Eve O'Sullivan

From: Eve O'Sullivan
Sent: 14 November 2018 11:44
To: 'Department of Arts, Heritage, Regional, Rural & Gaeltach Affairs'
Cc: 'Connie.Kelleher@chg.gov.ie'
Subject: S0012-03 Port of Waterford Company
Attachments: Underwater Archaeological Impact Assessment Creadan Bank.pdf

Dear Sir/Madam

Re: S0012-03 Dumping at Sea Application from Port of Waterford Company

In accordance with Section 5(l)(a) of the Dumping at Sea Act 1996, as amended, I am to inform you of the receipt on 12 November 2018, of further information (attached) relating to Underwater Archaeology and the Dumping at Sea Permit application from Port of Waterford Company in relation to Waterford Harbour (Register number S0012-03).

The application and associated correspondence are available to view on the Agency's website at www.epa.ie.

The Agency will have regard to any comments made in accordance with the Act and will write, in due course, to each person who makes such a comment, to advise them of the Agency's decision on the application.

Please use the register number of the Dumping at Sea Permit application, S0012-03, in any future communication in respect of same. Please address correspondence to the *Environmental Licensing Programme, Environmental Protection Agency, P. 0. Box 3000, Johnstown Castle Estate, County Wexford.*

Please note that there is no requirement for you to acknowledge receipt of this email.

Regards
Eve O'Sullivan
Programme Officer

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PROJECT

Archaeological Impact Assessment, Creadan Bank, Waterford Harbour.

PREPARED BY

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LICENCE NO.

18R0107 & 18D109

DATE

October 2018

CLIENT

Port of Waterford

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Acknowledgments

Mizen Archaeology would like to thank *the Port of Waterford* Company and in particular Capt. Darren Doyle, for their assistance during the project.

1. Introduction

1.1 General

This Archaeological Impact Assessment report relates to an application for a Dumping at Sea Permit by the Port of Waterford Company with regard to proposed channel dredging within Waterford Estuary (Ref. S0012-03). The Port's current permit is valid until 2021 and this new application shall facilitate an increase in tonnages and also include two new areas of dredging. One of these areas is Creadan Bank, which has not previously been subject to archaeological assessment.

1.2 Scope of Works

The *Port of Waterford* shall undertake dredging within Waterford Estuary (Fig. 1). It is proposed to carry out capital dredging at Creadan Bank should if the seabed levels increases beyond historical levels at this location.

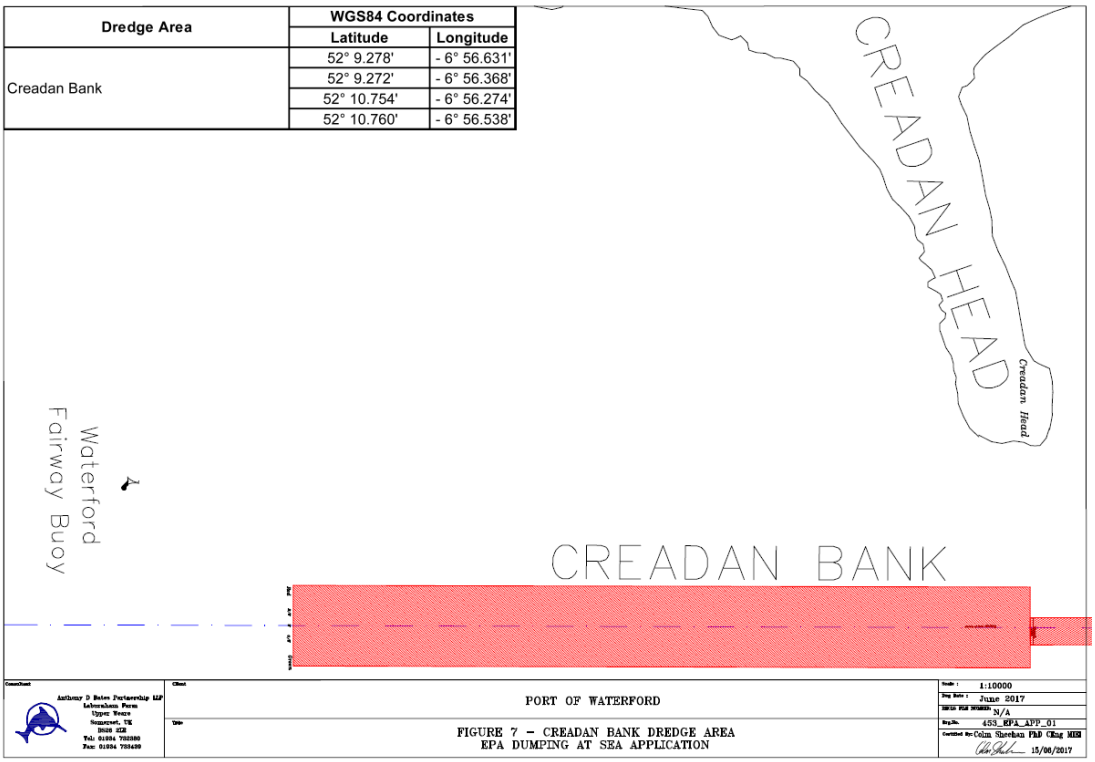


Figure 1 Proposed capital dredging area location.

1.3 Conventions, Legislation and Guidelines

The Archaeological Impact Assessment was undertaken with due regard to the following national and international protective conventions, legislation and guidelines and legislation:

- National Monument Act, 1930, amended 1954, 1987, 1994 and 2004
- Heritage Act, 1995
- National Cultural Institutions Act, 1997
- Framework and Principles for the Protection of the Archaeological Heritage, 1999, Department of Arts, Heritage, Gaeltacht and the Islands
- Local Government (Planning and Development) Act, 2000
- European Convention on the Protection of the Archaeological Heritage (the 'Valletta Convention') ratified by Ireland in 1997
- International Council on Monuments and Sites (ICOMOS), advisory body to UNESCO concerning protection of sites and recommendation of World Heritage sites ratified by Ireland in 1992

2. Methodology

2.1 Desktop Assessment

A range of archival and documentary sources were utilised to assess the potential impacts of the proposed dredging operations on the cultural heritage of Waterford Estuary:

- The Record of Monuments and Places (RMP): compiled by the Archaeological Survey of Ireland comprises of lists, classifications of monuments and maps of all recorded monuments with known locations and zones of archaeological significance. The National Monuments Service Wreck Viewer was also checked. The records are also accessible online from the National Monuments Section (NMS) at www.archaeology.ie. These were used to establish the wider archaeological context of the site, both marine and terrestrial.
- The Excavations Bulletin: and its online database which contains summaries of all archaeological excavations (marine and terrestrial) carried out in Ireland, was also examined.
- Cartography: several historic maps and charts were examined (see bibliography below for a full list).
- Aerial photography: a variety of low and high altitude aerial photography (vertical and oblique) was examined (www.archaeology.ie).
- Documentary sources: several sources were examined. For a full list of all sources examined see bibliography below.
- Wreck Inventory of Ireland Database (WIID) and Wreck Viewer: The information contained within the inventory was gathered from a broad range of cartographic, archaeological and documentary sources, and each entry in the Inventory gives information on the ship's name,

type of vessel, port of origin, owner's name, cargo, date of loss and other relevant information where available.

2.2 Geophysical Data

The Geophysical survey was undertaken by HydroMaster Ltd. The survey complied with the National Monuments Service's '*Guidelines for carrying out geophysical survey for archaeological Purposes*'. A combination of high resolution, hull mounted multibeam and sidescan sonar was considered to be the best acoustic survey for the Creadan Bank.

The caesium magnetometer used was of high sensitivity allowing variations of 1 nT to be clearly identified. The sample rate was 1 Hz or higher to allow detection of smaller targets. The towfish was flown at an altitude of less than 6m.

The Applanix POS MV Wavemaster navigation system was employed for the survey and Teledyne PDS software was used.

3. Receiving Environment

3.1 Location

Waterford Harbour which separates the counties of Waterford and Wexford extends from Waterford City on the upper northern reaches of the harbour to Dunmore East on the southwest side of the harbour and Hook Head in Co. Wexford on the southeast. It is formed by the estuary of 'the three sisters'; the Suir, the Nore, and the Barrow Rivers. The harbour has a varying coastline including cliffs, mudflats, pebble and sandy beaches. Creadan Head is located on the western side of Waterford Harbour *c.* 5km north of the fishing village of Dunmore East (Fig. 2). The proposed dredge coordinates are;

Latitude	Longitude
52° 9.278'	-6° 56.631'
52° 9.272'	-6° 56.368'
52° 10.754'	-6° 56.274'
52° 10.760'	-6° 56.538'

Table 1: Co-ordinates of proposed dredge area.

Figure 2 Site location Map depicting Creadan Head (encircled, OSI) within Waterford Estuary.

4. Results of Desktop Study

4.1 The Mesolithic Period

The earliest definitive evidence of archaeological activity in Ireland dates to the Mesolithic Period *c.* 8000–4000BC. Seasonal occupation of the littoral and wider coastal zone, lakeshore, riverine and riparian locations are a feature of these nomadic peoples whose lifestyle largely comprised of hunting, gathering and fishing. Their seasonal camps and hut sites are extremely rare and are difficult to find due to their ephemeral nature and archaeological visibility on the landscape. Their sites are primarily manifested by the remains of their dumped waste material from cooking and fires, known as shell or kitchen middens. These shell middens have been largely found exposed in sand dune complexes around our coasts. Two important examples occur immediately west of the site at Knockavelish (WA027-013) and at Creadan (WA027-095). The first of the two sites were excavated by the Ballylough survey team in 1988 who were initially investigating the exposed midden. An area of *c.* 60m sq. was excavated by Green, who recovered over 2000 lithics and revealed a rough floor (5m x 5m) and a possible hearth indicative of a Later Mesolithic culture (Green 1986, 5–7; Green *et al*. 1988).

The Ballylough Survey project also identified Fornaught as a habitation site (WA027-012) with intense activity where 251 artefacts were collected by field-walking. A stone pavement and shell

midden were revealed by excavation (E000349) in 1986 when almost 500 lithic artefacts, including a Bann flake, were recovered indicating a Mesolithic presence (Green et al. 1987).

4.2 The Neolithic Period

The advent of the Neolithic Period, *c.* 4000–2500BC, witnessed a transformation of lifestyle from the earlier nomadic hunter gatherer to permanent settlement, agriculture and the domesticity of animals. The impact of mankind in the Neolithic Period was permanent and visible. For the first-time mankind altered the landscape by clearing forests, planting crops, storing food, building permanent houses and farmsteads, created fields and defined territories by constructing massive megalithic tombs for their dead. Neolithic activity is indicated in the study area by the presence of Harristown passage tomb (WA027-007) located *c.* 2km to the west of Knockavelish. A habitation site was also uncovered at Creadan (WA027-024) situated *c.* 2km to the south-west of the southern limits of the study area. The site contained over 1000 lithics, some indicating a Neolithic date, were collected in field-walking again by the BallyLough survey team. The aforementioned habitation site at Fornaught is also thought to have a Neolithic phase as indicated by the lithics.

4.3 The Bronze Age Period

The Bronze Age Period, 2500–500BC is best represented in the Waterford estuary by the presence of burnt mounds or *fulachta fiadh*. *Fulachta fiadh*, were used for heating water serving a variety of functions but were primarily used for cooking. Examples can be found immediately south of the study area at Creadon (WA027-094) and with a cluster of three just over 4km to the north-west at Ballinkina (WA018-017001–3). The example at Creadan was excavated by the licence holder, after it was exposed during a storm in (O'Donoghue, 2016). The trough was perfectly preserved and dated to the Late Bronze Age (*ibid*).

Other Bronze Age evidence in the study area also comes from the secondary use of Harristown passage tomb in the form of a cremation pit (WA027-007006), cremated remains (WA027-007007), a pit burial (WA027-007001), an urn burial (WA027-007002, 4 and 5) and a cist (WA027-007003).

4.4 The Iron Age Period

The Iron age, *c.* 500BC–AD 400 has been seen as the 'dark age' in Irish archaeology due to its traditionally poor visibility on the landscape. This period is perhaps best associated with promontory forts, both coastal and inland. These forts were imbued with prestige and power due to their

prominent position on the landscape and the considerable effort that went into their construction. They were thought to be immersed in ritual activity. Examples can be found at Nymphall (WA027-088) and Shanooan (WA027-035001) at Dunmore East to the southwest of the study area.

4.5 The Early Medieval Period

Settlement in the study area in the Early Medieval Period, *c.* AD 400–800 is best exemplified in a secular context by earthen ringforts and cashels. They were most likely occupied by extended and dispersed family units and were probably largely self-sufficient. The interior would have contained features such as domestic dwellings, outhouses, animal pens, food processing structures, craft areas, hearths and souterrains. A mixed economy would have been practised which would have involved cereal growing and animal husbandry and in particular, dairying. Several examples can be found in the study area at Knockavelish (WA027-011) and at Broomhill (WX049-023) on the Wexford side of the harbour.

4.6 The Viking Period

Waterford was founded as part of the Vikings expansion into Europe and North America and the estuary would have bared witness to the plethora of Viking ships passing in and out of the town.

The first Viking settlement in the Waterford area was at Woodstown on the banks of the river Suir, *c.* 5km west from the city. This site, dating to *c.* 840 was discovered by archaeologists in 2003 in advance of the construction of the Waterford City Bypass. The settlement at Woodstown was established as a base for raiding both at their new home and also abroad in Wales, England and France. It was also a major international trading settlement, home to craftsmen and specialised metal workers connecting Ireland to the larger Viking world. This proto-town did not survive and later in 914, the Vikings established Ireland's first permanent city at Waterford–in an area which is still known as the Viking Triangle.

4.7 The Later Medieval Period

Following the capture of Waterford by the Anglo-Normans in 1170, Henry II arrived in Ireland to establish his control. He sailed up the Waterford Estuary with a fleet of up to 400 vessels carrying 500 knights and 4,000 soldiers and landed at Crooke. Waterford prospered under Anglo-Norman control and the estuary became a busy sea-route. During the 13th century, 50% of Ireland's overseas trade was passing through Waterford Estuary emphasising its importance.

Duncannon Fort lies c. 4km to the north-east of Creadan Head. The fortification of the natural promontory was first proposed in 1551–2 in order to provide a garrison that would suppress piracy and secure Waterford and New Ross against invasion (Colfer 2004). Construction did not begin however until 1587, in response to the threat from the Spanish Armada (Sinnot 1970, 10 and Fig. 3).

Figure 3 Extract from Map of Duncannon Fort dating to 1611 (The British Library).

As the primary stronghold of the parliamentary forces in Co. Wexford, Duncannon Fort was the focus of immense enterprise during the confederate War of the 1640, where native Irish and Old English were forced into an uncomfortable alliance (Colfer 2004, 93).

In 1645 the *Great Lewis*, flagship of the Parliamentary Navy, engaged in supporting and supplying the Parliamentary troops in Duncannon Fort, was bombarded by the Royalist and Confederate Irish during the siege of the Fort and was lost about a mile down harbour of the Fort. The defensive capability of Duncannon Fort declined from the end of the 17th century in favour of Passage East on the Waterford side of the estuary.

4.8 The Post-Medieval and Early-Modern Period

There is a scatter of country houses overlooking the estuary which are listed in the Inventory of Architectural Heritage database (NIAH) including Island View House (Reg. No. 22902706), Ballyglan House (Reg. No. 22901814) and a farm house (Reg. No. 15704910). These are generally 18th–19th century in date.

Evidence of smuggling trade is indicated by the presence of rock-cut steps at Creadan Head. The stretch of road leading to it is known locally as '*Bóthar na Mná Gorm'* (The Road of the Black Women) and is most likely a reference to transportation of African slaves.

4.9 Boats, Shipping and Shipwrecks

From Prehistoric times, people have utilised Waterford Estuary exploiting its rich resources. Logboats would have been built and utilised by inhabitants of prehistoric settlement sites in the wider cultural area, such as Creadan.

Nordic-style vessels were introduced to the Waterford Estuary with the establishment of a Viking settlement in the 9th century at Woodstown on the southern bank of the River Suir. The present town of Waterford was founded in 914 by the Vikings, the wealth of which was primarily built on maritime trade and communications (O'Sullivan and Breen 2007, 110). Irish dynasties had also acquired the own fleets of ships.

Following the capture of Waterford by the Anglo Normans in 1170, Henry II arrived in Ireland to establish his control. He sailed up the Waterford Estuary with a fleet of up to 400 vessels carrying 500 knights and 4,000 soldiers, and landed at Crooke. Waterford prospered under Anglo Norman control and the estuary became a busy sea route. During the 13th century 50% of Ireland's overseas trade was passing through Waterford Estuary.

During the 14th and 15th century Waterford's trade routes expanded from being primarily with England to further developing with Spain, France and Venice (Kelleher 2009).

Political turmoil during the 17th century led to increased fortification of the shoreline and to an increase in military vessels in the estuary. Heavily armed ships were engaged in the supply and patrol of Duncannon Fort.

A substantial wreck was previously discovered at Duncannon Bar, *c.*1.5 km north of the study area, during archaeological monitoring of dredging operations by Waterford Port. Subsequent test excavation undertaken by the National Monuments Service revealed a mid-17th Century wooden vessel surviving almost intact below the seabed, and a line of cannons, with their breech ends

exposed, on the western side-slope of the main navigation channel (Kelleher, 2004). The site is exposed and re-covered again on the seabed by sand and silt during the course of the year owing to the combined influences of the weather, tides, shipping and dredging activity and its preservation is monitored by the National Monuments Service (ibid). The wreck, generically known as *Duncannon Wreck 1*, may represent the remains of *the Great Lewis*, flagship of the Parliamentary Navy, engaged in supporting and supplying the Parliamentary troops in Duncannon Fort, bombarded by the Royalist and Confederate Irish during the siege of the Fort (https://www.archaeology.ie/underwater-archaeology/wreck-viewer).

Monitoring of dredging operations at Duncannon Bar revealed another shipwreck, *Duncannon Wreck 2* in 2003. The recovered timbers produced a date of 1543AD, and a subsequent geophysical survey of the area of the wreck indicate that a substantial part of the wreck may be buried up to 3m beneath the seabed (https://www.archaeology.ie/underwater-archaeology/wreck-viewer).

The Shipwreck Inventory of Ireland includes at least 250 wrecking events for the Waterford Estuary Waterford River or just Waterford and the precise location for most of these is unknown. It should be noted that the Inventory does not claim to record shipwrecking instances in any detail before *c.* 1750. It therefore remains possible that earlier wrecking and other sea-related instances occurred in the medieval and prehistoric past but have left no historical record. WIID list 12 wrecking's occurring in the immediate Creadan area between 1862 and 1905. In addition to this, the National Monuments Service Wreck Viewer depicts several further wrecking in the area (Fig. 4).

Name	Date	Location	Description
Angelica	23/01/1862	Creadan Bay Bank (beside Sophia)	Vessel of Genoa carrying a cargo of grain, had called at Queenstown for orders. The ship took on a pilot for Newcastle but was driven in by a gale. Master Domina and the crew were saved.
Montcalm	12/10/1870	Creadan Head	Vessel owned by Morgan & Drysdale of Swansea. En route from Swansea to Wexford with coal when she lost her sails and was driven onto the rocks. The crew took to the boats and landed safely.
Tiger	22/01/1862	Creadan Head (Waterford side, between Broomhill and the Hook)	1112-ton 1-year-old full-rigged Ship of Bath, Nova Scotia, with a general cargo and three passengers. Wrecked while en route from Boston to Liverpool. Two crew were lost attempting to get a line ashore. The Tintern rescued the remaining 22.
Little	December	Creadan Head	Vessel lost between Creadan Head and

Queen	1848	to Woodstown Strand	Woodstown Strand; crew saved.
Telegram	15/03/1905	Creadan Head, ½ mile ENE of	37-ton 44-year-old wooden fishing smack of Brixham. The master and owner was J. Power of Dunmore East, Waterford. She was laid up at Dunmore, in ballast, with 4 crew on board. She foundered in a SW force 10 and was a total loss.
Sophia	22/01/1862	Creadan Head, inside	Waterford vessel went ashore and was destroyed when the wheel broke and became unmanageable. Captain Barry and the crew were rescued by the Gannett. The next day, the Angelica was wrecked beside her on Creadan Bay Bank.
Donegal	12/11/1876	Creadan Head, near	142-ton 68-year-old wooden brig of Dublin. Her owner was J. Weldon, of Dublin, and her master was R. Woolaghan. She was en route from Dublin to Cardiff, in ballast. She was running for shelter in a storm.
Stowell Brown	13/02/1884	Credan Head / between Creadan Head and Duncannon, Waterford Harbour, 1 mile from	1370-ton 11-year-old 4-masted wooden barque of St. John, N.B. Owned by H. Vaughan, of St. John, and master was A. K. Smith. Classed by the Bureau Veritas as '3/3, L.1.1 for 12 years from December 1873', having last been surveyed in January 1883.
Hansa	02/11/1899	Creadan Head, Abreast of	1,198-/1250-ton barque of Bremen, owned by Gebruder Kulenkampff, Germany. Built in 1875 by Rickmers, R.C, Geestemude. Measured L.55.04 x B.11.88 x D.7.74; Wrecked en route from St. John, New Brunswick, to Waterford with a crew of 15 under captain G.

Table 2: Instances of shipwrecking with known coordinates within the shipwreck inventory.

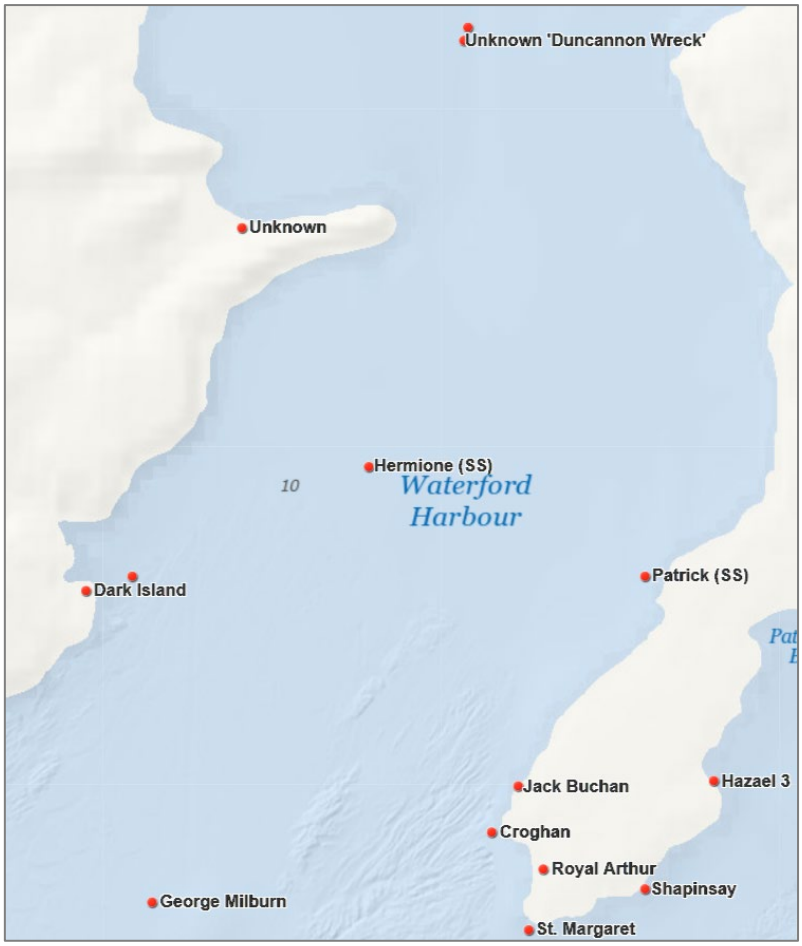


Figure 4 National Monuments Service wreck viewer (NMS).

5. Results of Geophysical Survey

The Geophysical Survey was undertaken by Hydromaster Ltd. under licence from the Department of Culture, Heritage and the Gaeltacht (18R0107).

Fifty-two targets were recorded in the magnetometer survey. None of these targets correspond with anomalies identified in acoustic survey suggesting that they are buried.

A further twenty-four targets were identified in the multi-beam and side-scan sonar surveys. These acoustic anomalies are interpreted as a possible tyre (Target 1), eleven cables of varied lengths (Targets 3, 4, 5, 6, 7, 8, 13, 15 and 20, 22, 23) and twelve unidentified anomalies (Targets 2, 9, 10, 11, 12, 14, 16, 17, 18, 19, 21, and 24).

Nine of the unidentified anomalies measures less than 1m in length; a further two are less than 2m in length and only three are greater than 3m.

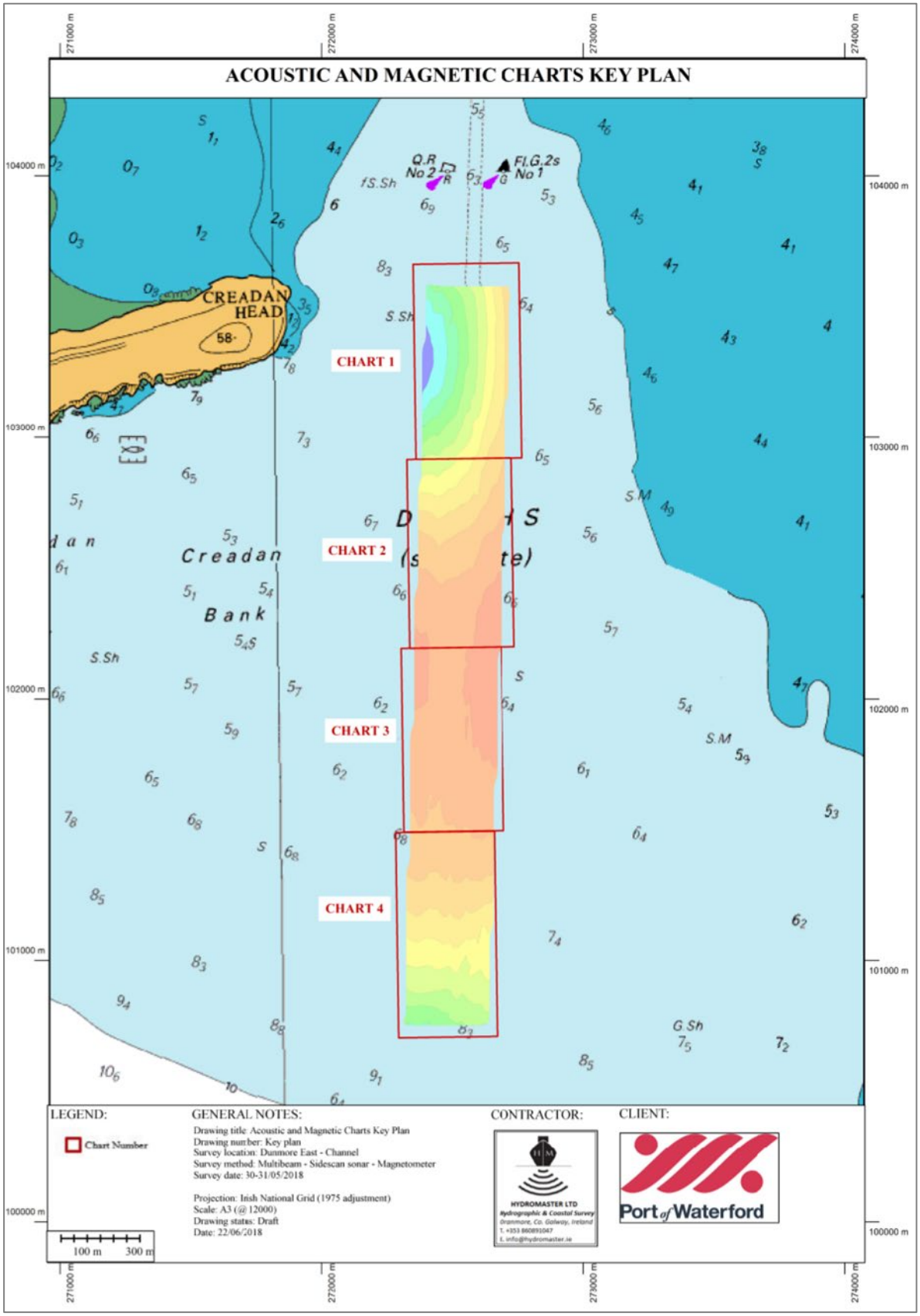


Figure 5 Overview of geophysical survey area.

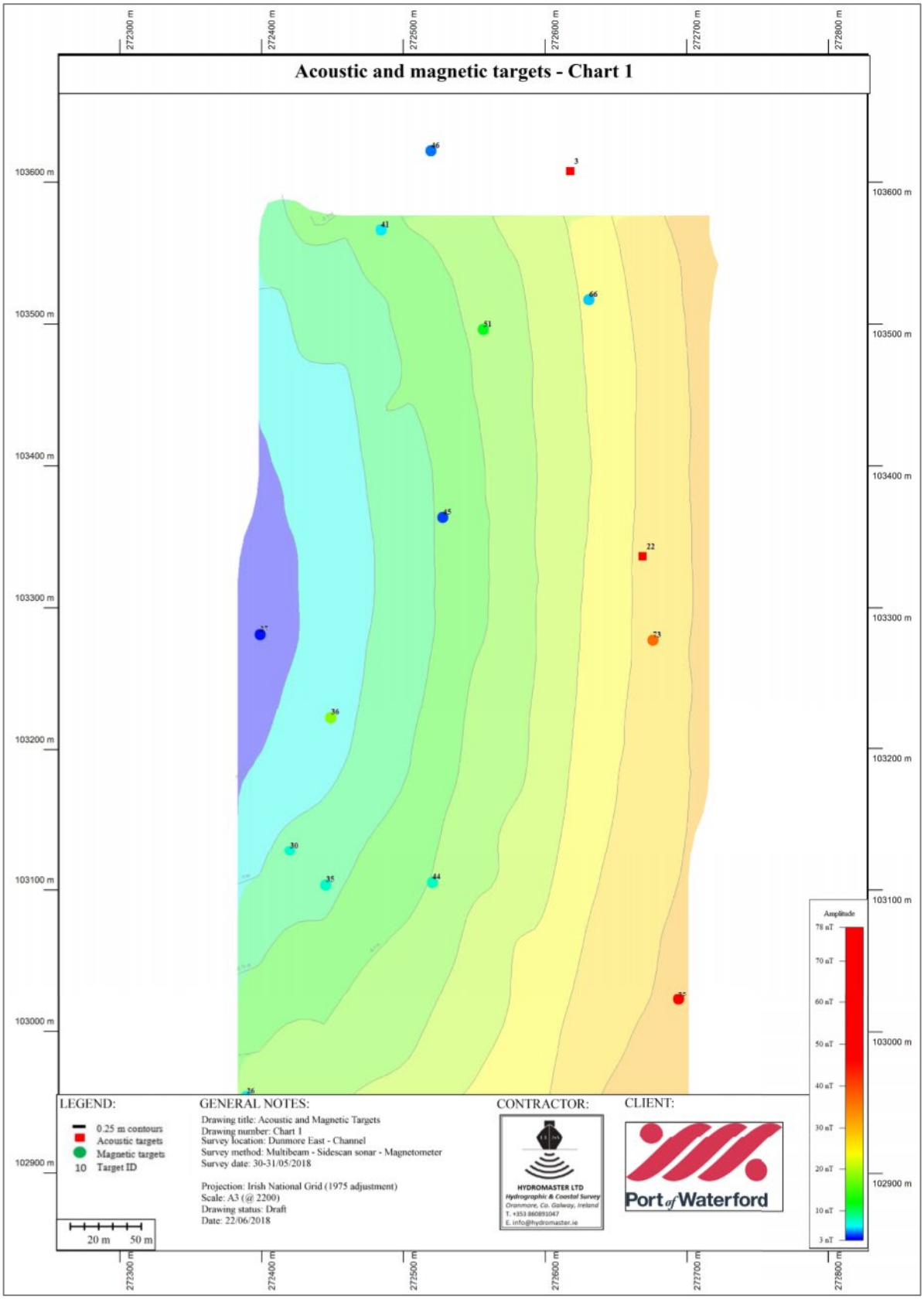


Figure 6 Acoustic and magnetic targets, chart 1.

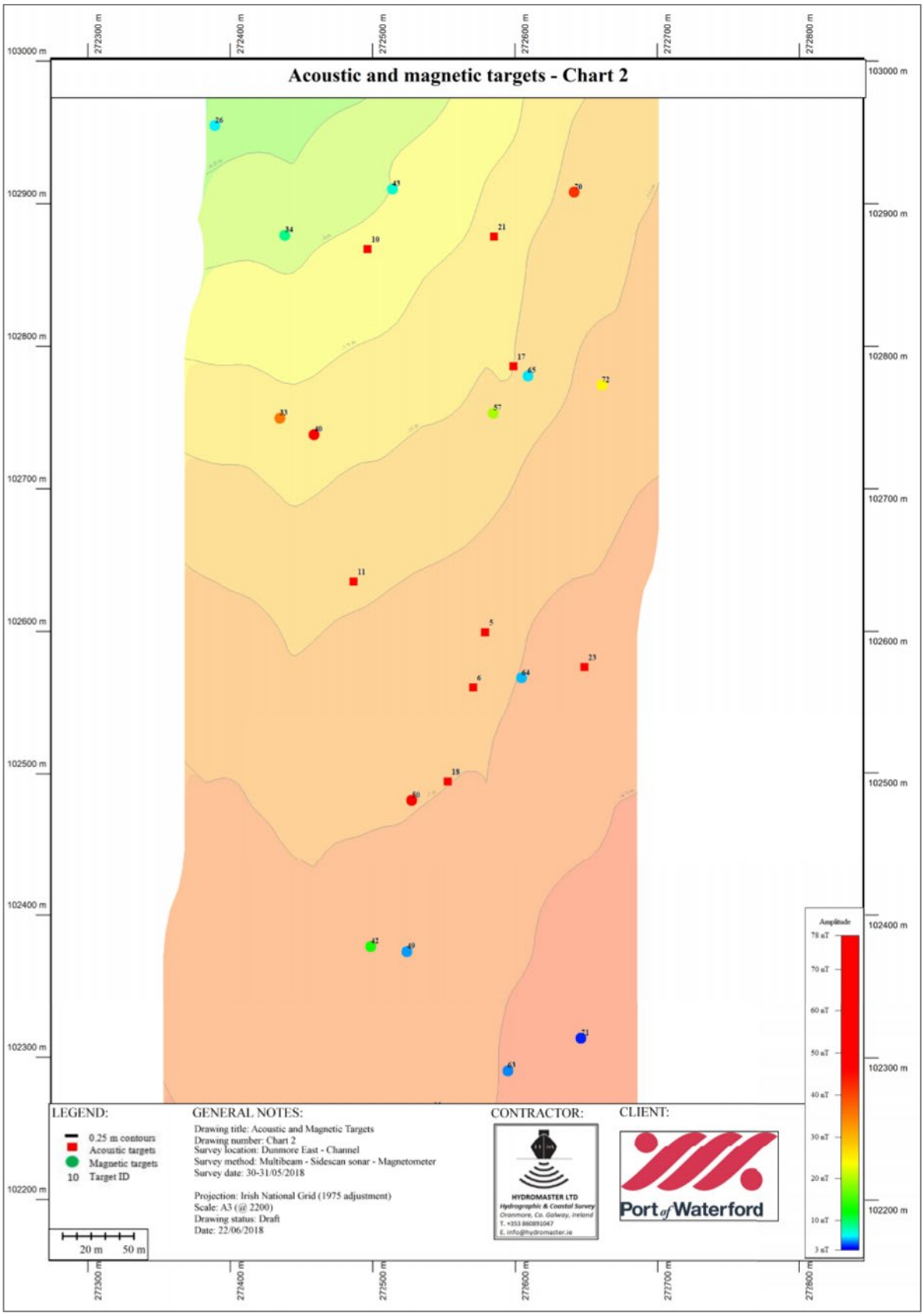


Figure 7 Acoustic and magnetic targets, chart 2

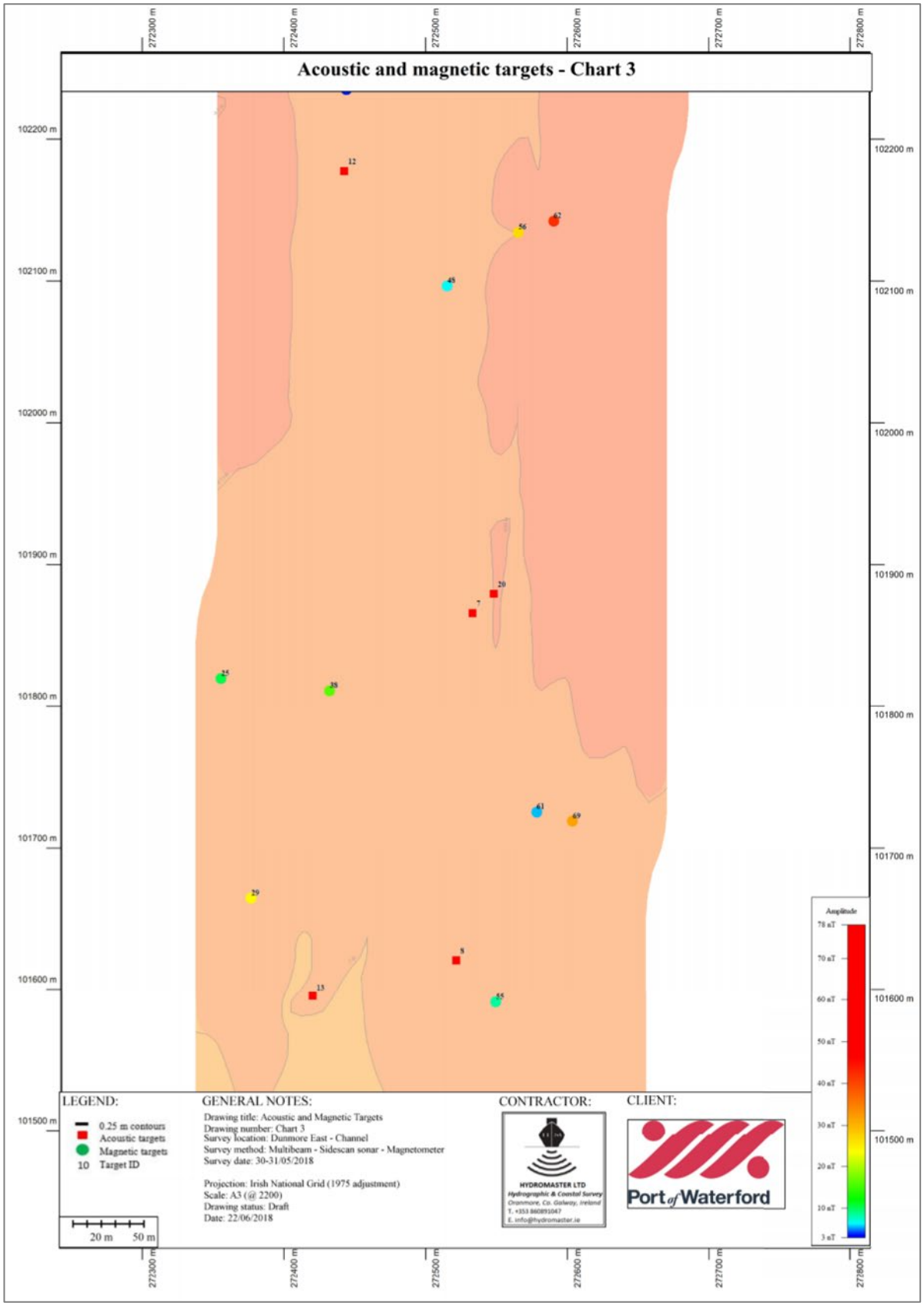


Figure 8 Acoustic and magnetic targets, chart 3.

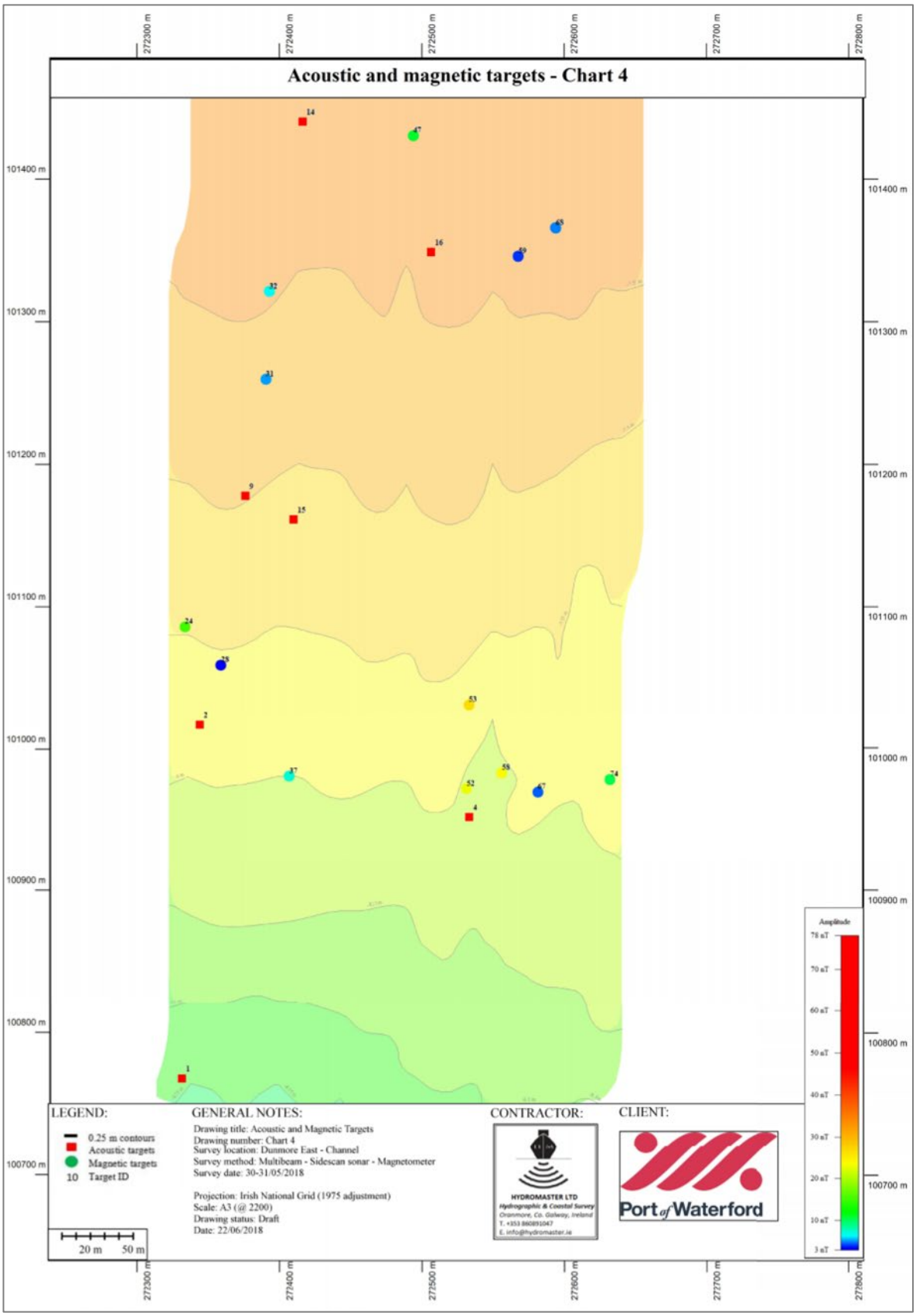
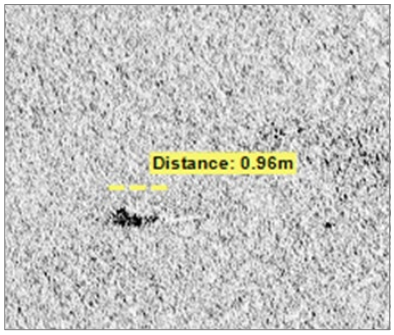
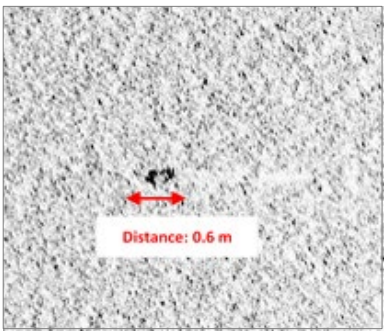


Figure 9 Acoustic and magnetic targets, chart 4.

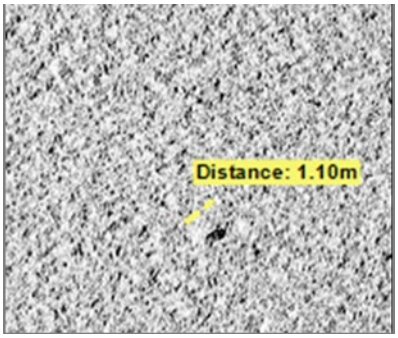
Images of Unidentified Acoustic Targets



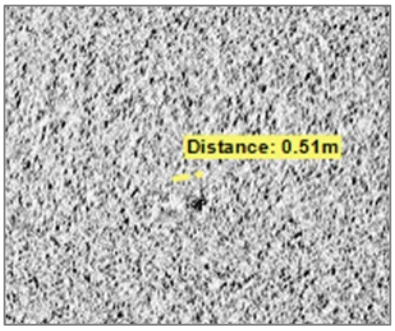
Acoustic Target 2



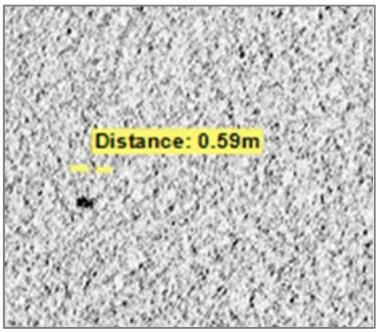
Acoustic Target 9



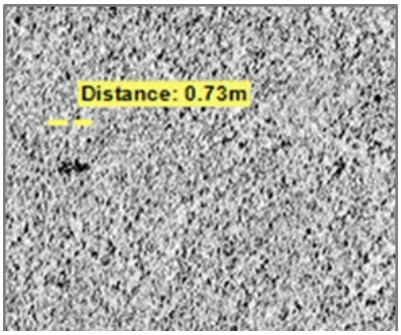
Acoustic Target 10



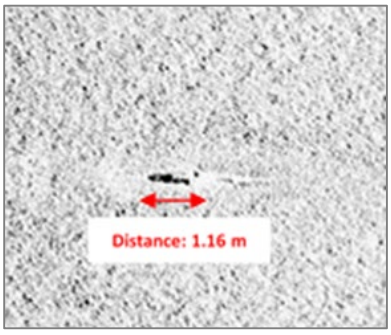
Acoustic Target 11



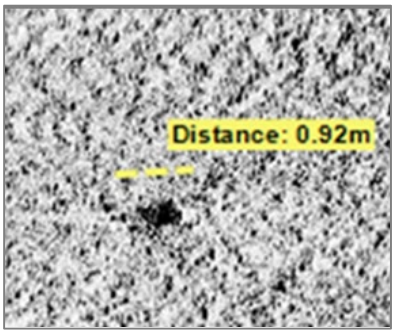
Acoustic Target 12



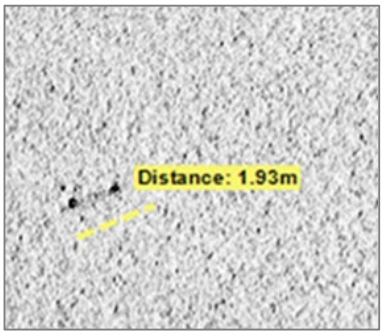
Acoustic Target 14



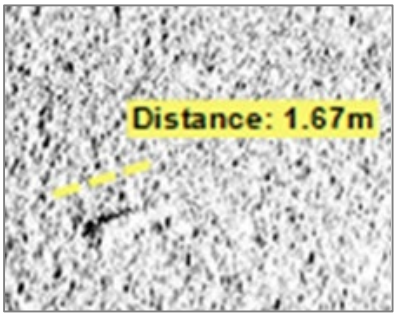
Acoustic Target 16



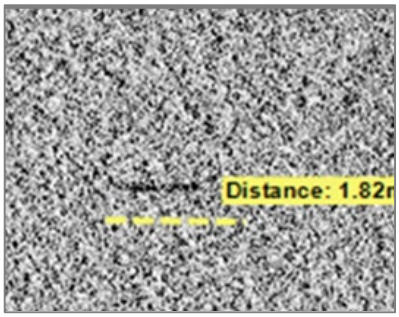
Acoustic Target 17



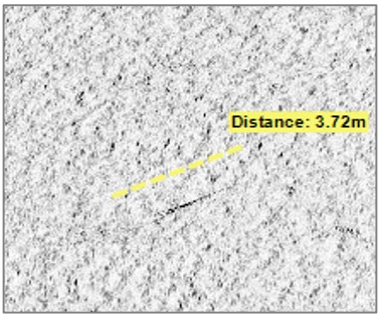
Acoustic Target 18



Acoustic Target 19



Acoustic Target 21



Acoustic Target 22

6. Results of Dive Survey

The dive truthing survey of the twelve unidentified anomalies was undertaken by a five-person team including dive supervisor, dive tender, stand-by diver, archaeological diver and archaeological supervisor (Plate 1). A surveying engineer located the anomalies using a Trimble 5800 DGPS with <8mm accuracy. At the time of the survey water depths varied between 6m and 10m. The high turbidity level resulted in near zero visibility during the dive survey. Underwater torches provided close-up view of features on the seabed. Where anomalies were not immediately found a circular dive search encompassing a diameter of c.10m was undertaken.

In general, the seabed comprised a layer of dark grey fine silt, between 10-20cm in depth, overlying silty clay. The dive inspection of the anomalies identified no features of archaeological significance. As expected the diver survey confirmed the presence of debris of similar estimated dimensions to those measured from the single-beam data. Seven of the anomalies (targets 2, 11, 16, 17, 18, 19, and 22) were identified as debris relating to fishing activities. A flat featureless seabed was noted at the location of the other five anomalies (targets 9, 10, 12,14, and 21) suggesting that these may have been mobile objects. The geophysical survey indicated that targets 9, 10, 12, 14 measured less than 1m in length while target 21 had presented in the survey as a 3m long object.

Plate 1: Dive Survey at Creadan Bank in progress.

7. Potential impacts of proposed dredging operations on the cultural heritage of Waterford Estuary

The results of the archaeological assessment demonstrate that the proposed dredging works is encompassed within an extremely rich, diverse archaeological landscape. Testament to this are the numerous monuments, shipwrecks and artefacts that have been recorded, on the seabed and along the estuary shores. Although there are no recorded archaeological monuments, including wrecks, within the confines of the dredge area, the record of several shipwrecks for the general area highlights the potential of the given environment to retain such sites or associated wreck material and artefacts.

A geophysical survey and subsequent dive inspection of the proposed dredge area revealed no identifiable archaeological shipwrecks, features or artefacts on the seabed.

However, the absence of definitive coherent archaeological shipwrecks or features on the seabed on the acoustic data does not reflect the potential subsea archaeological content within the seabed, and it is possible that archaeological remains survive beneath the surface of the seabed.

There are at least nine shipwrecks recorded Shipwreck for Creadan Bay/Creadan Head whose precise location is for the most part unknown or general i.e. 'off Creadan Head', 'between Creadan Head and Duncannon' (Table 2). Many more are recorded for the wider area of Waterford Estuary. Given the extent of the maritime traffic through time and the known number of recorded shipping losses within Waterford Estuary, and the identified 16th and 17th century wrecks from adjacent Duncannon Bar, the likelihood of the proposed dredging operations impacting previously unknown potential archaeological shipwrecks, features and artefacts is high.

8. Mitigation Measures

The initial capital dredging of Creadan Bank should be archaeologically monitored by an experienced, licensed archaeologist with marine dredging/maritime archaeological experience. In the event that the dredger impacts on a possible shipwreck, then the dredger shall be moved to a different area while a standby archaeological dive team, in place for such eventualities, is mobilised to undertake an inspection of the impacted material / wreck.

Should archaeological material, wreckage, timbers or other artefacts be recorded in the course of the monitoring, the monitoring archaeologist shall be empowered to temporarily suspend dredging in that area to recover and record the material. The recovered items shall be placed in temporary wet storage tanks provided on the dredger.

All mitigation measures are recommendations only. The ultimate decision rests with the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht in collaboration with the National Museum of Ireland.

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9.1 Other Sources

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National Library of Ireland: www.nli.ie

National Monuments Service online database: www.archaeology.ie

Wreck Inventory of Ireland database: By appointment with National Monuments Service

National Monuments Service's Wreck Viewer: www.archaeology.ie

9. Appendices

Appendix 1: Previous Excavations

Site name: Fornaght Strand, Creadan, Waterford

Licensee: Julianna O'Donoghue, 16E0079

Description: A well-preserved rectangular wooden trough constructed of planks and posts was excavated. Two sediment deposits were excavated from the trough; the upper deposit was similar to the surrounding estuary bed. Underlying this was a layer of heat-shattered stone which most likely

represents the final use of the trough. The eroded remains of a possible burnt mound were situated approximately 3m north-east of the exposed timber trough. The mound was composed of an oval spread of friable, burnt and blackened sandstone pieces in a matrix of black gritty gravel and beach sand with some modern shell inclusions.

The remains of a possible shell midden were exposed below the burnt stone spread. The midden material was composed entirely of small cockle shells with frequent inclusions of small twigs and some small animal bone fragments – possibly bird or fish bones.

Several other organic features were recorded on the surrounding mudflats. The features included stakes, possible wattle, and scatters of animal bones.

Site name: Fornaught Strand, Creadan, Waterford

Licensee: Marek Zvelebil, Ballylough Survey project (5707036)

Description: This site was initially located by the discovery of an exposed shell midden at the eastern edge of a field on the strand. In all, a total of 62 1m x O5m test pits and two trenches (11m x 1m and 14m x 1m) were excavated. Preliminary test pits opened at 20m intervals indicated a concentration of artefacts within a 40m area. This area was further examined at 10m intervals indicating a discrete concentration of flint artefacts. A total of 477 artefacts was recovered, three of which, a Bann flake and 2 uniplane cores, date to the late Mesolithic. Retouched artefacts, which numbered 14, included scrapers, notches, a spokeshave and a Bann flake.

Site name: Knockavelish

Licensee: Marek Zvelebil, Ballylough Survey project (5690038)

Description: This site is located in the estuarine zone not far from Fornaught Strand. Fieldwalking of the adjacent fields yielded remains of Neolithic settlement including a plano-convex knife and a strike-a-light. Sixty-one test pits were opened but the site exhibited no clear patterning of prehistoric finds and no cultural features. Of the 50 flint artefacts recovered none were chronologically diagnostic.