Marine Safety Investigation Unit

Transport Malta

MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the loss of control of the Maltese registered bulk carrier

JULIETTA D

in position 52° 25.5' N 003° 57.6' E

the allision with the Maltese registered oil / chemical tanker

PECHORA STAR

subsequent contact with a windfarm transition section and TSO platform,

and injuries to one crew member on board the Belgian registered tug

SOVEREIGN

on 31 January 2022

202201/027

MARINE SAFETY INVESTIGATION REPORT NO. 02/2023

FINAL

Investigations into marine casualties are conducted under the provisions of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 and therefore in accordance with Regulation XI-I/6 of the International Convention for the Safety of Life at Sea (SOLAS), and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009, establishing the fundamental principles governing the investigation of accidents in the maritime transport sector and amending Council Directive 1999/35/EC and Directive 2002/59/EC of the European Parliament and of the Council.

This safety investigation report is not written, in terms of content and style, with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 31 January 2022. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

The findings of the safety investigation are not binding on any party and the conclusions reached and recommendations made shall in no case create a presumption of liability (criminal and/or civil) or blame. It should be therefore noted that the content of this safety investigation report does not constitute legal advice in any way and should not be construed as such.

MARINE SAFETY INVESTIGATION UNIT
A3 Towers
Triq l-Arkata
Paola PLA 1212
Malta

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LIST OF REFERENCES AND SOURCES OF INFORMATION

Australian Transport Safety Bureau [ATSB] (2008). *Independent investigation into the grounding of the Panamanian registered bulk carrier Pasha Bulker on Nobbys Beach, Newcastle, New South Wales on 8 June 2007.* Author.

Bhatia, U. (2012). Anchorages – are they as safe as we think? *Seaways* (June), 4-5.

BMT SeaTech. (2008). *Effect of the minimum ballast condition on bulk carrier manoeuvrability for INTERCARGO*. Retrieved 15 December from https://www.intercargo.org/wp-content/uploads/2017/07/201707301829286888.pdf

CCTV footage from *Julietta D*

Danton, G. (1996). *The Theory and Practice of Seamanship* (11th ed): Author.

Dekker, S. (2014). *The field guide to understanding 'Human Error'* (3rd ed): Author.

European Maritime Casualty Investigation Platform.

House, D. J. (2004). *Seamanship techniques shipboard and marine operations* (Third ed.). Author.

Hydrographic Office Royal Netherlands Navy

International Association Classification Societies [IACS] (2005). *UR A1. Equipment* (Rev.5): Author.

IACS (2016). *UR A1. Anchoring Equipment* (Rev.6): Author.

IACS (2021). *UR A1. Anchoring Equipment* (Rev.7, Corr 1): Author.

International Maritime Organization [IMO]. (2020). *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978* (Consolidated ed.). Author.

Interviews with crew members of *Julietta D*

Interviews with crew members of *Pechora Star*

Julietta D's documents and logbooks

Julietta D's VDR data

Le Goubin, A. L. (2014). Safe anchorages – a mariner's perspective. *Seaways* (June), 8.

Lomouri, G. (2018). Time to get anchorages organised. *Seaways* (April), 4.

MARIN (2022). *Volume I. Innovative crash barrier concepts to prevent ship collisions with wind turbines.* (Version 0.3): Author.

Meteorological Office, UK

Netherlands Coast Guard Log files and recordings

Pechora Star's documents and logbooks

Pechora Star's VDR data

Rowe, R. W. (2000). *The shiphandler's guide* (Second ed.). The Nautical Institute.

Royal Netherlands Meteorological Institute (KNMI)

SafeSeaNet Ecosystem GUI

Salvor's Reports

TenneT (2022). *Ship adrift near TenneT platforms*. Retrieved 15 December from https://www.tennet.eu/news/ship-adrift-near-tennet-platforms

United Kingdom Hydrographic Office. (2020). *NP55. Sailing Directions North Sea (East) Pilot* (12th ed.). Author.

United Kingdom Hydrographic Office. (2020). *NP100. The Mariner's Handbook* (12th ed.): Author.

United Kingdon Hydrographic Office. (2021). *British Admiralty Nautical Chart 125 North Sea, Netherlands, Approaches to Ijmuiden*. UK Hydrographic Office.

Vattenfall. (2022). *Damage to Hollandse Kust Zuid wind farm after collision by Julietta D*. Retrieved 15 December from https://vattenfall-hollandsekust.nl/blog/2022/02/02/schade-aan-windpark-hollandse-kust-zuid-na-aanvaring-door-julietta-d/

GLOSSARY OF TERMS AND ABBREVIATIONS

ABS	American Bureau of Shipping
BA	British Admiralty
BFA	Barrier failure analysis
BV	Bureau Veritas
°C	Degrees Celsius
CCTV	Closed-circuit television
cm	Centimetres
COG	Course over ground
ECDIS	Electronic Chart Display and Information System
EGC	Enhanced Group Calling
EMCIP	European Maritime Casualty Information Platform
EMSA	European Maritime Safety Agency
FeBIMA	Federal Bureau for the Investigation of Maritime Accidents, Belgium
gt	Gross tonnage
HAT	Highest Astronomical Tide – is the highest level that the tide is predicted to rise above chart datum as a result of astronomical events.
IACS	International Association of Classification Societies
IMO	International Maritime Organization
ISM Code	International Safety Management Code
hPa	Hectopascal
Kg	Kilogrammes
kN	Kilonewtons
KNRM	*Koninklijke Nederlandse reddingsmaatschappij* (Royal Netherlands Sea Rescue Institution)
kW	Kilowatt
LRS	Lloyd's Register of Shipping
LT	Local time
m	Metre
METAREA	The world is divided into 21 METAREAs for the purpose of promulgating weather information and weather forecasting.
ms^{-1}	Metres per second
MSIU	Marine Safety Investigation Unit
mt	Metric tonnes
NAVTEX	Navigational telex
NCG	Netherlands Coast Guard
nm	Nautical miles
NOR	Notice of Readiness
OS	Ordinary seafarer
OOW	Officer of the watch

PA	Public address
RPM	Revolutions per minute
SMM	Safety Management Manual
SOG	Speed over ground
STCW	The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended
STW	Speed through water
SWL	Safe working load
(T)	True course
TSS	Traffic Separation Scheme
UHF	Ultra-high frequency
UTC	Coordinated Universal Time
VDR	Voyage data recorder
VHF	Very high frequency
VRM	Variable range marker

SUMMARY

On the morning of 31 January 2022, *Julietta D* was holding its anchorage position in Ijmuiden Anchorage Area no. 7, using the port anchor and the main engine. At one point, *Julietta D*'s heading altered substantially, and the vessel started falling South, onto the nearby anchored *Pechora Star*. Within a few minutes, *Julietta D*'s port hull made contact with the bow of *Pechora Star* and continued making contact with *Pechora Star*'s port side until both vessels were eventually clear of each other.

Julietta D sustained two hull breaches in way of its engine-room and water ingress was confirmed. *Julietta D* continued drifting in a somewhat Southerly direction, into a windfarm area, still under construction. Shortly after making contact with the windfarm's transition section, the crew members of *Julietta D* were airlifted from the vessel, following which, preparations for a salvage operation ensued. Unmanned and not under command, the vessel made contact with another platform within the same windfarm area.

Eventually, tug *Sovereign* was assigned to salvage *Julietta D*, reaching its position at 1550 (LT). After securing the towing line, and while the crew members were on their way to the bridge, a wave washed over the main deck, inflicting serious injuries to two crew members.

Julietta D was towed towards the port of Rotterdam, the Netherlands, and arrived within port limits on 01 February, at approximately 1400 (LT).

The MSIU believes that the immediate cause of the accident was the failure of *Julietta D*'s port anchor cable, followed by an apparent loss of control due to the prevailing weather conditions, leading to the subsequent allisions with *Pechora Star* and other windfarm structures / offshore electrical infrastructure. The MSIU has issued a number of recommendations to the interested parties, addressing critical conditions on board, and windfarm structure safety.

1 FACTUAL INFORMATION

1.1 Vessel, Voyage and Marine Casualty Particulars

Name	***Julietta D***	***Pechora Star***	***Sovereign***
Flag	Malta	Malta	Belgium
Classification Society	American Bureau of Shipping (ABS)	Lloyd's Register of Shipping (LRS)	Bureau Veritas (BV)
IMO Number	9590618	9488322	9262742
Type	Bulk Carrier	Oil / chemical tanker	Offshore vessel / anchor handling tug
Registered Owner	Julietta D B.V.	Valloeby Pechora Star Ltd.	Boskalis Offshore Shipping B.V.
Managers	Norbulk Shipping UK Ltd.	CST Schiffahrts GmbH & Co. KG, Germany	Boskalis Offshore Transport, The Netherlands
Construction	Steel	Steel	Steel
Length overall	189.99 m	128.60 m	67.40 m
Registered Length	183.67 m	120.85 m	61.27 m
Gross Tonnage	24,196	8,581	2,263
Minimum Safe Manning	14	11	10
Authorised Cargo	Cargo in bulk	Oil / Chemicals	General cargo
Port of Departure	Brunsbüttel, Germany	Brunsbüttel, Germany	Rotterdam, Netherlands
Port of Arrival	Amsterdam, Netherlands	Amsterdam, Netherlands	Rotterdam, Netherlands
Type of Voyage	International	International	Short International
Cargo Information	In ballast	10,370.47 mt of unleaded gasoline	Anchor handling equipment
Manning	18	17	12

Date and Time	31 January 2022, at 1030 (LT)		31 January 2022, at 1820 (LT)
Type of Marine Casualty or Incident	Serious Marine Casualty	Serious Marine Casualty	Serious Marine Casualty
Location of Occurrence	52° 25.5' N 003° 57.6' E		52° 12.25' N 004° 09.23' E
Place on Board	Engine-room, port hull	Bow, port quarter	Main deck
Injuries/Fatalities	None	None	Two seriously injured crew members
Damage/Environmental Impact	Hull breach	Hull breach	None
Ship Operation	Manoeuvring	At anchor	Manoeuvring
Voyage Segment	Anchored	Anchored	Transit
External & Internal Environment	The weather was overcast with an estimated visibility of five nautical miles. Northwesterly winds, strong gale, very high waves, and a Northwesterly swell of six metres height, were reported. The air and sea temperatures were 9 ℃ and 7 ℃, respectively.		
Persons on Board	18	17	12

1.2 Description of vessels

1.2.1 *Julietta D*

Julietta D (**Figure 1**) was a Maltese-registered, 24,196 gt bulk carrier, built by Zhejiang Ouhua Shipbuilding Co. Ltd. in Zhoushan, China, and delivered in 2013. The vessel was owned by Julietta D B.V., the Netherlands, and managed by Norbulk Shipping UK Ltd. American Bureau of Shipping (ABS) acted as the classification society as well as the recognised organisation, in terms of the International Safety Management (ISM) Code, for the vessel.

The vessel had a length overall of 189.99 m, a moulded breadth of 28.31 m, and a moulded depth of 15.19 m. Its summer draft was at 10.50 m, which corresponded to a summer deadweight of 37,202 metric tonnes (mt), and a summer displacement of 46,970 mt. *Julietta D* was designed to carry bulk cargo in five cargo holds and was fitted with four cargo handling cranes.

Propulsion system consisted of a 6-cylinder, slow-speed, two-stroke WÄRTSILÄ 6RTA48T-D marine diesel engine, which provided a power output of 7,000 kW at 102 rpm. This drove a right-handed, fixed pitch propeller, enabling *Julietta D* to reach a maximum speed of 15 knots while in ballast, and 13 knots in a laden condition. The vessel was also fitted with three auxiliary engines.

Julietta D's anchoring arrangements consisted of two M Spek anchors, each weighing 7,350 kg. The port and starboard anchors were fitted with 11 and 12 shackles, respectively. The windlasses were hydraulic, rated at 150 kN. The equipment numeral assigned by ABS to *Julietta D*, was U-36.

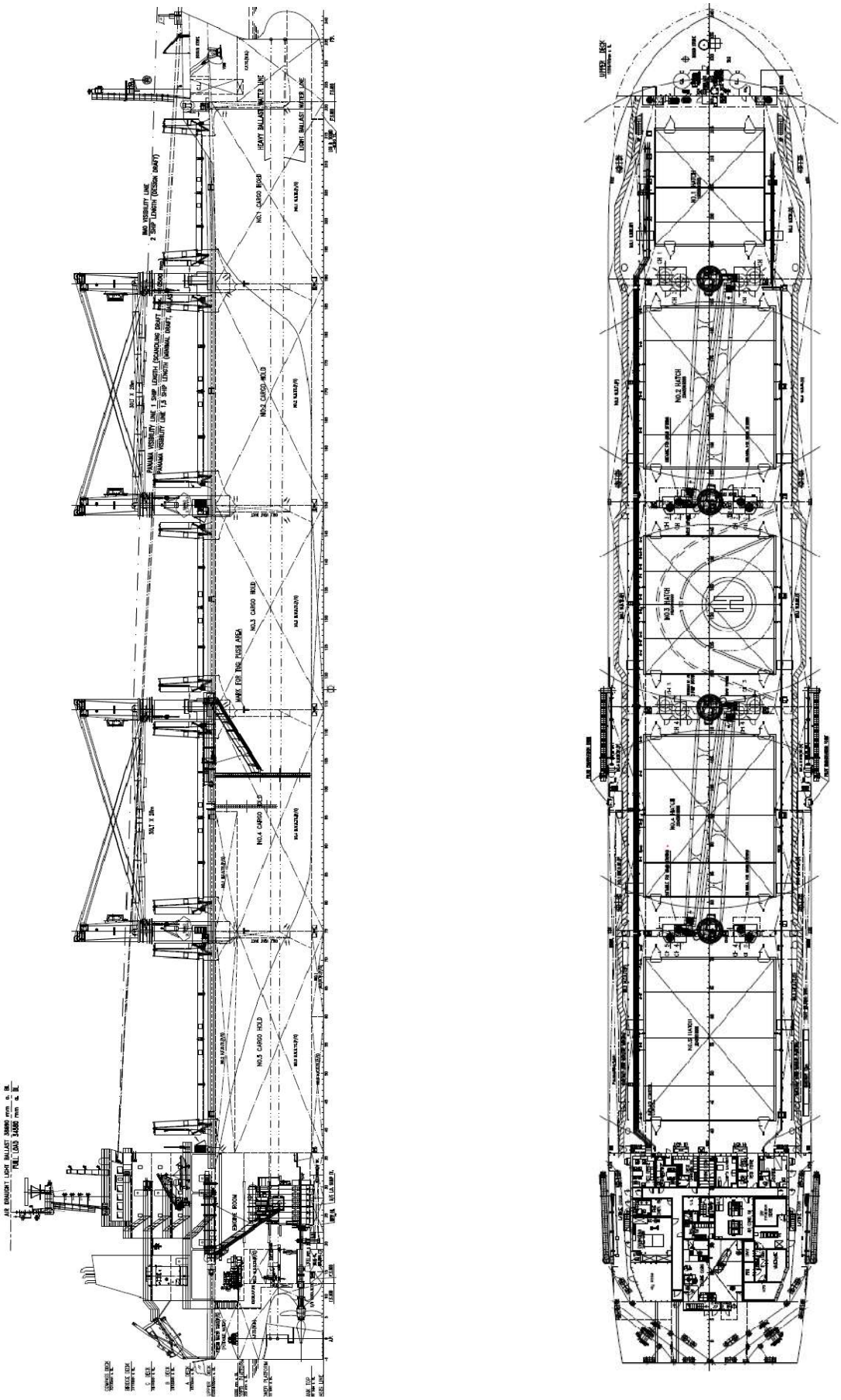

Figure 1: Extracts from the General Arrangement plan of *Julietta D*

1.2.1.1 Intact stability condition on departure Brunsbüttel, Germany

Julietta D departed her last port of call, Brunsbüttel, Germany, in a light ballast condition, with her next port of call being Amsterdam, the Netherlands. At the time, her displacement was calculated as tabulated in **Table 1**.

Table 1: Displacement Summary

ITEM	WEIGHT (T)	L.C.G. (M)	V.C.G. (M)	T.C.G. (M)	F.S.MT. (T-M)
DRY BULK CARGO	0.00	0.00	0.00	0.00	-----
TOTAL C A R G O	0.00	0.00	0.00	0.00	-----
FUEL OIL	448.90	47.36	12.34	-2.02	1929
DIESEL OIL	67.50	28.45	6.42	-4.90	104
LUB OIL	22.50	20.19	7.73	-1.91	27
FRESH WATER	324.30	1.48	13.78	0.72	225
WATER BALLAST	12928.10	111.43	5.24	0.00	4022
MISC ITEMS	306.70	75.03	2.32	0.20	102
DEADWEIGHT	14098.00	105.53	5.60	-0.07	6410
LIGHTSHIP	9767.58	84.60	10.12	0.01	-----
DISPLACEMENT	23865.58	96.96	7.45	-0.04	6410

Source: Norbulk Shipping UK Ltd.

Her air draft was at 37.31 m, with her forward, midships, and aft draft readings at 5.15 m, 5.72 m and 6.30 m, respectively, resulting in a 1.15 m trim by the stern. With a moulded depth of 15.19 m, *Julietta D*'s calculated freeboard at the forward end would have been 10.04 m, while at the aft end, it would have been 8.89 m. Her intact stability calculations also indicated that 52.5% of her propeller was immersed. As indicated in **Table 2**, *Julietta D*'s stability criteria met the minimum requirements of the IMO Code on Intact Stability for All Types of Ships.

Table 2: Stability criteria actual values compared with the required values

STABILITY CRITERIA (A749)	ACTUAL VALUE	REQUIRED
AREA FROM 0 TO 30 DEG	0.975 M RAD	0.055 M RAD
AREA FROM 0 TO 40.0 DEG	1.659 M RAD	0.09 M RAD
AREA FROM 30 TO 40.0 DEG	0.684 M RAD	0.03 M RAD
RIGHTING ARM AT 30 DEG	3.599 M	0.2 M
MAX RIGHTING ARM	4.195 M AT 44.1 DEG	AT ANGLE >=25 DEG
INIT METACENTRIC HEIGHT	6.94 M	0.15 M

Source: Norbulk Shipping UK Ltd.

Several of the weather criteria indicated in *Julietta D*'s intact stability condition, which were of interest to the safety investigation, are reproduced in **Table 3**.

Table 3: Weather criteria

Angle of upper deck immersion	33.88°
Angle of flooding	90.16°
Lateral windage area (Ship upright)	2650 m^2
Wind pressure lever from mid-draft	11.10 m

1.2.2 *Pechora Star*

Pechora Star (**Figure 2**) was an 8,581 gt, Maltese-registered, oil / chemical (Type 2) tanker. The vessel was owned by Valloeby Pechora Star Ltd., and managed by CST Schiffahrts GmbH & Co. KG, Germany. *Pechora Star* was built by 21st Century Shipbuilding Co. Ltd. in Tongyoung, Republic of Korea, in 2011. Lloyd's Register of Shipping (LRS) acted as the classification society as well as the recognised organisation, in terms of the International Safety Management (ISM) Code, for the vessel.

Figure 2: Pechora Star

Source and copyright: CST Schiffahrts GmbH & Co. KG, Germany

Pechora Star had a length overall of 128.60 m, a moulded breadth of 20.40 m, and a moulded depth of 11.50 m. The vessel had a summer draught of 8.71 m and a summer deadweight of 13,012.64 mt. Propulsive power was provided by a 6-cylinder, slow speed, two stroke, MAN B&W 6S35MC-MK7, marine diesel engine,

which produced 4,440 kW of power at 173 rpm. This drove a fixed pitch propeller, allowing *Pechora Star* to reach an estimated speed of 13 knots.

1.2.3 *Sovereign*

Sovereign (**Figure 3**) was a 2,263 gt offshore vessel / anchor handling tug, flying the Belgian flag. The tug was owned by Boskalis Offshore Shipping B.V., and managed by Boskalis Offshore Transport, the Netherlands. The tug was built in 2003 and was classed with Bureau Veritas (BV). *Sovereign* had a length overall of 67.40 m, a moulded breadth of 15.50 m, and a moulded depth of 7.50 m. The tug had a deck area of 344 m^2 and a bollard pull ahead of 192 mt.

Propulsive power was provided by two 16-cylinder, four-stroke, medium-speed, WÄRTSILÄ 16V32 LND marine diesel engines, each producing 6,000 kW of power at 750 rpm. These drove two controllable pitch propellers in fixed nozzles, enabling *Sovereign* to reach a maximum speed of 17 knots. The tug was also equipped with two electrically driven bow thrusters of 588 kW each, and one electrically driven stern thruster producing 660 kW.

Figure 3: *Sovereign*
Source and copyright: Boskalis Offshore Shipping B.V., the Netherlands

1.3 Crew Members

1.3.1 Manning on *Julietta D*

At the time of occurrence, *Julietta D* had a crew complement of 18. The crew members hailed from Ukraine, Russia, and the Philippines. The vessel was manned in excess of the level stipulated in the Minimum Safe Manning Certificate.

The master was a 42-year-old Ukrainian national. He had started his seafaring career in 1999 and had more than five years of experience in the rank of a master. His STCW II/2 certificate of competency was issued by the Ukrainian Maritime Administration, in the beginning of 2016. He joined *Julietta D* on 15 December 2021, in Panama. The master was not assigned any watchkeeping duties.

The chief officer was a 34-year-old Ukrainian national. He had started his seafaring career in 2005 and had over 16 years of experience with Norbulk Shipping UK Ltd. He had obtained his STCW II/2 chief mate certificate of competency in 2014, from the Ukrainian Maritime Administration, and had more than one year of experience in this rank. The chief officer had joined the vessel on 05 September 2021 at Callao, Chile. At sea, he kept the 0400 – 0800 and 1600 – 2000 watches and was assigned no watches in port.

The third officer was a 36-year-old Filipino national. He had joined the vessel along with the master, on his first contract with Norbulk Shipping UK Ltd. His STCW II/1 certificate of competency was issued in October 2021, by MARINA, the Philippines. The third officer was assigned the 0800 – 1200 and 2000 – 2400 watches at sea, and the 0600 – 1200 and 1800 – 2400 watches in port.

The chief engineer was a 56-year-old Russian national. He had joined *Julietta D* in Panama, on 07 August 2021. His STCW III/2 certificate of competency was issued by the Russian maritime authorities in December 2019. The chief engineer had more than nine years of experience in this rank, with Norbulk Shipping UK Ltd. He was not assigned any watchkeeping duties.

1.3.2 Manning on *Pechora Star*

At the time of the accident, there were 17 crew members. The crew complement was in excess of the number stipulated in the Minimum Safe Manning Certificate. Except

for the master, who was a Polish national, and the chief engineer, who was a German national, all the crew members were Filipino nationals. The working language on board was English.

The master was 62 years old. He had started his seafaring career in 1986 and had been serving as a master for over 12 years. He had served on *Pechora Star* for two and a half years, on a rotation basis with another master. He held an STCW II/2 certificate of competency, issued in 2009 by the Polish Maritime Office in Gdynia. The master joined *Pechora Star* at Rotterdam, the Netherlands, on 12 December 2021.

The chief engineer was 53 years old. He had started his seafaring career in 1990 and had sailed as a chief engineer for 22 years, 14 of which were served with CST Schiffahrts GmbH & Co. KG. He held an STCW III/2 certificate of competency, which was renewed in 2018 by the German maritime authorities. He had joined *Pechora Star* at Rotterdam, the Netherlands, on 31 October 2021.

The 30-year-old third officer held an STCW II/1 certificate of competency, which was issued by MARINA, the Philippines, in 2016. He joined *Pechora Star* on 23 July 2021 from La Corona, Spain. Prior to joining *Pechora Star*, he had worked with the Company for over four years. While this was his second contract on board the vessel, it was his first experience as a third officer[1].

1.3.3 Manning on *Sovereign*

There was a total of 12 crew members hailing from the Netherlands, Latvia, Ukraine, and the Philippines. All crew members had valid STCW certificates, which were a requirement since *Sovereign* was an offshore tug, in excess of 500 gt.

The master was a Dutch national, with more than 16 years of experience on board tugs engaged in salvage operations. He had several years of experience on board *Sovereign*, prior to which, he had worked on salvage vessels in the North Sea.

The chief officer was a Latvian national with 20 years of seafaring experience, 11 of which were served with Boskalis Offshore Transport. He held a chief officer's certificate of competency, issued in 2021 by the Latvian Registry of Seamen. *Julietta D*'s salvage operation was his first one in heavy weather conditions.

[1] The third officer had previously served as an ordinary seafarer on *Pechora Star* in 2019.

There were two second officers on board *Sovereign*, both of whom were Dutch nationals. The injured second officer (second officer 'A') had nine years of seafaring experience on board different types of vessels, including ocean going tugs, before joining Boskalis Offshore Transport. This was second officer 'A''s first voyage on board *Sovereign* and with Boskalis Offshore Transport. She held a chief officer's certificate of competency, issued in 2021 by the Dutch authorities. Upon joining, second officer 'A' successfully completed the vessel's specific training, including winch operation training.

The other second officer (second officer 'B') had several years of experience on board *Sovereign* and was trained and experienced in winch operations. Second officer 'B' also held a chief officer's certificate of competency.

1.4 Environment

Around the time of occurrence, the sky was overcast, and the visibility was estimated to be about five nautical miles (nm). The wind was blowing from a Northwesterly direction and had intensified into a strong gale, overnight, with gusts of about 48 knots being reported. Very high waves and a Northwesterly swell of 6.0 m, were recorded. The air and sea temperatures were 9 ℃ and 7 ℃, respectively.

1.4.1 Weather reports/forecasts

Enhanced Group Galling (EGC) messages for METAREA 1 received by *Julietta D* on the late evening of 30 January 2022, gave a general synopsis of the weather in the area, indicating multiple low pressures in the Northern Atlantic Ocean region in that METAREA. One of these low pressures was expected to move from 57° N 011° W at 1004 hPa, on 30 January 2022 2000 UTC, to 52° N 011° E, decreasing to 1001 hPa over a period of 24 hours (**Figure 4**). A day earlier, the low pressure was named storm *Corrie* by the United Kingdom's Met Office, given that it was deemed likely to have the potential to cause substantial impact.

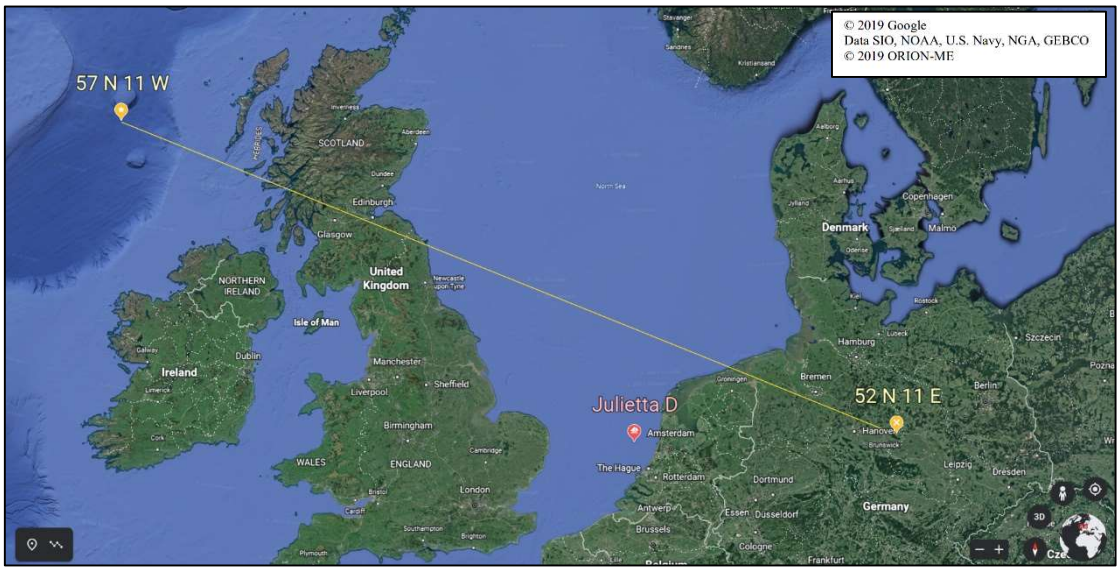

Figure 4: The expected projected path of the low pressure over a period of 24 hours in relation to the position of *Julietta D*

Over the NAVTEX, *Julietta D* received several gale warnings for the vessel's location on 30 January 2022, which indicated that the weather was expected to worsen to Beaufort Force 10 and the wind expected to veer from a Westerly to a Northwesterly direction (**Figure 5**).

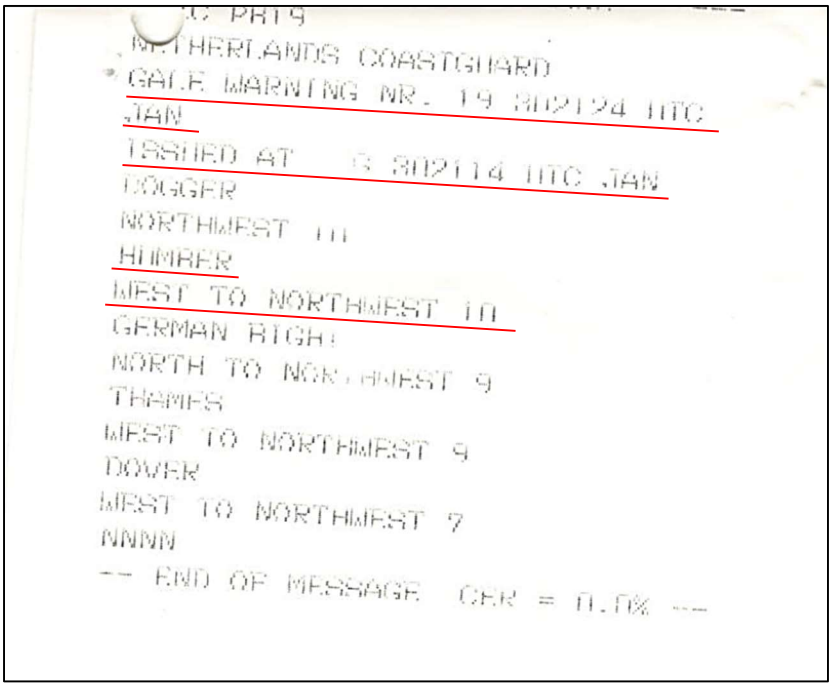

Figure 5: NAVTEX message received by *Julietta D* on 30 January 2022, at 2124 UTC, indicating the expected weather for the area (Humber). ***Red underline has been added by the safety investigation.***

1.5 Area of the accident

Amsterdam lies at the East end of the Noordzeekanaal and is one of the principal industrial centres in the Netherlands. The port is approached from the North Sea, via locks at Ijmuiden, and thence through the Noordzeekanaal (**Figure 6**). *Julietta D* was anchored in Ijmuiden Anchorage Area no. 7 (**Figure 7**); the Northern boundaries of which were shared with the East bound traffic lane of 'TSS Ijmuiden West Outer', leading to the pilot station. The *Hollandse Kust Zuid* windfarm was located approximately 1.8 nm South of the anchorage area. The nautical chart indicated that most of the windfarm area was still under construction. Entry into the windfarm boundaries was restricted to vessels not exceeding 24 m in length.

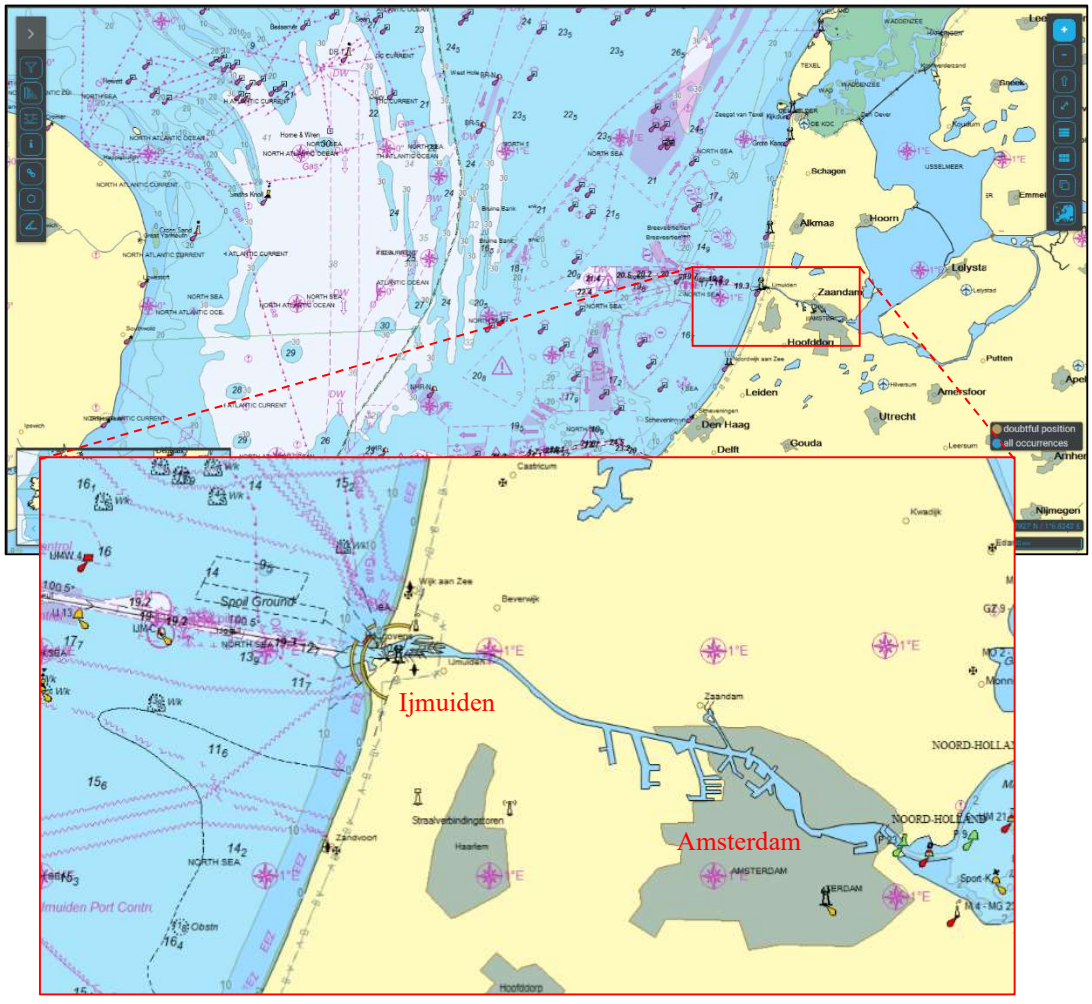

Figure 6: Approaches to Amsterdam, through Ijmuiden
Source: EMSA

Depths in the anchorage area varied between 20 m to 24 m, with several shallower patches of 19 m. The seabed around the anchorage area consisted mostly of sand,

with a small area near the Eastbound traffic lane consisting of sand and gravel. Several submarine cables and pipelines had been laid on the seabed, encapsulated in BA Chart 125 – Approaches to Ijmuiden. The chart's 'notes' cautioned mariners that the pipelines were not always buried. Mariners were also advised to neither anchor nor trawl in the vicinity of such installations.

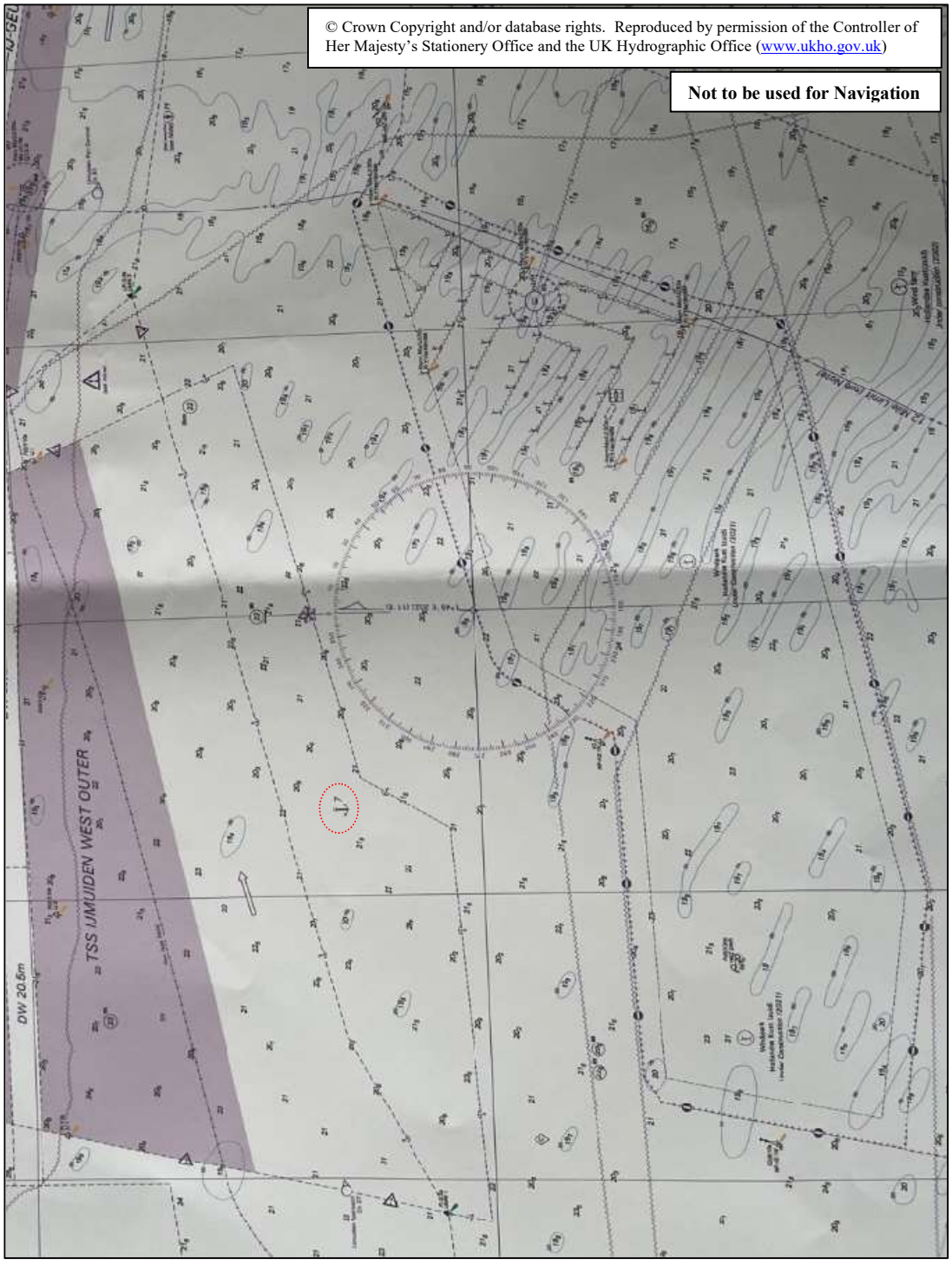

Figure 7: Extract from BA Chart 125 – Approaches to Ijmuiden
Source: British Admiralty

1.5.1 Wind turbines and farms

Wind turbines are offshore renewable energy installations, several of which are positioned close to shipping routes. Wind turbines normally comprise of a foundation below the sea level and a transition section, not less than 15 m high above the highest astronomical tide (HAT), having a yellow colour. Rocks may be laid around the foundations as a protection against prevailing currents. On top of the transition section, a 70 m to 80 m high platform is normally installed, forming the base of the turbine tower. Above it, the generator is fitted inside the nacelle, while the turbine's blades are at the other end of the generator. Each turbine blade may be more than 60 m long. The colour of the structure above the transition section is usually painted matt grey and the typical height of a fully installed wind turbine could reach 150 m. At the time of the accident, the *Hollandse Kust Zuid* windfarm had several wind turbines under construction, with 34 foundations already in position.

It is normal engineering practice for some wind farm areas, to have the network of cables running from individual turbines connected to a separate transformer platform containing relevant electrical switchgear, transformers, and other equipment to relay the power generated by the turbines to an onshore substation, via an underwater cable. During January 2022, two such transformer platforms (*Alpha* and *Beta*) were in the process of being built by the Dutch TSO TenneT, as part of the offshore connection of windfarm *Hollandse Kust Zuid*, being built by the energy company Vattenfall; the Alpha topside had already been installed and was being commissioned (a jack-up barge laid adjacent to the platform with 100 persons on board).

Outside Dutch territorial waters, several areas for windfarm installations had been earmarked at the time of writing of this safety investigation report (**Annex 1**).

1.6 *Julietta D*'s Safety Management Manual on anchoring

The vessel's Safety Management System Manual (SMM) included a section with guidance on anchoring. It was observed that in the planning section, the SMM cited environmental conditions referred to in IACS UR A1. The SMM further indicated that a vessel should avoid anchoring if environmental conditions listed in the document were present or in the weather forecast. Additionally, it recommended that if the vessel was already at anchor when the environmental conditions start to

deteriorate, the master should consider heaving up and get underway. However, the SMM also required the master to consider the use of the vessel's main engine to keep the vessel's position, reduce tension on the anchor cable and thus avoid dragging the anchor, if heaving up of the anchor was not possible. It cautioned that monitoring of the direction and tension of the anchor cable and position of the anchor were to be ensured when using the main engine.

Other sections of the SMM discussed the anchors' use in cases of emergency and listed procedures to confirm anchor dragging. The SMM indicated that although every available means should be considered during an emergency, it was unlikely that the vessel's anchors would be able to stop a large vessel with a drift rate of more than half a knot. It further cautioned that using the anchors to stop a vessel's drift, may result in the loss of the anchoring equipment and may cause a *catastrophic failure of the windlass drive motor* [*sic*]. While the motivation to use the anchors to prevent further consequences to the vessel may be understood, the SMM expressed caution on the potential danger to the anchor party, in such cases.

The SMM recommended that if the vessel dragged anchor, its bow had to be kept into the wind and the tension on the cable eased by using the main engine and steering, while heaving up the anchor.

1.7 Narrative[2]

On the evening of 22 January 2022, *Julietta D* departed from the port of Brunsbüttel, Germany, and headed in a ballast condition towards the port of Amsterdam, the Netherlands, to load a cargo of coal. On 23 January 2022, at around 1830, *Julietta D* dropped her port anchor on the Southern boundary of Ijmuiden Anchorage Area no. 7 ("JD1" in **Figure 8**), to carry out cargo hold cleaning. During the afternoon of 29 January 2022, a Notice of Readiness was tendered by the vessel. However, berthing was delayed due to weekend breaks and the unavailability of stevedores.

[2] Unless otherwise stated, the times in this safety investigation report are local time (UTC + 1). References to weather records were taken from the deck logbook of *Pechora Star*. The safety investigation was informed that *Julietta D*'s deck logbook had been lost overboard during the crew members' evacuation and therefore, could not be made available to the safety investigation.

Weather forecasts received during the vessel's time at the anchorage, indicated a gale warning and expectations for the weather to intensify into a storm during the period between 30 January, through 31 January 2022. Reading this, the master called a meeting with his crew members to discuss the preparations for the onset of heavy weather. In the anticipation of excessive rolling, the crew members were also advised to rest. At around noon on 30 January, *Julietta D* shifted its anchorage position within the same anchorage area but further North, to gain more sea room for the swinging circle and to be closer to the traffic separation scheme (TSS). At 1215, the port anchor was dropped to 10 shackles in the water, in position 52° 26.227' N 003° 57.75' E ("JD2"in **Figure 8**). By evening, a second generator was started, and checks on the relevant fuel oil levels were carried out. At around midnight, the chief engineer and the third engineer prepared the main engine for manoeuvring and stood watch in the engine-room.

Pechora Star arrived at the Ijmuiden Anchorage Area no.7 during the night of 30 January and at 2248, dropping its port anchor to seven shackles in the water, in position 52° 25.5' N 003° 57.6' E ("PS" in **Figure 8**). *Pechora Star*'s deck logbook indicated that, at around this time, the vessel experienced a South Southwesterly fresh breeze and the barometer read 1,015 hPa. By midnight, the wind direction veered to the West Northwest, and the pressure dropped by 3 hPa. Meanwhile, on board *Julietta D*, the master went to the bridge and kept watch together with the second officer and the lookout / helmsman.

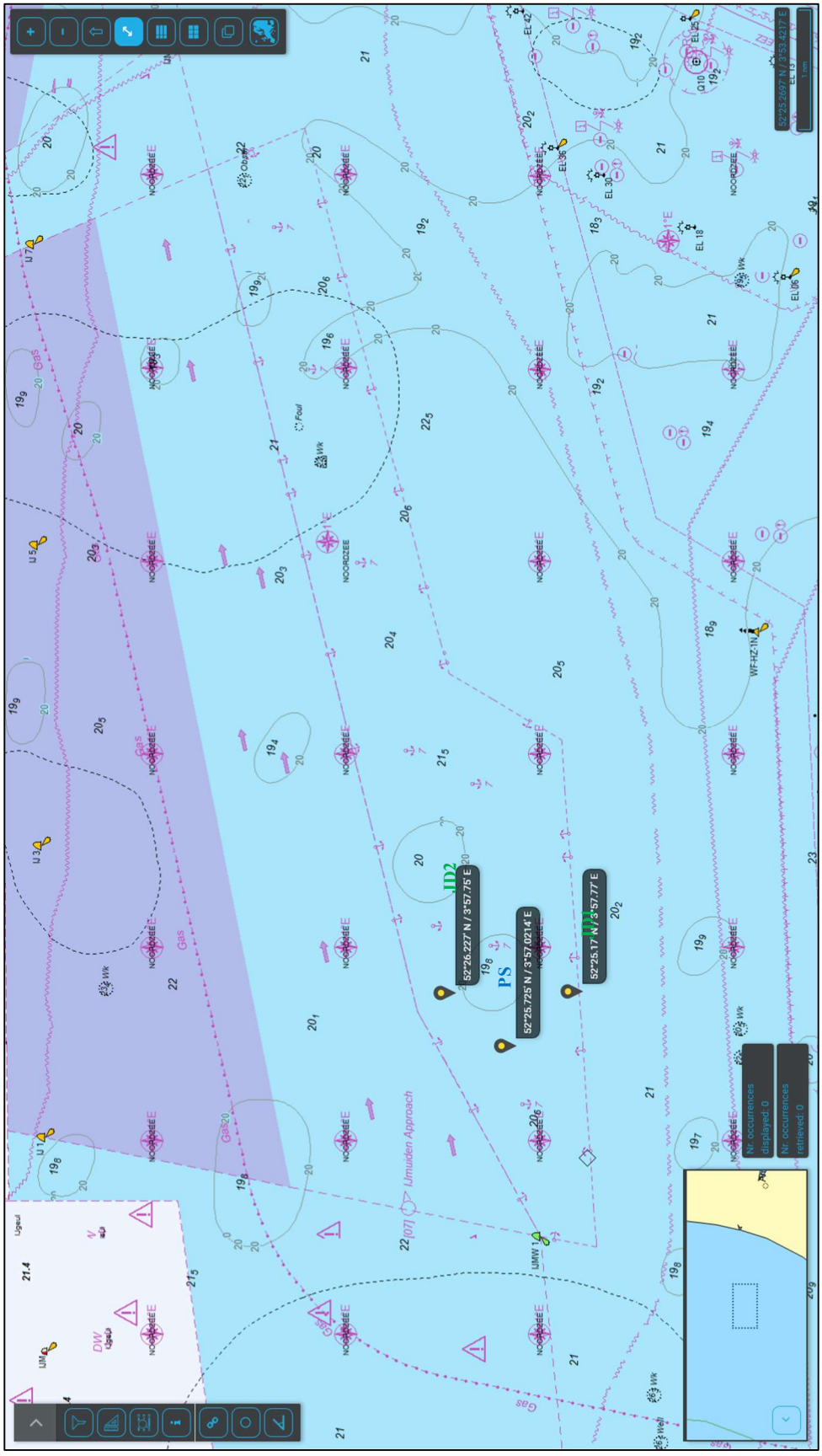

Figure 8: Map capture indicating *Julietta D*'s first (JD1) and second (JD2) anchorage positions and *Pechora Star*'s anchor position (PS) within Anchorage Area no. 7

Source: EMSA

Pechora Star's deck logbook further indicated that, at 0300 on 31 January 2022, the atmospheric pressure had dropped to 1,005 hPa, and the wind force had increased to Force 7.

At around this time, both the steering gear pumps on *Julietta D* were switched on, and the master started communicating helm orders to the helmsman, while using the main engine to keep the vessel's head to the wind, kicking the main engine to 'dead slow ahead' for brief periods (**Annex 2**, Part A). Shortly after 0630, the master of *Julietta D* felt that he required more engine power to keep the vessel's head to the wind. In fact, the bridge telegraph printout indicated that the main engine was not stopped from that moment, up until few minutes before the allision with *Pechora Star* (**Annex 2**, Part B).

Pechora Star's crew members recorded that as time progressed, the wind veered and increased in intensity, settling on a Northwesterly direction and a Beaufort Force 9 by 0800. At this time, due to the deterioration of weather conditions and the suspected dragging of the anchor, two more shackles were paid out on *Pechora Star*'s port anchor.

During the morning hours, the chief officer of *Julietta D* visited the bridge to check if the master required his assistance. The master confirmed that no assistance was required and therefore, he returned to his cabin. The movements of *Julietta D* were managed without any issues until about 1028, when the vessel's speed over ground (SOG) was suddenly observed to reach three knots. At this stage, the main engine was on full ahead and the wheel was hard over to starboard. The S-band RADAR had one variable range marker (VRM 1) set to 0.70 nm and the other (VRM 2) set to 1.27 nm. *Pechora Star* was to the South Southwest of *Julietta D*, between the two VRMs (**Figure 9**).

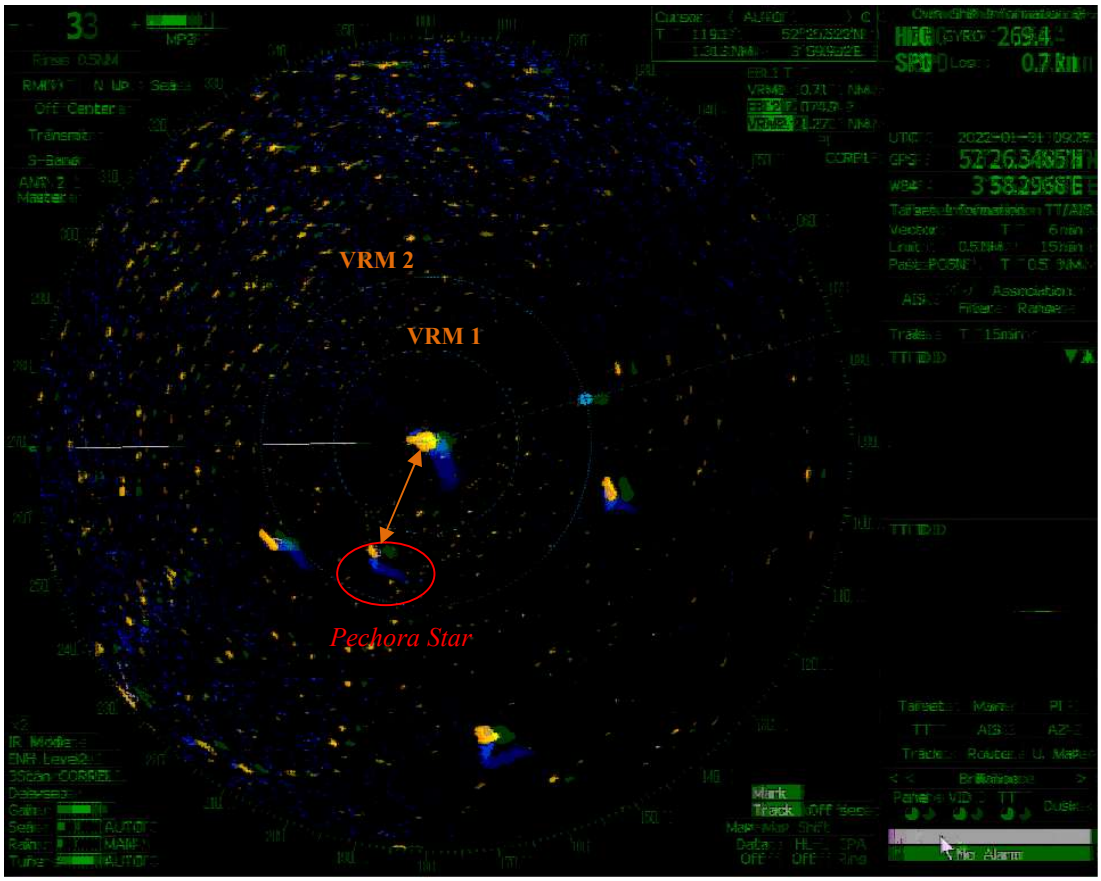

Figure 9: S-band RADAR screenshot at 1028 LT Vessel's STW 0.7 knots and SOG reaching 3.0 knots (SOG is not shown on this S-band RADAR screen)

By 1030, VRM 1 was touching the echo of *Pechora Star* (**Figure 10**) and a few minutes later, the master requested the third officer to contact *Pechora Star* over the fixed, two-way, very high frequency (VHF) radio, and inform the OOW that *Julietta D* was dragging its anchor. At this stage, the vessel's speed through the water (STW) increased to 1.9 knots and the SOG was 5.5 knots. *Julietta D*'s heading also changed to become perpendicular to the headings of other anchored vessels in the vicinity.

The third officer's initial call to *Pechora Star* was on VHF channel 06 (in his native language) following which, both vessels returned to VHF channel 16. Shortly after, Ijmuiden Approach called *Julietta D* and inquired whether the vessel was underway and drifting, to which the third officer replied in the affirmative. He also informed Ijmuiden Approach that *Julietta D*'s main engine was running 'full ahead'. At this stage, *Julietta D* was closing in towards *Pechora Star*, with a STW of around one knot and a SOG of around three knots.

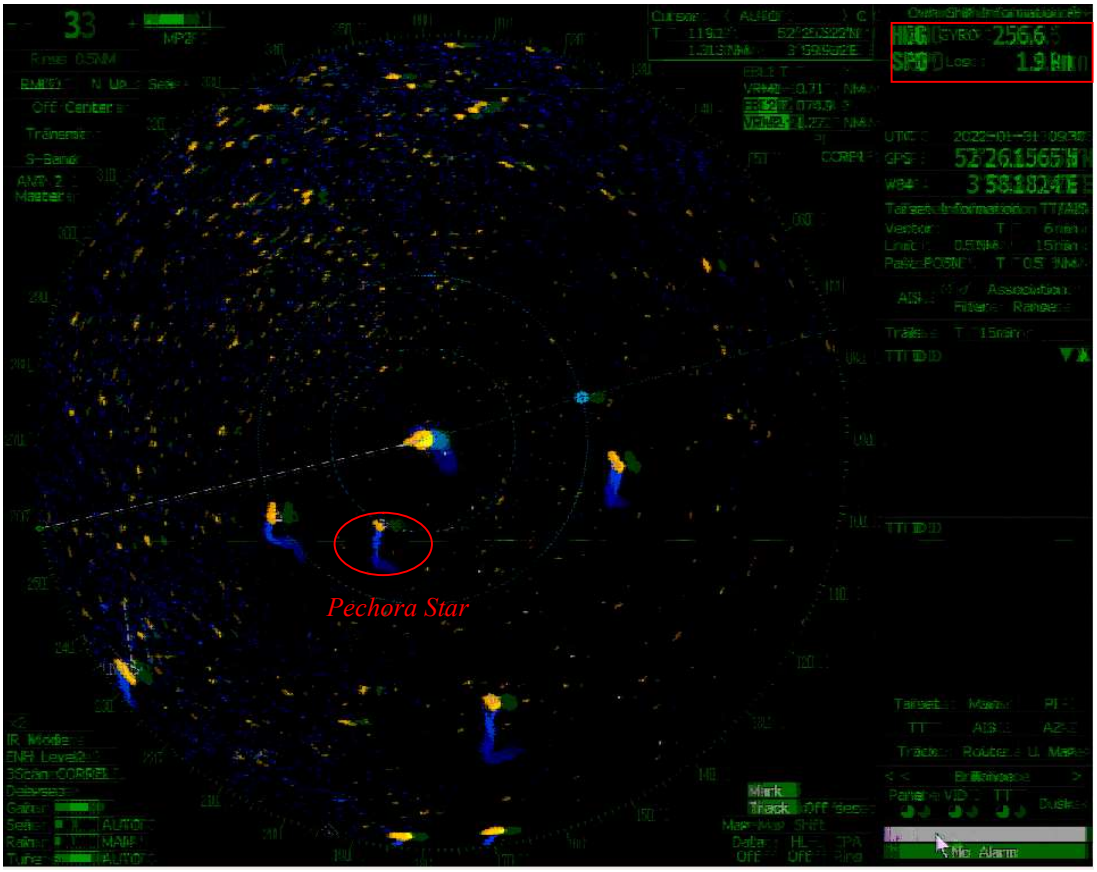

Figure 10: S-band RADAR screenshot at 1030 LT – VRM 1 touching the echo of *Pechora Star*

At 1038 (**Figure 11**), when the master of *Julietta D* increased the main engine to 'nav. full ahead' and the wheel kept hard over to the starboard; the SOG was noticed to drop to two knots. A minute later, the master of *Julietta D* called Ijmuiden Approach, advising that the vessel was dragging anchor and confirmed that the main engine was on 'full ahead'. Ijmuiden Approach acknowledged the message and inquired whether the vessel was able to keep clear of *Pechora Star*. The master of *Julietta D* responded that he was unable to do anything from his side and requested that *Pechora Star* keeps clear of *Julietta D*. At this point, *Pechora Star* was about 0.2 nm South of *Julietta D*.

Ijmuiden Approach then contacted *Pechora Star*, advising that *Julietta D* was dragging anchor towards it and that although it was manoeuvring with the main engine on full power, it was unable to acquire the necessary headway. The OOW of *Pechora Star* replied that the vessel intended to heave up the anchor. At this stage, the OOW of *Pechora Star* had already called the master to the bridge and notified the chief engineer to prepare the main engine. He had also started the two steering gear pumps.

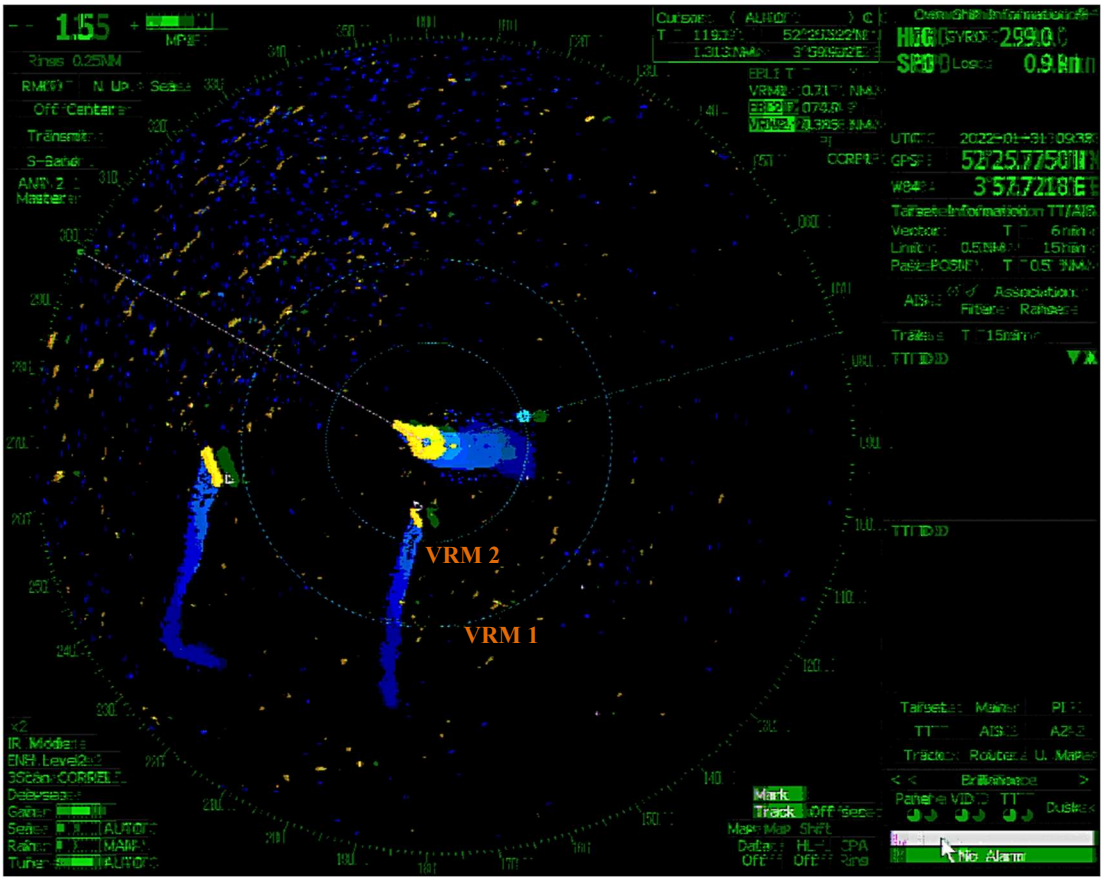

Figure 11: S-band RADAR screenshot at 1038 LT – VRM 2 had been adjusted to 0.385 nm and RADAR range had been reduced to 1.5 nm

At 1042 (**Figure 12**), *Julietta D*'s wheel was put to midships, and the main engine gradually stopped. The master made an announcement on the public address (PA) system, advising the crew members to brace for a collision on the port side. During this time, the vessel's STW was 0.8 knots, its SOG was 2.5 knots, and its COG was 214.4° (T). The master subsequently pulled the telegraph astern. At around this time, the master of *Pechora Star* arrived on the bridge and noticed *Julietta D*'s propeller turning, as it rose above the water. In the meantime, after the Netherlands Coast Guard (NCG) established contact with *Pechora Star*, the latter advised that although the main engine was ready, it could also observe *Julietta D* drifting too fast and that a collision was imminent.

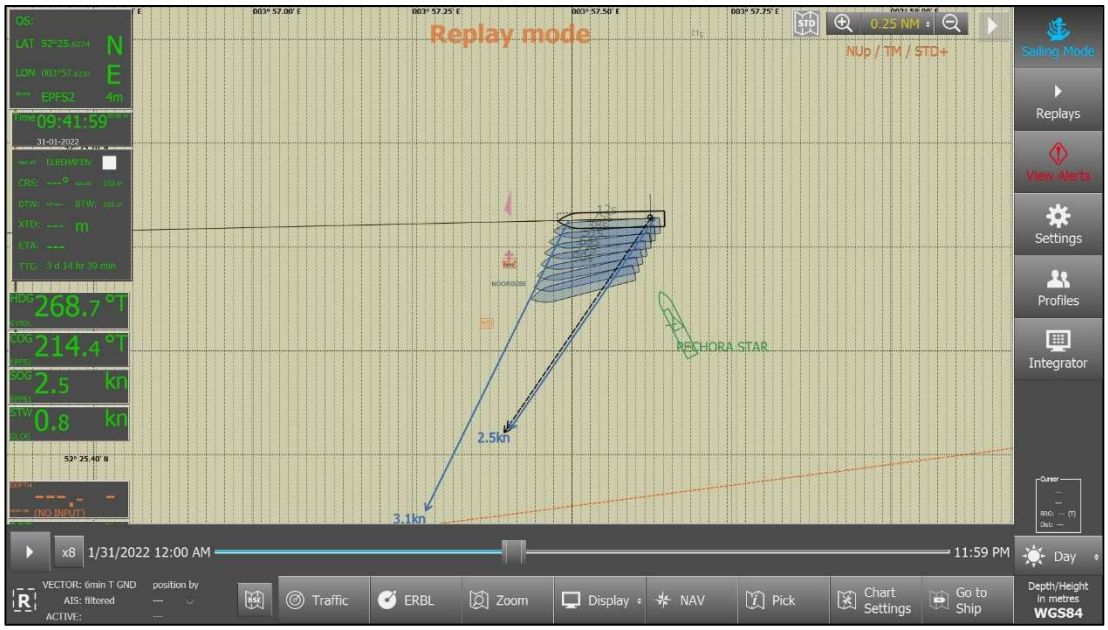

Figure 12: *Julietta D*'s ECDIS in replay mode, displaying the vessel's drift projection at 1041:59

Approximately one minute later, *Julietta D*'s COG changed to 199° (T) and the projected drift on the ECDIS, indicated that contact with *Pechora Star* was inevitable (**Figure 13**).

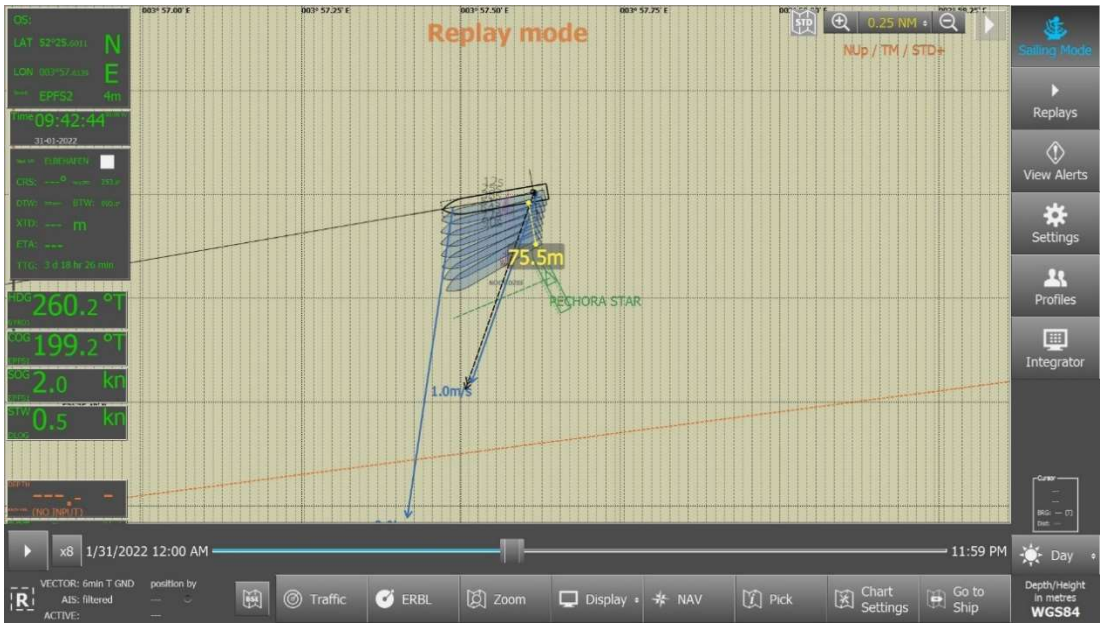

Figure 13: *Julietta D* ECDIS replay showing the change in drift projection

At 1043:39, in position 52° 25.5701' N 003° 57.6166' E, the port quarter of *Julietta D* made contact with *Pechora Star'*s bow (**Figure 14**).

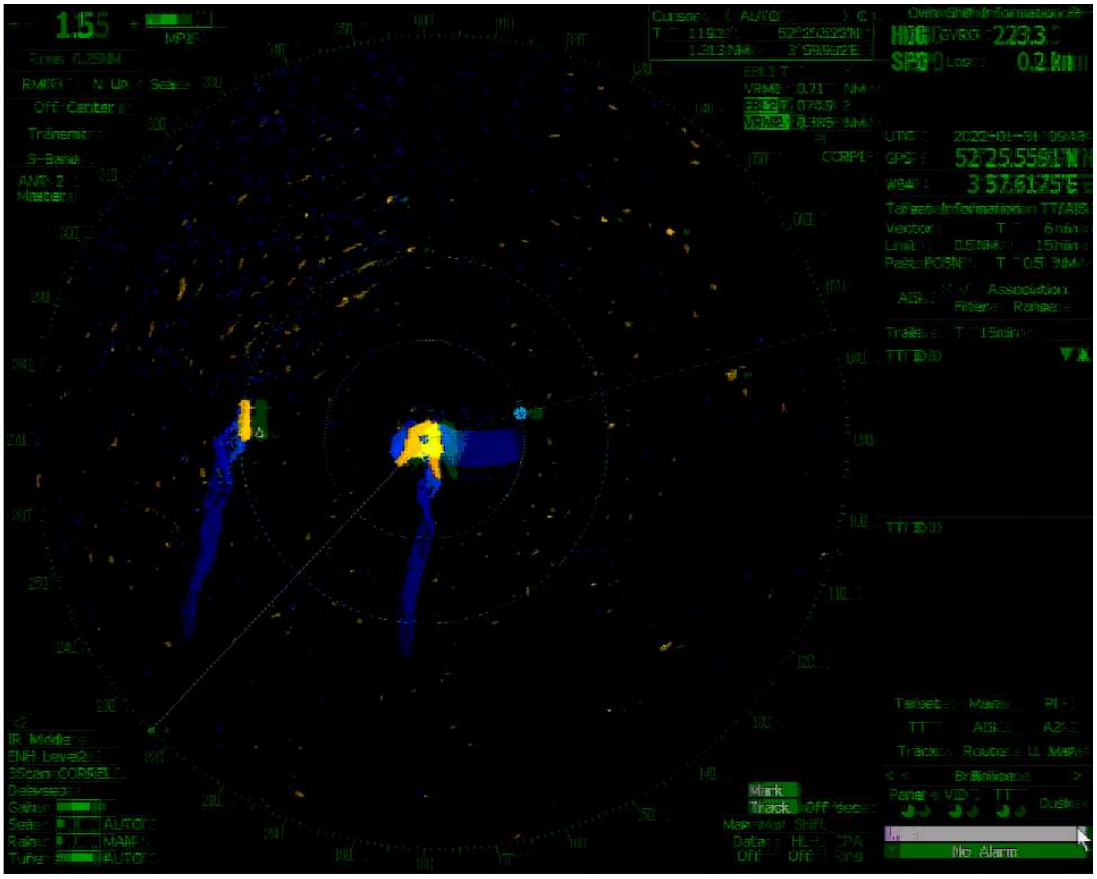

Figure 14: S-band RADAR screenshot at 1044 LT – Collision with *Pechora Star*

Following the allision, *Julietta D*'s main engine automatically stopped. In consultations with the chief engineer (who confirmed that the main engine parameters were in order), the master pulled the telegraph to stop and reversed again the main engine to forward. Meanwhile, during inspections inside *Julietta D*'s engine-room, the engineers noticed a large hole in way of the engine-room workshop on the lower platform. There was also water ingress. During this time, the master of *Pechora Star* reported the allision to the NCG. As *Julietta D* kept drifted, further contact was made along the port side of *Pechora Star*.

Shortly after, the engineers on *Julietta D* identified a second hull breach in way of the freshwater system and the diesel generators on the engine-room's upper platform. All damages were reported to the master[3]. At 1049, he called all crew members to the bridge and ordered the 'abandon ship' on the vessel's PA system. Subsequently, the

[3] The engineers also advised the master that it was very difficult to repair the larger damage, and that the dimensions of the second hole could not be properly assessed due to machinery / equipment blocking the area. They further informed the master that the water was reaching the diesel generators, which could possibly result in electrical damages.

master briefed Ijmuiden Approach of the situation. Ijmuiden Approach advised the master to call and inform the NCG on VHF channel 16. As requested, the master reported to the NCG that his vessel was not under command, was taking water from two separate breaches in the hull, that the pump[4] was not working, and that the vessel required shore assistance.

In the meantime, the chief engineer briefly remained in the engine-room to close the valves of the freshwater system from the upper platform, which was by then leaking fresh water inside the engine-room. He also stopped the electric motors and the hydrophore. Around that time, various low insulation alarms and engine-room bilge water high level alarms started going off. By now, *Julietta D* had already drifted outside the Southern boundary of Anchorage Area no. 7 (**Figure 15**).

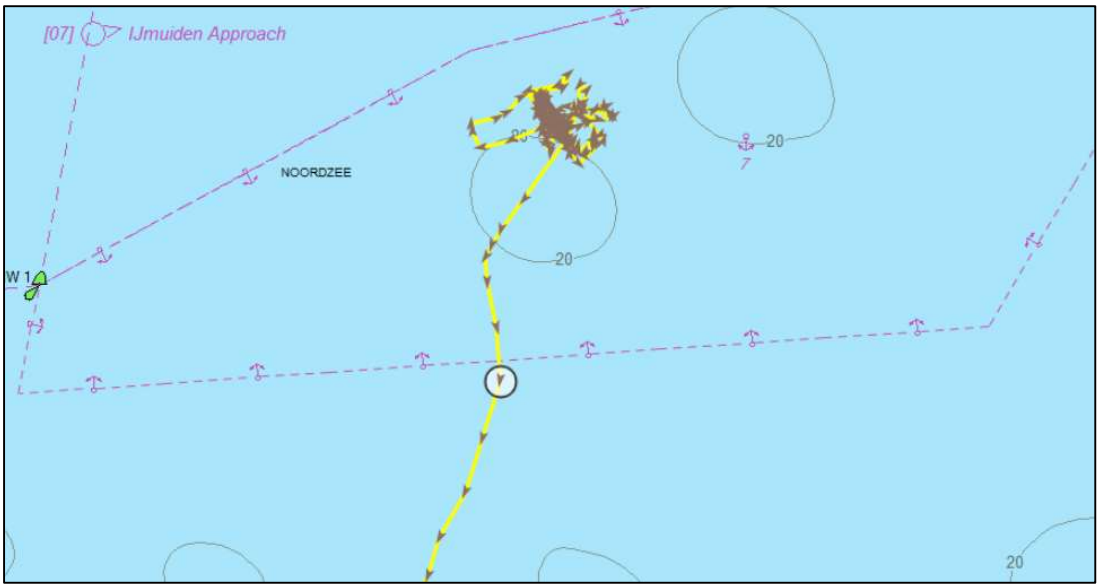

Figure 15: *Julietta D*'s AIS track, circled position at 1050:40
Source: EMSA

During the VHF call from *Julietta D*, the NCG verified the number of persons on board and then asked the master on the type of assistance that would be required *i.e.*, whether he wanted his crew to abandon the vessel, or have the vessel towed into the harbour. The master replied that *Julietta D* required towage assistance and enquired on the earliest possibility for a tow. The NCG acknowledged the master's response, informed him that they will be alerting a rescue vessel to assist them, and that it will be ensured that a tugboat will attend. However, the NCG also warned the master that

[4] The master did not specify which pump(s) he was referring to.

the latter may take several hours. The master then requested the NCG to evacuate his crew, in view of the water ingress into the engine-room[5]. The NCG acknowledged the master's last message and requested the vessel to stand by and keep the NCG updated. During this time, *Julietta D* was drifting in a more or less Southerly direction at a STW of 3.6 knots and a SOG of 5.4 knots. During another call to *Julietta D*, the NCG confirmed that the rescue vessel and the helicopters were heading to the vessel's position and again, requested to be kept updated on the developing situation.

The safety investigation observed that at around 1056, the *Hollandse Kust Zuid* (HKZ) windfarm transition sections, which were still under construction, became visible on *Julietta D*'s S-band RADAR, which was set at a range of 1.5 nm (**Figure 16**). Although the boundaries of the windfarm were visible on the ECDIS, the positions of these transition sections (considering that the area was still under construction) had not been marked.

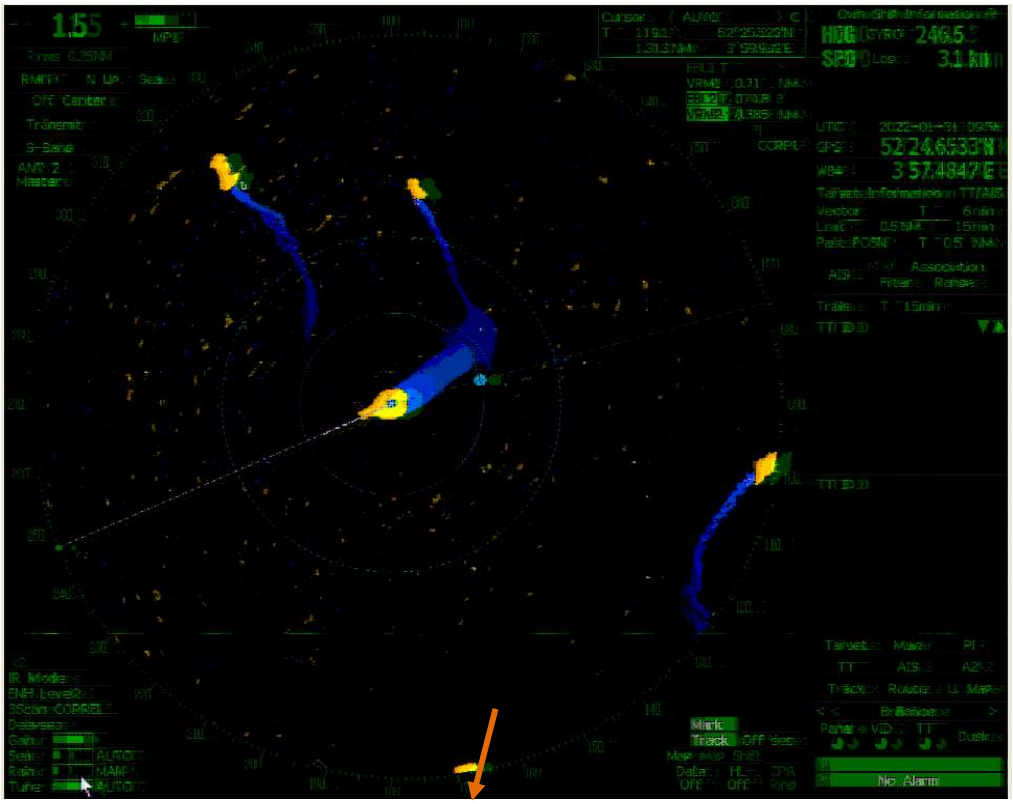

Figure 16: S-band RADAR screenshot at 1056 LT – Windfarm transition sections visible on the RADAR screen

[5] The engine-room alarm log indicated that at least four engine-room bilge wells had an active high-level alarm.

In the meantime, the NCG alerted offshore supply vessel *Glomar Baltic*, which was approximately 13 nm to the East of *Julietta D*. *Glomar Baltic* was requested to proceed towards *Julietta* D and assist its crew members, if necessary. At 1112:34, the master pressed the main engine emergency stop button to avoid damages to the main engine and at 1112:43 (**Figure 17**), he saved the VDR data. At this time, *Julietta D* was approaching the perimeter of the windfarm, with one of the windfarm transition sections being about 0.5 nm away[6]. Meanwhile, the crew members of *Julietta D* were still mustering on the bridge. Seeing that an allision with a windfarm transition section was also inevitable, the master warned them to hold on tight to the railings on the bridge.

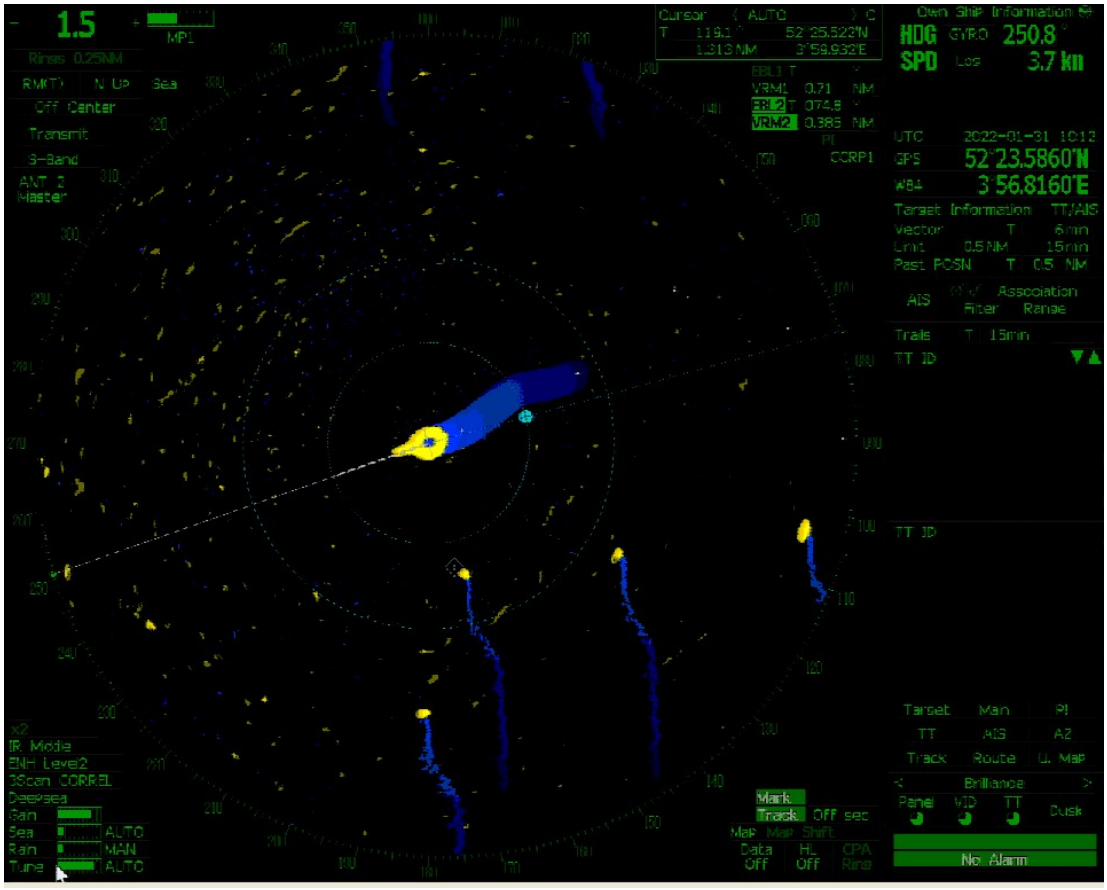

Figure 17: S-band RADAR screenshot at 1112 LT – more windfarm transition sections detected by the RADAR

The NCG authorised *Glomar Baltic* to proceed through the windfarm area at around 1117 and shortly after, the NCG called *Julietta D* to advise that the rescue helicopter would be on site in about 12 minutes. NCG also expressed the intention of lowering a

[6] The master also recalled seeing a structure resembling an oil rig in the distance, in the way of their drift.

rescue diver to lead the crew members' evacuations by helicopter. Soon after the call, *Julietta D*'s port hull made contact with one of the windfarm transition sections that was still under construction (**Figure 18**).

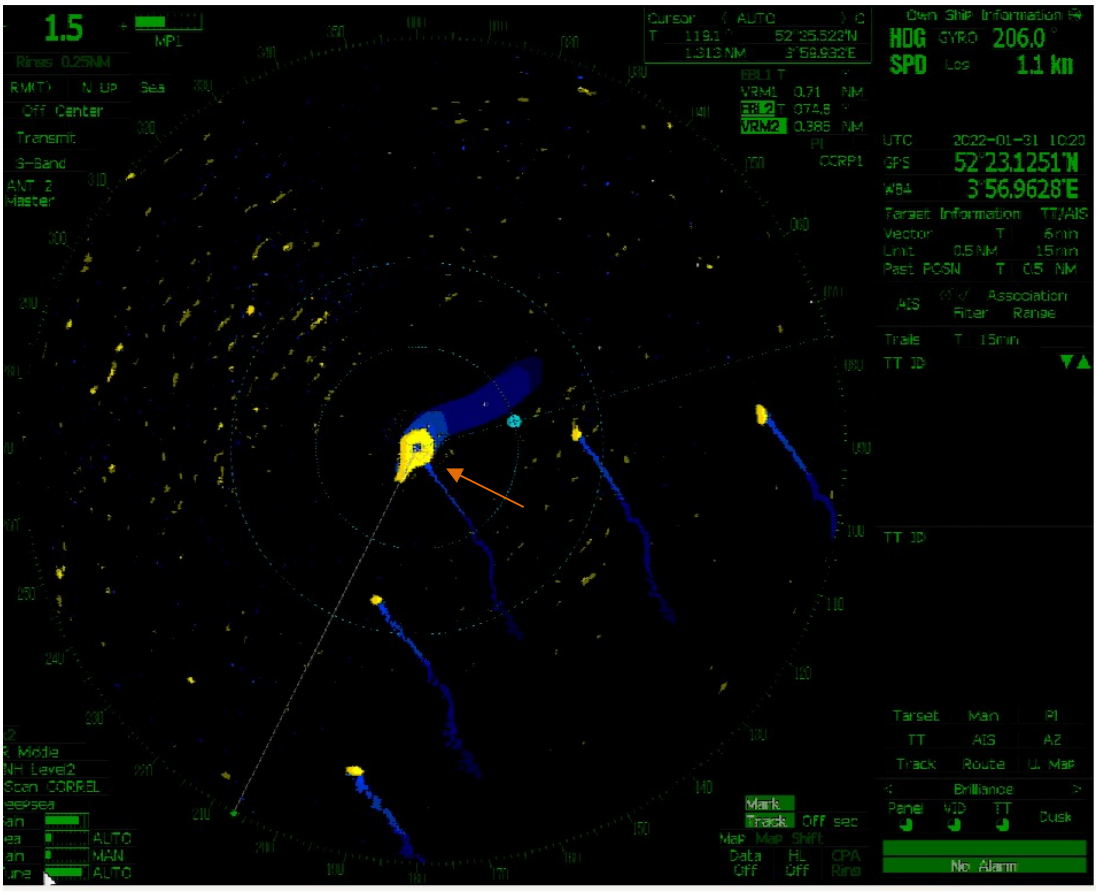

Figure 18: S-band RADAR screenshot at 1120 LT – *Julietta D* makes contact with a windfarm transition section

By 1130, the first rescue helicopter reached *Julietta D* and the crew members were directed to proceed to the vessel's forecastle for evacuation. Once on the forecastle deck, the master noticed that the port side anchor and most of its cable had been lost, realising that rather than dragging anchor, the vessel had been adrift. When the rescue diver landed on the vessel, the master requested authorisation to allow him to remain on board and drop the starboard anchor, as an attempt to stop the vessel's uncontrolled drift. However, due to the risks involved, and considering the limitations of the helicopter's operations, his request was not acceded to.

During the evacuation, *Julietta D* was drifting in a South Southeasterly direction. Concerned that the jack-up barge with 109 people on board could be in the line of drift, its crew members were requested to muster for any eventuality. An offshore

supply vessel (*Glomar Viking*) in the vicinity was alerted and requested to be prepared to assist the platform's crew members, should the need arise[7].

Around an hour after the first rescue helicopter arrived on site, all the *Julietta D* crew members were safely evacuated and transferred to Schiphol airport. *Glomar Baltic* was asked by the NCG to stand down shortly before, since its assistance was no longer required.

1.8 Salvage operation

A reconnaissance flight carried out after the crew members' evacuation, indicated that water may be flowing in and out of the vessel, although no oil / oil sheens could be detected. The flight crew also observed that the vessel's lighting was on, and the RADAR scanners were rotating, confirming that there was still electrical power on board.

By 1400, the appointed salvage team was on its way to the heliport in Pistool Haven, Rotterdam for an induction, safety debrief and mandatory pre-flight checks before departure. Two large tugs were also assigned to assist in the salvage operation of *Julietta D*; one was around 50 nm to the Southwest of *Julietta D* and the other tug, *Sovereign*, was bound to depart from Rotterdam. At around 1422, a situation report received by the NCG indicated that *Julietta D* was drifting at a speed of two knots and was 0.7 nm away from the *Beta* transformer platform (*HZB)*[8]. At 1436, *Julietta D*'s port side struck platform *HZB*[9] (**Figure 19**). Reconnaissance of the area revealed another hull breach[10], between 1.0 m and 1.5 m above the waterline, and that water was flowing out through this breach.

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[7] After drifting through the HKZ wind area, an operational oil and gas platform became at risk. The crew members on board were cautioned to be ready to evacuate. However, *Julietta D* did not allide with the platform.

[8] As indicated earlier in this safety investigation report, the transformer platform was still under construction, with its jacket already fitted.

[9] At the time of the occurrence, only the jacket was installed.

[10] This breach was later confirmed to have occurred in way of water ballast tank no. 2 port.

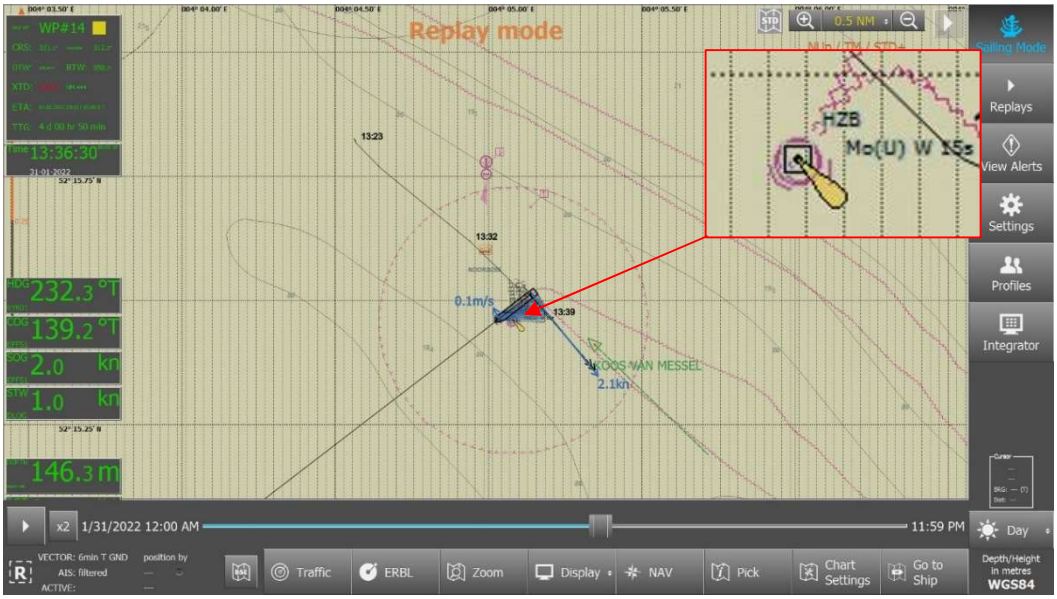


Figure 19: *Julietta D*'s ECDIS extract, at the time that it allided with platform *HZB*

At 1656, salvage team transfers from the helicopter to the bow of *Julietta D* commenced. An initial inspection was carried out on board, which confirmed that the engine-room was flooded[11] (**Figure 20**), while all five cargo holds were dry. The vessel seemed upright, and the emergency generator was running. Although draft readings proved challenging due to the sea state and the vessel's movements, the salvage company estimated the readings to be 3.5 m at the bow, 5.5 m at midships, and 8.5 m at the stern on both, the port and starboard sides.

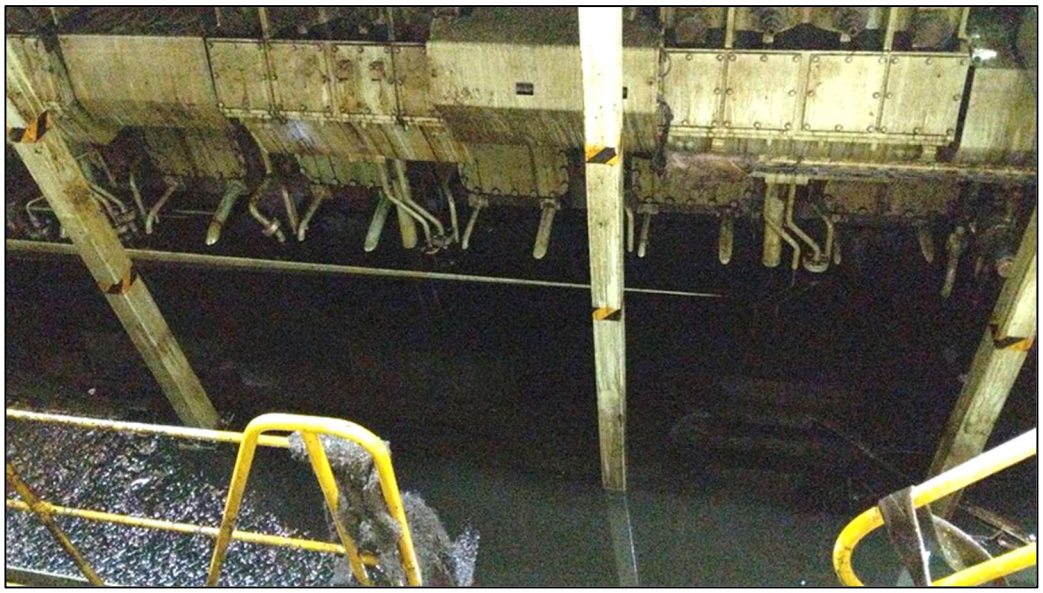


Figure 20: Flooded engine-room

[11] The salvors had estimated that water level had reached up to three metres below the main engine's cylinders.

At around 1830, tug *Sovereign* connected and slowly paid out its tow line to *Julietta D*'s bow. Soon, it was able to pull *Julietta D*'s heading into the wind and swell, stabilizing it in the process, and enabling a safer working environment for a stern tug to be connected. By then, *Julietta D* had reached the closest point it ever came to the coast, which was about 3.0 nm (**Figure 21**). By 1900, the second tug was connected astern. However, its tow line parted soon after and it had to return to base, to collect a new tow line.

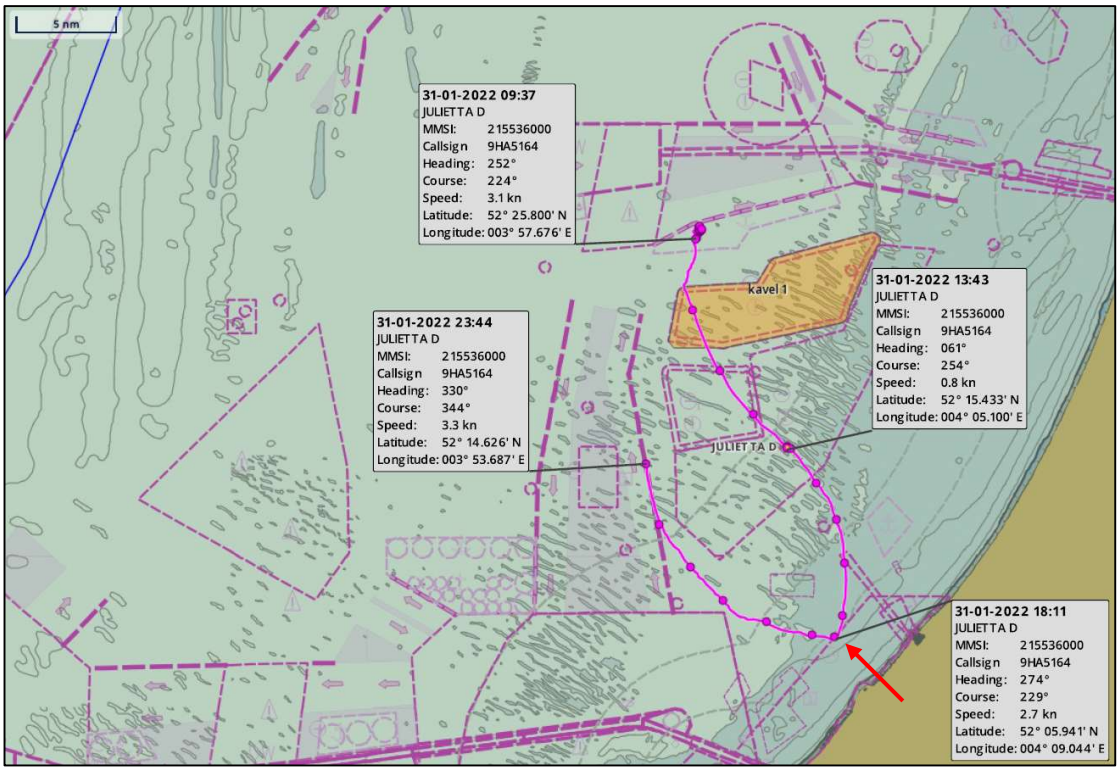


Figure 21: Julietta D's track on 31 January 2022. Times are in UTC. Closest point to the coast indicated in red

Source: The Netherlands Coast Guard

The salvage team on board continued to inspect *Julietta D*'s condition on an hourly basis and confirmed that no further increase of the water level was observed inside the engine-room. By 2300, the salvage team adjusted *Julietta D*'s rudder from starboard 20° to midships[12]. Another tug, which had been called to take over from the first aft tug, reached *Julietta D*'s position at around 0100 on 01 February 2022. During towage, the weather did not subside enough for the tow to proceed towards the port. While the wind had reduced to a moderate breeze, with gusts of 25 knots, the sea was

[12] Sometime after 1047 on 31 January 2022, the VDR of *Julietta D* indicated that its rudder angle was set to more than 20° to starboard. The safety investigation could not establish whether this was a helm order, or whether the rudder had moved to this position under the effect of the sea.

still recorded to reach heights of between 4.0 m and 5.0 m. *Julietta D* was towed at an approximate SOG of 2.5 knots, first heading in a Northerly direction, then altering to the West, and then joining the Southbound Lane of TSS Maas North (**Figure 22**).

During the morning hours of 01 February 2022, following further salvage discussions, another salvage team was lowered on board the vessel and at around 0945, a pilot boarded to discuss the intentions and approaches to the port. Once the plan was agreed, *Julietta D*'s course was altered towards the port of Rotterdam. Following the necessary permissions from the Rotterdam's Harbour Master, the Rotterdam Port Authority issued the authorisation for *Julietta D* at 1149, to enter the port as a place of refuge. *Julietta D* cleared the breakwaters between 1346 and 1355. Port tugs took over from *Sovereign* at 1426 to bring the *Julietta D* alongside her designated berth. At 2200, *Julietta D* was safely brought alongside at ADM Europoort, Rotterdam.

Figure 22 displays *Sovereign*'s track initiating at its departure from Rotterdam to the towing operation of *Julietta D* and back to Rotterdam port.

Julietta D remained more or less stable; however, a 3° list to the port side was observed, following its entrance into the sheltered waters of the port. Draft readings (**Table 4**) were taken inside the port in shallow waters.

Table 4: *Julietta D*'s drafts in sheltered waters

	Port	**Starboard**
Bow	4.00 m	3.60 m
Midship	5.30 m	4.85 m
Stern	8.10 m	7.40 m

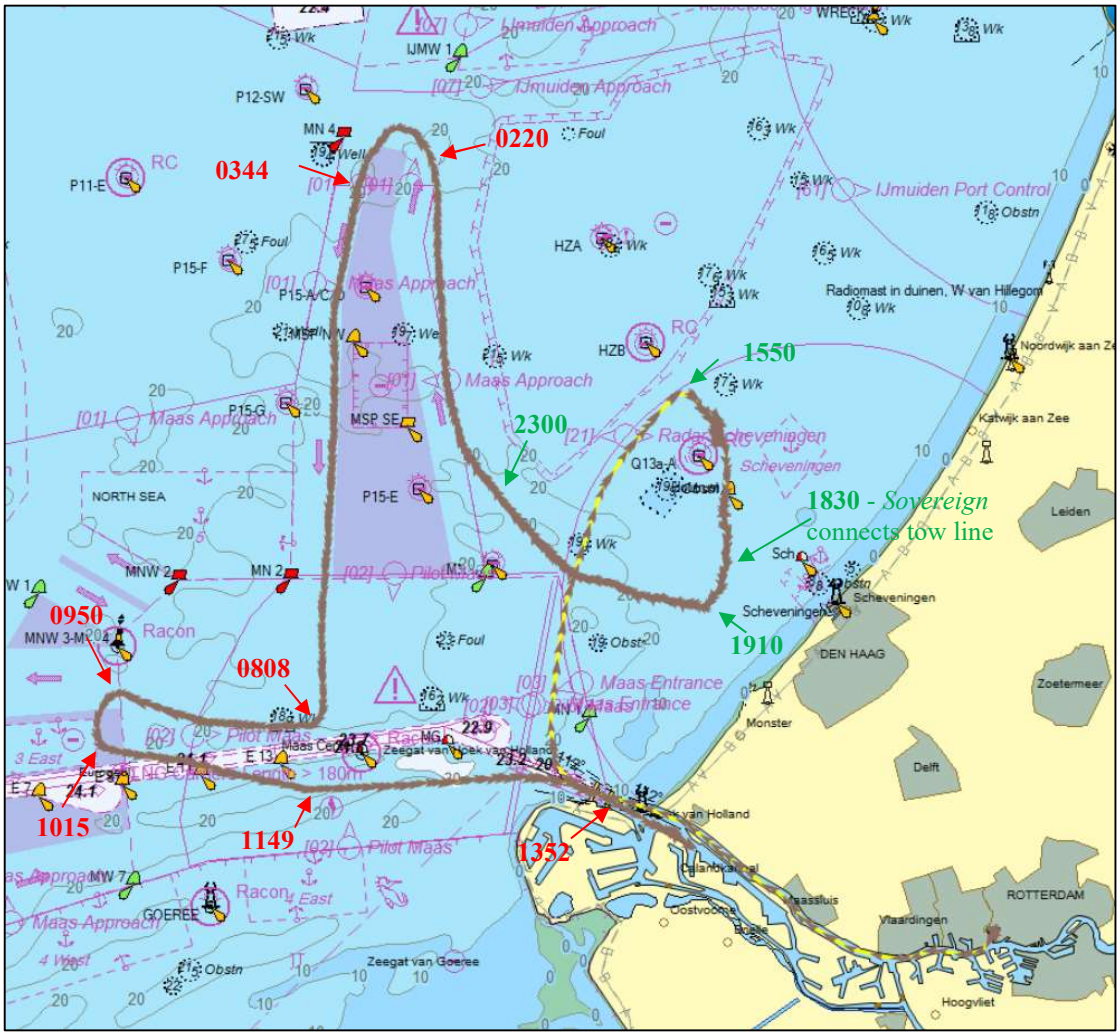


Figure 22: *Sovereign*'s track. Timings in green refer to 31 January, while timings in red refer to 01 February 2022

Source: EMSA

1.8.1 *Sovereign*'s role in the salvage of *Julietta D*[13]

SMIT Salvage, a part of BOSKALIS, negotiated the Lloyd's Open Form Salvage Contract with the owner and insurer of *Julietta D*.

On the morning of 31 January, *Sovereign* was alongside at the port of Rotterdam. At around 1100, while a scaffolding was being erected to rectify an oil leak from its deck crane, it was assigned the salvage of *Julietta D*. The crew members were informed that *Julietta D* was drifting unmanned towards the shore. The crane repair job was cancelled, the scaffolding dismantled, and the crew started to prepare the tug to sail in inclement weather conditions.

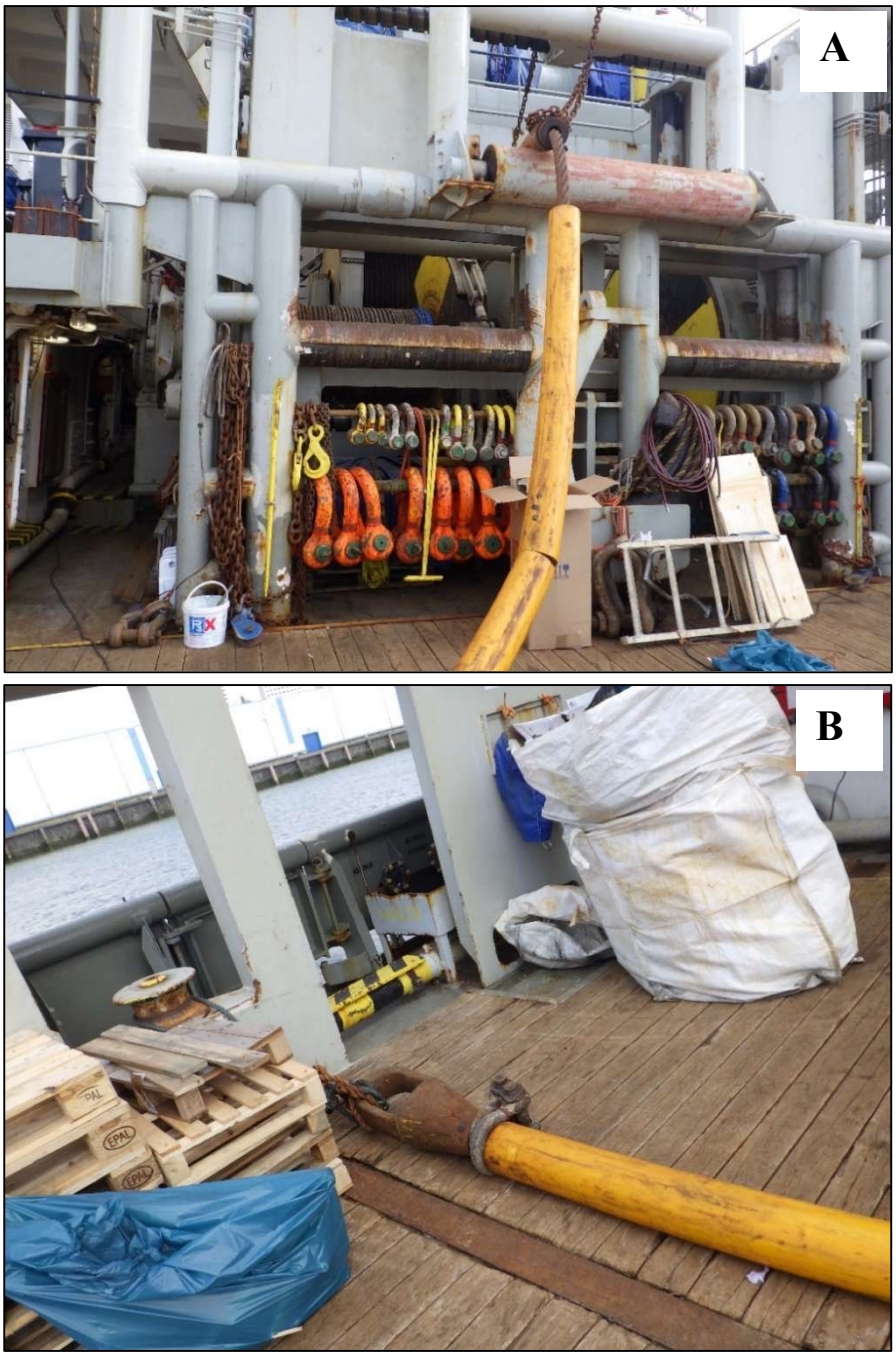
[13] Section 1.8.1 of this safety investigation report was compiled by FeBIMA.

Around the same time, KNRM rescue vessel *Koos van Messel* left the port of Scheveningen towards the drifting *Julietta D* and by approximately 1220, it arrived at *Julietta D*'s position.

At 1250, *Sovereign* cast off the quay, while its crew members continued with their preparations for the inclement weather. The crew members were also required to prepare for the upcoming salvage operations, which necessitated the positioning of the *Dyneema* towing line. This towing line was stowed in the forepeak store (**Figure 23**), from where it had to be brought aft, to the working deck.

Figure 23: *Dyneema* towing line stowed in the forepeak store of *Sovereign*
Source and copyright: FeBIMA

Since the deck crane could not be used, the towing line had to be pulled out of the forepeak store manually, through the accommodation at the tween deck level, and to the working deck at the aft of the vessel. One end of the towing line was then connected to the towing wire on the winch, and a messenger line was connected to the other end, to pass the towing line to *Julietta D* (**Figures 24 A** and **B**). The towing line was then flaked out on deck.



Figures 24 A and B: A showing the steel towing wire on the winch and B, the end of the same steel towing wire. The *Dyneema* towing line was attached to this towing wire

Source and copyright: FeBIMA

At 1430, *Sovereign* left the sheltered port area and proceeded out to open sea. The crew members were briefed on the adverse weather conditions. Towing operations in heavy seas were exceptional for *Sovereign* and the crew members were not accustomed to towing operations in stormy weather.

The tug's freeboard at the working deck was 1.2 m, and this deck was open at the stern (**Figure 25**). The crew was cautioned to be aware of green seas and to work in pairs in order to have someone keeping an eye on the sea. Shelter on the main deck was possible near the crash rails on the tug's sides (**Figure 25** inset).

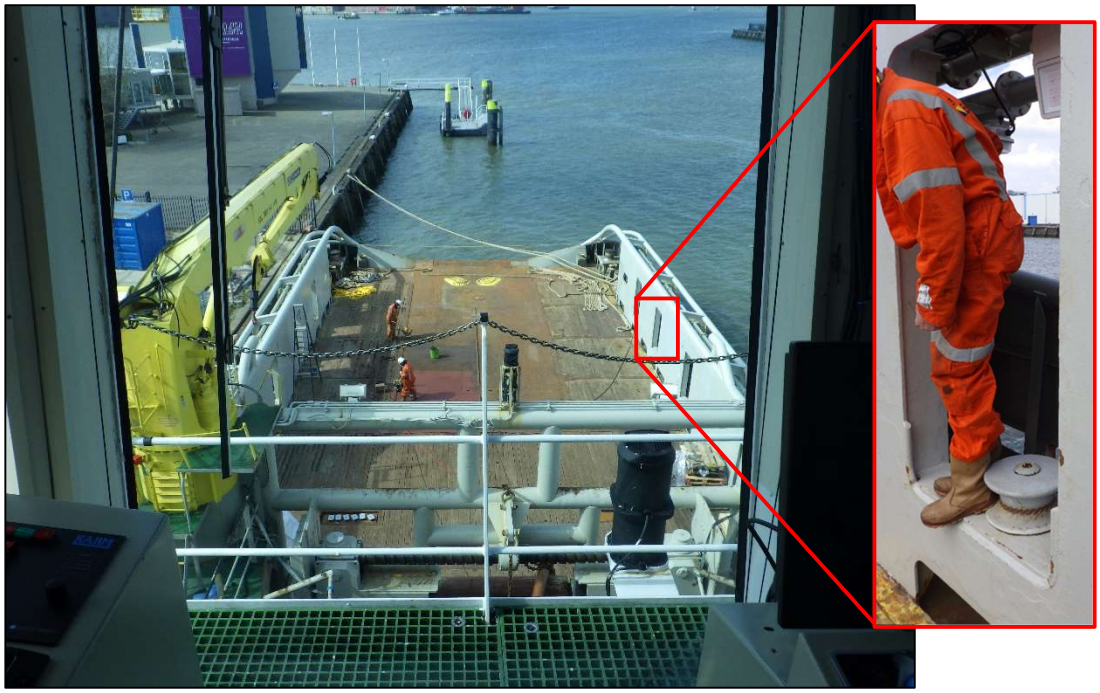


Figure 25: *Sovereign*'s low freeboard at the aft. Photo inset showing a simulated photograph of a crew member using the crash rail for shelter
Source and copyright: FeBIMA

The bridge team was monitoring the sea condition, as well. Communication between the bridge and the crew on deck was via portable UHF (ultra-high frequency) radios. The portable radios had to be carried in the pockets of the coveralls, as no shoulder straps or mic extensions were available on board. One portable UHF radio was on the bridge to allow communication with the deck crew, as the tug's fixed communication equipment was using VHF. The UHF radios transmitted in semi-duplex operation *i.e.*, when transmission and reception was possible, one at a time, by the use of two frequencies.

At 1550, *Sovereign* arrived at the location of *Julietta D* and started assessing the situation (**Figure 26**).

Figure 26: The bulk carrier *Julietta D* adrift with tug *Sovereign* at its stern and rescue boat *Koos van Messel* to its starboard side
Source and copyright: FeBIMA

At 1625, the salvage team boarded *Julietta D* from a helicopter. *Sovereign* moved to the lee side (which was on port side) of *Julietta D*, and positioned its stern towards *Julietta D*, thereby exposing its working deck, to facilitate receipt of the heaving line from the salvage team on board. The salvage team discussed the operation with *Sovereign*, following which, a toolbox talk was held on board *Sovereign* to inform and advise the crew members on the operation.

At around 1630, the crew members stood by in a safe position on deck, near the midships section. At one point, a wave washed on deck, lifting, and entangling the *Dyneema* towing line. Seeing this, some of the crew members attempted to keep the *Dyneema* towing line in place. At 1650, the salvage team shot the first heaving line from *Julietta D* towards *Sovereign*, using a line throwing apparatus, but the line fell in the water. As the crew members of *Sovereign* were not prepared to recover it from the water, they were unable to take the line on board and connect it to the messenger line of the *Dyneema* towing line.

Within the next moment, another wave rolled on deck, with crew members observing around 50 cm of head on deck. *Sovereign*'s bosun, who was occupied with the detangling of the towing line, fell on the deck. Although he was not injured, his clothes were soaking wet, his lifejacket inflated automatically, and he had to leave the area for the accommodation to recover from the shock. The chief officer followed

him to the bridge to check on his condition and to discuss with the master on a way forward for the operation.

Second officer 'B', who was experienced in the operation of the winch, was assigned the winch operation. Since experience in winch operation was a necessity to pay out the towing line in heavy weather, second officer 'A' was advised to join and remain with the chief officer on deck and relieve the bosun.

The skipper of the rescue vessel *Koos Van Messel* had noticed that the first attempt to take a heaving line from *Julietta D* to *Sovereign* had not succeeded. He therefore proposed to bring a heaving line from *Sovereign* towards *Julietta D*, to decrease the distance. At 1720, *Koos van Messel* approached the aft end of *Sovereign* to receive the heaving line. However, their first attempt was also unsuccessful. Not to get in between *Julietta D* and the tug, the skipper then proposed to reposition *Koos van Messel* on *Sovereign*'s starboard side. Meanwhile, the salvage team on board *Julietta D* had recovered the line attached to the line throwing apparatus from the water and were getting ready to shoot another line towards *Sovereign*. At 1815, the heaving line from *Julietta D* was successfully fired towards *Sovereign* and the messenger line was subsequently connected to the *Dyneema* towing line.

By this time, the bosun had returned on deck. The chief officer and second officer 'A' guided the *Dyneema* towing line as it ran off the deck to prevent it from getting slack in the water and foul the propeller. At around 1820, the towing line was set, and the chief officer and second officer 'A' proceeded to the bridge. Since it was not possible to walk behind the crash rails (**Figure 27**), the chief officer and second officer 'A' had to walk on the open deck.

Figure 27: No passage available behind the crash rail
Source and copyright: FeBIMA

As soon as they turned their backs towards the aft of the vessel and proceeded towards the accommodation, the bridge team members observed a wave rolling on deck. Although they tried to alert the chief officer and second officer 'A' on the UHF portable radio, neither the chief officer nor second officer 'A' understood what was being transmitted by the bridge team. Unaware of the wave, they were caught before they could reach a safe place near the crash rail. Both crew members were thrown across the deck, towards a nearby portable ladder. The chief officer injured his back and required assistance from the other crew members to make his way inside the accommodation. Second officer 'A' lost her helmet and hit her head against the stowed portable ladder. She also injured her left upper leg. Second officer 'A' was able to make her way to the vessel's hospital by herself, where she was joined by the chief officer. By 1830, the *Dyneema* towing line was connected to *Julietta D* and in position for towing operation to start[14].

[14] Reference can be made to **Annex 3** of this safety investigation report for a full timeline on the events involving the tug *Sovereign*.

1.8.1.1 Injuries sustained by the crew members of *Sovereign*

After *Julietta D* was berthed, the chief officer and second officer 'A' were taken to a local hospital for a medical check-up. The second officer 'A' was diagnosed with a Morel-Lavallée lesion on the left upper leg, in addition to a head wound. The chief officer was diagnosed with a fracture of a vertebra, spondylosis, and several herniated discs.

1.9 Sustained damages

1.9.1 Damages to *Julietta D*

Damage surveys by an ABS surveyor at berth and in a drydock revealed:

- damage to the port side of the forecastle deck bulwark, between frames 218 and 230, including the side shell plating over a depth of one metre and the deck over a width of one metre (**Figure 28 A**);
- damages to the port side shell plating, guardrails, deck fittings and deck plating, in way of frames 190 to 192, between the main deck and the bilge plating;
- damages and penetration of the port side shell plating, guardrails, deck fittings and deck plating, in way of frames 160 and 163, between the main deck and the bilge plating, affecting the port side water ballast tank no. 2 (**Figure 28 B)**;
- damages to port side shell plating, guardrails, deck fittings and deck plating, in way of frames 36 to 50, between the main deck and the bilge plating (**Figure 28 C**);
- damages and penetration of the port side shell plating, between frames 18 and 32, in the vicinity of the engine-room parts store (**Figure 28 D**);
- damages and penetration of the port side shell plating, between frames -5 and 18, in the vicinity of the engine-room (**Figure 28 E**); and
- damages to the deck plating on A-deck, in way of the bunker davit, and to the deck plating of the overhanging deck, along the bunker davit, in way of frames 33 to 36 (**Figure 28 F**).

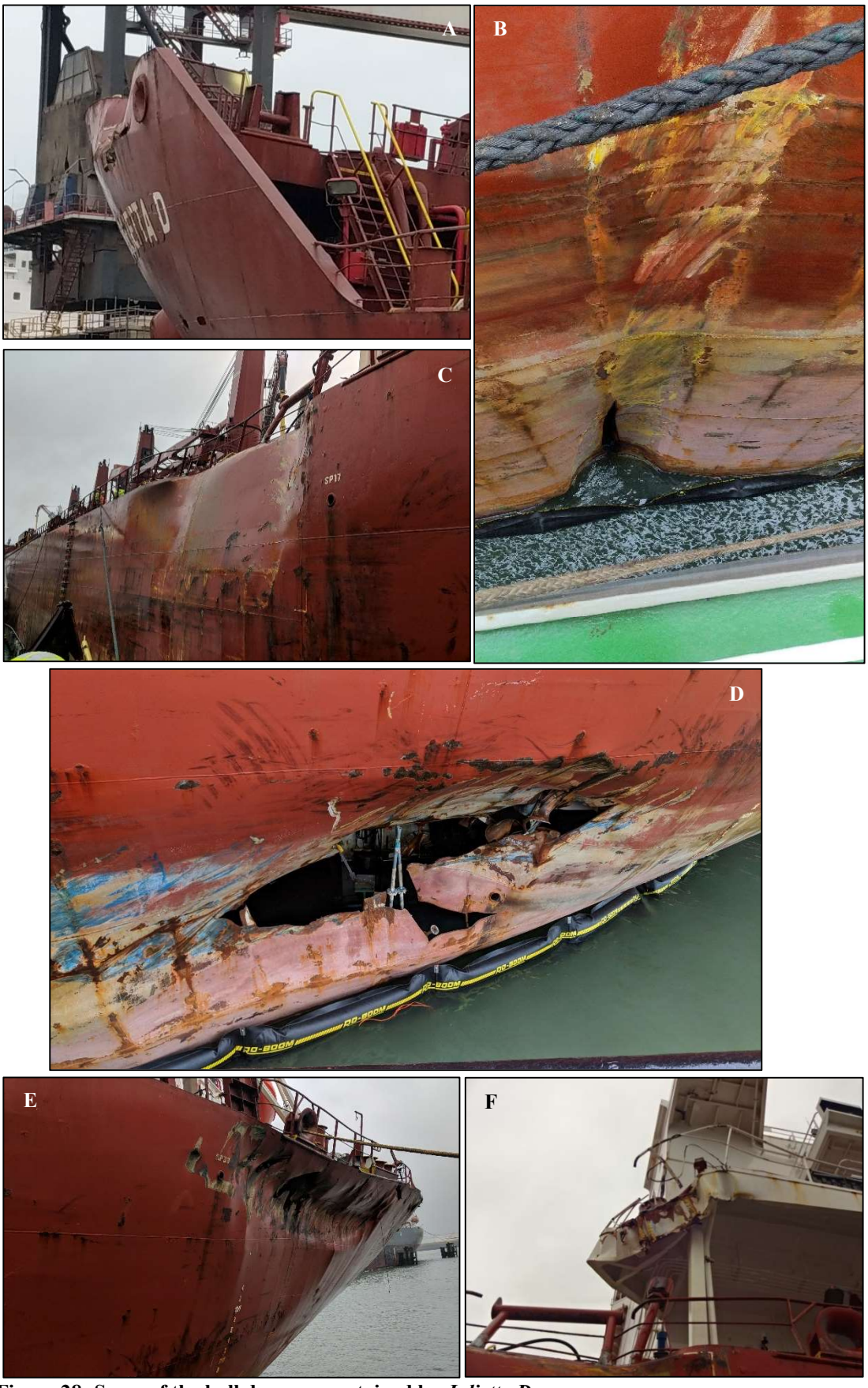


Figure 28: Some of the hull damages sustained by *Julietta D*

The port side anchor and more than 10 shackles of anchor cable were lost. Part of the 11th shackle was still on the windlass drum (**Figure 29**). The bitter end was intact. The lost port anchor was recovered from the seabed on 03 February 2022, in position 52° 26.43' N 003° 58.39' E. Following an inspection at a repair yard, several lengths and kenter shackles were replaced and eventually re-connected to the remainder of the chain on board.

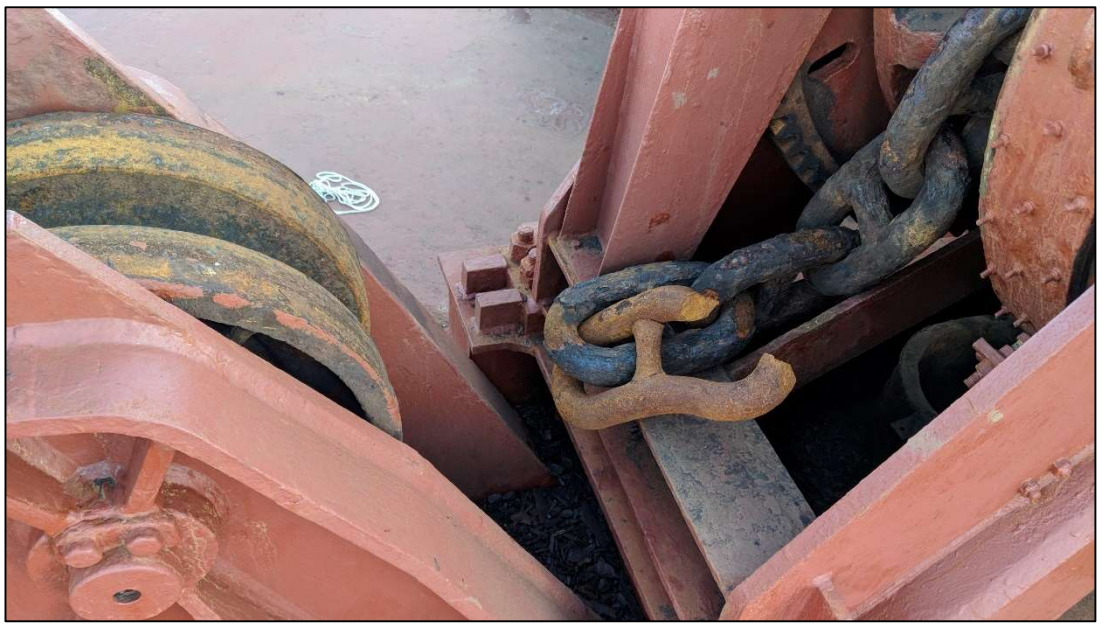


Figure 29: Port side anchor cable damaged joining shackle

A survey of the engine-room, after the seawater was pumped out, revealed that the main engine, electrical cabling and associated systems, control panels, distribution boards, insulation, lagging and electromotors / pumps fitted in the lower decks of the engine-room, were affected by seawater. ABS required that the main engine and all other affected equipment were to be overhauled and repaired / renewed, as necessary, following which, a full dock trial and sea trial had to be carried out.

On the blocks in dry dock, one blade from the propellor was observed to be freshly damaged (**Figure 30**).

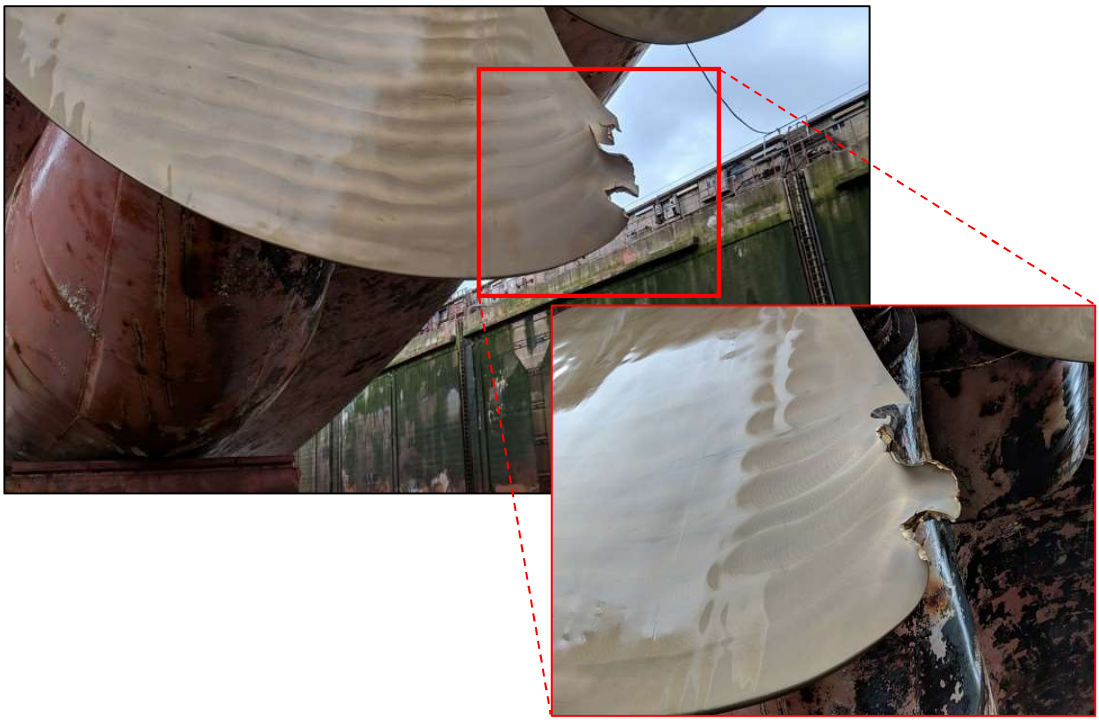


Figure 30: Damage incurred by one blade of the propellor

1.9.2 Damages to *Pechora Star*

A damage survey was carried out on *Pechora Star*'s forecastle area, at the port of Amsterdam, the Netherlands. The survey revealed distortions, punctures, and fractures in the following areas:

- the forecastle's bulwark, its associated structure, and the forecastle plating in way of the bulwark, from frame 166 on the port side around the centreline to frame 178 on the starboard side (**Figure 31 A**);
- the forecastle plating and associated underdeck stiffening, between frames 174 and 180;
- the bow plate shell stiffeners, from the centreline to the 4th frame on the starboard side;
- the bow plate shell stiffeners, from the centreline to the bulkhead at frame 166 on the port side;
- the bosun's store hatch cover coaming connection to the deck (**Figure 31 B**);
- the Panama chocks and gooseneck vents in the abovementioned areas;
- the port side mooring rope rollers;

- the Suez light platform;
- the forecastle's davit and its foundation (**Figure 31 C**); and
- the foremost area of the bosun's store and on the port side, in way of the bulkhead connection deck plate. This damage had compromised the watertight integrity, resulting in the flooding of the bosun's store with approximately 50 mm of water, with the additional water overflowing into the bow thruster room.

Moreover, as the bow thruster room was flooded with approximately 3.0 m of water, the bow thruster and the electrically driven emergency fire pump were completely submerged and inoperative.

A survey of the external hull, carried out from a barge revealed that the port anchor was not fully heaved in and that it had a bent stock (**Figure 31 D**). The damage survey carried out in the location of the allision, around the port side of the engine-room, showed distortions, punctures and fractures in the following locations:

- the poop deck plating from the side shell to approximately 1,500 mm inboard, between frames 23 and 30 (**Figure 31 E**);
- the guardrails, air vents and gooseneck vents in way of the above-mentioned spaces (**Figure 31 F**);
- the side shell stiffeners between frames 25 and 30;
- the ventilation ducts and sounding pipes in way of the side shell, between frames 25 and 30;
- the connection of the bulkhead to the side shell, at frame 26, compromising the watertight integrity (**Figure 31 E**); and
- the guardrails at frame 41 on the port side, from the side shell to the first set of steps down to the main deck.

Figure 31: Some of the damages sustained by *Pechora Star*

Inside the engine-room, the insulation of the fuel pipes inside the purifier room was found wet and required drying and cleaning. The filling and ventilation pipes for the hydraulic oil tanks were sheared off and the level of the hydraulic oil tank was noted to have increased after the accident, suggesting that water had seeped in from the damaged filling pipe.

1.9.3 Damages to *Hollandse Kust Zuid* windfarm

Shortly after the allision with *Pechora Star*, *Julietta D*'s port hull made contact with the transition section of windfarm foundation HZ E4 which, at the time, was still under construction (**Figure 32**).

Figure 32: Aerial photograph showing some of the damages to the transition section of windfarm foundation HZ E4

Source: Vattenfall. (2022). Damage to Hollandse Kust Zuid wind farm after collision by Julietta D. Retrieved 15 December from https://vattenfall-hollandsekust.nl/blog/2022/02/02/schade-aan-windpark-hollandse-kust-zuid-na-aanvaring-door-julietta-d/

During *Julietta D*'s Southbound drift, the vessel also made several contacts with the jacket of the transformer platform *HZB* (still under construction). Cracks, indentations, damages to the protective paint coating and other structural damages in various areas were observed following a post collision inspection (**Figure 33**).

Figure 33: Part of the damages to *HZB*

Source: TenneT (2022). Ship adrift near TenneT platforms. Retrieved 15 December from https://www.tennet.eu/news/ship-adrift-near-tennet-platforms

1.10 Similar occurrences

Two months after the events involving *Julietta D*, the MSIU was notified of a similar occurrence, where in near gale weather, an anchored vessel was observed to close-in on a bulk carrier anchored in the Westhinder Anchorage Area. When the anchor dragging vessel was alerted by both the VTS and the bulk carrier, it reported that it was manoeuvring and underway. However, the vessel dragging her anchor was unable to control its movement and subsequently allided with the bulk carrier, resulting in a hull breach, in way of port side ballast water tank of the former. After the allision, the vessel dragging anchor managed to recover control and proceeded further North for re-anchoring.

The MSIU was notified of several other occurrences of anchor dragging and loss of anchors in the anchorage areas around the Netherlands, although they did not result in any allisions.

2 ANALYSIS – PART A

2.1 Purpose

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future.

2.2 Co-operation

The Netherlands, Belgium and Latvia were identified as States with substantial interest in this safety investigation. Cooperation was very forthcoming, and information requested during the safety investigation had been provided. Belgium has also actively contributed to the compilation of this safety investigation report.

2.3 Probable cause of *Julietta D*'s drift

The port anchor, along with 10 shackles of chain, were found lying on the seabed, in the vicinity of *Julietta D*'s re-located anchorage position. This suggested that rather than dragging her anchor towards *Pechora Star*, *Julietta D* had in fact lost her port anchor and drifted towards *Pechora Star*.

2.3.1 Anchor cable failure

ABS had assigned equipment numeral U-36 to *Julietta D*, which corresponded to equipment number 2380. An equipment number is calculated for each vessel to determine the weights and dimensions of anchor, chains, *etc*., required by that particular vessel. The calculation takes into consideration the displacement of the vessel, the width and height, and its lateral surface above the water amongst other things. As specified in the Unified Requirements (UR) A1, adopted by the International Association of Classification Societies (IACS), this equipment number is based on an assumed current speed of 2.5 ms^{-1}, a wind speed of 25 ms^{-1} and a scope of chain cable between 6 and 10[15]. *Julietta D*'s certificates for its anchors, cable and its fittings confirmed that the fitted equipment met the specified requirements.

[15] The scope is the ratio between the length of chain paid out and the water depth.

However, this UR further established that the equipment requirements were intended for the temporary mooring of a vessel within a harbour or sheltered area, when the vessel was awaiting berth, tide, *etc*. As such, the equipment was neither designed to hold a vessel in an exposed area in rough weather, nor to stop a drifting / moving vessel. It is understood that in such conditions, the loads on the anchoring equipment would increase dramatically and to a degree that its components may be either damaged, fail, or are even lost as a result of the high energy forces generated, particularly in large vessels.

The MSIU had requested for *Julietta D*'s broken anchor chain link, with the aim of carrying out destructive and non-destructive tests to establish the technical cause of the chain link's failure; however, this was not made available to the safety investigation[16]. Therefore, the safety investigation was unable to determine the technical cause of the chain link's failure and could only hypothesize that:

a. stresses on the port anchor chain exceeded the breaking load of the chain link;

b. a combination of the vessel's bow rising on a wave, which was higher than what had been previously encountered, and the resultant 'stretching' of the anchor cable caused extra strain on the chain link, causing its failure;

c. a combination of helm and engine orders may have added additional stresses on the anchor cable, causing the chain link to fail[17]; and /or

d. the chain link material parted due to fatigue failure.

2.3.2 Manoeuvrability of *Julietta D*

As indicated elsewhere in this safety investigation report, from midnight onwards, the master used the main engine to reduce excessive loads on the port anchor and chain and prevent the anchor from dragging. The master described how, at one point, during the morning hours of 31 January, the vessel turned with its starboard beam to the wind and waves, following which, he could not manoeuvre the vessel any longer (**Figure 34**). In fact, by 1027, the VDR recorded that the wheel was set hard over to starboard, while the main engine was running on full ahead with a Westerly heading.

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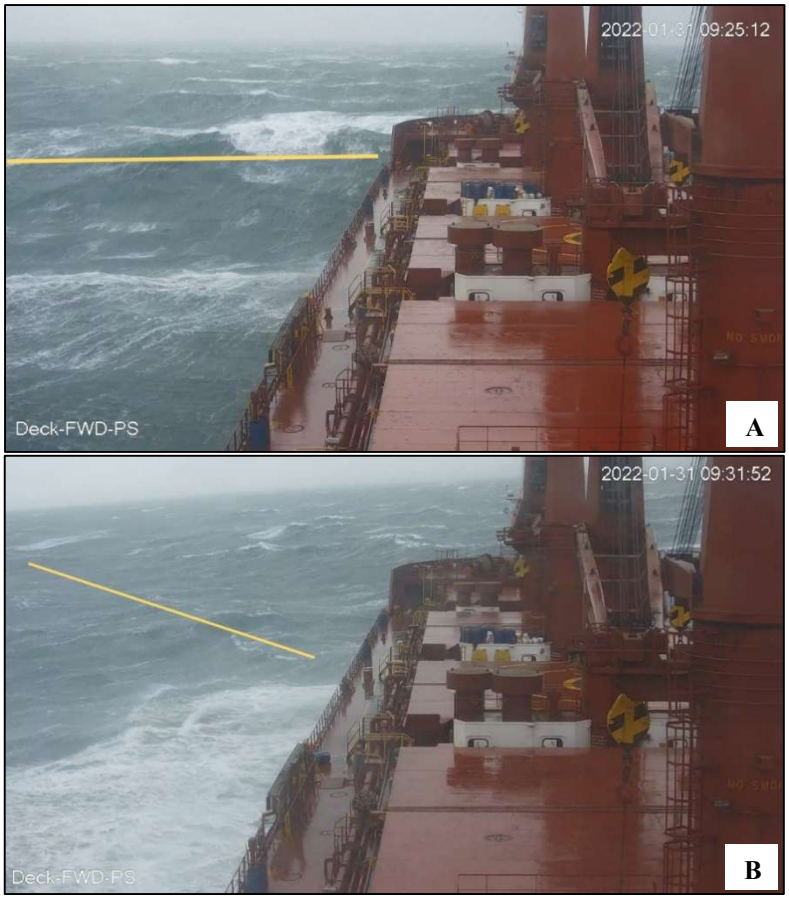
[16] The Company was unable to provide the failed chain link and explained that since it formed part of the physical evidence involved in the accident, it has been preserved as is, because it may be required in the ongoing litigation.

[17] Further analysis on this matter is included in section 2.3.3.1.

However, the vessel's COG, although fluctuating, indicated that *Julietta D* was actually moving in a Southerly to South Southwesterly direction (**Figure 35**).



Figures 34 A & 34 B: Stills from footage taken from CCTV camera fitted on the port of *Julietta D* showing the wave approach change within a span of six minutes (time in UTC)

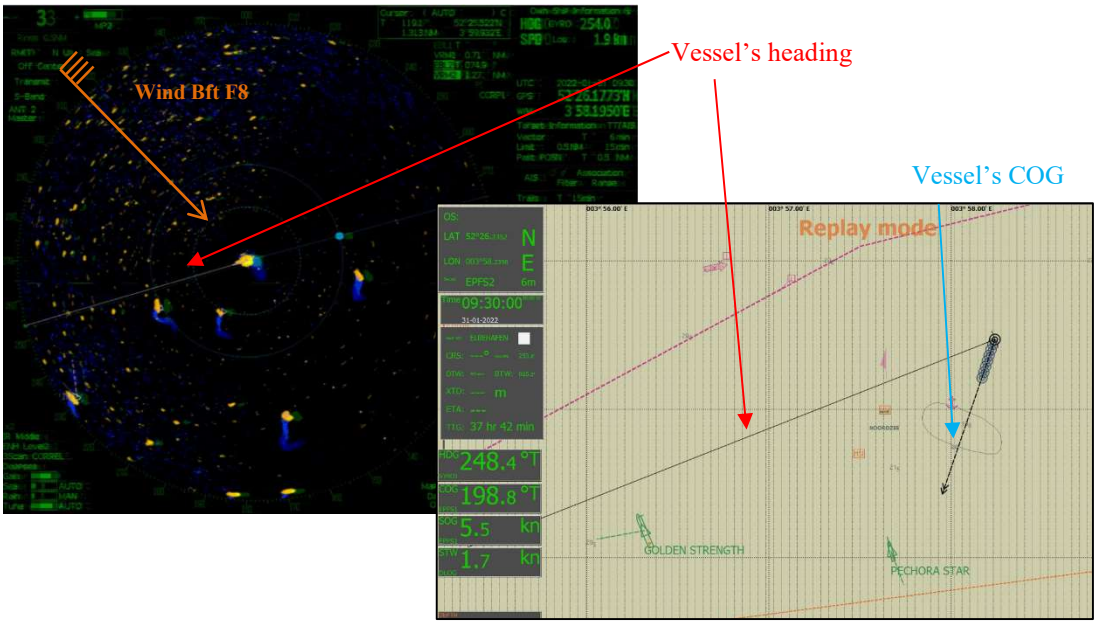


Figure 35: Screenshots from S-band RADAR and ECDIS in replay mode, at 1030, with wind direction superimposed on the RADAR screenshot

Julietta D was in a light ballast condition, with all of her water ballast tanks full, her forepeak tank half full and her aft peak tank and cargo hold no. 3 empty. As a result, *Julietta D*'s mean draft read 5.72 m, which translated into a mean (high) freeboard of 9.47 m. This indicated that most of *Julietta D*'s hull was above the waterline, with a calculated lateral windage area of 2,650 m^2.

While at anchor, *Julietta D* was encountering the wind head on, meaning the wind forces generated were working against her frontal windage area which, for the purpose of this safety investigation can be estimated as follows:

*28.31 m (Breadth) * 28.72 m (Air draft[18]) = 813.06 m^2 (Frontal windage area).*

Once *Julietta D*'s anchor failed, and her bow fell away from the wind, the wind force would have had a much larger area (**Figure 36**) to act upon.

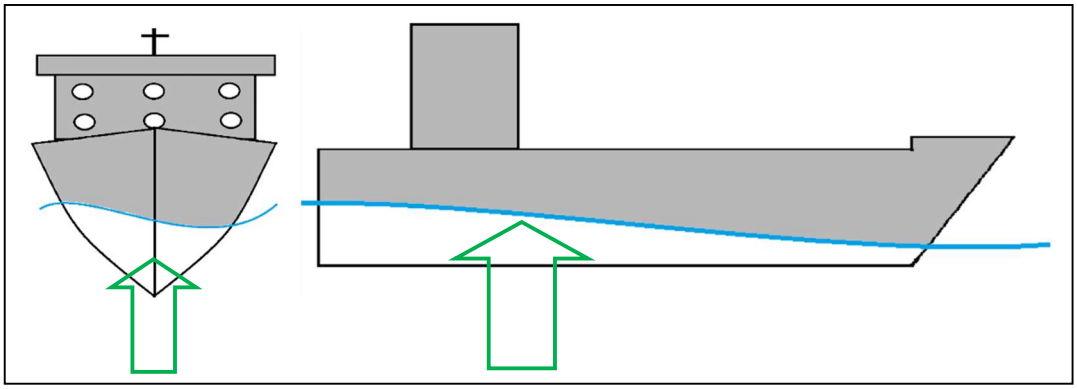


Figure 36: Frontal windage area (on the left) as compared to the lateral windage area (on the right)

A reduced draft on a vessel tends to decrease its inertia, thus making it susceptible to generate momentum much more easily to stimulating forces, such as the wind. This meant that the main engine, which was already operating at Full Ahead, had to develop more power to counteract the wind force being generated on her starboard beam.

The crew members recalled that *Julietta D*'s main engine was operating seamlessly, prior to the events of 31 January. However, at around 1039, the master informed

[18] Air draft, after subtracting the height of the mast from the compass deck.

Ijmuiden VTS that although the main engine was on Nav Full Ahead[19], the vessel was still dragging anchor[20].

Julietta D's departure condition indicated that 52.5% of its propeller was immersed. This would have led to an overall decrease in its efficiency, allowing for its ventilation while rotating; which would also have increased stresses on the propulsion components of the main engine. Propeller ventilation normally occurs when the load on the main engine is high and the propeller's immersion underwater is limited, which is exacerbated in heavy seas, when the relative motions between the free surface and the propeller are large, exposing the blades even further. When the propeller works in an aerated water environment, the water streamlines detach from the blades, leading to a reduction on propeller load. Furthermore, the torque applied to the propeller causes it to spin at a much higher rate of revolution, while out of the water.

Ultimately, the thrust provided by the propeller is reduced, causing the vessel to reach a slower speed, compared to a fully submerged propeller coupled to the same power output, as well as reducing the propeller control over the hull. The reduction in efficiency of the propeller has a direct effect on the steering forces that the rudder can apply, all the more so because, due to the shallow draft, most of the rudder area would also be out of the water. Although not mentioned during the collection of accident data, it was also not excluded that the engineers had to watch for turbo charger surging[21] and which would therefore impose a limitation on the main engine RPM.

While *Julietta D* was at anchor, its pivot point would have been at the hawse pipe and the rudder would have a greater turning lever, thus making it easier for the vessel to respond to rudder movements. However, once the port anchor chain broke, the pivot point would have shifted aft by around a third of the vessel's length, thereby reducing the turning lever. For *Julietta D* to respond in the same manner before the anchor chain broke, it would have required more power. However, with the main engine

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[19] Engine's RPM were increased.

[20] At this stage, the master was still under the impression that *Julietta D* was dragging its anchor.

[21] Turbo charger surging is caused by the backflow of air into the engine-room, through the suction side of the compressor side. It is a phenomenon which happens when the discharge volute pressure exceeds the pressure built up in the turbo chargers' diffuser. Surging can cause vibrations and generates forces, high enough to potentially damage the turbo charger blades. Turbo charger surging is not uncommon in heavy weather conditions when the immersed areas of the propeller blades vary due to *e.g.*, the vessel's pitching motion.

already operating at Full Ahead under the prevailing weather conditions, *Julietta D* was attaining an average speed of only three knots. In comparison, the vessel's wheelhouse poster indicated that 'Full Ahead' would enable the vessel to reach a speed of 10.7 knots (reached during the sea trials[22]). This suggested that while the weather conditions were already hampering the crew members' efforts to keep the vessel steady, the loss of the port anchor brought the vessel to a point where the crew members could no longer control the vessel's movements.

The safety investigation was unable to ascertain the effects of the current, as the vessel's high freeboard and the strong winds, which produced high waves and swell, masked these effects.

2.3.3 Arrival stability condition / heavy weather preparation

Julietta D's Loading and Stability Manual gave two main conditions, applicable when the vessel would not be carrying any cargo: a normal ballast condition, and a heavy ballast condition. The Loading and Stability Manual also included various stages of the voyage, such as departure, mid-way, and arrival conditions. The heavy ballast condition was further divided into a condition for when the vessel's arrival was either for cargo operation, or otherwise.

The main difference between the two ballast conditions was the use of cargo hold no. 3 for ballast water. For this safety investigation, a comparison was made between each of the arrival conditions (**Table 5**).

[22] Wind 10 knots or less, no current, water depth twice vessel's draft or greater, clean hull and intermediate drafts or unusual trim.

Table 5: Comparison of ballast conditions

	Actual ballast condition of *Julietta D*	Normal ballast condition (Arrival)	Heavy ballast condition (Arrival for operation)	Heavy ballast condition (Arrival not for operation)
Displacement	23865.58 mt	24865.00 mt	31792.00 mt	34996.00 mt
Ballast weight	12928.10 mt	14530.00 mt	21457.00 mt	24660.90 mt
Max aft draft	6.30 m	6.20 m	7.45 m	7.65 m
Trim	-1.15 m	-0.54 m	-0.10 m	0.81 m
Propeller immersion	52.5 %	51 % – 50 %	72 % – 50 %	76 % – 50 %
GM_{fluid}	6.94 m	6.33 m	4.56 m	4.41 m

Julietta D arrived at Ijmuiden anchorage in a light ballast condition, with her cargo holds prepared for loading. According to the crew members, *Julietta D* was already prepared for heavy weather, prior to its departure from the last port; they were expecting storms, being the North Sea, during the winter season. In fact, a few days before the storm of 31 January, *Julietta D* had already encountered near gale[23] winds with the same stability condition, but without any consequences.

The safety investigation understood that the preparations for heavy weather carried out on the day prior to the accident, were mostly focused on re-locating the vessel to a more spacious location within the anchorage area, informing the crew members to take adequate rest, and ensuring main engine readiness by midnight. No discussions were held on increasing the vessel's stability to a heavy ballast condition, in preparation for the upcoming storm.

As it may be observed in **Table 5**, in its actual condition *Julietta D* was a stiff vessel[24] with a GM of almost 7.0 m. One may argue that in addition to reducing the GM by 2.5 m (and thus reducing the stresses on the vessel), the taking of heavy ballast would have immersed the propeller even further below the water. As discussed earlier, a

[23] Storm Malik passed North of the UK, in an Easterly direction bringing strong winds to the North Sea on 29 January 2022.

[24] A stiff vessel is one with a very large GM, producing large righting moments that cause the vessel to be excessively stable, which induce the vessel to return very quickly and violently to the upright, when heeled. The roll period would be very short.

partly immersed propeller would lead to a reduction (or a loss) in the vessel's propulsion and compromised steering capabilities, especially against the natural forces generated during a storm. Furthermore, increasing the vessel's draft would create a smaller frontal and lateral windage area (approximately 1,000 m^2 smaller).

From the crew members' perspective, however, taking in ballast water in cargo hold no. 3 would not have been a straightforward decision. The vessel had arrived at the anchorage area on the evening of 23 January to carry out cargo holds' cleaning, in preparation for a cargo hold inspection upon arrival and subsequent loading. On 29 January, the vessel tendered a Notice of Readiness (NOR), within the agreed timeframe of the charter party, indicating that its cargo holds were now ready for loading. However, entry into port was further delayed due to the unavailability of stevedores, followed by the inclement weather. Cargo hold no.3's maximum ballast water capacity was of 10,130.9 t. It would have taken the crew members more than eight hours[25] to pump ballast water into that cargo hold, and an additional number of hours to empty it and make it ready for inspection, once the storm would have passed. The master would most probably have had to face the commercial challenges and perhaps a loss of charter, had the vessel's berthing prospects be announced whilst the vessel was not ready for loading.

2.3.3.1 Heavy weather – options available on paper

The best option for mariners when encountering severe adverse weather conditions, is to re-route their voyage and avoid such conditions completely. However, it is not always possible to do so. Then, seeking shelter may not always be an available option either, especially if located miles away. The Ijmuiden Anchorage Area is open to Northerly winds and seas. The closest shelter from Northerly winds for *Julietta D* was closer to the United Kingdom's Southern coast, on the opposite side of the English Channel, and further South.

In anticipation of adverse weather, vessels lying at anchor may opt to heave up the anchor, head to sea, and ride out the worst of the weather there.

[25] *Julietta D* was equipped with two ballast water pumps, with a capacity of 600 m^3hr^{-1} each.

Heaving-to normally works best by placing the vessel in one of the following three positions:

(a) with the sea on the bow and steaming at a reduced speed sufficient for steering;

(b) with the sea abaft the beam and at a similarly reduced speed; or

(c) stopped and drifting to leeward.

Each of these position produces different results, depending on the type of vessel and its load condition. As a rule, option (a) is normally desired when there is little sea room to leeward, as the vessel would make slow progress over the ground. However, it is a difficult position to hold for a light vessel, which tends to fall off the wind, similar to the case of *Julietta D.*

For positions (b) and (c) to work as intended, the vessel is required to have ample sea room to the leeward shore, since in (b), the vessel is expected to steer before the wind, and thus towards a lee shore. In the case of scenario (c), the vessel is allowed to drift towards the lee shore. For option (b), a good steering capability is required as the danger of pooping[26] exists, while for option (c), the vessel would be expected to roll heavily, requiring it to have an adequate GM from the start; additionally, in this case, synchronism[27] may develop. Storm *Corrie*'s projected passage was relatively close to the North of where *Julietta D* was anchored. It would not be an expected approach for any master to head towards the storm's passage, and then to fall back away from the storm. It is safe to conclude that, for a satisfactorily heaving-to, the vessel required a good steering capability. With a high freeboard vessel and the propeller and rudder mostly out of the water, this would have been risky for *Julietta D*, unless the heaving-to was executed in sheltered waters.

Deploying the second anchor to bring the vessel in an open moor condition, in preparation for heavy weather, may be the least sought-after solution by mariners. This is because whilst the deployment of both anchors requires ample sea room in the

[26] When the vessel falls into the trough of a wave and does not rise with the wave, allowing for the incoming wave to break over the poop deck area, which may cause considerable damage at the stern.

[27] This occurs when the roll period of the vessel is equal to the apparent wave period, this results in each roll movement of the vessel to be amplified by the waves, causing synchronous rolling as the vessel rolls to larger angles which progressively increase.

anchorage area for the vessel to manoeuvre, it is also a time-consuming procedure. Should the procedure be affected by the changing of the tide set and rate, the anchors could easily cross, in which case, shore assistance would most likely be required to clear the anchors.

The master considered that the best option was for the vessel to remain at anchor and use the main engine to maintain position and reduce the tension on the anchoring equipment. This procedure was recommended by the vessel's SMM, in cases when heaving up the anchor was not considered possible. However, it was also noted that the SMM required the monitoring of the direction and tension of the anchor cable when using the main engine while at anchor. This meant that a crew member would have to be stationed on the forecastle, throughout the period when the main engine was used to maintain the vessel's position, considering that there were no other means to monitor the anchor cable, such as cameras.

The safety investigation was not aware whether the master had considered posting a lookout on the forecastle deck. However, doing so in the height of the storm would have posed an extremely high safety risk to any crew member stationed there. That not being an option, the master would, therefore, have had to use his knowledge and past experience to determine the direction of the anchor cable as the safer, available option.

2.3.4 Correlation with the occurrence of *Pasha Bulker*[28]

On 08 June 2007, the bulk carrier *Pasha Bulker* grounded on Nobbys Beach, Newcastle, Australia, after weighing anchor and attempting to put to sea in stormy conditions. Similar to *Julietta D*, *Pasha Bulker* was in a light ballast condition, with its cargo holds empty, ready to load a cargo of coal. The vessel's windage area, coupled with a reduction in its propeller's immersion in the prevailing weather conditions, were considered to be contributing factors for the reduction in the vessel's steering capabilities.

On the day of occurrence, several other vessels remained at anchor, off the coast of Newcastle, awaiting their berth. Most of the vessels reported dragging their anchor and eventually, also headed out to sea. One vessel (also a bulk carrier) in light

[28] ATSB Transport Safety Investigation Report, Marine Occurrence Investigation No. 243.

condition, reported difficulty to steer, had to let go a second anchor, and take in heavy ballast to improve its steering capability. At one point, its anchor cables fouled each other, and a tug was dispatched to connect a tow line. The operation failed due to the heavy weather conditions. Other vessels reported failures of their windlasses and had to either cut their anchor cables or maintain their position using their main engines.

The events which had occurred off the coast of Newcastle, Australia, involving multiple vessels, gave a clear indication of all the possible repercussions *Julietta D* (or any vessel anchored, at the time) may have had while deploying a second anchor, and / or experienced a failure of mooring equipment. It further shed light on the options taken by several vessels that chose to remain at anchor and ride out the inclement weather in the anchorage area.

2.4 Allision with *Pechora Star*

The time span from when *Julietta D*'s anchor chain broke, until the first contact with *Pechora Star*, was approximately 15 minutes. At 1032, the master of *Julietta D* was still under the impression that the vessel was dragging its anchor and in fact, he requested the OOW to call *Pechora Star* and notify them of this situation.

The OOW of *Pechora Star* notified his master, requested for the main engine control transfer from the engine-room to the bridge, and started the two steering gear pumps. By the time the master of *Pechora Star* arrived on the bridge, *Julietta D* was around two cables[29] off *Pechora Star*'s starboard bow. The master assessed the situation and concluded that there was little that *Pechora Star* could do to avoid the allision. This was because it would take approximately 30 minutes for *Pechora Star* to heave up nine shackles of its anchor chain from the water and get underway. Furthermore, turning *Pechora Star*'s bow to either side while still at anchor, would have exposed the vessel's cargo tanks, which at the time were loaded with 10,370.47 mt of unleaded gasoline. In the master's early assessment, it also appeared that *Julietta D* would drift across *Pechora Star*'s bow (**Figure 12**).

In the meantime, *Julietta D*'s master first attempted to increase the main engine's RPM, with the intention to increase the distance between the two vessels. A few

[29] One cable is approximately 185 m.

minutes later, as it appeared that the vessel was not responding as expected, the master ordered that the wheel is turned to midship, and the telegraph pulled astern. The safety investigation believes that there was not enough sea room for *Julietta D* to manoeuvre away from *Pechora Star*; the winds and seas were overwhelming *Julietta D*'s attempted manoeuvres. Accident data received by the MSIU indicated that the master was observing both the navigational equipment, and the situation outside the bridge windows and there were no cues to indicate that the anchor had been in fact lost. The master was constantly trying to make sense of the situation, based on his perception of the prevailing status, *i.e.*, the vessel dragging anchor, and how his actions suddenly did not have the desired effect on the vessel. Initially convinced that a wave larger than normal had caused the vessel's bow to turn away from the wind, the master was fixed on turning the vessel's head back into the wind. However, as the situation progressed and *Julietta D* was closing in on *Pechora Star*, his focus changed to the impending allision.

The dynamic and uncertain situation, coupled with the limited time to process it, brought the master in a cognitive fixation state. In hindsight, had he received indications that the port anchor and cable were lost, he could have opted to request the crew members to drop the starboard anchor. However, apart from the high safety risks that the anchor party would have faced, deploying the starboard anchor could not be considered as a definite solution to the evolving situation. Besides that, the anchor party would have required their time to reach the forecastle. Then, dropping the starboard anchor in inclement weather would most likely have resulted in its running out and subsequent loss.

Upon allision, the main engine of *Julietta D* had stopped / stalled and after confirming with the chief engineer, the master was able to retake control of the main engine from the bridge, within minutes. As the safety investigation did not come across any data which suggested a failure and /or malfunction of the main engine, the latter was not considered to be a contributing factor. Nevertheless, the damages to one of *Julietta D*'s propeller blades (**Figure 30**) suggested that it may have struck *Pechora Star*'s anchor cable. Furthermore, a 'start interlock' alarm (logged in the engine-rooms alarm history) confirmed the unavailability of the main engine, around the time of allision with *Pechora Star*.

2.5 Master's decisions to abandon the vessel

The initial allisions with *Pechora Star* resulted in two hull breaches in way of *Julietta D*'s engine-room, compromising the hull's integrity, leading to water ingress into the space. The master was aware that with one compartment compromised, *Julietta D* would not have been in danger of sinking. This was also reflected in his initial request to the NCG to send towage assistance to the vessel.

Once the NCG informed the master that a tugboat might take several hours to reach *Julietta D*'s position, the master requested the evacuation of the crew members. This decision was not taken in a vacuum. The master was able to observe several windfarm transition sections and what he described as an 'oil rig' in the direction of their drift. Even if *Julietta D* had survived the ordeal of 31 January 2022, the risks involved were unacceptable for the master; further allisions with other structures could have caused further additional hull breaches, which would have opened up the possibility of the vessel losing its reserve buoyancy. Then, it was the master's understanding, that the distant 'oil rig' was an explosion / fire hazard, should *Julietta D* allide with it. Moreover, at the foreground of it all, the master wanted to avoid the possibility of initiating the crew members' evacuations at a late stage, also considering that abandoning the vessel in lifeboats and life rafts, in the prevailing weather conditions, was not free of risks.

2.6 Allision with windfarm transition sections and jacket of the platform

Site 2 is the area occupied by the *Hollandse Kust Zuid* windfarm[30]. *Julietta D* had crossed the Northern perimeter of this windfarm just after 1100, at the time when the crew members were still mustering on the bridge. The situation on board the vessel was very complex:

- *Julietta D*'s main engine was stopped;
- steering the vessel away from the windfarm area was not an available option to the crew members;
- a tugboat was not immediately available to control the vessel's drift; and

[30] *Vide* map in **Annex 1**.

- dropping the other anchor in this area:
    - would have risked damages to the numerous submarine cables and pipelines laid on the seabed; and
    - was risky to the anchor party in the prevailing situation.

There were no installed barrier systems (physical and / or procedural) that could have assisted the crew members to prevent the allisions of *Julietta D* with the transition section of a wind turbine and with the jacket of a transformer platform, both still under construction (or, for that matter, any other vessel in this situation).

Back in 2019, the Maritime Research Institute of the Netherlands (MARIN), had predicted that by 2030 (when all the planned windfarms would have been constructed)[31], an average range of 1.5 to 2.5 allisions between vessels and windfarms could occur on an annual basis (depending on the scenario).

Following *Julietta D*'s accident, MARIN launched an explorative study to develop a set of realistic conceptual physical barriers and to test their ability to stop and hold a vessel from breaching windfarm areas. Three conceptual barriers were tested in the Institute's test basin, using a scale model similar to *Julietta D*. Although the results were promising, it is understood that further research and tests using different scale models and different scenarios would be required to improve on the concepts.

On 26 September 2022, the Dutch Safety Board (DSB) also launched an investigation, focussing on the safety risks stemming from the increasing use of the North Sea by various parties. At the time of publishing this safety investigation report, DSB's research is still on going.

2.7 'Safe anchorages'

Numerous contributions have been written by stakeholders, discussing what makes anchorages, 'safe anchorages'. Concerns on lack of traffic control within an anchorage area, lack of designated anchoring positions, and unsuitable choices for anchorage areas, have come up frequently. The local port authorities normally do not direct vessels to anchor in particular positions, but instead direct vessels to the

[31] Refer to **Annex 1**.

anchorage area, in which they should anchor. It is then the master's decision to choose the appropriate position for dropping the anchor, keeping in mind the vessel's swinging circle, the amount of cable to pay out, the distance from other vessels anchored in the vicinity, the vessel's manoeuvrability in a congested anchorage, *etc.* Apart from being potentially subjective, the choice for an anchorage location also depends strongly on the type of vessel being considered.

In the case of *Julietta D*, the master opted to re-position his vessel further North to have more sea room from the other vessels anchored in the anchorage area, and to be closer to the inbound TSS. It so happened that (the fully laden) *Pechora Star* arrived at the same anchorage area few hours later and anchored less than one nautical mile South of *Julietta D*'s new anchored position. The master of *Pechora Star* indicated that the location was suitable for the vessel to anchor, while the master of *Julietta D* was of the opinion that *Pechora Star*'s anchoring position was too close for comfort (since he had re-anchored the vessel earlier to have more sea room).

As mentioned earlier, anchors and anchorage equipment are designed with the intention of temporary mooring of a vessel within a harbour or sheltered area, while the vessel is awaiting berth, tide, *etc*. However, navigators may still face challenges in finding anchorage areas that offer shelter, have a good holding ground, and are of adequate depth for their vessel's anchoring equipment. While Ijmuiden Anchorage Area no.7 was not too deep, its holding ground mostly consisted of sand, and although better than rocks, it was not the best of holding grounds for anchoring. Moreover, this anchorage area afforded no shelter to anchored vessels.

The MSIU queried the European Maritime Casualty Information Platform (EMCIP) for similar occurrences involving the loss of anchors and / or dragging of anchors, with a focus on Ijmuiden's Anchorage Area no.7. Five reported occurrences happening between 2016 and 2022, were identified to have similar dynamics in EMCIP. One very similar occurrence to the events on board *Julietta D* was of a vessel dragging anchor and unable to start its engines on time, resulting in an allision with another vessel in near gale wind conditions. In that case, however, both vessels sustained minor damages.

3 ANALYSIS – PART B

3.1 Salvage

The safety investigation recognised the complexity of the salvage operation. It took less than 20 minutes from the moment the master of *Julietta D* requested the NCG to evacuate the crew, until the salvors were mobilized. Various communications and meetings between salvors and stakeholders had to take place to plan a way forward with the salvage of *Julietta D*, which naturally took some time. The tug *Sovereign* was appointed for the salvage of *Julietta D* at around 1100, at a time when the crew members were busy with maintenance works on board. However, it took almost three and a half hours for *Sovereign* to eventually reach the open sea and start heading towards the stricken *Julietta D*. By this time, the latter was unmanned and drifting at an average speed of about 2.5 knots in a Southeasterly direction. From 1220 onwards, *Julietta D* was continuously in sight of the rescue vessel *Koos van Messel*, which had been deployed on site for observation purpose only.

Accident data received by the safety investigation, revealed that the 10 m contour line was considered to be the cut-off limit for securing a tow. Once the waves reached shallower waters, their energy would be compressed in a relatively smaller body of water, which would cause the waves to increase in height. This would have made it even more difficult and dangerous for the salvors to secure a tow line, and to board and remain on *Julietta D*.

Reaching *Julietta D* by sea was challenging due to the inclement weather and the distance. In fact, offshore supply vessel *Glomar Baltic*, which was called by the NCG at the early stages to assist in the evacuation of the crew members, if required, had not arrived on site by the time all crew members were airlifted off the forecastle. AIS track records revealed that at the time, *Glomar Baltic* was more than 7.0 nm from *Julietta D.*

It was only about six hours after *Julietta D*'s crew members had been evacuated that salvors could be transferred on board to assess the situation. Moreover, just an hour later, after several takes to transfer a heaving line from *Julietta D*, *Sovereign* managed to secure a tow line. *Julietta D* at that stage, was just about 2.0 nm off the 10 m

contour line (**Figure 37**) *i.e.*, about an hour away from reaching the cut-off limit for salvage.

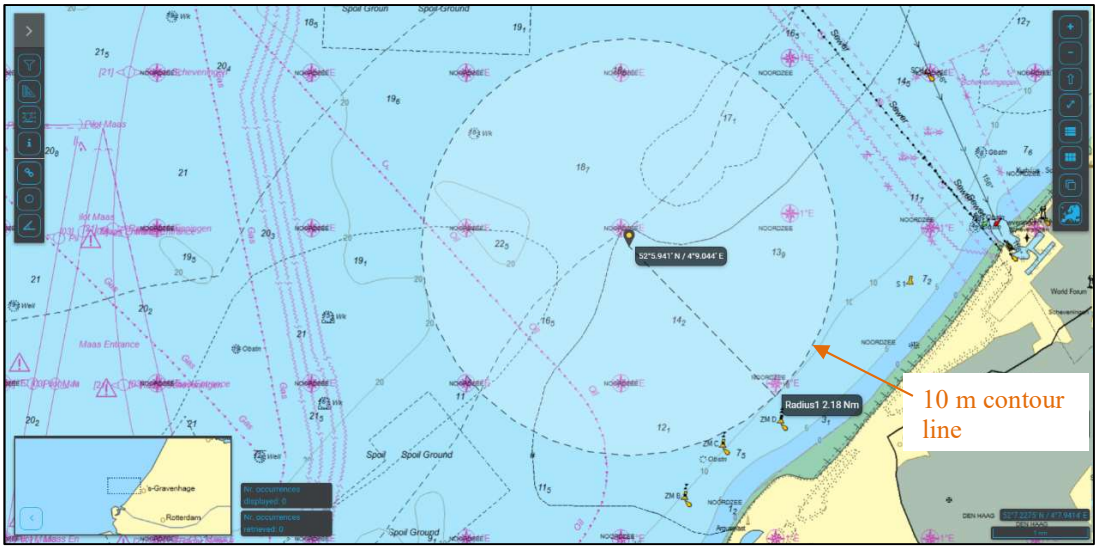


Figure 37: Map capture indicating the closest position reached by *Julietta D* to the 10 m contour line
Source: EMSA

3.2 Reserve buoyancy

Julietta D's first hull breach happened as a result of the allision with the bow of *Pechora Star*, in way of the engine-room's workshop, almost in line with the vessel's waterline. Subsequently, due to the inclement weather conditions in the area, which caused the vessel to roll in the seaway, water entered the engine-room from this breach. A second hull breach, stemming from another contact with *Pechora Star*, materialised at the upper platform of the engine-room (which was one deck below the upper deck of the vessel).

Although this breach was not close to the waterline, the contact with *Pechora Star* damaged the vessel's port side freshwater tank, which led to fresh water spilling inside the engine-room and contributing further to the increase in the water level in the bilges. In fact, within 10 minutes of *Julietta D*'s initial allision with *Pechora Star*, four separate engine-room bilge high-level alarms were triggered.

The safety investigation was not provided with enough detailed information to determine whether the pumps had been started to mitigate the water ingress. Nonetheless, considering the rate of water ingress and the various low insulation

alarms, it was not excluded that the pumps either did not cope with the water ingress, or would have tripped.

In one of *Julietta D*'s damage control booklet sample cases, a flooding calculation of the whole engine-room compartment (starting from a partial draft condition), indicated that the vessel would have about 5.6 m of height available, before progressive flooding could occur, also considering that the forward and aft drafts would reach 7.69m and 10.62 m, respectively. Draft assessments carried out by the salvors, after *Julietta D* reached sheltered waters, indicated that its maximum drafts were 4.00 m forward and 8.10 m at the stern. This indicated that in actual fact, *Julietta D* had enough reserve buoyancy to remain afloat, even after the sustained hull breach in way of water ballast tank no. 2 port, when the vessel made contact with the jacket of the transformer platform *HZB*.

4 ANALYSIS – PART C[32]

4.1 Selection of tug *Sovereign*

During the time that Boskalis was contracted for the salvage of *Julietta D*, *Sovereign* was berthed at the port of Rotterdam which was relatively close to the location where the *Julietta D* events were unfolding. Even though *Sovereign*'s crew members were busy with ongoing maintenance on the crane, *Sovereign* still remained the ideal tug within the Company for the task. *Sovereign* was kitted with a *Dyneema* towing line and was already manned with crew members experienced in towing operations. Furthermore, the tug had sufficient bollard pull for the task and its design provided a working deck with protected crash rails on the side, which supplied a degree of protection for the crew members while at sea.

4.1.1 Tug preparation

The crew members on board *Sovereign* were informed that *Julietta D* was drifting towards the coast and a prompt response was essential to prevent grounding and to establish a towing connection before dark. Needless to say, the crew members were working under time pressures due to the nature of this operation.

Although the crane repairs were immediately halted and the tools secured, it took *Sovereign* almost two hours to depart from her berth, and preparations for the upcoming salvage still had to be carried out. The crew members took the opportunity of the sheltered waters within the fairway to prepare the *Dyneema* towing line. However, as the crane was out of order, the crew members had to transfer the towing line manually, from the forepeak store to the working deck area, astern. After this operation, the equipment on deck had to be secured in preparation for the weather conditions at sea. It is possible that, due to the time sensitive operation at hand, the multiple tasks on deck in preparation for it, and the fact that the crew members were not used to conducting towing operations in stormy weather, the crew members may have overlooked the securing of the *Dyneema* towing line against green seas, even if it was expected that green seas would be shipped on deck and cautioned to look for shelter when it happens.

[32] This part of the analysis was adapted from the analysis carried out by FeBIMA, using the Barrier Failure Analysis methodology, refer to **Annex 4**.

4.2 Immediate cause of the crew member's injuries

At the time of the occurrence, the crew members were walking to the accommodation with their backs towards the stern, as it was not possible to walk behind the crash rail. Green seas rolled on deck and a wave reached the chief officer and second officer 'A', unexpectedly. Due to its force, both crew members were carried a few metres over the deck and slammed against a portable ladder stowed in the vicinity, resulting in injuries.

4.2.1 Communication on board *Sovereign*

Once *Sovereign* reached *Julietta D*, the bridge team established communication with the salvors who were stationed on board the stricken vessel. Discussions regarding the procedure on how to pass the *Dyneema* towing line to *Julietta D* then took place. *Sovereign*'s crew members were briefed on the agreed procedures and proceeded to the working deck. The crew members were equipped with UHF portable radios which were neither fitted with a microphone extension nor a shoulder strap. Consequently, the radios were carried in the crew member's coverall pockets, which made it even more difficult for the crew members to hear communication from the bridge over the gale force winds. It also transpired that the use of portable UHF radios was part of a back-up plan for the standard VHF radios that were normally used. New portable VHF radios for use on deck had been ordered but had not yet been delivered on board.

When the bosun fell on deck as a result of a wave flooding the working deck from astern, and when the chief officer and second officer 'A' suffered injuries due to a similar wave, the bridge warned the crew members of the incoming wave(s). In both cases, the crew members did not attempt to seek shelter in one of the openings in the crash rail and were taken by surprise as if they were unaware of the incoming danger.

After the bosun's fall, a stop to operation was called and the chief officer proceeded to the bridge and the operation was assessed again. The safety investigation believed that the audibility of the intraship communication was not brought to the fore at this stage and therefore, not assessed. Consequently, after replacing the bosun with second officer 'A' on deck, the intraship communication remained the same. It may be argued that whilst alternatives could have been considered, say, using the vessel's

horn to warn the crew on deck about the incoming waves, it has to be acknowledged that *Sovereign* was not working by itself and there were several other parties involved. The sounding of *Sovereign*'s horn may have resulted in confusion. Thus, this left the crew members to manage with the equipment available, and focus on getting the job done *i.e.*, securing the *Dyneema* towing line to *Julietta D* before it reached the 10 m contour line and before the night sets in.

THE FOLLOWING CONCLUSIONS, SAFETY ACTIONS AND RECOMMENDATIONS SHALL IN NO CASE CREATE A PRESUMPTION OF BLAME OR LIABILITY. NEITHER ARE THEY BINDING NOR LISTED IN ANY ORDER OF PRIORITY.

5 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

5.1 Immediate Safety Factors

.1 *Julietta D*'s port anchor cable broke, causing the vessel to fall away from the wind and drift in a Southerly direction.

.2 *Julietta D*'s light ballast condition contributed to a larger windage area and for her propeller to be only partially immersed. This reduced her manoeuvrability capabilities, and which contributed to the vessel being overwhelmed by the prevailing weather conditions.

5.2 Other Safety Factors

.1 Ijmuiden Anchorage Area no. 7 afforded no shelter from the prevailing weather conditions.

.2 The master of *Julietta D* was under the impression that the vessel was dragging its anchor rather than drifting, dedicating time to try and make sense of the incomplete contextual information.

.3 There was not enough time for *Pechora Star* to weigh her anchor and move clear from the drifting *Julietta D*.

.4 Accident data indicated that *Julietta D*'s main engine was operating seamlessly on the day of the occurrence, thus it was not considered to have contributed to this occurrence.

.5 It was considered likely that *Julietta D*'s main engine stopped upon allision with *Pechora Star* as her propeller struck the latter vessel's anchor cable.

.6 The crew members of *Julietta* D were unable to repair the damages to the vessel's hull in way of the engine-room. Consequently, the master was informed the water ingress flowing into the engine-room would most likely cause electrical damage and hence, he took the decision to stop the main engine to prevent any further damages.

.7 The master's decision to abandon *Julietta D* was influenced by the time required for a tugboat to reach the vessel's position, and his concerns on the hazards posed by the windfarm and rigs, which lay in the direction of *Julietta D*'s drift.

.8 No barriers existed (physical and / or procedural), which could have helped prevent *Julietta D*'s breach inside the windfarm perimeter and the subsequent allisions with the transition section of a wind turbine and the jacket of a transformer platform.

.9 *Sovereign* took almost five hours to reach *Julietta D*'s location. *Sovereign* was about 25 nautical miles away and its crew members were engaged in maintenance work on the tug's crane when it was appointed, and the inclement weather in the area, which would have reduced the tug's speed.

.10 The intraship communication on board *Sovereign* was not effective once the tug was in the open sea in inclement weather conditions. This contributed to both the chief officer and second officer 'A' being unaware of a rolling wave on deck, which slammed them against a portable ladder leading to their injuries.

5.3 Other Findings

.1 *Julietta D* had sufficient reserve buoyancy and the salvors were able to take control of the vessel and secure the vessel in a safe port.

.2 *Julietta D* was considered by her crew members to have already been prepared for heavy weather conditions on 31 January 2022.

.3 The vessel's SMM section on anchoring referred to the environmental conditions described in IACS UR A1 (Section A1.1.4; as of Rev 6 of the UR), as two separate conditions that if forecasted or present, should be avoided. However, since *Julietta D* was built in 2013, her Equipment Number would have been calculated based on the UR A1 Rev 5, which was valid at the time. In Rev 5 of this UR, there is no mention of an alternative weather condition, which should be considered.

.4 Environment condition '1', referred to in the vessel's SMM, indicated a weather condition of 25 ms^{-1} (48 knots) wind speed and no waves. The safety investigation was of the view that this weather condition is unattainable / ambiguous.

.5 Vessels' anchoring equipment is designed for the temporary mooring of a vessel within a harbour or sheltered area. However; not all anchorage areas offer shelter, and / or a good holding ground.

6 ACTIONS TAKEN

6.1 Safety Actions Taken During the Course of the Safety Investigation

6.1.1 CST Schiffahrts, Germany

Following the accident involving *Pechora Star*, CST Schiffarhrts promulgated the Company's investigation report within its fleet to share the lessons learnt.

6.1.2 Boskalis Offshore Transport, The Netherlands

Following the injuries of two of its crew members, Boskalis Offshore Transport took the following safety actions:

- a new type of safety helmet with an adjustable chin strap was introduced to increase head protection;
- a new set of portable radios and compatible shoulder straps were provided on board *Sovereign*;
- a procedure to secure the *Dyneema* towing line on deck was adapted on board, to prevent it from getting entangled in green seas. This procedure also eliminated the need for crew members to be on deck to keep the lie in position, thus reducing the exposure of the crew members to incoming waves.

7 RECOMMENDATIONS

Norbulk Shipping UK Ltd. is recommended to:

02/2023_R1 clarify the vessel's SMM anchor planning in the description of environmental condition '1', including the provision of technical guidance to the master on necessary actions when another vessel anchors very close not own vessel.

02/2023_R2 install CCTV cameras to capture a clear view of the forecastle deck, so that in cases of inclement weather conditions, the OOWs would have the necessary information of the circumstances at the location, without having to risk sending crew members on site. This may also assist in the monitoring of the anchor cable remotely whilst the vessel is at anchor.

02/2023_R3 provide technical assistance to the master on the taking of water ballast during inclement weather, following the tendering of the Notice of Readiness (NoR).

02/2023_R4 promulgate this safety investigation report with its fleet to ensure lessons learnt are shared.

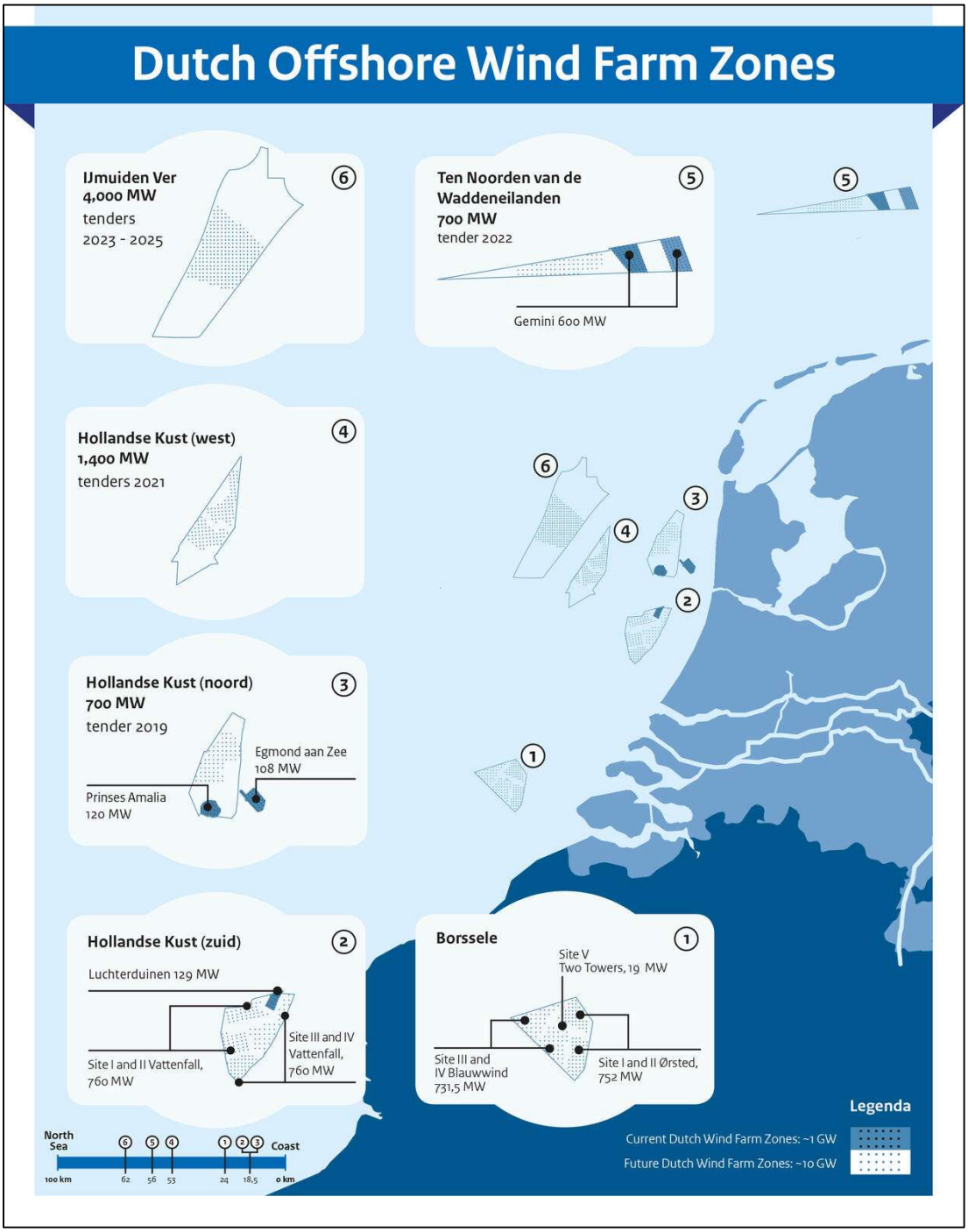
02/2023_R5 provide further information on actions to be taken in cases of critical structural damages sustained by the vessel, to crew members employed by the company.

Vattenfall and TenneT are recommended to:

02/2023_R6 explore and study the possibilities to install (innovative) physical barrier systems to prevent allisions with critical windfarm structures.

ANNEXES

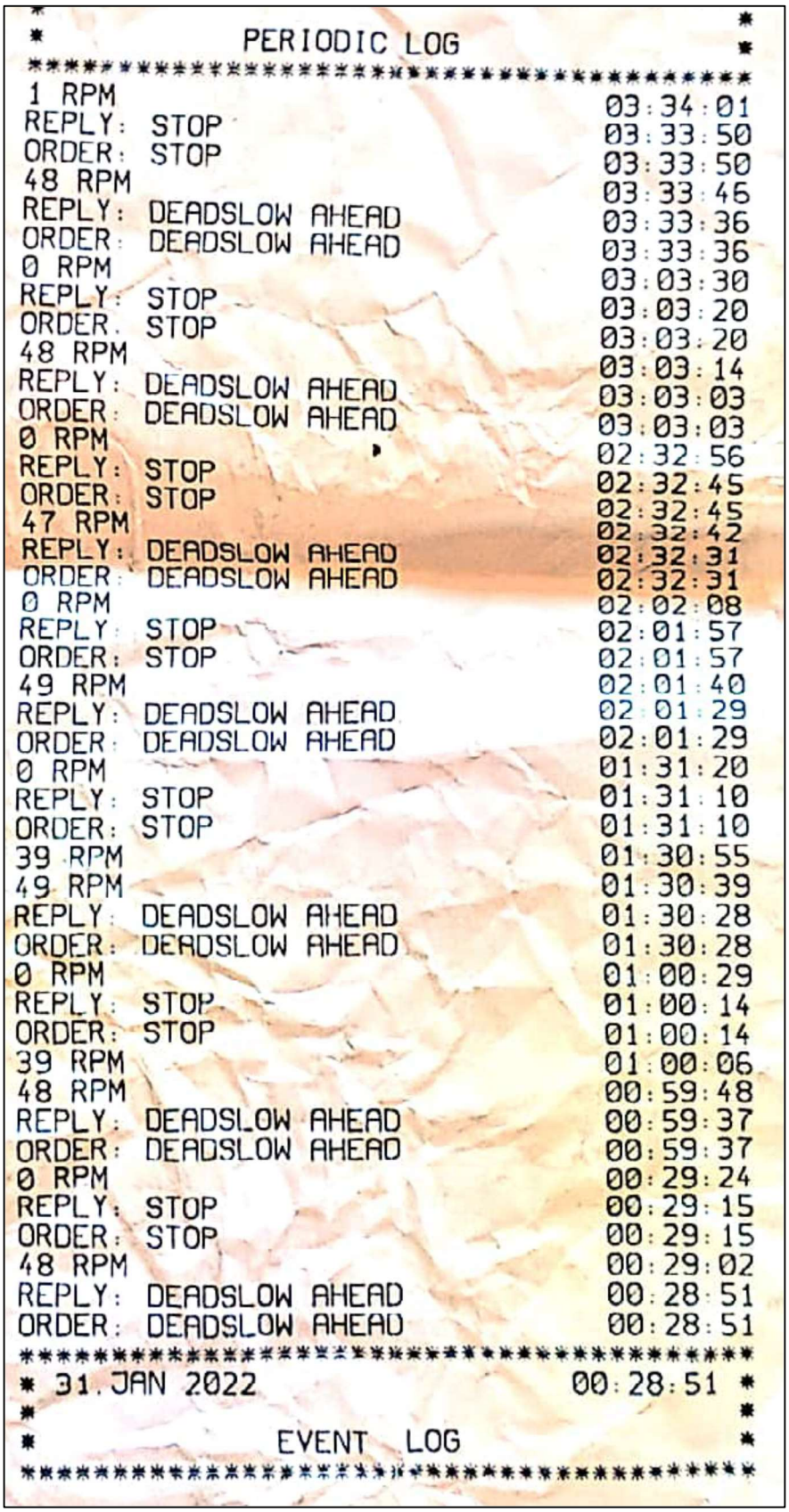
Annex 1 – Dutch Offshore Wind Farm Zones



Annex 2 – Extracts from the telegraph log

(Local Time to be corrected by deducting 1’ 08”)

Part A (0028:51 – 0334:01 LT)



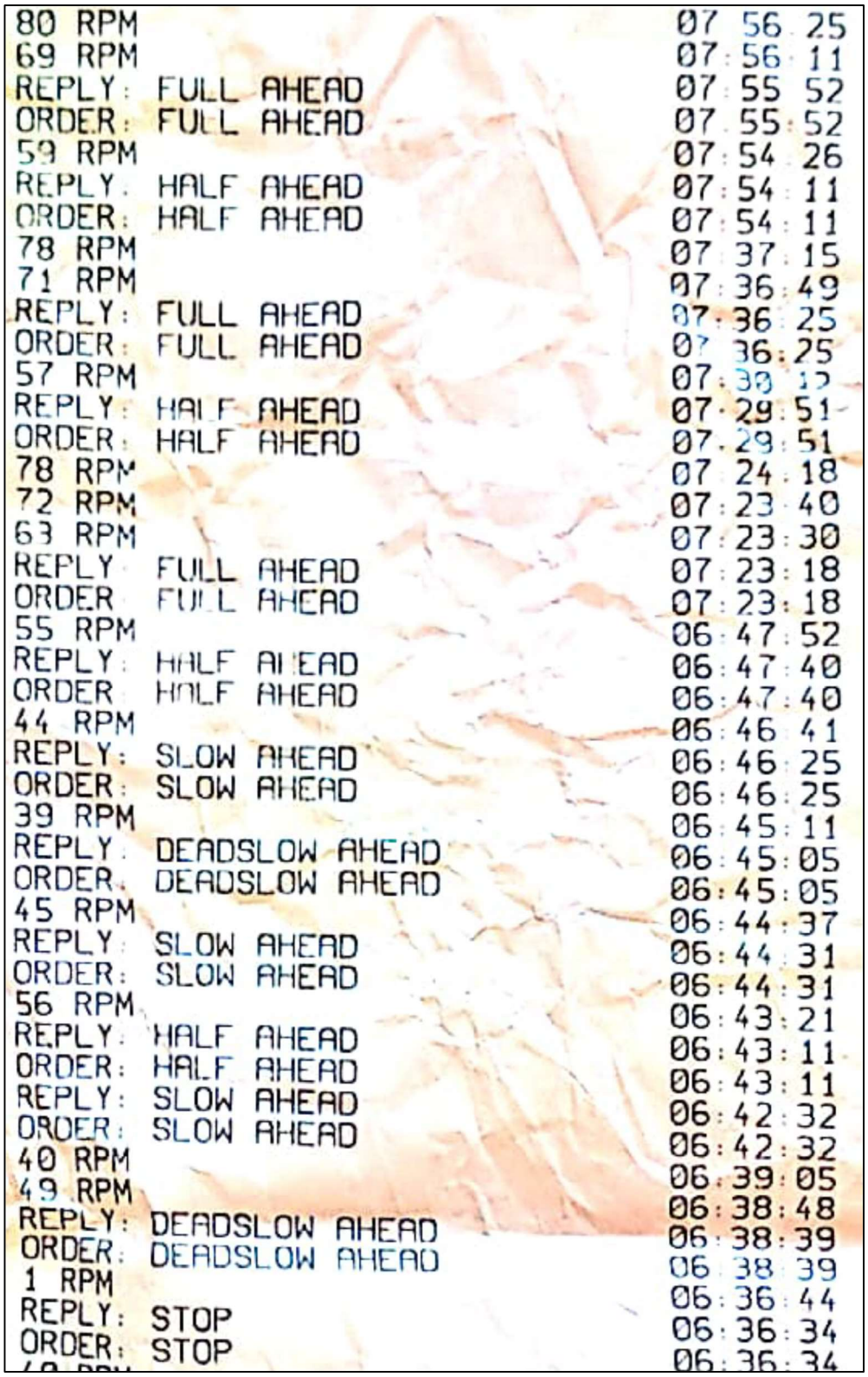
PERIODIC LOG

1 RPM	03:34:01
REPLY: STOP	03:33:50
ORDER: STOP	03:33:50
48 RPM	03:33:46
REPLY: DEADSLOW AHEAD	03:33:36
ORDER: DEADSLOW AHEAD	03:33:36
0 RPM	03:03:30
REPLY: STOP	03:03:20
ORDER: STOP	03:03:20
48 RPM	03:03:14
REPLY: DEADSLOW AHEAD	03:03:03
ORDER: DEADSLOW AHEAD	03:03:03
0 RPM	02:32:56
REPLY: STOP	02:32:45
ORDER: STOP	02:32:45
47 RPM	02:32:42
REPLY: DEADSLOW AHEAD	02:32:31
ORDER: DEADSLOW AHEAD	02:32:31
0 RPM	02:02:08
REPLY: STOP	02:01:57
ORDER: STOP	02:01:57
49 RPM	02:01:40
REPLY: DEADSLOW AHEAD	02:01:29
ORDER: DEADSLOW AHEAD	02:01:29
0 RPM	01:31:20
REPLY: STOP	01:31:10
ORDER: STOP	01:31:10
39 RPM	01:30:55
49 RPM	01:30:39
REPLY: DEADSLOW AHEAD	01:30:28
ORDER: DEADSLOW AHEAD	01:30:28
0 RPM	01:00:29
REPLY: STOP	01:00:14
ORDER: STOP	01:00:14
39 RPM	01:00:06
48 RPM	00:59:48
REPLY: DEADSLOW AHEAD	00:59:37
ORDER: DEADSLOW AHEAD	00:59:37
0 RPM	00:29:24
REPLY: STOP	00:29:15
ORDER: STOP	00:29:15
48 RPM	00:29:02
REPLY: DEADSLOW AHEAD	00:28:51
ORDER: DEADSLOW AHEAD	00:28:51

31 JAN 2022 00:28:51

EVENT LOG

Part B (0636:34 – 0756:25)



Annex 3 – *Sovereign* Incident Timeline

Date and Time/Confidence Level	*Description*	*Actor*
31-jan-2022	Upon notice for the need to salvage Storm Corrie blowing, wind 125kmhr^{-1}, 9-10 bft	Weather
31-jan-2022	Upon notice for the need to salvage Crane repair ongoing, scaffolding built on deck and staircase of crane dismantled	SOVEREIGN
31-jan-2022	Upon notice for the need to salvage Afloat, damaged and abandoned	JULIETTA D
31-jan-2022	Upon notice for the need to salvage Offered assistance to salvage JULIETTA D	SMIT Boskalis salvage
31-jan-2022	Upon notice for the need to salvage Lloyd's open Form discussed with Insurance and owner of JULIETTA D	SMIT Boskalis salvage
31-jan-2022	Upon notice for the need to salvage Received question from SMIT to deploy a salvage vessel	Operations Boskalis offshore
31/01/2022 11:00:00	Tasked for salvage operation	SOVEREIGN
31/01/2022 11:00:00	Crane repairs halted and equipment restored, preparations started to sail	Deck crew SOVEREIGN
31/01/2022 11:00:00	Operations team tasked SOVEREIGN	Operations Boskalis offshore
31/01/2022 12:50:00	Left quay	SOVEREIGN
31/01/2022 12:50:00	Dyneema line pulled out forepeak	Deck crew SOVEREIGN
31/01/2022 12:50:00	Sea fastening equipment for heavy weather	Deck crew SOVEREIGN
31/01/2022 12:50:00	Assistance on deck for preparation of Dyneema line	C/O SOVEREIGN
31/01/2022 14:30:00	Near Maasvlakte, end of sheltered fairway	SOVEREIGN
31/01/2022 15:50:00	Arrived at JULIETTA D	SOVEREIGN
31/01/2022 15:50:00	Assessed situation	Master SOVEREIGN
31/01/2022 16:25:00	Dropped on board JULIETTA D by helicopter	Salvage team JULIETTA D
31/01/2022 16:25:00	Asked to approach towards PS bow, lee side	Master SOVEREIGN
31/01/2022 16:25:00	Toolbox given regarding salvage operation JULIETTA D	Master SOVEREIGN
31/01/2022 16:30:00	Water on deck when in safe working place	SOVEREIGN
31/01/2022 16:30:00	UHF radios in use, difficult to understand Bridge due to wind	Deck crew SOVEREIGN
31/01/2022 16:30:00	Try to keep Dyneema and pick-up rope on deck	Deck crew SOVEREIGN
31/01/2022 16:30:00	Look out for rollers and in communication with deck crew	Bridge SOVEREIGN
31/01/2022 16:30:00	Tangled due to water on deck	SOVEREIGN Dyneema line
31/01/2022 16:40:00	Communication with SOVEREIGN regarding salvage job	Salvage team JULIETTA D
31/01/2022 16:40:00	Close to PS bow of JULIETTA D	SOVEREIGN
31/01/2022 16:40:00	Swell washed against SB aft crash rail	SOVEREIGN
31/01/2022 16:40:00	Water on deck	SOVEREIGN
31/01/2022 16:40:00	Monitoring water on deck	Deck crew SOVEREIGN
31/01/2022 16:40:00	Communication with salvage team	Bridge SOVEREIGN
31/01/2022 16:50:00	Shot a line with line throwing apparatus of JULIETTA D	Salvage team JULIETTA D
31/01/2022 16:50:00	Missed SOVEREIGN and line landed in the water	Salvage team JULIETTA D
31/01/2022 16:50:00	Deck crew was not prepared to receive the heaving line, no bosun hook ready	Deck crew SOVEREIGN
31/01/2022 16:50:00	Was not informed of heaving line	Bridge SOVEREIGN
31-jan-2022	Were recovering heaving line	Salvage team JULIETTA D
31-jan-2022	Water washed on deck	SOVEREIGN

Date and Time/Confidence Level	*Description*	*Actor*
31-jan-2022	Crew hided when water washed on deck	Deck crew SOVEREIGN
31-jan-2022	Bosun fell down when a wave came on deck, lifejacket inflated, no injuries	Bosun SOVEREIGN
31-jan-2022	Came on deck as Bosun went inside	2/O SOVEREIGN
31-jan-2022	Proposed to bring the Dyneema line to JULIETTA D with a heaving line of the SOVEREIGN	KNRM Rescue boat "Koos Van Messel"
31-jan-2022	Stopped operations to assess the situation	Master SOVEREIGN
31/01/2022 17:20:00	Attached a heaving line with metal weight to the messenger line of the Dyneema rope	Deck crew SOVEREIGN
31/01/2022 17:20:00	Noticed wrong heaving line in use and did not throw line to Rescue boat	C/O SOVEREIGN
31/01/2022 17:20:00	To PS aft to pick up heaving line	KNRM Rescue boat "Koos Van Messel"
31/01/2022 18:15:00	Shot another heaving line from line throwing apparatus	Salvage team JULIETTA D
31/01/2022 18:15:00	Informed of heaving line and attached the line to the messenger line	Deck crew SOVEREIGN
31/01/2022 18:15:00	Instructed salvage team to shoot heaving line in the winch put on deck	Bridge SOVEREIGN
31/01/2022 18:15:00	Moved to SB aft of SOVEREIGN, not in between SOVEREIGN and JULIETTA D	KNRM Rescue boat "Koos Van Messel"
31/01/2022 18:15:00	Attempt to pick up heaving line from SOVEREIGN, moves out when heaving line from salvage team comes on deck SOVEREIGN	KNRM Rescue boat "Koos Van Messel"
31/01/2022 18:18:00	Heaving up the line by hand	Salvage team JULIETTA D
31/01/2022 18:18:00	Guided heaving line to keep propellers clear	C/O SOVEREIGN
31/01/2022 18:18:00	Guided heaving line to keep propellers clear	2/O SOVEREIGN
31/01/2022 18:18:00	Instructed to keep line clear from propeller and to guide the line to help the salvage team	Master SOVEREIGN
31/01/2022 18:20:00	Messenger line and Dyneema are slowly pulled off	Deck crew SOVEREIGN
31/01/2022 18:20:00	Returned on deck	Bosun SOVEREIGN
31/01/2022 18:20:00	Returned inside and did not hear warning for the wave	C/O SOVEREIGN
31/01/2022 18:20:00	Returned inside	2/O SOVEREIGN
31/01/2022 18:20:00	Warned for a wave	Master SOVEREIGN
31-jan-2022	A wave rolled on deck	Deck crew SOVEREIGN
31-jan-2022	Surprised by wave in the back, not able to reach safety position at crash rail	C/O SOVEREIGN
31-jan-2022	Surprised by wave in the back, not able to reach safety position at crash rail	2/O SOVEREIGN
31/01/2022 18:25:00	Dyneema pulled on deck	Salvage team JULIETTA D
31/01/2022 18:25:00	Inside accommodation, supported by crew	C/O SOVEREIGN
31/01/2022 18:25:00	Inside accommodation	2/O SOVEREIGN
31/01/2022 18:30:00	Dyneema connected	Salvage team JULIETTA D
31/01/2022 18:30:00	Paying out tow wire	Deck crew SOVEREIGN
31/01/2022 18:30:00	Assessed damage and first aid	Master SOVEREIGN
31/01/2022 19:00:00	Chief mate complained about pain in back	C/O SOVEREIGN
31/01/2022 19:00:00	Second mate needed stitches	2/O SOVEREIGN
31/01/2022 19:00:00	Pain killer taken	C/O SOVEREIGN
31/01/2022 19:00:00	Head wound stitched	2/O SOVEREIGN
1/02/2022 16:00:00	Hospital for check up	C/O SOVEREIGN
1/02/2022 16:00:00	Hospital for check up	2/O SOVEREIGN

Annex 4 – BFA Diagram – *Sovereign* crew member's injuries