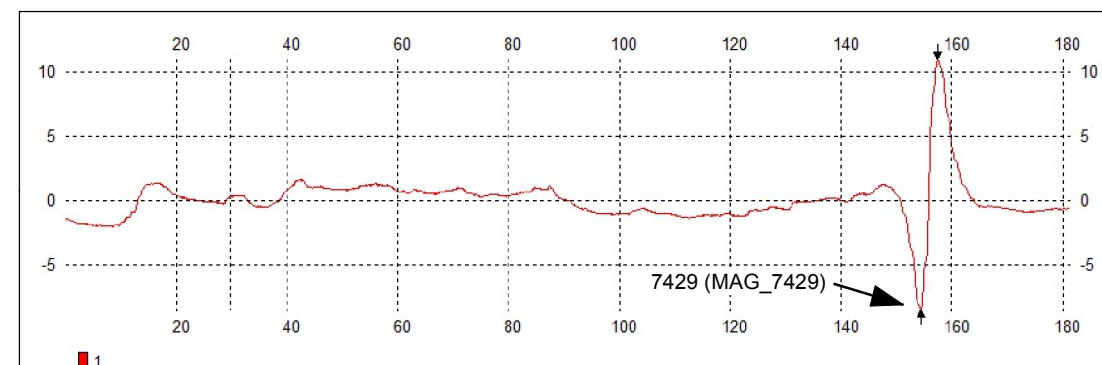
Magnetometer profile (positive peak) of 7430 (MAG_6382) measuring 71 nT in total



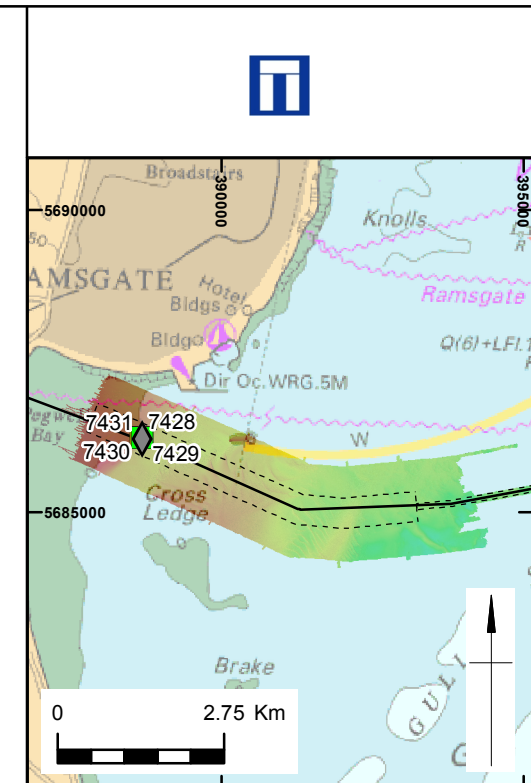
Magnetometer profile (negative peak) of 7430 (MAG_6382) measuring 71 nT in total and (positive peak) of 7431 (MAG_6384) measuring 65 nT in total.



Magnetometer profile (negative peak) of 7428 measuring 34 nT in total



Magnetometer profile of 7429 measuring 20 nT in total



NEMOLink Route

— RPL

Geophysical Anomalies

- A2: Uncertain origin of possible archaeological interest
- O3: Lifted/cleared previously
- Route corridor

Location

- MAG_6382 As Found
- MAG_6384 As Found
- ◆ MAG_6382 Relocation
- 50 m Temporary Exclusion Zone

Coordinate system:
UTM WGS84 Z31N

Geophysical data acquired in 2016 by Gardline Geosurvey Ltd.
ROV images acquired in 2017 by Deep Ocean.

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MAG_6384. Possible ceiling planking.



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MAG_6384. Possible frame with the metal joining system through metal knee fixed with a square head bolt.



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MAG_6384. Possible metal knee used as reinforcement.




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MAG_6384. Detail of the metal knee reinforcement.




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7029C-7029E Wooden tampion and muzzle cord



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