ACCIDENT REPORT

Report on the investigation of

the grounding of the cargo ship

Carrier

at Raynes Jetty in Llanddulas, North Wales

on 3 April 2012

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 8/2013 MAY 2013

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ARCC	-	Aeronautical Rescue Co-ordination Centre
ARU	-	Animal Rescue Unit
ATSB	-	Australian Transport Safety Bureau
BBC	-	British Broadcasting Corporation
CHA	-	Competent Harbour Authority
CP	-	Charter party
CPP	-	Controllable pitch propeller
DfT	-	Department for Transport
e.K	-	Eingetragener Kaufmann
FRS	-	Fire Rescue Services
GL	-	Germanischer Lloyd
GT	-	Gross tonnage
kW	-	kilowatt
MCA	-	Maritime and Coastguard Agency
MDHC	-	Mersey Docks and Harbour Company
Met Office	-	Meteorological Office
MoD	-	Ministry of Defence
MRCC	-	Maritime Rescue Co-ordination Centre
MSI	-	Maritime Safety Information
NOS	-	National Occupational Standards
OS	-	Ordinary Seaman
PFSO	-	Port Facilities Security Officer
PMSC	-	Port Marine Safety Code
PSS	-	Port Skills and Safety
RAF	-	Royal Air Force
RNAS	-	Royal Naval Air Station
RN	-	Royal Navy
SAR	-	Search and rescue
SHA	-	Statutory Harbour Authority

STCW	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended
UKHO	-	UK Hydrographic Office
VHF	-	Very high frequency

Times: All times used in this report are local (UTC + 1) unless otherwise stated.

Carrier

SYNOPSIS

At 2008 on 3 April 2012, the cargo vessel *Carrier* ran aground on the coast of North Wales. The vessel had been loading limestone at Raynes Jetty (attached to Raynes Quarry at Llanddulas) when the weather deteriorated rapidly. The master decided to finish loading and put to sea; however, strong winds and large waves overwhelmed the vessel while it was manoeuvring away from the jetty, causing it to be driven onto the shore. *Carrier* suffered substantial damage and was declared a 'total constructive loss'. Approximately 33000 litres of gas oil was spilled into the sea. Some delays were caused to the shore-based rescue operation due to a lack of serviceable search and rescue helicopters, but ultimately the crew were rescued from the stricken vessel without injury.

The UK's Meteorological Office had disseminated repeated warnings of gale force winds both on the day of the accident and the previous day. Although *Carrier*'s master had this information, it was evident that he considered there to be enough time for him to berth and load before the weather deteriorated. Staff at Raynes Jetty had also formed the impression that the wind speed would not increase until much later in the evening. However, as forecast, the wind speed increased rapidly from 1820 onwards. The master was keen to load as much cargo as possible, and although he first decided to leave the berth at 1900, he gave the final order to cease loading nearly an hour later.

Raynes Jetty was a privately owned harbour, considered to be an extension of the quarry, with no statutory or competent harbour authority. Although some of the risks of marine operations at Raynes Jetty had been considered, there was no safety management system of the type recommended in the Port Marine Safety Code. As a result, the marine operations at the jetty had not been adequately planned or controlled.

The investigation found that the terminology used in UK maritime weather forecasts was confusing to non-native mariners and shore-based staff who had not undergone marine training. There is a significant risk that the people the forecast is designed to assist do not understand what is being reported.

The Department for Transport has been recommended to engage with the Maritime and Coastguard Agency and the Port Marine Safety Code steering group to broaden the application and uptake of the Port Marine Safety Code by operators of non-statutory harbours. The Maritime and Coastguard Agency has been recommended to work with the UK Meteorological Office to ensure that terminology used in weather broadcasts will be clearly understood by mariners and other users of the service. The operators of Raynes Jetty have been recommended to improve the control and oversight of its marine operations through the implementation of an appropriate marine safety management system; a recommendation has also been made to the owner of *Carrier* designed to ensure masters of its vessels are provided with the information and guidance needed to make properly informed decisions when trading in areas where severe weather is likely.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *CARRIER* AND ACCIDENT

SHIP PARTICULARS

Vessel's name	*Carrier*
Flag	Antigua and Barbuda
Classification society	Germanischer Lloyd
IMO number/fishing numbers	8504959
Type	General cargo
Registered owner	Reederei Erwin Strahlmann e.K., Germany
Manager (crew and technical)	Reederei Erwin Strahlmann e.K., Poland
Year of build	1985
Construction	Steel
Length overall	82.02m
Gross tonnage	1587
Main propulsion	Deutz KHD SBV 6M 628, 882kW at 230RPM
Bow thruster	120kW, 3 speed electric motor-driven
Steering	Electro hydraulic twin ram steering with Becker rudder
Authorised cargo	Dry bulk cargo

VOYAGE PARTICULARS

Port of departure	Belfast, Ireland
Port of arrival	Llanddulas, North Wales, UK
Type of voyage	Short international
Cargo information	Limestone
Manning	7

MARINE CASUALTY INFORMATION

Date and time	3 April 2012, 1909 UTC
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Raynes Jetty, Llanddulas
Place on board	Entire ship
Injuries/fatalities	None
Damage/environmental impact	Total constructive loss, approximately 33000 litres of gas oil spilled
Ship operation	Leaving berth
Voyage segment	Departure
External & internal environment	Wind speed 40 knots, wave height 4m, tide: high water at 2125
Persons on board	7

1.2 BACKGROUND

Carrier was mostly engaged in carrying bulk cargoes around the coast of the UK and Ireland, with occasional trips to continental Europe. Limestone from Raynes Quarry **(Figure 1)** at Llanddulas, to the east of Anglesey in North Wales, was transferred to a dedicated jetty where the cargo was loaded on to ships. The use of Raynes Jetty was constrained by the tidal height. The window for vessels to be alongside the jetty was normally from 4 hours before to 1 hour after high water. Occasionally, vessels were deliberately sat aground on the berth to await the next high water window but this was not considered to be safe practice due to the presence of scattered rocks in the proximity of the jetty[1] **(Figure 2)**. *Carrier* had loaded at Raynes Jetty on two occasions in the 5 year period preceding the accident: once in 2010 and again in December 2011. Due to poor trading conditions, the vessel had been laid up without cargo from June 2011 to October 2011.

1.3 NARRATIVE

1.3.1 Anchorage and berthing

On the morning of 3 April 2012, *Carrier* arrived at Llanddulas, approximately 10 miles east of Great Ormes Head **(Figure 3)**, from Belfast in Northern Ireland. *Carrier* had been delayed leaving Belfast and another vessel had berthed on the morning high tide at Raynes Jetty. *Carrier*'s master was asked by the jetty staff to anchor his vessel 2nm north of the jetty and wait for the next tidal window to load its cargo. The weather was forecast to deteriorate during the day, with gale force winds predicted for the Irish Sea area.

At 1600, the master and the jetty staff discussed the weather and decided that it was safe for the vessel to go alongside and load. At around 1645, *Carrier* weighed anchor and proceeded to Raynes Jetty. At the time, a force 5 wind was blowing from a west-north-westerly direction. By 1730, the vessel was tied up, port side alongside the western side of the jetty. The vessel was secured with two head lines, two stern lines and forward and aft spring lines. The master and the jetty operators then held a brief discussion during which they decided that if the weather deteriorated, loading operations would be aborted and the vessel would leave the berth.

Carrier was berthed alongside so that its stern was in line with the seaward end of the jetty. There was a drop of approximately 3m from the jetty to the vessel's aft mooring deck; this caused the stern lines to have a steep lead to the securing points on the jetty.

1.3.2 Loading

Cargo work commenced at 1739. The vessel had a stern trim of 1m with an aft draught of 2.7m. There were approximately 47,000 litres of gas oil in the fuel tanks, 380 litres of lubricating oil in the main engine sump and small quantities of slops on board.

Carrier had been contracted to load 2200 tonnes of limestone at Raynes Jetty for delivery to Rye in the south-east of England. Although the declared rate of loading at Raynes Jetty was 1100 tonnes per hour, the cargo loading meter on the jetty indicated that only 700 tonnes was loaded in the first hour. Part of the cargo

[1] Raynes Jetty was not a designated NABSA (Not Afloat But Safely Aground) berth.

Figure 1: Raynes quarry and Jetty

Figure 2: Seabed and scattered rocks close to Raynes Jetty

Reproduced from Admiralty Chart BA 1978-0 by permission of the Controller of HMSO and the UK Hydrographic Office

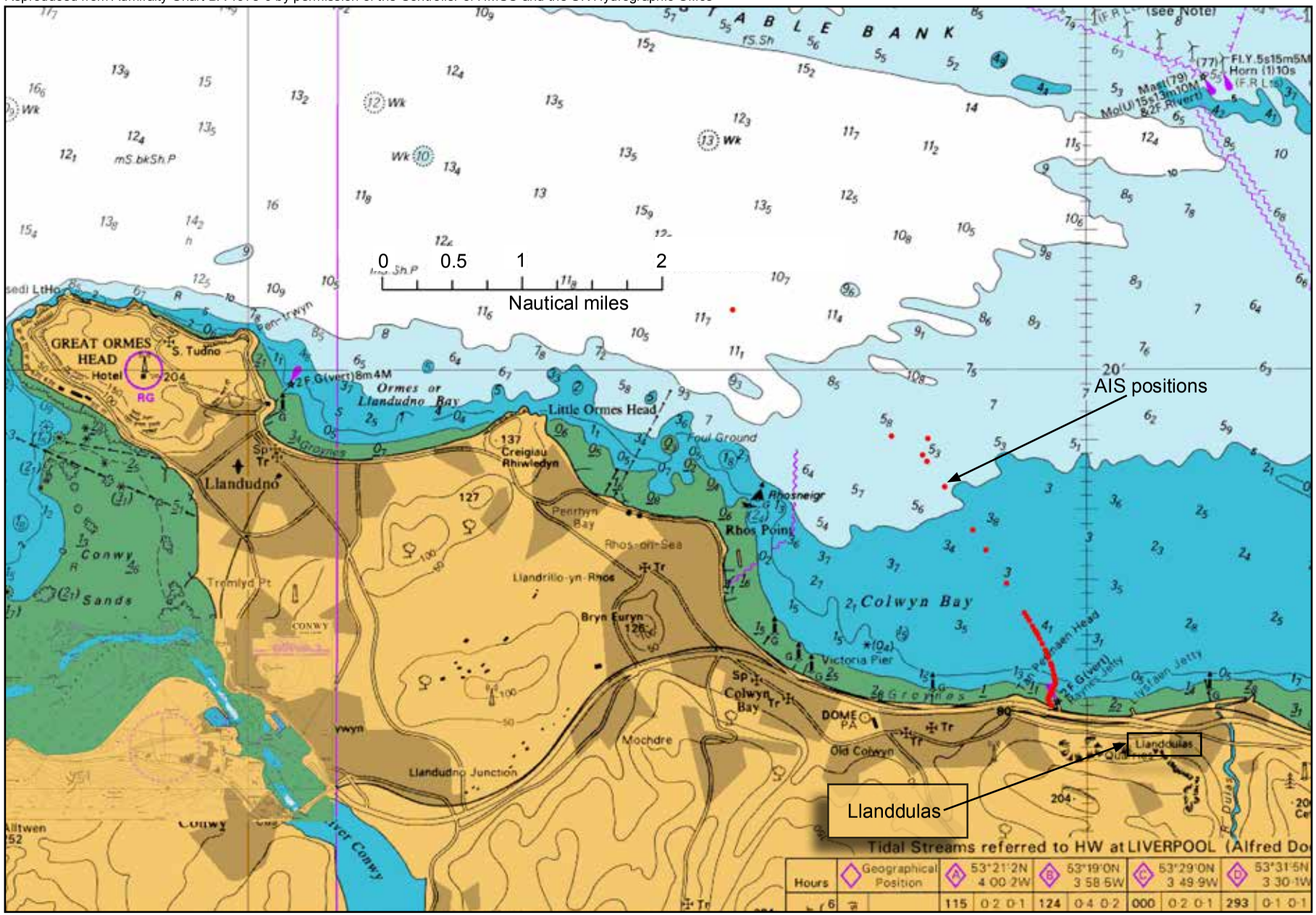


Figure 3: Chart extract showing the location of Llanddulas and *Carrier*'s AIS track towards the berth

transfer system from the quarry to the jetty had become constricted by a lump of cargo; the problem was quickly resolved by the quarry personnel and the loading rate was restored to normal.

During the loading operation, the chief engineer pumped out approximately 600 tonnes of ballast water, following a sequence agreed with the chief officer. The deck ratings and third officer monitored the mooring lines and the chief officer supervised the loading of cargo. A jetty supervisor and his assistant managed the operation of the loading equipment from a cargo control cabin on the jetty.

1.3.3 Deterioration of the weather

Between 1820 and 1830, the direction of the wind veered from west-north-west to north-east. The wind speeds began to increase rapidly after 1830 and, by 1840, gusts of 25 knots were recorded. At around 1900, the master decided to abort loading and leave the berth. He did not convey his intention to the jetty staff, although he had expressed his concern to them about the deteriorating weather conditions at around 1845. The master ordered the engines to be prepared for departure and asked the crew to secure an additional line at the stern. He was concerned about the two existing stern lines which were chafing at the fairleads due to the steep lead to the jetty. Within a few minutes of passing the third line, the two original stern lines parted. The vessel remained in approximately the same position and, by 1915, the main engine and bow thruster were ready to be used.

The master asked the jetty supervisor to stop loading at around 1923 and the supervisor shut the cargo feeder flap in the quarry using a remote operating switch located in the cargo control cabin. Concerned about the deteriorating weather, the jetty supervisor telephoned the shipping agent and told him about the situation. The master then asked the jetty supervisor to restart loading. As it was not possible to re-open the cargo feeder flap remotely, the supervisor contacted his colleague at the quarry loader to re-open it. The cargo loading continued while the crew closed *Carrier*'s hatch covers. The shipping agent arrived at the jetty at approximately 1940. By 1956, loading was completely stopped and all the hatch covers were closed. A total of 1686 tonnes of cargo had been loaded.

1.3.4 Departure from Raynes Jetty and subsequent grounding

The master and chief officer were in the wheelhouse and the chief engineer was in the engine room for the departure. The master operated all the manoeuvring controls himself and did not discuss his intended actions with anyone. He set the propeller pitch to around 50% astern and instructed the third officer and three other crew members to let go all the lines except the forward spring. When the vessel's speed reached 0.6 knot, the forward spring was released.

Carrier was underway by about 2000. By this time, the sea had become very rough with wave heights in excess of 4m. The master attempted to keep the vessel parallel to the jetty and, although he increased the astern pitch, the vessel's speed did not exceed 1.4 knots. The waves washed on to the main deck and the master asked all the crew on deck to go up to the wheelhouse. With the forward most quarter of the vessel's length still overlapping the seaward end of the jetty, *Carrier* was pushed by wind and breaking waves approximately 50m to the west **(Figure 4)**. Astern speed reduced to 0.3 knot.

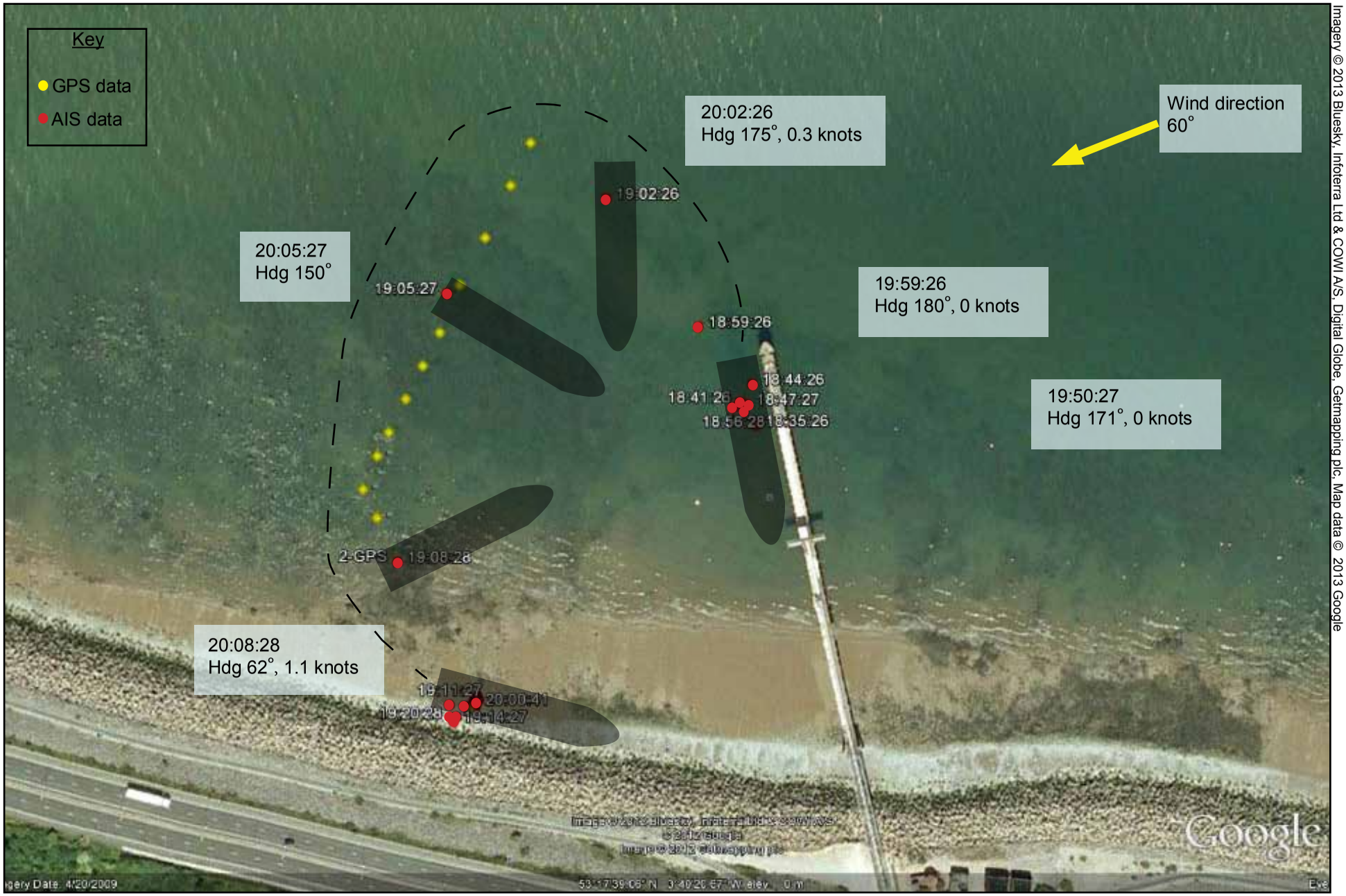


Figure 4: Simulation, derived from AIS track and GPS data, of *Carrier* leaving Raynes Jetty and grounding

Realising that the vessel was not making sufficient sternway and was beginning to be forced bodily towards the beach, the master put the CPP to full ahead and placed the steering hard to port. Although the vessel's bow turned partially into the wind, *Carrier* continued to be forced onto the beach until its stern grounded at 2008. The master informed the jetty staff that the vessel was aground, and at 2014 the jetty supervisor called the coastguard using the very high frequency (VHF) radio in the loading cabin. Coastguard officers at Liverpool Maritime Co-ordination Centre (MRCC) responded to the broadcast. Within the next 2 minutes, the vessel was blown beam on to the tetrapods[2] **(Figure 5)** that made up the coastal defences on the beach. The master called Liverpool MRCC and apprised them of the situation. He activated the engine emergency stop and called the chief engineer to the wheelhouse.

Figure 5: *Carrier* beached against the tetrapods lining the shore

1.3.5 Rescue attempts

The vessel continued to be battered against the tetrapods, causing fixtures on the bridge to break free and fall down. The wind speed exceeded 40 knots and waves were breaking at the level of the bridge. Coastguard officers at Liverpool MRCC handed over co-ordination of the incident to their colleagues at Holyhead MRCC. This MRCC was closer to Raynes Jetty, and coastguard officers began considering the various options available for rescuing the crew.

At 2029, coastguard officers from Holyhead MRCC mobilised the all weather lifeboats stationed at Rhyl and Llandudno to provide additional support from seaward. Due to the wind and sea conditions, both lifeboats were unable to approach the vessel and had to remain approximately 150m away from the scene.

[2] Tetrapods dissipate the energy of the waves washing into the coast

They stood by to assist in case the vessel broke up. Having consulted with other emergency services, Raynes Jetty staff, and the master of *Carrier*, coastguard officers from Holyhead MRCC decided that, given the environmental conditions, it would be best to rescue the crew either from the land or by air.

The coastguard local manager, in consultation with the police, requested the local Fire and Rescue Services (FRS) to provide lighting and general support to the rescue operation. An animal rescue unit (ARU) was thought to be most suited to the situation as it carried electrical generators and portable lighting, and it was brought to the scene. FRS staff initially chose to set up the ARU on the cycle path which ran close to the beach, however they subsequently decided against this option because the location was too exposed to the effects of the very rough seas. At 2140, police officers closed the A55 dual carriageway road which ran along the coast, allowing the ARU to be set up on the road. An ambulance unit also arrived at the scene in preparation to receive the crew members from the vessel. Due to the darkness and adverse weather, the extent of pollution from the vessel could not be ascertained, but there was a strong smell of gas oil in the area. It was decided that it would not be possible to rescue the crew from the land.

1.3.6 Helicopter rescue

At 2018, shortly after the first reports of the grounding, coastguard officers from Holyhead MRCC requested the duty staff at the Aeronautical Rescue Co-ordination Centre (ARCC) at Royal Air Force (RAF)Kinloss to make preparations for an air rescue. There were four Search and Rescue (SAR) helicopters based relatively close to Raynes Jetty, at RAF Valley. However, none were available due to technical problems: one had a fault in the flying control system; one was having an engine replaced; one had a cracked airframe; and one had an unserviceable gearbox. The ARCC duty controller then contacted RAF Leconfield on the east coast of England to request a SAR helicopter. Due to poor weather conditions, including snow showers in northern central England, it was decided to deploy helicopter R177 based at Royal Naval Air Station (RNAS) Prestwick in Scotland instead. R177, which was completing a SAR response to another incident at the time, diverted to Llanddulas and arrived on scene at 2200 after refuelling at RAF Valley. The ARCC duty controller also asked Irish Authorities to launch R116, based in Dublin. This also suffered a technical fault while preparing to launch and was not available to assist.

Carrier's crew were winched off the vessel and landed onto the A55 dual carriageway in pairs. Large waves were breaking over the vessel throughout. At around 2240, while the third officer was being connected to the winch line, a large wave engulfed the bridge and swept him onto the superstructure. This resulted in the winch line being caught on a light fitting on the vessel. The line was freed and the winching operation recommenced; however, the winch stopped working and the third officer was left hanging approximately half a meter below the helicopter. A crew member on R177 pulled him in, and after landing him on the A55, R177 went to RAF Valley for repairs. This left the aircraft's winchman and two of *Carrier*'s crew members still on board the vessel.

At 2249, the duty controller at ARCC Kinloss contacted RAF Leconfield again. Although the weather conditions were still very poor, helicopter R128 was dispatched from the East Riding of Yorkshire, to North Wales. It arrived at the scene at 0035 after a hazardous low level flight though poor weather in northern central England.

By 0049 on 4 April, the crew of R128 had rescued the winchman from R177 and the remaining two crew members from *Carrier*. The lifeboats had left the scene by midnight as their crews, having been on scene in very rough sea conditions for several hours, were suffering from sea sickness.

1.3.7 Damage, pollution and wreck removal

The environmental conditions remained severe well into the next day **(Figure 6)** and the vessel continued to suffer further damage as it moved with tidal and wave effects. Almost all of *Carrier*'s double bottom tanks, and wing tanks on the starboard side that extended below the waterline, were breached. Approximately 33000 litres of gas oil, and a few hundred litres of lubricating oil from the main engine sump, leaked into the sea.

Figure 6: Continuing severe environmental conditions on 4 April 2012

Carrier's rudder and propeller were severely damaged during the grounding; the tips of all four propeller blades were lost **(Figure 7)**. The vessel remained upright, despite wave action and the change of tides. After the grounding, parts of the tetrapods penetrated into the hull **(Figure 8)** and the engine room was breached. Accommodation bulkheads collapsed and a large number of fittings, both on the wheelhouse and in the accommodation, broke loose.

Carrier was declared a 'total constructive loss' by its insurers. A demolition and wreck removal company cut up the vessel in-situ, removing the last of the wreck on 9 May 2012.

Figure 7: Propeller and rudder damage (**inset:** damaged blade tips)

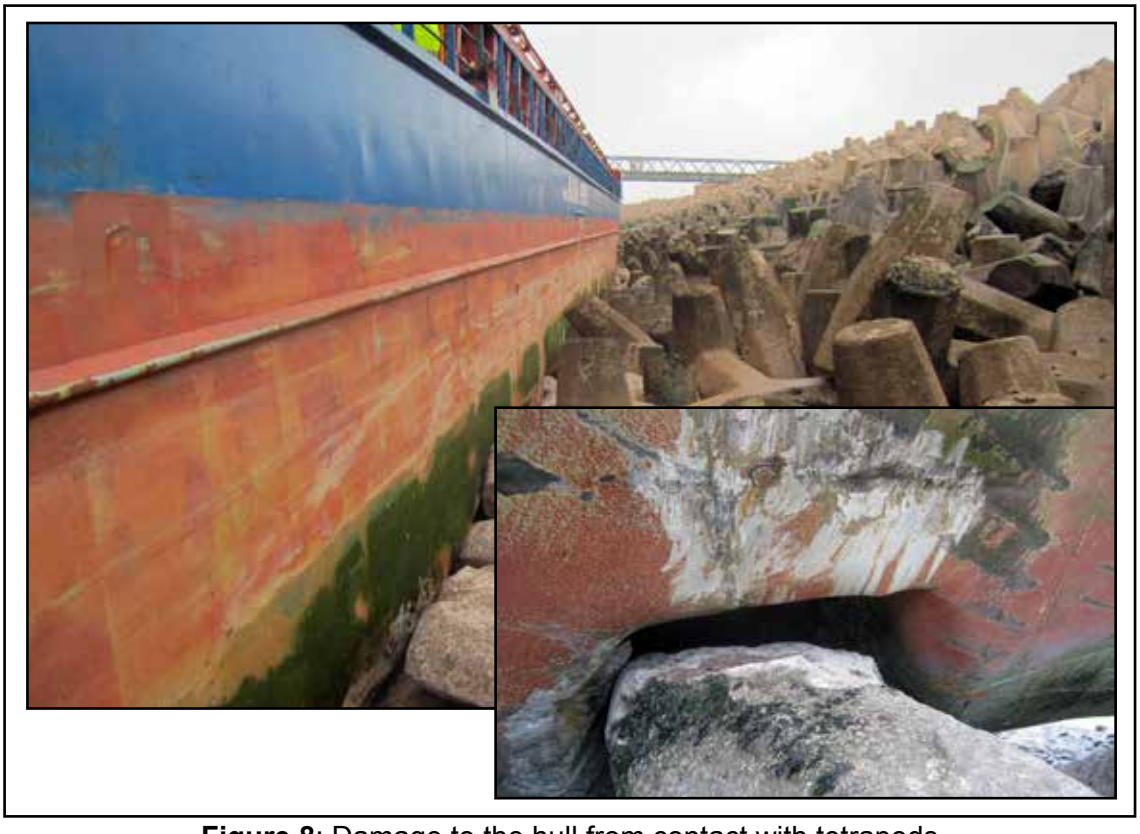


Figure 8: Damage to the hull from contact with tetrapods

1.4 CREW

All seven crew members on board *Carrier* were Polish nationals. There were three deck officers: the master, chief officer and third officer. The engine department consisted of only the chief engineer. The three remaining crew members comprised two deck ratings and a cook who also acted as an ordinary seaman (OS).

The master, who had a total of 17 years' experience in the rank, joined *Carrier* for the first time on 7 February 2012. He held an STCW[3] II/2 (unlimited) master's certificate of competency issued by the Polish Maritime Administration and endorsed by the maritime administration of Antigua & Barbuda. He had been employed as master on other vessels operated by Reederei Erwin Strahlmann Eingetragener Kaufmann (e.K.) since 2005. The master had visited Raynes Jetty only once before, in 2007.

The master and chief officer normally stayed on the bridge during berthing and unberthing operations. Mooring duties were carried out by the third officer and the deck ratings (including the OS-cook). The chief engineer normally remained in the engine room during manoeuvring.

1.5 OPERATION AND EMPLOYMENT OF *CARRIER*

1.5.1 Ship owner and charterer

Carrier was owned by Reederei Erwin Strahlmann e.K. Germany, which was established in 1988. Technical and crew management was carried out by Erwin Strahlmann e.K, Poland. At the time of the accident, the company owned 46 vessels. The majority of the crew on board these vessels were Polish nationals. Echoship, Denmark acted as the cargo broker for Reederei Erwin Strahlmann e.K. and the companies had been closely associated for many years.

1.5.2 Ship broker and chartering agent

Quality Freight (UK), a ship broker and chartering agent based in Liverpool, dealt with all the cargoes from Raynes Jetty. The company set up the Charter Party (CP) agreement for *Carrier* between Echoship and CEMEX UK Materials Ltd and also appointed the shipping agent for the vessel. The shipping agent was a retired master mariner who had 25 years' experience in the rank of master.

Representatives of Quality Freight (UK) normally communicated directly with the masters of the vessels fixed to load at Raynes Jetty. Each vessel was sent a four page document **(Annex A)** entitled 'Information sheet – Raynes Jetty, Llandullas'. The document gave a detailed description of the loading constraints at Raynes Jetty due to the tidal and exposed nature of the area; the limitations imposed by its physical size; loading rates; communication channels; requirements for a pilot; and signals at the jetty during night and day. Concerning the weather and tidal conditions, it stated:

> *"strong to gale force easterlies may prevent vessels from loading. With westerly winds and a north westerly swell vessels are advised to keep well clear of the jetty until called to go alongside approximately 4.5 hours before hw Liverpool."*

[3] STCW – International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (as amended).

The document also stated:

"pilotage is not compulsory, and most vessels do not bother with one."

This document was sent to *Carrier* in December 2011 when the vessel last called at Raynes Jetty. The document was not re-sent before *Carrier*'s final visit to Raynes Jetty and the master at the time of the accident was unaware that the document either existed or that it might still be on board.

On 2 April, a director of Quality Freight (UK) contacted the master by email and suggested to him that if he had visited Raynes Jetty in the past, he might not need to employ a pilot. The master confirmed that he had been to Raynes Jetty before and stated that he would not need a pilot. He also received loading instructions from Quality Freight (UK); he was not sent a copy of the charter party.

1.5.3 Charter party details

The CP between Echoship (as agents to owners) and CEMEX UK Materials Ltd (the operators of Raynes Quarry and Jetty) was dated 29 March 2012. The freight rate for limestone was quoted as £7.50 per tonne. The CP contained a clause stating that if the vessel was prevented from loading for 24 hours due to bad weather, the owners had the option to cancel the voyage without incurring any penalties (over and above the loss of the freight).

1.6 ENVIRONMENTAL CONDITIONS

1.6.1 Sources of weather forecast information

The Maritime and Coastguard Agency (MCA) is responsible for the provision of Maritime Safety Information (MSI) to ships at sea around the UK. This service includes the broadcast of gale warnings, shipping forecasts, and inshore weather forecasts. The UK Meteorological Office (commonly referred to as the Met Office) sends routine weather forecasts and gale warnings by email to each of the MCA's MRCCs and the British Broadcasting Corporation (BBC). The shipping forecast, including any gale warnings, is broadcast four times a day on BBC Radio 4. The MCA also broadcasts meteorological information via the NAVTEX[4] system.

On the day of the accident, the NAVTEX broadcasts comprised: shipping forecasts at 0320, 0720 and 1920; inshore weather forecast at 0300, 0920 and 2120; and gale warnings on receipt from the Met Office. Gale warnings were broadcast as and when necessary and remained in force until revoked. The NAVTEX receiver on *Carrier* was in good working order and printed the transmissions as they were received. The printouts received from 1 April onwards had been removed from the instrument and pinned up on a noticeboard on the bridge. There was no NAVTEX receiver at Raynes Jetty or in the office at the quarry.

From 0750 on 3 April, coastguard officers from Holyhead MRCC broadcast weather information transmissions on VHF radio at 3-hourly intervals; these included the shipping forecast, navigation warnings and inshore weather forecast. The staff at Raynes Jetty did not listen to these announcements.

[4] NAVTEX is an international automated direct-printing service for promulgation of navigational and meteorological warnings and other urgent information to vessels.

The manager of Raynes Quarry referred to websites such as '*XCWeather*' and those operated by the BBC for weather forecasts when planning loading operations. On the day of the accident, before the vessel was brought in to load, the quarry manager and loading supervisor at Raynes Jetty reported looking at either one or both of these websites, which they understood to be linked to the Met Office's Inshore Waters forecast. The Inshore Waters forecast for 3 April for Great Ormes Head to the Mull of Galloway was 'west veering north 4 or 5, increasing 6 to gale 8'. They formed the impression that the winds would increase to force 5 by 2100 that evening. Both the Met Office and BBC confirmed that their websites were kept updated whenever gale warnings were in force.

An anemometer was available in Raynes Jetty's loading control cabin. It was not used on the day of the accident. The general rule of thumb employed by the jetty staff was to recommend vessels not to berth if '*white horses*'[5] were visible. Although jetty staff often deferred to a vessel's master over whether or not to berth, they had, on rare occasions, stopped vessels from coming in to load during bad weather.

The Mersey Docks and Harbour Company (MDHC) had contracted with the Met Office to provide a more detailed 5-day forecast given at 3-hourly intervals. The forecast included detailed predictions of wind speed averages and gusts at heights of 10m, 50m and 100m above sea level; wind direction; and the period, direction and height of waves and swell **(Annex B)**. This data, in tabular and graphical formats, was used to help manage port and pilotage operations.

1.6.2 Weather forecasting terminology

The terminology used by UK maritime weather forecasters has a specific structure and meaning. However, *Carrier*'s master was not sure of the meaning of some of the words used in UK maritime weather forecasts. The terminology is defined in The Admiralty List of Radio Signals Volume 3(1). The words used to quantify the expected time of the arrival of gales from the time of issue of the warnings were: 'imminent' to mean within 6 hours, 'soon' to mean between 6 and 12 hours, and 'later' to mean after 12 hours. There is no common international terminology; other national meteorological offices specify the time periods in hours, or use more readily understood terms such as morning, forenoon, and afternoon **(Table 1)**.

A list of terms used by the UK Met Office is found at **Annex C**.

[5] The term '*white horses*' was used to describe when the weather deteriorated such that crests of waves became sufficiently large so that they broke and appeared to be white in colour.

National Weather Service	Terminology to indicate validity period for gale warnings
UK Met Office	Expected period from the time of issue: Imminent (within 6 hours), Soon (between 6 hours and 12 hours), Later (after 12 hours)
Australian Bureau of Meteorology	Time of issue and description of the speed of movement of the weather system in the area concerned
US National Weather Service	Time period for which the warning is valid e.g. *Gale warning in effect from 7 am this afternoon to 8 pm Eastern Standard Time*
Meteo-France	Time period for which the warning is valid e.g. *Friday 1800 to Saturday 0600*.
Environment Canada	Time period for which the warning is valid
South Africa Weather Service	Time of issue or time period for which the warning is valid e.g. *Marion forties east: W to SW 35 in the south in the second half of the period*
India Meteorology Department	Part of the day for which the warning is valid e.g. *morning, forenoon, afternoon*
Japan Meteorology Agency	Time from which the warning is valid e.g. W*arning valid 211500 JST*

Table 1: International gale warning terminology

1.6.3 Gale warnings

At 1624 on 2 April, the Met Office issued the first of a series of gale warnings for the Irish Sea, predicting north-east gale force winds for the next day.

At 0720 on 3 April, another gale warning was issued:

"gale warnings: Lundy, Fastnet, Irish sea, Malin, Hebrides …

…tonight 24-hr fcsts - Lundy, Fastnet, Irish sea: nw 4 or 5, veer ne 6 to gale 8, perhaps sev gale 9 later."

The sea areas as defined by the Met Office are shown in **Figure 9**; Raynes Jetty was in the Irish Sea area. The next gale warning transmitted by the Met Office was at 1032 on 3 April. A NAVTEX printout, partly defaced from being soaked in seawater, was found on the deck of *Carrier*'s bridge; the gale warning was underlined **(Figure 10)** and stated:

"Irish sea

northerly gale force 8 imminent, increasing severe gale force 9 soon."

Image courtesy of The Met Office

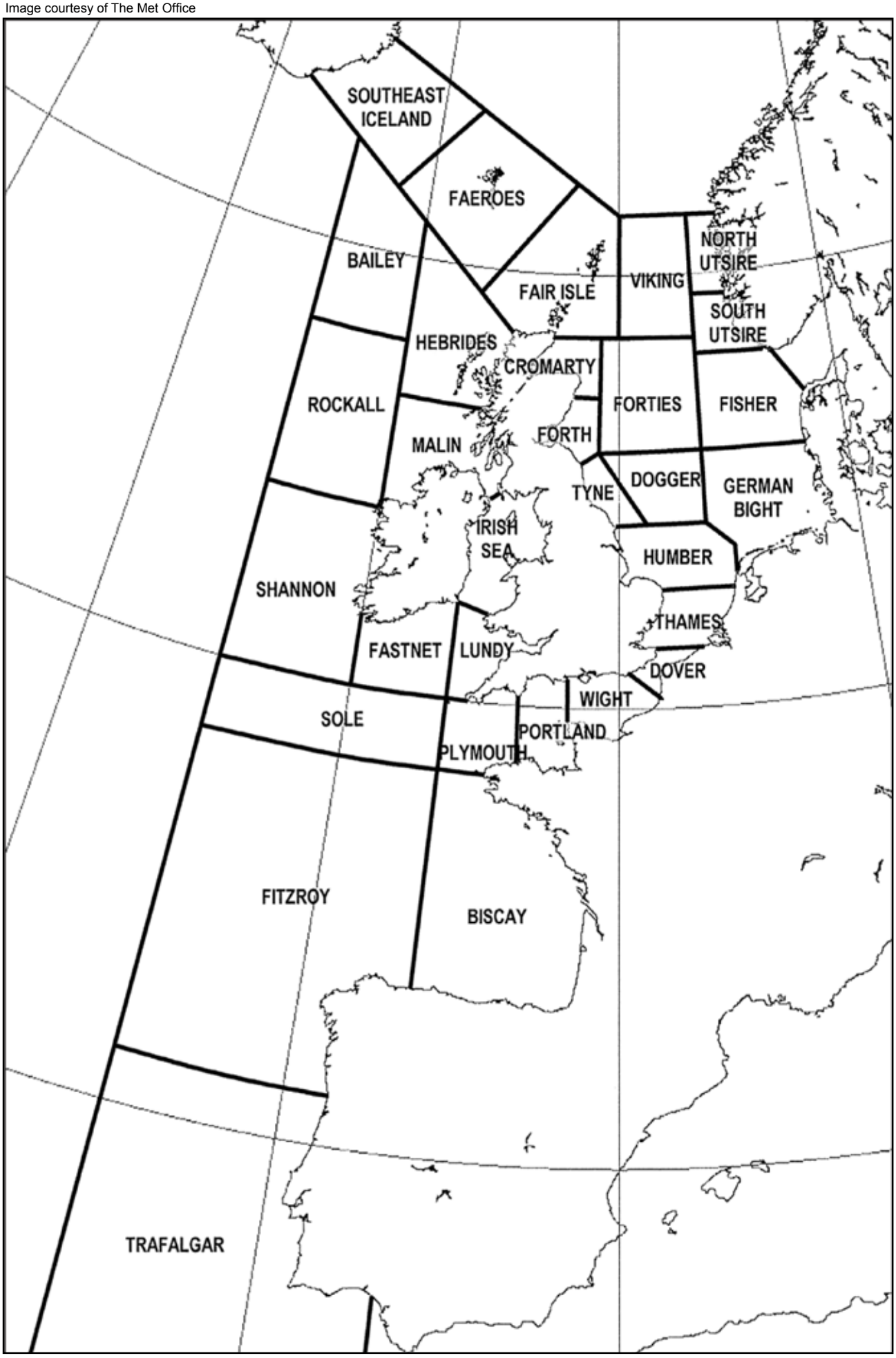


Figure 9: UK Meteorological Office sea areas

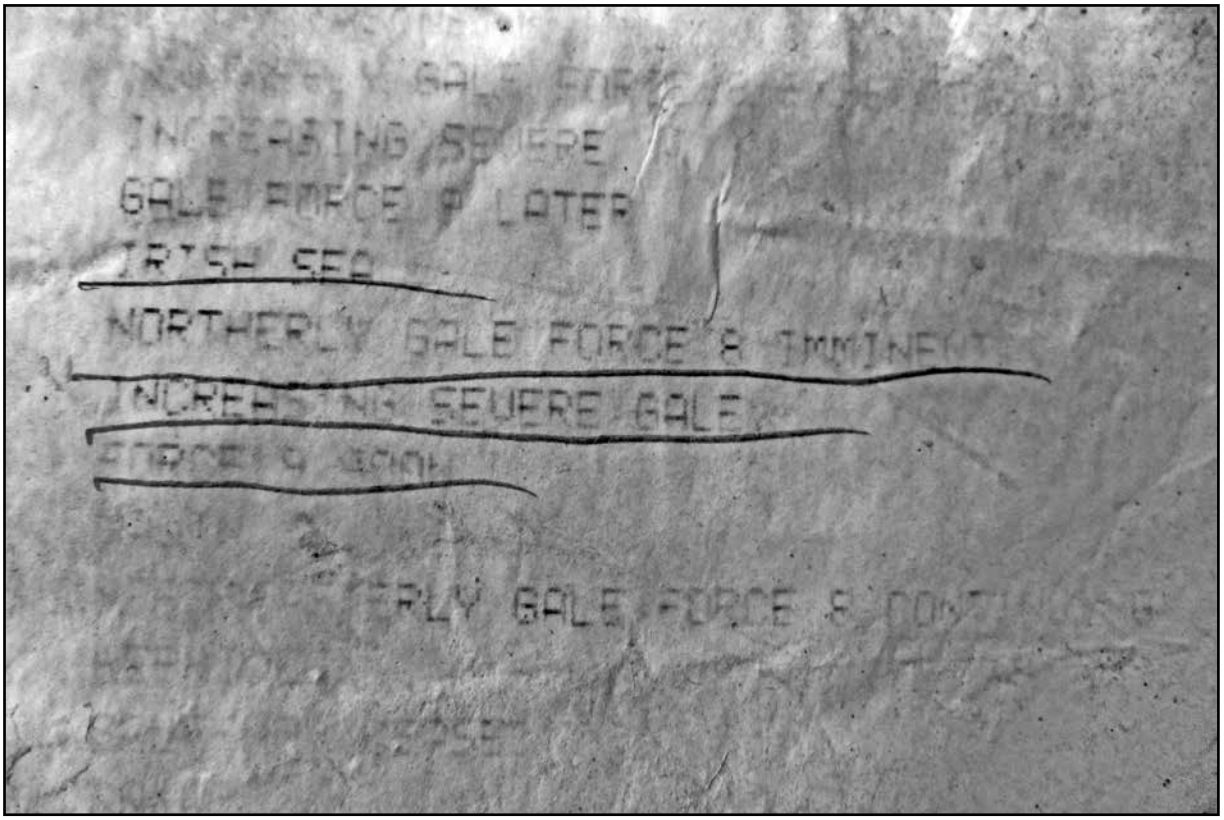


Figure 10: NAVTEX printout found on bridge deck

The shipping forecast issued by the Met Office at 1130 on 3 April and broadcast on VHF subsequently, stated:

> *"Lundy, Fastnet, Irish sea*
>
> *northwest 5 or 6 veering north 7 to severe gale 9. Moderate becoming rough or very rough …"*

The Met Office also made the following forecast:

> *"Inshore Waters Forecast to 12 miles offshore for the period 1200 UTC Tuesday 03 April to 1200 UTC Wednesday 04 April 2012*
>
> *General Situation*
>
> *An area of low pressure will move slowly southwards across the United Kingdom today. Cold conditions with strong to gale force winds and wintry showers will follow from the north, although a ridge of high pressure will move across northern areas during Wednesday.*
>
> *Great Orme Head to the Mull of Galloway – (SWW)*
>
> *24 hour forecast:*
>
> *Westerly or northwesterly 4 or 5 at first in south, otherwise northerly or northeasterly 6 to gale 8.*
>
> *Moderate or rough.*

Occasional rain, then wintry showers.

Moderate or good, occasionally poor."

1.6.4 Recorded weather data

The actual weather data recorded on the day of the accident was obtained from the Rhyl Flats offshore wind farm, which was approximately 5m north of Raynes Jetty. The wind speed and wave heights from 1630 to 2010 are indicated in **Figure 11** and the wind direction during this period is in **Figure 12**.

The normally expected patterns of sea state at corresponding wind speeds are shown in **Table 2**.

Carrier did not have any instruments for measuring wind speed or direction

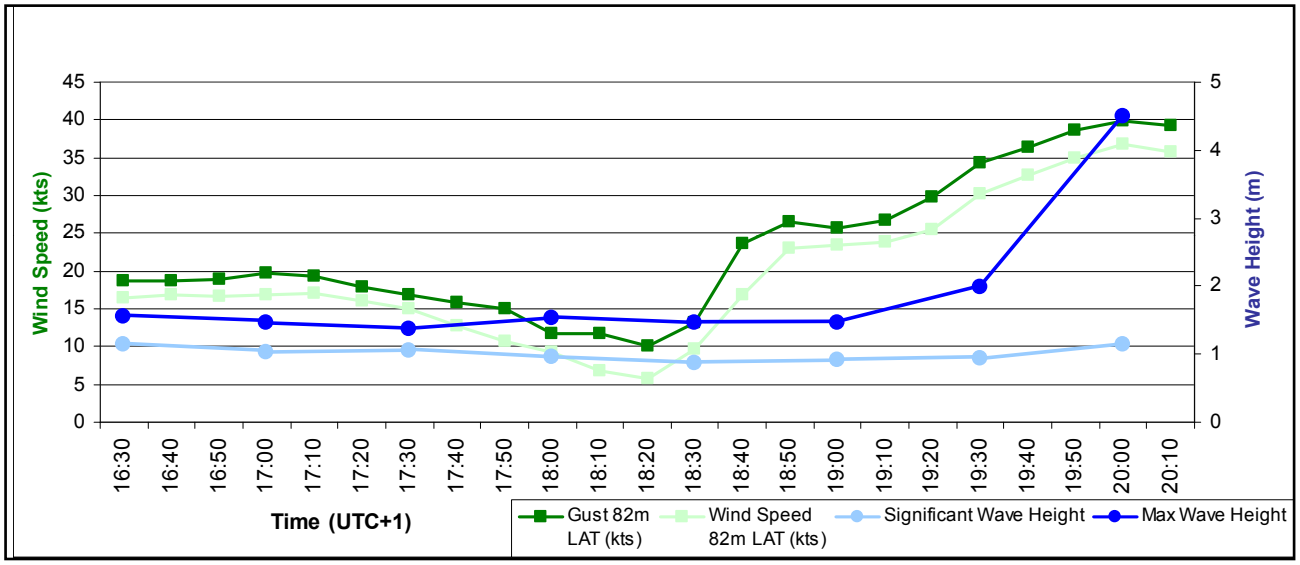


Figure 11: Wind speed and wave height data from 1630 to 2010 on 3 April

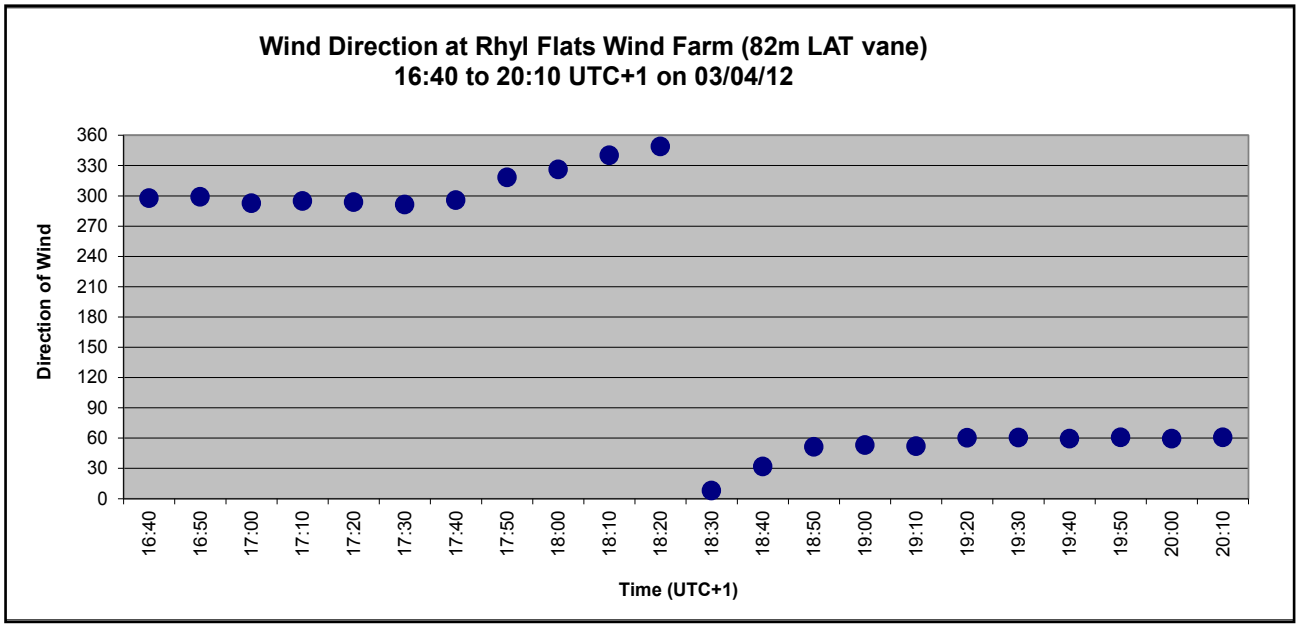


Figure 12: Wind direction from 1640 to 2010 on 3 April

Beaufort Scale of wind force	Wind speed in knots	Sea conditions
4	11-16	Small waves with breaking crests. Fairly frequent white horses
5	17-21	Moderate waves of some length. Many white horses
6	22-27	Long waves begin to form. White foam crests are very frequent.
7	28-33	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction.
8	34-40	Moderately high waves with breaking crests forming spindrift.

Table 2: Expected behaviour of the sea as wind speed increases

1.7 PROPULSION AND CARGO HOLD

1.7.1 Propulsion system

When *Carrier* was delivered in 1985 the propulsion system, comprising a 600kW output engine, gearbox, CPP, and the control and monitoring system, was supplied as a complete package by MAN B&W Diesel A/S. At delivery, the astern propulsion power was stated to be 80% of the power ahead. Manoeuvring was always carried out from the wheelhouse.

1.7.2 Engine replacement

Due to a serious component failure, *Carrier'*s owners replaced the original engine with an 882kW output power DEUTZ unit in 2002. The CPP control system included an electronic circuit board with two potentiometers for ahead and astern pitch calibration adjustments. When the vessel was delivered in 1985, these potentiometers were used to set the maximum pitch of the propeller so that the engine was fully loaded in both ahead and astern directions. There was no record of these adjustments being changed when the more powerful engine was fitted, and MAN B&W Diesel A/S was not involved in the engine replacement or subsequent CPP system tests. Consequently, although the CPP system would have been capable of applying more pitch to the propeller blades, it is likely that the pitch settings remained matched to the old engine, and the greater power output from the new engine was not fully used.

In October 2002, *Carrier* conducted sea trials off the coast of Finland in the presence of a surveyor representing the Germanischer Lloyd (GL) classification society. A comprehensive set of propulsion system checks, including several movements from ahead to astern, and from astern to ahead, were successfully completed. The GL report of the sea trial stated that during the crash stop test it took 20 seconds for the propeller pitch to reach full astern pitch from the full ahead setting; full astern speed was reached 8 minutes after the full astern pitch order was given.

1.7.3 Cargo hold

Carrier's cargo hold was one continuous compartment with dimensions of 51.6m length, 9m width and 6.15m depth. It was possible to subdivide the cargo compartment into six sections if required using portable bulkheads which were kept on board. None of these bulkheads were in use at the time of the accident. The six hatch covers for the hold could be operated from the two control stations, located at the forward and after ends of the hold. When open, the covers were stowed in a concertina fashion, with three covers at the forward end and three aft.

1.8 RAYNES QUARRY AND JETTY

Raynes Quarry and Raynes Jetty were privately owned by CEMEX UK Materials Ltd, which produced and supplied building material. Although the quarry and jetty had existed since 1860, Raynes Jetty was substantially rebuilt in 1983. As an indication of its usage in recent times, approximately 150 vessels were loaded with a combined total of nearly 400,000 tonnes of cargo at Raynes Jetty during 2011.

The largest size of vessel that could be loaded at Raynes Jetty was 4500GT. Ships normally berthed on the western side of the jetty, unless the wind was blowing from a north-westerly direction. Due to the shallow depth of water at the shore end, all vessels were berthed with their bow pointing towards the beach. Tugs were available from Holyhead or Liverpool ports if required.

The quarry manager had overall responsibility for all the operations of the quarry, including the loading of vessels at Raynes Jetty. The manager's experience of port operations was limited to that gained during his tenure at Raynes Jetty. The risk assessment for the use of Raynes Jetty had not considered the hazards associated with cargo operations during bad weather.

1.9 HARBOUR AUTHORITIES

1.9.1 Statutory harbour authorities

Harbours in the UK are broadly considered as either those which are governed by a statutory harbour authority (SHA) or other, non-statutory harbours, such as Raynes Jetty. The larger ports and harbours in the UK tend to be governed by SHAs, and consequently these are the focus of legislation and voluntary codes of practice.

The functions of statutory harbour authorities, as defined in the Harbours Act 1964 (Great Britain), include:

- The construction, maintenance, and operation of a harbour, dock or pier; and provision of warehouses and cranes.
- Navigational safety functions such as the provision of lighting and buoys, dredging, and removal of wrecks.
- Regulating the movement and berthing of ships.
- Carrying out cargo-handling activities and other harbour operations.
- The prevention of pollution, and conservation of nature.

SHAs have legal authority to discharge these functions, normally by enforcing local byelaws. They also have the authority to appoint harbourmasters and levy harbour dues. In return, SHAs have an 'open port duty', which means that the harbour must be open to anyone for the shipping and unshipping of goods and/or the embarking and disembarking of passengers. The SHA also has a duty to maintain and manage the harbour. The SHA may also make general or special directions relating to pilotage or vessel movements in their area of responsibility.

SHAs are expected to operate in accordance with the Port Marine Safety Code (PMSC) as a means of demonstrating their compliance with the relevant legislation.

1.9.2 Competent harbour authorities

Under the Pilotage Act of both 1913 and 1983, the local administration of pilotage was carried out by pilotage authorities. Each pilotage authority administered one or more of the 94 pilotage districts[6]. The Pilotage Act 1987 introduced the concept of Competent Harbour Authorities (CHA). These took over the responsibility to provide pilotage functions in, and sometimes adjacent to, statutory harbour areas. Not every part of the former pilotage districts was provided with a CHA.

1.9.3 Non-statutory harbours

There are several categories of non-statutory harbours. These include: wharves and jetties that were built under Royal Charter or, more recently, constructed under licence from harbour authorities; minor fishery harbours; and minor ferry ports. Private business enterprises that have been in existence for many years, such as Raynes Jetty, may have no need for the regulatory powers, or wish to accept the duties, conferred by becoming a SHA. Consequently, there is no need for a longstanding wharf or jetty, operated by a business for the sole purpose of exporting or importing goods, to require specific statutory empowerment.

Although non-statutory harbours do not have the same range of explicit legal duties as an SHA, the general duties required under the Health and Safety at Work Act 1974 and the Docks Regulations 1988 apply.

The Department for Transport (DfT) publishes freight data spanning the last 10 years for ports in the UK which have handled more than 1000 tonnes of freight per annum. The statistics that were published in 2011 indicate that, at that time, there were a maximum of 10 non-statutory harbours in this category.

1.9.4 Raynes Jetty

Until 1988, Raynes Jetty came under the jurisdiction of the pilotage district of Liverpool. In 1988, when the MDHC became the CHA for Liverpool, the jurisdiction of the CHA was reduced to the port limits of Liverpool. As Raynes Jetty was outside this limit, MDHC ceased to have any connection with it. Pilotage services within MDHC's area were subcontracted to a separate company, Liverpool Pilotage Services Ltd (Liverpool Pilots). However, Liverpool Pilots continued to provide pilotage services, by mutual agreement, to any vessels requesting assistance

[6] Source: The law of harbours, coasts and pilotage: Richard Douglas, Peter Lane and Monica Peto published by LLP Limited, 1997

to berth or sail from Raynes Jetty. The cost of pilotage, from where *Carrier* was anchored before the accident to Raynes Jetty, was reported to have been approximately £600.

The manager of Raynes Quarry was listed as the recognised operating authority and port facilities security officer (PFSO) in the Admiralty Sailing Directions (NP37): West Coasts of England and Wales Pilot. In January 2011, staff from the UK Hydrographics Office (UKHO) communicated with the quarry manager requesting him to inform them if any changes were to be applied to NP37. The quarry manager responded, requesting that some additional information, which had been reproduced from Quality Freight (UK)'s pre-arrival advice note **(Annex A)**, be added to NP37. The 2008 version of the relevant part of NP37, and the corrections that were made to it, are at **Annex D**. The significant differences were:

- The 2011 edition stated that vessels were allowed to come in to load 4 hours before high water tide instead of 3 hours as stated in the 2008 edition.

- While the wind direction was not specifically stated in the 2008 edition, the 2011 edition stated that '*vessels cannot be worked'* if wind speed reached force 5 or over from north-west, through north to north-east.

- The contact details of Quality Freight (UK) were provided in the 2011 edition for arranging the service of a pilot if required.

A copy of the 2011 edition NP37 was available on board *Carrier* at the time of the accident and the master was aware of the advice it contained relating to Raynes Jetty. A copy of the page from NP37 referring to Raynes Jetty was also available in the loading cabin at the jetty.

1.10 GUIDANCE FOR SAFETY IN PORTS

1.10.1 Port Marine Safety Code

The Port Marine Safety Code (PMSC) was established following a review of the Pilotage Act in 1998. The main proposal resulting from this review was that a code of best practice should be developed that summarised the legal duties and powers of SHAs relating to marine safety. SHAs were expected to work to achieve the agreed standards in the PMSC, on a voluntary basis, by implementing its requirements and following the associated guides to best practice. One of the primary aims of the PMSC is to enhance safety for those who use or work in ports, their ships, passengers and the environment. The PMSC requires that harbour authorities should conduct a formal risk assessment of all aspects of their operation and, from this, derive a register of the risks involved and an effective safety management system to control them.

The PMSC contains guidance on the responsibilities of the duty holder who is accountable for managing port operations safely and efficiently. The following were stated as included in the role of the duty holder:

- *maintaining strategic oversight and direction of all aspects of the harbour operation, including marine safety.*

- *responsibility for the development of policies, plans, systems and procedures for safe navigation;*

- *ensuring that assessments and reviews are undertaken as required, to maintain and improve marine safety.*

The PMSC also requires the appointment of a designated person whose main responsibility is to provide assurance to the duty holder that the port's safety management system is in compliance with the PMSC.

Compliance with the PMSC is initially by self-assessment, and port operators were invited to inform the DfT, and more recently the MCA, if they considered that their operations met the requirements. As a non-statutory harbour, the managers of Raynes Jetty were not obliged to comply with the PMSC. There had been no attempt to use the PMSC as a means of demonstrating compliance with the applicable legislation, or following the best practices set out in the PMSC.

1.10.2 A Guide to Good Practice on Port Marine Operations

A Guide to Good Practice on Port Marine Operations (referred to as the guide) provides detailed guidance reinforcing and building on the principles of the PMSC. The guide explains what a harbour authority should do to comply with the code. Section 11 of the guide, Professional Qualifications and Competencies for Port Marine Personnel, provides a detailed explanation on how harbour authorities can ensure that those in charge of or involved with the safety of navigation within their ports are qualified and competent to carry out their functions.

1.10.3 Port Skills and Safety

Port Skills and Safety (PSS), formed in 2002, is the UK ports industry's organisation for health, safety, skills and standards. PSS is a daughter organisation of the UK Major Ports Group and British Ports Association; the majority of UK ports are members of PSS. The organisation has published national occupational standards (NOS)[7] for port marine personnel, including harbourmasters, pilots, stevedores and marine operators, as well as guidance notes for ports to assess their employees against the NOS. In co-operation with the MCA and the Health and Safety Executive, PSS has also developed nationally approved qualifications for port operatives and guidance on port activities. Membership of PSS is voluntary and is available to all harbour authorities, whether statutory or otherwise.

1.11 PROVISION OF SEARCH AND RESCUE HELICOPTERS

The UK's Search and Rescue (SAR) helicopters were, at the time of the investigation, operated by the Ministry of Defence (MoD) and the MCA (on behalf of the DfT[8]). The ARCC at RAF Kinloss co-ordinated the deployment of both military and civilian operated SAR helicopters in the UK Search and Rescue Region. The normal provision was for there to be 12 aircraft, stationed around the UK, to be available for SAR tasks. These included:

- Sea King military helicopters, based at two Royal Navy (RN) and six RAF air stations.

[7] National Occupational Standards (NOS) are statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding.

[8] The MCA is an executive agency of the DfT. It is funded by and functionally accountable to the DfT.

- Civilian SAR helicopters operated by private companies under MCA-managed contracts at four coastguard air stations.

The MoD no longer has a requirement to provide SAR for military purposes; the military Sea King helicopters are over 30 years old and due to be phased out by 2016. During the latter part of the investigation, the DfT agreed a contract with Bristow Helicopters Ltd to provide the UK's SAR helicopter service. Commercially-operated SAR helicopters are due to be introduced from March 2015 onwards as the Sea Kings are retired. Responsibility for helicopter SAR provision will then rest entirely with the DfT.

RAF staff reported that it was extremely unusual for all four of the helicopters stationed at RAF Valley to be unserviceable with such substantial technical faults. The lack of SAR aircraft from RAF Valley put significant pressure on the remaining SAR fleet. The crew of R128 from RAF Leconfield were obliged to make an extremely hazardous flight, in very poor weather conditions, across the width of the UK to complete the rescue.

1.12 PREVIOUS / SIMILAR ACCIDENTS

In January 2008, the Bahamas registered ro-ro cargo vessel *Riverdance* grounded and became stranded on the Shell Flats, off Cleveleys Beach, Lancashire. The vessel suffered difficulties due to heavy seas, and its stability was affected due to water ingress. One of the vessel's two main engines shut down due to extreme angles of list. This resulted in the vessel lacking the power to bring its head into the wind, and *Riverdance* lay beam on to the wind and seas. The vessel was finally washed on to the beach. The prevailing severe weather conditions prevented the vessel from being refloated, and subsequent attempts to salvage it failed. *Riverdance* was finally cut up in-situ.

The Australian Transport Safety Bureau (ATSB) reported[9] on its investigation of the grounding of the Panamanian registered *Pasha Bulker* on 8 June 2007. The vessel was anchored along with 57 other bulk carriers off the east coast of Australia. On the previous day, the Bureau of Meteorology had issued a gale warning for the area with winds expected to increase to 45 knots, gusting to 63 knots. Seven vessels weighed anchor and put to sea as the weather deteriorated. By 0600 on 8 June, the wind was gusting to nearly 50 knots and *Pasha Bulker* was among 27 ships still at anchor. *Pasha Bulker* got underway by 0748 and steamed along the coast for more than an hour. However, when the master altered the vessel's course in the heavy weather, he lost control, resulting in the vessel running aground. Several other vessels dragged their anchors. The vessels that had put to sea before the winds increased substantially, were not affected.

[9] ATSB Marine occurrence investigation No. 243

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 THE ACCIDENT

Carrier was behind schedule and needed to load a full cargo in order to make its next voyage commercially successful. The master and operators of Raynes Jetty attempted to load the vessel so that it could sail before the forecasted bad weather arrived.

Once alongside, deteriorating wind and sea conditions prompted the master to decide to abort loading and put to sea. Unfortunately, the initial decision to depart was left too late, and further delays were allowed before *Carrier* finally left Raynes Jetty. By then, the sea and weather conditions had deteriorated to such an extent that it was unsafe for the vessel to manoeuvre away from the jetty. It was equally hazardous to remain at the jetty; *Carrier*'s moorings were already beginning to part due to the poor leads and subsequent chafing of the lines as the vessel moved in the rough weather.

Once *Carrier* got underway, the combination of the master's choice of manoeuvre and the limited power available from the propulsion system, resulted in the vessel being overwhelmed by the heavy seas and strong winds. In this situation, it was inevitable that *Carrier* would be blown onto the shore and severely damaged against the coastal defences.

2.3 RECORDED WEATHER

It was considered that the wind and wave data that were recorded at the Rhyl Flats wind farm was sufficiently representative of the conditions at *Carrier*'s initial anchoring position, and later at Raynes Jetty, to provide adequate context in which to analyse the decisions to berth and load the vessel.

2.4 MASTER'S DECISIONS

2.4.1 Decision to berth

There was no anemometer on board *Carrier*. However, at the time of weighing anchor *Carrier*'s master, an experienced mariner, could not have missed the presence of 'white horses' in the sea around him **(Table 1)**. These should have indicated to him that there was a force 5 wind blowing. Similarly, it should not have been difficult for him to deduce that the wind was blowing from a west-north-westerly direction. The master was also aware of the gale warnings that he had received through the NAVTEX system and from the coastguard's VHF broadcasts. The gale warnings were persistent - starting on 2 April and eventually narrowing the predicted time the gale would arrive to within a 6-hour period from 1032 on 3 April. Inshore weather forecasts made specific reference to nearby Great Ormes Head, predicting force 6 to gale force winds in the area that day from 1200 onwards. Although *Carrier*'s master did not have the Raynes Jetty information sheet from

Quality Freight (UK), he had consulted NP37. His own observations, the weather forecasts, and the advice in NP37 ought to have made it clear to the master that the conditions at Raynes Jetty were likely to become very challenging.

Despite all the advice, indications and warnings that were available to him, the master decided to berth and load *Carrier*. In isolation, and with the benefit of hindsight, the decision to press on with berthing and loading appears to have been very unwise. There were, however, several factors which contributed to the master's decision.

When *Carrier* weighed anchor, although there was a strong wind blowing, it had not yet reached the magnitude that was predicted by the forecasts. It is extremely difficult to produce totally accurate and reliable weather forecasts; therefore it is likely that the master considered that the strong winds would not come until later than predicted, if at all. The information in NP37 was advisory, and without the further emphasis provided in Quality Freight (UK)'s information sheet, or any other local advice, there was nothing to counter the master's conclusions.

Carrier's master was also concerned that, having arrived late from Belfast, he had already lost half a day, directly impinging on the cargo-earning capacity of the vessel. Difficult trading conditions and low cargo rates made *Carrier*'s economic success extremely marginal and there was little room to absorb any additional costs from delays. Being unaware of the clause in the CP relating to bad weather, the master was understandably anxious to load as soon as possible. Had he been aware of the clause, he might have given more consideration to delaying, or even cancelling, loading.

The staff at Raynes Jetty agreed with the master's decision to berth and load. From the master's perspective, the jetty staff were far more experienced in the details of this operation than he was, and ought to have had a better appreciation of the local weather conditions. He therefore was reassured that he had made a correct decision by the apparent endorsement of his plan by the jetty staff.

Even if the weather did deteriorate it was evident, from the master's conversation with the jetty staff after the vessel had berthed, that he felt he could stop loading and sail if necessary. Unfortunately, he left this decision too late.

2.4.2 Factors delaying departure

The reduced cargo loading rate during *Carrier*'s first hour alongside caused a shortfall of 400 tonnes of cargo. This equated to a loss of 22 minutes of loading time at the declared loading rate of 1100 tonnes an hour. With payment proportional to the amount carried, the master was understandably keen to load a full cargo. The reduced loading rate was therefore unwelcome, placing the master under further pressure to decide on the balance between loading cargo and the deteriorating weather.

There were several actions which demonstrated the master's preoccupation with this decision, including: delaying the decision to depart until 1900 despite the significant increase in the wind speed from 1820; stopping cargo loading at 1923 and then restarting it shortly afterwards; and continuing to load as the wind speed and wave height increased until 1955, when the last of the hatch covers were closed **(Figure 13)**.

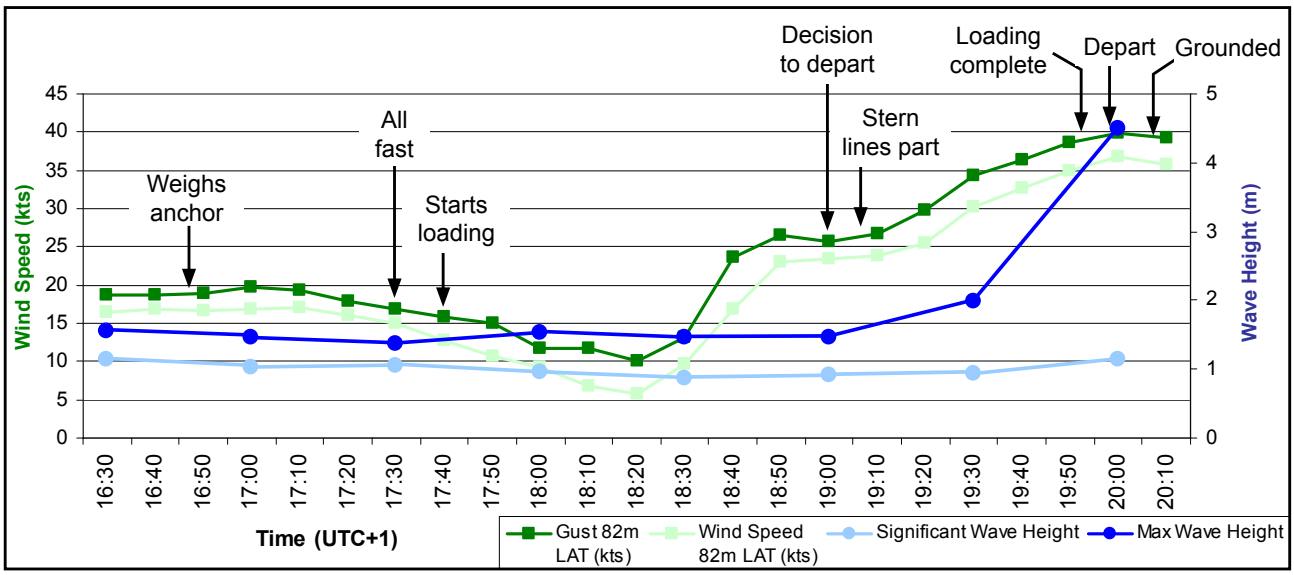


Figure 13: Timeline of events and environmental conditions

2.4.3 Summary

It was evident from the master's decisions throughout the accident that he was well aware of the potential for poor weather, but that he hoped to be able to complete loading and sail before the weather got too bad. During this period he received no information or guidance from jetty staff to persuade him otherwise even though they were apparently aware of an Inshore Waters forecast which was predicting force 6 to gale force 8 winds from a north-easterly direction.

A ship is most productive if its cargo-carrying capability is fully exploited. Nevertheless, commercial considerations must not be allowed to take precedence over safety. Unfortunately, the series of decisions to berth and then delay the departure, directly contributed to the loss of the vessel. Further, it endangered the lives of the crew, put the safety of the jetty, the jetty staff and the rescuers at risk.

2.5 SHIP-HANDLING DURING BAD WEATHER

2.5.1 Manoeuvring

As *Carrier* was berthed with its bow to the shore, and the water depth ahead was insufficient to allow forward movements, the master had no option but to manoeuvre stern-first away from the jetty. Moving astern, keeping the vessel parallel to the berth, and then turning the stern to starboard in order to face the vessel seaward, would have been an acceptable and safe manoeuvring strategy in good weather. However, as the strong gale force wind had veered to the north-east, *Carrier*'s beam would have been increasingly exposed to the wind as it moved astern following the line of the jetty. Not only would this limit the effectiveness of the astern propulsion, but it would also cause the vessel to make leeway and turn until it was lying beam-on to the wind. In these circumstances, a considerable amount of power and sea room would have been needed to turn *Carrier* into wind. The master's subsequent attempts to use ahead propulsion simply caused *Carrier* to move bodily to starboard, vulnerable to the forces of the wind and breaking waves, until it grounded.

Carrier's master had not considered any other options, but given the limited power and space available, a better option might have been to expose as little of *Carrier*'s side area to the wind as possible. This could have been done by coming astern and turning the stern to port, directly into wind. If necessary, the turn into wind could also have been assisted by using a backspring. Once into wind, the vessel was more likely to be able to make some stern way - providing that the stern was able to sustain the force of the waves and remain adequately watertight. While this might have been hazardous and extremely slow, *Carrier* ought to have been able to at least maintain its position. When the vessel was sufficiently clear of the shore it could have been turned head to sea. Also, the water was still shallow enough so that an anchor could have been let go to assist turning the bow into wind if needed. While these manoeuvres would have been challenging and potentially hazardous, they offered a greater chance of success than the course of action the master chose.

2.5.2 Performance of propulsion machinery

The uniform damage to all four propeller blade tips indicate that *Carrier*'s propeller continued to turn under power until the master operated the main engine emergency stop after the grounding.

As the original adjustments for propeller pitch control were probably not altered when *Carrier*'s original engine was replaced with a more powerful one, the greater power of the new engine was unlikely to have been fully utilised. Earlier trials had indicated that it took about 8 minutes to reach full astern speed. The effect of any increase in the new engine's speed or torque might have been noticed as an improvement in the vessel's acceleration; however, even though there was more power available, the pitch response needed to be re-calibrated to ensure that the extra power was transmitted into propeller thrust efficiently.

Had the propeller pitch control been matched to the full power of the new engine, *Carrier*'s astern propulsion could have been more effective and encouraged the master to maintain astern thrust until his vessel was clear of the jetty.

When the master noticed that the vessel's speed astern had dropped to around 0.3 knot, and that the vessel had been pushed 50m away from the jetty, he put the propeller pitch to full ahead in an attempt to turn and get into deeper waters. Part of the reason that this manoeuvre was unsuccessful was because the time taken for the pitch to be reversed would have been approximately 20s (this was established during the sea trials in 2002). It would have then taken more time for the propeller to generate full ahead thrust.

2.5.3 Summary

It was evident from this and other similar accidents that attempting to manoeuvre a vessel with marginal amounts of power in confined waters and in heavy weather is extremely demanding and hazardous. Before attempting such manoeuvres, mariners must make sure that they fully understand the operating characteristics and limitations of their vessels' propulsion. Manoeuvres must be carefully planned and executed to make best use of all power and manoeuvring aids that are available.

2.6 ROLE OF JETTY STAFF

2.6.1 Berthing

The jetty staff agreed with *Carrier*'s master that the vessel could berth, and therefore helped to reinforce his interpretation of the weather forecasts. It is possible that, at the time of berthing, Anglesey and Great Ormes Head sheltered Raynes Jetty from the worst of the north-westerly winds, resulting in the sea appearing to be calmer close to the jetty.

The jetty staff had consulted weather forecasts which they understood to be linked to the Met Office's Inshore Waters forecast. However, they had formed the impression that the winds would only pick up to force 5 by 2100, by which time *Carrier* should have been ready to sail. It is not clear how they came to this conclusion; from as early as 1032 the Met Office had been predicting gale force winds in the Irish Sea area within the next 6 hours. Too much emphasis was placed on the conditions at the time of berthing, and the warnings of poor weather were not acted on.

2.6.2 Loading

The quarry manager must have agreed with the advice printed in NP37 as he had taken the trouble to provide it when the UKHO updated the publication in 2011. That advice effectively set the limitations for safe loading operations at Raynes Jetty.

The jetty operators had little knowledge of maritime weather forecasting, and therefore based their decisions on inadequate information. Had their understanding of the weather forecasts been more comprehensive, the jetty operators might have paid closer attention to the coastguard's broadcasts on VHF. If they had measured the wind speed with their anemometer, they likely would have realised that the wind speeds were gusting to the limits set out in NP37 as early as 1630.

It was most concerning that the staff at Raynes Jetty allowed the master to continue loading when the weather began to deteriorate. Even though they were under the mistaken impression that the winds were not due to pick up until 2100, it was impossible for them to have missed the rapid increase of wind speed from 1820 onwards. Instead of asking the master to sail as soon as possible, they continued to follow his instructions, trusting that he was making the right decisions; they neither challenged nor overruled him.

The poor leads for mooring lines at Raynes Jetty placed further limitations on using the berth in poor weather. *Carrier*'s two stern lines parted because they chafed against the face of the jetty. This added an unnecessary problem; in the prevailing conditions *Carrier* could neither remain alongside nor sail safely.

2.6.3 Departure

The jetty staff had no ship handling experience and it was unlikely that they would have been able to foresee the difficulties which *Carrier* would face when manoeuvring astern into the heavy seas. They did not have the necessary knowledge or experience to influence the master's decisions. The shipping agent

was the only person who had the necessary marine expertise to offer advice; however, he was only alerted after the vessel's lines started parting and the wind speed had increased to 30 knots.

If the risks of port operations in poor weather had been properly assessed, jetty staff could have been provided with detailed guidance on the best actions to take. This should identify the thresholds at which decisions need to be made as weather deteriorates, other factors that should be considered and list contacts who can offer additional advice if needed.

Considering the close proximity of the jetty to the position where *Carrier* grounded, the risk of the vessel making contact with the jetty, either while manoeuvring or as it began to ground, was significant. It was fortunate that after being grounded and washed ashore, the vessel was prevented from further movement by the tetrapods which effectively anchored it in place. If the vessel had been carrying heavy fuel oil instead of gas oil, the environmental damage could have been far more severe and longer lasting.

2.6.4 Marine risks

This accident demonstrates that, where the safety of port operations is at risk during adverse weather conditions, it is vital for shore-based staff involved in marine operations to have a good understanding of maritime weather forecasting and access to accurate data on local wind speed and direction. Staff must also have a clear understanding of their role in managing marine risks. At the very least, this must include the knowledge and ability to take the correct action when weather conditions exceed safe operating limits.

2.7 PILOTAGE

NP37 stated that it was not compulsory to engage a pilot in order to berth at Raynes Jetty. The master would have been understandably keen to avoid the additional costs of hiring a pilot, considering the low freight rates for the cargo. The email sent to the master by Quality Freight (UK), stating that if he had visited Raynes Jetty in the past he may not need a pilot, was also considered to have influenced the master's decision not to request one.

Raynes Jetty had unrestricted access from the sea, and manoeuvring to and from the berth in good weather should have been well within the capabilities of a master experienced on coastal vessels. However, there was more to the operation than just manoeuvring the vessel; Liverpool Pilots would have had access to detailed local weather forecasts and a good understanding of what the forecasts implied. It was quite likely that, had they been asked, Liverpool Pilots would have advised the master against putting his vessel alongside until the conditions improved.

2.8 OPERATION AND STATUS OF NON-STATUTORY HARBOURS

2.8.1 Obligations and responsibilities

Raynes Quarry and Jetty have existed for over 150 years and the operators had no need for any specific statutory empowerment in order to continue functioning. The staff responsible for Raynes Quarry perceived the operation of the jetty to be

an extension of the quarry; the jetty was far too small and isolated to be thought of as a 'harbour' in the typical sense. As a result, the obligations and responsibilities associated with port and harbour operations were not fully applied.

The obligations and duties of statutory harbour authorities are clearly defined. In practical terms, these should be no different for non-statutory harbours such as Raynes Jetty. The PMSC and accompanying guide contain useful advice on conducting the affairs of a harbour and the knowledge expected of personnel in charge of port operations.

2.8.2 Access to maritime skills

The quarry manager, responsible for the entire operation including quarrying, transporting and loading the cargo onto ships, had no qualification related to port operations or navigational safety. The only experience he had in this field was whatever he had gained at Raynes Jetty. He had come to rely on staff from Quality Freight (UK), who provided some maritime advice on an ad hoc and voluntary basis. Although the role of Quality Freight (UK)'s staff was that of cargo brokers and agents, they were also willing to offer general advice about pilotage requirements, tidal and weather restrictions. They were not formally contracted to carry out these functions on behalf of Raynes Jetty, and had no responsibility to consider every aspect of the marine operation. It was not surprising that they did not consider it within their role to give specific advice to masters and jetty staff on the predicted weather for each loading operation.

The PMSC (and the accompanying guide) sets out the tasks that needed to be considered and emphasises the importance of the roles of the duty holder and designated person. Significant emphasis is placed on managing marine safety and, specifically, policies, plans, systems and procedures for safe navigation. It would have been unrealistic to expect the staff at Raynes Jetty to be able to discharge these responsibilities without additional support from specialists.

2.8.3 Safety management

It was apparent that some of the risks of port operations at Raynes Jetty had been considered by the quarry's managers. This was most evident from the information in NP37 relating to the use of the berth. However, the absence of formal marine support to the operation of Raynes Jetty was clear; the need to control marine risks had not been identified and the risks themselves had not been adequately controlled.

There was no safety management system to control the marine risks involved in the operation of Raynes Jetty of the type set out in the PMSC. While the PMSC was originally directed towards operations in major ports, the underlying principles are applicable to ports of all sizes. Compliance with the PMSC is not compulsory, but it is a recognised method for port operators to demonstrate that they are managing their other legal responsibilities appropriately.

If the principles of the PMSC had been implemented at Raynes Jetty (with the benefit of specialised advice in marine operations), there would have been a register of all the risks involved in jetty and marine operations. This would then have triggered more detailed risk assessments where necessary. One of these risk assessments ought to have considered how to manage the berthing and loading of

vessels in deteriorating weather. These safety management principles are explained in the guide to good practice on port marine operations, which describes the factors that should be considered and gives practical advice on how to implement the PMSC.

The risks involved in marine operations at Raynes Jetty could have been controlled more effectively if the safety management principles of the PMSC had been applied in conjunction with advice from marine specialists.

2.8.4 Support for non-statutory harbours

While small, non-statutory harbours might not merit the staff and infrastructure of a larger port, it is clear that there is still a need to identify and manage similar types of marine risks. This function is as relevant to safety management as it is to commercial operation.

Some non-statutory harbours lie within the geographical limits of SHAs and are included in the overall management of the SHA. Operators of such non-statutory harbours can therefore benefit from expertise within the SHA and, potentially, the CHA as well.

Other options were available. These might have included arranging for a port operations consultant to provide the necessary advice and support to the quarry manager. Alternatively, quarry staff could have arranged for training from organisations such as PSS. This would have enabled them to learn the necessary skills to be able to manage the port operations themselves and work towards implementing the most important elements of the PMSC.

It is concerning that there may be other harbours like Raynes Jetty around the UK coast which consider themselves outside the normal scope of port operations. As there are fewer than 10 non-statutory harbours in the UK, which handle more than 1000 tonnes of cargo per annum, it would be highly desirable to identify the operators of these harbours and encourage them to adopt appropriate elements of the PMSC as a means of managing marine risks.

2.9 WEATHER FORECASTING TERMINOLOGY

The terms ‘later’, ‘soon’ and ‘imminent’ have traditionally been used by the Met Office and are defined in Admiralty List of Radio Signals Volume 3(1). A copy of the List of Radio Signals was available on board *Carrier* as it is mandatory under international regulations to carry this, or an equivalent publication on board. However, the terms used by the UK Met Office are not part of the international meteorological lexicon. This accident demonstrates that they have the potential to cause misunderstanding, especially with seafarers who are not UK nationals and who may have obtained their qualifications and competency certificates elsewhere.

The NAVTEX message that was found on the bridge deck, warning of ‘imminent’ gale force winds, demonstrates that the master was aware that the weather was likely to deteriorate. What was clear from the investigation was that the master was confused by the terminology used in UK maritime weather forecasts. He did not appreciate the meaning of the term ‘imminent’ and, as a consequence, did not know how quickly the bad weather was expected to arrive.

In the absence of an internationally agreed terminology, other major maritime nations use clear language in their weather forecasts **(Table 2)**. The terms 'soon', 'imminent' and 'later' are relatively commonly used words in the English language; this accident demonstrates that non-native seafarers, who are not familiar with the words as specific forecasting terms, may not recognise them as such - let alone associate them with pre-defined time periods. Therefore, it may not even occur to them to refer to the Admiralty List of Radio Signals, or other sources of information, to check the precise meaning. Considering the number of non-UK seafarers sailing on vessels around the UK coast, it would be beneficial to make warnings about severe weather explicit and self-explanatory. Watchkeepers should not be left in doubt or need to look up definitions. Equally, staff at small harbours around the UK coast may be relying on information available through coastguard VHF and BBC radio broadcasts. It is quite likely that they might not have marine training or access to the appropriate reference books, and may not understand the weather forecast either.

As there is a significant risk that many of the people who the forecast is designed to assist do not understand what is being reported, there is a case for making the terminology used in UK maritime weather forecasts explicit. The MCA and Met Office should therefore review their forecasting terminology in order to make it easier for non-native seafarers to understand the precise meaning of the terms used.

2.10 RESCUE

The decision not to attempt the rescue of *Carrier*'s crew from land or sea was well founded considering the extreme conditions at the time; air rescue was probably the most practical option. The rescue was delayed primarily due to the technical problems with all four helicopters at RAF Valley, but also due to the snow storms in northern and central England preventing a helicopter from RAF Leconfield launching immediately. It was 2200 by the time R177 (which needed to refuel after being diverted from another SAR incident) arrived from Prestwick. The snagging of the winch line, which resulted in R177 having to abort further rescue attempts, was an unfortunate consequence of attempting a rescue in such poor weather conditions.

When R128 was subsequently tasked from RAF Leconfield the crew faced a very challenging, and potentially hazardous, cross country flight to the scene. This would have been avoided if any of the four helicopters from RAF Valley had been serviceable.

The performance of all the helicopter crews was extremely commendable. However, the risks they faced during the rescue were exacerbated by the lack of more locally available SAR helicopters. It was extremely fortunate that the situation on board *Carrier* remained stable for long enough to enable all the crew to be rescued without injury.

During the latter stages of the investigation, the DfT agreed a contract to provide search and rescue helicopter services for the whole of the UK from 2015. It is hoped that the existing SAR helicopter fleet can provide adequate serviceability until then.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT WHICH HAVE RESULTED IN RECOMMENDATIONS

1. The master's decision to abort loading and put to sea was taken too late. Thereafter, the combination of the choice of manoeuvre and limited propulsion power led to *Carrier* being overwhelmed by the heavy seas and strong winds, causing it to run aground. [2.2]

2. The master's decision to berth his vessel was influenced by a number of factors, including: the weather at the time not being as bad as predicted, seeking to minimise any delay, endorsement of his decision to berth by staff at Raynes Jetty, and the expectation that he would be able to stop loading and sail if the weather did deteriorate. [2.4.1]

3. Payment for the voyage was proportional to the amount of cargo loaded, and the master sought to load as much as possible before deciding to depart from Raynes Jetty. [2.4.2]

4. Decisions taken by the master throughout the accident indicated that he was well aware of the potential for poor weather, but that he hoped to be able to complete loading and sail before the weather got too bad. [2.4.3].

5. The astern manoeuvre used to depart from Raynes Jetty exposed *Carrier*'s beam to the wind, reducing its ability to make sternway and turn. Subsequent use of ahead propulsion caused *Carrier* to move bodily to starboard, vulnerable to the force of wind and waves, until it grounded. A different choice of manoeuvre (making sternway directly into wind) might have offered a greater chance of success. [2.5.1]

6. It was evident from this, and other similar accidents, that attempting to manoeuvre a vessel with marginal amounts of power in confined waters and in heavy weather is extremely demanding and hazardous. Manoeuvres must be carefully planned and executed to make best use of whatever power and manoeuvring aids are available. [2.5.3]

7. Staff at Raynes Jetty agreed with the master that *Carrier* could berth on the basis that there were no 'white horses' in the sea around the berth. Despite apparently being aware of the Inshore Waters forecast predicting strong winds they placed too much emphasis on the conditions at the time of berthing and the warnings of poor weather were not acted on. [2.6.1]

8. Jetty staff allowed *Carrier* to continue loading despite the weather conditions exceeding the limits published in NP37 [2.6.2]

9. Jetty staff did not have the necessary skills or guidance to help them decide on the best actions to take as the weather deteriorated. They were therefore unprepared to take action, offer constructive advice or challenge the master's decisions. [2.6.3]

10. Shore-based staff involved in port operations must have a clear understanding of their role in managing marine risks. At the very least, this must include the knowledge and ability to take the correct action when weather conditions exceed safe operating limits. [2.6.4]

3.2 OTHER SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION ALSO LEADING TO RECOMMENDATIONS

1. Pilotage was not compulsory for berthing at Raynes Jetty, and the master was understandably keen to avoid the additional costs of hiring a pilot. Had he taken a pilot, or been able to seek advice from a competent harbour authority, it is likely that he would have been advised against putting his vessel alongside until the weather improved. [2.7]

2. The operation of Raynes Jetty was perceived to be a natural extension of the quarry. The obligations and responsibilities associated with port and harbour operations were not fully applied. [2.8.1]

3. None of the staff at Raynes Quarry or Jetty had significant maritime expertise, and any marine advice that was provided was on an ad-hoc and voluntary basis. [2.8.2]

4. Although some of the risks of marine operations at Raynes Jetty had been considered, there was no safety management system of the type set out in the PMSC. As a result, the control of marine operations had not been properly planned. [2.8.3]

5. A number of options were available to ensure that the operators of Raynes Jetty received a proper level of support to manage marine operations. If this support had been in place, it would have enabled the operators to work towards implementing the most important elements of the PMSC. [2.8.4]

6. It is concerning that there may be other harbours like Raynes Jetty around the UK coast whose operators consider themselves outside the normal scope of port operations. As there are fewer than 10 non-statutory harbours (which handle more than 1000 tonnes of cargo per annum) in the UK, it would be highly desirable to identify the operators of these harbours and encourage them to adopt appropriate elements of the PMSC as a means of managing marine risks. [2.8.4]

7. The terminology used in UK maritime weather forecasts is potentially misleading to non-native mariners and shore-based staff who have received no marine training. There is a significant risk that the people who the forecast is designed to assist do not understand what is being reported. [2.9]

3.3 SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION WHICH HAVE BEEN ADDRESSED OR HAVE NOT RESULTED IN RECOMMENDATIONS

1. The propeller pitch response was probably not recalibrated to match the new, more powerful, main engine, and it is unlikely that all the extra power was transmitted into propeller thrust efficiently. [2.5.2]

2. During the final turn before *Carrier* grounded, it is unlikely that there was sufficient time for the propeller pitch to move from full astern to full ahead and for the engine to respond in order to generate the maximum amount of ahead thrust. [2.5.2]

3. The risks faced by the SAR helicopter crews who responded to the accident were exacerbated by the limited availability of SAR helicopters on that night. It was extremely fortunate that the situation on board *Carrier* remained stable for long enough to enable all the crew and the winchman to be rescued without injury. [2.10]

SECTION 4 - ACTION TAKEN

4.1 REEDEREI ERWIN STRAHLMANN E.K.

The managers of Reederei Erwin Strahlmann e.K have taken the decision not to let any of their vessels call at Raynes Jetty in the future.

SECTION 5 - RECOMMENDATIONS

The **Department for Transport** is recommended to:

2013/115 Engage with the MCA and the Port Marine Safety Code Steering Group to broaden the application and uptake of the Port Marine Safety Code by operators of non-statutory harbours.

The **Maritime and Coastguard Agency** is recommended to:

2013/116 Work with the UK Meteorological Office to review the terminology used in maritime weather forecasting to ensure that severe weather warning broadcasts are self-explanatory and explicit, with the aim of removing the potential need to consult other sources of information in order for users to fully understand the implications of such broadcasts.

CEMEX UK Materials Limited is recommended to:

2013/117 Establish better control of maritime operations at Raynes Jetty by developing and implementing a safety management system, which incorporates logical elements of the Port Marine Safety Code, and:

- Provides support to jetty staff when making effective operational decisions about berthing and loading ships safely.
- Delivers advice, or access to sources of advice, about maritime operations including weather forecasting, mooring arrangements and ship manoeuvring in the vicinity of the berth.

Reederei Erwin Strahlmann e.K. is recommended to:

2013/118 Ensure masters of its vessels are better equipped to make well informed decisions by providing them with:

- Advice on the different terminology used by national weather forecasting services.
- Details about clauses in their charter-party agreements relating to bad weather.
- Guidance and training on the most effective techniques for manoeuvring in severe weather conditions.

Marine Accident Investigation Branch
May 2013

Safety recommendations shall in no case create a presumption of blame or liability

Annex A

Information sheet on Raynes Jetty from Quality Freight

QUALITY FREIGHT UK LTD
[redacted]

ATTENTION MASTER MV CARRIER

FM QUALITY FREIGHT UK [redacted]
DUTY MOBILE [redacted]

CEMEX /QUALITY FREIGHT (UK) LTD

INFORMATION SHEET - RAYNES JETTY, LLANDDULAS

TO ENSURE EFFICIENT LOADING AT THE ABOVE INSTALLATION PLEASE ENSURE THAT MASTER AND CHIEF OFFICERS HAVE A COPY OF THIS LETTER ONBOARD PRIOR TO CALLING AT RAYNES JETTY.

DEAR CAPTAIN OF MV CARRIER
PLEASE NOTE YOU ARE LOADING ABOUT 2100 MTONS OF LIMESTONE IN ONE GRADE ALL TYPE 1

FROM RAYNES JETTY , LLANDDULAS TO COWES , IOW
ASSUMING YOU SAIL FROM BIRKENHEAD AT 1400 HOURS WE EXPECTED VESSEL TO BERTH TONIGHT AROUND 2300 HOURS LOADING AND SAILING EXPECTED BY 0300 / 0330 HOURS SAME TIDE.

PLEASE KEEP THIS OFFICE FULLY ADVISED ON VESSELS POSITION AND ETA RAYNES JETTY PLEASE NOTE PILOTAGE IS NOT COMPULSORY PLEASE READ THE BELOW INFORMATION AND ADVISE IF YOU ARE HAPPY TO PROCEED WITHOUT A PILOT.

PLEASE KINDLY SEND ALL YOUR ISPS AND CREW LIST WHEN ABLE.

NOTE: FOLLOWING DETAILS ARE GIVEN IN GOOD FAITH BUT WITHOUT GUARANTEE.

RAYNES JETTY

CONSTRUCTED IN 1983, RAYNES JETTY IS OWNED BY CEMEX UK
GEOGRAPHICAL POSITION IS LATITUDE 53 DEGREES 17.56' NORTH LONGITUDE 03 DEGREES 40.42@ WEST EXTENDS 162 METRES TO SEAWARD IN A 345 T/165 T DIRECTION FROM THE HIGH WATER MARK ON A 9 METRE LIVERPOOL TIDE.

HIGH WATER AT THE JETTY IS ABOUT 27 MINUTES BEFORE LIVERPOOL AND APPROXIMATELY 1 METRE BELOW TIDE TABLE PREDICTIONS FOR HW LIVERPOOL AT IT'S SEAWARD END. THE DEPTH OF WATER AT THE INSHORE END OF THE JETTY IS REPORTEDLY REDUCED BY APPROXIMATELY 1.0 METRE.

THE LENGTH AVAILABLE FOR USE BY VESSELS UPTO 140M
THE CHARTED DEPTHS OF WATER MAY VARY WITH THE WEATHER CONDITIONS AND IT IS IMPORTANT FOR ALL VESSELS TO CHECK WITH LOADING OPERATORS PRIOR TO BERTHING THAT
IN NORMAL CONDITIONS THEY CAN LOAD AND SAIL WITHOUT PROBLEM.

VESSELS ARE ALWAYS AFLOAT WHILST LOADING AND ALONGSIDE. NO GROUNDING OR DRYING OUT TAKES PLACE UNDER NORMAL CIRCUMSTANCES ALTHOUGH SHIPS HAVE BEEN AGROUND AT RAYNES SAFELY.

ALL OWNERS SHOULD CHECK WITH QUALITY FREIGHT UK , PRIOR TO FIXING, TO CONFIRM THAT LOA, BREADTH, DRAFT, AIRDRAFT TO TOP OF HATCH COAMING IN BALLAST ARE ACCEPTABLE AND THAT EFFICIENT WATER WILL BE AVAILABLE.

CEMEX LOAD ABT 300 SHIPS PER YEAR AT RAYNES JETTY. AS A RESULT THE QUARRY STAFF ARE HIGHLY EXPERIENCED AND SKILLED IN SAFE AND EFFICIENT BERTHING, LOADING AND UNBERTHING OF SHIPS. MASTERS WHO ARE ARRIVING AT RAYNES SHOULD CLOSELY FOLLOW THE INSTRUCTIONS OF THE SHIPLOADER WHO CAN BE CONTACTED ON VHF CH 16 (WORKING CHANNEL 14) WHILST THE JETTY IS MANNED.

THE QUARRY MANAGER HAS THE ULTIMATE AUTHORITY OF RAYNES JETTY AND AS A RESULT WILL DECIDE THE LOADING ROTATION OF VESSELS. HE WILL OF COURSE BEAR IN MIND OWNERS INDIVIDUAL REQUIREMENTS AND ACT ACCORDINGLY TO ENSURE THE MOST EXPEDIENT AND SAFE TURN ROUND OF VESSELS.

<u>WEATHER INFORMATION</u>

THE JETTY IS GENERALLY SHELTERED FROM WINDS OUT OF THE WEST THROUGH SOUTH TO THE SOUTH EAST.

IN NORTH EASTERLIES TO NORTH WESTERLIES LOADING CAN TAKE PLACE AS LONG AS MODERATE SEA-STATES PERSIST.

STRONG TO GALE FORCE EASTERLIES MAY PREVENT VESSELS FROM LOADING.WITH WESTERLY WINDS AND A NORTH WESTERLY SWELL VESSELS ARE ADVISED TO KEEP WELL CLEAR OF THE JETTY UNTIL CALLED TO GO ALONGSIDE APPROXIMATELY 4.5 HOURS BEFORE HW LIVERPOOL. THIS SHOULD BE CHECKED WITH THE JETTY ON VHF CHANNEL 16 (WORKING CHANNEL 14).

IT IS GENERALLY NOT POSSIBLE TO LOAD WITH THE WIND BETWEEN NORTH AND WEST ABOVE FORCE 6 BUT <u>MASTERS SHOULD ALWAYS</u>

CONTACT THE JETTY BY VHF TO ESTABLISH THE ACTUAL SEA STATE ALONGSIDE.

IN ALL OTHER CONDITIONS OF THE WIND IT IS SAFE TO BERTH AT THE JETTY FOR LOADING.

PILOTAGE

PILOTAGE IS NOT COMPULSORY. AND MOST VESSELS DO NOT BOTHER WITH ONE.

IF A PILOT IS REQUIRED FOR ALL VESSELS THE PILOT IS TAKEN AT THE MERSEY BAR. IT IS ESSENTIAL THEREFORE THAT QUALITY FREIGHT ARE ADVISED FOR THE VESSEL'S ETA AT BAR PILOT STATION 24 HRS IN ADVANCE GIVING GT / NT LOA AND DRAFT IN BALLAST IN GOOD TIME.

TIDAL STREAMS

ON THE FLOOD TIDE THE TIDAL STREAM SETS EASTERLY, GOES SLACK FOR A VERY SHORT PERIOD AT HW, THEN SETS WESTERLY ON THE EBB. THE TIDAL STREAMS IN THE AREA HAVE A MARKED AFFECT ON VESSELS APPROACHING THE JETTY.

BERTHING

VESSELS ARE NORMALLY GIVEN THE SIGNAL TO WEIGHT ANCHOR AND PROCEED ALONGSIDE A MINIMUM OF 4.5 HOURS BEFORE HW LIVERPOOL.

THE INITIAL CALL WILL BE MADE ON VHF CH 16 WITH ANY SUBSEQUENT COMMUNICATIONS TAKING PLACE ON CH 14. IF THE VESSEL HAS A MOBILE PLEASE ADVISE THE NUMBER .

IT IS IMPERATIVE THAT MASTERS ARE READY AND LISTENING OUT ON VHF 16 AS ABOVE AND REPLY PROMPTLY TO THE JETTY - DELAYS IN ANSWERING AND BERTHING COULD RESULT IN THE VESSEL NOT BEING COMPLETED ON THE SAME TIDE.

THE BERTHING TIME SHOULD BE CONFIRMED WITH QUALITY FREIGHT UK FROM PREVIOUS PORT OR PRIOR TO ARRIVAL AT RAYNES JETTY. QUALITY FREIGHT. CAN ALSO ADVISE IF THERE ARE ANY OTHER VESSELS SCHEDULED TO LOAD AND GIVE REALISTIC PROSPECTS FOR BERTHING.

UNDER NORMAL CONDITIONS I.E WESTERLY WINDS SHIPS BERTH PORT SIDE TOO ON THE WESTWARD SIDE OF THE JETTY SO THAT THE TIDAL STREAM SETS ONTO THE BERTH ON A RISING TIDE.

BERTHING ON THE EAST SIDE OF THE JETTY CAN BE ARRANGED AND WILL BE DISCUSSED WHEN SHIPS ARE CALLED IN TO LOAD.

VESSELS ARE REQUESTED TO HAVE THEIR HATCHES OPEN AS SOON AS POSSIBLE SO THAT LOADING CAN COMMENCE IMMEDIATELY UPON BERTHING.

IT IS POSSIBLE TO LOAD CERTAIN SHALLOW DRAFT VESSEL ON THE EBB OF A DAYTIME TIDE BUT THIS DEPENDS ON THE TOTAL CARGO TO BE LIFTED AND THE TIME OF ARRIVAL ALLONGSIDE THE JETTY. THIS CAN BE CHECKED WITH QUALITY FREIGHT OR THE QUARRY MANAGER. SUCH ARRANGEMENTS NEED TO BE MADE IN ADVANCE.

AT NIGHT, IF NO OTHER VESSEL IS LOADING ON THE FLOOD TIDE, THE QUARRY MANAGER WILL NOT AGREE TO LOADING ON THE EBB APART FROM IN VERY EXCEPTIONAL CIRCUMSTANCES.

NOTE CARE MUST BE TAKEN BY CREW IN OFFERING SHIPS ROPES TO JETTY PERSONEL ON BERTHING - PLEASE WOULD ALL CAPTAINS ENSURE CREW TRY AND KEEP ROPES FOR CLEAR OF WATER.

APPROXIMATE BERTH LIMITATIONS

LENGTH OVERALL - ABT 140M .
EXTREME BREADTH - 16.50M.
DRAFT UP TO 6.60 METRES DEPENDING ON HEIGHT OF TIDE.

LOADING RATES

THE LOADING RATE AT RAYNES JETTY IS ABOUT 1000 TONNES PER HOUR DEPENDING ON THE GRADE OF CARGO AND THE NUMBER OF VESSELS TO BE LOADED ON THE SAME TIDE. IT IS THEREFORE VERY IMPORTANT FOR VESSELS TO HAVE MINIMUM BALLAST R.O.B ON BERTHING. IF THIS IS NOT POSSIBLE DUE TO WEATHER CONDITIONS EDWARD NICHOLSON RUNCORN OR THE QUARRY ARE TO BE INFORMED AS SOON AS POSSIBLE.

VESSELS ARE REQUIRED TO SAIL FROM THE BERTH IMMEDIATELY UPON COMPLETION OF LOADING AS DIRECTED BY THE QUARRY MANAGER AND JETTY PERSONEL.

COMMUNICATIONS

ALL VESSELS OR AGENTS AT THEIR LAST PORT SHOULD ADVISE ON THE FOLLOWING NUMBERS, OF THEIR ETA AND ANY SUBSEQUENT UPDATE:-

QUALITY FREIGHT UK LTD
[redacted] .

NIGHT SIGNALS

AA) AS AA) ABOVE FOR DAY SIGNALS.

BB) THE JETTY IS MARKED FROM SEAWARD BY TWO FIXED GREEN LIGHTS DISPLAYED VERTIALLY.(JETTY LIGHTING IS VERY GOOD).

CC) AS BB) ABOVE.

DD) WHEN THE JETTY REMAINS UNLIT **KEEP CLEAR - NO LOADING**.

ADDITIONAL INFORMATION

UNDER NORMAL CIRCUMSTANCES THE JETTY IS OPERATIONAL 24 HOURS PER DAY, 7 DAYS PER WEEK INCLUDING WEEKENDS.

LOADING IS BY PRIOR ARANGEMENT.
WEEKEND, BANK HOLIDAY AND OTHER HOLIDAY PERIOD LOADING ARE SUBJECT TO CONFIRMATION BY CHECKING WITH QUALITY FREIGHT.

IF DUE TO BAD WEATHER CONDITIONS THERE IS A BACKLOG OF VESSELS WAITING TO LOAD, ROTATION WILL BE AT THE QUARRY MANAGERS DISCRETION. VESSELS WILL BE INFORMED OF THEIR TURN AND APPROXIMATE LOADING TIME AS EARLY AS POSSIBLE.

RMC RAYNES QUARRY

TELEPHONE: [redacted]
FAX: [redacted]

V. H. F.
CALL SIGN FOR JETTY IS "RAYNES JETTY" ON CH 16.
THE JETTY VHF IS ONLY MANNED WHEN A VESSEL IS DUE FOR LOADING, NORMALLY 4.5 HOURS BEFORE HW LIVERPOOL (DAY OR NIGHT).

SIGNALS ON THE JETTY

DAY SIGNALS

AA) THE MASTER OF THE APPROACHING VESSEL SHOULD MATCH HIS PORT OR STBD SIDELIGHT WITH THE RED OR GREEN LIGHT ON THE TOP OF THE ORANGE CABIN THUS RED TO RED GREEN TO GREEN PORT SIDE TOO ON THE WEST SIDE STBD SIDE TOO ON EAST SIDE

BB) THE CROSS CONVEYOR WILL BE OUT ON THE SIDE OF THE JETTY OPPOSITE TO THAT ON WHICH THE VESSEL IS REQUIRED TO BERTH.

CC) NO LIGHTS BEING DISPLAYED AND THE CROSS CONVEYOR CENTRALISED MEANS **KEEP CLEAR - NO LOADING.**

NOTE-BY DAY THE RED AND GREEN LIGHTS ARE NOT EASY TO SEE AND THE BEST INDICATION IS GIVEN BY THE POSITION OF THE CROSS CONVEYOR.

BEST REGARDS
QUALITY FREIGHT UK LTD

Annex B

Sample of data provided to The Mersey Docks and Harbour Company by The UK Metereological Office

Five Day Forecast

Tel: 0870 900 0100 www.metoffice.gov.uk

For access to a forecaster:
Communications Manager: [redacted] Email: [redacted]

THE MERSEY DOCKS AND HARBOUR COMPANY

Forecast Issued on Tuesday, 03 April 2012 at 12:26 UTC

Liverpool BAR

HEADLINE

GALE WARNING IN FORCE	YES	**LIGHTNING RISK:** 3 (moderate)
SEA TEMP (Celsius)	PS 08	

GENERAL SITUATION: Frontal wave across the UK tracks slowly south through Tuesday with a strong to gale northeasterly flow. This will persist through Wednesday before slowly backing northwesterly and easing on Thursday as the frontal wave reaches the continent and a ridge of high pressure over the Atlantic extends east over the southern UK. The ridge drifts west by the weekend allowing Atlantic fronts to cross the UK Friday and Saturday.

CONFIDENCE: High overall but low for detail on Tuesday and Wednesday due to uncertainties in track and development of frontal wave.

AT A GLANCE - VALID UNTIL 1800 Wed 04-Apr-2012

Phase	Wind (Mean)	Time (UTC)	Sea (Sig)	Time (UTC)
Max	33	04/0400	2.2	04/0400
Min	04	03/1500	0.9	03/1600

Times in 'UTC' - Cloud Height (FT) above sea level = 5/8 coverage or more below 5000ft

	Tue 03-Apr-2012				Wed 04-Apr-2012				
	12	15	18	21	00	03	06	09	12
Weather	RAIN	DRY	DRY	RAIN	RAIN	RAIN	RAIN	RAIN	DRY
Visibility	9KM	10KM+	8KM	8KM	9KM	9KM	10KM+	10KM+	10KM+
Temp	6	7	6	4	4	4	5	5	7
Cloud	2900	NIL SIG	2500	2100	2000	2000	2200	3800	NIL SIG

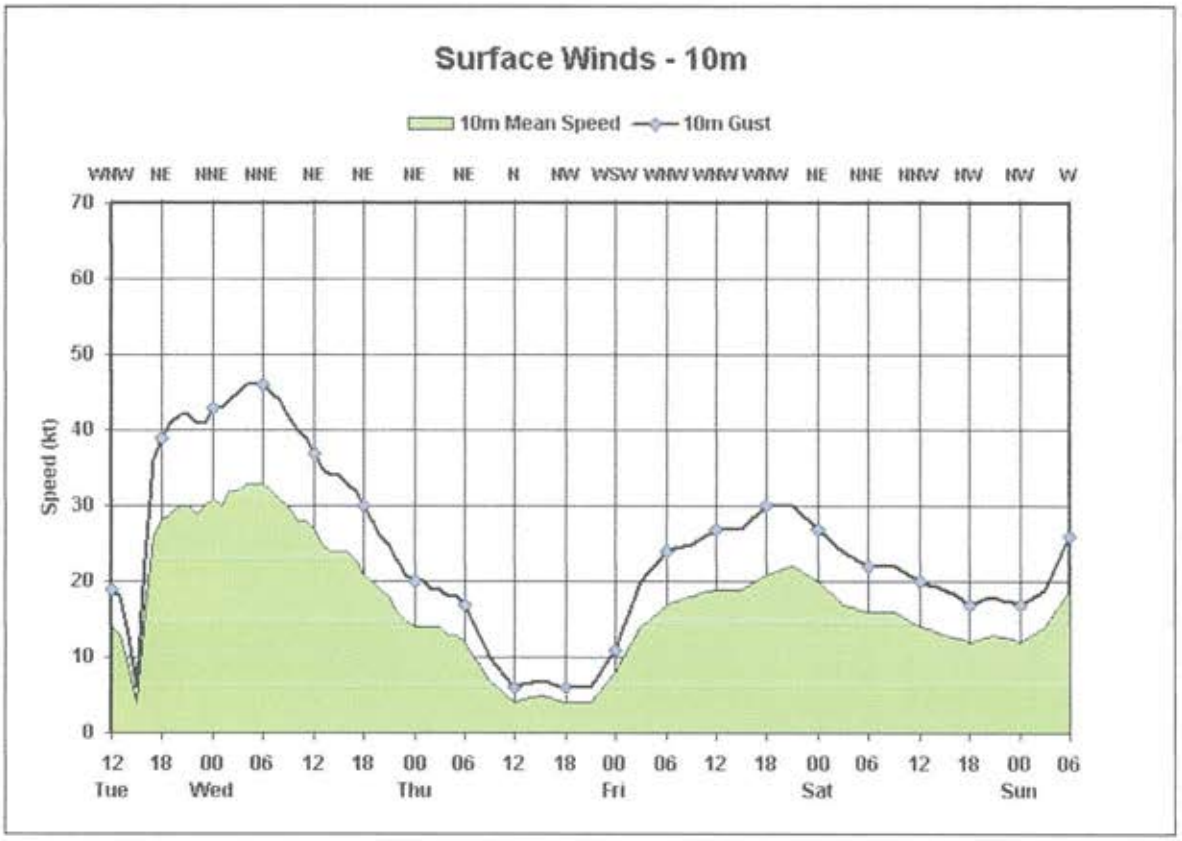
Times in 'UTC' - Wind Speed in 'Knots' - Wave and Swell Heights in 'Metres' - Wave and Swell Periods in 'Seconds'

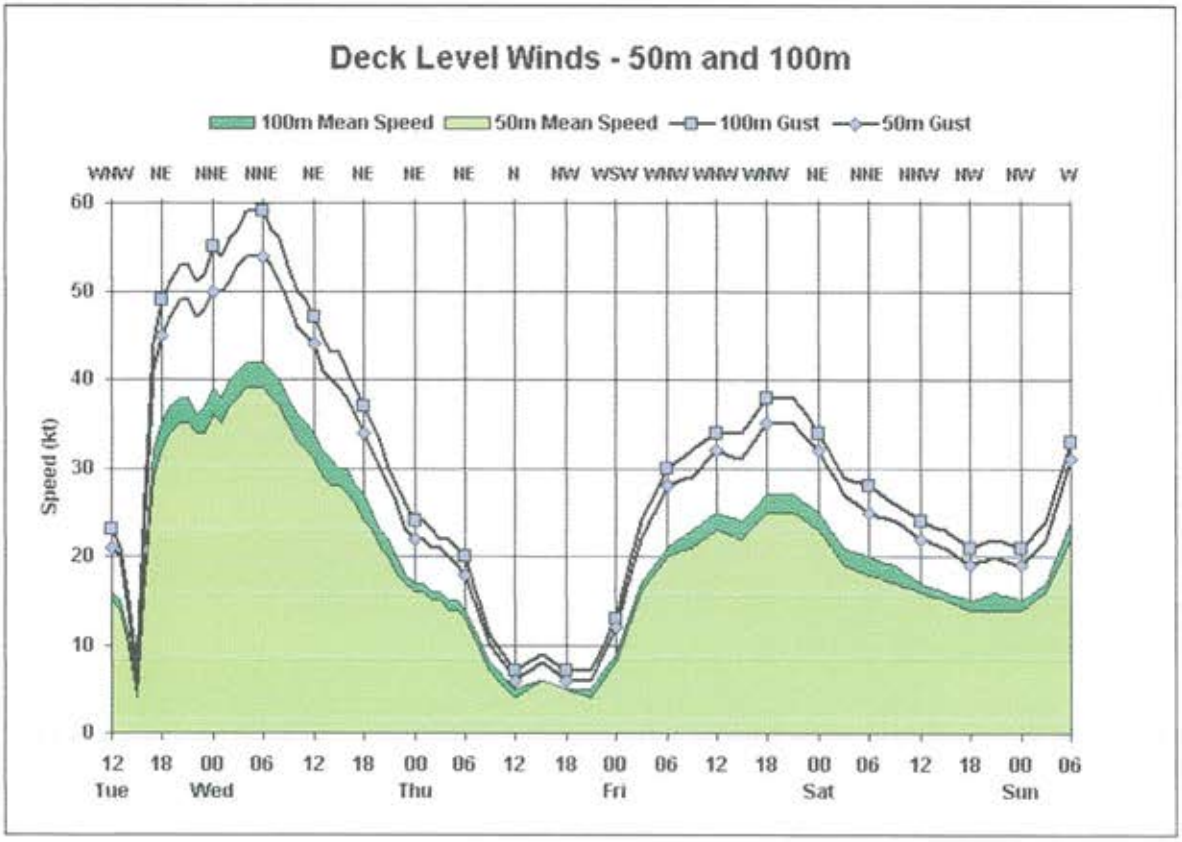
		Tue 03-Apr-2012				Wed 04-Apr-2012								Thu 05
		12	15	18	21	00	03	06	09	12	15	18	21	00
Wind Dirn		WNW	NW	NE	NNE	NNE	NNE	NNE	NE	NE	NE	NE	NE	NE
10m Wnd Spd		14	4	28	30	31	32	33	30	27	24	21	18	14
10m Gust		19	6	39	42	43	45	46	42	37	34	30	25	20
50m Wnd Spd		15	4	32	35	36	38	39	35	31	28	24	20	16
50m Gust		21	6	45	49	50	53	54	49	44	39	34	28	22
100m Wnd Spd		16	5	35	38	39	41	42	38	34	30	27	22	17
100m Gust		23	7	49	53	55	57	59	53	47	43	37	30	24
Sig Wav Hgt		1.3	1.1	1.4	2.1	2.0	2.1	2.2	2.0	1.7	1.6	1.4	1.3	1.0
Max Wav Hgt		2.1	1.8	2.2	3.3	3.2	3.4	3.6	3.3	2.8	2.6	2.2	2.1	1.6
Sig Wav Prd		4	4	4	5	5	5	5	5	5	4	4	4	4
Swell Dirn		NW	WNW	NW	NW	NW	NW	NW	NW	NW	NNW	NNW	NNW	NNW
Swell Hgt		0.1	0.9	0.3	0.4	0.3	0.3	0.4	0.5	0.5	0.3	0.3	0.4	0.3
Swell Prd		6	5	6	7	7	7	7	7	7	6	6	6	5

	Thu 05-Apr-2012				Fri 06-Apr-2012				Sat 07-Apr-2012				Sun 08-Apr-	
	03	06	12	18	00	06	12	18	00	06	12	18	00	06
Wind Dirn	NE	NE	N	NW	WSW	WNW	WNW	WNW	NE	NNE	NNW	NW	NW	W
10m Wnd Spd	14	12	4	4	8	17	19	21	20	16	14	12	12	19
10m Gust	19	17	6	6	11	24	27	30	27	22	20	17	17	26
50m Wnd Spd	15	13	4	5	8	20	23	25	23	18	16	14	14	22
50m Gust	21	18	6	6	12	28	32	35	32	25	22	19	19	31
100m Wnd Spd	16	14	5	5	9	21	25	27	25	20	17	15	15	24
100m Gust	22	20	7	7	13	30	34	38	34	28	24	21	21	33
Sig Wav Hgt	0.7	0.5	0.1	0.0	0.1	0.8	1.5	1.7	1.3	1.0	1.1	1.0	1.0	1.1
Max Wav Hgt	1.1	0.7	0.2	0.0	0.2	1.3	2.4	2.7	2.1	1.6	1.8	1.6	1.6	1.8
Sig Wav Prd	3	3	3	5	6	2	4	4	4	4	4	3	3	3
Swell Dirn	NNW	NNW	NNE	N	N	N	N	N	NW	NW	N	NNE	N	NNW
Swell Hgt	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.5	0.2	0.1	0.1	0.2	0.1
Swell Prd	5	4	0	0	0	0	5	5	5	6	5	4	4	4

Liverpool BAR

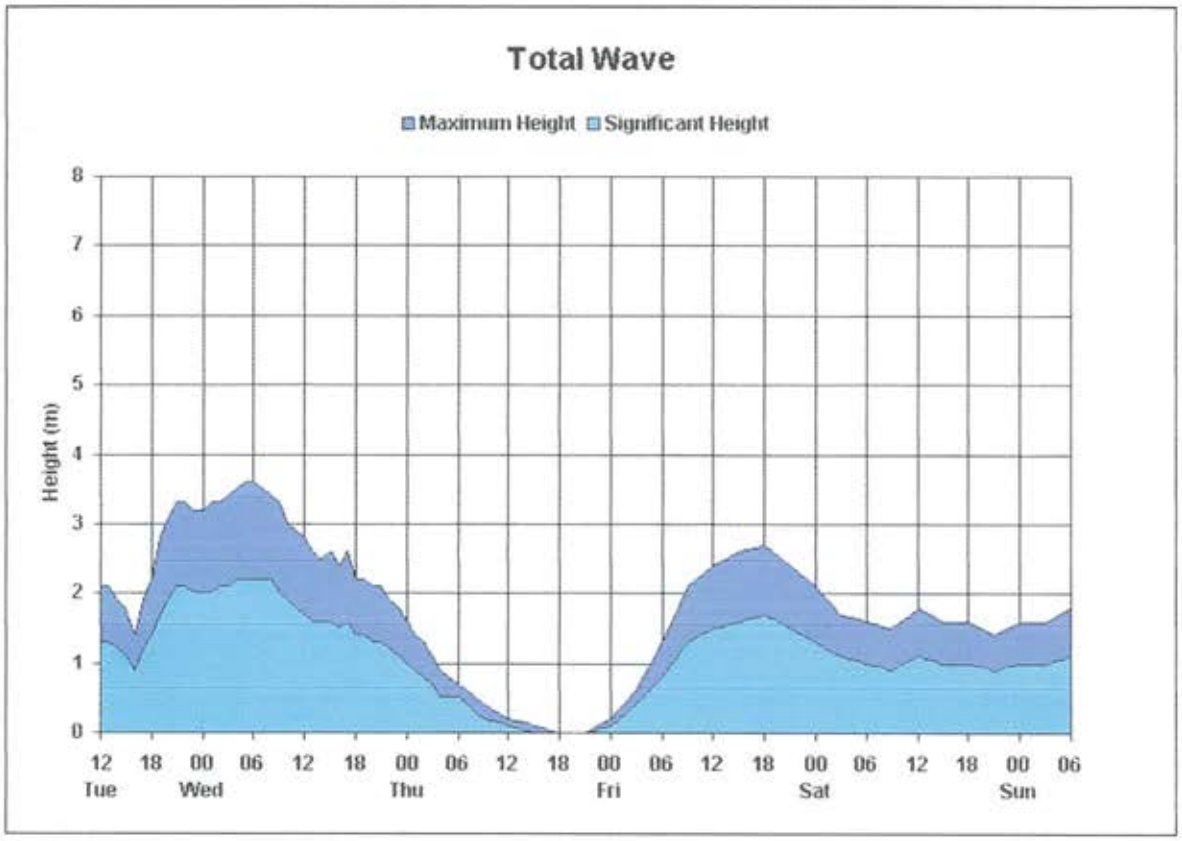
Issued on Tuesday, 03 April 2012 at 12:26 UTC

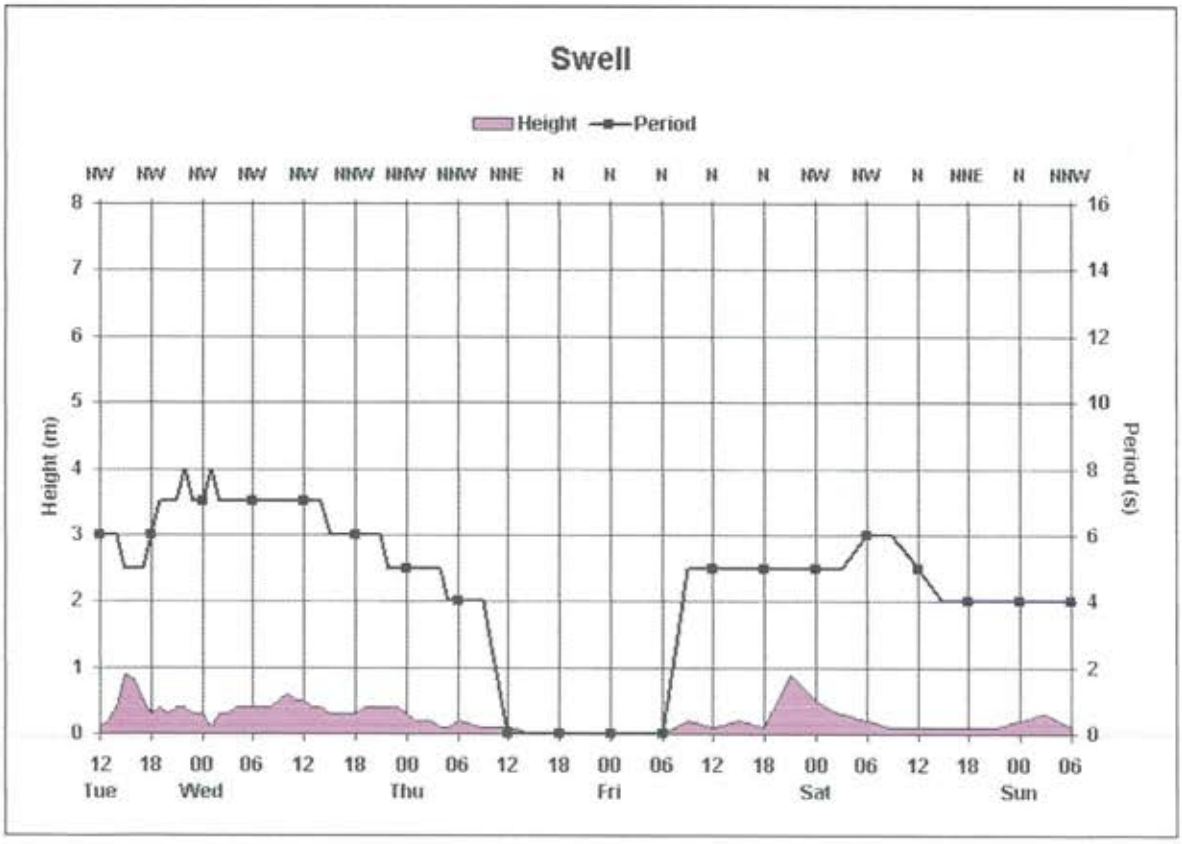




Liverpool BAR

Issued on Tuesday, 03 April 2012 at 12:26 UTC





Annex C

UK Metereological Office’s glossary of marine forecasts

Met Office

Marine forecasts glossary

Marine forecasts contain a number of terms which are used to convey specific meanings.

Gale warnings

Gale
Winds of at least Beaufort force 8 (34–40 knots) or gusts reaching 43–51 knots

Severe gale
Winds of force 9 (41–47 knots) or gusts reaching 52–60 knots

Storm
Winds of force 10 (48–55 knots) or gusts reaching 61–68 knots

Violent storm
Winds of force 11 (56–63 knots) or gusts of 69 knots or more

Hurricane force
Winds of force 12 (64 knots or more)

Note: The term used is 'hurricane force'; the term 'hurricane' on its own means a true tropical cyclone, not experienced in British waters.

Imminent
Expected within six hours of time of issue

Soon
Expected within six to 12 hours of time of issue

Later
Expected more than 12 hours from time of issue

Visibility

Very poor
Visibility less than 1,000 metres

Poor
Visibility between 1,000 metres and 2 nautical miles

Moderate
Visibility between 2 and 5 nautical miles

Good
Visibility more than 5 nautical miles

Movement of pressure systems

Slowly
Moving at less than 15 knots

Steadily
Moving at 15 to 25 knots

Rather quickly
Moving at 25 to 35 knots

Rapidly
Moving at 35 to 45 knots

Very rapidly
Moving at more than 45 knots

Pressure tendency in station reports

Rising (or falling) more slowly
Pressure rising (or falling) at a progressively slower rate through the preceding three hours

Rising (or falling) slowly
Pressure change of 0.1 to 1.5 hPa in the preceding three hours

Rising (or falling)

Pressure change of 1.6 to 3.5 hPa in the preceding three hours

Rising (or falling) quickly

Pressure change of 3.6 to 6.0 hPa in the preceding three hours

Rising (or falling) v. rapidly

Pressure change of more than 6.0 hPa in the preceding three hours

Now rising (or falling)

Pressure has been falling (rising) or steady in the preceding three hours, but at the time of observation was definitely rising (falling)

Note: For those more familiar with the millibar, 1 hPa = 1 mb

Wind

Wind direction

Indicates the direction from which the wind is blowing

Becoming cyclonic

Indicates that there will be considerable change in wind direction across the path of a depression within the forecast area

Veering

The changing of the wind direction clockwise, e.g. SW to W

Backing

The changing of the wind in the opposite direction to veering (anticlockwise), e.g. SE to NE

Sea state

Smooth

Wave height less than 0.5 m

Slight

Wave height of 0.5 to 1.25 m

Moderate

Wave height of 1.25 to 2.5 m

Rough

Wave height of 2.5 to 4.0 m

Very rough

Wave height of 4.0 to 6.0 m

High

Wave height of 6.0 to 9.0 m

Very high

Wave height of 9.0 to 14.0 m

Phenomenal

Wave height more than 14.0 m

Annex D

Admiralty Sailing Directions NP37

Llanddulas

8.21

1 **General information.** Llanddulas, a small town and port which includes Llysfaen, is situated near the coast, 1½ miles E of Penmaen Head (53°17′·68N 3°40′·85W). Two jetties extend from the coast close W of Llanddulas and are Raynes Jetty is used for loading crushed limestone from the quarry nearby. Llanddulas Jetty is closed.

2 **Pilots** are available for berthing at the jetty by arrangement with Quality Freight (Tel 0151 355 6006). They are supplied by Liverpool Pilotage (8.85), and board vessels at Bar Light Float (53°32′·01N 3°20′·98W) or off Point Lynas (53°25′·00N 4°17′·39W).

Anchorage. Vessels awaiting a berth at the jetty can anchor in the vicinity, 2 miles offshore, in at least 5 m, good holding.

Raynes Jetty

8.22

1 **General information.** Raynes Jetty (53°17′·63N 3°40′·35W) extends 218 m N from the shore at Llysfaen, 5 cables W of Llanddulas. Two green fixed vertical lights are exhibited from the head of the jetty.

Traffic. In 2010, 99 vessels called at this port totalling 331 ,258 tonnes dwt.

Vessels up to 100 m in length can be loaded on either side of the jetty, at a rate of up to 1100 tonnes per hour; the largest vessel that can be handled being one of 4500 dwt.

2 Vessels usually stay on the berth between 4 hours before until 1 hour after HW when there are depths of about 7·5 m alongside. The maximum draught accepted at HW is 6 m. Depending on tide the jetty can dry out at LW.

Owing to the exposed position of the jetty vessels cannot be worked when winds reach force 5 or over from northwest through to north east , the Jetty remains sheltered in southerly winds.

3 The operating authority is CEMEX UK Materials Ltd, Raynes Quarry, Llysfaen, Colwyn Bay, Conwy LL29 9YW. The operating authority is represented by the Quarry Manager / PFSO , to whom pre-arrival information should be sent to comply with ISPS Code , details as below :-

Quarry Manager / PFSO - Operations - United Kingdom
Office : +044(01492)517378 , Fax: +044(01492)512939 ,
Mobile: +044(0791)9227057
Address: Raynes Quarry, Abergele Road, Llysfaen, Colwyn Bay. LL29 9YW
e-Mail: [redacted]@cemex.com
www.cemex.co.uk

Supplies: No fuel or Fresh water is available. No waste disposal facilities under exemption from MCA

For further details on port operations, see *Admiralty List of Radio Signals Volume 6(1).*

Llanddulas Jetty

8.23

1 **General information.** Llanddulas Jetty (53°17′·63N 3°39′·48W), also known as Llysfaen Jetty, extends about 204 m NNW from the shore at Llanddulas and dries alongside at LW. The jetty is now derelict and should not be approached without contacting the owners Hanson Aggregates (Tel 01492 622256)

Marine Accident Report