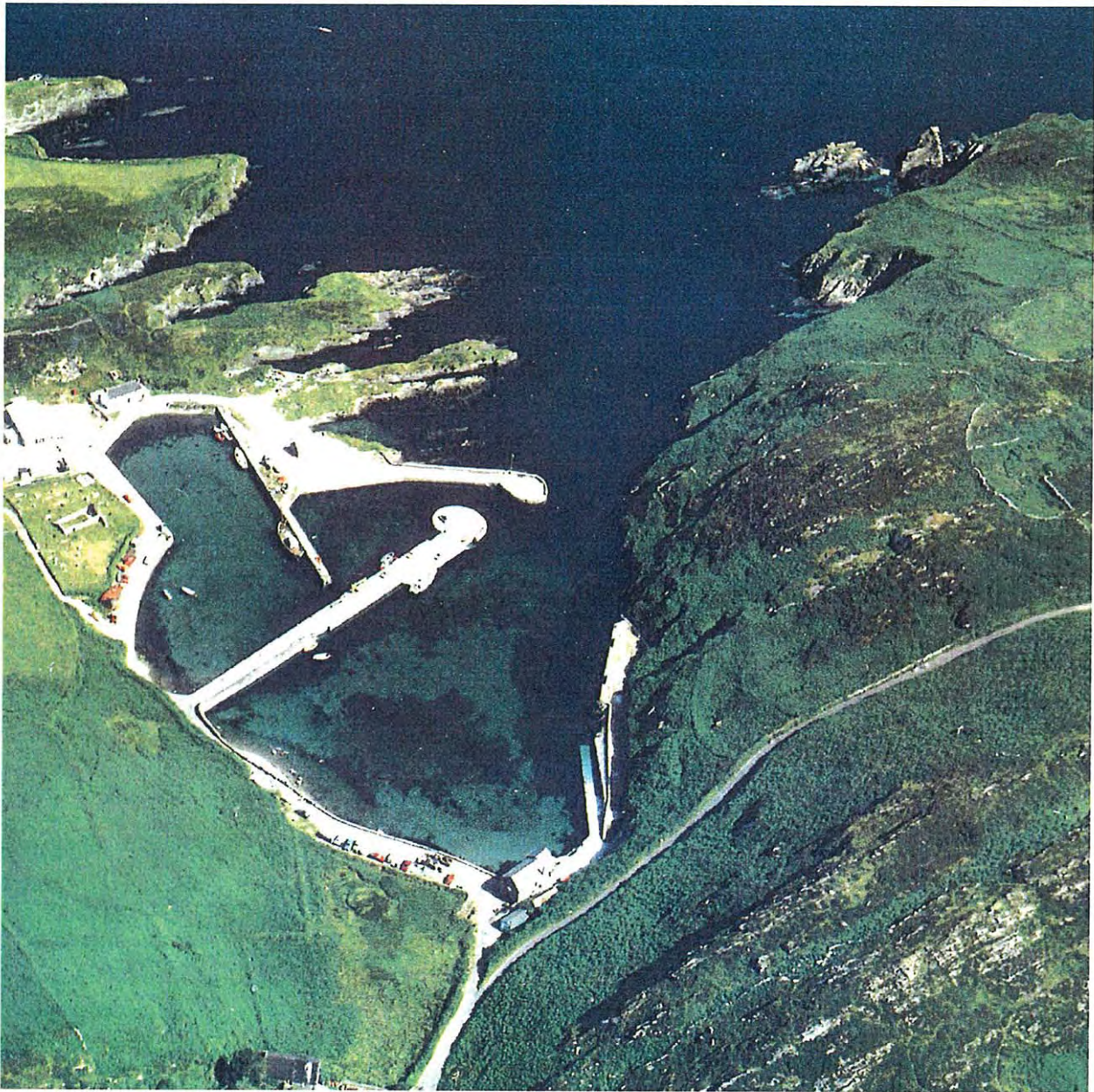


APPENDIX D

Archaeological Assessment, North Harbour, Clear Island, Co. Cork.



Boland Archaeological Services Ltd.

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Geophysical survey conducted under The National Monuments Act 1930-1994:
Licence No. 02R152 02D092

Client: The Department of Communications Marine and Natural Resources

BAS Ltd. Report Number BAS 01-11-02

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1.0 INTRODUCTION

1.1 INTRODUCTION

The Department of the Marine and Natural Resources commissioned *Boland Archaeological Services Ltd.* to conduct a geophysical investigation and archaeological assessment of a proposed harbour development at North Harbour, Clear Island, County Cork. (Figure 1.1). The shoreline, seabed and high-resolution geophysical survey was conducted in November 2002, and the acquired data processed and interpreted by BAS Ltd. during November 2002.



Figure 1.1: Site location map

The aims of the investigation, as outlined by Dúchas are:

To identify areas of potential archaeology;

To identify potential archaeological structures;

To identify potential archaeological artefacts;

Provide co-ordinates, which allow relocation of features identified.

1.2 THE SITE

The site of the proposed pier development is located at North Harbour Clear Island Co. Cork (fig 1.1, 1.2 & 1.3). Cape Clear Island, a parish, in the Eastern Division of the Barony of West Carbery, County Cork, and province of Munster. The island's Irish name is *Innish Dhamley*, and in ecclesiastical records *Insula Sanctae Clarae* (Lewis 1837, 249). It is the principal island of a large cluster of islands in the Atlantic Ocean, lying off the coast of Carbery, and situated between Dundedy Head and Brow Head. The island is separated from the mainland by the sound of Glaskenane, in which is always a strong tide, and in high winds a very heavy sea (Lewis 1837, 249).

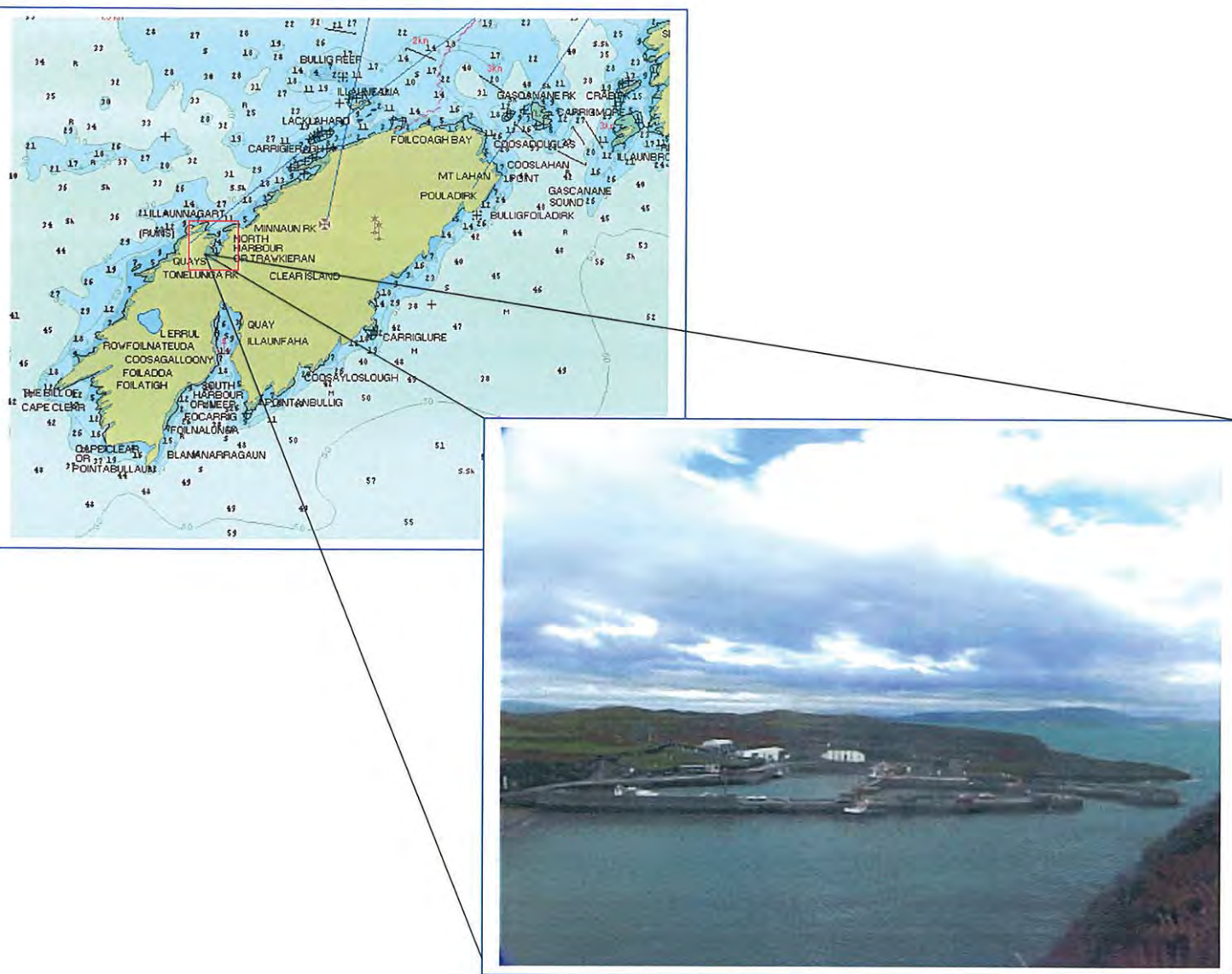


Figure 1.2: Site location chart, the proposed development zone is highlighted by the red box.

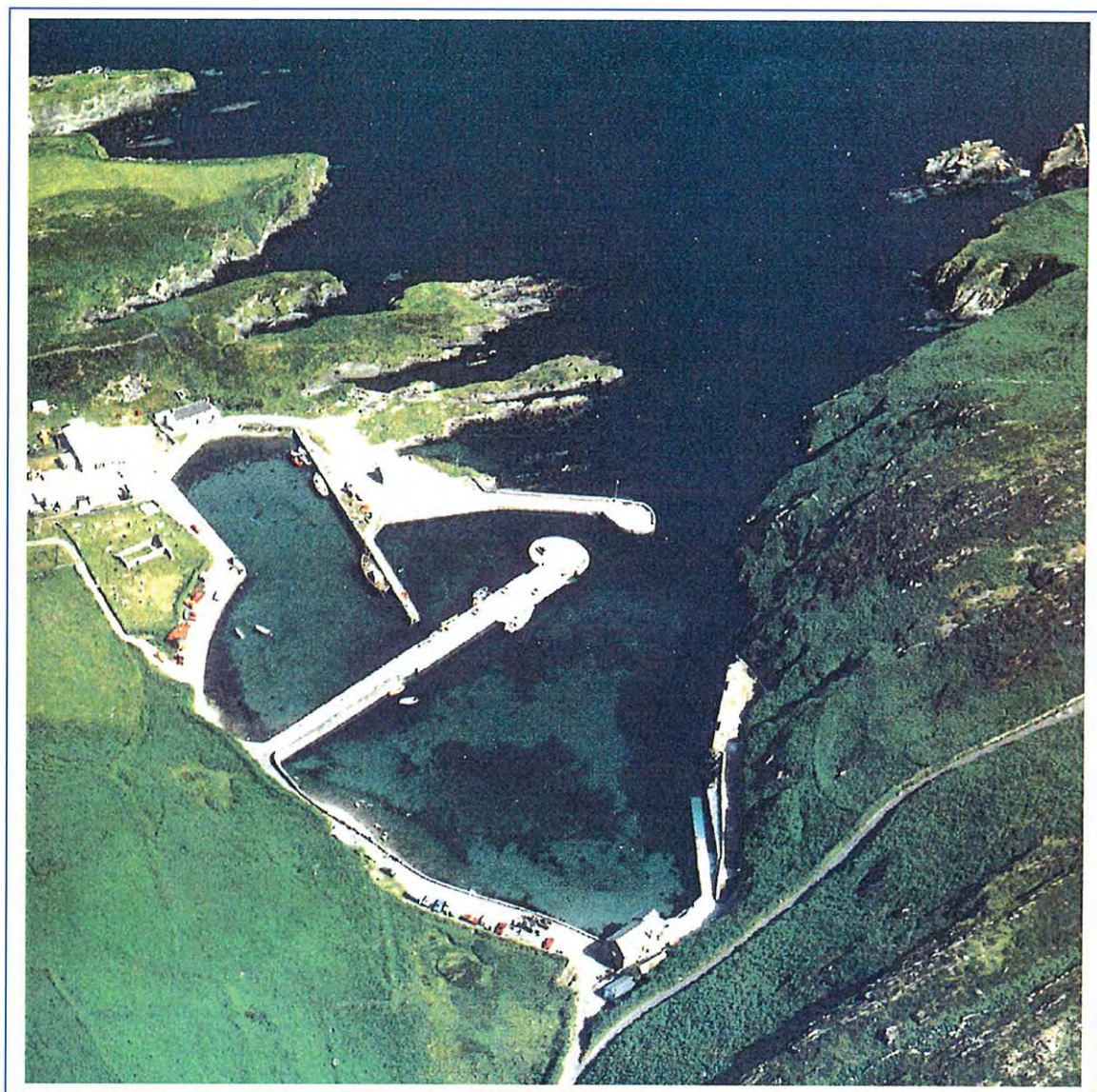


Figure 1.3: Site location image

1.3 THE DEVELOPMENT

The final design of the harbour development and breakwater positions are not complete at this time. The development proposes to:

1. Widen the existing pier.
2. Dredge the seabed within the harbour.
3. Widen the foreshore road.
4. Construct two breakwaters.
5. Construct a slipway

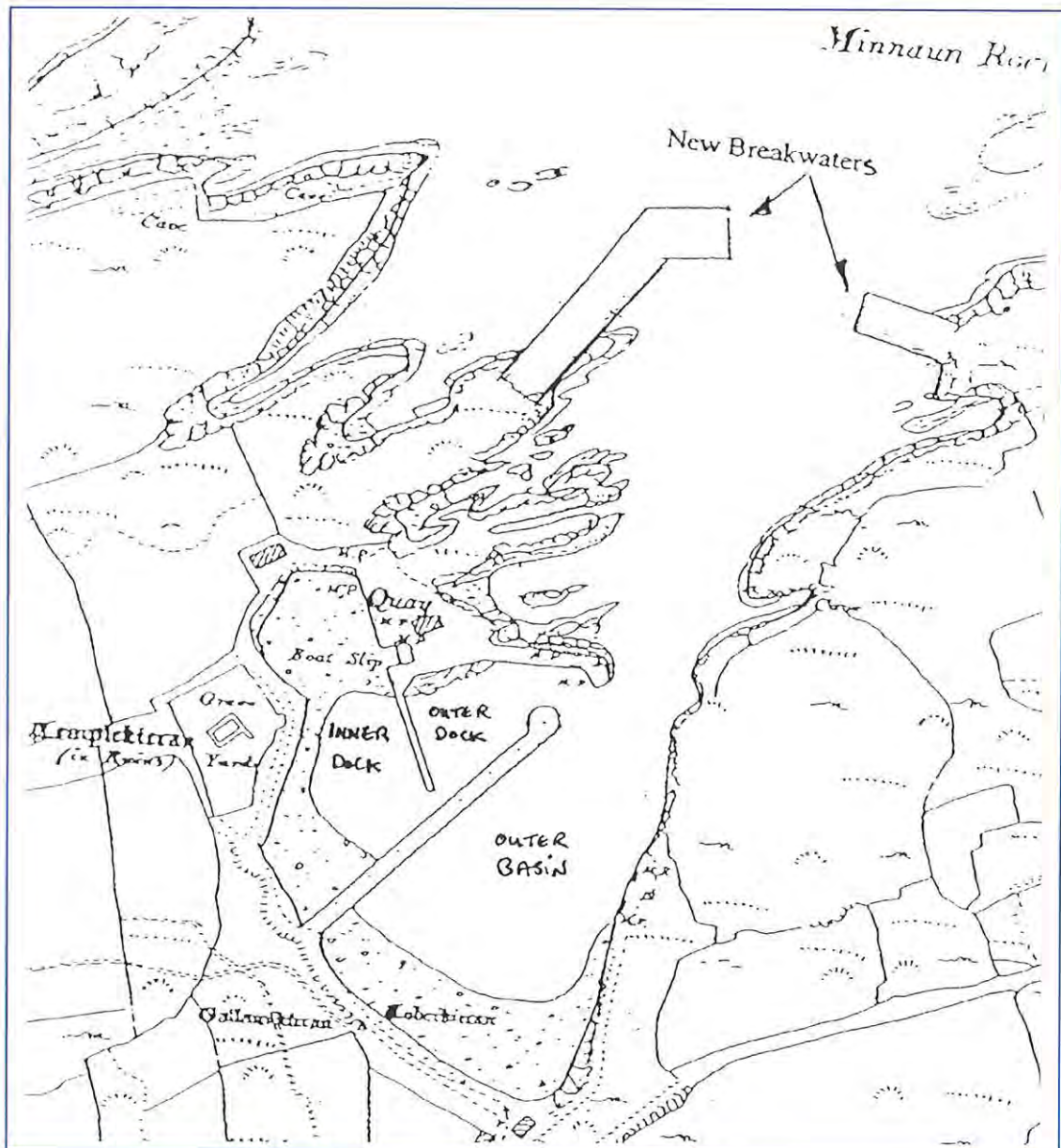


Figure 1.3.1: The Proposed Breakwater Development

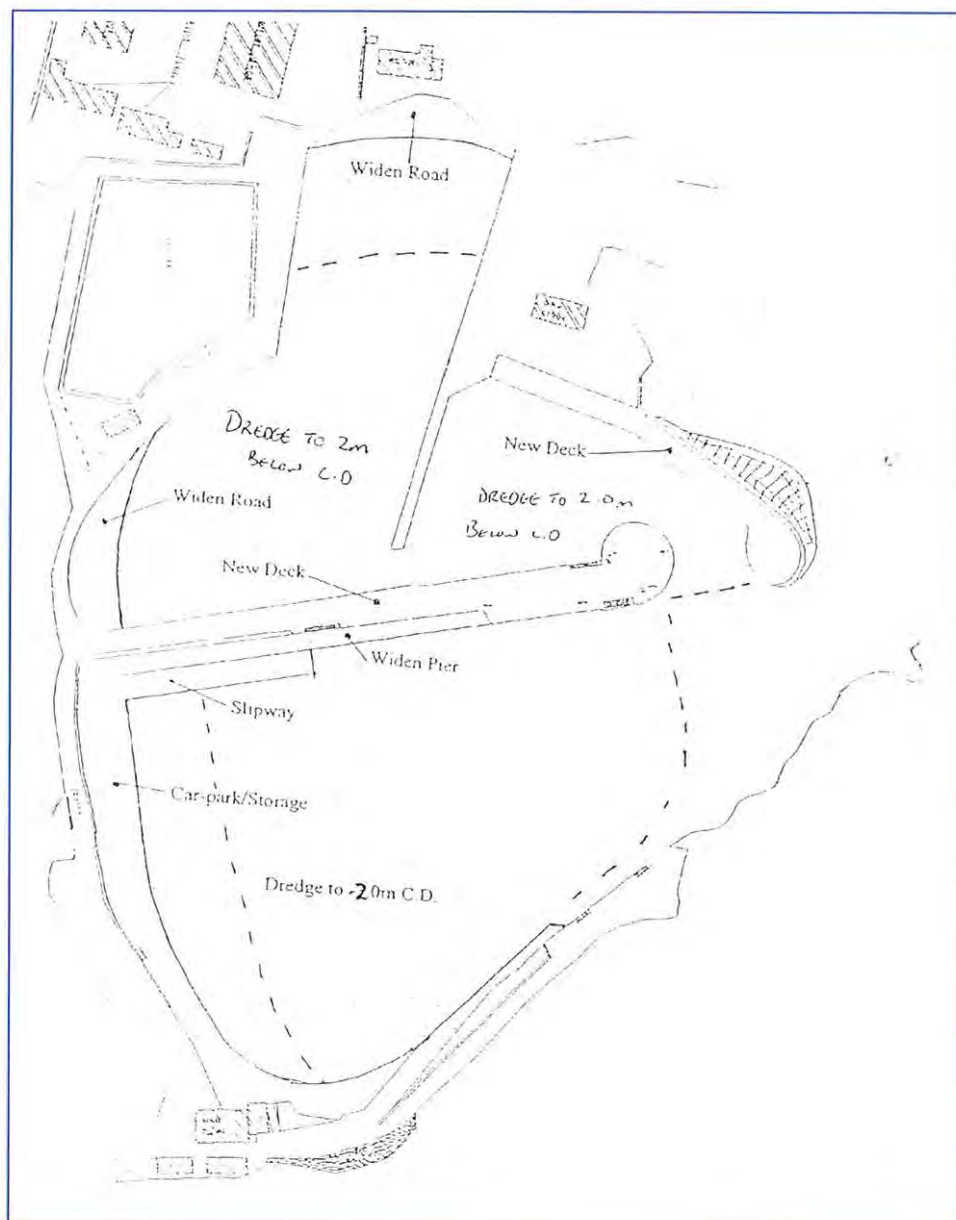


Figure 1.3.2: The Proposed Harbour Development

1.4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

1.4.1 Introduction

Cape Clear Island, a parish, in the Eastern Division of the barony of West Carbery, county of Cork, and province of Munster. The island's Irish name is *Innish Dhamley*, and in ecclesiastical records *Insula Sanctae Clarae* (Lewis 1837, 249). It is the principal island of a large cluster of islands in the Atlantic Ocean, lying off the coast of Carbery, and situated between Dundedy Head and Brow Head. The island is separated from the mainland by the sound of Glaskenane, in which is always a strong tide, and in high winds a very heavy sea (Lewis 1837, 249).

The Island is c. 3 miles in length and 1½ miles in breadth and is divided into 16 townlands, as recorded on the O.S. map: Ardgort, Ballyieragh North, Ballyieragh South, Carhoona, Comillane, Croha East, Croha West, Glen East, Glen Middle, Glen West, Gortnalour, Keenleen, Killickaforavane, Knockanacohig, Knockannamaurnagh, and Lissamona. The area of the whole island is close to 1500 acres (Conlon 1918, 53).

1.4.2 Early History

The early history of the island is linked to St. Kieran. Archdall (1873) says Kieran was born in 352. Colgan (1948) says he founded his monastery in 402. The *Annals of Innisfallen* at A.D. 402 state that 'Kieran and Deaglan, two bishops came from Rome to preach the Gospel in Ireland. Kieran, after having preached the Gospel in *Inis-Cléire*, and all over *Corca-Laidhe*, founded a bishop's see at *Saigher* in Ossory. The *Annals of Innisfallen* also state that Saint Kieran, Bishop of *Saighir*, and patron saint of the people of Ossory, was born in the island called Cape Clear in *Corca-Laidhe* (in the County of Cork).

Corca-Laidhe, the original country of the *Dairinne*, or O'Driscolls / *Ui Eidersceoil*, was at first co-extensive with the diocese of Ross, lying along the sea-board district of south-west Cork. Gradually this territory was encroached upon by the surrounding 'tribes', and, at length, *Corca-Laidhe* was confined to the parishes of Myross, Glanbarahane (now Castlehaven), Tullagh, Creagh, Kilcoe, Aghadowne, and Cleere. In this territory they built the castles of *Gleann Bearchain* or Castlehaven, Lough Hyne, Ardagh, Baltimore (*Dun na Sead*), *Dun-na-nGall*, Dunanore on Cape Clear Island, Rincoliskey, and a castle and abbey on Sherkin Island (Conlon 1918, 55). In 1636 the entire of O'Driscoll's country paid tribute to the MacCarthy Reagh.

The O'Driscolls, several of whom were kings of the island had large possessions and held five or six castles in different parts of the country, which were all forfeited in the insurrection of 1601. In the *Miscellany of the Celtic Society* there is record of a grant from the King to Thomas Crooke:- "All of O'Driscoll's country, etc., with the islands of Cape Cleere, etc... the chief rents being £4 15s. 4d. out of Sloughtea in Cleere Island, etc."

Mention is also made of an Inquisition taken at the 'towne of Roscarrybry in the County of Corke, the 8th day of April, in sixth year of the reign of our sovereign Lord James of England, etc., before William, Lord Bishop of Cork (and another)':-

"...The illande of Cape Clyre, twelve ploughlands, etc., within the lordship or country of Collymore...And they have ordered that the said Donogho O Driskoll, son and heir of Sir Fynyne, should have and enjoy to him and his heirs for ever the lands and rents ensuing, namely,...Glane and Cryhagh in the island of Clyre, three ploughlands...The thirty acres of Comenteady, the chief rent assigned for the moeity of Donogh O Driskoll, namely, out of the lands of Sloughtea in the island of Clyre, whereof part is due upon other their lands of Chryhaghe, four pounds, fifteen shillings, four pence."

1.4.3 The Castle

Dunanore (*Dún-an-Óir*) castle, or the Golden Fort, is situated overhanging the sea, a half-mile west of North Harbour. Its distance from all the landing places, would suggest it was built more for the purpose of a safe retreat in case of invasion, than for defence of the shores (Lewis 1837). The castle is supposed to have been built in the 13th century, but the date of its original construction is by no means certain (Healy 1988). On 22 March 1602, the castle held by Captain Tyrell, a close lieutenant of Donal Cam O'Sullivan Beare, was taken over by Captain Roger Harvey for Queen Elizabeth, following the battle of Kinsale, and the surrender of the castle of Baltimore (Dunashed) and at Sherkin (Dunalong). In the early part of December 1649, during the Confederate War, the Lord Lieutenant 'took Cape Clear and its ordnance'. In the days of Queen Anne, in the early part of the 18th century the island had a garrison (Healy 1988).

1.4.4 19th Century History

In the 1830s 649 acres were subdivided into 137 small farms of about five acres each, and about 200 acres were arable and the remainder rough pasture (Lewis 1837, 249). The chief crops were oats and potatoes. The manure was sand and seaweed and the chief supply of fuel was brought from the mainland. Flax was grown in the nineteenth century in some parts and spun into yarn (Townsend 1810; Lewis 1837), and coarse woolen cloths were manufactured for domestic use.

According to the census of 1891 it is recorded that there were 222 houses, 208 in 1901, and 214 in 1911. The houses were mostly built of stone and thatched. There were 1215 persons in 1891, 1123 in 1901, and 1017 in 1911. In the census of 1831 it is recorded that there were 206 houses with 1059 persons (200 families).

1.4.5 Fishing

Fishing has always been the chief source of employment of the islanders. The men were described by Lewis (1837, 249) as, 'expert and resolute seamen, and the best pilots on the coast.' In 1833 a pier had been built at Baltimore. This pier was used as a landing place for Cape Clear fishermen who at this time 'were wholly employed in fishing' (Lewis 1837) and had established a market for cured fish (Fitzgerald 1999).

Lewis (1837) recorded that the islander's 'fishing craft and tackle [had] been much improved since the establishment of the late Fishery Board: [and that] they now go to sea in hookers, or half-decked vessels, to the distance of 20 or 30 leagues'.

However, the people of Cape Clear suffered during and after the famine. The post-Famine destitution of the islanders was aggravated by exceptional distress in 1862 which prompted the Catholic parish priest, Fr. Leader, to appeal for help to a Miss Angel Burdett-Coutts (Duchess of Teck, *Baroness Burdett-Coutts*), a wealthy but philanthropic English woman. Her generous response to a report of 31 October 1862, that she commissioned, spearheaded a series of innovative projects, which benefited the community of Cape Clear, especially from 1879 onwards.

Burdett-Coutts believed that, in the long term, the prosperity of the islanders lay in the revival and development of the fishing industry. Traditionally, fishing in Cape Clear was primarily focused on feeding the family rather than supplying a market economy (Davis 1886, 486). Lewis (1837) would, however, lead us to believe otherwise. He reveals that the women on the island were responsible for curing the fish. These cured fish were sold to 'retail merchants' who visited the island for the express purpose of buying these cured fish. He further records that any fish that remained unsold were sent to the 'Cork market'.

However, Burdett-Coutts recognised that, if the Cape Clear fishermen were to emulate the success of their foreign counterparts, they needed the capital to invest in the bigger and better equipped boats suitable for deep-sea fishing rather than the traditional 'crazy open hooker' (Davis 1886, 486). The baroness provided half the cost as an interest free loan, which was repayable annually over a period as long as twenty years. The repayments were to be paid into a permanent £10,000 fund established by the baroness in 1880s so that the money could be used for further loans. In one year from 1880 to 1881 the Cape Clear fleet increased from eight to fifteen vessels, largely financed by £5,000 from the fund (*Irish Builder*, 15 March 1881, 76). By 1886 the Cape Clear fleet consisted of eighteen vessels of 'as fine a model and as well equipped and as well mannered as any on the ocean' (Davis 1886, 25).

Smith (1893) would later write, "They have thirty or forty boats belonging to the place, with which they take considerable quantities of fish, and by this means they are able to pay their

rent...The principal fish taken are cod, hake, ling, mackerel etc.; hake is their staple fish, which they salt and dry."

Kinsale fishermen were also known to come to the island and build huts, where they would cure their fish, and for this they paid a 'smart rent' (Smith 1893).

1.4.6 The Harbours

The island has two fine harbours: 1. *Cuan Tráig Ciaráin*, which faces northwards; and 2. *Cuan Aniar* in the south, directly opposite the northern harbour. The narrowest part of the island is between these two harbours. The distance is not more than a quarter of a mile. The narrow stretch is called the Cummer. In the article on Clear Island in the 'Illustrated Guide to the Northern, Western and Southern Islands, etc. (Antiquarian Handbook Series, R.S.A.I.) by Westropp, we read,

"Clear Island...has a church and well, Templekieran and Toberkieran,...The ruin is near the seashore and can be approached from sea by the 'North Harbour', called Trawkieran, where there are a strand, a landing place, and a small dock."

1.4.7 North Harbour (or Trawkieran)

The north harbour consists of a sheltered embayment, which bridges the townlands of Ballyieragh North and Knockanacohig. In 1836 there was a quay on the eastern side of the embayment and 'rude' dock on the western side (OS 6" Map, Sheet 153, 1st Edn. 1842; Mr. Donnell's Report on the Fishery Harbours, Appendix No. XVIII, 117. *First Report of the Commissioners of Inquiry into the State of the Irish Fisheries; with The Minutes of Evidence, and Appendix. MDCCCXXXVI*).

Alexander Nimmo had proposed the extension of and improvement of the North Harbour and the Board of Works granted out of the fund accruing under the Act of the 5th Geo. IV. C. 64, the sum of £420 and Mr. Beecher, the estate owner, contributed £230 towards these improvements (Mr. Donnell's Report on the Fishery Harbours, Appendix No. XVIII, 117).

The new pier was completed by December 1849. It is recorded in the 'Return of all Piers and Harbours built under the Board of Works in Ireland since the passing of the Act 9 Vict. C. 3' (British Parliamentary Papers 1884-85, [167 and 266], 2) that the cost to the Board amounted to £475 and 5 shillings. The same pier had masonry repaired in 1883 at the cost of £200.

The second edition OS Map, revised in 1899 and published in 1902 (OS 6" Map, Sheet 153, 2nd Edn. 1899), clearly depicts the new linear quay structure, and the pre-existing quay or 'dock' as it was labelled in the first edition. The quay on the eastern side of the harbour is not depicted on the later second edition and may have fallen out of use. Conlon (1918, 54) would

later write "The north harbour has a fine pier, and is the one used by shipping as it is sheltered".

Not far from the harbour are the ruins of St. Kieran's church; on the shore is an ancient stone with a cross rudely sculptured on it, and at a short distance a holy well. This well is covered at high tide, 'yet on its receding, the water...is found perfectly fresh' (Burke 1908, 119). The close proximity of the flat-topped standing stone to the well is remarkable.

On the north side of the island, and about a quarter of a mile from the shore, Lewis (1837) recorded that vessels could anchor in moderate weather.

1.4.8 South Harbour (or Ineer)

There is no quay depicted on the first edition at South Harbour (OS 6" Map, Sheet 153, 1st Edn. 1842). There is a coastguard station located on the eastern shore and a named dwelling, 'Seaview Cottage'. The revised edition (OS 6" Map, Sheet 153, 2nd Edn. 1899) reveals that a quay was built in the interim at the South harbour. This was built at the joint expense of Sir W.W. Becher, Bart., and the late Fishery Board. The coastguard station is not depicted, perhaps no longer utilised.

1.4.9 The Lighthouse and Signal Tower

There is a disused lighthouse on *Faill Cahill*, the highest cliff on the island, 480 feet above the sea, on the southern coast, erected by the corporation for improving the port of Dublin. In clear weather the light could be seen from all points at a distance of 28 nautical miles.

Surveyors and sailors complained of 'the too great elevation and ill chosen position of Cape Clear light' (*Second Report of the Commissioners appointed to Inquire into the State and Condition of the Tidal and other Harbours; Shores and Navigable Rivers of Great Britain and Ireland*, British Parliamentary Papers 1846, XVIII, VI) and the lighthouse on Cape Clear was replaced by the Fastnet Rock lighthouse, about 4 miles to the south-west.

Adjoining the disused lighthouse is a signal tower, erected after the attempt of the French to land at Bantry Bay, and purchased by the above corporation. Burnt in the early 19th century, it was later converted into residential quarters for lighthouse keepers (Power et al. 1992).

1.5 SITES AND MONUMENTS RECORD OF CLEAR ISLAND

Source: Sites and Monuments Record of Co. Wexford (Sheet), Dúchas, The Heritage Service.

Site No.	Sheet/plan/trace	NGC	Townland	Class
CO153:5	153:5:3	09607, 02260	Lissamona	Coastal promontory fort
CO 153:6/01	153:5:3	09630, 02258	Lissamona	Ringfort
CO 153:7/01	153:5:6	09623, 02220	Lissamona	Burial ground
CO 153:7/02	153:5:6	09624, 02221	Lissamona	Cross-slab
CO 153:8	153:5:6	09635, 02165	Croha West	Passage-tomb art stone
CO 153:9	153:6:4	09692, 02235	Killickaforavane	Burial ground
CO 153:10	153:6:4	09712, 02217	Killickaforavane	Passage-tomb
CO 153:11	153:6:1	09730, 02244	Gortnalour	Boulder-burial
CO 153:12	153:6:2	09748, 02306	Comillane	Stone row
CO 153:13/01	153:6:2	09778, 02292	Comillane	Holy well
CO 153:13/02	153:6:2	09779, 02294	Comillane	Burial ground
CO 153:14	153:9:4	09423, 02025	Ballyieragh Nth	Coastal promontory fort
CO 153:15/01	153:5:4	09460, 02167	Ballyieragh Nth	Possible coastal promontory fort
CO 153:15/02	153:5:4	09467, 02169	Ballyieragh Nth	Tower house and bawn
CO 153:16	153:9:2	09493, 02112	Ballyieragh Nth	Cross-slab
CO 153:17/01	153:5:5	09521, 02193	Ballyieragh Nth	Graveyard
CO 153:17/02	153:5:5	09521, 02193	Ballyieragh Nth	Church
CO 153:18/02	153:5:5	09526, 02185	Ballyieragh Nth	Holy well
CO 153:20	153:9:3	09583, 02080	Glen West	Possible standing stone
CO 153:21	153:10:1	09650, 02155	Croha West	Cup-marked standing stone
CO 153:22/02	153:10:1	09672, 02125	Glen East	Signal tower
CO 153:26	153:6:2	09785, 02259	Comillane	Cup-marked stone
CO 153:27	153:6:1	09730, 02236	Gortnalour	Possible <i>fulacht fiadh</i>
CO 153:28	153:6:1	09723, 02243	Knockannamaurnagh	Possible <i>fulacht fiadh</i>

1.6 SHIPWRECKS LISTED FOR THE AREA OF CLEAR ISLAND

Source: Historic Shipwrecks of Waterford and Wexford, Dúchas, The Heritage Service; Bourke, E. J. 1994, *Shipwrecks of the Irish Coast*, 1105-1993 (Vol. 1). Dublin. Bourke, E. J. 1998, *Shipwrecks of the Irish Coast*, 932-1997 (Vol. 2). Dublin.

NAME	DATE	LOCATION	DETAILS
<u>Advance</u>	12 Feb. 1870	between Fayal and Cape Clear	1,388-ton Liverpool vessel. En route from Callao to Antwerp. Cargo of guano.
<i>Adventure</i>	12 Nov. 1812	near Cape Clear	Liverpool to Limerick. Sunk by the privateer <i>Brestois</i> .
<i>Agnes</i>	8 Jan. 1773	between Kinsale and Cape Clear	Driven ashore. Cargo saved.
<i>Antoinette</i>	13 May 1915	c. 20 miles off Cape Clear	Local fishing vessel.
<i>Bradford</i>	5 / 28 Nov. 1916	near Old Head of Kinsale / near Cape Clear	Admiralty-hired trawler.
<i>Dauntless</i>	16 May 1908	Bullig Rock, entrance to North Harbour, Cape Clear	Wooden fishing lugger, 32 tons, of Cape Clear Island.
<i>Elizabeth</i>	11 March 1842	near Cape Clear	En route from New Orleans.
<u>Eliza Saunders</u>	13 Jan. 1850	Cape Clear	This vessel caught fire and sank.
<i>England</i>	16 Feb. 1695	off Cape Clear	This 5th rate, 40 gun, had been in action with a French man of war and sank.
<i>Enoch Bonner</i>	7 Sept 1867	west point of Cape Clear	698-ton barque. En route from Liverpool to Boston with a general cargo.
<i>General de Scabou</i>	4 Nov. 1849	off Cape Clear	Sligo to Trieste.
<i>George</i>	September 1842	off Cape Clear	Schooner of London. En route from Marseilles to Clyde. Abandoned.
<i>Helvellyn</i>	17 Dec. 1867	near Cape Clear Is.	Cargo of coal and iron.
<i>Herman Behrent</i>	13 March 1869	c. 7 miles NW of Cape Clear	351-ton wooden barque en route from Limerick to Cardiff in ballast.
<i>Hibernia</i>	20 Oct. 1845	off Cape Clear	Fishing smack of Cape Clear.

<i>Illyrian</i>	15 May 1884	Faill Uí Chathail, under old Cape Clear lighthouse; 51 26 18N 09 49 12W	Iron screw steamer of Liverpool. 1,956 or 2,967 tons. En route from Liverpool to Boston, Mass. with a general cargo of wool, whiskey and brandy.
<i>Kerry Head</i>	21 / 22 Oct. 1940	5 miles south of Black Ball Head / Sheep Head, near Cape Clear; 51 30 14N 10 02 04W	825 ton steam coaster en route from Limerick to England, in ballast. Bombed and sunk by a German submarine.
<i>Lord Canterbury</i>	23 Dec. 1847	off Cape Clear	599-ton sailing vessel
<i>Maigue</i>	6 Jan. 1940	south side of Cape Clear Is.	456-ton Limerick SS Co. vessel.
<i>Mary Ann</i>	10 Dec. 1866	2½ miles SW of Cape Clear	Wooden barque en route from Liverpool to Trinidad de Cuba with 560-ton cargo of coal.
<i>Mullion</i>	9 Dec. 1878	Drollán Rock, Cape Clear	En route from Spain with a cargo of cork.
<i>Neptune</i>	15 Jan. 1760	Cape Clear	En route from Cromorgan to London.
<i>Nestorian</i>	2 Jan. 1917	Bullane Rock, SW tip Cape Clear Is.; 51 25 30N 09 32 00W	6,395 ton British steamship en route from Galveston to Liverpool with general cargo, which included steel and shell heads.
<i>Onward</i>	7 June 1888	north side of Cape Clear Is.	Wooden schooner. 95 tons. En route from Newport, Mon. to Dingle with a cargo of coal.
<i>Penthyn</i>	22 July 1818	off Cape Clear	en route from Liverpool to Newfoundland
<i>Pride of Erin</i>	8 Oct. 1896	Cape Clear Island	Wooden fishing dandy. 42 tons. The vessel was moored at Cape Clear Island when she was lost.
<i>Prince of Wales</i>	31 Jan. 1771	3 leagues east of Cape Clear	300-ton ship en route from Alicant to Newry.
<i>Princess Dagmar</i>	29 March 1873	west of Cape Clear	1,009 tons. En route from Calcutta to Barrow-in-Furness with a cargo of jute.

<i>Rose</i>	24 Jan. 1786	off Cape Clear	En route from Philadelphia to Dublin.
<i>Rotterdam Packet</i>	27 Feb. 1749	Cape Clear	En route from Dublin to Antigua.
<i>St. George</i>	23 May 1797	Cape Clear	En route from Limerick to Cork.
<i>Sarah</i>	21 / 22 Sept. 1852	off Cape Clear	267 ton brig. En route from Ibrail to Cork or Queenstown.

2.0 SITE SURVEYS

2.1 SURVEY DESIGN

Shoreline, seabed and marine geophysical surveys were conducted in the area of the proposed development. The shoreline survey comprised a foreshore inspection at low tide, centred on the proposed foreshore development. The geophysical survey comprised a seabed profile, side-scan sonar and proton magnetometer survey of the proposed development area. The seabed survey comprised of a seabed inspection, investigation of geophysical anomalies and a metal detection survey.

The zone of geophysical survey outlined in red

The zone of foreshore survey outlined in black

The zone of underwater survey outlined in magenta

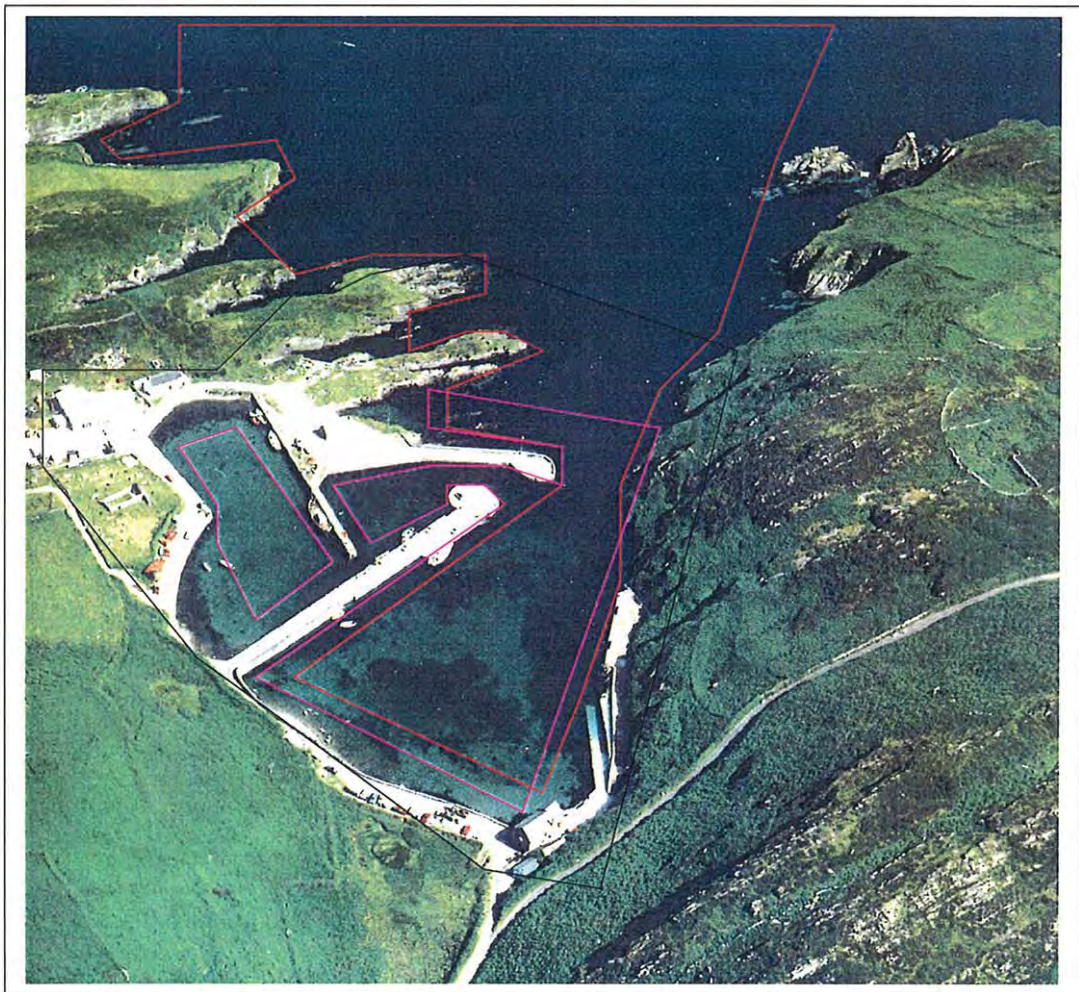


Figure 2.2.1 Zones of survey

2.2 FORESHORE AND SEABED SURVEYS

2.2.0 Introduction

Conducted at a period of low water the foreshore / intertidal survey of the proposed development site at North Harbour, Clear Island is separated into five areas.

The Foreshore Road, The Outer Basin, The Inner Dock, The Outer Dock, The Approaches.

Conducted during calm sea conditions the seabed survey was conducted by way of a visual inspection from the pier / breakwater and foreshore and a diver based survey of the seabed.

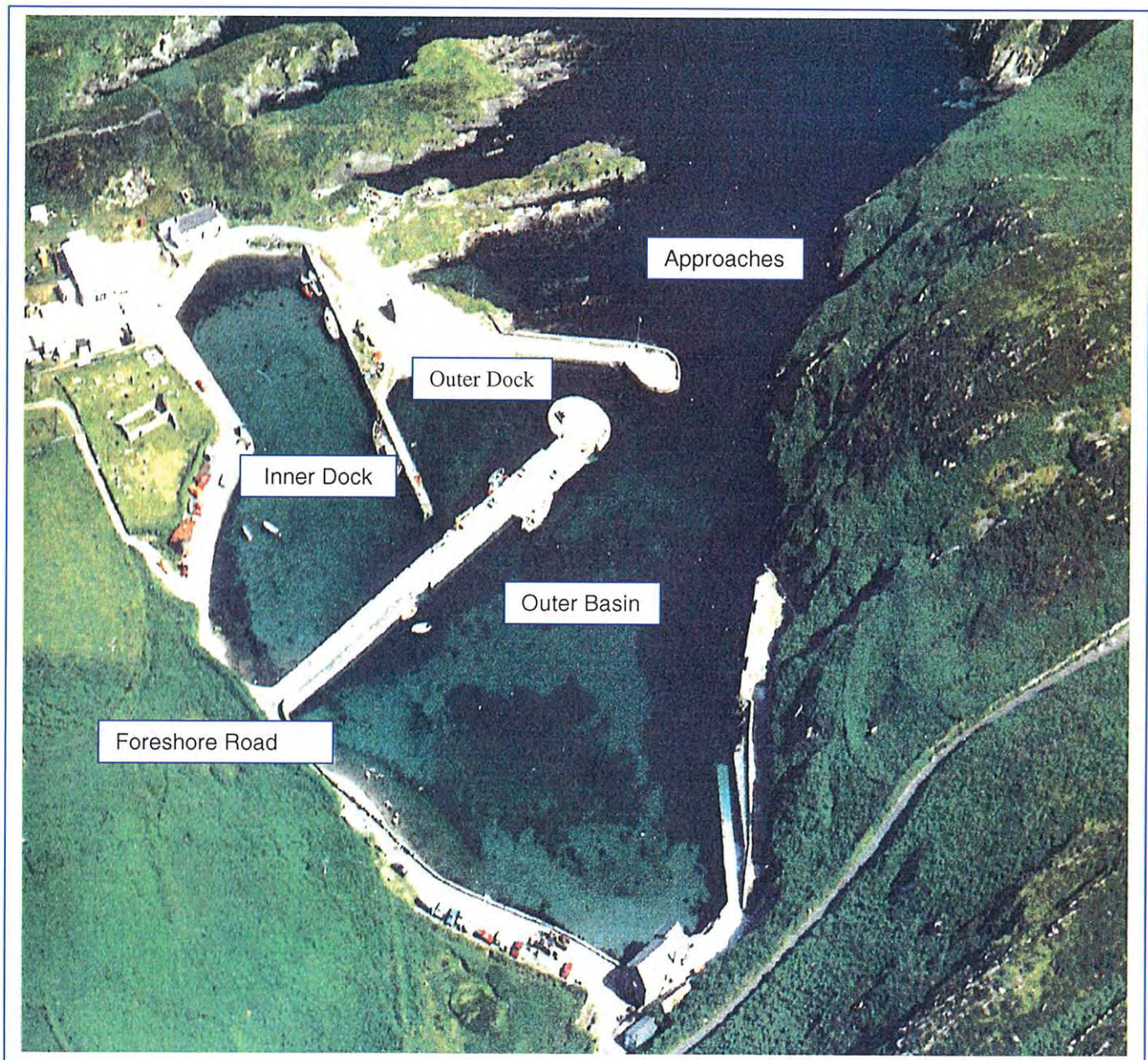


Figure 2.2.2 Location of foreshore / intertidal survey zones

2.2.1 The Foreshore Road

The present foreshore road and seawall was constructed in 1959 to prevent erosion of the foreshore, which was severe at the time causing destruction to the nearby buildings and monuments.

The roadway and seawall (figure 2.2.3) isolates and protects a number of features which were previously foreshore features.

1. The remains of a boathouse (figure 2.2.4 / 5) known locally as the landlords boathouse was constructed in the early part of the 19th century by the Becher family for their own use.
2. St Kieran's Pillar Stone and Holy Well (figure 2.2.6 / 7) is situated opposite the entrance to the harbour. The Pillar Stone has been moved on a number of occasions its original location is unrecorded.
3. St Kierans Church and Graveyard (figure 2.2.8), the church constructed in the 12th or 13th Century stands on the site of an older building. The graveyard is still in use and has been for many centuries. The boundary wall surrounding the site dates from 1906-1907 and was built under the direction of a local priest.



Figure 2.2.3 The foreshore road and seawall



Figure 2.2.4 The Landlords Boathouse



Figure 2.2.5 The Landlords boathouse



Figure 2.2.6 Pillar stone and holy well



Figure 2.2.7 Pillar stone



Figure 2.2.8 Church and Graveyard

2.2.2 The Outer Basin

The outer basin was formed with the construction of the central or Duffy's pier in 1840. It encompasses the entrance to the harbour (figure 2.2. 9 / 10) and a small pier stone known as "Sean Rua's Pier."

Sean Rua's Pier was constructed by the Becher Family in the early 1800's for the importation of coal (figure 2.2. 13)

The foreshore within the outer basin is comprised of transient, fine silty sand overlaying heavy gravels. (figure 2.2. 11 / 12)

No archaeological features or artefacts were observed during the foreshore assessment of the Outer Basin.



Figure 2.2.9 The Outer Basin and harbour entrance



Figure 2.2.10 The Outer Basin and foreshore



Figure 2.2.11 The Outer Basin and foreshore



Figure 2.2.12 The Outer Basin and foreshore



Figure 2.2.13 "Sean Rua's Pier."

2.2.3 The Inner Dock

The inner dock was initially constructed as an inner harbour with the construction of the breakwater and central pier in 1840. The initial inner harbour comprised of the present inner and outer docks.

A boom wall was constructed between the breakwater and the central pier in 1900 forming the inner and outer docks.

An entrance to the dock was formed by the construction of plank slots in the central pier and the boom wall (figure 2.2.17).

The foreshore within the inner dock is comprised of transient, fine silty sand overlaying heavy gravels. (figure 2.2. 14 /15/16)

No archaeological features or artefacts were observed during the foreshore assessment of the inner dock.



Figure 2.2.14 Foreshore Inner dock area



Figure 2.2.15 Foreshore Inner dock area



Figure 2.2.16 Foreshore Inner dock area



Figure 2.2.17 The Dock entrance and plank gate slots

2.2.4 The Outer Dock

As with the inner dock the outer dock was created with construction of a boom wall between the breakwater and the central pier in 1900.

The outer dock did not de-water during the period of survey.

A small subsurface transient gravel storm beach was observed adjacent to the boom wall, which would indicate the presence of strong wave action within the outer dock.

The outer section of the central pier collapsed during a storm in 1987. The damaged section of pier and the adjacent breakwater were repaired with a Larsen pile and concrete structure during the summer of 1988. (figure 2.2. 18/19)



Figure 2.2.18 The Outer Dock and the repaired section of the Central Pier



Figure 2.2.19 The Outer Dock and the repaired section of the Central Pier

2.2.5 The Approaches

The approaches to the North Harbour consist of a narrow channel, which runs between steep gorse lined stone cliffs (figure 2.2.20 /21).

The funnel like approaches has the effect of channelling and possibly amplifying the effect of sea swell within the harbour.

The possible location of the proposed breakwaters is indicated in figure 2.2 .22, note the location of the blue marker buoy.

A small rocky headland known locally as Powder Point lies directly seaward of the breakwater (figure 2.2.21)

A small concrete rectangular structure utilised to store blasting powder for use on the island is located on powder point overlooking the approaches to the North Harbour. (figure 2.2.23)



Figure 2.2.20 The approaches to the North Harbour



Figure 2.2.21 The approaches to the North Harbour

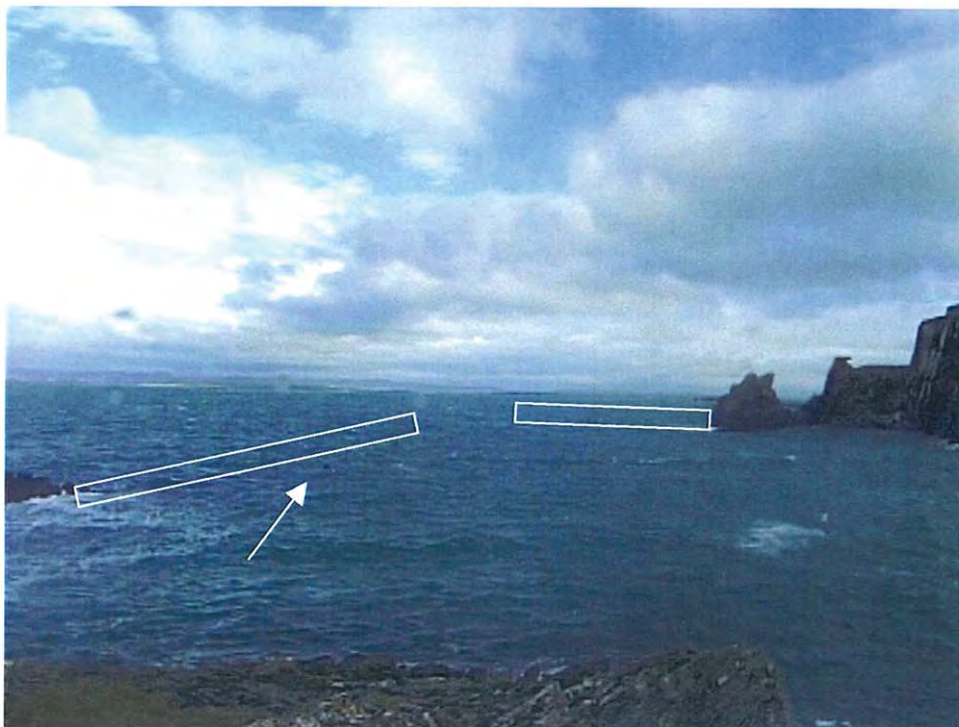


Figure 2.2.22 Possible location of the proposed breakwaters (note the blue marker buoy)



Figure 2.2.23 The powder store on Powder Point which overlooks the approaches.

2.2.6 The Seabed Survey

Conducted during a period of calm sea conditions the diver based seabed survey confirmed the bottom type and features as revealed by the geophysical survey.

The seabed within the harbour consists of gravel overlain in areas with soft silty sand.

Two six inch wavin pipes extend from the foreshore along the bed of the harbour and terminate beyond the breakwater in the inner approaches (figure 2.2.24).

A two inch chain is located running up the rocky foreshore seaward of the breakwater.

The area of seabed at the entrance to the outer dock has been impacted by a cement grouting material.

Local fishermen indicated the existence of peat within the harbour, but no indications of peat were observed on the surface of the seabed within the harbour.

No archaeological features or artefacts were observed on the surface of the seabed within the harbour.

It is probable that the high energy conditions which exist within the harbour during storm conditions has buried archaeological materials within the seabed.

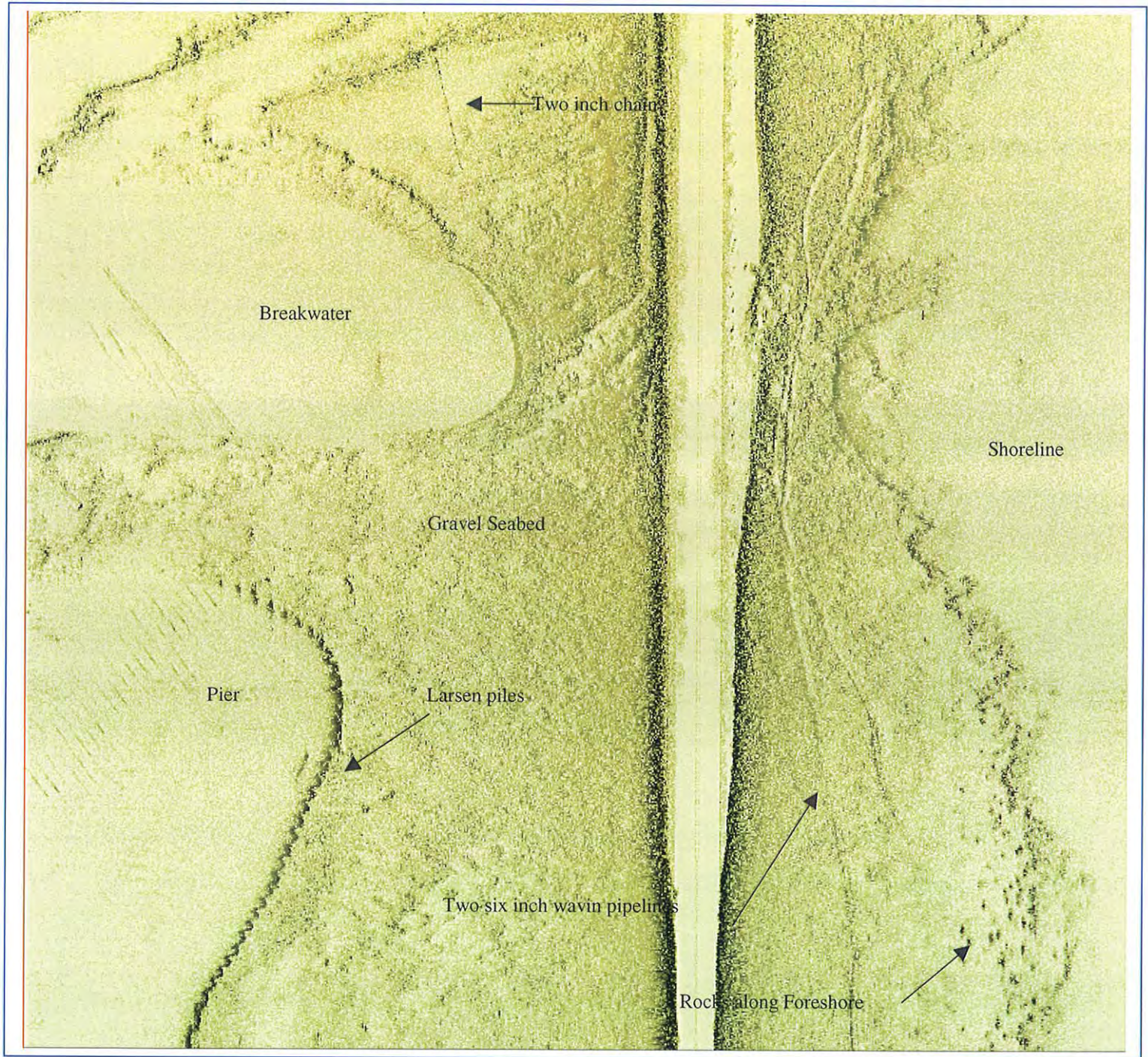


Figure 2.2.24 Sonograph image of the seabed within the Harbour and approaches.

2.3 GEOPHYSICAL SURVEY

2.3.1 Background

The high-resolution geophysical surveys of the proposed harbour development were conducted during November 2002 (Figures 2.3.1 and 2.3.2). The acquired data was processed and interpreted by BAS Ltd. during November 2002.

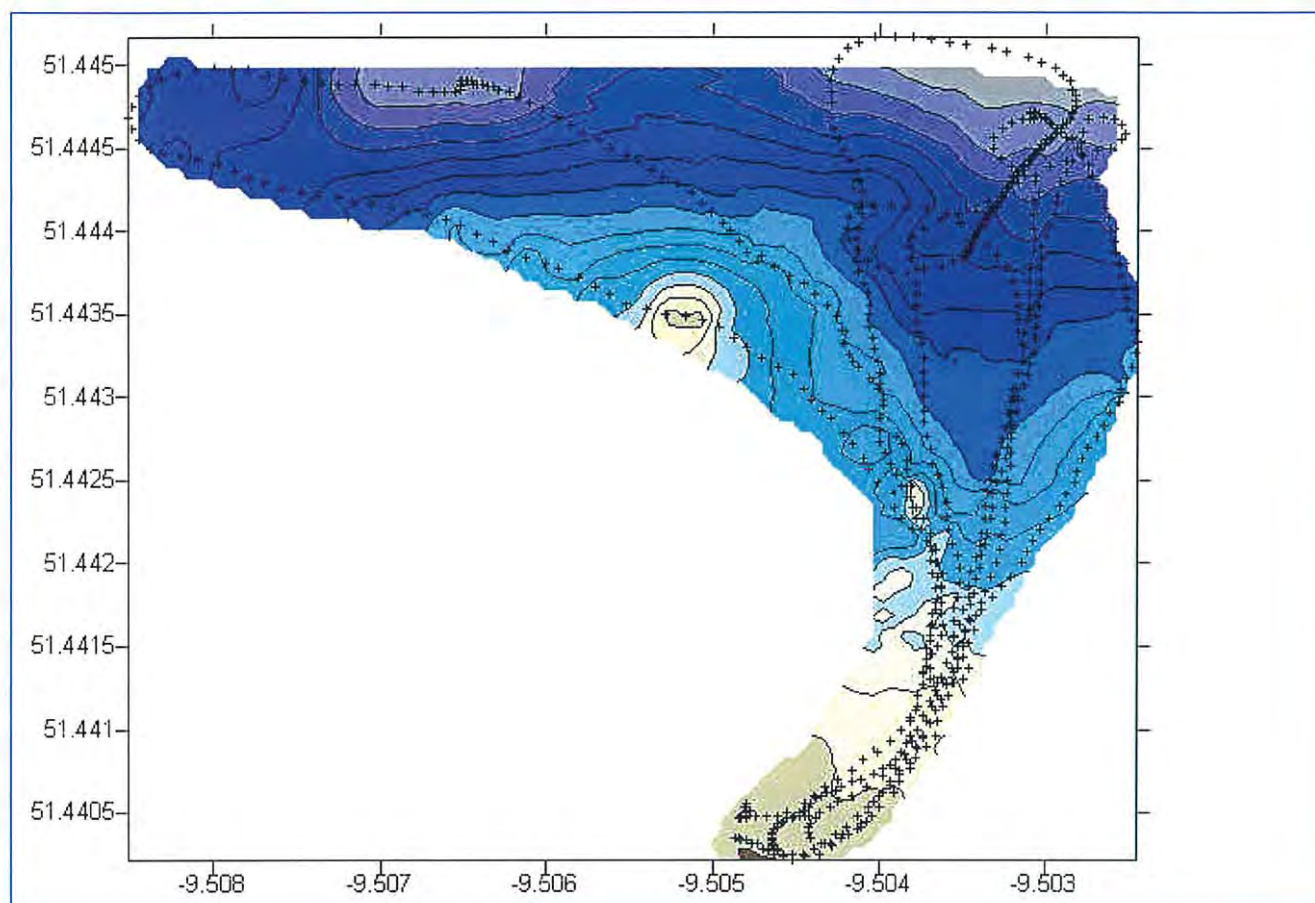


Figure 2.3.1: Track chart of survey route overlaid on 2-dimensional contour plot of bathymetric data for the survey site.

2.3.2 The role of geophysics in marine archaeological assessments

Since the 1960's, a variety of marine geophysical techniques have been applied to maritime archaeology (Frey, 1971; Mazel, 1985; Rao, 1988). However, it is only over the past decade that the applicable geophysical techniques have attained the resolution required by the maritime archaeologist in site-specific studies. Additionally, the decrease in the cost of these systems has led to a profound increase in their application to both reconnaissance and site-specific archaeological investigations (Hobbs *et al.*, 1994; Barto Arnold, 1996; Quinn, *et al.*, 1997; 1998; 2000; Momber and Green, 2000). In many countries, geophysical survey is now regarded as standard instrumentation for pre-development and research-led maritime archaeological programmes. The techniques most commonly used in these investigations are bathymetric surveying, side-scan sonar, sub-bottom profiling and magnetometry.

This section of the report details the methodology and results of geophysical surveys conducted over the proposed pier development at Clear Island by BAS Ltd.. All survey procedures were conducted in accordance with the guidelines set out by Duchas – The Heritage Service.

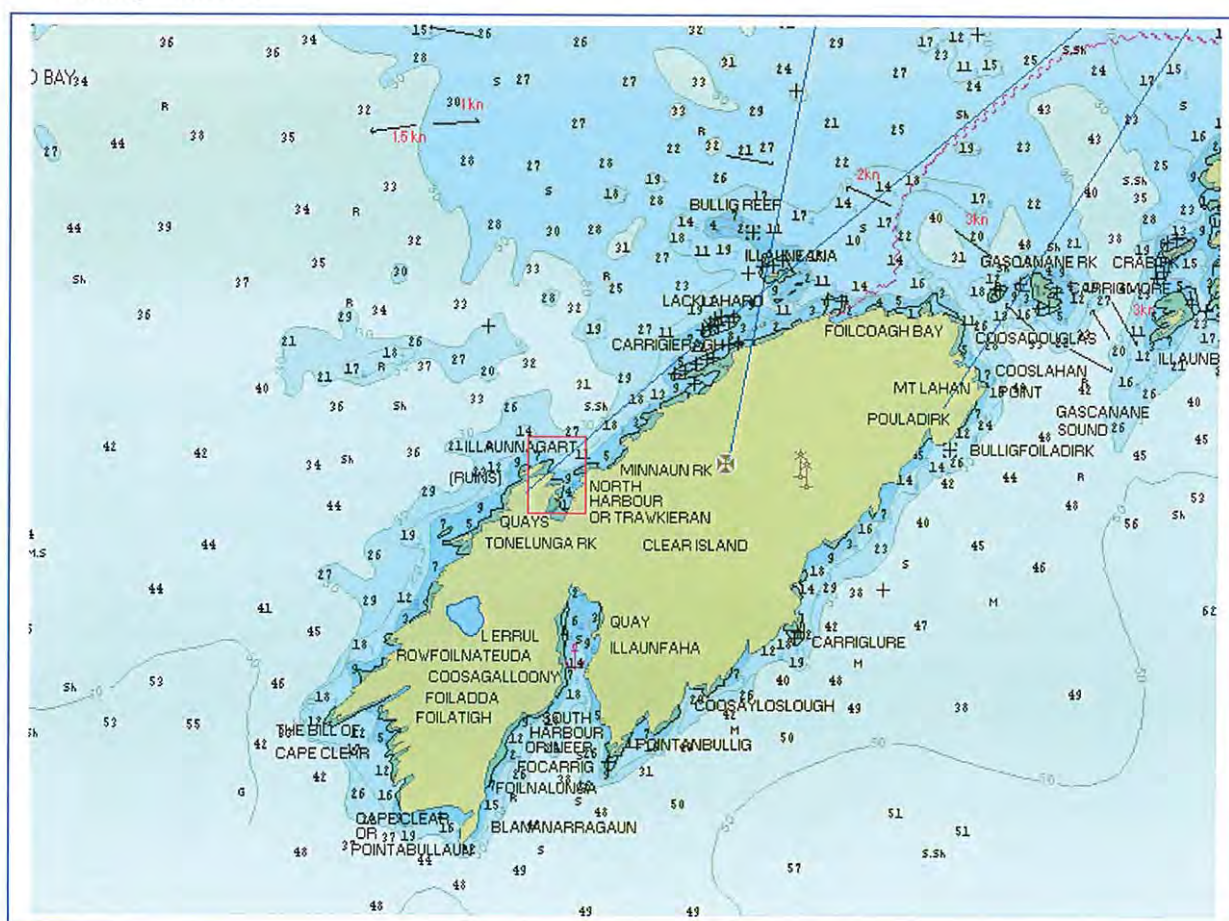


Figure 2.3.2: Area of geophysical survey (highlighted by the red rectangle) overlaid on admiralty chart of Clear Island.

2.3.3 Methodology

2.3.3.1 Introduction

Interpreters of geophysical data tend to concentrate on anomalies, i.e. on appreciable differences between a constant or smoothly varying background and a very strong or 'anomalous' geophysical signature. Archaeo-geophysical anomalies take many forms. For example, a concentration of iron cannon in gullies on a bedrock substrate would give rise to a sharp magnetic anomaly, but may not be imaged in a side-scan sonar survey. Conversely, a wooden vessel on a planar sand substrate may present a noticeable high-backscatter anomaly on side-scan data, but would not be imaged in a magnetometer survey.

For archaeological surveys, a calm sea-state is an essential pre-requisite as the majority of the geophysical interpretation requires the identification of very subtle anomalies. This necessitates the acquisition of very high-resolution data with corresponding high signal-to-noise-ratio (SNR). Therefore, geophysical data acquired for archaeological purposes can only be gathered at sea during calm weather conditions.

2.3.3.2 Differential global positioning system (DGPS)

In order to interpret any geophysical data acquired at sea, the geophysical observation needs to be related to a geographical position. Positional data for the survey, with a quoted accuracy of 1-5m, was provided by a *Litton Marine* LMX 400 series differential global positioning system (Figure 2.3.3). Positional data were downloaded at a 1-second interval via a standard RS-232 serial port interface into *Hypack* software on a PC platform. The WGS-84 ellipsoid was used as datum.



Figure 2.3.3: Left: *Litton Marine* LMX-400 Series differential global positioning system (DGPS); Right: Setting up the DGPS antennae on the deck.

2.3.3.3 Bathymetric survey

Bathymetry is the measurement of water depths. A critical method for the investigations of sites of high archaeological potential is the production of detailed bathymetric basemaps. Both 2- and 3-dimensional bathymetric models can aid our understanding and interpretation of the cultural landscape, providing morphological maps of the seabed, lakebed and riverbed. It should be noted that this technique provides very little detail on the material properties of the seabed or sub-surface. However, when combined with other geophysical techniques, bathymetric data can act as a template for site-specific and reconnaissance scale surveys. The simplest method of conducting a bathymetric survey is to interface an echo-sounder with a DGPS. The echo-sounder measures the time taken for an acoustic pulse to be transmitted from the transducer, to the seafloor and back. This time reading is converted to a depth reading by multiplying the time taken by an assumed velocity of sound in water (in this case a velocity of 1500 ms^{-1} is used).

The Clear Island bathymetric survey was conducted using a single-beam echo-sounder operating at 200 kHz. Positional and bathymetric data were downloaded at 2-second intervals via an RS-232 serial port interface to a laptop. The bathymetric data were corrected for tidal variations over the survey period and plotted as a series of 2-dimensional contour. Sea swell was negligible throughout the bathymetric survey, thereby negating the need for any swell or heave corrections. Layback corrections were not required as the DGPS antenna was mounted directly above the echo-sounder.

2.3.3.4 Side-scan sonar survey

Side-scan sonar is the current instrument of choice in seafloor mapping due to its ability to cover large tracts of the seafloor in short time-periods. The most common uses of side-scan sonar include sediment mapping, shipwreck location and downed aircraft location. A basic side -scan sonar system consists of a top-side processing unit, a cable for electronic transmission and towing, and a subsurface unit (a towfish) that transmits and receives acoustic energy for imaging (Figure 2.3.4). Side-scan transmits narrow beams of acoustic energy (sound) out to either side of the towfish and across the bottom. Sound is reflected back from the bottom and from objects to the towfish. Certain frequencies work better than others, high frequencies such as 500kHz give excellent resolution but the acoustic energy only travels a short distance. Lower frequencies such as 100kHz give lower resolution but the distance the pulse travels is greatly improved. The towfish generates one acoustic pulse at a time and waits for the sound to be reflected back. The imaging range is determined by how long the towfish waits before transmitting the next pulse of acoustic energy. The image is thus built up one line of data at a time. Hard objects reflect more energy causing a dark signal on the image, soft objects that do not reflect as much energy are imaged as lighter signals. The absence of sound such as shadows behind objects show up as white areas on a sonar image, termed 'acoustic shadows'.

The side-scan sonar survey of the Clear Island site was conducted using a dual-frequency *GeoAcoustics* Model 159A side-scan sonar towfish and Model SS941 transceiver system at an operational frequency of 500kHz (Figure 2.3.4). Data were acquired without slant-range correction, with swath width set at 114 m (57 m per channel). Trackline spacing was fixed, ensuring in excess of 200% seafloor coverage was achieved throughout the survey. Sonar data were acquired in SEG-Y format, processed in *GeoPro LC* on an Apple Macintosh platform and logged to 2GB Jaz disks (Figure 2.3.4).



Figure 2.3.4: a) *GeoAcoustics* Model 159-A side-scan sonar towfish with Model SS941 transceiver; b) GeoPro LC software on Apple Macintosh platform.

2.3.3.5 Magnetometer survey

Magnetometers measure the strength of the earth's magnetic field and can detect variations in this field caused by the presence of ferrous material or ferrous objects submerged or buried in the marine environment. The earth's magnetic field varies in intensity over the surface of the earth. At the poles, the field is concentrated and therefore has a high intensity. A magnetometer would read 61,000 nT at the poles, whilst at the equator, the field is quite weak with a typical reading of 24,000 nT. In a localised area, the magnetic field tends to be quite even. If an iron object is introduced into the area (for example a wreck or ordnance), the lines of force are disturbed. The amount of disturbance is a function of the mass of the object.

The magnetometer survey of the Clear Island site was conducted using an *Aquascan* AX2000 proton magnetometer linked to the *Litton Marine* LMX-400 DGPS unit. Trackline spacing followed the same 50m pattern as the side-scan sonar survey, thus ensuring adequate coverage for archaeological survey as recommended by Duchas – The Heritage Service.

2.3.3.6 Post-processing

Post-processing of the geophysical data is broadly sub-divided into the processing of positional information (DGPS), side-scan data and magnetometer data:

- The post-processing of the NMEA strings from the DGPS is conducted to produce the trackline charts of the geophysical surveys. This involves stripping the co-ordinate pairs together with their corresponding GMT time-fix.
- Post-processing of the side-scan sonar data is conducted on a PC platform using *Octopus Marine* 461 processing software, allowing for slant-range correction, dimension and co-ordinate extraction of the SEG-Y data.
- Post-processing of the proton magnetometer data is conducted in *Surfer* and involves correcting the data for di-urnal variations, gridding the data and contouring it at set intervals. 2- and 3-dimensional plots are then constructed and plotted against bathymetry.

2.3.4 RESULTS AND INTERPRETATION

2.3.4.1 Bathymetry

The results of the bathymetric survey of the proposed site are displayed as a 2-dimensional contour plot (Figure 2.3.5) and 3-dimensional model (Figure 2.3.6) below. The site is characterised by a steep gradient seabed, deepening towards the northwest. Water depths within the survey area range from -2 to -34 meters

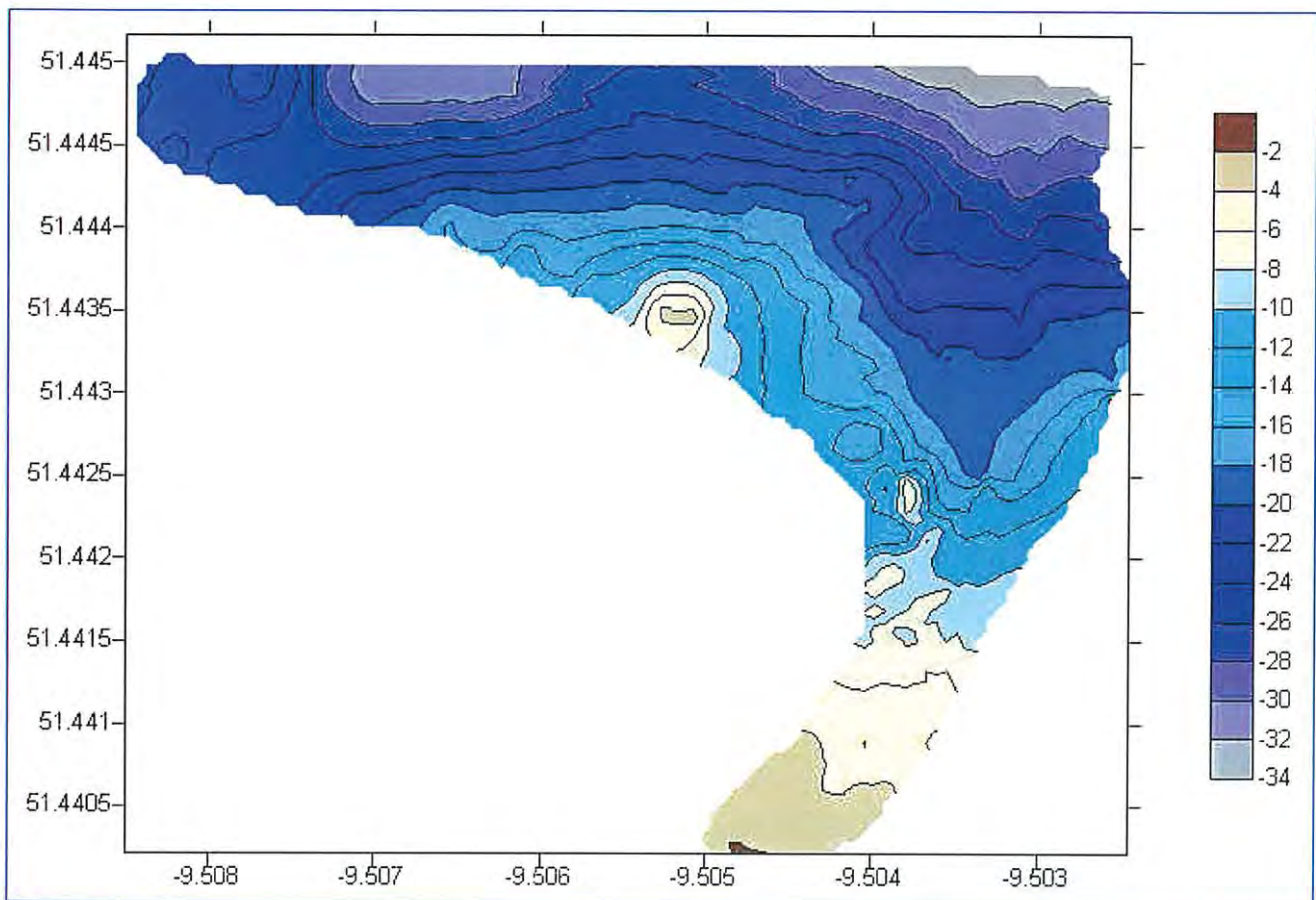


Figure 2.3.5: 2-dimensional contour plot of bathymetric data acquired over the proposed site.
Bathymetry is contoured at 2 m intervals

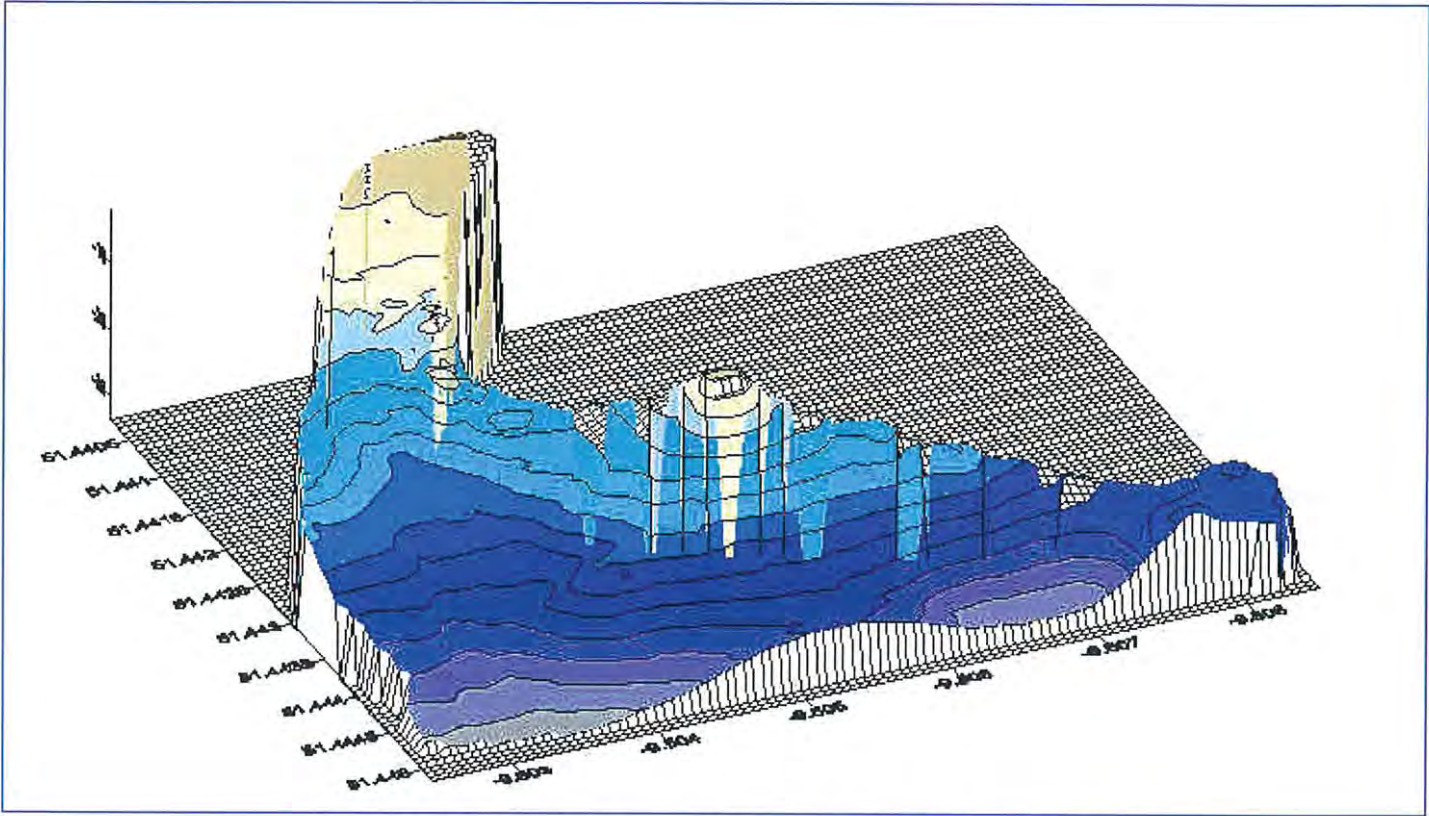


Figure 2.3.6: 3-dimensional model of the results of the bathymetric survey.

2.3.4.2 Geology and seabed sediments

The substrate at the proposed site is predominantly characterised by medium-to-high backscatter, variable tone returns, indicative of a mixed rock / gravel seabed (Figures 2.3.7).

A steep gradient in the water column indicates a sloping seabed, rising in the direction of travel.



Figure 2.3.7: Sonograph indicating the substrate at the proposed development site

2.3.4.3 Magnetometer survey results

The results of the magnetometer survey of the proposed site are presented in Figures 2.3.8 and 2.3.9 as 2-dimensional contour plots of magnetic deviation and in figure 2.3.10 as a 3-dimensional contour plots of magnetic deviation. The magnetic deviation in the survey area ranges from +200 to -4000 nT. There are no strong 'bulls-eye' anomalies in the area. (which normally indicate the presence of ferrous material and possibly cultural material). Overall, the magnetic deviation is high for the area of the harbour reflecting the usage of steel in the construction of the breakwater and pier.

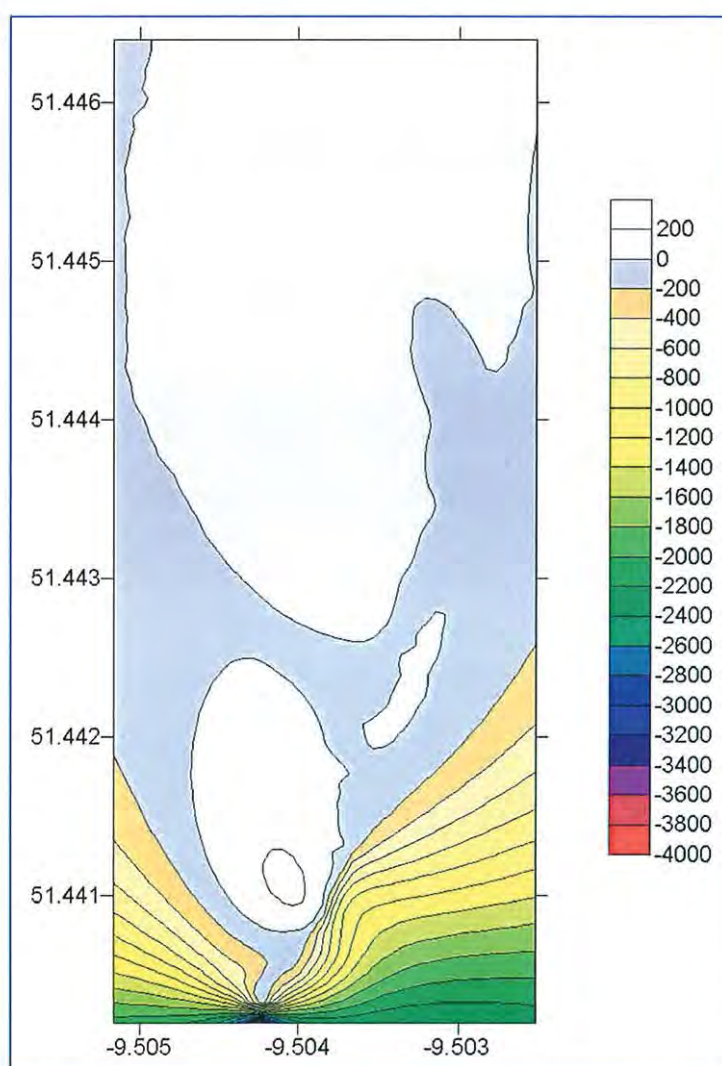


Figure 2.3.8: 2-dimensional contour plot of magnetic deviation for the survey grid plotted from +200 to -4000 nT

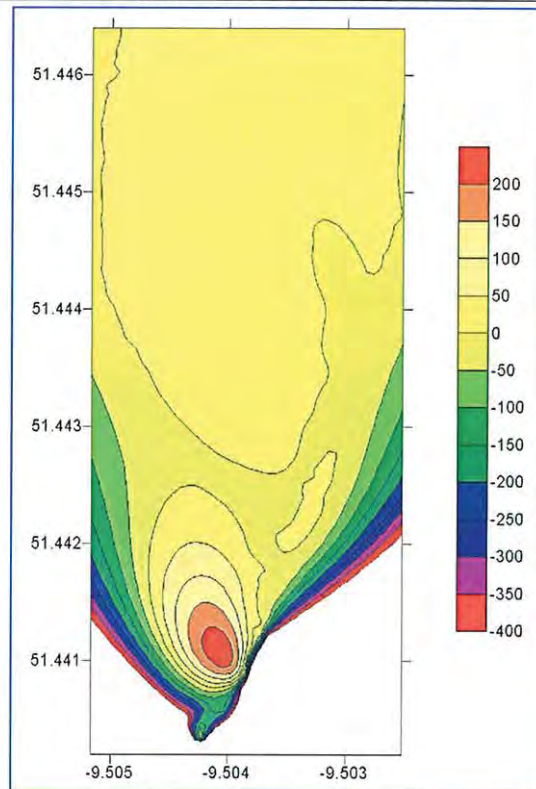


Figure 2.3.9A: 2-dimensional contour plot of magnetic deviation for the survey grid plotted from +200 to -400 nT.

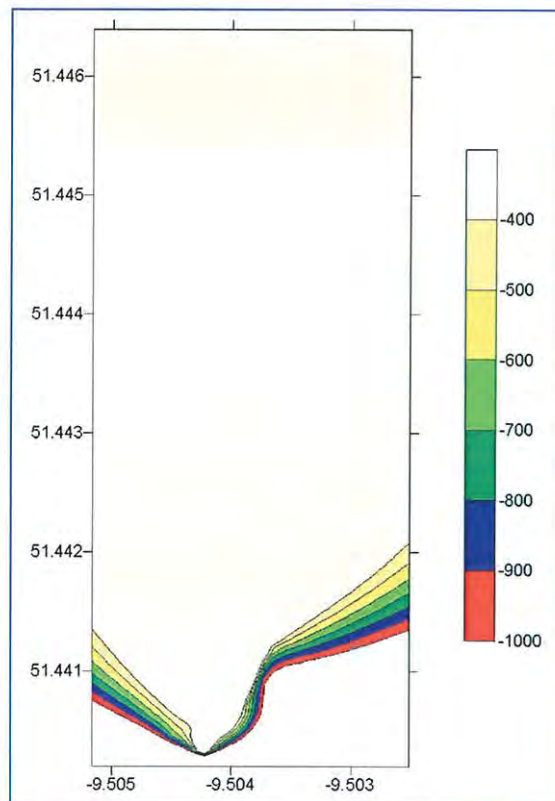


Figure 2.3.9B: 2-dimensional contour plot of magnetic deviation for the survey grid plotted from -400 to -1000 nT

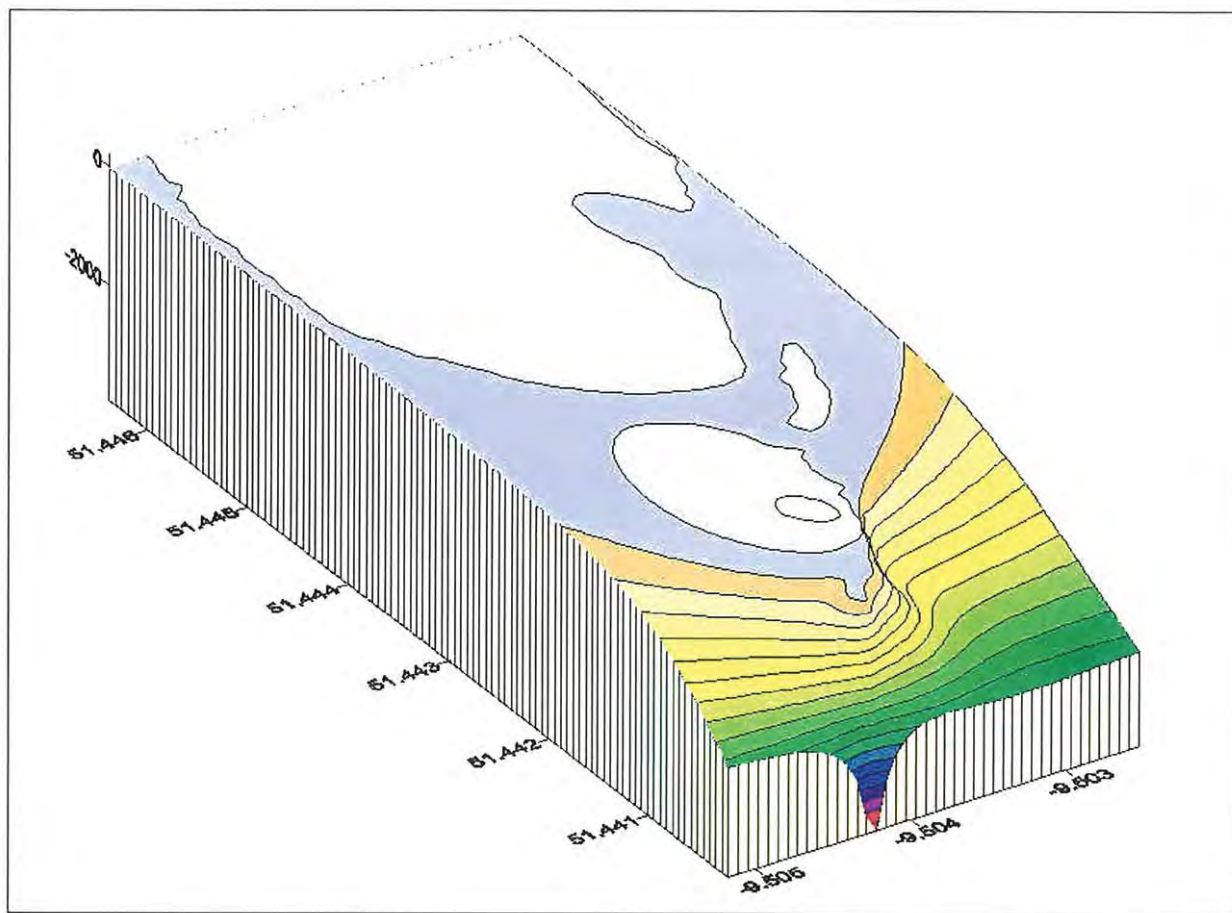


Figure 2.3.10: 3-dimensional model of the magnetic deviation for the survey grid.

2.3.4.4 Side-scan sonar survey results

A total of four anomalies of possible archaeological potential are interpreted from the side-scan sonar survey of the proposed site. The ID tags and Latitude-Longitude pairs for each anomaly are listed in Table 2.3.2. Anomaly dimensions and type-images are listed in Table 2.3.3 and individual descriptions are listed in Table 2.3.4.

ID	Latitude (N)	Longitude (W)
S1	51.44267	-9.503205
S2	51.44154	-9.50338
S3	51.44130	-9.50374
S4	51.44148	-9.50373

Table 2.3.2: Anomaly list interpreted from the 500 kHz side-scan sonar survey. lat-long pairs are given in decimal degrees.

ID	Dimensions (m)	Tentative Interpretation
S1	3m x .5 m Apparent Height.4 M	(S2) High backscatter upstanding anomaly, on a gravel bed. Possible isolated rock or manmade feature
S2	1.3m x.9 m NAH	(s8) High backscatter upstanding anomaly, on a gravel bed. Possible manmade feature
S3	6m X .25M NAH	(s9) High backscatter narrow linear anomaly. Possible chain or warp
S4	4.9m X .25m NAH	(s11) High backscatter narrow linear anomaly. Possible chain or warp

Table 2.3.4: Anomaly descriptions. See Table 2.3.3 for side-scan sonar anomaly images.




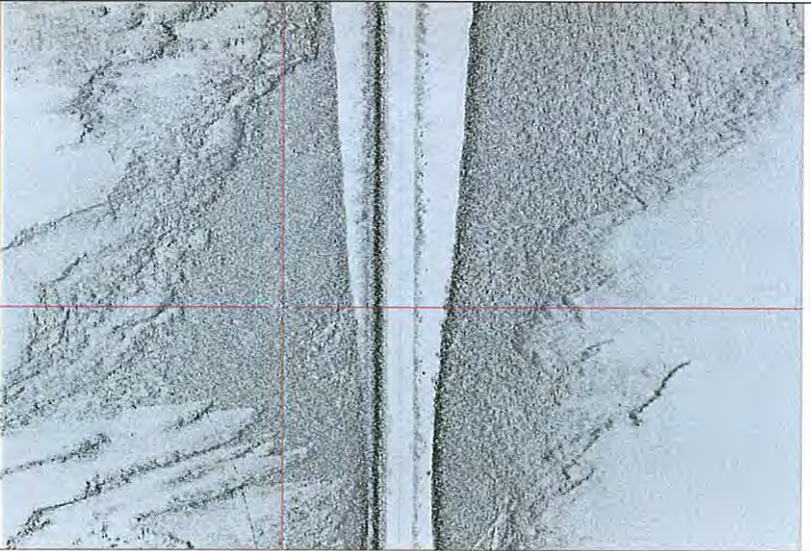
I.D.	Dimensions (m)	Side-scan sonar image
S1	3m x .5 m Apparent Height.4 M	
S2	1.3m x 1.3m Apparent Height .9 m	
S3	6m X .25M NAH	
S4	4.9m X .25m NAH	

Table 2.3.3: Side-scan sonar images and dimensions of the anomalies listed in Table 2.3.2.

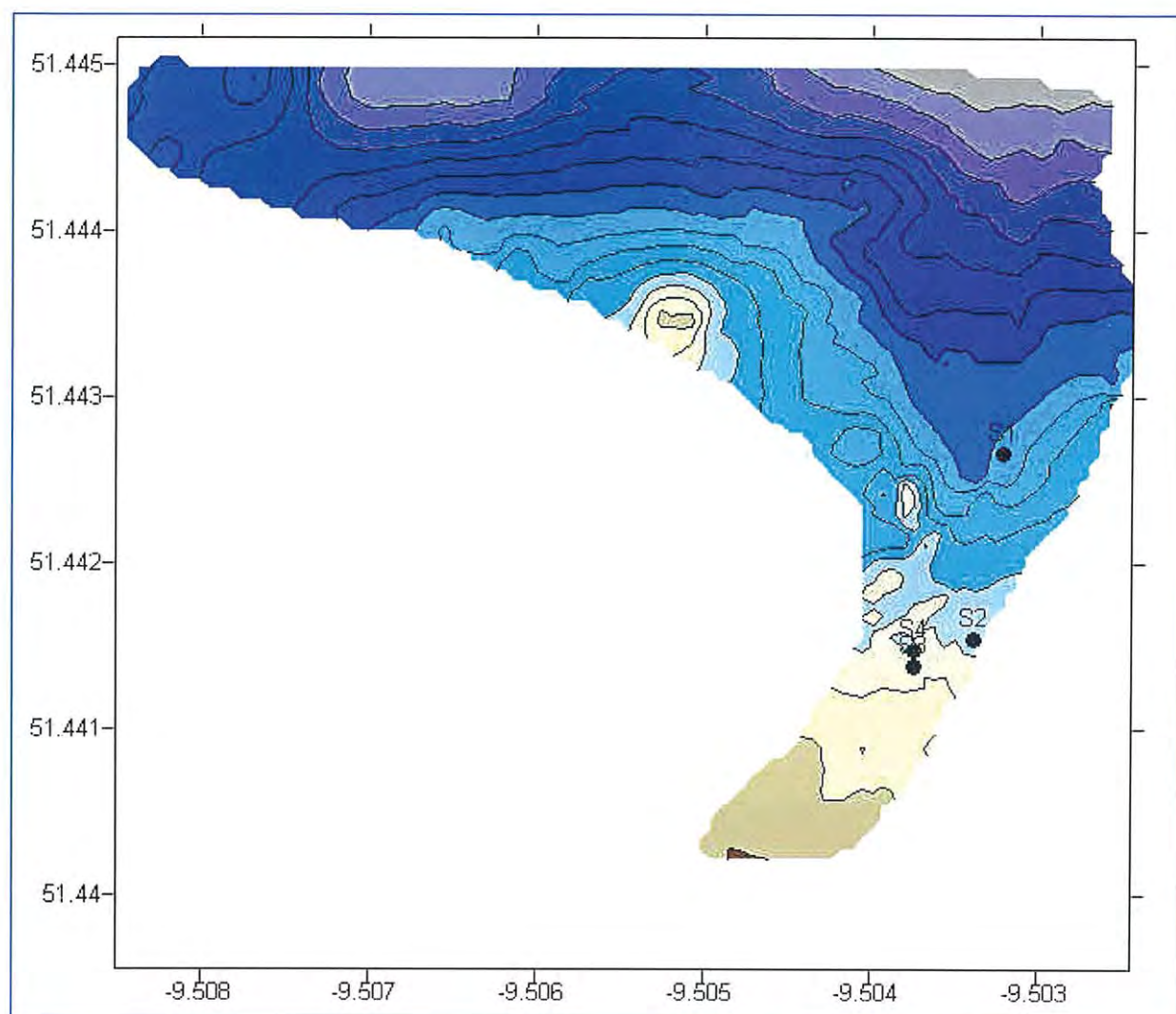


Figure 2.3.11: The position of each side-scan anomaly is plotted against the results of the bathymetric survey for the proposed site

2.3.4.5 Data integration and interpretation

Figure 2.3.12 highlights the spatial distribution of the landmark positions (red) and side-scan (black) anomalies with respect to bathymetric variation over the proposed site.

Anomaly S1 lies in the outer approaches to the harbour in water depths in excess of 20m

Anomaly S2 lies in the inner approaches to the harbour in water depths in excess of 8m

Anomalies S3 & S4, which may be the same object lie in the inner approaches to the harbour in water depths in excess of 8m

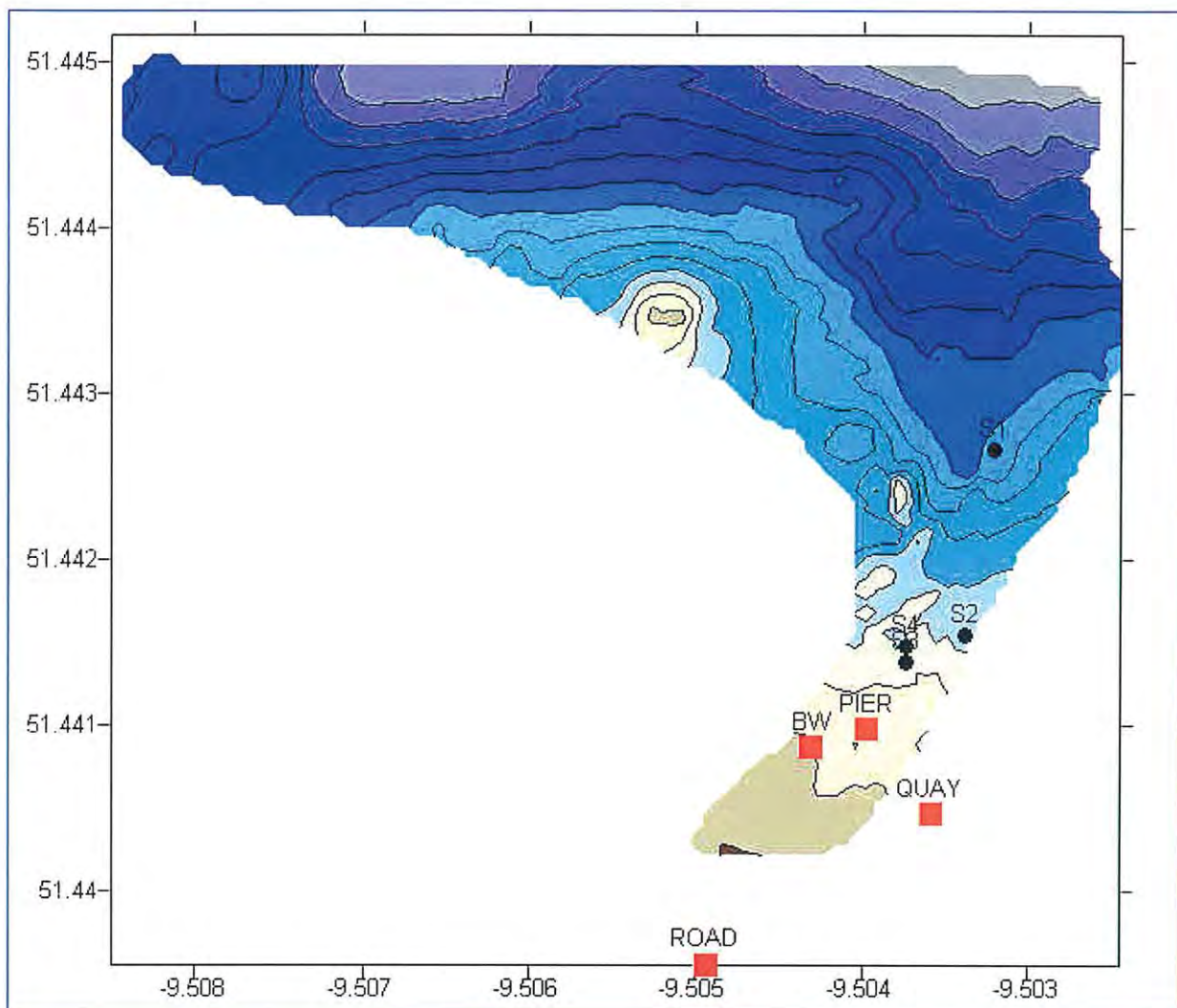


Figure 2.3.12: The position of each sidescan and landmark positions are plotted against the results of the bathymetric survey for the proposed site

2.3.4.6 Results of Survey

The results of the desktop survey would indicate that the inlet now known as the North Harbour has been utilised as a landing place from an early period.

The foreshore survey noted:

- That a number of monuments are located on or close to the foreshore.
- That the original foreshore has been impacted by the construction of a foreshore road.
- That the quays and piers of the harbour were constructed from the 1800's onwards

The seabed survey noted:

- That the seabed within the area of proposed development is comprised of gravels overlain in areas by a silty sand.
- That the seabed within the area of proposed development has the ability to retain archaeology
- That the seabed within the area of proposed development is impacted by the forces of heavy sea swells.
- That no features or artefacts of archaeological importance were located by the seabed survey.

The geophysical survey noted:

- That water depths extended from -2m within the harbour to over -30m in the outer approaches.
- That the approaches to the harbour are magnetically clean and that the harbour area has a very high magnetic signature due to the volume of metal contained within the piers and breakwater.
- That no strong 'bulls-eye' anomalies were recorded in the area. (which normally indicate the presence of ferrous material and possibly cultural material).
- That three anomalies were located by sidescan sonar outside the proposed development zone within the approaches to the harbour

3. IMPACTS CONCLUSIONS MITIGATION

3.1 Impacts

1. A section of the central pier will be encased by the proposed extension works.
2. The seabed within the harbour will be impacted by dredging operations.
3. The upper foreshore will be impacted by infilling and the extension of the foreshore road.
4. The seabed will be impacted by the works required to construct the proposed breakwaters
5. The final design for the development is not complete at this stage and further impacts may be proposed.

3.2 Conclusions

- The area of and surrounding the North Harbour has been inhabited and utilised for maritime activities from an early period.
- The harbour which dominates the site today was constructed in 1840 and upgraded / repaired to the present time.
- The seabed within and surrounding the area of proposed development has the potential to retain archaeology.
- It is possible that peat horizons lie within the seabed.
- It is probable that small artefacts are contained within the seabed of the harbour and its approaches.
- The potential of impacting buried archaeology during the proposed development must be regarded as being high.
- No features of archaeological importance were located by the seabed survey.
- Three anomalies were located by the sidescan survey.
- The pier development will remove a section of the existing stone pier from the visual environment.
- The dredging aspect of the development may impact artefacts contained within the seabed.

3.3 Mitigation

1. The final design proposals should be reviewed for possible further impacts.
2. The records of the site testing operations should be reviewed for the existence of peats.
3. The present central pier should be recorded by way of a drawn and/or photographic survey, prior to the commencement of on site works.
4. The three anomalies located by way of the sidescan sonar survey should be further investigated if they fall within the zone of construction detailed in the final design proposal.
5. Procedures for the archaeological monitoring of the proposed dredging operations should be put in place.

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