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Subject:	Spirit Energy ISH 1 Submission - Appendix T - V, X, Z - ZC - ZO [BRO-D.FID4510105]
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CONFIDENTIAL MESSAGE - INTENDED RECIPIENT ONLY

Please find attached Appendix T - V, X, Z - ZC – ZO

Kind regards

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APPENDIX U

MARINE ACCIDENT INVESTIGATION BRANCH, REPORT ON THE INVESTIGATION OF THE COLLISION BETWEEN SAGE SKY AND STEMA BARGE II ON 20 NOVEMBER 2016 (MARCH 2018)

ACCIDENT REPORT

Report on the investigation of the

collision between

Saga Sky

and

Stema Barge II

English Channel, off the Kent Coast

on 20 November 2016

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SERIOUS MARINE CASUALTY REPORT NO 3/2018 MARCH 2018

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.

Front cover image courtesy of FameFlyNet.uk.com

All MAIB publications can be found on our website: www.gov.uk/maib

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

BPI	Burial Protection Index
CAST	Coastguard Agreement for Salvage and Towage
CATS	Central Area Transmission System
CBRAM	Cable Burial Risk Assessment Methodology
CGOC	Coastguard Operations Centre
CNIS	Channel Navigation Information Service
DNVGL	Classification society formed by the merger of Det Norske Veritas and Germanischer Lloyd
ETA	Estimated Time of Arrival
ETV	Emergency towing vessel
GMDSS	Global Maritime Distress and Safety System
HINSIB	Horizon International Naval Surveying and Inspection Bureau
hr	hour
IFA 1	Interconnector France-Angleterre 1
IHO	International Hydrographic Organization
km	kilometre
kt	knot
kW	kilowatt
LNG	Liquefied Natural Gas
LOA	length overall
m	metre
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MMO	Marine Management Organisation
MSN	Merchant Shipping Notice
MW	megawatt
nm	nautical mile
Ro-Ro	Roll on, Roll off

RTE	Réseau de Transport d'Électricité
SAR	Search and Rescue
SEMFF	South East Multi-Function Framework
Sitrep	Situation report
SME	Subject matter expert
SOLAS	International Convention for the Safety of Life at Sea 1974, as amended
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention)
t	tonne
UKHO	United Kingdom Hydrographic Office
UTC	Universal Co-ordinated Time
VHF	Very High Frequency

TIMES: all times used in this report are UTC unless otherwise stated

Saga Sky

Stema Barge II

SYNOPSIS

At approximately 0850 on 20 November 2016, the general cargo ship *Saga Sky* collided with the rock carrying barge *Stema Barge II* about 2 miles off the south coast of the UK. Both vessels were being driven towards the coast under the influence of adverse weather conditions created by Storm Angus, during which time two subsea power cables were severed.

Stema Barge II was being used to supply rock armour to a sea defence project commissioned by Network Rail. The barge had been anchored close to the subsea cable runs of Interconnector France-Angleterre 1, a high voltage power supply system operating between the UK and France.

After *Saga Sky* had passed through Dover Strait in the south-west traffic lane, the weather deteriorated significantly with the approach of Storm Angus. The south-westerly wind and tidal stream significantly reduced the ship's progress. The master attempted to turn the ship to starboard to steer a reciprocal course and run with the weather until the storm abated. The effect of the wind acting on the ship's cranes and aft superstructure overcame the turning moment of the rudder and prevented the turn from being completed. Despite maintaining propulsion, *Saga Sky* was blown broadside over a distance of approximately 7.4nm while the master continued with his attempts to turn the vessel to starboard until it collided with *Stema Barge II*. The combination of wind and tide propelled *Saga Sky*, beam on to the wind, at speeds of up to 9kts, and even after deploying both anchors the ship continued to move under the effects of the storm.

Both vessels dragged their anchors and two of the four subsea cable pairs that made up the interconnector were severed.

The investigation examined the reason for *Saga Sky* continuing to proceed in adverse forecast weather conditions, and the rationale for the master's attempted turning manoeuvre. It found deficiencies with the ship's weather forecast reception facilities, deficiencies in the sea defence project planning process, and potential shortfalls in the provision of emergency response assets.

Recommendations have been made to: the Marine Management Organisation, to improve its marine licence application process; the United Kingdom Hydrographic Office (UKHO), to promote the International Hydrographic Organization's (IHO) recommendation for implementing anchoring restrictions near subsea cables; the Maritime and Coastguard Agency, to commission a study to review the full range of emergency response assets available in the Dover Strait area and in conjunction with the UKHO to justify the need for regulatory powers which could be applied, where approriate, to ensure vessels comply with IHO recommendations made in respect of anchoring restrictions near subsea cables. A recommendation has also been made to *Saga Sky*'s manager, to enhance its shipboard procedures in respect of heavy weather operational guidance.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *SAGA SKY*/*STEMA BARGE II* AND ACCIDENT

SHIP PARTICULARS		
Vessel's name	*Saga Sky*	*Stema Barge II*
Flag	Hong Kong, China	Honduras
Classification society	DNVGL	Horizon International Naval Surveying and Inspection Bureau (HINSIB)
IMO number	9144354	L-0858273
Type	General cargo ship	Barge
Registered owner	Saga Shipholding (Norway) AS	Splitt Chartering ApS
Manager(s)	Anglo-Eastern Ship Management Ltd	Stema Shipping A/S
Construction	Steel	Steel
Year of build	1996	2007
Length overall	199m	135m
Gross tonnage	29,381	25,000
Minimum safe manning	14	Unmanned
Authorised cargo	Dry cargo	Rock
VOYAGE PARTICULARS		
Port of departure	Brake, Germany	Larvik, Norway
Port of arrival	Nueva Palmira, Uruguay (intended)	Folkestone, UK (anchored offshore)
Type of voyage	International	International
Cargo information	None	Rock armour
Manning	23	None
MARINE CASUALTY INFORMATION		
Date and time	20 November 2016, approximately 0850	
Type of marine casualty or incident	Serious Marine Casualty	
Location of incident	English Channel	
Place on board	Overside (starboard)	Overside (port)
Injuries/fatalities	None	None
Damage/environmental impact	Ruptured starboard ballast tanks	Ruptured port ballast tanks
Ship operation	In passage	Moored
Voyage segment	Mid water	At anchor
External & internal environment	South-westerly hurricane force winds (80kts), rough seas (6m wave height)	
Persons on board	23	None

1.2 BACKGROUND

Saga Sky was a 29,381gt general cargo ship, which carried forest products from South America to Northern Europe. It had sailed in ballast from Brake, Germany and was bound for Uruguay.

Stema Barge II was an unpropelled barge capable of carrying 25,000 tonnes of rock and was moored offshore between Folkestone and Dover as part of a sea defence project commissioned by Network Rail. The barge had been at anchor since 7 November and its cargo had been partially discharged to the sea defence work at Shakespeare Beach.

Interconnector France-Angleterre (IFA) 1 is a 2,000MW high voltage direct current electrical interconnector between the UK and French transmission systems. Commissioned in 1986, it is approximately 70km in length, with 45km of subsea cable. The cables come ashore near Folkestone in the UK and near Calais in France.

Storm Angus was an extra-tropical cyclone, which had developed in the Atlantic Ocean. It was forecast to arrive on the south coast of England on 20 November, then to move quickly across southern England into the North Sea, bringing a period of gales or severe gales to many southern areas.

1.3 NARRATIVE

1.3.1 *Saga Sky*

In the early hours of 20 November, *Saga Sky* was passing through Dover Strait in the south-west traffic lane **(Figure 1)**, when the weather deteriorated, with both wind and tidal stream acting against the ship's progress. Between 0300 and 0500, the wind increased to gale force 8 **(Figure 2)**.

At 0500, the ship was adjacent to the Varne Bank and the master estimated its speed at 9kts. The vessel's VDR showed an actual speed of 7.2kts through the water and 5kts over the ground.

During the next 2 hours the wind continued to increase, reaching severe gale force 9 with the ship noting wind gusts of up to 80kts. This caused *Saga Sky* to slow further as the force of the wind acted against its structure. The master attempted to counter the effects of the weather by increasing main engine speed, but this resulted in the ship pitching heavily. The pitching, coupled with the ballast condition, allowed the propeller to come clear of the water, causing the main engine to overspeed and shut down. This happened on several occasions but the engineers were able to restart the engine promptly each time.

Despite being able to maintain propulsion, by 0615 the ship was making only 1kt ahead. At 0700, *Saga Sky* was south-west of Dover and, with Varne Bank on its port quarter, the master decided to turn the ship to starboard onto a reciprocal course and run with the weather until the storm abated.

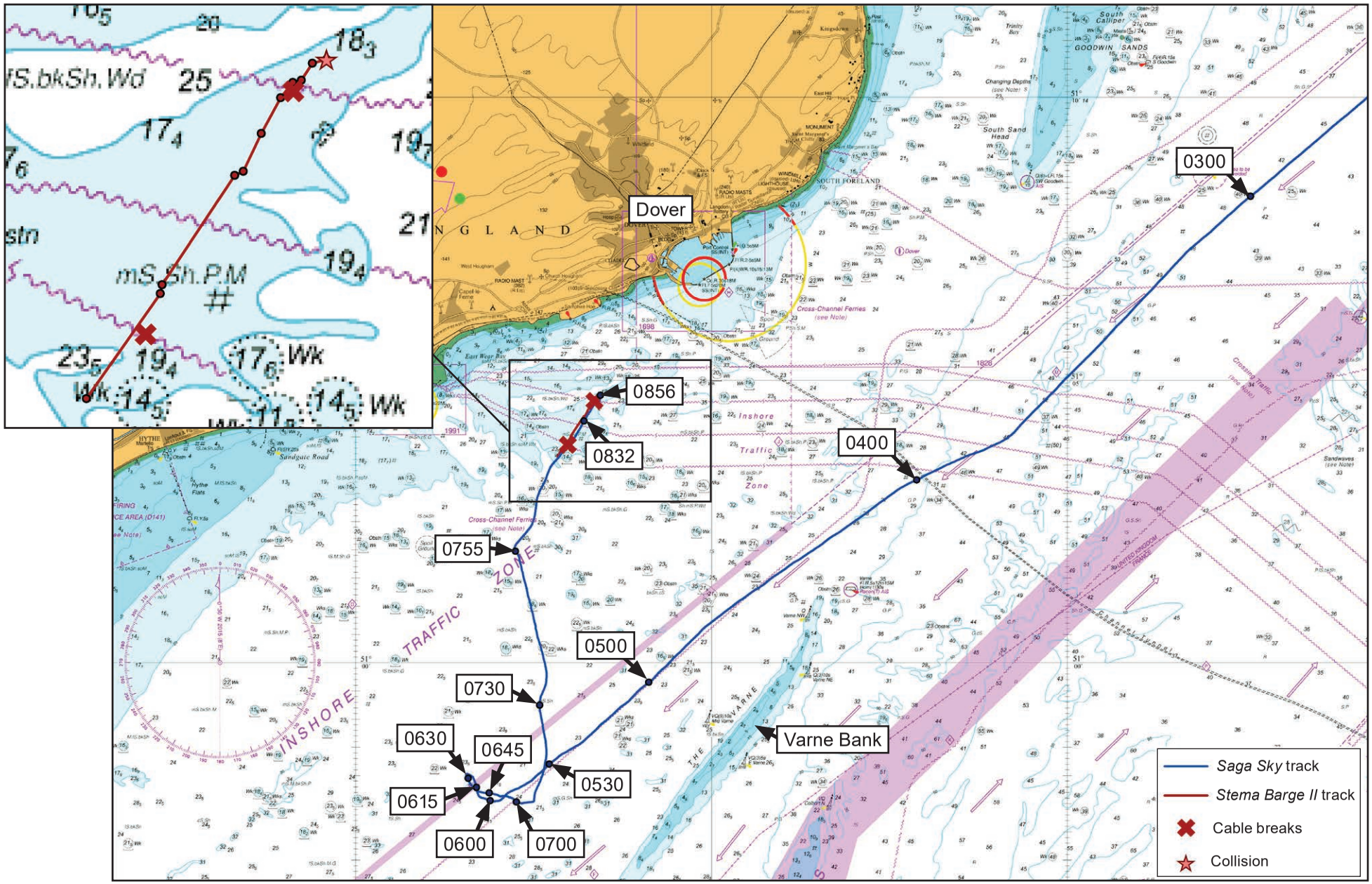

Figure 1: Reconstructed approximate tracks of *Saga Sky* and *Stema Barge II* using recorded positional radar information

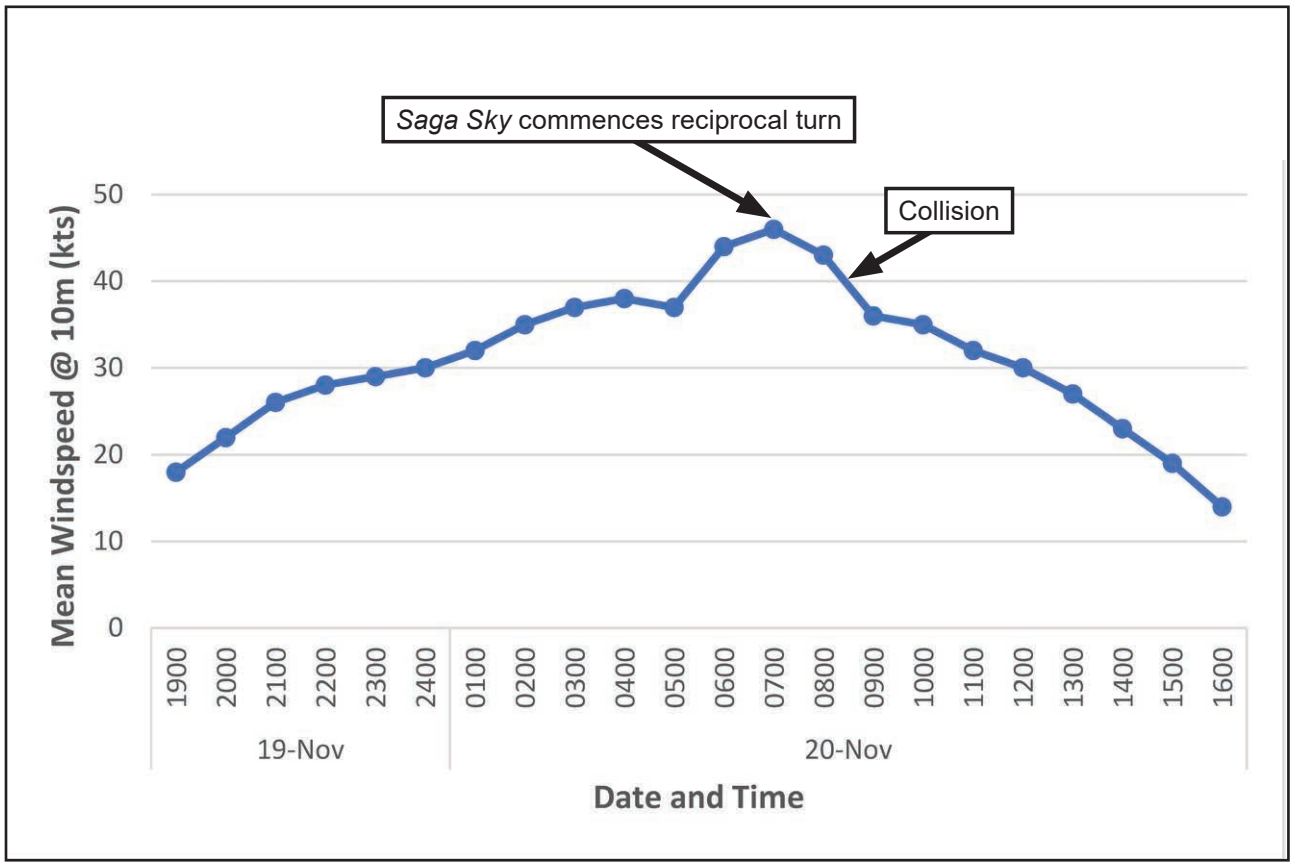

Figure 2: Graph showing wind speed against time
Note: Over the sea, gusts can be expected to be approximately 1.4 times the assessed strength of the mean wind at 10 metres.

At 0708, the master communicated his intention to Coastguard Operations Centre (CGOC) Dover. The CGOC watch officer gave the master permission to turn the ship into the inshore traffic lane. A series of communications between CGOC Dover and *Saga Sky* then followed.

As the master began to turn *Saga Sky*, the effect of the wind acting on the aft superstructure and the ship's cranes, which had been secured aft for passage, overcame the lift from the rudder and prevented the turn from being completed. As the vessel came beam on to the sea it began rolling heavily with the bridge inclinometer showing angles in excess of 40°.

The master made repeated unsuccessful attempts to turn *Saga Sky* to starboard and onto a reciprocal course. However, the ship remained generally on a west-north-westerly heading with the wind and sea pushing it in a northerly direction towards the UK coast. *Stema Barge II*, which had also been affected by the prevailing weather, was situated between *Saga Sky* and the coast.

At 0755, CGOC Dover transmitted the first of several prompts to the master to consider anchoring. The master had already considered deploying an anchor but was of the opinion that conditions were such that it was unsafe to allow an anchor party to operate on the forward deck.

At 0819, *Saga Sky* was at imminent risk of colliding with *Stema Barge II* when the master requested CGOC Dover to send a tug. At 0825, CGOC Dover advised the master that tug assistance was being sought.

At 0832, in an attempt to avoid a collision with *Stema Barge II*, *Saga Sky*'s master ordered the port anchor to be deployed. The anchor was let go and the cable run out to its full length of 11 shackles. This was followed by release of the starboard anchor. Notwithstanding these efforts, at approximately 0850 *Saga Sky* collided with *Stema Barge II* and, at 0856, the master broadcast a "Mayday" message. Following the collision, the two vessels remained locked together and stopped drifting.

In the period between 0700, when the master made his decision to turn and run with the prevailing weather, and approximately 0850, when *Saga Sky* and *Stema Barge II* collided, *Saga Sky* had travelled beam on to the weather and under the influence of the wind and tide a distance of approximately 7.4nm at speeds of up to 9kts.

CGOC Dover reacted to the "Mayday" message by tasking the RNLI lifeboat at Dover, Port of Dover tugs, and other vessels in the vicinity to assist. At 0836, the coastguard requested the assistance of a French tug, and at 0838 the French authorities agreed to send the tug *Abeille Languedoc*, which was located in Boulogne and stated that it would be mobilised in 30 minutes (see section 1.10).

At 0917, *Saga Sky*'s master requested an evacuation of the ship. This request was repeated at 0919 when he reported that there were 23 persons on board.

By 0930, CGOC Dover had confirmed that the evacuation would be carried out by helicopter. Evacuation of non-essential personnel commenced at 0945. At 1021, with all non-essential personnel evacuated, the master informed CGOC that the situation on the ship was stable and that he wished to cancel the evacuation. By 1027, helicopter operations had been suspended.

1.3.2 *Stema Barge II*

Between 7 and 10 November, *Stema Barge II* had dragged anchor approximately 0.5nm before settling at a position close to cable route 4, the most southerly cable route of IFA 1, where it remained until the arrival of Storm Angus on the morning of 20 November. As the storm reached its peak off Dover, the barge's anchor again began to drag. Over the course of several hours, the barge moved a further 1.2nm until it reached the point at which the collision occurred, about 2 miles off the coast **(Figure 1)**.

1.3.3 Damage

Saga Sky suffered damage to ballast tanks along its starboard side **(Figures 3a** and **3b)**, and the crew were able to compensate for the resulting port list by pumping out ballast from the port ballast tanks. The vessel was assessed by French surveyors as remaining seaworthy and it subsequently crossed the English Channel with the French tug *Abeille Languedoc* in attendance. It then berthed alongside in Dunkirk until a dry dock became available in which to complete permanent repairs.

Stema Barge II suffered extensive damage to its port ballast tanks. The barge remained at anchor off Dover for several days until arrangements were made to tow it to a facility on the River Tyne to carry out repairs **(Figure 4)**.

The subsea cables of IFA 1 were damaged in way of cable routes 2 and 4 (see section 1.4.1). Subsequent seabed surveys indicated that the cable pairs at both routes were severed and that seabed scars consistent with anchor dragging crossed cable routes 2 **(Figure 5)**, 3 and 4. Despite a clear scar crossing cable route 3, no damage was recorded on these cables.

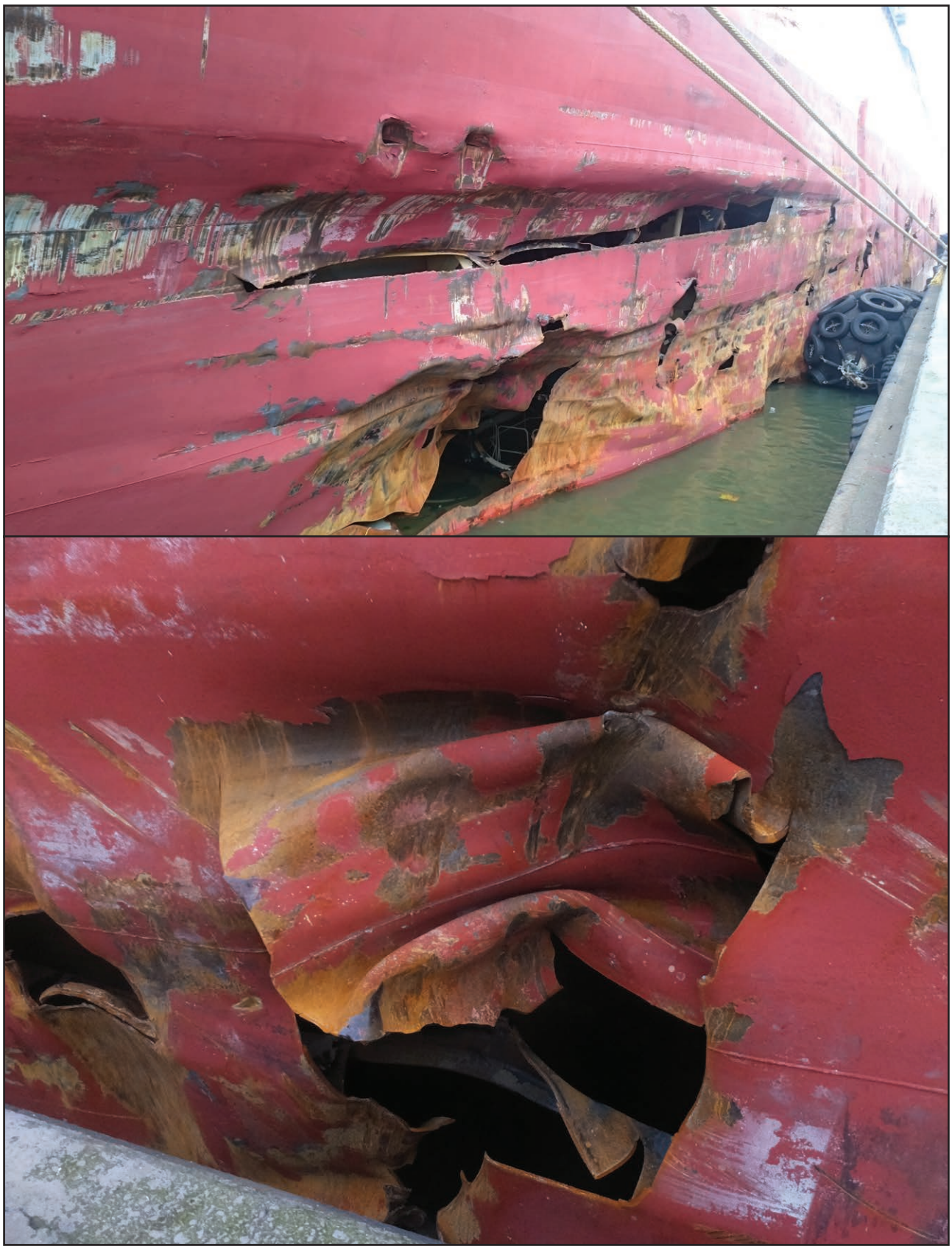

Figure 3a and **3b**: Damage to *Saga Sky*'s starboard side

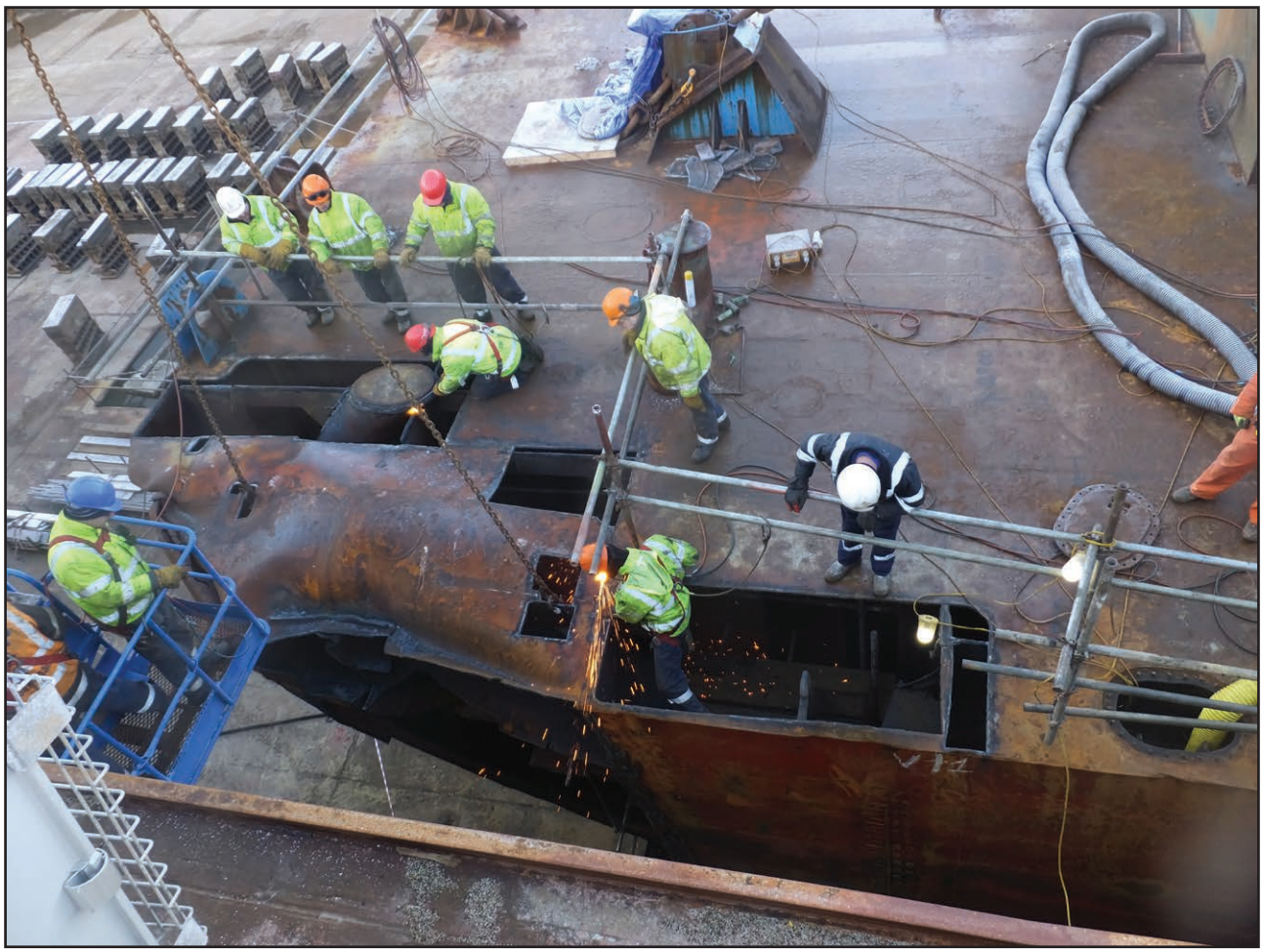

Figure 4: *Stema Barge II* undergoing repairs

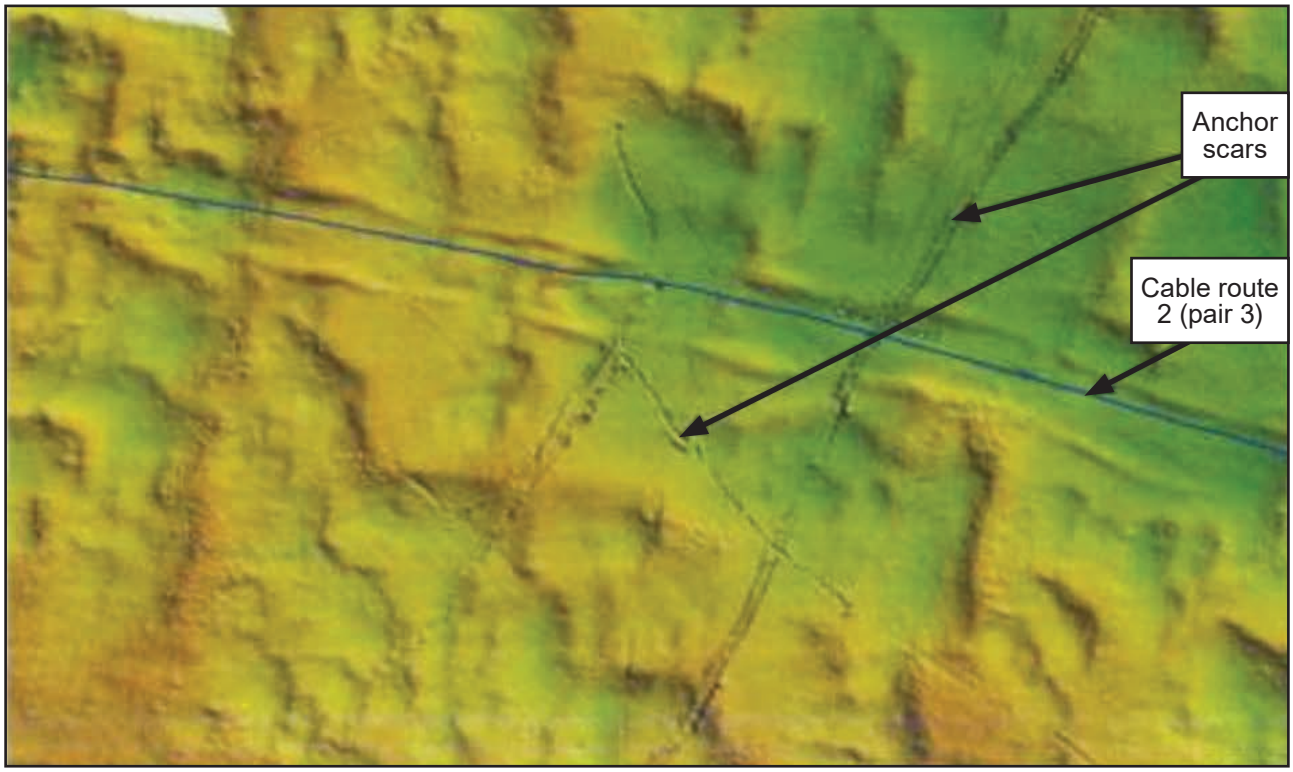

Figure 5: Seabed scan image of cable route 2

1.4 SUBSEA CABLES

1.4.1 Interconnector France-Angleterre

IFA 1 consists of four pairs of cables **(Figure 6)**. Cable pairs 1 and 3 (cable routes 4 and 2) are owned by Réseau de Transport d'Électricité (RTE), the French transmission system operator. Pairs 2 and 4 (routes 3 and 1) are owned by the UK company National Grid Interconnectors Limited, which is a wholly owned subsidiary of National Grid Plc.

The cable pairs are laid in trenches approximately 850m apart. The geology of the seabed in the area of the cables varies between hard chalk with a thin layer of sediment and Gault Clay.

The UK cables were manufactured and installed to the orders of the Central Electricity Generating Board. The French cables were manufactured by NEXANS (formerly CABLES DE LYON) for RTE. All of the cables have a single steel wire armature and mass impregnated paper insulation. They have no known toxicity in the maritime environment.

The UK landing point for the subsea cables is near Folkestone, Kent. The French landing point for the cables is near Calais. Once ashore the cables connect to converter stations and then to the national transmission systems.

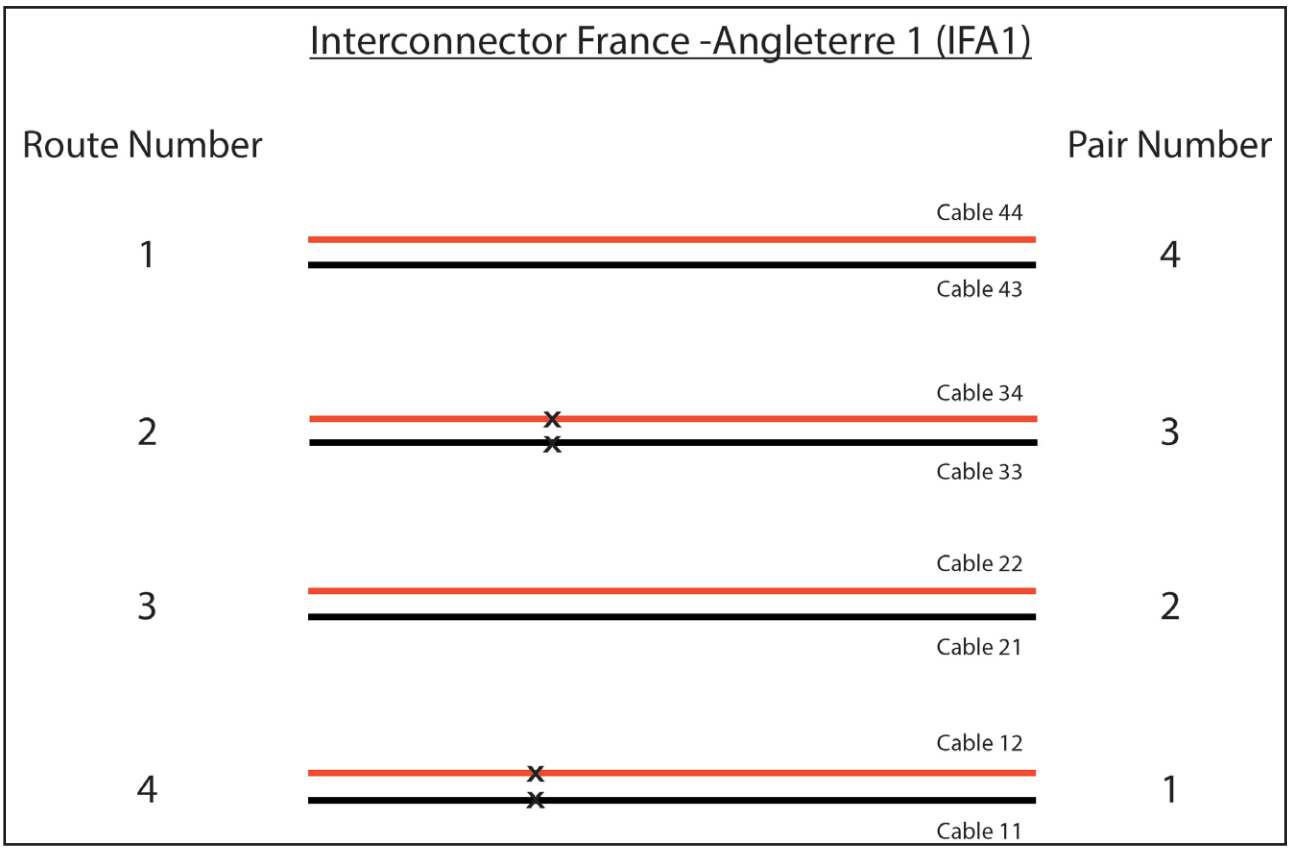

Figure 6: Interconnector France-Angleterre 1 (IFA 1)

1.4.2 Cable protection regulation

Article 27 of the Convention on the Law of the High Seas (1958) states:

> *'Every State shall take the necessary legislative measures to provide that the breaking or injury by a ship flying its flag or by a person subject to its jurisdiction of a submarine cable beneath the high seas done wilfully or through culpable negligence, in such a manner as to be liable to interrupt or obstruct telegraphic or telephonic communications, and similarly the breaking or injury of a submarine pipeline or high-voltage power cable shall be a punishable offence. This provision shall not apply to any break or injury caused by persons who acted merely with the legitimate object of saving their lives or their ships, after having taken all necessary precautions to avoid such break or injury.'*

1.4.3 Cable burial guidance

In 1986, when IFA 1 was commissioned, there was no formal guidance relating to cable burial depths. However, a form of risk assessment was undertaken, which resulted in the cables being buried to a depth of 1.5m beneath the seabed in areas where the depth of water was less than 60m.

The importance of subsea power cables has increased with the development of offshore renewable energy and the need to bring the energy ashore.

It is widely recognised that ships' anchors pose a significant hazard to submarine cables as they are designed to penetrate the seabed. The depth of penetration will depend on the size and type of anchor and the nature of the seabed.

In 1997, a Burial Protection Index (BPI) was introduced. The BPI was aimed primarily at fibre optic communication cables, but it has been used to inform studies into burial depths for power transmission cables.

The BPI works on the principle that the penetration of anchors or fishing gear will be dependent on the strength of the soil. The BPI considers size and density of vessel traffic and the proximity of recognised anchorages.

In the UK, the Crown Estate owns the territorial seabed out to a distance of 12nm from the high water mark and has a responsibility for offshore wind energy. It currently provides comprehensive guidance on cable route planning and separation.

In 2012, the Crown Estate produced a document titled 'Principles of Cable Routeing & Spacing' (prepared by Red Penguin Associates Ltd), which gives guidance on cable protection. An extract is at **Annex A**, which includes reconstructed graphs of BPI against recommended cable burial depth in respect of a range of soil characteristics, and anchor penetration depth against drag distance in respect of a 5t and a 2t anchor in soft clay.

More recently Cable Burial Risk Assessment Methodology (CBRAM) has been studied by the Carbon Trust, an independent company which, among other things, helps to develop low-carbon technologies including renewable power. This has taken the form of a collaboration with the UK government, Scottish government and industry with the aim of bringing down the cost of offshore electricity.

The CBRAM advocates a more risk-based approach to cable burial depth. It questions whether the BPI is too conservative in respect of seabed soil conditions and fails to look sufficiently at the probability of incidents involving anchors. Among other factors, it offers a 'probabilistic' approach to risk. The Carbon Trust document 'Guidance for the Protection of Cable *Depth of Lowering* Specification CTC835', published in February 2015, refers to the probabilistic risk assessment process. An extract is at **Annex B**.

1.4.4 Cable repair process

Damage to subsea cables can occur through a number of different mechanisms including during installation, from ships' anchors or commercial fishing activities and through natural events resulting in changes to the seabed topography.

If a cable has been damaged, both ends of the damaged section need to be recovered to the surface. A spare length of cable is used to join the cable ends after which the cable is lowered to the seabed. As the repaired cable is now longer it cannot be re-laid in the original trench. The additional bight (often referred to as an 'omega') is difficult to bury owing to its relatively tight radius, and is therefore commonly left lying on the seabed protected by concrete mattresses positioned at key points around it. However, following repairs significant lengths of cable can be left unprotected and exposed to risk of damage on the seabed.

1.4.5 IFA 1 repair history

Cable pair 2 had been repaired in 2003. This repair is believed to have been required as the result of cable deterioration due to an installation fault. Some of the seabed scans conducted since 20 November 2016 indicate that additional repairs might have been carried out previously to other cables.

Since its installation in 1986, there have been no reported planned maintenance or condition surveys carried out on the interconnector.

1.4.6 Recent developments

An International Hydrographic Organization (IHO) Assembly meeting held at Monaco in April 2017 recommended that the following wording should be used in nautical publications such as The Mariner's Handbook and Annual Summary of Notices to Mariners:

> *'Certain submarine cables are used for telecommunications functions while others are used for power transmission. All power cables and most telecommunications cables carry dangerous high voltages. Damaging or severing a submarine cable, whether a telecommunications cable or a power cable, may, in some circumstances be considered as a national disaster and very severe criminal penalties may apply. Electrocution, with injury or loss of life, could occur if any cables carrying high voltage are broached. Depending on whether the cable is primarily for power or telecommunications, damage may result in power cuts, loss of voice, data transfer or internet connectivity. In these circumstances cables are considered to be critical infrastructure.*
>
> *In view of the serious consequences resulting from damage to submarine cables, vessel operators should take special care when anchoring, fishing, mining, dredging, or engaging in underwater operations near areas where these*

cables may exist or have been reported to exist. In order to minimize the risk of such damage as much as possible, vessels should avoid any such activity at a minimum distance of 0.25-nautical mile[.1] on either side of submarine cables.

Mariners are also warned that the seafloor where cables were originally buried may have changed and cables become exposed; therefore particular caution should be taken when operating vessels in areas where submarine cables exist especially where the depth of water means that there is a limited under-keel clearance.

Vessels fouling a submarine cable should not attempt to clear or raise the cable due to the high possibility of damaging the cable. No attempt should be made to cut a cable and anchors or gear that cannot be cleared should not be slipped. Before any attempt to slip or cut gear from a cable is made, the cable should first be lowered to the seafloor. Note that there is a risk of capsizing smaller vessels (primarily fishing vessels) if they attempt to bring a cable to the surface. Following an incident of fouling a cable, a vessel should immediately notify the local responsible authority of the position, type, and amount of gear remaining on the seafloor. In inland areas or along the coast, warning signs or marker beacons are often erected to warn the mariner of the existence of submarine cables.

Incidents involving the fouling of submarine cables should be reported at the shortest possible notice to the responsible authorities[.2] who should be advised as to the nature of the problem and the position of the vessel.

Notes:

[.1] Each responsible authority can set this distance to a value that they feel is appropriate.

[.2] The responsible authorities can be listed here, as well as contact methods (telephone, facsimile, VHF, e-mail, internet, etc) and required information.'

1.5 NETWORK RAIL SEA DEFENCE PROJECT

Network Rail is the owner and manager of most of the UK rail network infrastructure, and is responsible for its maintenance, renewal and enhancement. This includes the tracks, signalling and overhead wires. Network Rail is an 'arm's length public body'[1] of the Department for Transport. It has no shareholders and reinvests its income in the railways.

The sea defence project was initiated because of storm damage to the Dover/ Folkestone rail line that had occurred in December 2015. This formed part of a larger project to repair the line and give greater protection from environmental damage. Permission had been granted by the Crown Estate to build the sea defence. A condition of the approval was that Network Rail obtained a marine licence from the Marine Management Organisation (MMO) to carry out operations at Shakespeare Beach.

Network Rail contracted the work to Costain Ltd, which was the principal contractor of the South East Multi-Function Framework (SEMFF) which, in turn, sub-contracted the supply of rock armour to Stema Shipping UK Ltd.

[1] 'Arm's-length public body' is a general term used to cover several types of organisation which operate at varying, and often contested, degrees of independence from government.

1.6 *STEMA BARGE II* OPERATIONS

1.6.1 The barge

Stema Barge II was owned by Splitt Chartering ApS of Denmark, and chartered by Stema Shipping A/S to deliver rock armour in support of the sea defence project. Stema Shipping UK Ltd managed UK aspects of the contract with SEMFF.

The offshore delivery of rock using *Stema Barge II* commenced in July 2016. The rocks were transported from Norway in *Stema Barge II*, which was then anchored offshore between Folkestone and Dover. The rocks were moved inshore via a specified transhipment route on a smaller barge, *Charlie Rock*, and deposited at Shakespeare Beach **(Figures 7a** and **7b)**. Both barges had no integral means of propulsion and were manoeuvred using tugs.

Following the accident, Stema Shipping A/S carried out anchor and chain calculations **(Annex C)**, which compared the actual anchor and chain cable carried by *Stema Barge II* against the requirements contained in DNVGL Rules for Ships. The results concluded that the total weight of the barge anchor and cable exceeded the DNVGL requirements by 51%.

1.6.2 Barge anchorage

Stema Shipping UK Ltd prepared a 'rock supply – sea deliveries method statement' **(Annex D)**, which included a proposed anchorage box for *Stema Barge II* and identified a transhipment corridor from the anchorage to Shakespeare Beach. Development of the method statement involved liaison with local fishing interests and with English Channel swimming organisations that operated from Shakespeare Beach.

The method statement was prepared by an experienced project manager who did not have any formal maritime background or training.

A seabed survey was commissioned to map the seabed near the anchorage and along the transhipment corridor. The purpose of this survey was to identify objects on the seabed. On completion of the project, a similar survey was required to identify any dropped rocks that would need to be either removed or mitigated. The MMO felt that this was particularly important in respect of hazards to fishing (seabed trawling). The method statement made the following comment in respect of the seabed survey:

> *'The results of this* [survey] *and the method used will be made available to the contractor, client and local fisheries interests. The location of the transhipment 'box' will need to be agreed and need to consider the marine traffic and the numerous wrecks and war graves.'* [sic]

The proposed square anchorage box with top left and bottom right co-ordinates of 51˚ 04.40'N, 01˚ 17.00'E and 51˚ 03.85'N, 01˚ 16.10'E respectively was highlighted on an extract from an Admiralty chart. The box was located directly above IFA 1, cable route 3, which was not shown on the chart extract **(Figure 8)**.

Stema Barge II was towed to the UK by the anchor handling tug *Bremen Fighter* on 7 November 2016. A handwritten entry in the tug logbook appeared to indicate that the barge was then anchored in position 51º 03.21'N 001º 15.84'E. However, a

recording of radar imagery from the Channel Navigation Information Service (CNIS) at Dover showed the barge's actual position as 51º 03.6444'N 001º 15.6583'E. Neither of these positions was within the proposed anchorage box. The CNIS radar recordings show that the barge was anchored approximately 0.28nm south-west of IFA 1, cable route 4 **(Figure 9)**.

Figure 7a: *Stema Barge II* transferring rock to *Charlie Rock*

Figure 7b: *Charlie Rock* discharging rock armour

Reproduced from Admiralty Chart 1892 edition dated 21 March 1980 by permission of HMSO and the UK Hydrographic Office

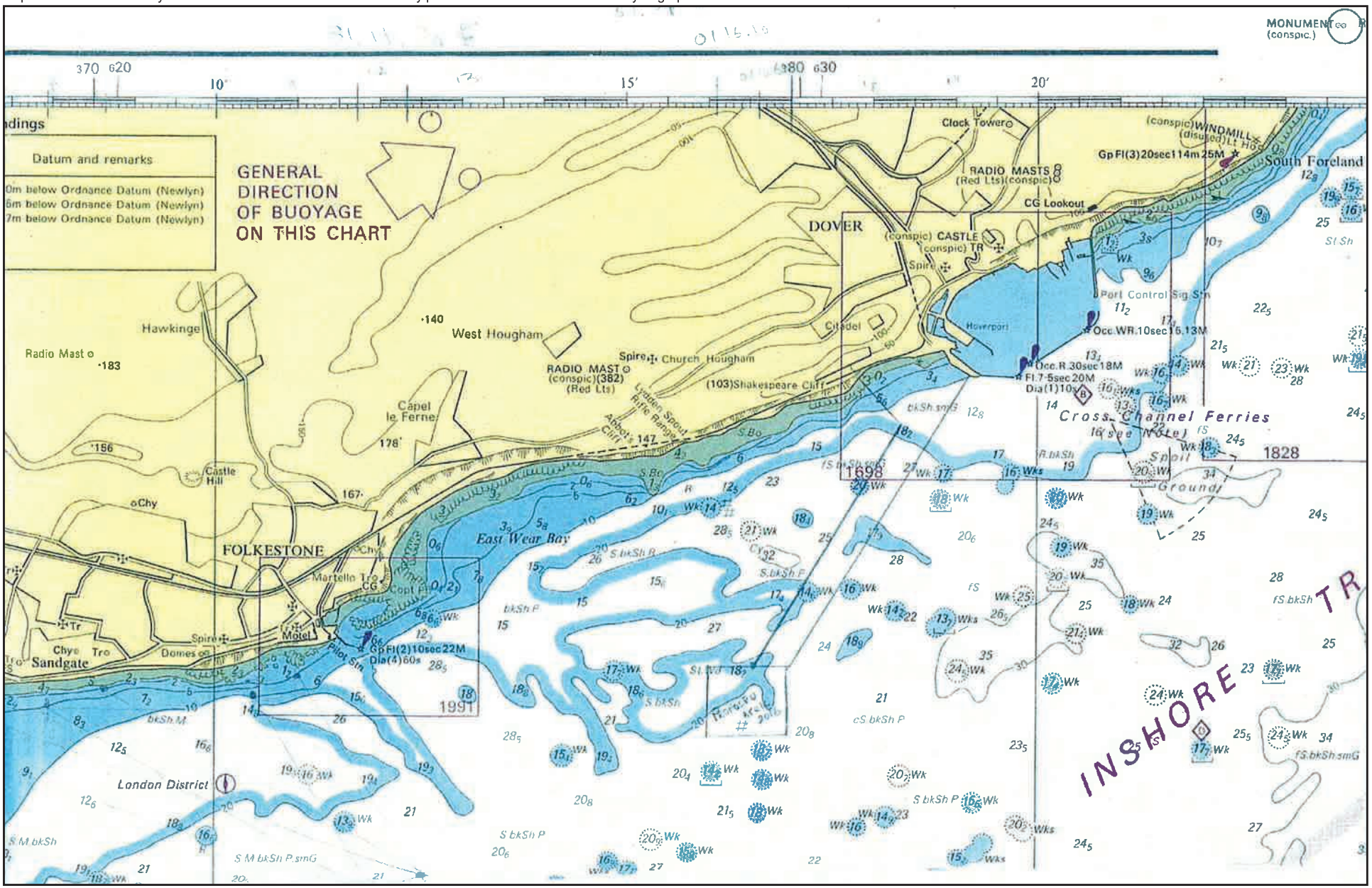

Figure 8: Stema Shipping UK Ltd chart extract

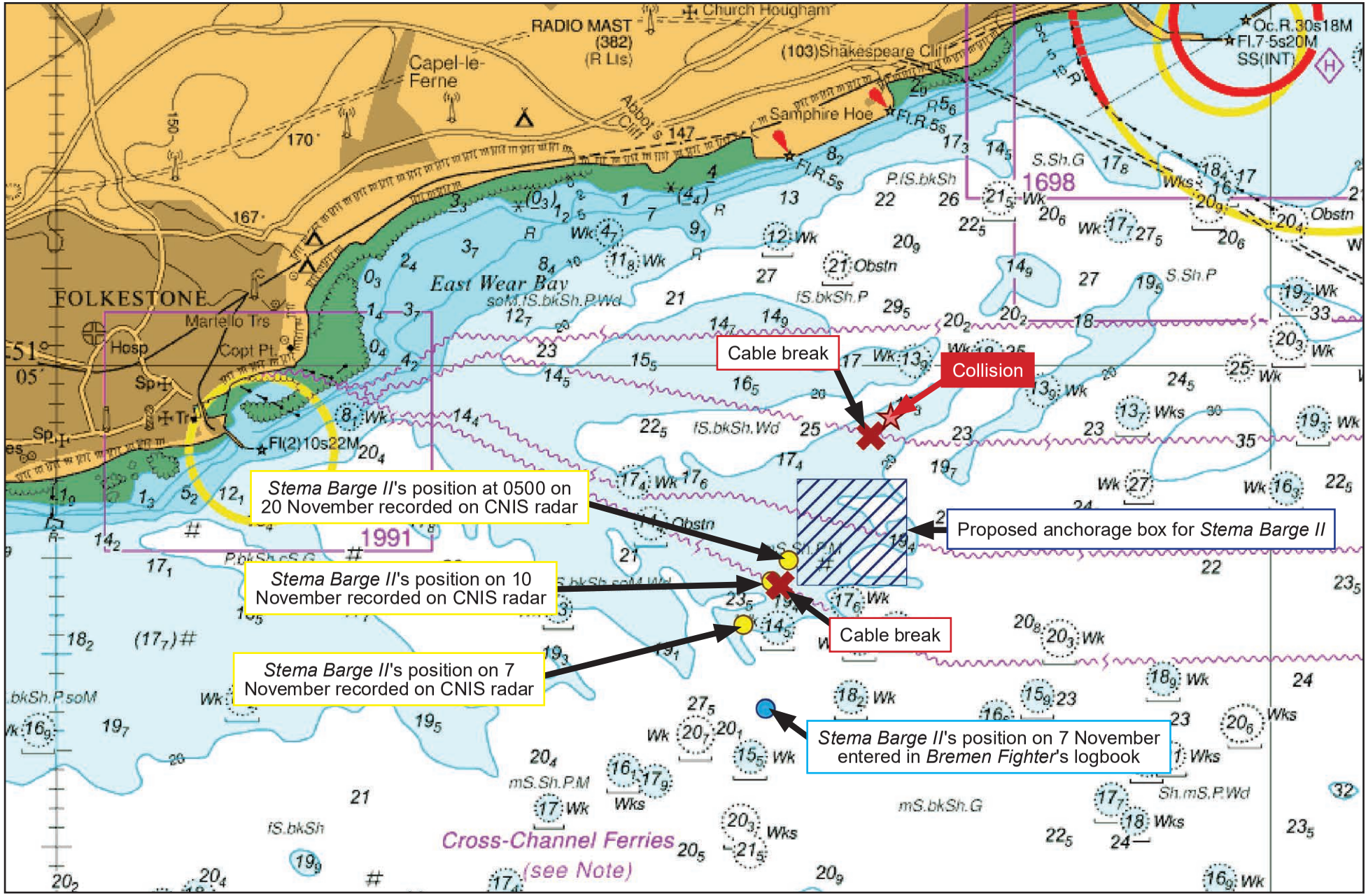

Figure 9: Admiralty Chart 1892 extract showing anchorage locations

1.6.3 Admiralty Chart 1892

The chart used by Stema Shipping UK Ltd to prepare its method statement and determine the proposed anchorage box was Admiralty Chart 1892 entitled 'Dover Strait Western Part'. The chart was dated 21 March 1980 (additional marking noted 'new edition 18 February 1977, 21 March 1980').

The four subsea cable routes of IFA 1 were first charted on a new edition of Admiralty Chart 1892 published on 10 July 1987.

The extant version of Admiralty Chart 1892 on 20 November 2016 was dated 26 February 2015 and stated the following in its chart notes:

> *'SUBMARINE CABLES AND PIPELINES*
>
> *Mariners are advised not to anchor or trawl in the vicinity of submarine cables and pipelines.'*

The chart carried an 'Anchoring Restricted' warning for co-ordinates 50° 59.0N 1° 42.0E, stating that vessels exceeding 50m in length were prohibited from anchoring in the area indicated. The stated warning referred to the inshore landing area of IFA 1 on the French side of the English Channel. The restricted anchorage warning was further referenced in the Admiralty Sailing Directions Dover Strait Pilot:

> *'Four cross-channel submarine power cables, spaced 5 cables apart and buried to 1.5 m coverage and land at two points near Sangatte (50°57'N 1°45'E). The cables are protected by an area, extending 4 1/2 miles NW of Sangatte and shown on the chart, in which vessels over 50 m in length are prohibited from anchoring. All vessels are warned against anchoring or trawling in the vicinity of the cables and on no account to cut the cables should they be fouled.'*

There was no equivalent restricted zone on the UK side of the English Channel. However, the general notice referring to submarine cables applied. The UK Maritime and Coastguard Agency (MCA) has no legislative powers to protect subsea cables or pipelines and therefore relies on generic notes printed on charts, and more comprehensive information detailed in The Mariner's Handbook and specific Notices to Mariners.

1.7 MARINE LICENCE

1.7.1 Marine Management Organisation

The Marine and Coastal Access Act 2009 (the Act) was developed to protect UK waters by creating a system for improved management and protection of the marine and coastal environment.

The Act gave rise to the MMO being established and cited it as the competent marine planning authority on behalf of the UK government, delivering marine functions in English territorial waters and UK offshore waters (for matters that are not devolved) such as marine licensing and enforcement of marine legislation. The MMO was launched in April 2010 and functions as the centre of marine expertise for

the UK. Its role is to provide a consistent and unified approach to the co-ordination and distribution of information and data, and improve efficiency by replacing a number of previously separate organisations.

Section 66 of the Act lists the range of marine activities that are required to be licensed, including the following:

> *'To construct, alter or improve any works within the UK marine licensing area either –*
>
> *(a) in or over the sea, or*
>
> *(b) on or under the seabed.'*

The MMO does not have a full range of expertise to cover all aspects of marine licence applications and relies on primary advisors to provide specific advice. The MCA, as a primary and statutory advisor, gives support. Other primary advisors for the Network Rail sea defence project marine licence application included Trinity House and Dover Harbour Board.

1.7.2 Network Rail's marine licence application

Network Rail's application to the MMO for a marine licence to carry out the sea defence project at Shakespeare Beach required the submission of a significant number of planning related documents.

During the MMO's review of the application, the following key elements were considered:

- protection of the environment
- protection of human health
- prevention of interference with legitimate uses of the sea.

The 'rock supply – sea deliveries method statement' including the chart extract, coupled with the seabed survey, was used by the SEMFF to inform a navigational risk assessment. The method statement and navigational risk assessment were submitted to the MMO by Network Rail as part of the marine licence application process.

The MMO then approached the MCA to review and comment on the application prior to the licence being granted. In particular, it was asked to provide comments or observations, within its remit, in respect of the various factors to which MMO must have regard when determining applications.

The navigational chart used to determine the anchorage was out of date and did not show the subsea cables of IFA 1. The chart used was owned by Stema Shipping UK Ltd and was part of a chart folio that had been used to support similar method statements on other UK projects. The charts were not regularly replaced and were not subject to chart updates.

While the rock delivery method statement and navigational risk assessment formed part of Network Rail's application, the licence issued by the MMO referred only to the coastal sea defence works and did not formally take into account operations away from the foreshore. However, the acceptance letter from the MCA to the MMO required the following conditions:

'Conditions:

- *The Licencee must ensure that HM Coastguard, in this case… The National Maritime Operations Centre is made aware of the works prior to commencement.*

- *The Licencee must notify the UK Hydrographic Office to permit the promulgation of maritime safety information and updating of nautical charts and publications through the national Notice to Mariners system.*

- *Any consented pipeline protection works must ensure existing and future safe navigation is not compromised. The MCA would accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum but under no circumstances should depth reductions compromise safe navigation.'*

1.8 *SAGA SKY*

1.8.1 The ship

Saga Sky was one of seven Tide-class open hatch general cargo carriers forming part of the Saga Shipholding (Norway) AS fleet. These vessels were designed with two large gantry cranes with rain protection to keep the cargo dry during loading and discharging. These cranes were stowed at the aft end of the main deck against the accommodation block when the ship was at sea.

The vessel was owned by Saga Shipholding (Norway) AS, which was owned by the NYK Group through Saga Shipholding (Isle of Man) Ltd and NYK Holding (Europe) BV. The vessel was managed by Anglo-Eastern Ship Management Ltd, who provided both crewing arrangements and technical management. The vessel was manned with Filipino officers and crew. Anglo-Eastern Ship Management Ltd managed in excess of 500 vessels of various types including bulk carriers, tankers, ro-ro ships and car carriers, LNG carriers and offshore vessels.

1.8.2 The master

Saga Sky's master was a 41 year old Filipino national. He held an STCW II/2, IV/2 certificate of competency issued by the Republic of the Philippines. He had joined *Saga Welco* as a third officer in 2006, and was promoted to chief officer in 2009 and to master in 2012. He had held command on both *Saga Sky* and its sister vessel *Saga Wind*. His contract on *Saga Sky* had started in April 2016.

The master was aware of the ship's handling characteristics in poor weather and had, on occasion, delayed sailing until a weather front had passed through. He had also turned the vessel to run with the weather on previous occasions and believed that other masters had also done so.

1.8.3 Manoeuvrability

Saga Sky had a Sulzer 7RTA52 main engine, which produced 8951kW at 117rpm. This drove a single fixed pitch, right-hand turning propeller. The ship had a maximum speed of 16.8kts with a service speed of 15kts. It was fitted with a semi-spade Mariner type rudder with a maximum angle of 36º to port and starboard. The ship's turning circle was approximately 0.5nm.

1.8.4 Weather forecasts and routeing information

Saga Sky received weather information from sources including Weathernews Inc. Weathernews information, which was sent directly to the master by email, took into account the ship's planned route and gave specific guidance based on the expected conditions.

An accompanying weather forecast **(Annex E)** was issued at 2345 on 18 November 2016 and emailed by Weathernews Inc. to the master following *Saga Sky*'s departure from Brake, Germany. It covered the period from midnight on 18 November through to midnight on 24 November and noted that there was a low pressure system with strong to near gale force winds expected to pass through before *Saga Sky* had completed its transit of the English Channel. It also indicated that, once *Saga Sky* was clear of the English Channel another low pressure system was expected over the UK, causing north-westerly near gale force winds and over 5m rough waves in the Bay of Biscay.

Regular updated weather information could also be received through a weather fax and a Navtex[2] receiver on board. However, at the time of the accident, both the weather fax and the Navtex receiver were defective. Notwithstanding this, weather information was regularly broadcast by CGOC Dover on VHF radio.

1.8.5 Management company shipboard procedures

Anglo-Eastern Ship Management Ltd's Shipboard Procedures Manual contained a section relating to navigation in heavy weather. The information included 'general guidelines for heavy weather' and information relating to navigation in the vicinity of tropical revolving storms and mid-latitude depressions.

The general guidelines stated: *'the most common reason for heavy weather damage is lack of proper route planning taking into consideration the 96 hrs, 72 hrs and 48 hrs forecasts during planning'*.

The guidance highlighted the importance of taking precautions before the onset of forecast heavy weather and the need to ensure that during heavy weather, weather reports were obtained at intervals of not greater than 6 hours. It also emphasised the need to ensure that the ship was not being strained or the engine overloaded.

The procedure required that when encountering heavy weather, the Anglo-Eastern Ship Management Ltd operations department was to be notified of current conditions and forecasts at least every 6 hours.

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[2] Navtex (Navigational Telex) is an international automated direct-printing service for delivery of navigational and meteorological warnings and forecasts, as well as urgent maritime safety information to ships. Navtex forms part of the Global Maritime Distress and Safety System (GMDSS).

1.9 STORM ANGUS

1.9.1 Extra-tropical cyclones

Extra-tropical cyclones (also known as mid-latitude or baroclinic storms) are low pressure systems with associated cold fronts, warm fronts, and occluded fronts[3], which are primarily energised by horizontal temperature contrasts in the atmosphere.

1.9.2 Naming storms

During the autumn and winter of 2015/16, the UK Meteorological Office (Met Office) and Met Éireann in Ireland, commenced a pilot scheme called 'Name our Storm'. The aim of the campaign was to make more people aware of the approaching threat posed by adverse weather by encouraging them to propose names for storms with the potential to cause significant damage.

The project was continued into 2016/17 and Storm Angus was the first named storm of the season. The storm brought strong wind gusts to the south and south-west of England, particularly in exposed coastal locations.

1.9.3 Forecasting of Storm Angus

Storm Angus developed as an extra-tropical cyclone in the Atlantic Ocean. It was forecast to arrive on the south coast of England on 20 November as an area of low pressure moving quickly across southern England into the North Sea, bringing a period of gales or severe gales and rain to many southern areas.

The severity of the storm increased rapidly from midnight on 19 November when it reached land, and the Met Office forecast indicated the possibility of structural damage due to the wind strength. This information was made available to mariners through regular broadcasts by CGOC Dover.

CGOC Dover alerted vessels on VHF radio channels 11 and 16 of impending maritime safety broadcasts (which included weather warnings) and advised which channel to listen on depending on vessel location. Throughout 19 and 20 November, the UK Met Office issued updates to the shipping forecast. In respect of the Dover area, the forecast conditions deteriorated throughout this period **(Annex F)**.

At 0015 on 19 November, the forecast for the period 0000 that day to 0000 the next day was south or south-west winds force 5 to 7 with moderate or rough seas. By 0505, the wind was predicted to increase to gale force 8, possibly severe gale 9, with rough or very rough seas.

By 0001 on 20 November, the forecast for the period 0000 to 0000 the following day stated that a deep Atlantic low in the western English Channel would move north-eastwards to be centred in the southern North Sea on the afternoon of 20 November and then in southern Sweden by the early hours of the next morning.

At 0015 on 20 November, the forecast for the Dover area was for south veering south-west severe gale 9 to violent storm 11 winds with very rough or high seas. This forecast was repeated at 0505 that day.

[3] Quote from Stan Goldenberg (HRD) USA National Oceanic & Atmospheric Administration

1.9.4 Beaufort scale

The Beaufort scale is a tool used to relate wind speed to observed sea conditions. The scale is widely used in the maritime industry and is used by the UK Met Office when issuing shipping forecasts. The extract at **Table 1** relates to the weather conditions forecast and experienced on 20 November:

Force	Description	Wind Speed (knots)	Probable Maximum Wave Height (metres)	Sea State
5	Fresh breeze	17 - 21	2.5	Moderate waves taking a more pronounced long form; many white horses are formed; chance of some spray
6	Strong breeze	22 - 27	4.0	Long waves begin to form, frequent white foam crests some airborne spray
7	High wind, moderate gale, near gale	28 - 33	5.5	Foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray
8	Gale, fresh gale	34 - 40	7.5	Moderately high waves with breaking crests, considerable airborne spray
9	Strong/ severe gale	41 - 47	10.0	High waves whose crests sometimes roll over, dense foam and large amounts of airborne spray
10	Storm, whole gale	48 - 55	12.5	Very high waves with overhanging crests, large amounts of airborne spray with reduced visibility
11	Violent storm	56 - 63	16.0	Exceptionally high waves, very large amounts of airborne spray severely reduce visibility
12	Hurricane force	Above 64	Above 16.0	Huge waves, air filled with driving spray and greatly reduced visibility

Table 1: Beaufort scale extract

The wave heights and sea state shown in the table relate to open ocean conditions and are not directly applicable to inshore waters.

1.9.5 Actual conditions

In the event, south-westerly wind speeds in excess of 64kts and wave heights up to 6m were recorded in the Dover area between 0500 and 0900 on the morning of 20 November **(Figure 2)**.

1.10 TUG AVAILABILITY

1.10.1 Commercial options

As the situation developed, CGOC Dover contacted towage and salvage brokers to ascertain the availability of tugs capable of response, assistance and salvage. It was quickly established that there were no suitable assets within several hours steaming of Dover.

1.10.2 Local assets

Dover Harbour Board responded to a request from CGOC Dover for tug assistance and, at 0901, the port's two harbour tugs were tasked to the scene. Tug *Doughty*, the duty tug, departed the eastern port entrance at 0905 and reported that sea conditions were extreme. By 0919, *Doughty* had aborted passage to the scene and returned to harbour owing to the swell conditions. The duty tug master reported that he could, with difficulty, have reached *Saga Sky*, but with the tug's low freeboard the sea conditions would not have allowed his crew to access the deck to provide assistance to the casualty vessel. The tug *Dauntless* had made departure preparations but had not left the harbour confines before *Doughty*'s attempt to reach *Saga Sky* was aborted.

1.10.3 Emergency towing vessels

The first vessels of the UK's emergency towing vessels (ETV) fleet were introduced in 1994 in response to recommendations contained in Lord Donaldson's report 'Safer Ships, Cleaner Seas', published in May 1994 following the MV *Braer* oil spill off the coast of Shetland, Scotland.

The fleet of four ETVs – *Anglian Prince*, *Anglian Princess*, *Anglian Sovereign* and *Anglian Monarch* – was based in strategic locations around the UK; two covered the south coast of England from bases in Falmouth and Dover, and two covered Scottish waters from bases at Stornoway and Lerwick. The four-strong ETV fleet was intended to be operational 24 hours a day 365 days a year, and maintained at 30 minutes' readiness to sail. One tug was allocated to each of the four operating areas on a rotational basis, worked around maintenance schedules. The ETV stationed at Dover was funded jointly with French maritime authorities.

In 2010, the government announced that as part of its Comprehensive Spending Review, the ETV fleet would no longer be funded by the MCA from September 2011, saving £32.5m over the Spending Review period. The Department for Transport stated: '*Emergency towing vessels are mainly deployed when vessels break down. The government believes state provision of ETVs does not represent a correct use of taxpayers' money and that ship salvage should be a commercial matter between a ship's operator and the salvor.*'[4]

[4] Department for Transport, Transport Spending Review 2010, 20 October 2010

On 30 September 2011, it was announced that the two ETVs operating in the Minch and the Shetland Islands would remain for an additional 3 months, with interim funding by the UK government. However, this was reduced to just one ETV for a fixed period of 90 days, stationed at Kirkwall. Subsequently, the vessel was funded until the end of the UK government Spending Review (March 2015). The review concluded that retention of the vessel "*was not a spending priority*", signalling its removal as of March 2016.

In June 2016, London Offshore Consultants published a study commissioned by the MCA entitled Assessment of ETV Provision for North and North West Scotland. The assessment concluded, inter alia, that:

> *'An analysis performed for this assessment looked at the likely proportion of vessels which visit the area and might be assisted by an ETV over a range of bollard pull capabilities. This was found to be a useful and simplistic way of assessing risk reduction against the range of bollard pull capabilities. When associated with other risk factors, the conclusion was that an ETV with a bollard pull of about 120t would be likely to provide for a reduction in risk posed by drifting or disabled vessels into the ALARP (As Low as Reasonably Practical) range.'*

Following lobbying from special interest groups and support by Scottish MPs, the MCA awarded a 5-year contract for a new Scottish ETV, to begin on 31 December 2016. *Herakles* was replaced by *Levoli Black*, a 70m towing vessel of 2283gt and a bollard pull of 139t. *Levoli Black* had previously operated as an ETV for The Netherlands.

Although the removal of most of the UK ETVs has reduced the UK's emergency towing facility, the MCA counter pollution unit retains responsibility for co-ordinating emergency towage. At the outset of an incident, the MCA contacts tug brokers to ascertain the availability of towing assets. The information identifying available assets is then passed to the casualty vessel's master and owner/manager to enable a contract to be instigated.

If the above procedure is unsuccessful, the MCA can employ a vessel under the Coastguard Agreement for Salvage and Towage (CAST) contract. However, this is a limited option, which gives a fixed price contract but does not guarantee tug availability. Currently, there are 44 tugs listed under the CAST contract. These range from harbour tugs through to deep sea capable vessels. At this time, no tugs are listed in the CAST contract in the Port of Dover.

Following the removal of the UK ETV stationed in Dover Strait, the préfet maritime of the Channel and the North Sea[5] relocated a French tug from the west coast of France to provide emergency response cover at the eastern end of the English Channel.

[5] The French State appoint a préfet maritime to exercise authority over the sea on behalf of the state in a particular region (a préfecture maritime). The préfet maritime oversees the French sovereignty at sea, monitoring operation, safety of the users, police and rescue operations, etc. He also commands all armed vessels linked to his region.

1.10.4 French tug *Abeille Languedoc*

Following the attempt by the Port of Dover harbour tugs to go to the assistance of *Saga Sky*, CGOC Dover recognised that a larger, more capable asset would be required, and at 0836 contacted the préfet maritime through the French Maritime Rescue Co-ordination Centre at Cap Griz-Nez.

The French tug *Abeille Languedoc* **(Figure 10)**, a response, rescue and salvage tug, which was located in Boulogne, was tasked at approximately 0840. The tug was at 30 minutes' notice to sail and had an estimated transit time of 2 hours. At 0943, Cap Griz-Nez reported an ETA of 2 hours. It arrived on scene at approximately 1140.

Post-collision, both *Saga Sky* and *Stema Barge II* remained stationary with their respective drifts towards shore arrested. As the wind speed subsequently decreased CGOC Dover assessed that the risk of the vessels grounding had diminished but that the French tug would still be required to fully stabilise the situation. As the weather continued to improve, the master was able to detach *Saga Sky* from *Stema Barge II* and then manoeuvre the ship to a suitable anchorage under escort from *Abeille Languedoc*.

Photograph courtesy of VesselFinder.com

Figure 10: French tug *Abeille Languedoc*

1.11 PREVIOUS SIMILAR ACCIDENT

At 2200 on 25 June 2007, the tanker *Young Lady*[6] started to drag its anchor in Tees Bay; the wind speed was in excess of 40kts and there was a heavy northerly swell.

The master decided to weigh anchor and depart, but during the operation the windlass hydraulic motor exploded and the cable ran out to the bitter end. The vessel continued to drag its anchor until 2300 when, passing over the CATS[7] gas pipeline, the anchor flukes snagged the pipe.

The vessel was caught on the pipeline for about 10 minutes before a wide yaw caused the flukes to free themselves. *Young Lady* continued dragging until the anchor finally held as it rode over a shoal patch, 2.5 miles off a lee shore. There were no injuries sustained or damage caused by pollution.

A subsequent survey of the pipeline showed that *Young Lady*'s anchor had lifted the pipeline out of its trench and dragged it about 6m laterally. The pipeline suffered damage to the concrete coating and impact damage to the steel surface.

The MAIB investigation found that:

- The master was aware that the anchorage was not recommended in the forecast conditions, and the decision to remain at anchor was inappropriate.
- There was no statutory requirement for anyone to monitor the area adjacent to the CATS pipeline, or to identify vessels anchoring too close.
- A number of strategic oil and gas pipelines run close to large vessel anchorages. A breach of these pipelines could have significant implications for the United Kingdom's energy supply.
- The risks associated with large vessels anchoring or dragging over pipelines had not been fully assessed. Consequently, some strategic pipelines could be vulnerable to snagging by large anchors.

A recommendation was made to the Department for Transport, the Department for Business Enterprise and Regulatory Reform[8] and the Health and Safety Executive to conduct a review of the risk assessment process for the protection of pipelines from surface vessel interaction.

This recommendation was accepted and implemented by all three bodies.

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6 MAIB Report No. 3/2008.

7 The Central Area Transmission System was a natural gas transportation and processing system that transported gas through a pipeline from the central North Sea to a reception and processing terminal in the north east of England.

8 The Department for Business, Enterprise and Regulatory Reform (BERR) was a United Kingdom government department. The department was created on 28 June 2007 on the disbanding of the Department of Trade and Industry (DTI), and was itself disbanded on 6 June 2009 on the creation of the Department for Business, Innovation and Skills.

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 FATIGUE

There is no evidence that any of the crew were suffering from fatigue and, therefore, it is not considered a contributing factor to this accident.

2.3 OVERVIEW

The general cargo ship *Saga Sky* collided with the rock carrying barge *Stema Barge II* about 2 miles off the south coast of the UK. Both vessels were being driven towards the coast under the influence of adverse weather conditions created by Storm Angus.

Saga Sky's master had attempted to turn the ship to starboard to steer a reciprocal course. However, the effect of the wind acting on the ship's cranes and aft superstructure overcame the turning moment of the rudder and prevented the turn from being completed. Despite later deploying both anchors, the ship was blown onto *Stema Barge II*, which had been anchored close to the subsea cable runs of IFA 1 and had dragged its anchor under the influence of the weather conditions.

The analysis explores why *Saga Sky*'s master decided to turn the ship onto a reciprocal course, why a collision between *Saga Sky* and *Stema Barge II* was not prevented, and why cable routes 2 and 4 of IFA 1 were severed in the period leading up to and during the accident.

2.4 CABLE BURIAL AND ACCIDENT DAMAGE

The cables comprising IFA 1 were originally buried to a depth of approximately 1.5m. A cable burial depth of 1.5m in areas where the depth of water was less than 60m was chosen in the absence of any available formal guidance. However, since IFA 1 was constructed, relevant formal guidance has been published, including the BPI methodology and CBRAM.

Stema Barge II's anchor weighed 8.415t and had flukes 1.925m in length. Using the BPI methodology, the recommended cable burial depth would be 1.5m for fine sand and greater for softer soils, with a potential anchor penetration depth of 6m in soft clay. Using CBRAM, the potential anchor penetration depth would be 1 x fluke length (1.925m) in sand and stiff clay, and 3 x fluke length (5.775m) in soft silt and clay.

The seabed geology in the vicinity of IFA 1 varied between hard chalk with a thin layer of sediment and Gault Clay. It is therefore possible that a cable burial depth of more than 1.5m would have been chosen had the BPI methodology been available and taken into account at the time of IFA 1's construction.

Other than the report of a cable repair in 2003, there are no available records of cable survey or maintenance. However, post-accident seabed scans indicate that a number of repairs had been made to the interconnector. A combination of repairs and shifting seabed geology is likely to have exposed cable sections and left them vulnerable to damage from ships' anchors or fishing gear. With no planned maintenance or condition surveys carried out on the interconnector, changes to the seabed and consequent cable exposure are likely to have gone unnoticed.

On 7 November, *Stema Barge II* was anchored in close proximity to cable route 4. By 0500, on 20 November, the barge had moved under the influence of the weather to a position between cable routes 4 and 3. It continued to move in a north-easterly direction and, by the time of the collision at approximately 0850, had passed over cable routes 3 and 2. In his attempt to avoid colliding with *Stema Barge II*, *Saga Sky*'s master had deployed both of the vessel's anchors. Post-accident seabed scans show anchor scars consistent with the tracks of *Saga Sky* and *Stema Barge II* intersecting cable route 2 and anchor scars consistent with the track of *Stema Barge II* crossing cable routes 4 and 3.

In view of the reconstructed tracks of *Saga Sky* and *Stema Barge II* during the period leading up to and during the accident, and supporting images from seabed scans, it is concluded that their anchors probably impacted with the cables of IFA 1 at the points where damage occurred.

2.5 NETWORK RAIL MARINE LICENCE APPLICATION

Under the requirements of the Marine and Coastal Access Act 2009, Network Rail was required to apply to the MMO for a marine licence to conduct the sea defence project at Shakespeare Beach. The marine licence granted by the MMO referred only to the sea defence works and did not formally take into account operations away from the foreshore.

Notwithstanding the above, the licence application submitted by Network Rail to the MMO included a proposed anchorage box for *Stema Barge II* and identified a transhipment corridor from the anchorage to the beach. It also included a navigation risk assessment based on a seabed survey. A seabed survey was required by the MMO before and on completion of the project as a means of identifying any rocks dropped during transhipment that would need to be removed or mitigated.

The MCA, on behalf of the MMO, reviewed and accepted the navigational safety aspects of the marine licence application, subject to the National Maritime Operations Centre and UK Hydrographic Office being notified before the work commenced.

While the Marine and Coastal Access Act 2009 required a marine licence to be granted for the sea defence project activity, the scope of the associated operations to be considered before a licence could be issued was left to the MMO's discretion. In this case, the MMO required seabed surveys to be conducted for the purpose of identifying any rocks dropped during transhipment. In referring the marine licence application to the MCA, the MMO provided no detail on the objectives of the MCA's review or what was required to be assessed.

Stema Shipping UK Ltd's preparation of the 'rock supply – sea deliveries method statement' was based on a template that had been used successfully on previous projects. It contained all the elements required to deliver the rock from the quarry

to the beach. However, the navigational chart used to determine *Stema Barge II*'s proposed anchorage box and transhipment corridor was obtained from a folio of out of date charts owned by Stema Shipping UK Ltd.

The edition of Admiralty Chart 1892 extant at the time of the accident was dated 26 February 2015 and the subsea cables of IFA 1 were first charted on the 10 July 1987 edition. The chart used by Stema Shipping UK Ltd was dated 21 March 1980 and consequently did not show the subsea cables of IFA 1.

Although the method statement was prepared by an experienced project manager, he had no formal maritime background or training and was more focused on the impact that the project would have on local fishing interests and English Channel swimming organisations that operated from Shakespeare Beach.

That an out of date chart had been used for the method statement and had passed through the project planning phase, including the marine licence application process, without being questioned, demonstrates a lack of focus on navigational risks. Consequently, the fact that the proposed anchorage box for *Stema Barge II* was located directly above IFA 1, cable route 3, was not identified.

2.6 ADMIRALTY CHART INFORMATION

Had the current edition of Admiralty Chart 1892 been used in Network Rail's marine licence application and more focus given to navigational risks, the safety implications of the proposed anchorage box and transhipment corridor for *Stema Barge II* might well have been recognised. However, the extent to which they would have prevented the marine licence from being granted is uncertain.

Current chart information relating to the submarine cables indicates that vessels over 50m in length are prohibited from anchoring in the vicinity of the cable transits in French coastal waters. However, a general notice to mariners, which advises mariners not to anchor or trawl in the vicinity of submarine cables, is all that pertains to the cables on the UK side of the English Channel.

Currently, there are no prescribed minimum distances from submarine cables that ships in UK waters should apply when anchoring or conducting other underwater activities. In view of the potentially severe consequences of vessels fouling submarine cables, the IHO has recently recommended that responsible authorities should set a minimum distance, nominally 0.25nm, for such activities. However, the MCA has no statutory powers to impose criteria for the protection of subsea infrastructure.

The MAIB's *Young Lady* investigation report identified that the relevant BA chart specifically advised vessels not to anchor or trawl within 0.25nm of the CATS pipeline. *Young Lady* was initially anchored 1.5nm from the pipeline before it later started to drag anchor. Resulting issues were that the vessel remained anchored too close to the pipeline for the forecast weather conditions, and there was no statutory requirement for anyone to monitor the area adjacent to the pipeline.

Prescribing minimum distances from submarine cables within which ships should avoid anchoring would heighten the attention given by mariners to avoiding the risk of fouling submarine cables, and such distances could be taken into consideration during the assessments of marine licence applications.

2.7 WEATHER CONSIDERATIONS

Weathernews Inc. emailed *Saga Sky*'s master with weather routeing information and an accompanying weather forecast following the ship's departure from Brake, Germany.

On passage, *Saga Sky*'s weather fax and Navtex receiver were both defective, which limited the vessel's ability to receive live and forecast weather information. Notwithstanding this, CGOC Dover regularly broadcast UK Met Office weather forecast updates for shipping by VHF radio, which the ship was able to receive.

The weather forecast for *Saga Sky*'s intended route from Weathernews Inc. had identified a low pressure system with forecast strong to near gale force winds moving into the English Channel, and had highlighted this in its information to the master. The subsequent weather forecast updates broadcast by CGOC Dover predicted deteriorating conditions. At 0015 on 20 November, the forecast was for south veering south-west severe gale 9 to violent storm 11 with very rough or high seas.

Anglo-Eastern Ship Management Ltd's general guidelines for navigation in heavy weather advised the need for proper route planning taking into account the forecast weather. It also advised the need for weather forecast updates to be received at intervals of not more than 6 hours, informing the Anglo-Eastern Ship Management Ltd operations department accordingly, and to ensure that the ship was not strained or the engine overloaded.

In not acting on the forecast of deteriorating weather conditions, *Saga Sky*'s master underestimated the risk of the weather overpowering the ship, particularly as its ballast condition resulted in a large windage area.

The accompanying weather forecast to the email received from Weathernews Inc. following the ship's departure from Brake, identified another low pressure system that was expected to impact on the ship once *Saga Sky* was clear of the English Channel.

In the absence of vessel-specific guidance as a reference for assessing the effect the forecast weather conditions would have on *Saga Sky*'s manoeuvrability, the master was reliant solely on his own knowledge and experience. It is also apparent that he was more focused on the second low pressure system than on the more immediate threat in the form of Storm Angus. Consequently, he chose to continue on passage rather than attempt to seek shelter on the eastern side of Dover Strait until the storm had passed through.

2.8 THE ATTEMPTED TURN TO STARBOARD

Having chosen to continue on passage through Dover Strait rather than attempt to seek shelter, *Saga Sky*'s master became increasingly concerned about the ship's reduction in speed and, by 0700, decided that an appropriate action would be to turn the ship to starboard onto a reciprocal course and run with the weather until the storm abated. His rationale for doing so was that he wished to retain control of the ship, he had performed a similar manoeuvre on previous occasions – albeit in deeper water with no navigational constraints. With Varne Bank on the ship's port quarter, a turn to port was not feasible.

As the master began to turn *Saga Sky*, the effect of the wind acting on the aft superstructure and the ship's cranes, which had been secured aft for passage, overcame the lift from the rudder and prevented the turn from being completed. Thereafter, *Saga Sky* remained on a broadly west-north-westerly heading with the wind and sea pushing the ship in a generally northerly direction towards the UK coast. There was now an urgent need to arrest the vessel's rate of drift.

Once the attempt to run down sea had failed the only viable options available to the master were to heave to[9] and/or deploy one or more anchors and/or seek tug assistance.

Rather than heave to, the master made repeated, but unsuccessful attempts to turn the ship around to starboard to run with the prevailing weather. Despite several prompts by CGOC Dover to consider deploying the ship's anchors to arrest the drift, he was initially of the opinion that conditions were insufficiently safe to allow an anchor party to operate on the forward deck.

Heaving to, deploying one or more anchors and seeking tug assistance remained available options. However, the master remained confident in his ability to turn the ship around and so took none of them until 0819. However, by that time, *Saga Sky* was at imminent risk of colliding with *Stema Barge II* and was drifting rapidly at speeds of up to 9kts, thereby reducing the holding effect of the anchors once they were deployed.

If severe weather impedes progress, good seamanship is to heave-to and ride out the storm. It can also include deploying one or more anchors to supplement the ship's propulsion in overcoming the effect of the weather. Although heaving-to may still cause a ship to drift, the rate of drift will be reduced, allowing more time in which to consider anchoring under controlled conditions and/or to seek tug assistance. Other recognised methods of riding out heavy weather are to run down sea, which in this case failed or, where navigationally safe to do so, to stop engines and drift.

2.9 EMERGENCY RESPONSE

Following repeated unsuccessful attempts to turn *Saga Sky* onto a reciprocal course, the master requested tug assistance from CGOC Dover and deployed both anchors in an attempt to prevent a collision with *Stema Barge II*. CGOC Dover had contacted towage and salvage brokers as the situation developed, to ascertain the availability of tugs capable of response, assistance and salvage. With no suitable assets available, they contacted Dover Harbour Board to request assistance from its harbour tugs. They also contacted the French authorities to request assistance from the French tug *Abeille Languedoc*.

The Port of Dover tugs were intended for assisting manoeuvres within the harbour confines and did not possess the capability to safely operate under the severe conditions outside of the harbour breakwater. It is therefore unsurprising that tug *Doughty*'s master abandoned his attempt to provide assistance shortly after leaving the shelter of Dover harbour.

The French tug was activated and despatched by the French authorities to assist. However, with the tug at 30 minutes' notice to sail and a transit time of approximately 2 hours, it was unable to provide the immediate assistance required. Even if *Saga*

[9] Where a ship is manoeuvred to maintain a heading into the wind and sea to reduce wind-induced drift.

Sky had avoided collision with *Stema Barge II*, it is likely that it would have grounded on the UK coast around 30 minutes later - well before the French tug could have been in a position to provide assistance.

Following the master's decision to turn *Saga Sky* to starboard onto a reciprocal course, the ship started drifting towards the UK coast. This was apparent to both the master and CGOC Dover, and prompted them both to consider the option of deploying one or more ship's anchors in an attempt to arrest the drift. Having decided that it was not safe to allow an anchor party to operate on the forward deck, the only options available to the master to arrest the ship's drift and address the risk of the ship running aground was to heave to and/or seek tug assistance, which he delayed doing until 0819.

Even if the French tug *Abeille Languedoc* had been tasked as early as 0700, when the master decided to turn *Saga Sky* to run down sea, it would not have arrived in time to prevent the vessel from colliding with *Stema Barge II* at approximately 0850. It is also unlikely that it would have been able to prevent *Saga Sky* from running aground had the ship avoided *Stema Barge II*. The lack of any suitable tug assets in the vicinity of Dover meant that Anglo-Eastern Ship Management Ltd would not have been able to engage a commercial salvor in time to avert *Saga Sky*'s collision (or possible grounding). The consequences of *Saga Sky* running aground with around 1,180t of fuel oil and 165t of diesel oil on board could have had a severe impact on the local environment.

This accident demonstrates that ships' crews who encounter difficulty in severe weather conditions when in navigationally constrained waters may not always apply good seamanship and, as a consequence, may have insufficient time in which to arrange for a commercial tug in the normal way (given commercial and availability considerations). It also demonstrates that a ship's anchors will be used in extremis in an attempt to prevent it from running aground (regardless of any restrictions on anchoring) with consequent potential damage to subsea cables and other seabed infrastructure.

The Dover Strait is cited as one of the busiest shipping lanes in the world, with an estimated 400 vessels passing through it each day. Over the years, a number of measures have been introduced to improve the safety of shipping using the Strait and so protect the local environment. Specifically, in 1967 a Traffic Separation Scheme (TSS) was implemented in the Strait, the first International Maritime Organization approved TSS in the world, and in 1972 the Channel Navigation Information Service was established. When the ETVs were introduced in 1994 and stationed in strategically significant locations, one of the four was stationed in the Dover Strait (see section 1.10.3). In the absence of the dedicated Dover Strait ETV, the nearest tug capable of rendering assistance to *Saga Sky* was more than 2 hours' steaming time away from the scene and, as such, was not capable of reacting within the time available. Given the volume of traffic using the Dover Strait and the apparent absence of local commercial salvage assets, it would be appropriate to review the availability of emergency towage provision in the Dover Strait, as has already been done for north and north-west Scottish waters.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. The marine licence granted by the MMO referred only to the sea defence works and did not formally take into account operations away from the foreshore. [2.5]

2. In referring the marine licence application to the MCA, the MMO provided no detail on the objectives of the MCA's review or what it required the MCA to assess. [2.5]

3. That an out of date chart had been used for the method statement and had passed through the project planning phase, including the marine licence application process, without being questioned demonstrates a lack of focus on navigational risks. [2.5]

4. Currently, there are no prescribed minimum distances from submarine cables that ships in UK waters should apply when anchoring or conducting other underwater activities. [2.6]

5. The MCA has no statutory powers to impose criteria for the protection of subsea infrastructure. [2.6]

6. On passage, *Saga Sky*'s weather fax and Navtex receiver were both defective, which limited the vessel's ability to receive live and forecast weather information. [2.7]

7. In the absence of vessel-specific guidance as a reference for assessing the effect of forecast weather conditions would have on *Saga Sky*'s manoeuvrability, the master was reliant solely on his own knowledge and experience. [2.7]

8. Even if the French tug *Abeille Languedoc* had been tasked as early as 0700, when the master decided to turn *Saga Sky* to run down sea, it would not have arrived in time to prevent the vessel from colliding with *Stema Barge II*. It is also unlikely that it would have been able to prevent *Saga Sky* from running aground had the ship avoided *Stema Barge II*. [2.9]

9. The lack of any suitable tug assets in the vicinity of Dover meant that Anglo-Eastern Ship Management Ltd would not have been able to engage a commercial salvor in time to avert *Saga Sky*'s collision (or possible grounding). [2.9]

10. Ships' crews who encounter difficulty in severe weather conditions within navigational constraints may have insufficient time in which to arrange for a commercial tug in the normal way (given commercial and availability considerations). [2.9]

11. A ship's anchors will be used in extremis in an attempt to prevent it from running aground (regardless of any restrictions on anchoring) with consequent potential damage to subsea cables and other seabed infrastructure. [2.9]

12. Given the volume of traffic using the Dover Strait and the apparent absence of local commercial salvage assets, it would be appropriate to review the availability of emergency towage provision in the Dover Strait, as has already been done for north

and north-west Scottish waters. [2.9]

3.2 OTHER SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT[10]

1. It is possible that a cable burial depth of more than 1.5m would have been decided had the BPI methology been available and taken into account at the time of IFA 1's construction. [2.4]

2. With no planned maintenance or condition surveys carried out on IFA 1, changes to the seabed and consequent cable exposure are likely to have gone unnoticed. [2.4]

3. In view of the reconstructed tracks of *Saga Sky* and *Stema Barge II* during the period leading up to and during the accident, and supporting images from seabed scans, it is concluded that their anchors probably impacted with the cables of IFA 1 at the points where damage occurred. [2.4]

4. In not acting on the deteriorating forecast weather conditions, *Saga Sky*'s master underestimated the risk of the weather overpowering the ship, particularly as its ballast condition resulted in a large windage area. [2.7]

5. It is apparent that *Saga Sky*'s master was more focused on the second low pressure system than on the more immediate threat in the form of Storm Angus. [2.7]

6. Despite several prompts by CGOC Dover to consider deploying the ship's anchors to arrest the drift, *Saga Sky*'s master was initially of the opinion that conditions were not safe to allow an anchor party to operate on the forward deck. [2.8]

7. Heaving to, deploying one or more anchors and seeking tug assistance remained available options. However, the master remained confident in his ability to turn the ship around and so took none of them until *Saga Sky* was at imminent risk of colliding with *Stema Barge II*. [2.8]

8. The Port of Dover tugs did not possess the capability to safely operate under the severe conditions outside of the harbour breakwater. [2.9]

3.3 SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. Even if *Saga Sky* had avoided *Stema Barge II*, it is likely that it would have grounded on the UK coast within a further 30 minutes and before the French tug *Abeille Languedoc* was in a position to provide assistance. [2.9]

[10] These safety issues identify lessons to be learned. They do not merit a safety recommendation based on this investigation alone. However, they may be used for analysing trends in marine accidents or in support of a future safety recommendation.

SECTION 4 - ACTION TAKEN

4.1 ANGLO-EASTERN SHIP MANAGEMENT LTD

Anglo-Eastern Ship Management Ltd has since included in its Shipboard Procedures Manual additional generic guidance on the effect of wind on a ship's performance.

SECTION 5 - RECOMMENDATIONS

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

2018/104 Commission a study to review the full range of emergency response assets available in the Dover Strait area, including a reassessment of the need for a dedicated emergency towing capability.

The **Marine Management Organisation** is recommended to:

2018/105 Improve its marine licence application process by:

- Highlighting precisely what activities the particular marine licence is to cover, including any specified risks to be assessed in the submission.
- Clearly stipulating a requirement that the latest nautical publications are referred to in the submission.
- Ensuring that its primary advisors are clear on the objectives of their respective reviews and the elements of the application they are required to assess.

The **United Kingdom Hydrographic Office** is recommended to:

2018/106 Adopt the International Hydrographic Organization's recommendation for responsible authorities to set a minimum distance, nominally 0.25nm, from submarine cables, within which ships should avoid anchoring or conducting other underwater activities.

The **Maritime and Coastguard Agency** in conjunction with the **United Kingdom Hydrographic Office** is recommended to:

2018/107 Justify the need for regulatory powers which could be applied, where appropriate, to ensure vessels comply with International Hydrographic Organization recommendations made with respect to anchoring in the vicinity of submarine cables.

Anglo-Eastern Ship Management Ltd is recommended to:

2018/108 Enhance its shipboard procedures by developing vessel-specific guidance that its masters can refer to in order to estimate the effect forecast heavy weather conditions could have on their ships' manoeuvrability.

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

Marine Accident Report