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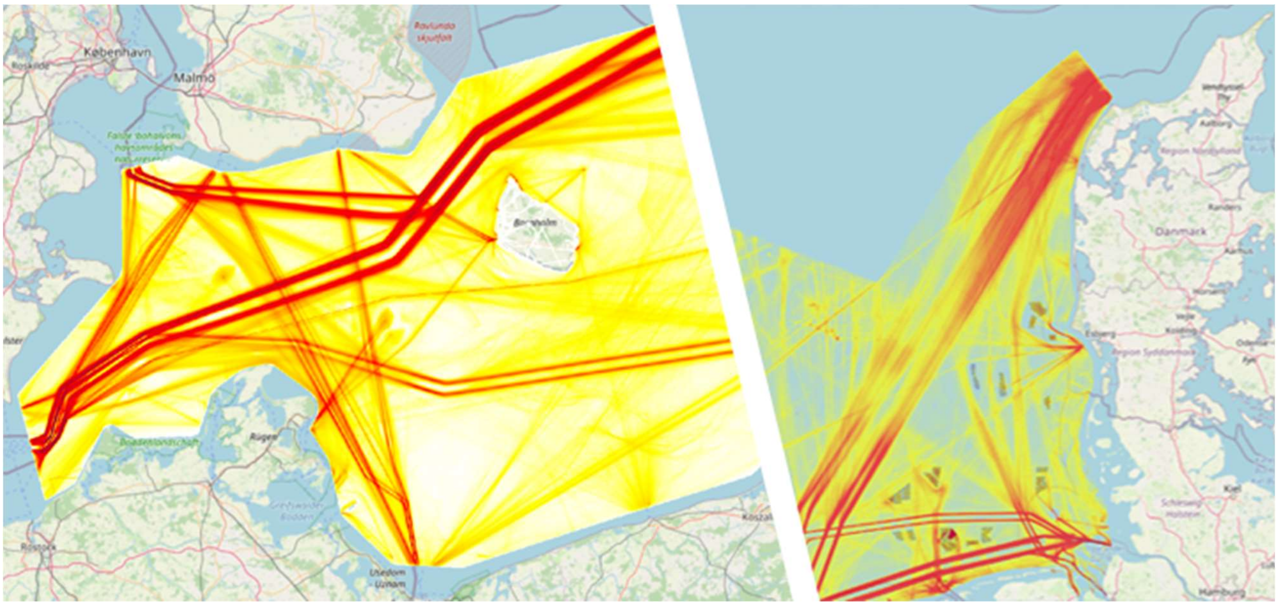
NORTH AND BALTIC SEA

Navigation Shipping Study

Expert's study on shipping traffic flows in the North and Baltic Seas and options to enhance the safety of shipping in the future

Work Package 1 – Traffic Study Report



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APPENDICES

1 EXECUTIVE SUMMARY

ABL performed a nautical risk study in two designated areas as per the scope of work. The first is the area of the North Sea under German jurisdiction, which adjoins the jurisdictions of the Netherlands to the South, and Denmark to the North. The second area is the area of the Baltic, at the boundary between the German, Danish, Swedish, and Polish jurisdictions.

The traffic study is performed with a particular interest in the current and future offshore windfarm development areas, to inform the stakeholder nations as they undertake their maritime spatial planning. This work is commissioned by the Federal Maritime and Hydrographic Agency of Germany.

2 INTRODUCTION

2.1 General

The European Union “2030 Climate and Energy Framework” requires the member states’ compliance with set EU-wide targets and policy objectives for the period from 2021 to 2030. This framework requires that by the year 2030:

- At least 40% cuts are achieved in greenhouse gas emissions (from 1990 levels)
- At least 32% share of the energy comes from renewable sources
- At least a 32.5% improvement is achieved in energy efficiency

The achievement of these climate targets by the EU-member countries is expected to involve heavy investment in renewable energy, most of which is anticipated to come in the form of offshore wind. To achieve the required output, the new offshore wind developments would have to cover a significant area in the maritime space off the coastline of European Union Member States.

Areas of interest include the North Sea and the Baltic Sea. In the North Sea, the east coast is already heavily trafficked by merchant and work vessels, and thus spatial demand is expected to become an important issue in achieving the balance between attributing space to offshore wind developments and maintaining safe and effective shipping traffic. The spatial demand may also increase due to other developments with spatial requirements, such as aquaculture. It is noted however that what is currently envisaged is that in most cases there can be an efficient overlap between offshore wind and aquaculture. In the Baltic, a similar picture is formed, as maritime space is expected to increasingly be claimed by offshore wind developments. This is of particular interest in narrow areas on the West side of the Baltic, including the North of Rugen area that is of interest to the study.

The Baltic Sea constitutes a major trade route for all countries on its coasts, through which the vast majority of exported and imported goods to and from those countries are being shipped. This traffic is then channelled to the North Sea or along the Norwegian coastline as part of the Northern Sea Route. It is therefore imperative that navigational safety and route efficiency is ensured in the aforementioned areas as new offshore windfarm and other offshore developments are planned.

2.2 Scope of ABL study

The scope of work for the study is split into five work packages:

- WP 1: Traffic analysis
- WP 2: Analysis of SN10

- WP 3: Analysis of EN13
- WP 4: Analysis of EO2
- WP 5: Ad-hoc analysis

The present report comprises Report 1 of Work Package 1, reporting the outcome of the traffic study for the area of interest around the German North Sea and Baltic Sea.

2.2.1 Work Package 1

ABL performed a comprehensive traffic analysis of the German waters in the Baltic Sea, with particular focus on the surrounding areas at the North and East of Rugen Island, and the area where Swedish, Danish, Polish, and German Exclusive Economic Zones (EEZs) meet.

Also, an analysis of route SN 10 in the North Sea, which covers the German waters within the limits of the EEZ extended to the jurisdictions of Denmark and the Netherlands.

The traffic analysis is focused on the observed shipping traffic of vessels in the study area excluding port, fluvial, and inland navigation areas. Also, due to the number of ships captured in the area, the study is focused on vessels provided with IMO identification numbers, with small special duty units, small fishing and pleasure craft only identified in the static list for the working datasets if they appear in the study area more than 10 times in the two-year dataset considered. The non-identified small crafts will appear without name or size characteristics.

3 METHODOLOGY

3.1 Assumptions and limitations

The analysis is based on the current maritime traffic situation based on Automatic Identification System (AIS) data.

Maritime traffic information was sourced through the availability of historic AIS data for the area of interest assessed in the study as defined in the following paragraphs of the present report.

Safety of Life at Sea (SOLAS) Convention requires all vessels of 300 gross tonnage or more employed in international voyages are equipped with an AIS transceiver since 2002. In recent years, given the improvement of technology and reduced cost of transmitter and receiver equipment, together with the introduction of an additional AIS class standard, several units with a gross tonnage <300 voluntarily became AIS-compliant.

The figures presented in the results of the traffic analysis include all the vessels for which AIS signals were picked up in the study area, SOLAS, and non-SOLAS.

However, a certain number of the latter vessels, such as pleasure craft, military-operation-involved units, fishing boats, etc.) will subsequently not be included in the dataset for the risk study of subsequent work packages and will not be considered in the risk modelling. Although this is a limitation on the overall number of vessels, the erratic transit of a variety of smaller units would not be representative of the commercial marine traffic in the area of analysis, and this is of no value to the aim of the assignment.

3.2 Analysis software

The traffic and risk analyses will be performed using the IWRAP (IALA Waterway Risk Assessment Program) Mk2 Version 6.6.2.

IWRAP is a traffic analysis and collision/grounding frequency calculation tool recommended by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

3.3 Baltic Sea Model development

This section intends to familiarise the reader with the modelling assumptions and parameters used in developing the environment for the present assessment.

3.3.1 Study area Boundaries Baltic Sea

The study area in the Baltic Sea covers the area of the German jurisdiction to the North and East of Rugen and the area where the Swedish, Danish, Polish, and German EEZ meet. The study area is presented in Figure 1.

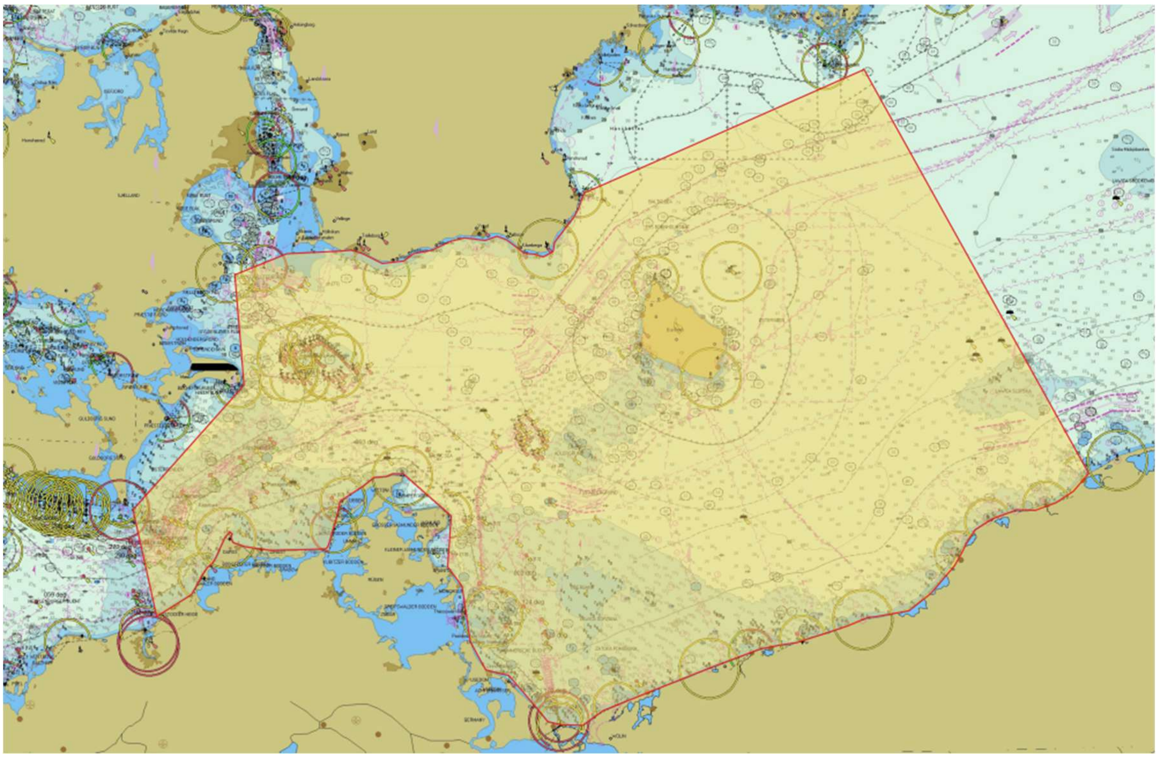

Figure 1: Area of study in the Baltic Sea

The model area extends further to the east of Bornholm Island, to pick up the formation of W-E bound traffic that enters the main area of interest for the study. The same applies to the Kadet Rinne area to the west of Rugen. The study area excludes inland navigable waters as well as port approaches, harbours, anchorages, and roads. These particular areas are generally regulated by the pertinent port authorities. In addition, waters, where pilotage is mandatory, are subject to a regulatory regime which might differ from coastal and high sea waters, and as such, it might mislead the overall analysis of the marine traffic in said specific areas.

The study area also excludes the Greifswalder Bodden, Kubitzer Bodden, and the passage through Stralsund. These areas are primarily used by small vessels, that do not interfere with the traffic in the study area.

As the assessment considers existing traffic, existing OWF developments in the study area between 2019 and 2020 have been included in the model. They are incorporated into the model as polygon areas representing the footprint of the developments. A full list of the OWFs that were included in the model is presented in Table 1.

Table 1: Existing OWFs in the Baltic study area

Germany	Denmark
Arkona	Kriegers Flak A
Wikinger	Kriegers Flak B
Baltic 1	
Baltic 2	

3.3.2 The layout of traffic corridors

The traffic corridors for the study were derived based on the AIS data for 2019 and 2020, and the algorithm used by the IWRAP Mk2. The latter composes individual AIS data points into a time series for each vessel. Subsequently, using proximity and speed criteria it extracts the pertinent trips for each vessel. Each trip is a complete and distinct track of the vessel's movement across the area of interest and contributes to qualitative and quantitative information for the assessment.

A density map was generated from the extracted trips, at a resolution of 200m x 200m and is presented in Figure 2.

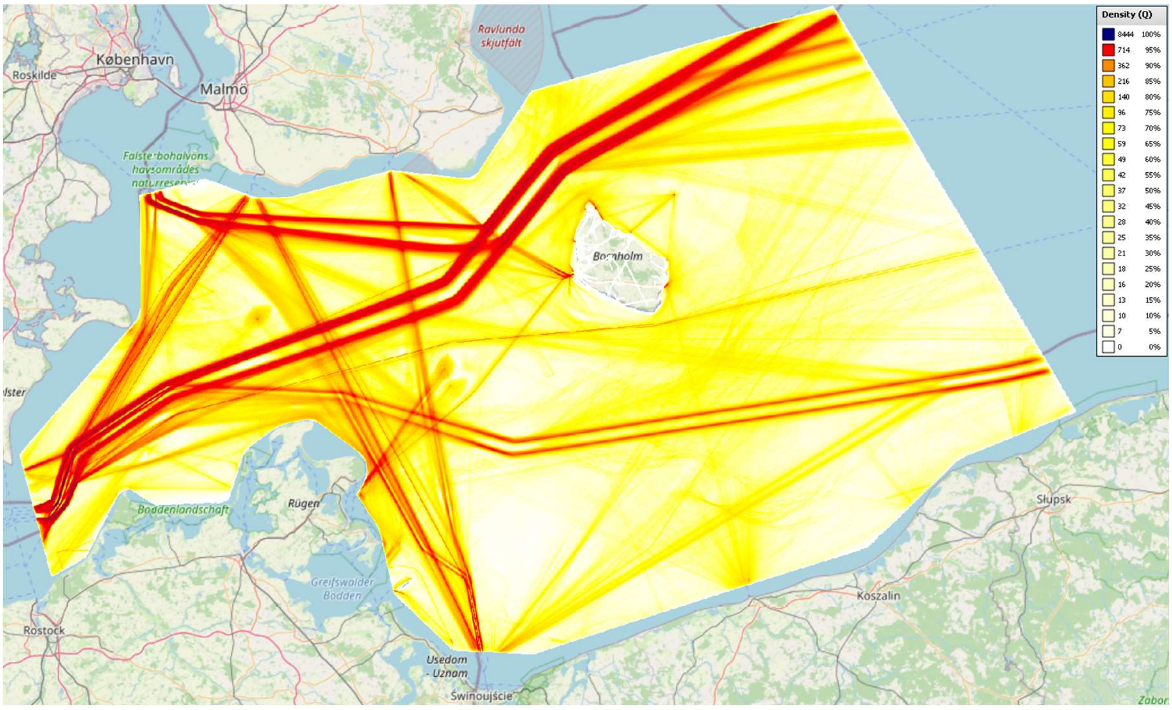

Figure 2: Density map generated for the Baltic Sea study area (resolution: 200m x 200m)

Based on the traffic distribution in Figure 2, a network of traffic corridors ("legs" in IWRAP Mk2) was developed to reflect the current system in place in the area of interest to the study. Each leg was attributed a specific width, reflecting the zone in which the software will look for vessel trips to attribute to it. This was chosen based on what appeared to be the requirement to cover the pertinent path as it is discernible on the density plot. A directional filter angle of 10 degrees was used as the alignment tolerance for each leg. This means that any vessel trip that intersects the leg in its width and has a heading deviating up to +/- 10 degrees from the direction of the leg axis, is added to the distribution for the leg. The network of legs comprising the analysis model is depicted in Figure 3.

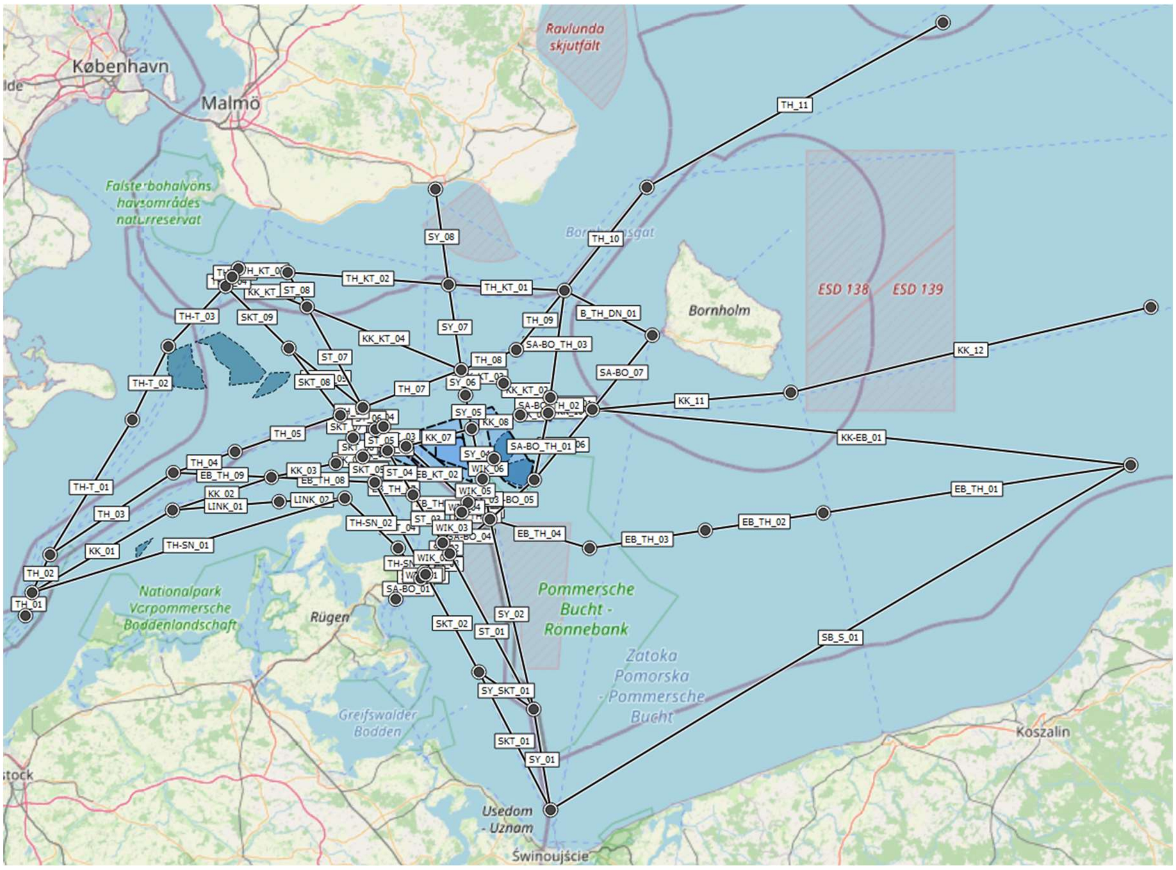

Figure 3: Network of traffic legs comprising the analysis model in the Baltic Sea

To aid with referencing the paths comprising the model developed, names were assigned at each leg based on the routeing projection of the geographical locations these legs were joining. This is merely a referencing convention and does not imply that vessels identified by the software on the pertinent legs necessarily travel from/to these destinations. The reference names of the modelled legs and the associated lane width assumed in the model are presented in Appendix A.

The coverage achieved by the assigned leg width is presented in Figure 4 overleaf.

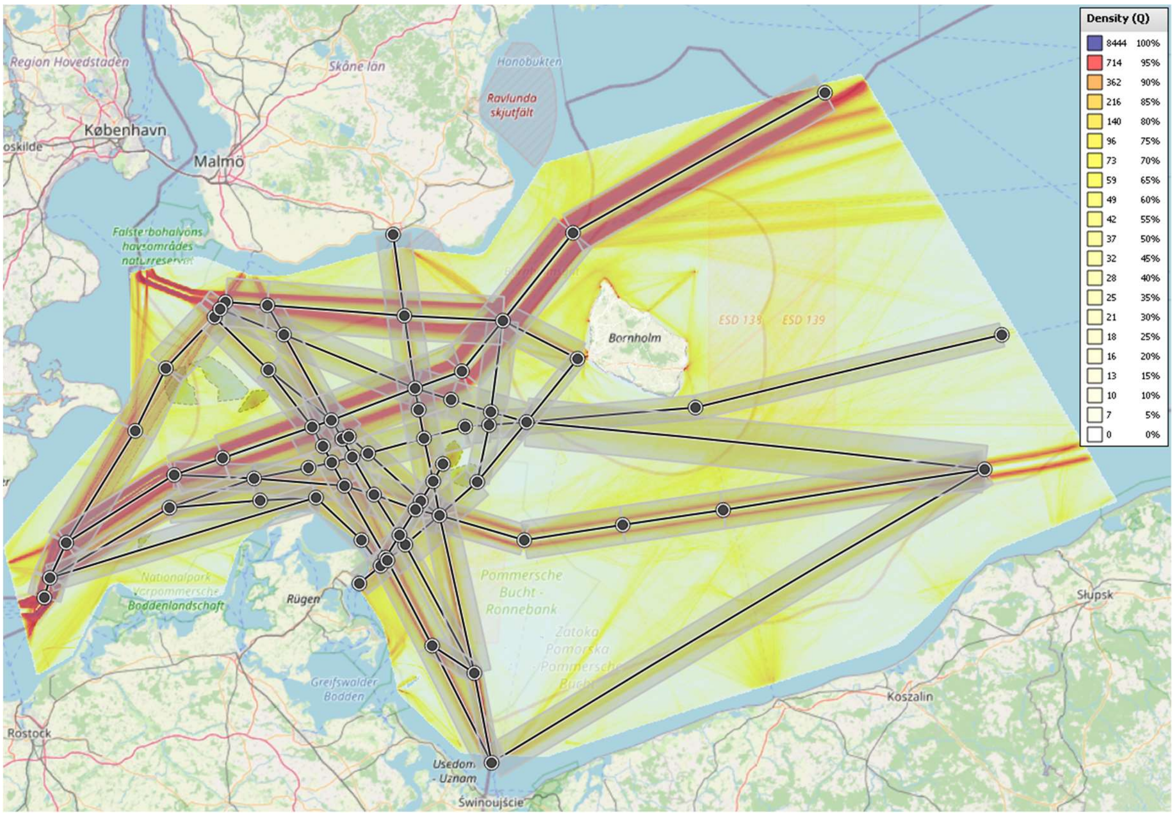

Figure 4: Coverage of tracks achieved by modelled legs in the Balti Sea study

3.3.3 Lateral distribution of leg traffic

The software used utilizes trips that are calculated as part of the traffic density analysis, along with the leg width and true heading of the vessels to assign vessels' trips to the pertinent legs. To compute the lateral distribution of vessels in the lane, it also uses the distance of the path of the trip from the axis of each leg they are attributed to it. This is numerically expressed as a composition (summation) of different distributions, which in turn is used to perform risk calculations. Traffic volumes and composition (vessels' sizes and types) will be reported for each leg in the study area relevant to the assessment. Summary traffic volumes for each leg are provided in Appendix B.

3.3.4 AIS dataset used

ABL was provided with AIS terrestrial data for the years 2019 and 2020, from The Baltic Marine Environment Protection Commission (Helsinki Commission - HELCOM) database, maintaining records of the traffic in the Baltic Sea. Data was converted from the raw AIS NMEA sentence and provided in comma-separated values (csv) files (stored separated for each month) with position reports at an interval of approximately 5 minutes (see Figure 5). Vessel size data was derived from the four coordinates present in the AIS message pertaining to the location of the transducer antenna. Vessels' type was therein included in text form. Because the latter form of reporting does not provide enough granularity in terms of the categories of cargo vessels, the values in the dataset were refined from databases and added to the model at a later stage, using a static list.

timestamp_pretty	timestamp	msgid	targetType	mmsi	lat	long	posacc	sog	cog	shipType	dimBow	draught	dimPort	dimStarboard	dimStern	month	week	imo	country	name	callsign
08/01/2019 01:06:21	1546909581000	3	A	111219504	55.696743	12.56694	0	0	348.5	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:31:40	1546907500000	1	A	111219504	55.674335	12.466971	0	102.2	75.9	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:25:37	1546907137000	1	A	111219504	55.59104	12.121021	0	11.1	207.4	NA	NA	NA	NA	NA	NA	1	2	NA	SAR	NA	NA
08/01/2019 00:31:35	1546907495000	1	A	111219504	55.6738	12.463239	0	102.2	75.8	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:37:45	1546907865000	1	A	111219504	55.69413	12.578887	0	50.3	296.8	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:37:35	1546907855000	1	A	111219504	55.69327	12.581877	0	52.1	297.2	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:26:39	1546907199000	3	A	111219504	55.593395	12.151878	0	102.2	54.1	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:25:34	1546907134000	1	A	111219504	55.59104	12.121021	0	11.1	207.4	NA	NA	NA	NA	NA	NA	1	2	NA	SAR	NA	NA
08/01/2019 00:38:28	1546907908000	3	A	111219504	55.696693	12.567837	0	8.3	283.6	SAR	1	NA	2	3	19	1	2	NA	SAR	NA	0
08/01/2019 00:25:44	1546907144000	3	A	111219504	55.590076	12.120392	0	33.6	184.6	NA	NA	NA	NA	NA	NA	1	2	NA	SAR	NA	NA
08/01/2019 00:44:53	1546908293000	3	A	205093000	55.474583	10.537996	1	0	45.8	UNKNOWN	70	4.4	6	5	10	1	2	7508958	Belgium	NIJPTANGH	ORWE
08/01/2019 00:13:00	1546906380000	3	A	205465000	53.734184	14.43882	0	10.5	321.3	CARGO	81	4.2	10	3	7	1	2	9136101	Belgium	FAST JEF	ONEE
08/01/2019 00:07:33	1546906053000	1	A	205093000	55.487034	10.549659	1	6.8	146	UNKNOWN	70	4.4	6	5	10	1	2	7508958	Belgium	NIJPTANGH	ORWE

Figure 5: Sample of HELCOM AIS data.

ABL pre-processed the dataset in an attempt to filter out irregularities in the form of Maritime Mobile Service Identity (MMSI)[1] duplication leading to the vessel's false location and AIS signal jumps.

Additional filtering was applied to MMSIs starting with 0 and 1 (denoting coast stations and search and rescue aircraft). Similarly, MMSIs starting with 8 (handheld devices) and 9 (freeform identity) were also purged from the dataset. A summary of the filtration process is presented in Table 2.

Table 2: Data filtering Summary for the Baltic Sea.

Total number of MMSI in identifiers in the set	15,898
Total number of MMSI in identifiers between 2xx and 7xx	15,643
Remaining vessels in model	15,643

The final AIS data timeline loaded in the model is presented in Figure 6 below.

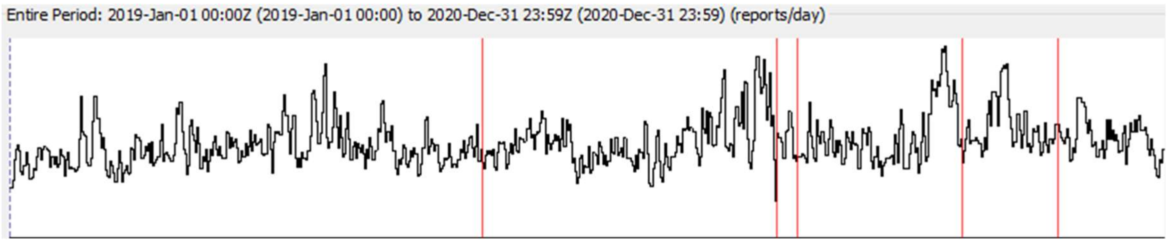

Figure 6: Baltic Sea, HELCOM AIS data time distribution.

The sample consistency is of moderate uniformity, with roughly 135,000 reports/day, and a standard deviation of 33,350. Small gaps include the ones marked in red, where the number of samples appears to be missing for intervals of approximately 1-hour on three occasions. There is also a single occasion in April 2020, where data are missing between 22:00 hours on the 29 April and 16:00 hours on the 30 April (18 hours). The influence of those gaps is considered in the factor that converts traffic to an annuity.

1 MMSI is a 9-digit number assigned by Administrations to each ship station as per Article 19 of ITU Regulations.

3.4 North Sea Model development

This section presents the modelling assumptions and parameters used in developing the environment for the traffic assessment of SN 10 in the North Sea.

3.4.1 Study area Boundaries in the North Sea

The study area in the North Sea focuses on route SN 10 which carries traffic between the Dutch ports and the Atlantic, and Skagerrak and the Baltic Sea. It is presented in Figure 7.

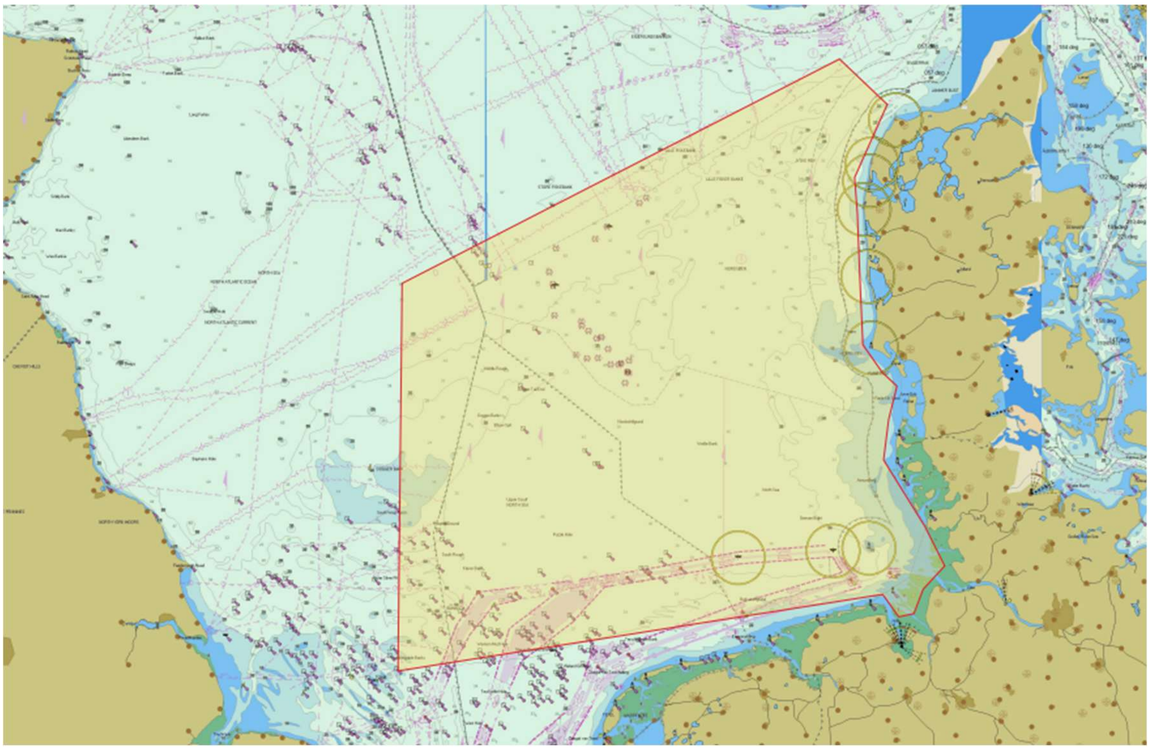

Figure 7: Area of study in the North Sea

The study looks at the maritime space between the TSS Off Friesland and Nordsøen, with a focus on the traffic to/from the Netherlands and the English Channel towards the Baltic Sea, or the Northern Sea Route.

The model area extends to the westernmost part of the German EEZ and the traffic corridor off the coasts of Germany and Denmark to the east. The study area excludes inland navigable waters as well as port approaches, harbours, anchorages, and roads. These particular areas are generally regulated by the pertinent port authorities and local regulations. In addition, waters, where pilotage is mandatory, are subject to a regulatory regime which might differ from coastal and high sea waters, and as such, it might mislead the overall analysis of the marine traffic in said specific areas.

For the assessment of current traffic, existing OWF developments in the study area for the period between 2019 and 2020 are included in the model. These are incorporated in the model as polygon areas representing the footprint of the developments. A full list of the OWFs that were included in the model is presented in Table 3.

Table 3: Existing OWFs in the North Sea study area

Denmark	Germany	The Netherlands
Horns Rev 1	Albatros	Buitengaats / Gemini I
Horns Rev 2	Alpha Ventus	ZeeEnergie / Gemini II
Horns Rev 3	Amrumbank West	
	BARD Offshore 1	
	Borkum Riffgrund 1	
	Borkum Riffgrund 2	
	Butendiek	
	DanTysk	
	Deutsche Bucht	
	Global Tech I	
	Gode Wind 01	
	Gode Wind 02	
	Hohe See	
	Meerwind Sud/Ost	
	Merkur Offshore	
	Nordergrunde	
	Nordsee One	
	Nordsee Ost	
	Riffgat	
	Sandbank	
	Trianel Windpark Borkum 1	
	Trianel Windpark Borkum 2	
	Veja Mate	

3.4.2 The layout of traffic corridors

The traffic corridors for the study were derived based on the AIS data for 2019 and 2020, and the algorithm used by the IWRAP Mk2. The algorithm composes individual AIS data points into a time series for each vessel. Subsequently, using proximity and speed criteria it extracts the pertinent trips for each vessel. Each trip is a complete and distinct track of the vessel's movement across the area of interest and contributes to qualitative and quantitative information for the assessment.

A density map was generated from the extracted trips, at a resolution of 250m x 250m and is presented in Figure 8.

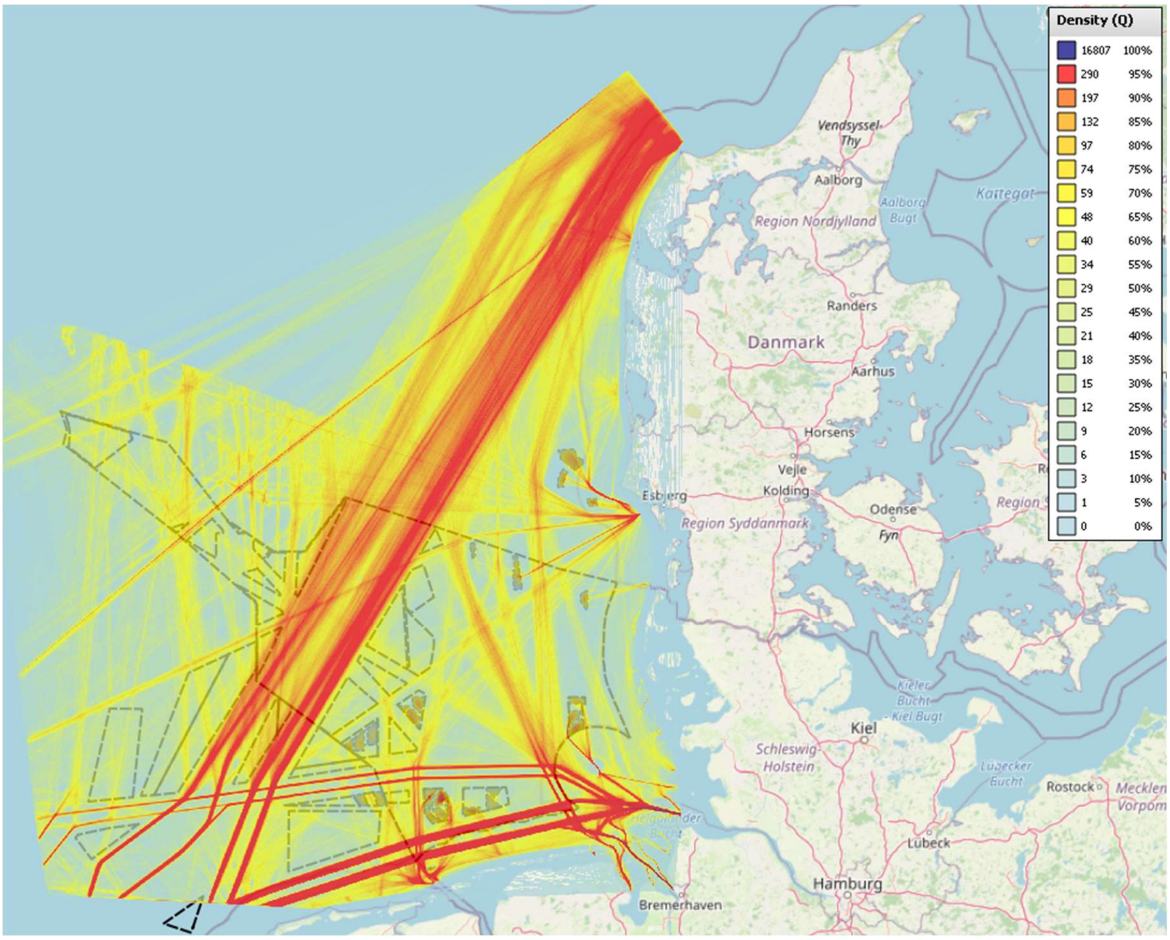

Figure 8: Density map generated for the North Sea study area (resolution: 250m x 250m)

Based on the traffic distribution of Figure 8, a network of traffic corridors ("legs" in IWRAP Mk2) was developed to reflect the current system in place in the area of interest to the study. Each leg was attributed a specific width, reflecting the zone in which the software will look for vessel trips to attribute to it. Same as for the Baltic, this was chosen based on what appeared to be the requirement to cover the pertinent path as it is discernible on the density plot. A directional filter angle of 10 degrees was used as the alignment tolerance for each leg to identify route-bound vessels. This means that any vessel's trip that intersects the leg in its width and has a heading deviating up to +/- 10 degrees from the direction of the leg axis, is added to the distribution for the leg.

Smaller angles of alignment tolerance were used in cases where corridors bifurcate to form two or more proxy corridors of similar alignment. The angles in such cases were assumed as the dichotomy of the angle formed between proxy legs.

The processing of the dataset identified Route SN 10 as being quite tidily separated into two main corridors, these corridors, as well as the SW-NE spur between the two, were modelled as a single leg, covering the full width of the route. The reason is that whilst most traffic follows the two main branches, there is a notable proportion of traffic that switches more than once between the two or navigates SN 10 with tracks non-compatible to the main route orientation. As a result, these vessels are not picked up by any of the relevant legs. To improve the capture of such traffic, the tolerance angle for SN 10 has been increased to ±20°.

The network of legs comprising the analysis model in the North Sea is depicted in Figure 9.

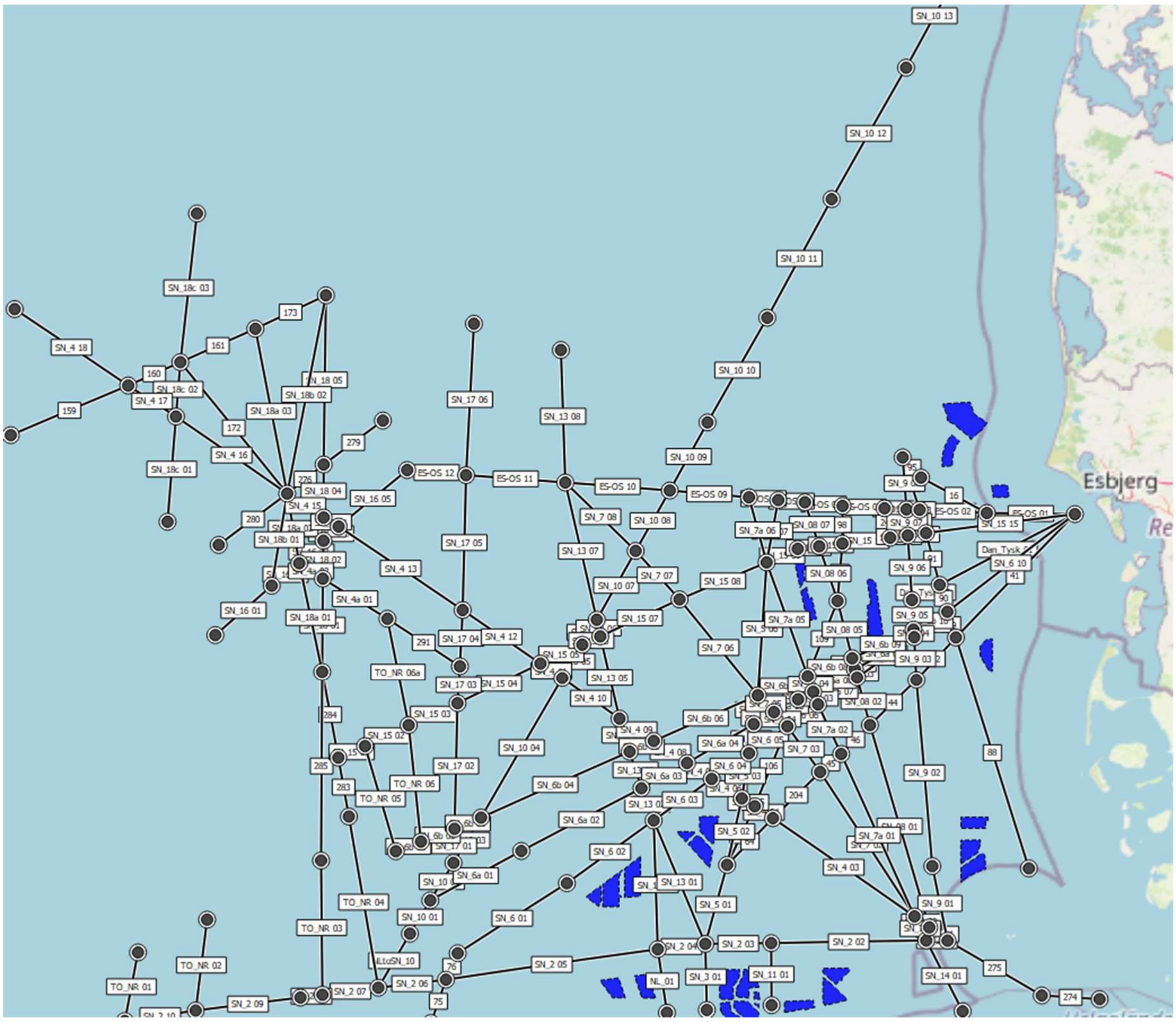

Figure 9: Network of traffic legs comprising the analysis model in the North Sea

To aid with referencing the paths comprising the model developed, names at each leg were assigned to the extent possible based on the naming system of the German MSP, or the routeing projection of the geographical locations these legs were joining. This is merely a referencing convention and does not imply that vessels identified by the software on the pertinent legs necessarily travel from/to these destinations. The reference names of the modelled legs and the associated lane width assumed in the model are presented in Appendix C.

The coverage achieved by the assigned leg width is presented in Figure 10 overleaf.

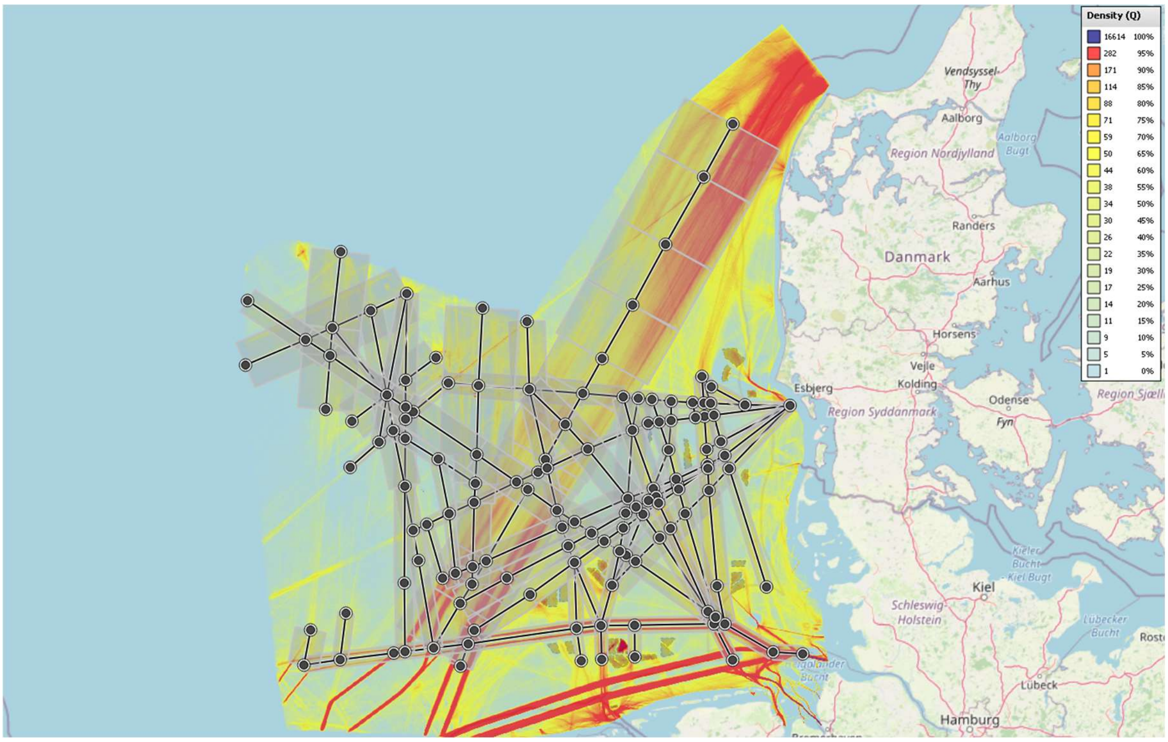

Figure 10: Coverage of tracks achieved by modelled legs in the North Sea

3.4.3 Lateral distribution of leg traffic

The software used utilizes trips that are calculated as part of the traffic density analysis, along with the leg width and true heading of the vessels to assign vessels' trips to the pertinent legs. To compute the lateral distribution of vessels in the lane, it also uses the distance of the path of the trip from the axis of each leg they are attributed to it. This is numerically expressed as a composition (summation) of different distributions, which in turn is used to perform risk calculations. Traffic volumes and composition (vessels' sizes and types) will be reported for each leg in the study area relevant to the assessment. Summary traffic volumes for each leg are provided in Appendix D.

3.4.4 AIS dataset used

ABL was provided with AIS terrestrial data for the years 2019 and 2020, from the European Maritime Safety Agency (EMSA), provided by the BSH. Data had been converted from the raw AIS NMEA sentences and provided in comma-separated values (csv) files (stored separated for each day) with position reports at irregular intervals, of approximately 10-15 minutes (see Figure 11 overleaf).

Separate data was provided by the Kystverket,[2] however, upon examination, it was found that the data had significant gaps in the area of study, reporting only at and around two

[2] Kystverket is the Norwegian Costal Administration colleting and storing AIS data of the North Sea Coastal States.

hotspot locations. Whilst observation intervals were shorter compared to the EMSA dataset, the low coverage did not warrant their use in the study.

Vessel size data was derived from the AIS dataset and supplemented as required from a static vessels list provided by the Kystverket to complement the 2019 dataset. Additional information on IMO vessels was obtained from Seaweb (maritime.ihs.com). The combined information was compiled into a static list.

Timestamp	OrigID	AISType	MMSI	Lat	Lon	SOG	IMO	ShipName	Callsign	ShipType	Draught	Length	Width	Destinatio	NavStatus
2019-01-01	SWE	1	265617170	59.305002	17.439923			HARRY	SGUL						15
2019-01-01	SWE	3	230987870	60.1118	19.924733		8634754	BARO	OI 6069						5
2019-01-01	DNK	1	219798000	56.370412	8.119995		8813013	TOENNE	OUIH						15
2019-01-01	DNK	18	219004054	55.060668	10.617477										15
2019-01-01	SWE	3	235065925	57.685752	11.886498	.1		SEABEAM	2BGN2						5
2019-01-01	DNK	1	357773000	57.74058	10.217822	11.2	8201624	MSC IRIS	H3JN						15
2019-01-01	DNK	1	245639000	55.01447	14.09798	11.7	9419319	FRASERBORG	PCJS						15
2019-01-01	SWE	1	244519000	54.633223	14.457233	16	9307372	GENCA	PHKD						15
2019-01-01	DNK	3	304010688	57.055043	9.927607		8919221	ANDRINA F	V2CQ						5
2019-01-01	GBR	1	235074296	50.382528	-4.18663		9533763	SD DEBORAH	2CNO2						15

Figure 11: Sample of EMSA AIS data for the North Sea.

ABL pre-processed the dataset in an attempt to filter out irregularities in the form of Maritime Mobile Service Identity (MMSI)[3] duplication leading to vessels' false location and AIS signal jumps.

Additional filtering was applied to MMSIs starting with 0 and 1 (denoting coast stations and search and rescue aircraft). Similarly, MMSIs starting with 8 (handheld devices) and 9 (freeform identity) were also purged from the dataset. A summary of the filtration process is presented in Table 4.

Table 4: Data filtering Summary for the North Sea

Total number of MMSI in identifiers in the set	25025
Total number of MMSI in identifiers between 2xx and 7xx	21781
Remaining vessels in model	21781

The final AIS data timeline loaded in the North Sea model is presented in Figure 12 below.

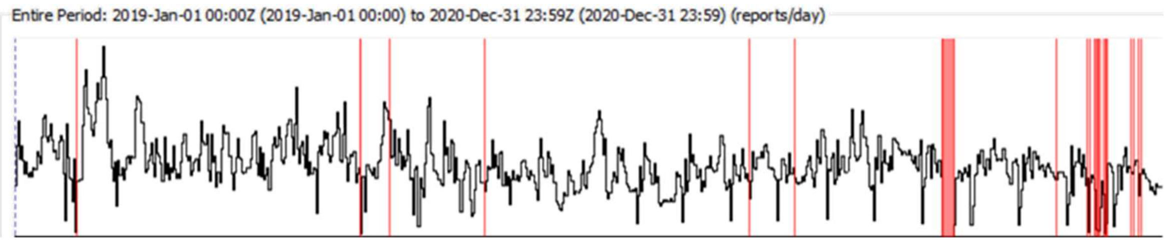

Figure 12: AIS data time distribution.

The sample consistency is of moderate uniformity, with roughly 86,900 reports/day, and a standard deviation of 31,781.

3 MMSI is a 9-digit number assigned by Administrations to each ship station as per Article 19 of ITU Regulations.

Notable gaps were found within the 2020 dataset, with the largest being the period between 13-08-2020 and 21-08-2020, a gap of 7.5 days. Also, notable gaps observed in the dataset are the following:

- 31h-long gap starting on 24-11-2020
- 20h-long gap starting on 21-11-2020
- 18h-long gap starting on 15-11-2020
- 16h-long gap starting on 19-11-2020
- 15h-long gap starting on 26-11-2020
- 8h-long gap starting on 17-12-2020
- 6h-long gap starting on 13-08-2020
- 4h-long gap starting on 13-11-2020
- 4h-long gap starting on 22-11-2020
- 3h-long gap starting on 21-11-2020
- 3h-long gap starting on 20-11-2020
- 2h-long gap starting on 11-05-2020
- 2h-long gap starting on 17-12-2020
- 2h-long gap starting on 27-08-2020

19 More gaps of smaller duration have also been noted in the 2-year dataset. The influence of all the aforementioned gaps is considered in the factor that converts traffic to an annuity.

A further challenge associated with the AIS dataset stems from the poor coverage that is noted in the central section of SN 10, which affects the footprint of the route within the German Economic Exclusive Zone (EEZ). This, as identified in previous studies (both by ABL and others), leads to underestimated traffic counts, as vessel tracks are interrupted in the area, and thus not picked up by the counting lines or traffic model legs. This was also noted at ABL's earlier "*Shipping Analysis of the North Sea*"[4] report.

To address this issue, an additional localised dataset was received from the Danish Maritime Authority (DMA), covering the area around the Danish offshore installations for the years 2019 – 2021. The area covered in this dataset is presented in Figure 13 overleaf.

The data for 2019 and 2020 from the DMA dataset was added to the traffic analysis model. The dataset is significantly denser compared to the BSH dataset, with reporting frequency in the order of 2 mins.

A gap of 16 days was noted for September 2019, and a gap of 14 days for October 2019, however, the rest of the dataset appeared complete, with minimal other gaps noted.

4 Shipping Analysis of The North Sea, undertaken on behalf of the Deutsches Bundesministerium des Innern, für Bau und Heimat, ABL 2021 (Web link).

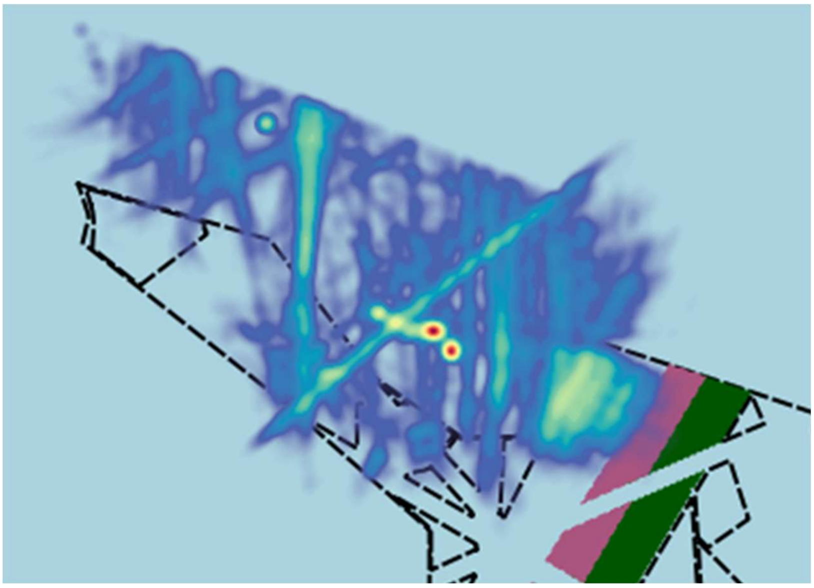

Figure 13: Coverage of additional AIS data provided by DMA

Following the introduction of the additional data, the sample consistency remained of moderate uniformity, also because the additional dataset was localised. Due to the high reporting frequency in the DMA dataset, the number of observations per day substantially increased.

3.4.5 AIS data gap mitigation

Whilst there are methods to enhance and complete gaps in vessel tracks (such as simple or kinematic interpolation), these become less effective and accurate as the length of the data gap increases. With data gaps noted in tracks of up to 10 hours (and in limited cases even longer), kinematic interpolation was not found to be a good means of mitigation. The process often would result in tracks with abstract paths within the footprint of route SN 10. This, in turn, is a likely indication that vessels leave the area of SN 10 before they re-join the main flows at the far ends of the route, with likely diversions, stops, or erratic route patterns.

Any attempt to bridge data gaps is a conscious compromise between traffic count and positional accuracy. As both parameters are important in quantifying collision/allision risk, achieving a point of compromise is a challenging process.

ABL has undertaken an iterative exercise to quantify potential improvements in the vessel count picked up by the traffic model along route SN 10, based on increasing the tolerance the algorithm assumes to split consecutive time-series observations for a vessel into separate tracks (leaving a gap in between).

Based on noting vessel tracks that follow erratic, and not linear tracks as they navigate in the footprint of route SN 10, ABL also used a similar iterative approach, to examine the effect of altering the angle of tolerance for the identification of route-bound vessels from the default ±10° divergence from the route axis.

In terms of the compromise between traffic volume and positional accuracy, ABL's approach in the present study was weighted towards the former. This is because the secondary corridors, within the current version of the German MSP, do not fully align with the tracks currently used in the study. This, combined with the blocking of route SN 06 as part of the Dutch MSP, that represents the traffic from the southern end of SN 10 to/from Esbjerg, will entail a full re-arrangement of the traffic corridors and distribution as the MSPs begin to materialise. I.e., routes will change and integrate, and with that, current lateral distributions of traffic will also change. It is thus more sensible for the current assessment to weigh in on observed traffic volume, rather than its positional accuracy.

The assumptions used in the traffic analysis to mitigate the effect of AIS data sparsity in parts of the model are presented in Table 5 overleaf.

Table 5: Traffic analysis assumptions for route SN 10

	Mitigative analysis assumption	Purpose
1.	Reverse on model refinement. Representation of the East, West (deep-water), and spur routes of SN 10 as a single leg of traffic in the model, covering the full footprint of the area.	Allow the algorithm to register more of the vessels that navigate the area of route SN 10 without following strictly the E, W, or spur corridors as route-bound vessels, on as many segments possible along the route.
2.	Limiting the length of legs that represent the segments along route SN 10.	
3.	Increase of the angle tolerance for the identification of route-bound vessels to ±20° from the axis of SN 10.	
4.	Bridging of gaps in tracks up to 12h in duration or 300 nm in distance through linear interpolation.	Track segments with very low speeds that could denote interpolation is missing a significant part of the track, are not considered in the volume count.
5.	Setting a lower bound calculated speed limit of 7 kts for a vessel's trip segments considered in the count.	

The above measures are intended to achieve as much loss of traffic volume as reasonably practicable, whilst at the same time limiting the bias in terms of assuming linear tracks where vessels have followed a different route.

4 BALTIC SEA TRAFFIC STUDY – BROADER AREA

This first work package aims to report the traffic patterns, identify the traffic corridors and their distribution, and provide an understanding of the current use of maritime space.

4.1 General (Baltic Sea)

The traffic density plot reflecting the existing patterns in the South Baltic Sea based on 2019 and 2020 AIS data is presented in Figure 14 below:

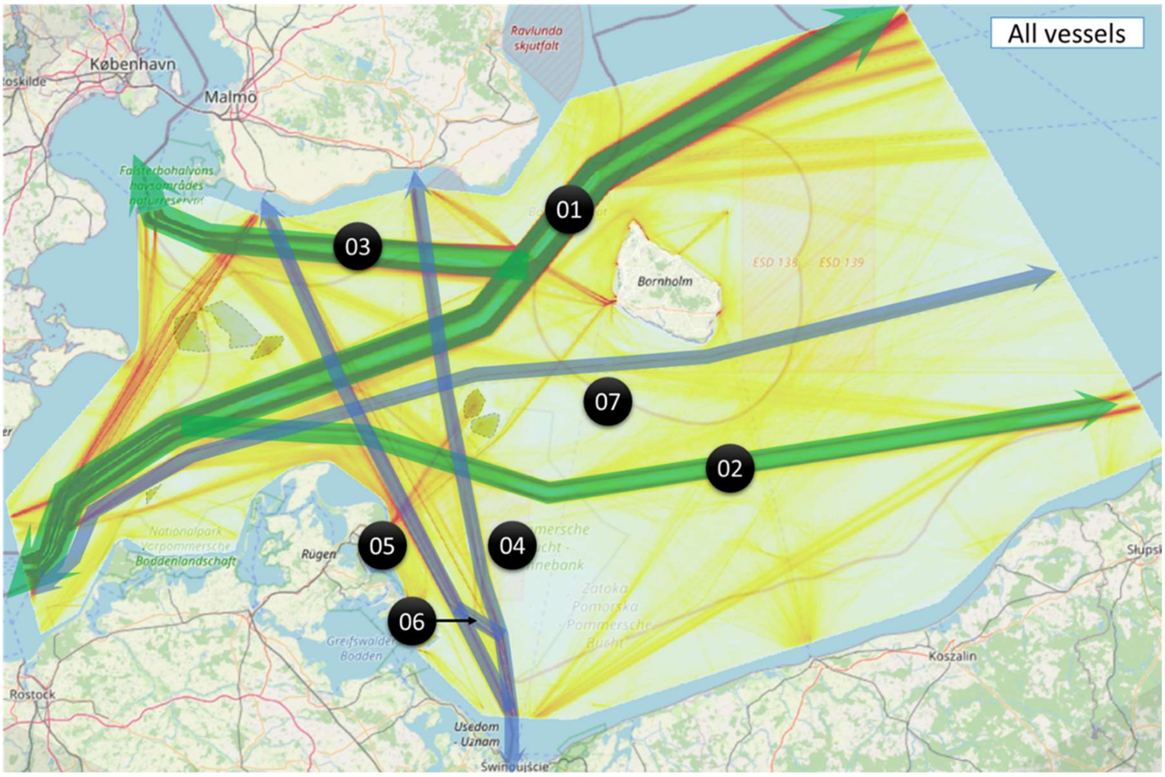

Figure 14: South Baltic Sea Traffic, all vessel types – Density Plot 200m x 200m.

The main traffic corridor in the Baltic is the SW-NE corridor that carries traffic from the Bay of Mecklenburg to the NE part of the Baltic (Note 01). Two other main corridors connect to the former. The first is the spur route to/from the SE Baltic, towards the ports of Poland and Kaliningrad (Note 02) and the second, which spurs off to/from Kattegat and into The Sound (Note 03).

There are also two main N-S cargo and passenger routes running on the East of Rugen. The first is the route that connects Swinoujscie to Ystad (Note 04), and the second is between Swinoujscie and Trelleborg (Note 05). The former includes the deep-water channel approach of Swinoujscie used by traffic heading both from/towards Ystad and Trelleborg. This route is the actual continuation of the recommended route starting from the eastern end of the Kadet Rinne deep water route passing north and east of Rugen Island up to the Swinoujscie pilot boarding ground for vessels between 11 and 13.5 metres of draught (Note

06). Vessels requiring lower depths (< 11m) either head to the recommended route or use the area between the two main N-S bound corridors to head north (junction to the route marked with note 05).

A secondary corridor detaches from the main SW-NE traffic corridor (Note 01) just after the end of the South of Gedser Traffic Separation Scheme (TSS), heading south of Bornholm Island towards Klaipeda and the oriental section of the Baltic Sea (Note 07). This route is used primarily by Ro-Ro/Pax and General Cargo vessels.

4.2 Merchant traffic

Merchant vessel traffic typically uses the primary routes described in the general section, however, there are also secondary corridors that are of significance to this traffic. These are presented in Figure 15.

The route annotated as 08 on the figure, presents how shipping traffic uses the deep-water channel out of Swinoujscie before heading west to the deep-water route, following the recommended route marked with safe water buoys, along the coastline of Rugen to sail towards Kattegat or to adjoin the South of Gedser TSS.

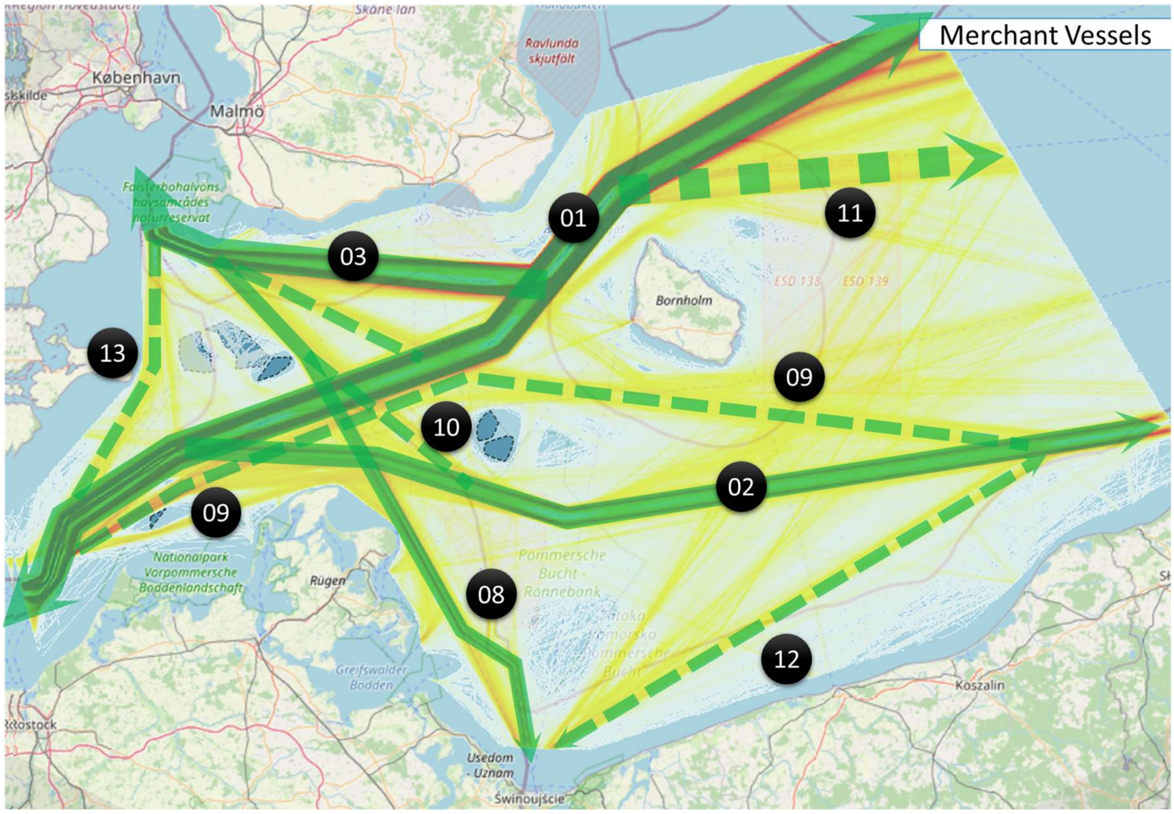

Figure 15: South Baltic Traffic, merchant vessels – Density Plot 200m x 200m.

Notes 09 display the way cargo traffic that uses the secondary route to the east described earlier under note 07, with the difference that a significant portion of this traffic re-joins the main corridor towards the Polish ports. Most likely, this traffic tends to avoid the transit within the boundary of the TSS lanes.

Traffic between Kattegat and the eastern Baltic follows the route denoted as 03 up to the point where it meets the main SW-NE corridor (Note 01) and then spurs to the east to join the main traffic to the ports of Poland and Kaliningrad. A corridor carrying traffic to and from Klaipeda also spurs off from the main SW-NE corridor, North of Bornholm Island (Note 11).

Note 12 denotes the corridor along the Pomeranian coast used by cargo traffic between Swinoujscie and the ports in the Gulf of Gdansk.

A corridor taking traffic from the main SW-NE route towards Kattegat between the South of Gedser and Off Falsterborev along the Danish coastline is marked by Note 13. Whilst predominantly used by Ro-Ro/Pax services, general cargo traffic is the secondary user of this passage.

4.3 Passenger traffic

Passenger vessels constitute the second most important contributor to vessel traffic in the area of the study. This includes ferry (Ro-Ro/Pax) traffic as well as cruise ships, and other smaller passenger-carrying craft.

The two most important routes in the model, as they both run in the area of interest for Germany's MSP and thus the present study, are the Swinoujscie to Ystad (Note 04) and Swinoujscie to Trelleborg (Note 05) as presented in Figure 16 overleaf.

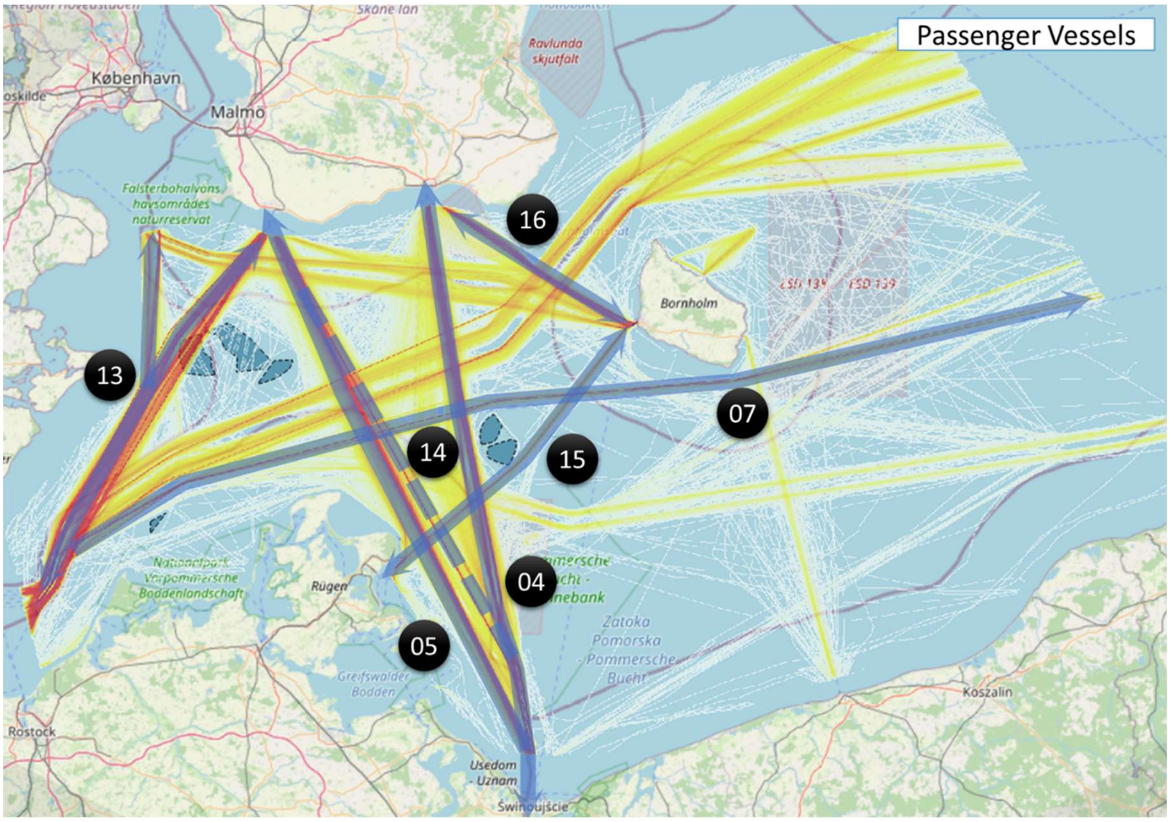

Figure 16: South Baltic Traffic, passenger vessels – Density Plot 200m x 200m.

Of significance is also the ferry traffic that leaves the Swinoujscie to Ystad corridor at the end of the deep-water route that leads to Swinoujscie and uses the intermediate space until it joins the Swinoujscie to Trelleborg route just south of the main SSE-NNW route (Note 14). Another route of high passenger vessel traffic is the Sassnitz to Bornholm line, which crosses to the immediate south of the area of interest (Note 15). Ferry services to Klaipeda, despite the lower volume, interest the area of the study Notable passenger vessel traffic is also noted between Bornholm and Ystad, but this route is of lower significance to the area. It is noted that Ro-Ro/Pax vessels are generally more manoeuvrable than cargo vessels if compared to a laden bulk carrier and tankers for example, and the crew is more acquainted with navigating through high traffic areas, as such, their effect on navigational risk would not have the same impact of other traffic.

It is worth pointing out how traffic adjusts its course in practice with the introduction of an OWF, as can be seen from the area where the Kriegers Flak OWF. The latter has been constructed within the period covered in the AIS dataset for the study (Note 13).

4.4 OWF support vessel traffic

Existing offshore windfarms have introduced additional regular traffic to the area (Figure 17), as they are frequently visited for maintenance activities. This can be daily, or more frequently when the weather permits. This traffic, however, as Crew Transfer Vessels are generally small in size and extremely manoeuvrable vessels, is of very low risk, as it can easily avoid other traffic.

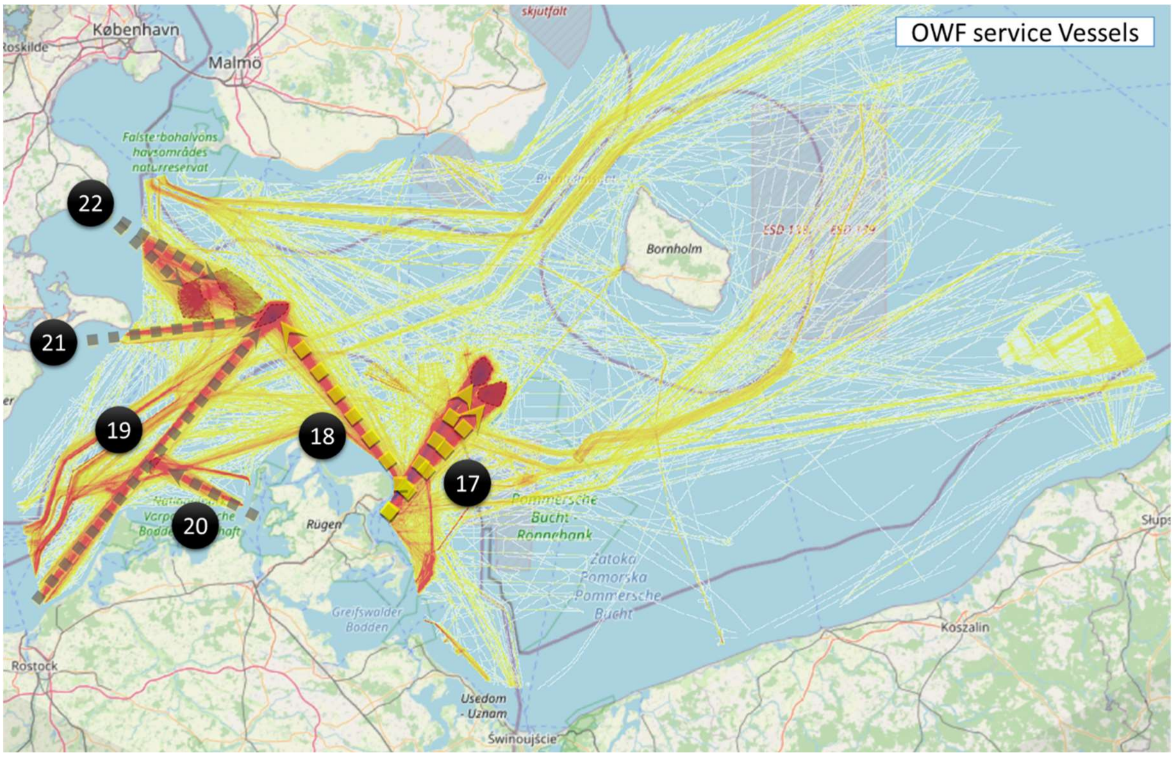

Figure 17: South Baltic Traffic, OWF support vessels – Density Plot 200m x 200m.

The main corridors used by CTV vessels that influence the study area is out of Sassnitz, and to the existing Wikinger and Arkona offshore windfarms (Note 17). Of smaller significance is the route of vessels out of Sassnitz to the EnBW Baltic 2 OWF, as it uses the West side of the corridor noted 05 and discussed earlier (Note 18). EnBW Baltic 2 is also serviced out of two more corridors. It receives vessels from Rostock, using the space to the East of the main traffic, and crossing the main SW-NE corridor just to the West of the North of Rugen TSS (Note 19), and from Klintholm in Denmark (Note 21). EnBW Baltic 1 OWF, receives traffic from Stralsund (Note 20).

4.5 Fishing vessel traffic

The assessment of fishing fleets is always a challenging task since AIS data available cannot include the entirety of the fishing vessels, these being commercial or recreational and mandatorily compliant or not with AIS.

The coastal states of the study (Germany, Denmark, Sweden, and Poland) report an overall commercial fishing fleet of approximately 410 units with a length overall (loa) > 10-12m and about 1,850 fishing boats of smaller loa[5].LOA. The model assessed included a total of 559

5 *ICES Fisheries overviews Baltic Sea Ecoregion Published 2 September 2019*

vessels reported as 'fishing' in one year period, however, this number also accounts for the potential fisheries activities conducted by units of other coastal states therefore registered in other countries located on the eastern side of the Baltic Sea

Based on the vessels categorized as fishing that appear in the dataset the plots of these units were observed and noticed to generally transit outside the main traffic corridors, except for the main SW-NE corridor NE from the Bornholmsgat TSS, inclusive, and the corridor from the latter to/from Kattegat (Figure 18).

There appears to be an area between the main traffic corridors, where Arcadis Ost 1 and the Baltic Eagle OWFs are to be constructed, that is currently of interest in terms of fishing activities (Note 23). Fishing vessels use the space to the west of the main N-S corridor, around the coastline of Jasmund to transit to the West or the South (Note 24). Fishing vessels appear to also use the area to the east of the Swinoujscie deep-water recommended route (Note 25).

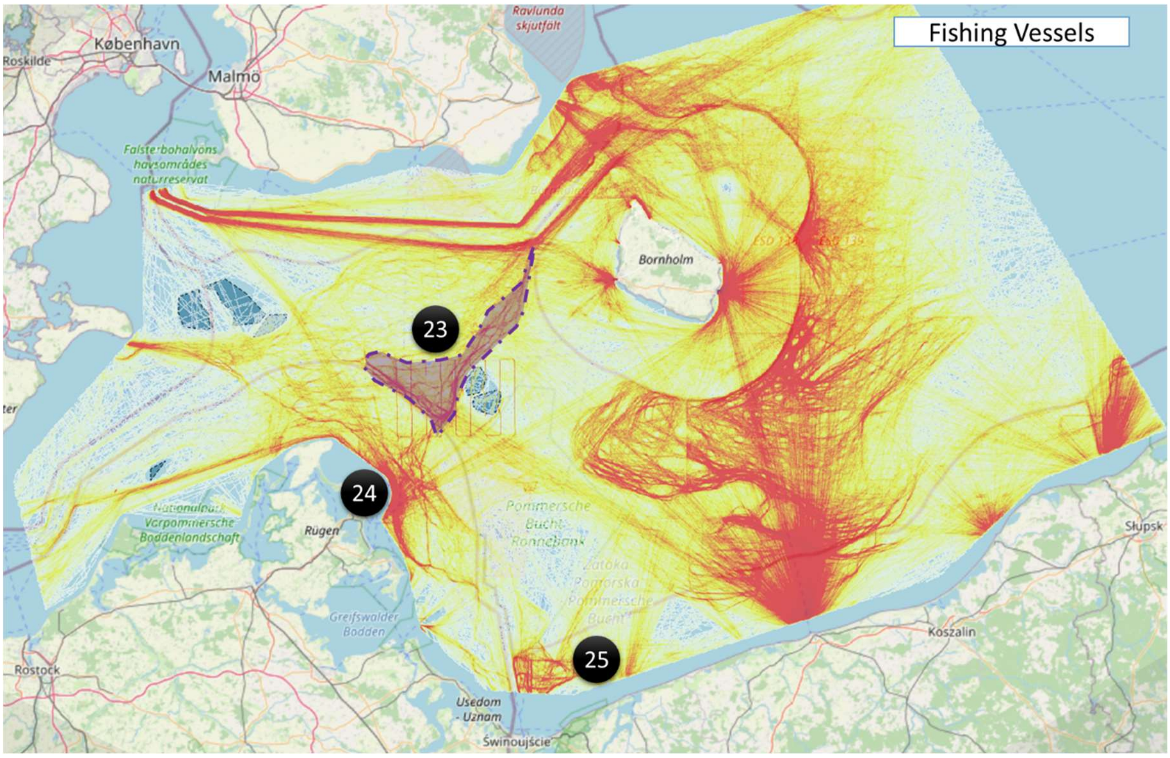

Figure 18: South Baltic Traffic, Fishing vessels – Density Plot 200m x 200m.

To relate fishing traffic to fishing activity, ABL performed a speed analysis and plotted the density diagram for fishing vessel traffic at a speed of ≤ 5 kts. The result of this assessment is presented in Figure 19. It can be seen that the area to the East and South of Bornholm Island, and down to the Polish coast is an area of high fishing activity. The area of interest to the study is an area of moderate fishing activity, most of which takes place outside the German territorial waters and EEZ, between the Arcadis Ost site and the existing windfarms, with the EO2-West being the area of heaviest fishing activity.

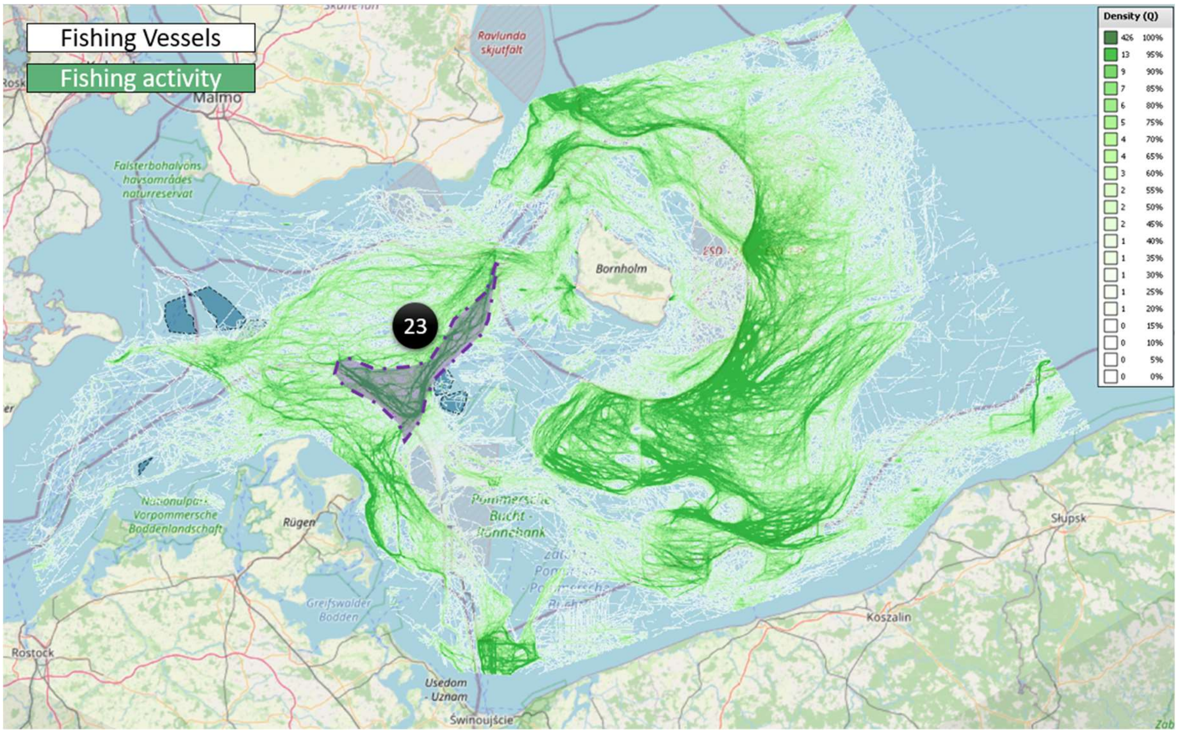

Figure 19: South Baltic Fishing Activity, Density Plot 200m x 200m.

5 BALTIC SEA TRAFFIC STUDY – AREA OF INTEREST FOR OWF DEVELOPMENTS

5.1 Traffic to the West of the focus area

Focusing on the area of the proposed offshore wind development plots (Figure 20), there are some relevant corridors of existing traffic, currently using the free maritime space. The heaviest traffic is noted to the west boundary of the area and includes the space that will be occupied by the Arcadis Ost 1 OWF and extends to the west. With the construction of Arcadis Ost 1 taking place soon, the corridor was modelled as two separate legs adjacent to each other. This decision is justified as:

1) It coincides with the actual observed routes, as the alignment of the eastern leg that runs through the position of Arcadis Ost 1 is the track of Ro-Ro/Pax vessels cutting from the end of the Swinoujscie approach to re-join the main corridor to Trelleborg.

2) This allows the model to capture the traffic in the area that will have to shift to the west post-construction of Arcadis Ost 1.

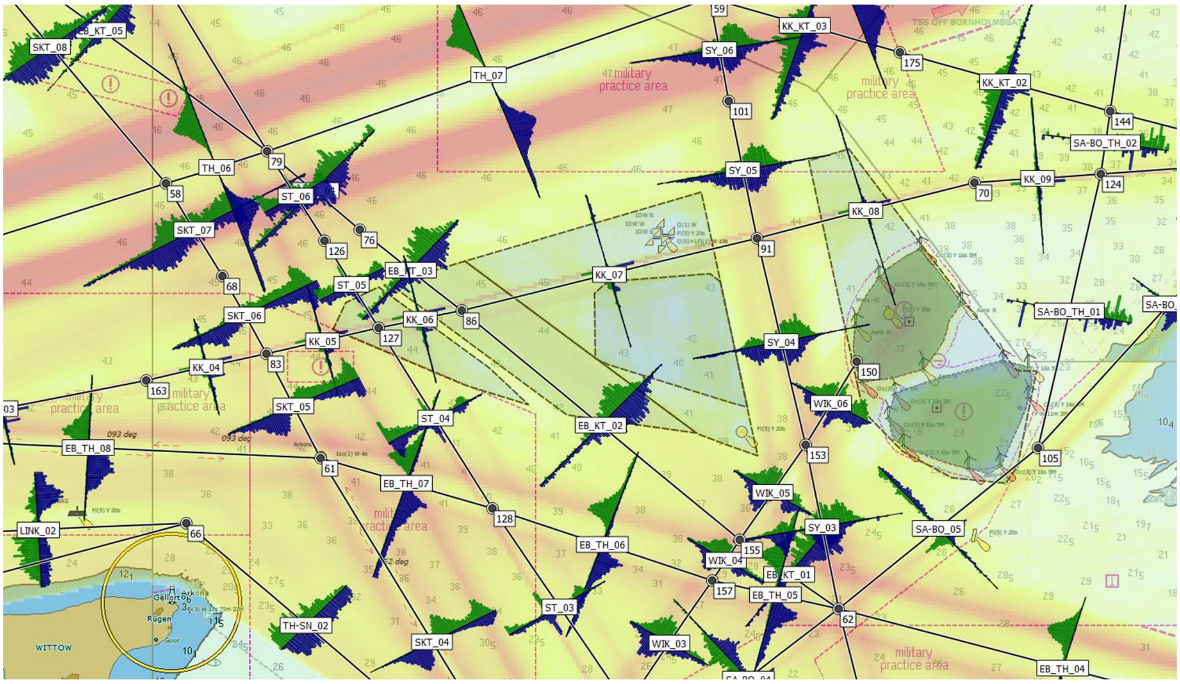

Figure 20: Focus area for study in the Baltic Sea

The western corridor, linking Swinoujscie to Trelleborg and the Kattegat (SKT), is trafficked by an array of different vessel types, however, there are two predominant groups. Ro-Ro/Pax vessels, and General Cargo vessels.

The former, are vessels that operate the route between Swinoujscie and Trelleborg and comprise medium-sized ferries. Their predominant size range is between 150m and 200m in length. The General Cargo vessels that use this passage mainly operate to/from Swinoujscie and through the Kattegat. These vessels leave the roadstead of Swinoujscie and Szczecin ports and follow the recommended track along the German coastline. The prime users are medium-sized General Cargo vessels, between 75m and 100m in length. The qualitative characteristics of this traffic are presented in Figure 21.

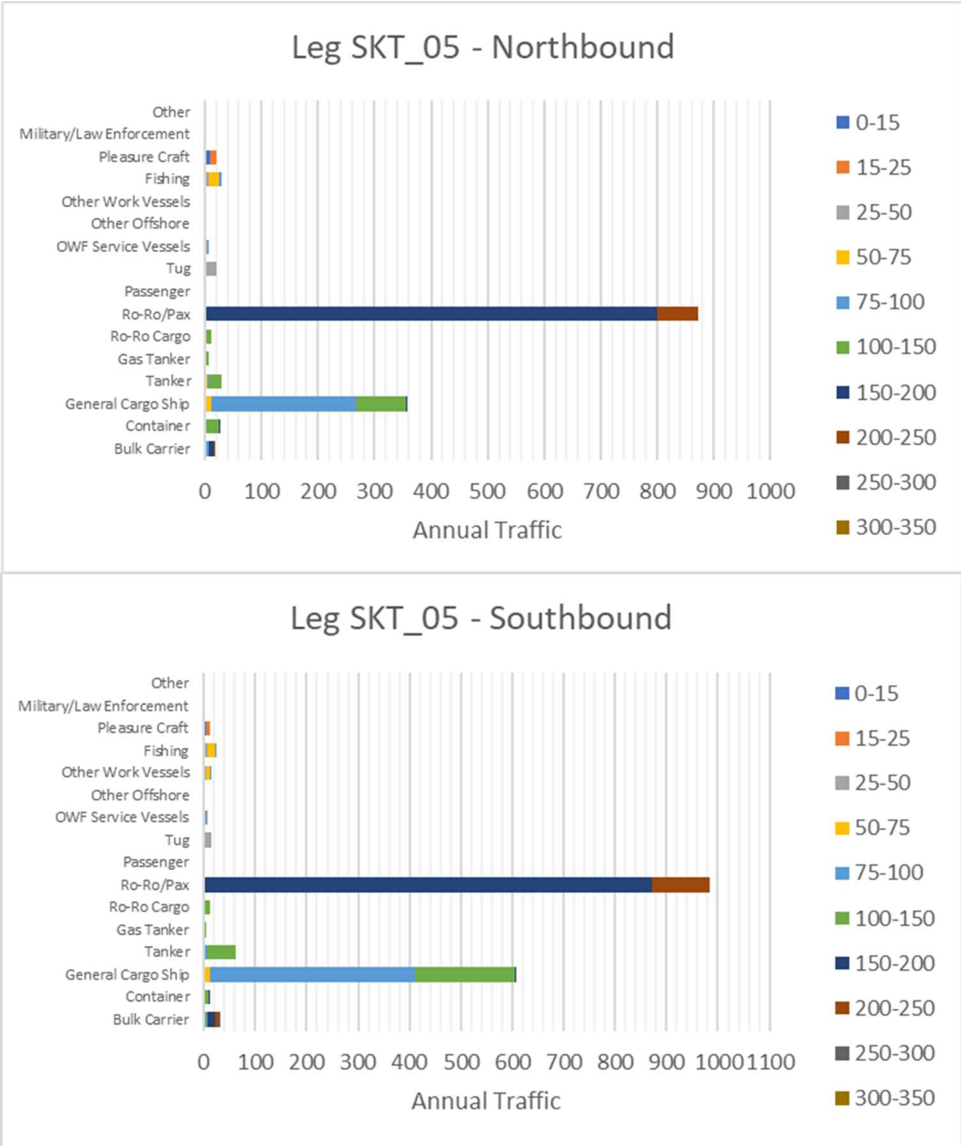

Figure 21: Traffic density and vessel size distribution on leg SKT_05

The corridor that crosses the area of the new Arcadis Ost 1 development (ST) is trafficked almost exclusively by Ro-Ro/Pax vessels. These vessels are of the same qualitative characteristics as the ones noted on the western corridor (SKT) as they form part of the same fleet that operates the line between Swinoujscie and Trelleborg. It is safe to say that these vessels on some occasions use this space and on others the main corridor to the west of Arcadis Ost 1. A breakdown of the qualitative characteristics of this traffic is presented in Figure 22.

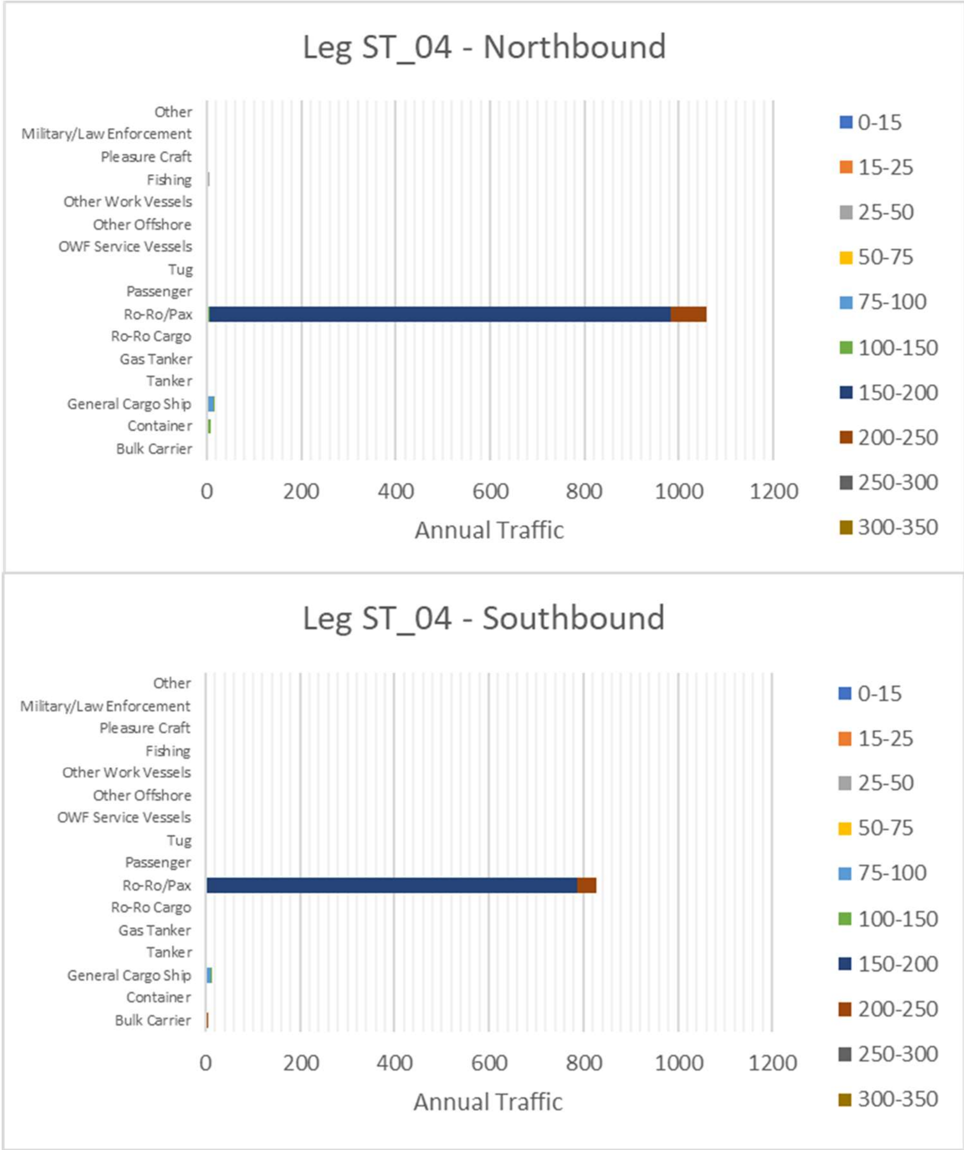

Figure 22: Traffic density and vessel size distribution on leg ST_04

It is expected that the traffic of corridor ST, following the construction of Arcadis Ost 1, will shift onto the SKT corridor. This shift will most likely occur gradually, between the point where these vessels leave the roadstead of Swinoujscie and Szczecin ports, and the point where they are expected to join SKT. This adjustment will occur between the current leg SKT and the obstruction to navigation created by the western end of Arcadis Ost 1

At that point, it is also reasonable to assume that the resultant traffic corridor SKT will shift slightly to the west in alignment, compared to its current position, as crossing traffic will seek to maintain a distance from Arcadis Ost 1 and other vessels.

It is noted that the fact that the primary users of these corridors are Ro-Ro/Pax vessels is favourable, as these vessels are more manoeuvrable compared to cargo vessels, thus more 'agile' in adapting their course to avoid congestion or a potential incident, and also are frequent users of the space, and thus well familiarised with the area.

However, the traffic is expected to develop quite linearly, there is no introduction of crossing or sharp alteration of course needed and therefore the navigation will be adjusted placing a waypoint instead of an existing straight track. These vessels are typically attributed a risk reduction factor.

5.2 Traffic through the focus area, between Arcadis Ost 1 and plot EO2

A traffic corridor is formed between the area that will be occupied by Arcadis Ost 1 OWF when the latter is constructed, and plot EO2, which includes the future Baltic Eagle OWF development. This corridor covers the area referred to as EO2-West, which is a candidate area for future offshore wind developments. Corridor (EB_KT) is used by traffic directed to/from Kattegat and the main W-E corridor to the Polish ports of Gdansk and Gdynia (EB-TH) – refer to Figure 23.

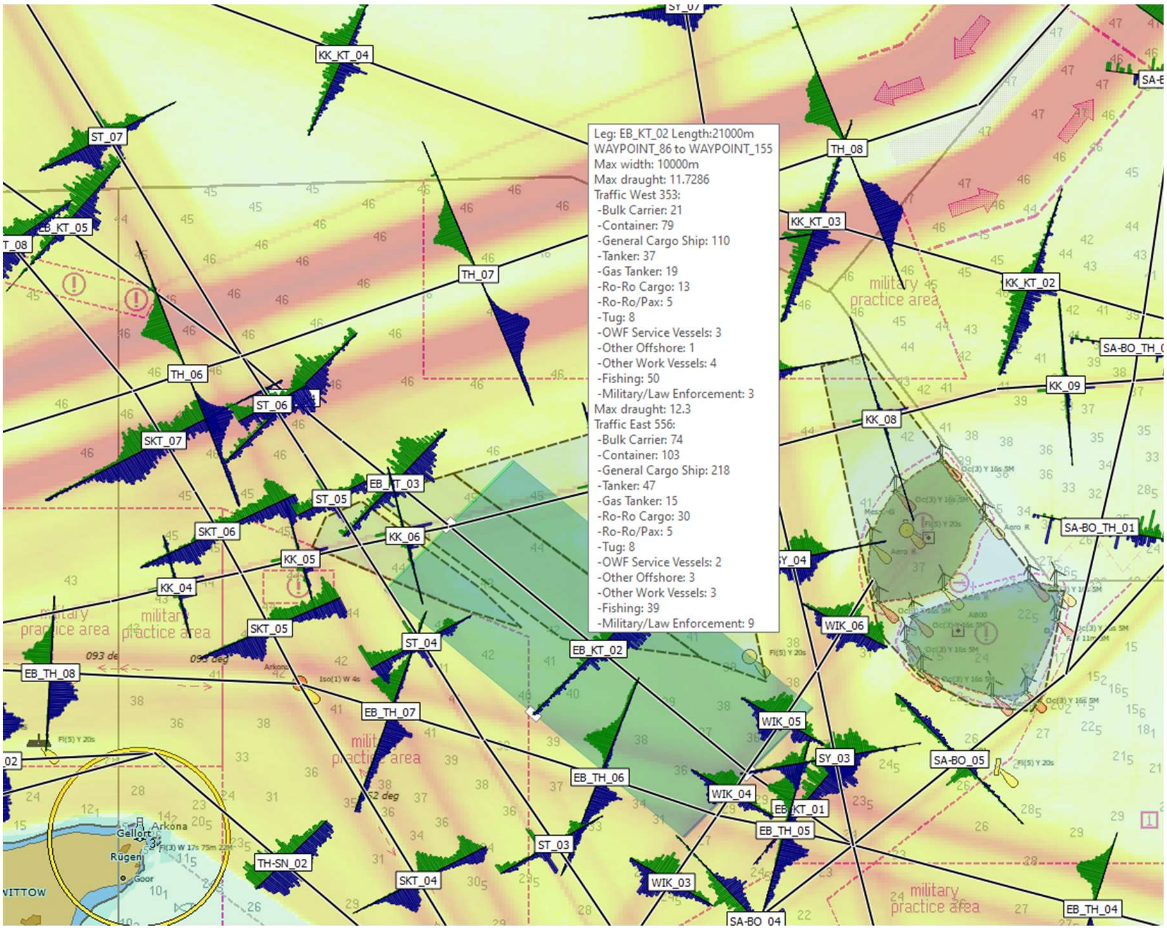

Figure 23: NW-SE corridor through the focus area of the study in the Baltic Sea

The users of this traffic corridor are predominantly cargo vessels and the traffic volumes noted in both directions are very small (in the order of 3 vessels a day approximately). The primary user group are medium-sized General Cargo vessels, of lengths between 75m and

100m, however with the largest in the group being in the range of 150m – 200m. The second most frequent users are feeder vessels, transporting containers between the European hub ports and Poland. Most are of LOA between 100m and 150m, with the largest ones noted in the group of 200m – 250m. Other types of cargo vessels noted to be using the corridor are Panamax Bulk Carriers, Coastal Tankers, and very small numbers of medium-sized Ro-Ro and Ro-Ro/Pax vessels.

As discussed earlier in the report, the EB_KT corridor is also used by small and medium-sized fishing vessels for transit as well as fishing activities.

A breakdown of the qualitative characteristics of this traffic on corridor EB_KT is presented in Figure 24.

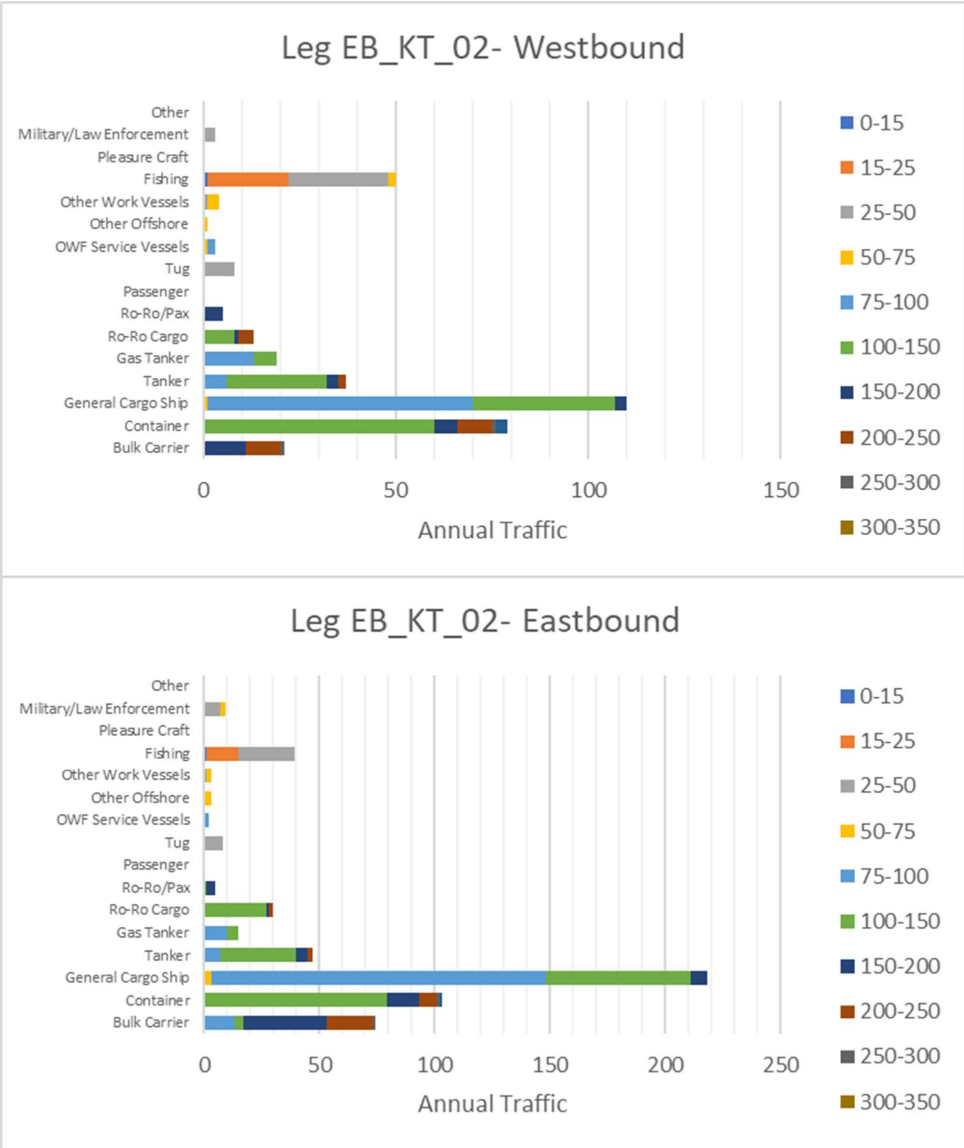

Figure 24: Traffic density and vessel size distribution on leg EB_KT_02

Should area EO2-West be developed for offshore wind, the traffic on this corridor will have to divert to alternative routes. The most likely scenario is that traffic from corridor SKT, which constitutes the vast majority of the eastbound traffic on EB-KT will transit along the SKT leg to join the EB_TH or continue on the ST leg. Ro-Ro/Pax traffic to and from Trelleborg, which constitutes a very small proportion of the traffic on EB_KT, will divert towards SKT. Similarly, northbound Ro-Ro/Pax traffic which is also very low (5 transits a year), instead of using the Swinoujscie to Ystad route before diverting onto EB_KT at the junction with EB-TH, will follow the ST route.

5.3 W-E traffic through the focus area, through Arcadis Ost 1 and plots EO1, EO2.

A second traffic corridor is noted to cross the area that will be occupied by Arcadis Ost 1 OWF, when the latter is constructed, and plots EO1 and EO2, which includes the future Baltic Eagle OWF and Ostwind 1 developments. This corridor (KK) is mainly used by traffic that detaches from the main SW-NE traffic corridor (TH) just after the exit of the South of Gedser TSS and then maintains its track south and slightly divergent to the TH through the area of interest before it adjusting their course leaving Bornholm Island on the north (Figure 25).

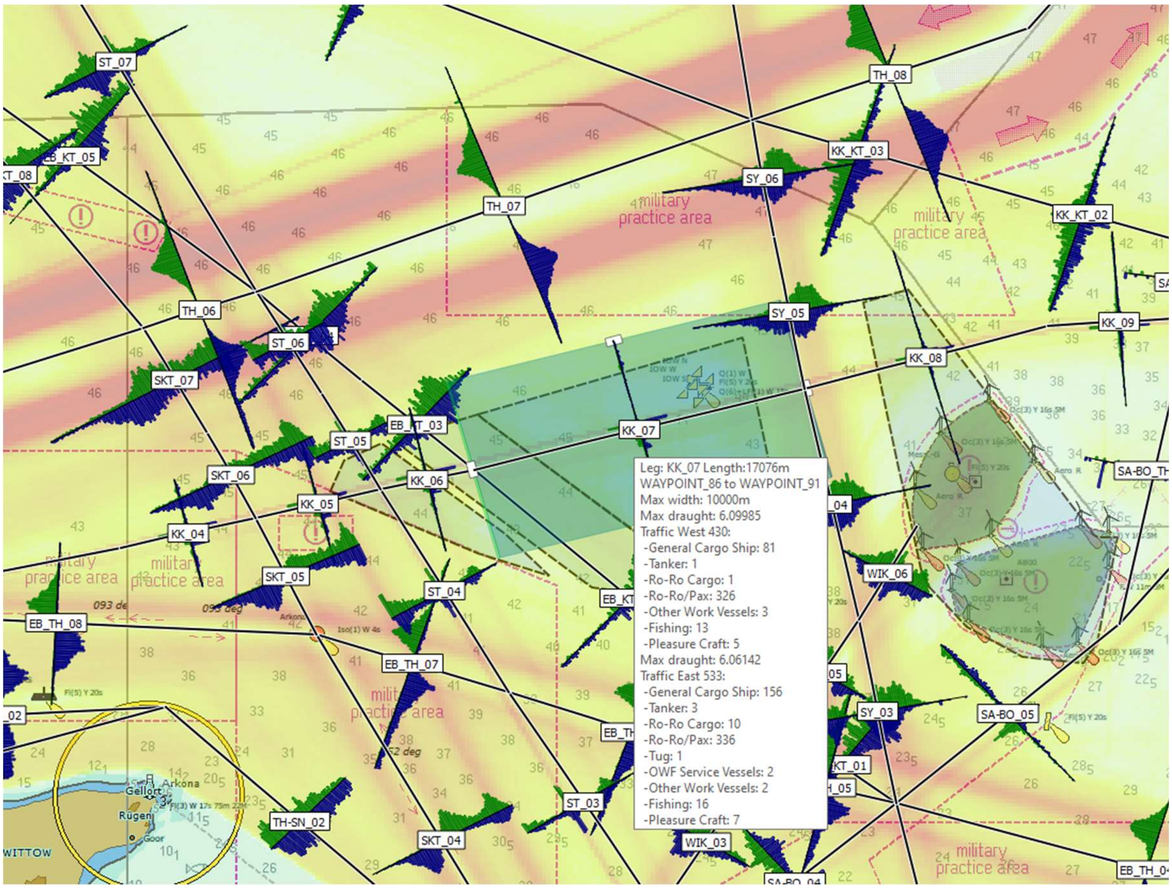

Figure 25: W-E corridor through the focus area of the study in the Baltic Sea

The traffic on this corridor comprises predominantly Ro-Ro/Pax vessels running on the Kiel – Klaipeda route, and fewer cargo vessels. The traffic volumes are low, in the order of 1 to 1,5 vessels per direction per day, whilst all ferry traffic is attributed to three vessels. All three Ro-Ro/Pax ferries on the route are medium-sized ferries of lengths between 150m and 200m. The remaining traffic comprises mainly small to medium-sized General Cargo ships, most in the range of 75m – 100m, and 1 to 3 annual crossings of other vessel types such as Tankers, Offshore vessels, Fishing and Pleasure Craft etc.

A breakdown of the qualitative characteristics of this traffic on corridor KK is presented in Figure 26.

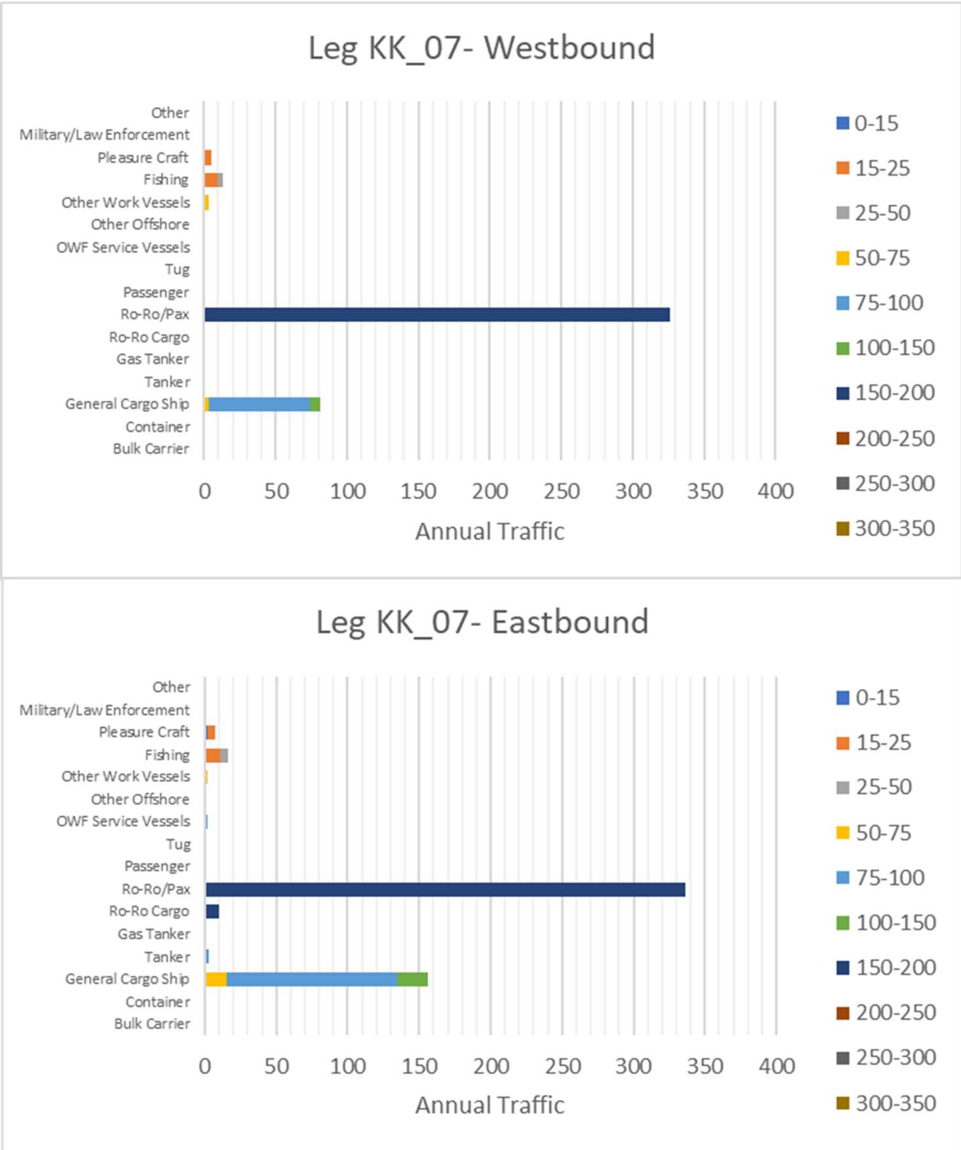

Figure 26: Traffic density and vessel size distribution on leg KK_07

The most logical diversion of this traffic would be following a similar track whilst passing Arcadis Ost 1, EO1, and EO2 on the N to re-join the original track past Wikinger OWF keeping clear from Arkona-Becken ODAS buoy. However, based on the spatial allocation for OWF in the Danish EEZ, it may be the case that the route to the north and east of EO1 will be impeded by possible future developments as the area is indicated to be of interest in the current (subject to approval) Danish MSP. If the latter applies, this traffic will be diverted onto the main W-E corridor (EB_TH). It will most likely follow that corridor up to the point it crosses the Baltic Pipeline, and then change course to NE to head to Klaipeda. This will lengthen the journey by approximately 16nm.

5.4 N-S traffic through the focus area, between EO1 and EO2.

The final corridor that will be discussed concerning the focus area, is the N-S traffic corridor between plots EO1 and EO2 (SY). I.e., between the existing Wikinger and Arkona OWFs, and the Baltic Eagle OWF that will soon be constructed (Figure 27).

Currently, traffic uses the approximately 3.4nm-wide corridor between plots EO1 and EO2, and on a limited number of trips uses the eastern part of area EO2. The traffic comprises almost exclusively Ro-Ro/Pax vessels servicing the Swinoujscie to Ystad line. The traffic density is just over an average of 4 trips a day in each direction, with an absolute balance between northbound and southbound traffic.

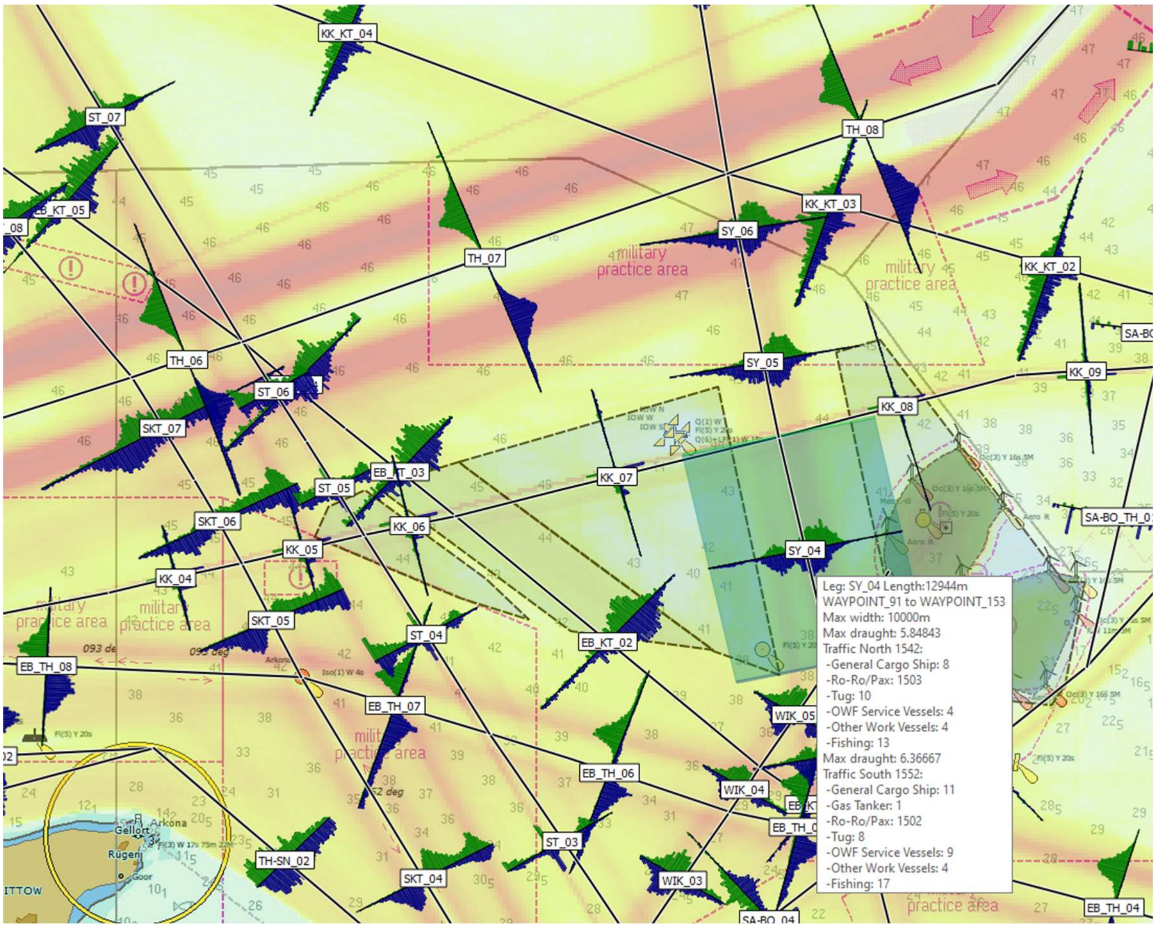

Figure 27: N-S corridor through the focus area of the study in the Baltic Sea, between EO1 and EO2

A breakdown of the qualitative characteristics of this traffic on corridor SY is presented in Figure 28

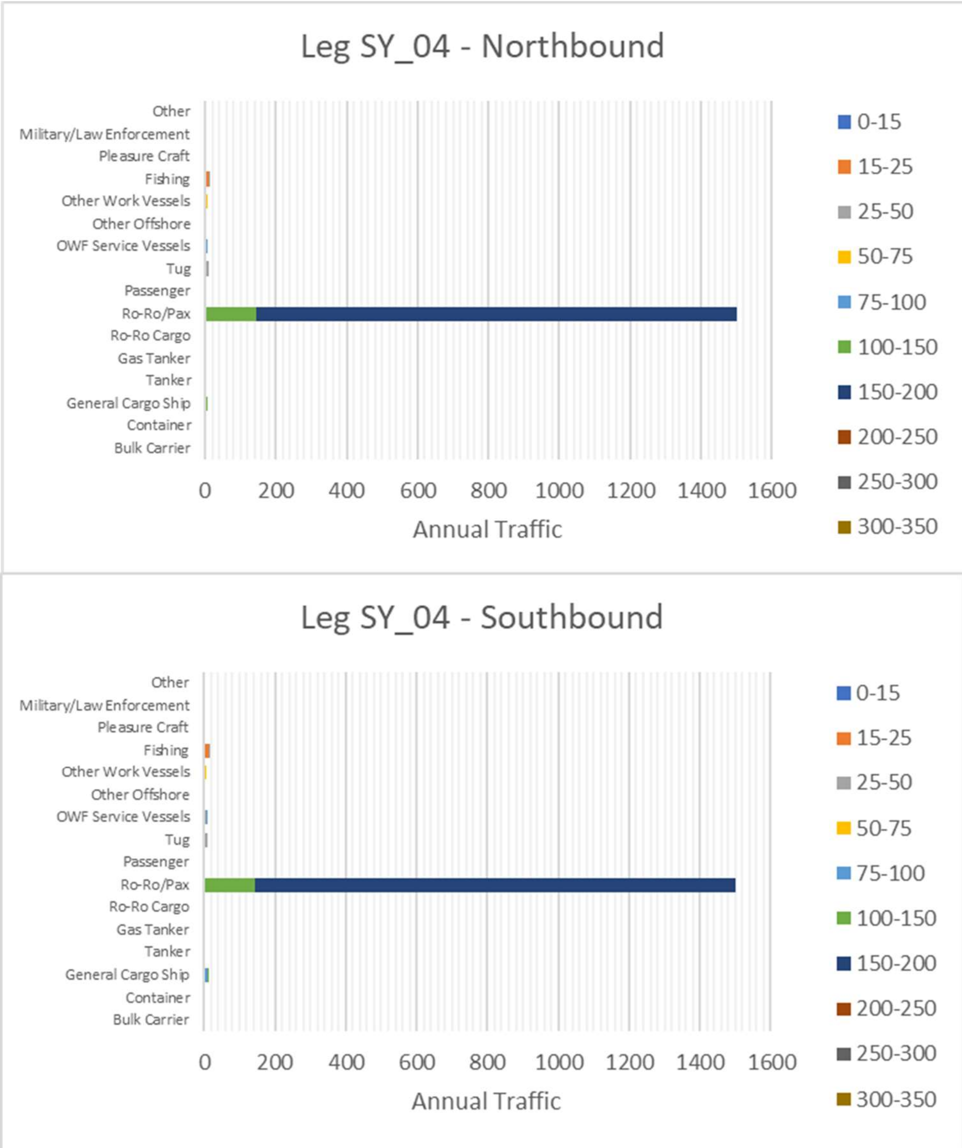

Figure 28: Traffic density and vessel size distribution on leg SY_04

A distant second traffic contributor is General Cargo traffic, with 8 – 11 annual crossings depending on the direction.

In the case of corridor SY, there will be no diversion of traffic, but rather a condensation into a narrower corridor. The development of EO2 with the construction of the Baltic Eagle OWF, as well as that of the northern part of EO1 with the Ostwind 1 OWF, and the associated safety zones around them, will most likely result in a corridor approximately 3.13nm wide, in which the two directions of traffic will have to be accommodated. In practice, the impact of that on navigation is expected to be minimal, as most of the trips noted in the 2019-2020 dataset are within the nominal corridor.

A point worth noting is that based on the future development plots considered by Sweden, which as we were informed are at a very early stage and still very much open, this traffic appears to subsequently be directed through a narrower corridor once it crosses to the Swedish EEZ. The corridor allowed on the Swedish side is approximately 2.0nm wide and aligned with the eastern part of the German corridor.

6 BALTIC SEA TRAFFIC VOLUMES - TIME SERIES STUDY

As part of the scope of the study, ABL has looked into how traffic in the broader area of interest has evolved over the past decade.

This assessment was performed based on additional AIS datasets obtained from HELCOM, for the years preceding 2019-2020. The analysis was performed on three months' worth of data from each year in the time series; in particular, February, July, and November. The time-series data cover the following years: 2011, 2013, 2015, 2016, 2017, and 2018.

6.1 Methodology

The method selected to compare traffic volumes and how these change between 2011 and 2020, was to establish six counting lines (gates – see Figure 29) and compare the traffic recorded through them in each direction for each of the years in the dataset. The recorded values and breakdown in ship type were hence multiplied by 4 to be converted to equivalent annual crossings. Whilst this methodology is not entirely accurate, it is expected to produce data of sufficient accuracy for the traffic change assessment. It is noted that this data is used only to approximate traffic changes, and not in quantitative risk analyses where the accuracy in the set is of importance.

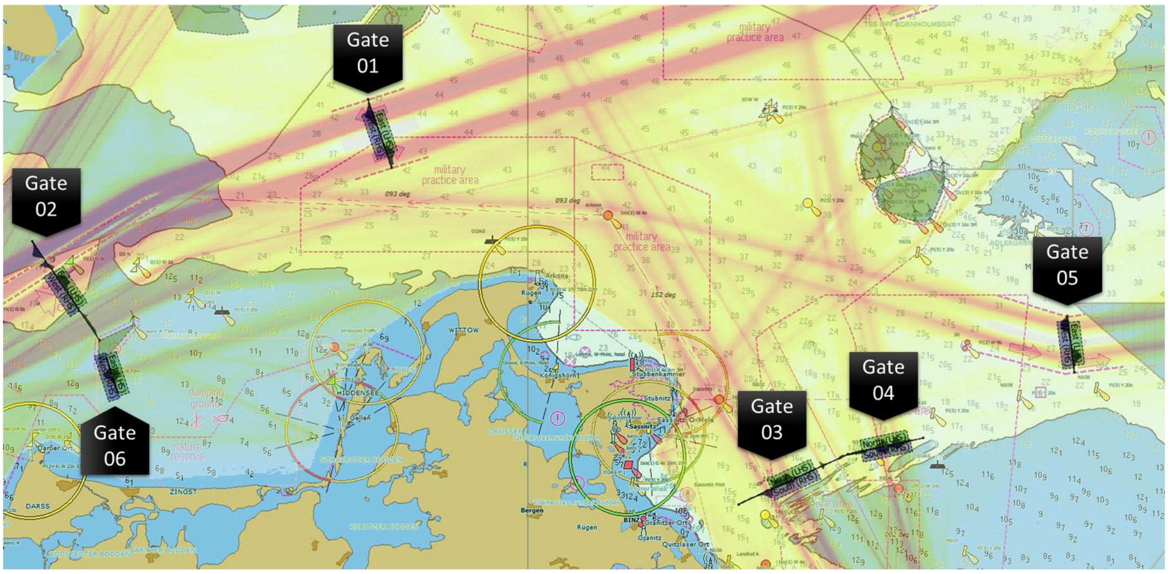

Figure 29: Location of counting lines (Gates) for time-series assessment in the Baltic Sea

Gate 01 was placed across the North of Rugen TSS, to capture the traffic that navigates the main route to the north of the area of interest. This will provide a good indication of the traffic heading to/from the NE Baltic.

Gate 02 was also placed on the main route, however further out to the west, after the point where traffic spurs to the north towards the Kattegat or Trelleborg. The gate was set to capture the traffic in the deep-water route, and down to the point of the EnBW Baltic 1 OWF.

Gate 06 was added to the south of the latter at request by the German authorities, to capture the vessel traffic to the south of the OWF, following the coastal route north of Rugen Island.

Gate 03 was placed on the main route between the ports of Swinoujscie and Szczecin and the Kattegat / Trelleborg (SKT), and Gate 04 was placed adjacent to it to capture the traffic between the aforementioned Polish ports and Ystad.

Gate 05 was placed across Adlergrund TSS, to capture the traffic using the corridor towards the Polish ports of Gdansk / Gdynia.

Gate traffic will be reported in terms of two numbers. The first reflects the crossings count by all vessels, including small leisure craft, patrol vessels, fishing vessels etc. All vessels with an AIS transponder were included in the HELCOM dataset. The second reported number will comprise merchant traffic only, excluding work vessels and all other applicable categories from the count.

This section of the report intends to identify if the traffic has an increasing, stable, or decreasing trend, and what part of the traffic in each area and for each year in the time series corresponds to merchant vessels.

6.2 Gate 01 Report

The vessel count for Gate 01 is presented in Figure 30 below.

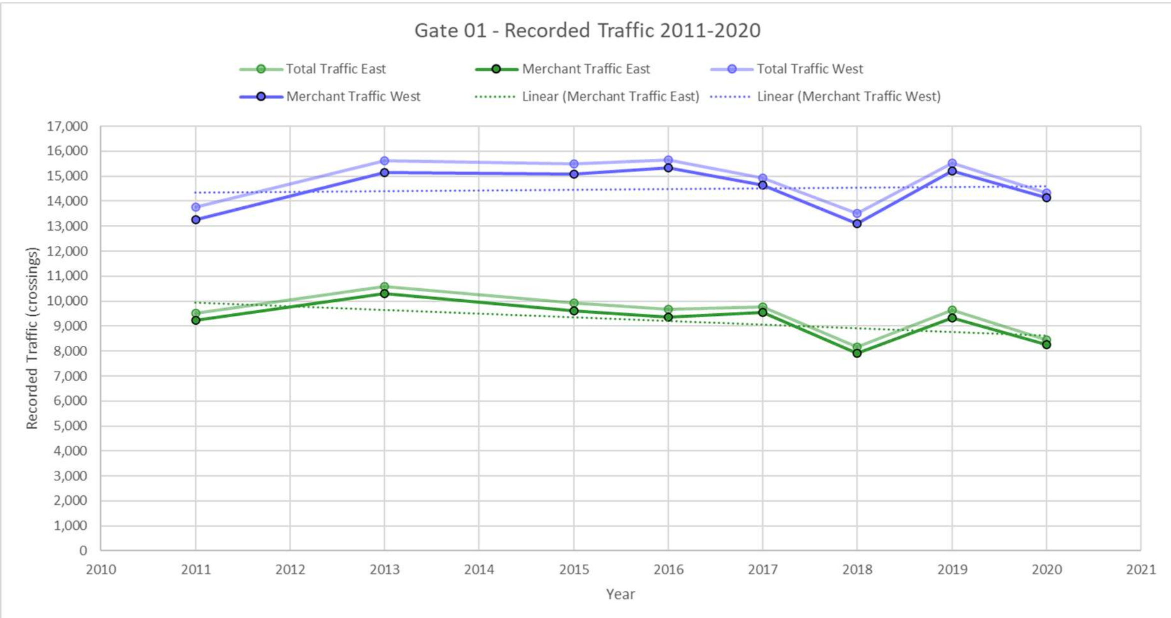

Figure 30: Time-series – Recoded traffic for Gate 01

Whilst the overall traffic in terms of vessel crossings appears to be mildly increasing during the last decade, the merchant traffic in the same set appears to have a gradually decreasing pattern.

It should be noted that there appears to be a characteristically steep dip in the recorded vessel traffic for the year 2018, which is consistent in all subsequent gate measurements but is not justifiable by any local or global economic conditions, ice formation, or other events that are reported for the Baltic. Also, the fact that this dip in traffic correlates with a proportional reduction in the data volume for all months examined in the time series, suggests that more likely than not, it pertains to an issue with the dataset provided for 2018. It is, therefore, useful to consider that traffic in 2018, would most likely be not accurate between the 2017 and 2019 values.

The traffic distribution between vessel types in either direction is presented in Figure 32 overleaf. The figure shows that cargo traffic is the prime user of the route, with General Cargo vessels being the most frequent users in both directions.

Tanker traffic and Ro-Ro cargo traffic appear to be the ones with the most notable fluctuations in the time series. The traffic appears to have peaked in the middle of the previous decade, especially notable for the westbound traffic.

What is also evident in the figure is the reduction in passenger vessel traffic between 2019 and 2020. Whilst the Ro-Ro/Pax sector maintained its flows as part of sustaining the transit of products on heavy goods vehicles, passenger-only traffic was almost eliminated, with the contraction of the cruise sector during the first year of the pandemic.

Whilst merchant traffic volumes appear to have a slightly reducing trend in Gate 01, the size of the vessels using the route appears to be increasing, thus increasing the overall tonnage on the route (see Figure 31).

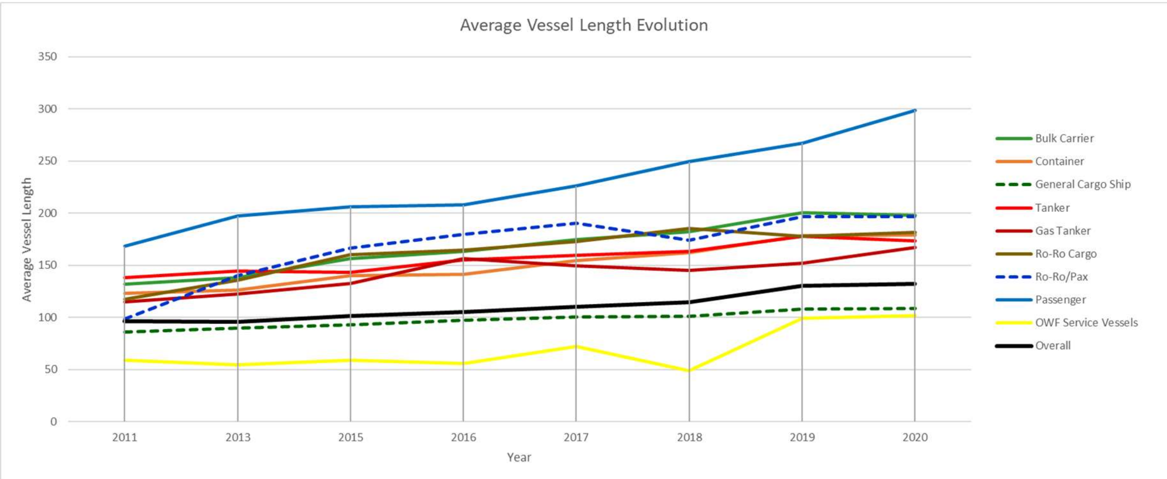

Figure 31: Average Vessel Length for Gate 01

Figure 32: Traffic density and vessel size distribution through Gate 01

6.3 Gate 02 Report

The vessel count for Gate 02 is presented in Figure 33 below. The pattern noted is at large consistent with that of the first gate, with the overall traffic numbers stable or slightly increasing, and the amount of merchant vessel crossings showing a decreasing trend.

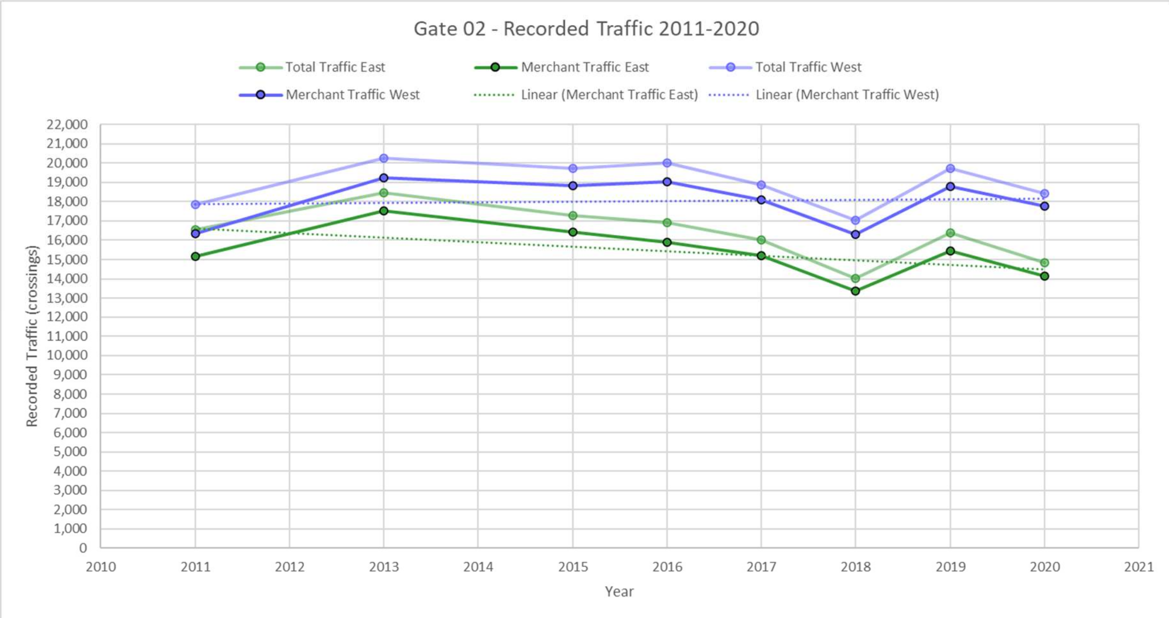

Figure 33: Time-series – Recoded traffic for Gate 02

The inconsistency noted with the traffic volumes for the year 2018 is also conspicuous in the reported results for Gate 02. Despite the apparent reduction in the number of vessel crossings noted at the gate, the overall tonnage is increasing, as a result of the increasing size of the vessels navigating the route.

From the breakdown of the traffic noted to vessel types, it can be seen that as the case is for Gate 01, General Cargo vessels are the prime user, with tankers and container carriers also being significant contributors to the traffic (see Figure 34).

The westbound route appears to number more crossings for most vessel types. The exception appears to be Ro-Ro/Pax vessels, that seem to be using the corridor more on eastbound journeys. This is a fictitious result, that is attributable to the fact that some vessels on the route to Trelleborg travel wide, and thus cross Gate 02 even though they do not follow the main SSW-NNE traffic route.

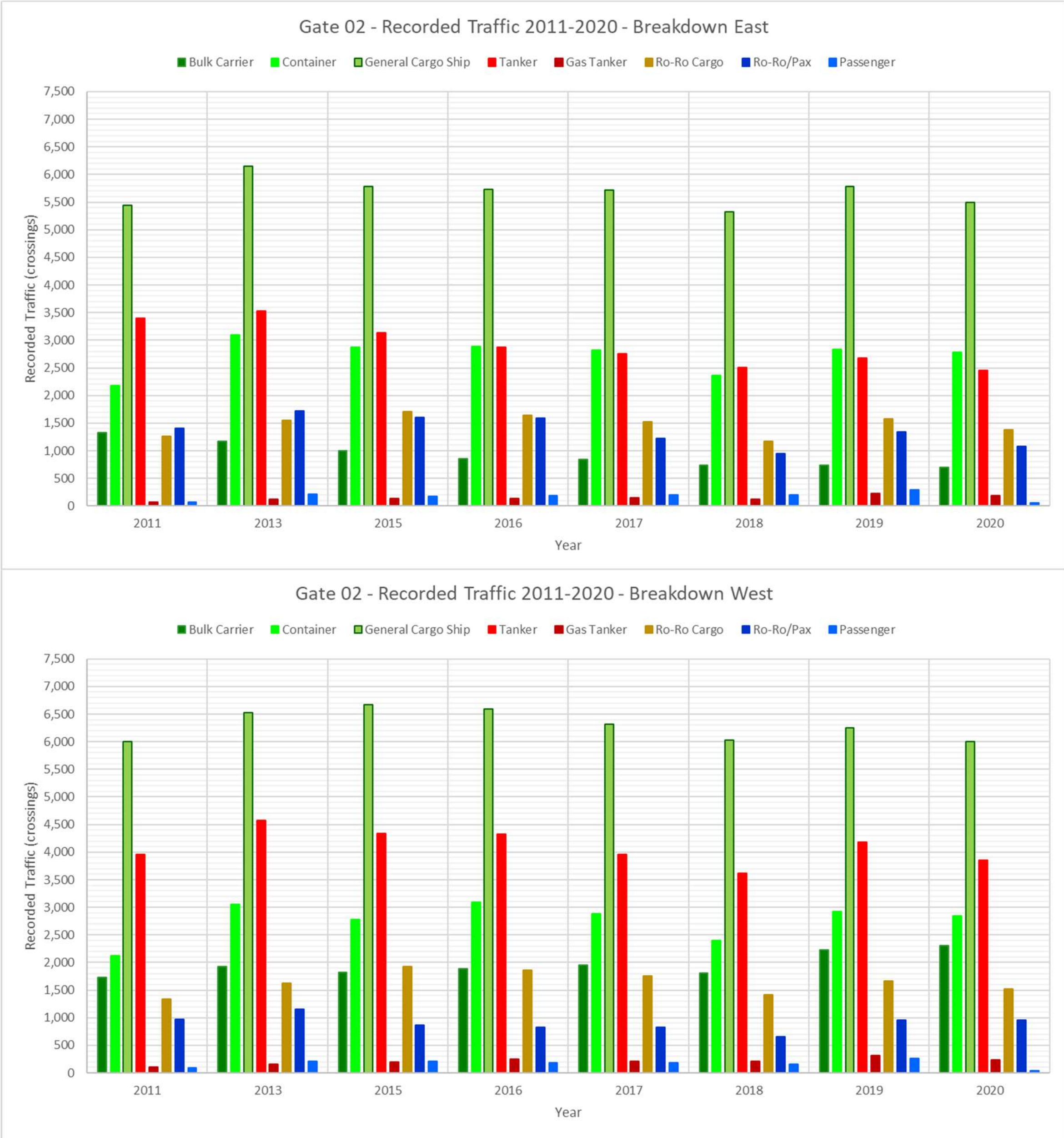

Figure 34: Traffic density and vessel size distribution through Gate 02

6.4 Gate 03 Report

The vessel count for Gate 03 is presented in Figure 35. The traffic noted shows an increasing pattern in terms of the number of vessels, both in total and when it comes to cargo vessels.

The total traffic appears to be increasing up to the year 2018 inclusive, with a notable dip for 2019, followed by a slight further reduction for 2020. Looking at the interval between 2015 and 2018, there seems to be a trend that sees work vessel traffic increase whilst merchant traffic crossings reduce before it picks up again for 2019 and stabilises for 2020.

This pattern could be associated with the construction (and the subsequent completion) of the Wikinger and Arkona OWFs.

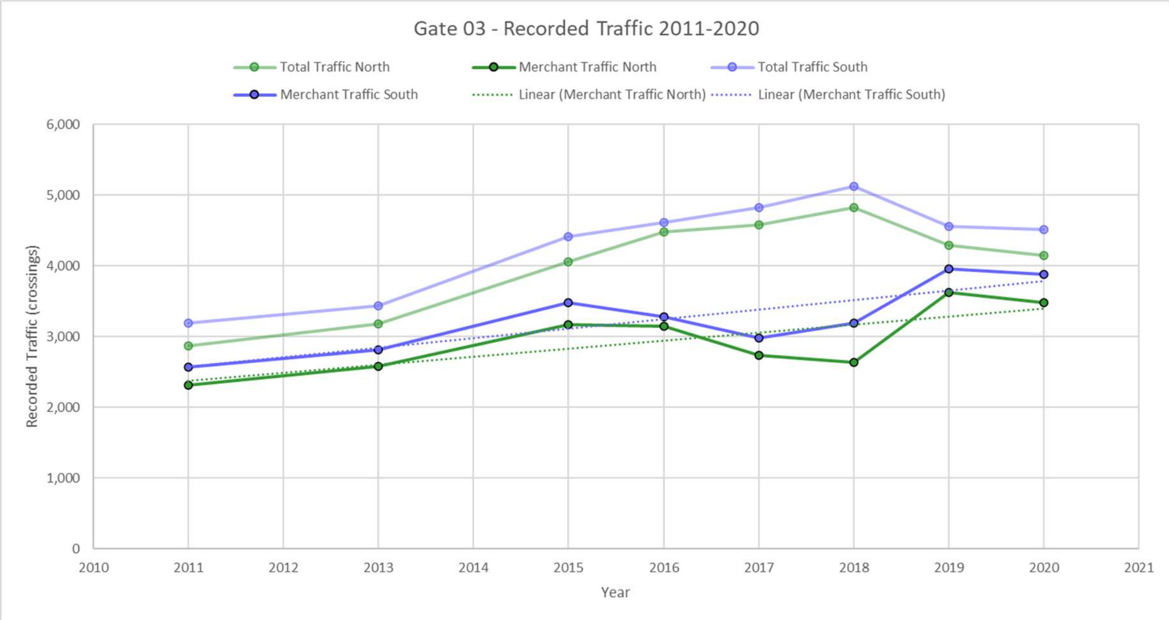

Figure 35: Time-series – Recoded traffic for Gate 03

Looking at the composition of the traffic picked up by Gate 03 (Figure 36), the prime merchant vessel users of the route are Ro-Ro/Pax and General Cargo vessels. Whilst the annual traffic of the latter appears to fluctuate through the last decade, there is a steadily increasing trend in the number of crossings by ferries, in both directions. The first notable increase appears to have taken place in 2015, and the second in 2019. The 2019 increase was maintained in 2020 despite the pandemic.

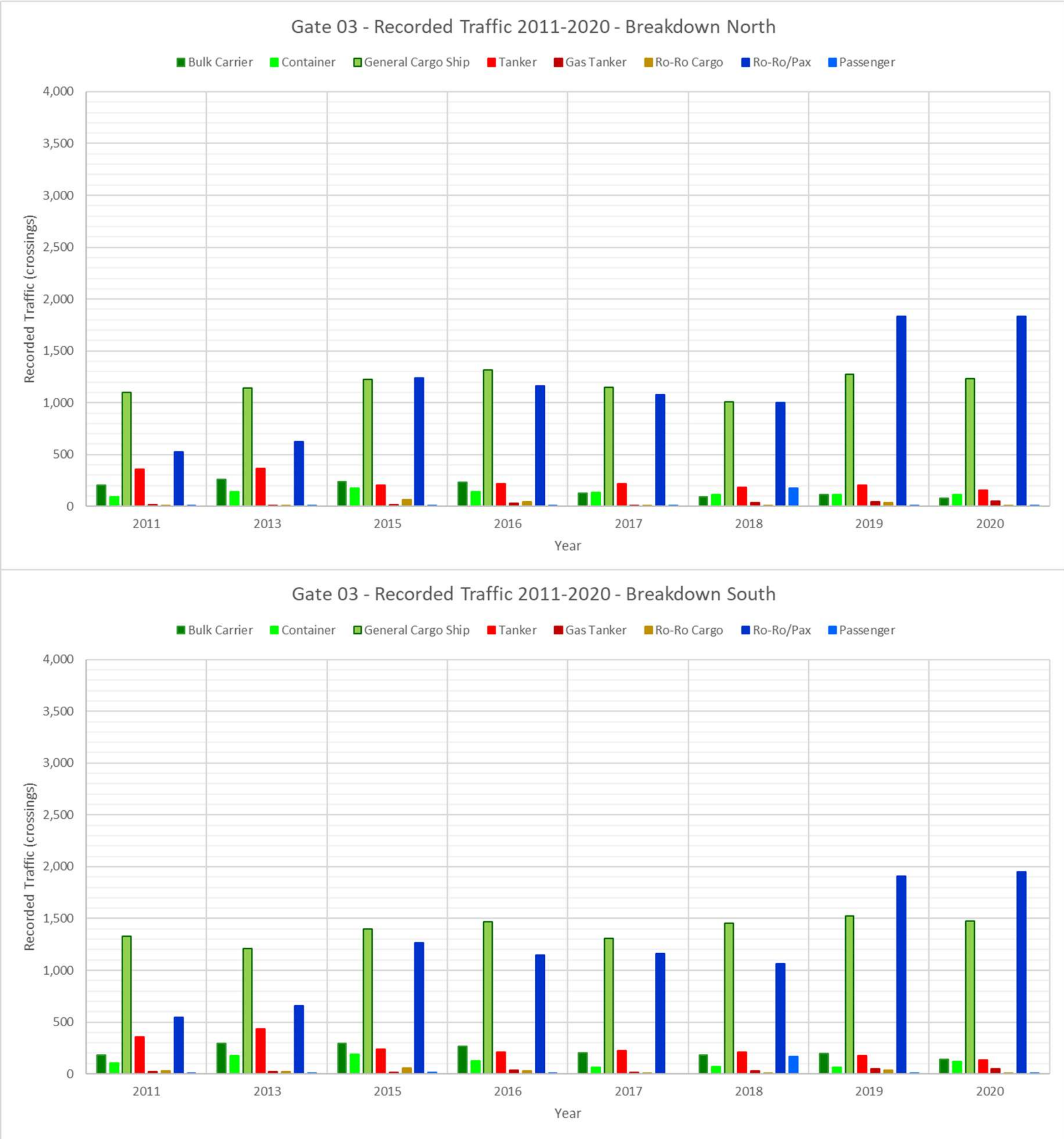

Figure 36: Traffic density and vessel size distribution through Gate 03

6.5 Gate 04 Report

The vessel count for Gate 04 is presented in Figure 37. The traffic noted shows a steady pattern for the most part of the last decade in terms of merchant and combined vessel traffic. There is a notable rise in traffic noted between 2011 and 2013, and then there are small fluctuations up to 2019. Then, there is a notable drop in traffic for 2020. This could be partly attributable to the effects of the pandemic, and part to the completion of the Wikinger and Arkona OWFs.

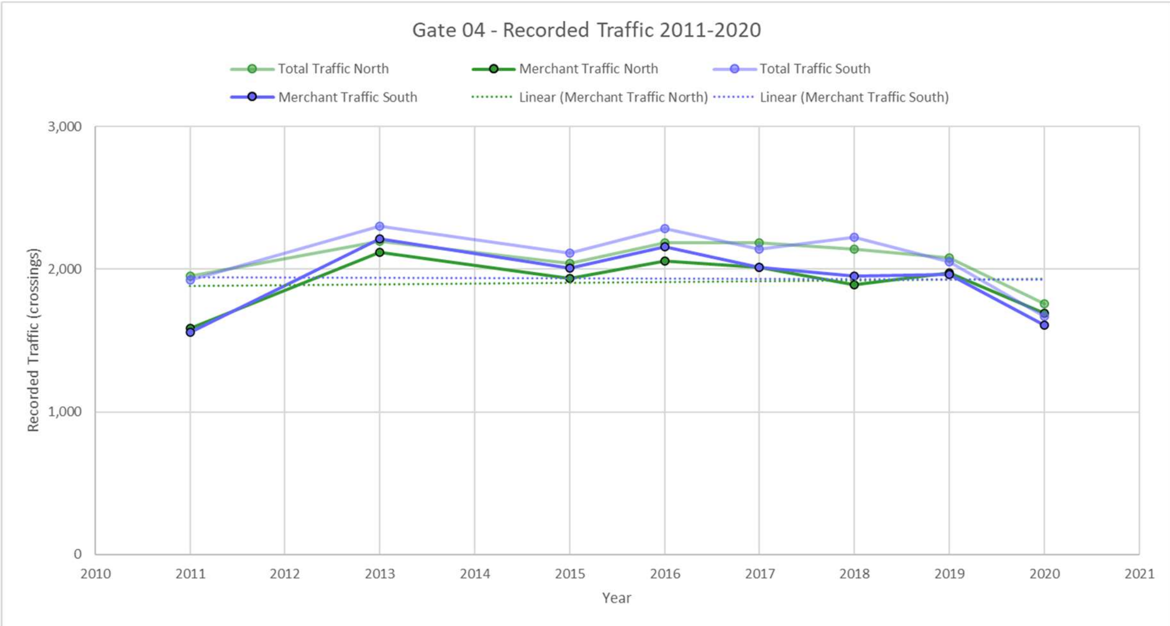

Figure 37: Time-series – Recoded traffic for Gate 04

In terms of the composition of merchant vessel traffic on the route, this is dominated by Ro-Ro/Pax vessels, servicing the ferry line between Swinoujscie and Ystad. As expected for the dominant vessel group, the fluctuation in annual Ferry traffic matches that of the total traffic. It is noted that most cargo traffic through this route comprises of General Cargo vessel traffic, with fewer tankers, and very sparse traffic from container and bulk carriers.

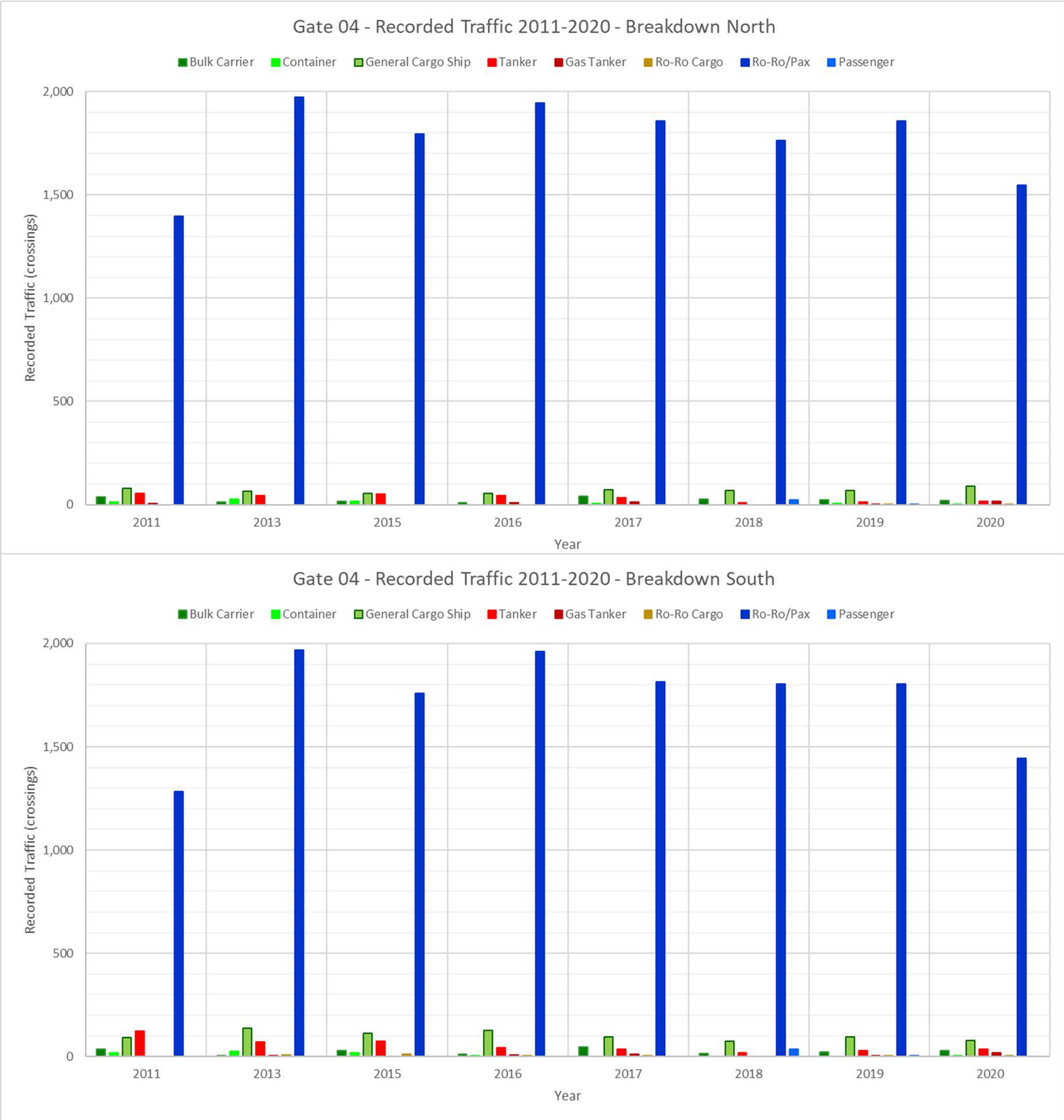

Figure 38: Traffic density and vessel size distribution through Gate 04

6.6 Gate 05 Report

The vessel count for Gate 05 is presented in Figure 39. This gate corresponds to the traffic through TSS Adlergrund. The traffic on this route shows an increasing trend in both directions over the last decade. There is a notable rise in traffic noted between 2011 and 2013, which is followed by a period of small fluctuations until 2016. Then traffic figures appear to drop for 2017, stabilise in 2018, and then increase steeply in 2019. The increase noted between 2018 and 2019 is steeper in the total numbers, suggesting the introduction of a higher proportion of work or other vessels on the route compared to that of cargo vessels.

Then, there is a notable drop in total traffic for 2020, the year of the pandemic. This drop appears to be exclusive to non-merchant vessels, as merchant (cargo and Pax) traffic appears to increase for 2020.

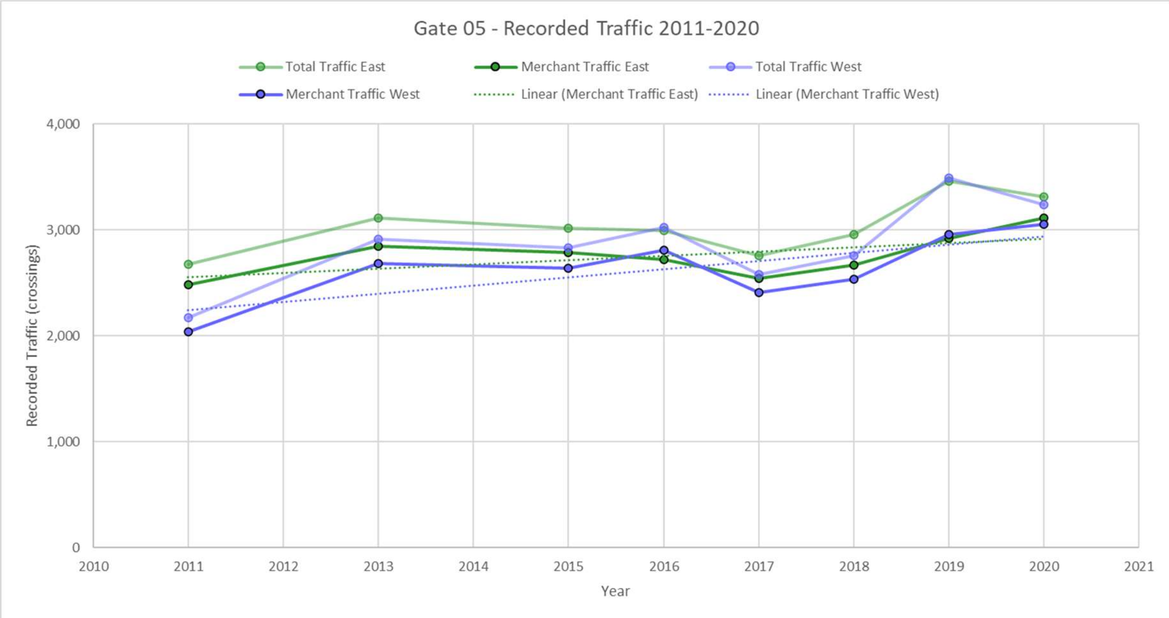

Figure 39: Time-series – Recoded traffic for Gate 05

General Cargo and container traffic are the main users of this route, with the trends of this traffic dictating the overall trend for the route. The route is also getting notable tanker and bulk carrier traffic, with the former reducing substantially in the second half of the past decade (especially eastbound vessels), and the latter showing very small fluctuations throughout the time series considered.

Ro-Ro cargo vessels, as well as passenger carrying vessels, represent smaller contributors to the traffic on this route. This is most likely because this route is mainly servicing the ports of Gdynia and Gdansk, whilst it is more attractive for lorry and passenger traffic to use the shortest crossing to Swinoujscie and complete the journey on land.

The traffic density and vessel size distribution for gate 05 are presented in Figure 40 overleaf.

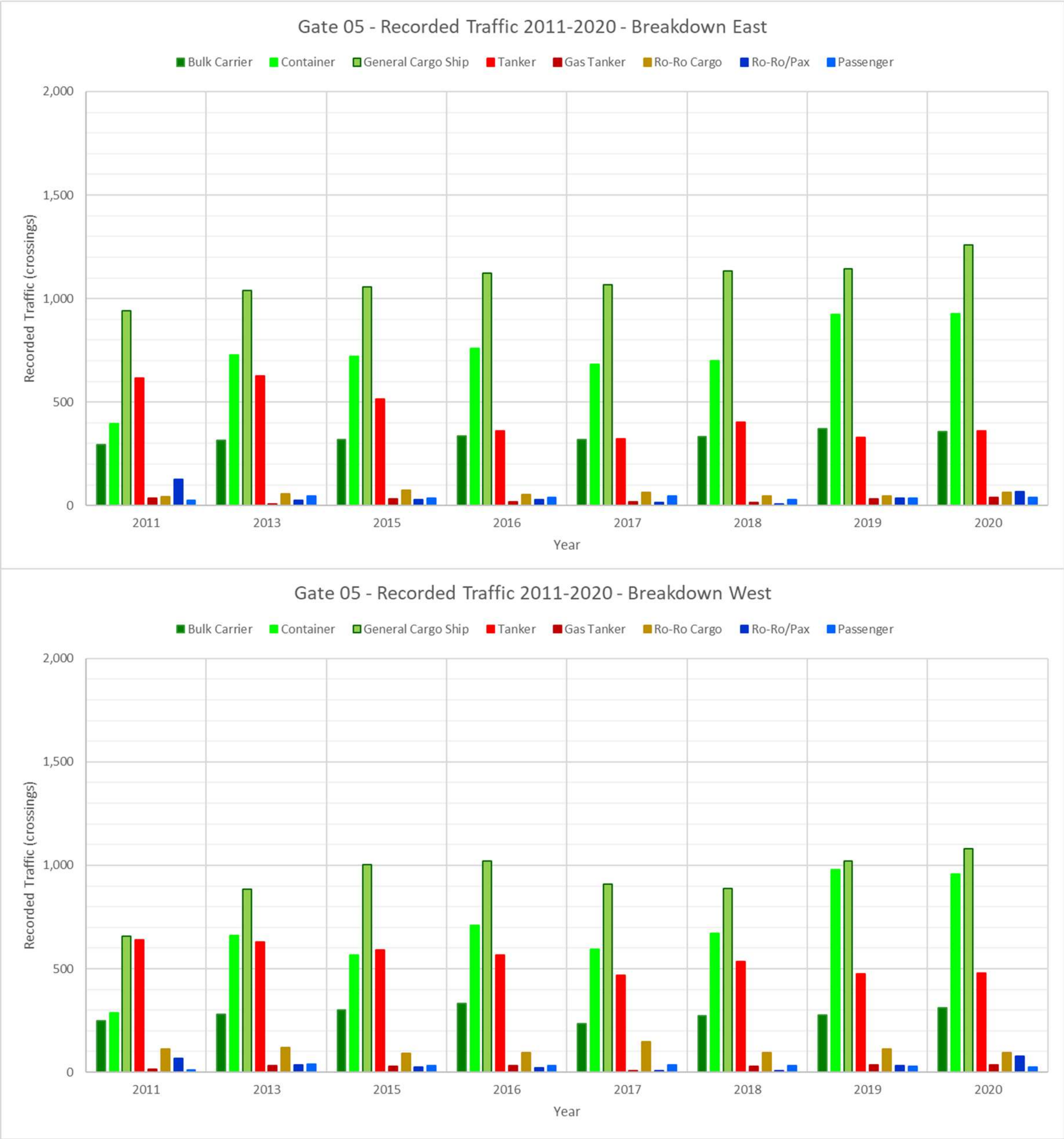

Figure 40: Traffic density and vessel size distribution through Gate 05

6.7 Gate 06 Report

The vessel count for Gate 06 is presented in Figure 41. This gate captures the traffic to the south of the EnBW Baltic 1 OWF. This is predominantly small vessel traffic, that uses the coastal corridor instead of the main routes. Part of this traffic is towards Stralsund, and part navigates around Rugen Island. The traffic on this route shows an increasing trend, though mild, in both directions over the last decade. This increase, however, is attributable to non-cargo traffic, as the latter shows a steady pattern with small, reducing fluctuations in the second half of the past decade.

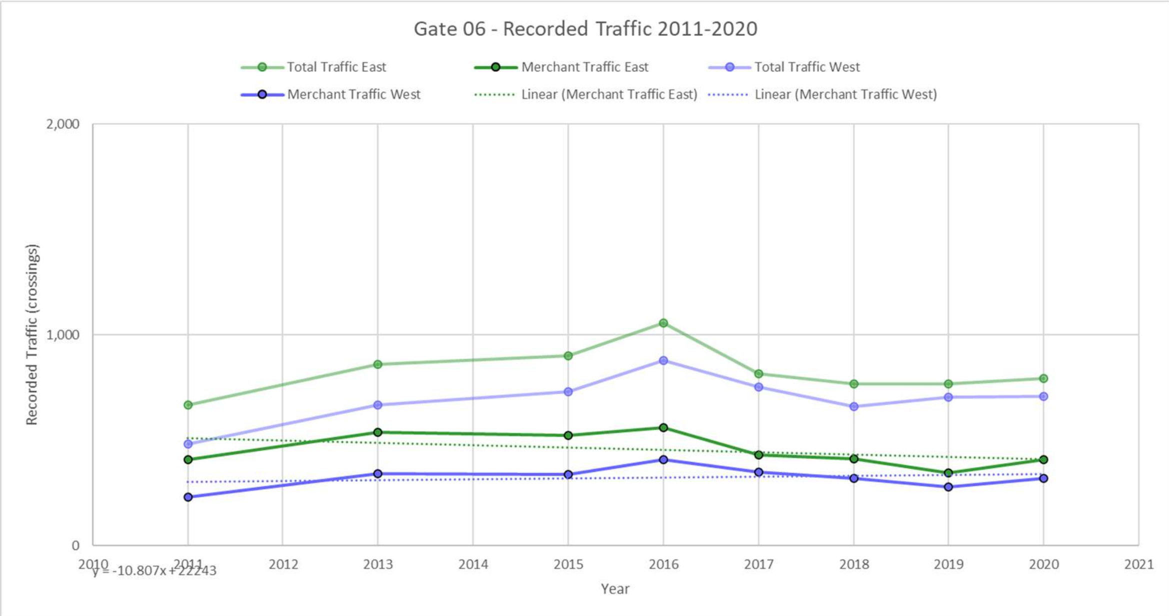

Figure 41: Time-series – Recoded traffic for Gate 06

The traffic on the route is mainly comprised of small General Cargo vessels, in both directions.

There is a smaller contribution to this traffic from small Tankers and Bulk Carriers, with other cargo vessel types not represented in the set.

The route is used predominantly eastbound.

The traffic density and vessel size distribution for gate 06 are presented in Figure 42 overleaf.

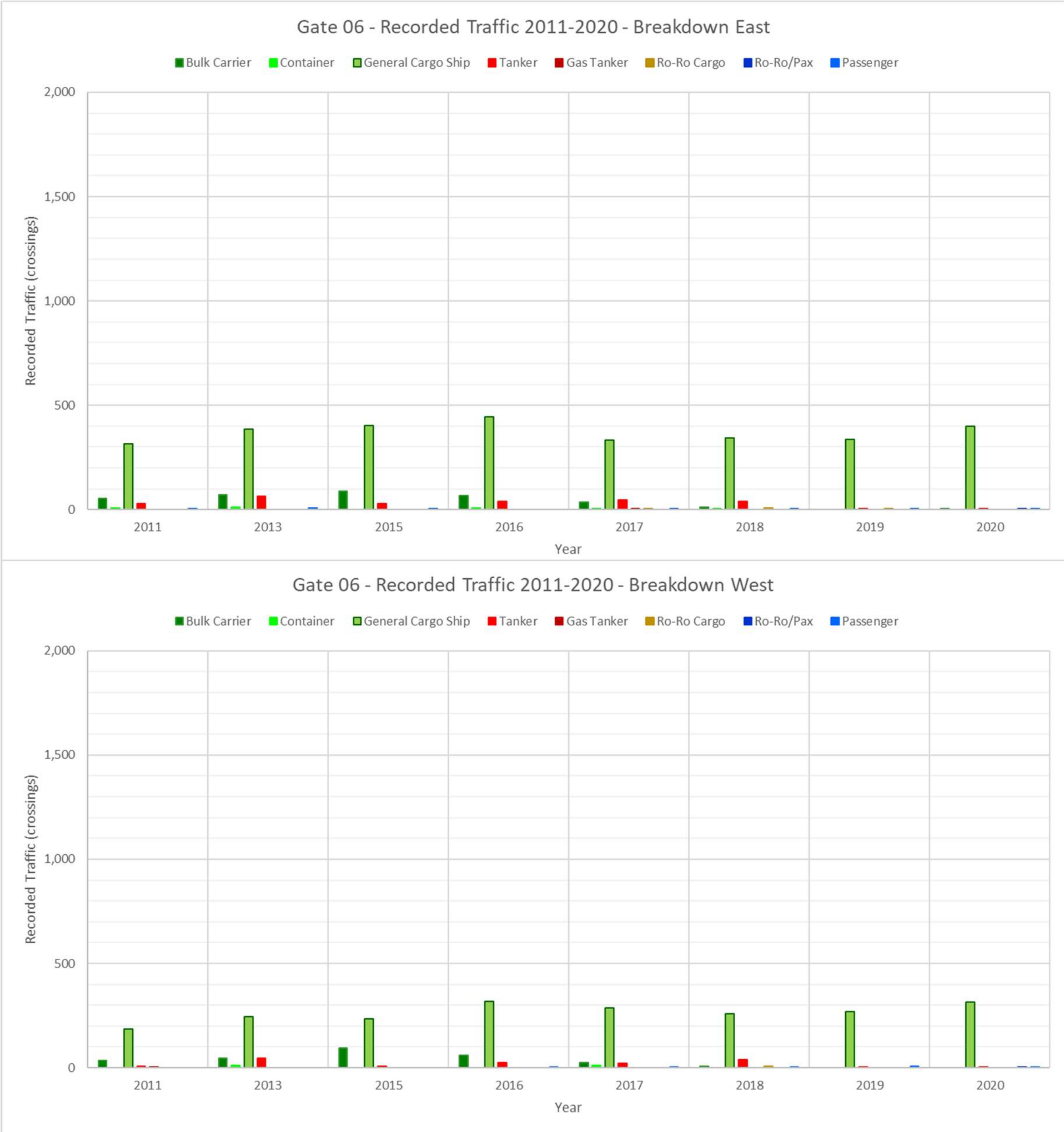

Figure 42: Traffic density and vessel size distribution through Gate 06

7 NORTH SEA TRAFFIC STUDY – BROADER AREA

This report aims to present the traffic patterns, identify the traffic corridors and their distribution, and provide an understanding of the current use of the maritime space in the study area considered for the North Sea.

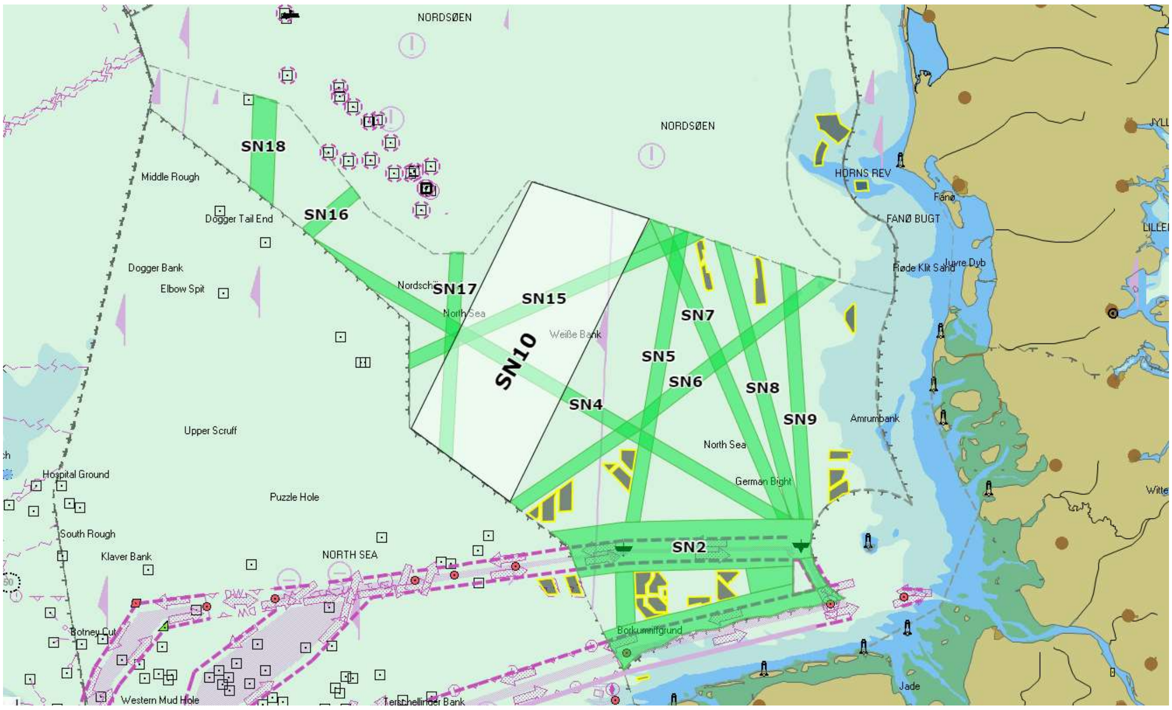

Figure 43: Traffic corridors according to German MSP

7.1 General (SE North Sea)

The traffic density plot that reflects the existing patterns in the north-eastern part of the North Sea in the area surrounding route SN 10 (the main access from the Atlantic and the

North Europe transport hubs into the Skagerrak and the Baltic Sea) is presented in Figure 44 below. The plot is based on 2019 and 2020 AIS data:

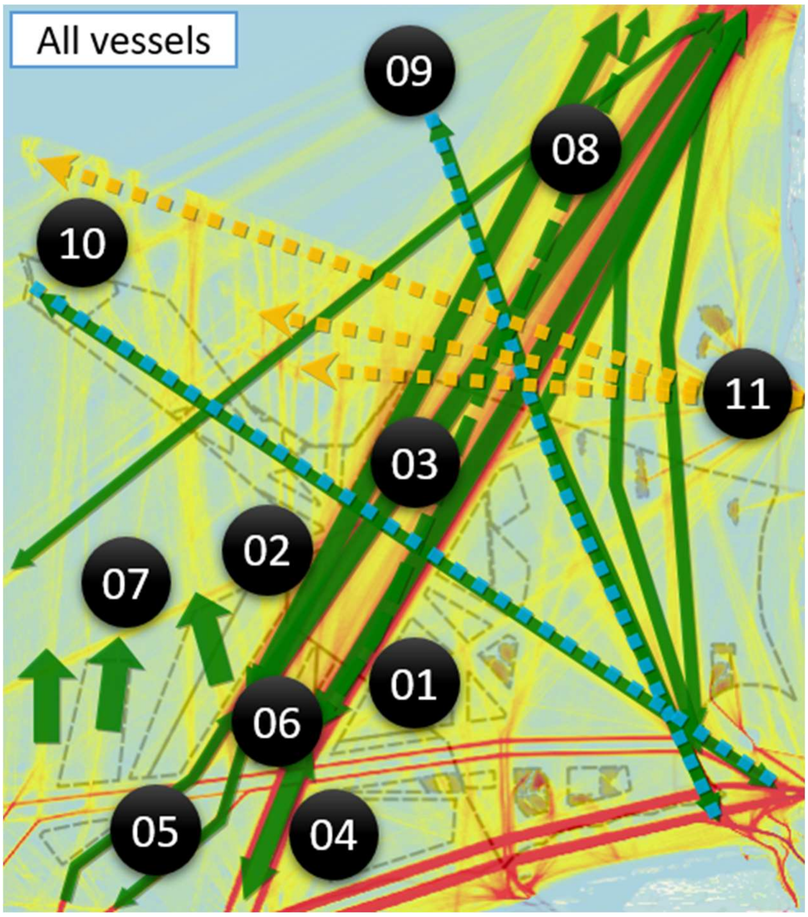

Figure 44: SE of North Sea Traffic, all vessel types – Density Plot 250m x 250m.

Route SN 10 is perceived to comprise two distinct traffic corridors. The eastern route, which typically carries General Cargo, Ro-Ro Cargo and small to medium Tankers (Note 01), and the western route which constitutes the deep-water route (Note 02) and carries larger Tanker and Bulk Carrier. There is a notional third, distinct spur route (Note 03) that connects the western crossing of TSS Off Friesland with the projection of route B which originates at the TSS Off Skagen and adjoins the German waters at the northern part of the SN10.

The eastern crossing of TSS Off Friesland, which is the continuation of the TSS Vlieland North, represents the traffic bounding the main hubs along the Belgian and Dutch coasts. (Note 04), whilst the western crossing on TTS Off Friesland coincides with the flow of shipping traffic transiting the Channel, the southern ports of the British Islands and the vessels which were transiting the mandatory tanker route from North of Hinder and those that navigate the deep-water route west Off Friesland (Note 05). Vessels from the latter that do not intend to proceed along the deep-water route in Danish waters (Route A) and are headed to the Skaggerak, opt for the shortest passage gradually spurring to the east as they cross route SN 10. This, combined with the vessels proceeding to the Northern Sea

Route or towards hubs located in Norway, coming TSS Off Texer divert westerly (Note 07), creates an area at the southern end of SN 10 where traffic is crossing and merging (Note 06).

At the north-western end of SN 10, there is a second notional spur corridor forming, with vessels leaving the Off Skagen deep-water route projection to join the eastern branch of the SN10 route (Note 08). Vessels appear to join the eastern route as early as the intersection with route SN4 or as late as the southern end of SN 10.

Route SN 10 within the German jurisdiction is crossed by two main routes out of the ports of Hamburg and Bremerhaven. The track heading NNW is Route SN 7, which carries traffic through the German Bight towards the Nordic areas (Note 09). Part of this traffic joins Route SN 10 to/from Skagerrak, whilst a small part of this traffic crosses to the North of the Danish offshore installations to head towards the Northern Sea Route. The second (Note 10) is of far lesser traffic volumes and follows Route SN 4 crossing the main route SN 10 almost at right angles, carrying traffic headed towards the Northern Sea Route, or the British Islands.

A further significant crossing point to Route SN 10, occurs at the boundary between Danish and German Jurisdictions, and to its immediate north (Note 11), where vessels in/out bound Esbjerg cross the main route to serve the Danish offshore installations and western destinations to SN 10.

7.2 Merchant traffic

Merchant vessel traffic typically uses the primary routes described in the general section, however, there are also secondary corridors that are of significance to this traffic. These are presented in Figure 45 overleaf.

The point annotated as 12 on the figure, presents the point where traffic from the Weser and Elbe River merges before following their intended courses to the north-west and north, or the west via TSS North Off Friesland or TSS Terschelling – German Bight.

North-west-bound vessels, typically follow the routes denoted as 09 and 10 in Figure 44, discussed earlier. Traffic on these routes comprises predominantly Container and General Cargo Ships, with notable Bulk Carrier and Tanker traffic.

North-bound vessels, use three distinct routes to navigate to the North from the German ports of the Elbe. The westernmost aligned route (Note 13) uses the SN 7 corridor until the area just before crossing the SN 10 east branch, where vessels veer to the east to join the latter. The main users of this route appear to be Bulk Carriers and General Cargo Ships.

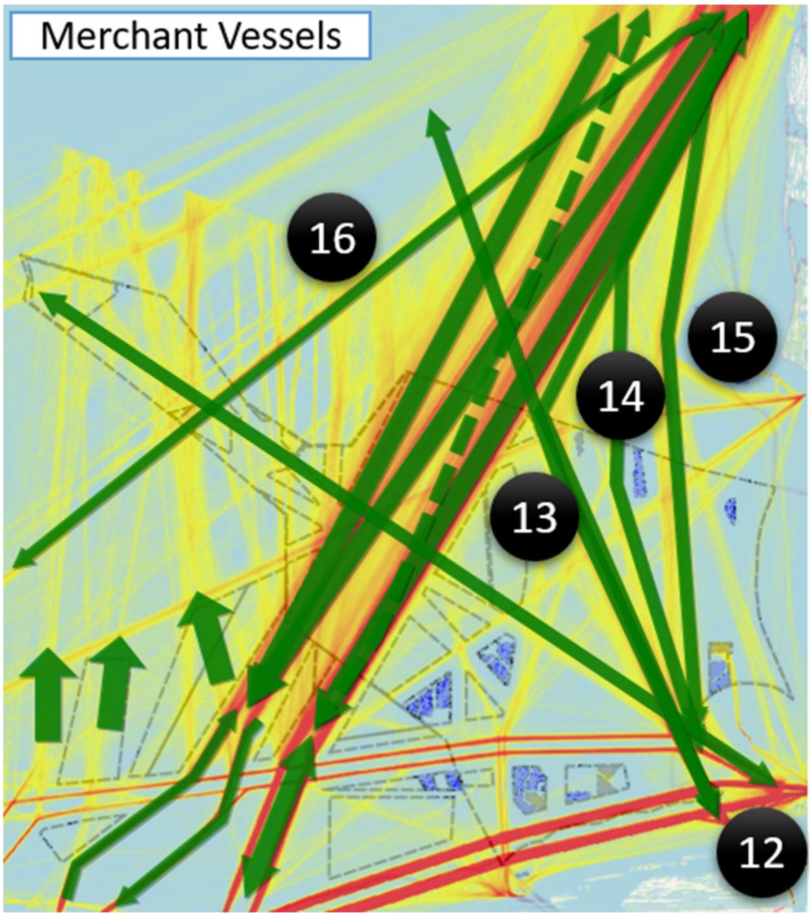

Figure 45: SE of North Sea Traffic, merchant vessels – Density Plot 250m x 250m.

To the east of the former, between OWFs Sandbank and Dansk Tysk, a second N-S route is running, aligned with SN 08 (Note 14). This route is trafficked less compared to that of SN 07 and is typically used by smaller vessels, with General Cargo Ships being the primary user.

The third N-S route, to the east of OWF Dan Tysk (Note 15), is the one that carries the highest traffic volumes of the three. Route SN 09 is primarily used by Container and General Cargo Ships, and also sees substantial Ro-Ro Cargo traffic. This coastal route is the most direct to the north from the German Ports.

To the west of SN 10, there is a converging SW-NE route that joins SN 10 at the entrance to Skagerrak (Note 16), which carries traffic from the UK Ports of Hull and Immingham. Ro-Ro Cargo vessels are the predominant user of this route, whilst there is also substantial General Cargo Ship traffic noted.

7.3 Passenger traffic

Passenger vessel traffic is not a key contributor to vessel traffic in the area of the study. Most passenger traffic noted pertains to Cruise Ships operating out of Hamburg, with smaller passenger ferry traffic noted near the German coastal zone (see Figure 46).

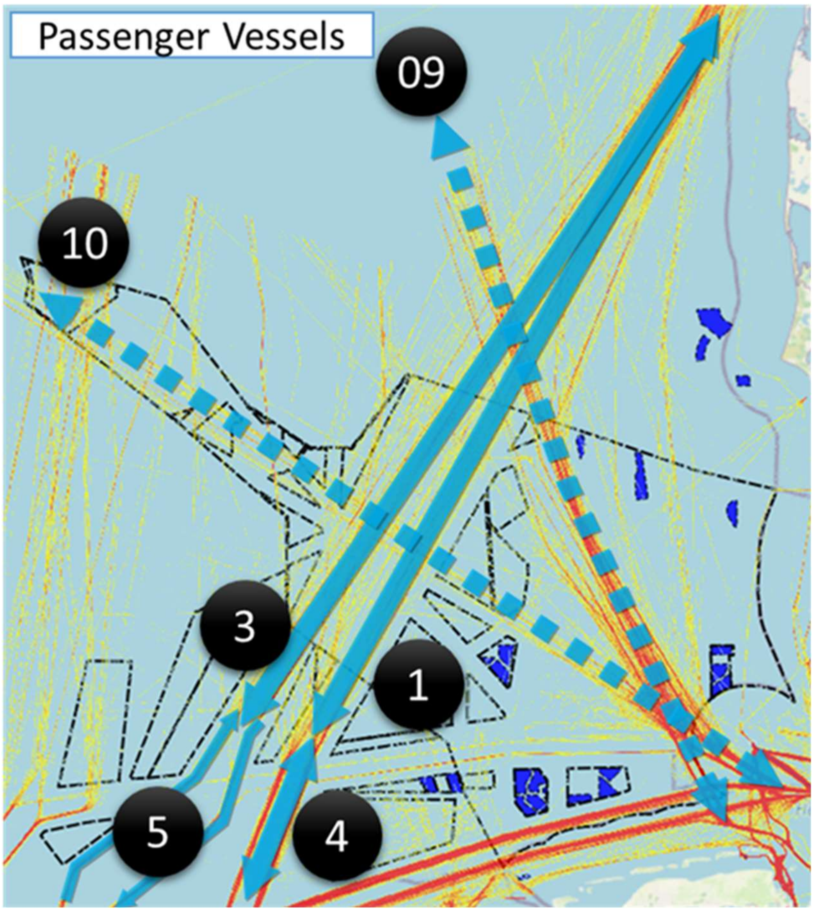

Figure 46: SE of North Sea Traffic, passenger vessels – Density Plot 250m x 250m.

Passenger vessels typically use the same routes as described in the general section. Most traffic enters/leaves the area from the main route out of the Dutch hub ports of Ijmuiden and Rotterdam through TSS Off Vlieland (Note 04), and the southern end of the western route coincides with the end of the Channel route through TSS Off Friesland (Note 05). The latter veers way to the east once it joins SN 10, away from the deep-water route (Note 03), navigating the shortest distance to Skagerrak (to join Note 01 north).

Cruise ships also use route SN 7 (Note 09) towards the Norwegian coastline, and route SN 4 (Note 10) to navigate toward the central part of the North Sea.

7.4 Support vessel traffic

Support vessels operate heavily in the area of interest, although not directly using route SN 10 in large volumes. Support vessels typically operate out of regional project-home ports, to the offshore facilities they serve and back, on frequent repeatable patterns. The exception to this relates to the tracks noted at the southern end of Figure 47, where the relevant traffic coincides with the main merchant traffic corridors. These tracks, however, most likely correspond to mobilisation journeys from the vessels' base ports (usually in the Netherlands or Belgium) to project ports.

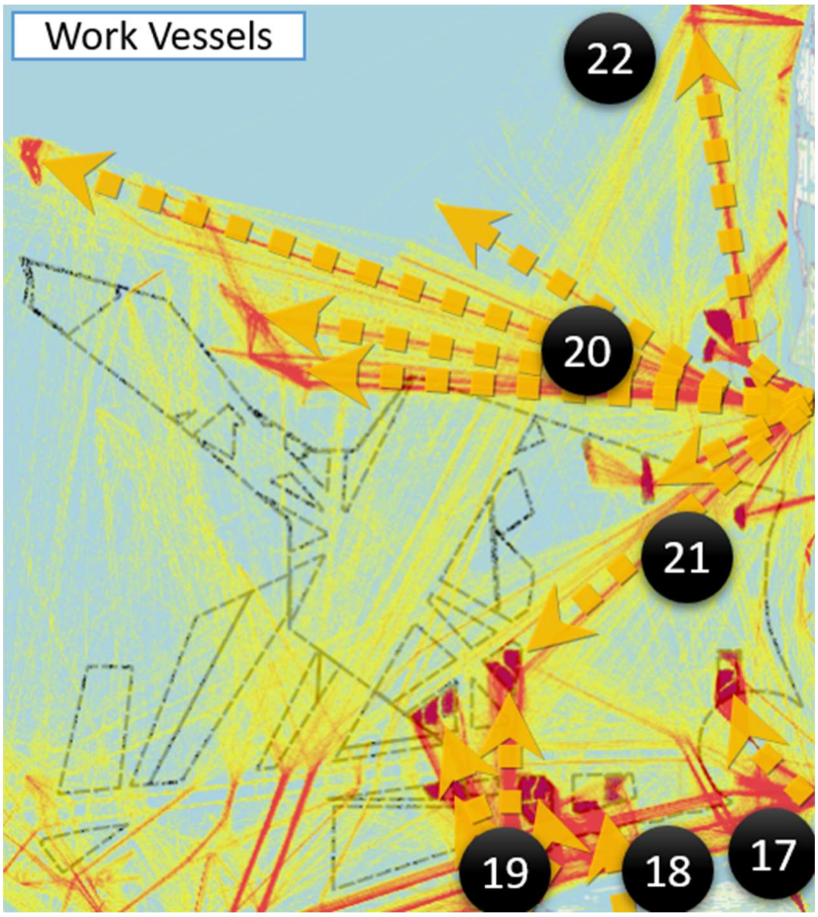

Figure 47: NE of North Sea Traffic, Support vessels – Density Plot 250m x 250m.

Note 17 shows Service Vessel traffic out of Cuxhaven and Helgoland to the OWFs within development area EN 04. OWFs within the development area EN 03 are typically served by vessels operating from Norddeich and Norderney (Note 18), whilst all other existing developments of the southern part of the German Bight (incl. EN 02, EN 06, EN 08) are serviced by vessels operating out of the aforementioned two ports, as well as Emden and Eemshaven in the Netherlands (Note 19).

Key routes operated by Service Vessels also originate from the Danish port of Esbjerg. The main routes are associated with the Danish offshore Oil & Gas developments to the west of Route SN 10 (Note 20). The safe accommodation and consolidation of these routes into a single crossing route as the future German and Danish MSPs materialise will need to be addressed in the future.

OWFs in the northern part of the German jurisdiction are typically served out of Esbjerg (Note 21).

Additional service vessel traffic is also noted out of Esbjerg to the north (Note 22). This traffic may potentially be traffic navigating towards the Baltic Sea or vessels associated with the development of the Danish energy island (although traffic to the latter is understood to originate primarily from Hvide Sande.

7.5 Fishing vessel traffic

Reiterating the earlier statement for the relevant section in the Baltic Sea, the assessment of fishing fleets is always a challenging task since the AIS data available cannot include the entirety of the fishing vessels, being these commercial or recreational and not mandatorily compliant with AIS.

The current model includes a total of 929 vessels reported as ‘fishing’ in two years’ worth of data. The areas of transit for these vessels are presented in Figure 48.

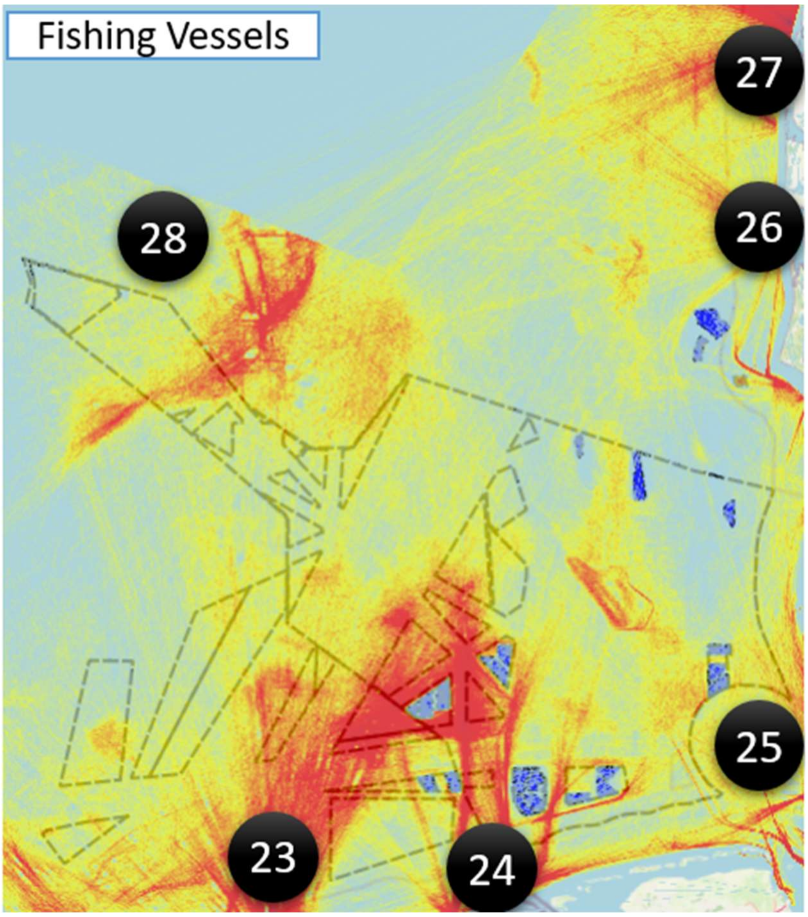

Figure 48: NE of North Sea Traffic, Fishing vessels – Density Plot 250m x 250m.

Based on the vessels categorized as fishing that appear in the dataset, the plots of these units only appear to use the area of main traffic corridors in the southern part of the model. Fishing vessels operating out of the western coast of the Netherlands were noted to use the area between TSS Off Vlieland and the southern end of SN 10 (Note 23), and part of the space between the existing OWFs of the southern German Bight.

Vessels from the northern Dutch and north-western German coastline, are noted to transit in the space between the existing OWFs, using routes SN 3 and SN 11 (Note 24). Limited transit activity from Fishing vessels is also noted out of the approach to Hamburg, in the area around and to the NW of Helgoland (Note 25).

Further north, off the Danish coast, Fishing vessels appear to operate out of Hvide Sande (Note 26) and Thyboron (Note 27).

Last, the transit of fishing vessels was noted around and to the west of the Danish offshore installations, most likely attributable to vessels from the UK east coast (Note 28).

To relate fishing traffic to fishing activity, ABL performed a speed analysis and plotted the density diagram for fishing vessel traffic at a speed of ≤ 5 kts. The result of this assessment is presented in Figure 49.

Figure 49: NE of North Sea Fishing Activity, Density Plot 250m x 250m.

Concerning route SN 10, it can be seen that fishing activity is present at the southern end of the route, within the Dutch jurisdiction and around the area occupied by offshore installations (Note 29).

Within the German jurisdiction, fishing activity appears to take place at the southern part of the eastern route, at and to the west of development areas EN 09, EN 10, and EN 12 (Note 30). Further North, fishing activity is also noted across route SN 10, at the location of, and including development area EN 13 (Note 31). This activity appears to extend within the Danish jurisdiction, at the southern tip of the Vest Nordsoen Island area.

Further north, within the Danish jurisdiction, fishing activity appears to take place at the eastern part of route SN 10, off the Ringkobing Fjord (Note 32).

8 NORTH SEA TRAFFIC STUDY – AREA OF INTEREST FOR OWF DEVELOPMENTS

8.1 Route SN 10 within the German Jurisdiction

The North Sea part of the study is focused on making the best use of the area of route SN 10, by exploring the potential for offshore wind developments within its footprint. Two such development options are considered for the German MSP (Figure 50).

The important parameters to consider from navigational traffic and risk perspective in assessing the relevant options are the consistency, volume, and distribution of traffic on route SN 10, as well as the crossing and re-directed routes that will result from the implementation of the Danish, Dutch, and German MSPs.

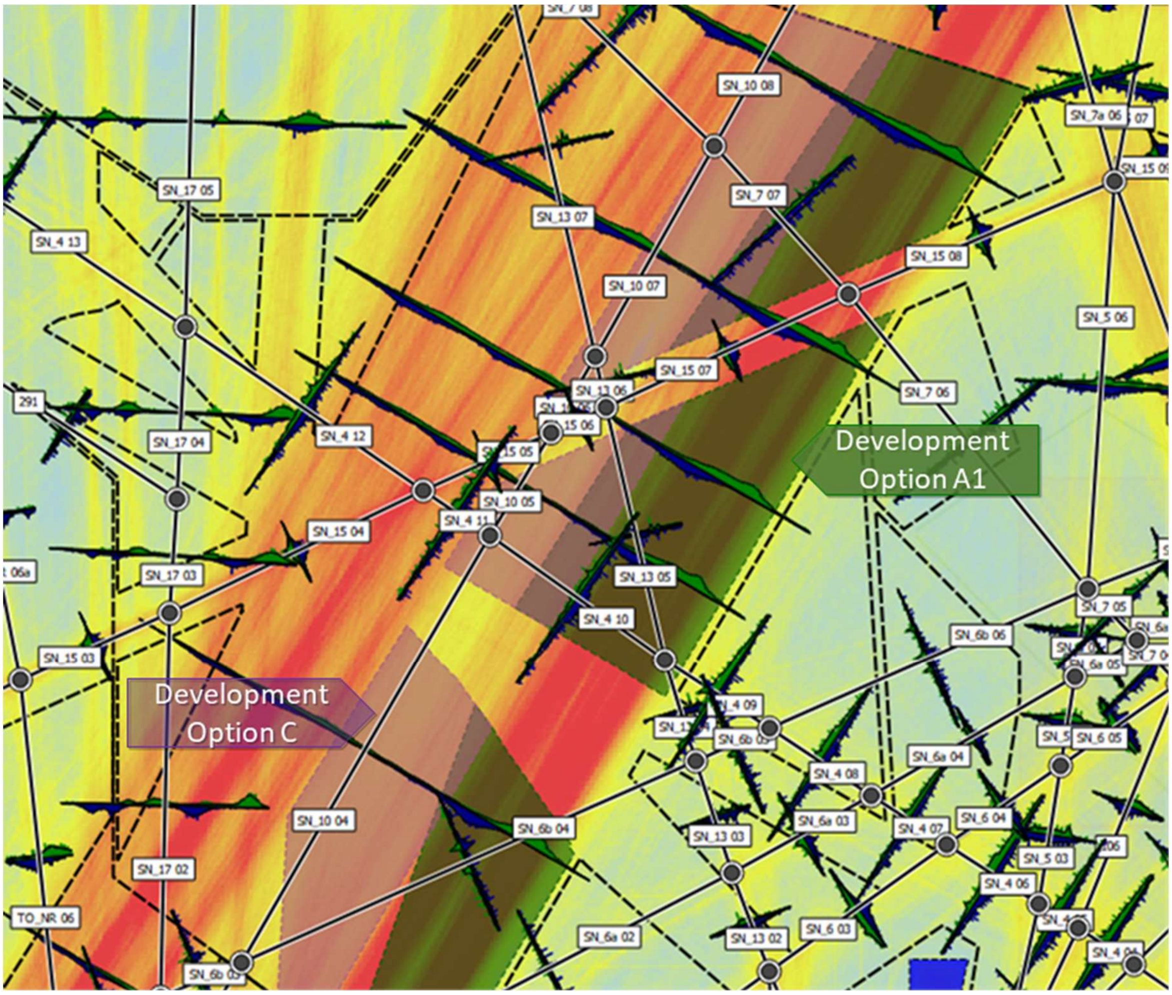

Figure 50: Focus area for study on SN 10, showing two options considered for additional development

Traffic on route SN 10 is the key influencing factor in the area, and thus its quantification is of utmost importance to the study. Earlier in the report, ABL commented on the challenges associated with estimating traffic volumes concerning AIS data coverage on route SN 10, and the mitigative approach used in this study.

The results obtained, show that the heaviest traffic in the area of interest is noted at the southern boundary of the German jurisdiction (Gate_2 in Figure 51).

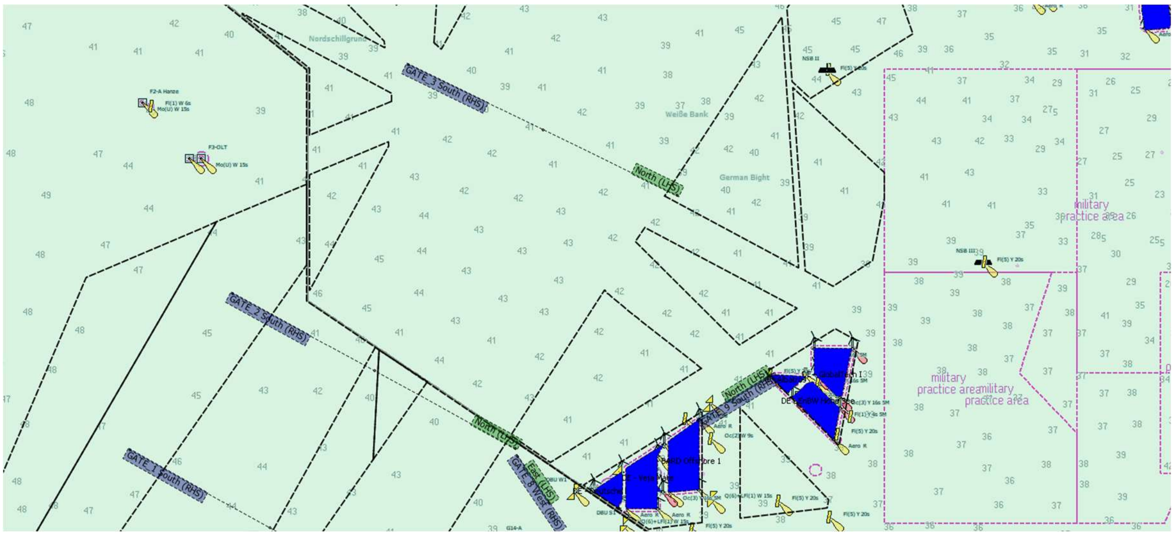

Figure 51: Counting lines at the southern part of the German EEZ

For the southern part of the German Jurisdiction, the analysis undertaken indicates northbound annual traffic volumes of 11,574 vessels and southbound annual traffic volumes of 10,986 vessels. The qualitative characteristics of this traffic are presented in Figure 52.

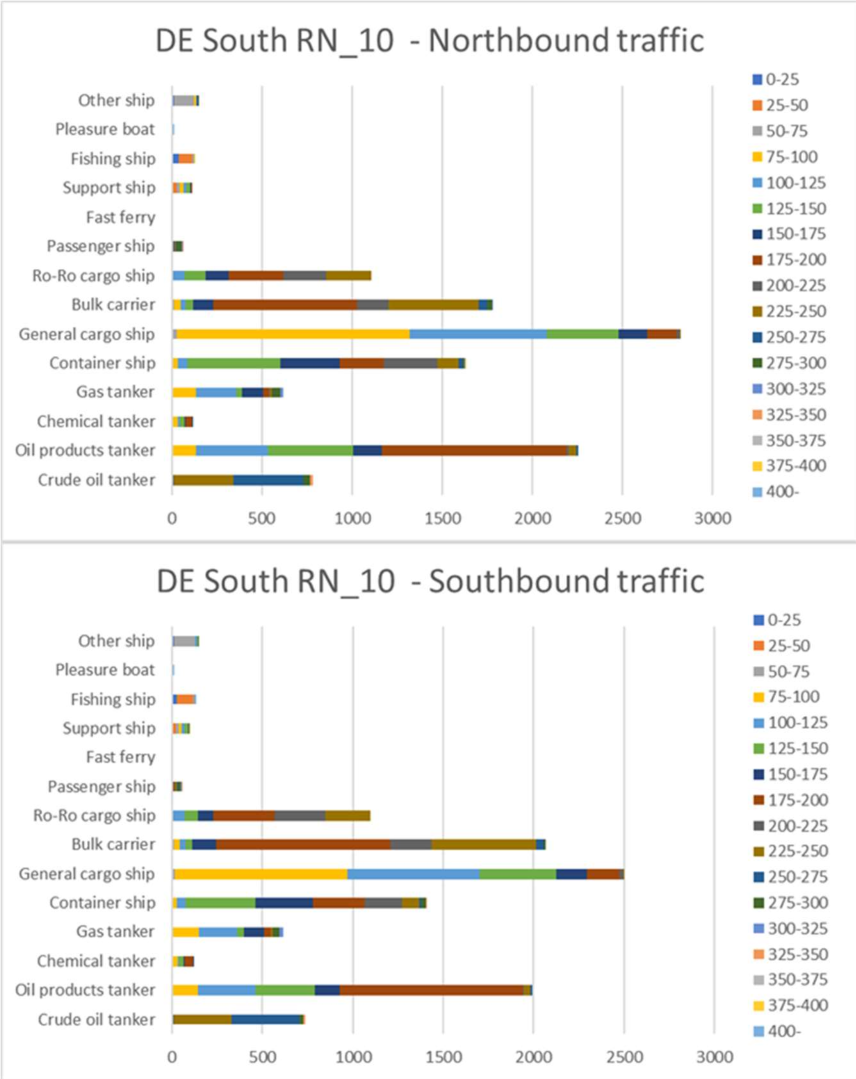

Figure 52: Traffic density and vessel size distribution on the southern part of SN 10, German EEZ

The primary users of route SN 10 are General Cargo Ships, Bulk Carriers and Tankers. The largest such assets typically use the western, deep-water route. There is also significant Container Ship, and Ro-Ro cargo traffic, whilst the rest of the vessel types are represented in much lower volumes.

Looking at the traffic on route SN 10 further to the north, in the area of the crossing routes SN 4 and SN 15, the analysis indicates reduced northbound traffic volumes. Northbound annual traffic volumes reduce to 8,825 vessels (-2,479), whilst southbound annual traffic volumes slightly increase to 11,615 vessels (+629). Part of this traffic change is justifiable by the vessels noted leaving/joining route SN 10 to/from the west for the northern route, and the vessels leaving/joining the route to/from Esbjerg on route SN 6, part of it is attributable to the conversion of AIS data into trips. This is a combined effect of poor coverage in the area and the fact that some vessels do not navigate the space in a conventional linear pattern. It is however believed that the reported numbers constitute a better, more realistic figure compared to ABL's previous study. The qualitative characteristics of this traffic are presented in Figure 53.

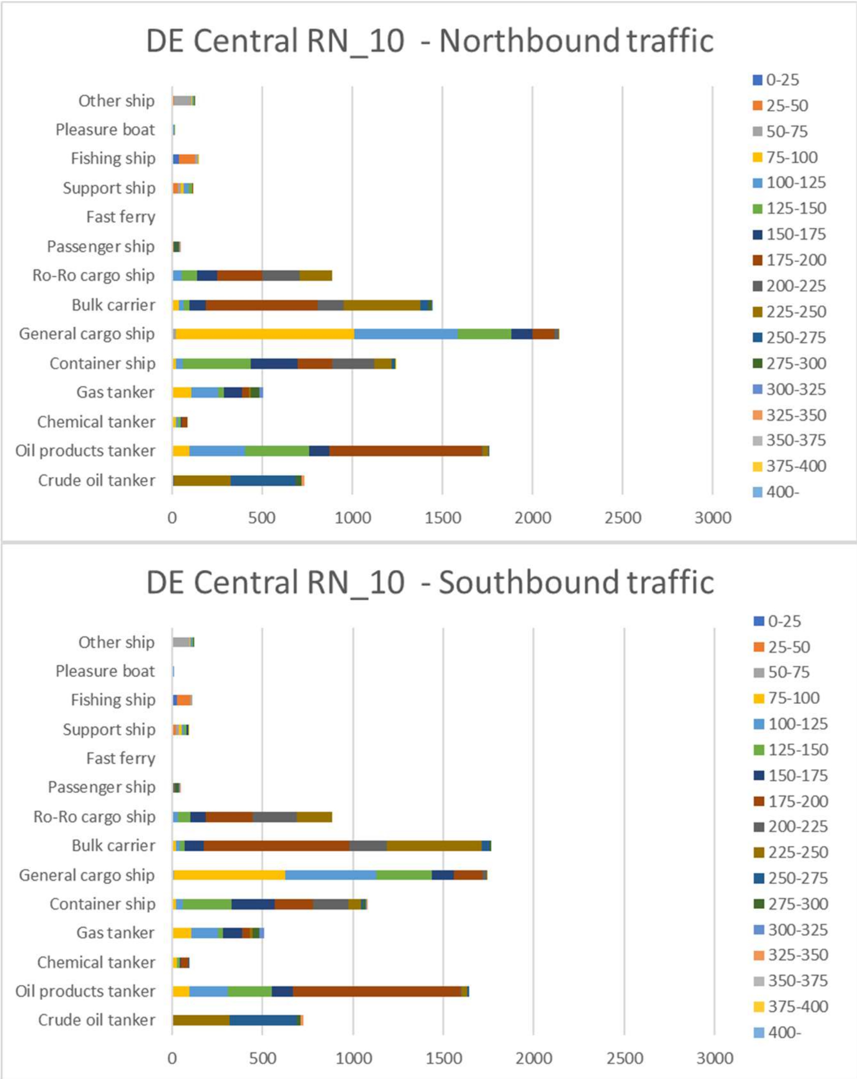

Figure 53: Traffic density and vessel size distribution on the central part of SN 10, German EEZ

In the northern part of the German jurisdiction, traffic volumes are reported to increase. Northbound annual traffic volumes increase to 11,615 vessels (+2790 – which is similar and slightly higher than the Northbound volume before the data irregularity), whilst southbound annual traffic volumes also increase, but to a lesser extent, to 11,738 vessels (+123). This can be partially attributed to contributing traffic from leg SN 13; however, the majority of this increment is attributed to the improvement in coverage offered by the additional AIS data provided by the DMA. The qualitative characteristics of the traffic at the northern part of route SN 10 are presented in Figure 54.

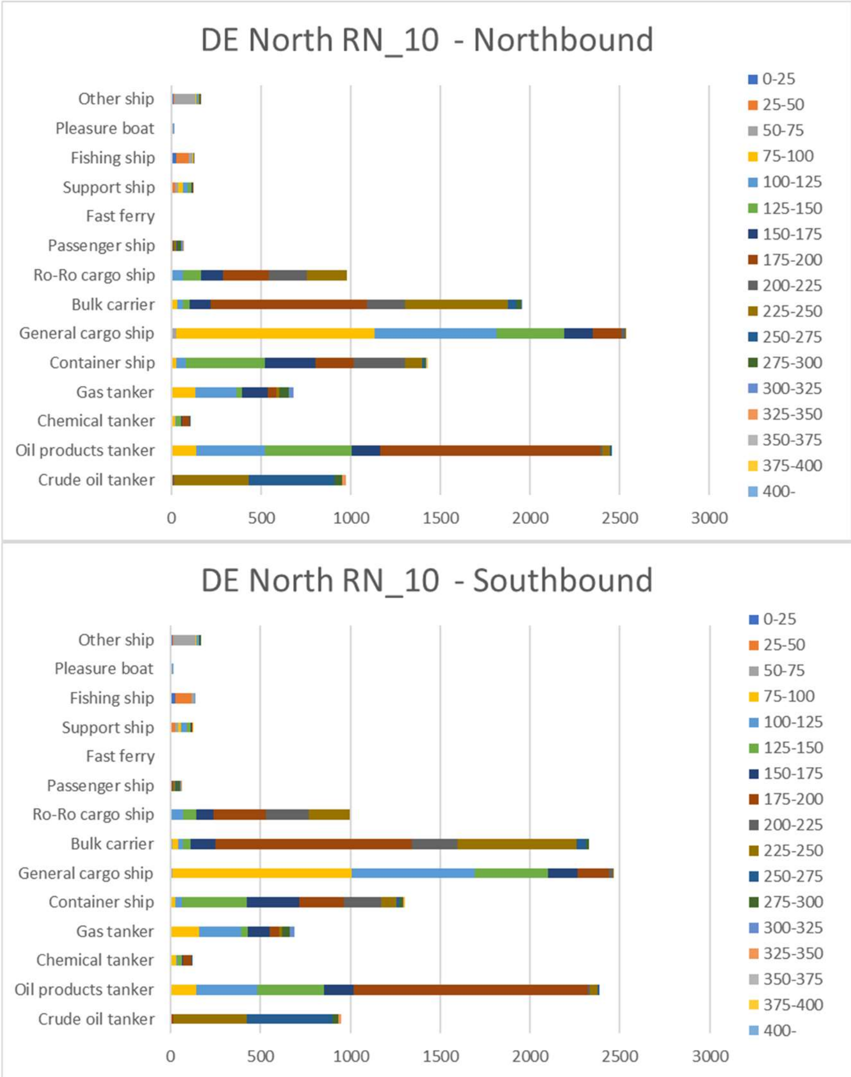

Figure 54: Traffic density and vessel size distribution in the northern part of SN 10, German EEZ

The primary users at this part of SN 10, remain General Cargo Ships, Bulk Carriers and Tankers, supplemented by significant Container Ship, and Ro-Ro cargo traffic. Non-cargo assets remain in small numbers, with little volumes in terms of overall traffic.

8.2 Future blockage of Route SN 6 within the German Jurisdiction

In the course of the present study, ABL was informed that the option for the development of OW at an area to the SE of route SN 10, within the Dutch jurisdiction, that effectively blocks route SN 6, is now conclusive.

ABL's understanding is that in the development of the German MSP, route SN 6 has been provisioned as a corridor through the OW development areas, to accommodate the traffic that assumes a direct route from/to the southern end of route SN 10 to/from Esbjerg. Currently, this traffic does not follow a defined corridor, as the point along route SN 10 where the relevant vessels detach from or join the main route varies. This is reliant on whether the vessels joined the route through the eastern or western crossing of TSS North of Friesland or the UK coast. The relevant traffic can join or leave route SN 10 at the southern end of the route, or as far north as the crossing of route SN 4.

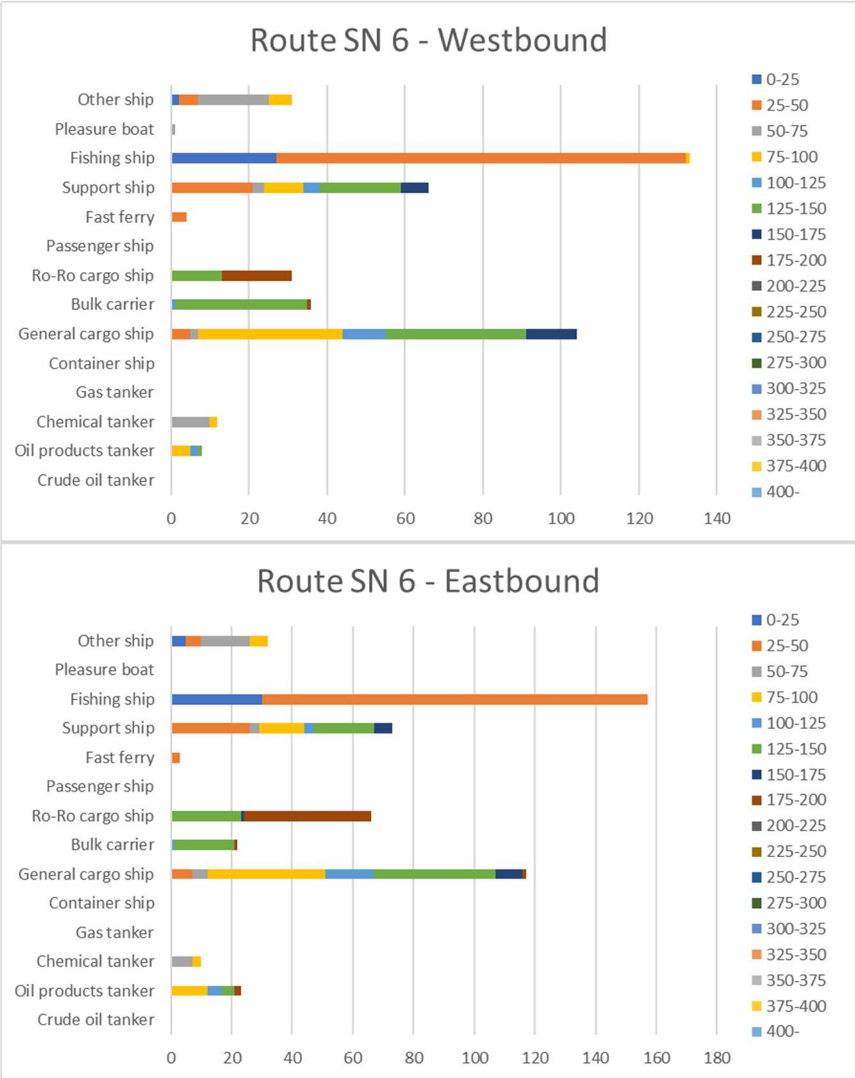

Figure 55: Traffic density and vessel size distribution of SN 6, German jurisdiction

Based on the analysis, the traffic corresponding to route SN 6, was found to comprise 503 annual vessel crossings to the east, and 426 annual vessel crossings to the west. The qualitative characteristics of the traffic relevant to route SN 6 are presented in Figure 55.

The analysis shows that the primary users of this route are Fishing vessels, General Cargo Ships, and Support Ships, i.e., the types of vessels associated with the construction, operation, and maintenance of offshore developments. Other notable users comprise Fishing vessels, limited however to the use of the SW part of the route, Ro-Ro Cargo, and Bulk Carrier vessels.

At the time of implementation of the Dutch MSP with the development of the relevant area at the SW corner of route SN 6, the relevant traffic will be staying on route SN 10, up to the point it intersects route SN 15, and then sail the SN 15 route to/from Esbjerg.

Based on the size classification of the vessels attributed to route SN 6, most of which are small, it is anticipated that based on the current layout of route SN 10, these vessels will be using the Eastern route.

8.3 Traffic diverting to the Northern Route

As discussed earlier in the report, the southern part of Route SN 10 primarily comprises traffic from:

a) The main route out of the Dutch hub ports of Ijmuiden and Rotterdam through TSS Off Vlieland.

b) The deep-water route through the two legs comprising TSS West Friesland.

A notable portion of the traffic in the area diverges from the two main routes comprising SN 10, and sails the open sea to the west of SN 10, to join the Northern Sea Route along the Norwegian coast. Because vessels detach/join both the western and eastern routes of SN 10, there is no clear corridor that this traffic follows, but it rather makes use of the available space. The vast majority of this traffic leaves the alignment of SN 10 south of the crossing of SN 4.

One way to view this traffic, which may be of the essence at the stage of implementation of the MSPs, is to look into the part of the traffic that is currently leaving/joining route SN 10 within the Dutch, and the German jurisdictions (see Figure 56).

Currently, the analysis notes 842 northbound vessels, and 1,103 southbound- vessels diverging from SN 10 within the Dutch jurisdiction. This includes the majority of the vessels originating from or heading towards the TSS West Friesland, and some of the southbound vessels towards TSS Off Vlieland.

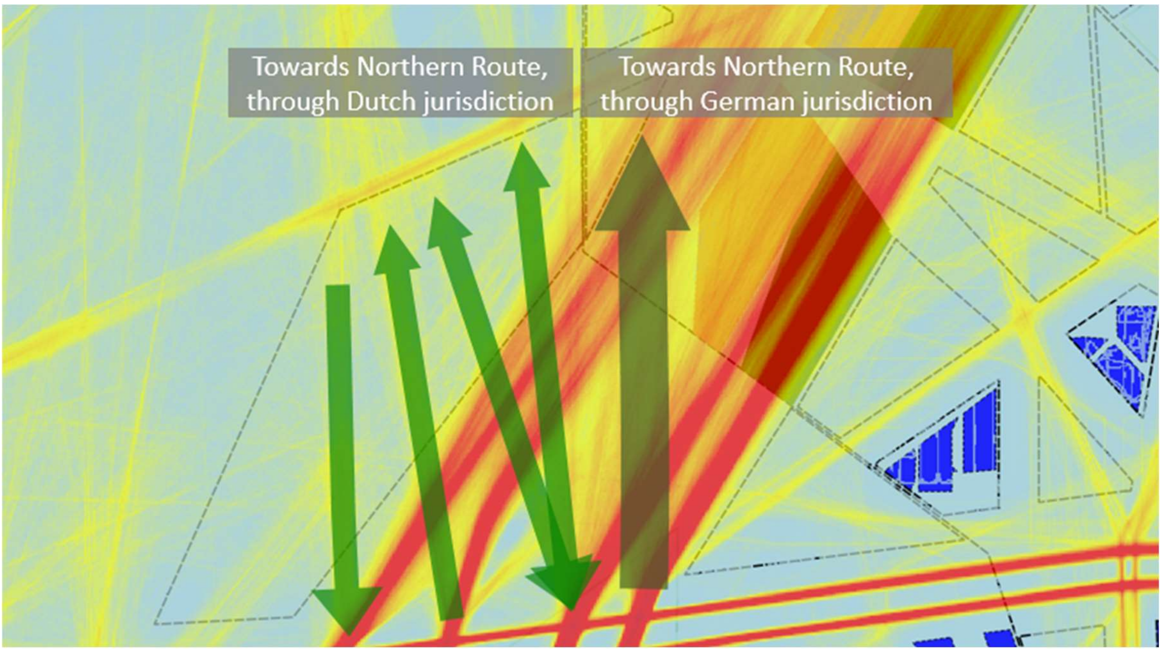

Figure 56: Traffic leaving SN 10 for the Northern Route

The remaining southbound vessels to Vlieland, as well as all northbound vessels from the latter, that diverge from the eastern route of SN 10, are leaving/joining SN 10 to join/returning from the Northern Sea Route through the German jurisdiction. This is equal to annual traffic volumes of 975 northbound, and 1,010 southbound.

With the implementation of the current MSPs, should the nominated area of the Dutch MSP to the west of SN 10 be developed in full, all relevant traffic will have to remain on SN 10, to detach through route SN 17 within the German jurisdiction. An alternative to that would be to allow a corridor between the Dutch development area and area EN 14 of the German MSP, as a second, relief route for the relevant traffic.

Traffic that is currently leaving/joining SN 10 within the German jurisdiction, will eventually be channelled through route SN 17 of the German MSP. For the traffic that currently leaves route SN 10 from the Dutch jurisdiction, it could be useful if a corridor was to be provisioned to transit from the eastern to the western route within SN 10 within the Dutch MSP.

8.4 Traffic around area EN 13

Development area EN 13 of the German MSP, is near the NE end of SN 10 within the German jurisdiction, at the boundaries with Denmark. The area is located to the east of the eastern branch of SN 10, at the crossing of SN 15 to Esbjerg. The majority of the development area is to the south of crossing route SN 15, however, there is a smaller segment, referred to as EN 13-North, that is at the junction between SN 10, SN 15, SN 5, and SN 7. Whilst the latter is much smaller in area than EN 13, its potential for development in OW will be considered in the study. The area of interest is presented in Figure 57.

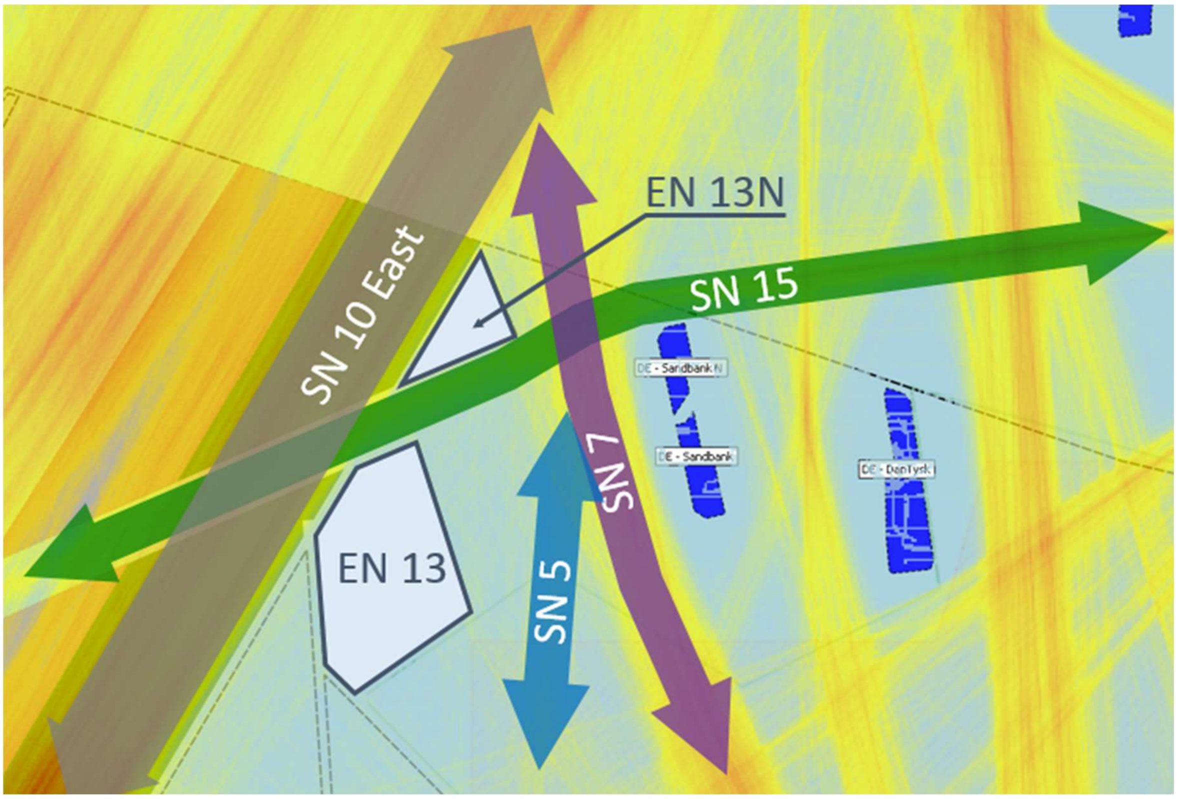

Figure 57: Traffic around development areas EN 13 and EN 13-North

The main traffic component in the area, is that of route SN 10, as presented in section 8.1.

Route SN 15 carries small amounts of traffic between the west and Esbjerg. Eastbound traffic noted in the model is of the order of 184 annual crossings and 180 annual westbound crossings. It is noted however that this number will increase with the implementation of the MSP, and the transfer of the traffic from SN 6 into SN 10 and eventually SN 15, as explained earlier (687 Eb. / 606 Wb.). The route is currently almost exclusively used by Ro-Ro Cargo vessels in both directions.

Routes SN 5 and SN 7, cross to the east of the area of interest and merge into SN 10 just north of area EN 13-N. Out of the two routes, SN 7 carries the most traffic, with SN 5 carrying approximately a quarter of the traffic volume of SN7.

Route SN 7 is the principal route for traffic between Hamburg and the Northern Sea Route, and also the main route for deep-draft vessels out of Hamburg and Bremerhaven to/from the deep-water route of SN 10. The analysis at the point of EN 13-N recorded 772 annual northbound crossings and 875 annual southbound crossings. This count includes all vessels based on the existing alignment of the routes.

The primary users of route SN 7 are noted to be Container Ships and Bulk Carriers, ranging in size from medium to very large. The route also sees notable traffic from small to medium-sized General Cargo Ships and Products Tankers. Also, smaller volumes of Ro-Ro Cargo vessels and Crude Oil Tankers, with little traffic noted for other user types. The qualitative characteristics of the traffic on route SN 7 are presented in Figure 58.

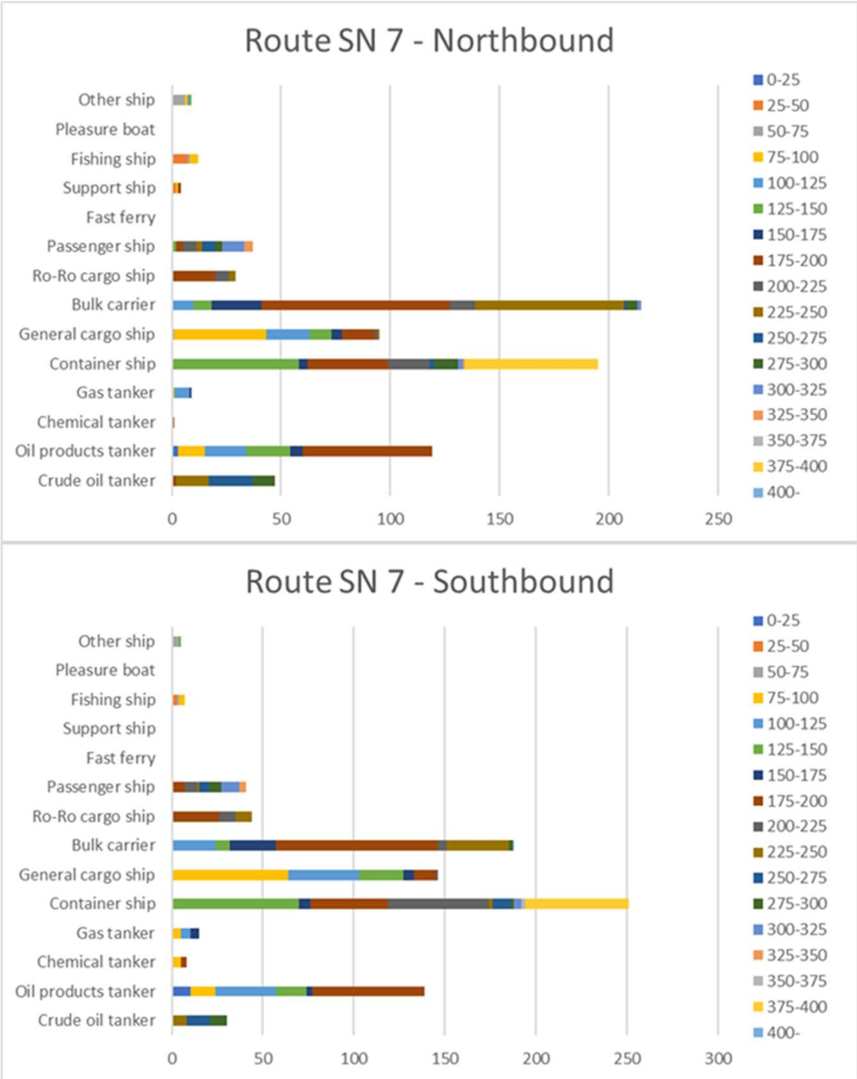

Figure 58: Traffic density and vessel size distribution of SN 7, German EEZ

Route SN 5 carries traffic from/to the ports of Emden and Leer to the North, through the northern part of route SN 10, which the relevant traffic joins/leaves at the area just to the North of EN 13-N. The analysis at the point of EN 13-N recorded 236 annual northbound crossings and 228 annual southbound crossings.

The primary users of route SN 5 are noted to be Bulk Carriers and General Cargo Ships. The former, range in size from small up to medium-large vessels, whilst the latter are in the small to medium range. There is also notable traffic from small, Feeder Container Ships and small to medium-sized Tankers. Fishing vessel traffic is also notable, with volumes approaching 10% of the overall traffic on the route. The qualitative characteristics of the traffic on route SN 7 are presented in Figure 59 overleaf.

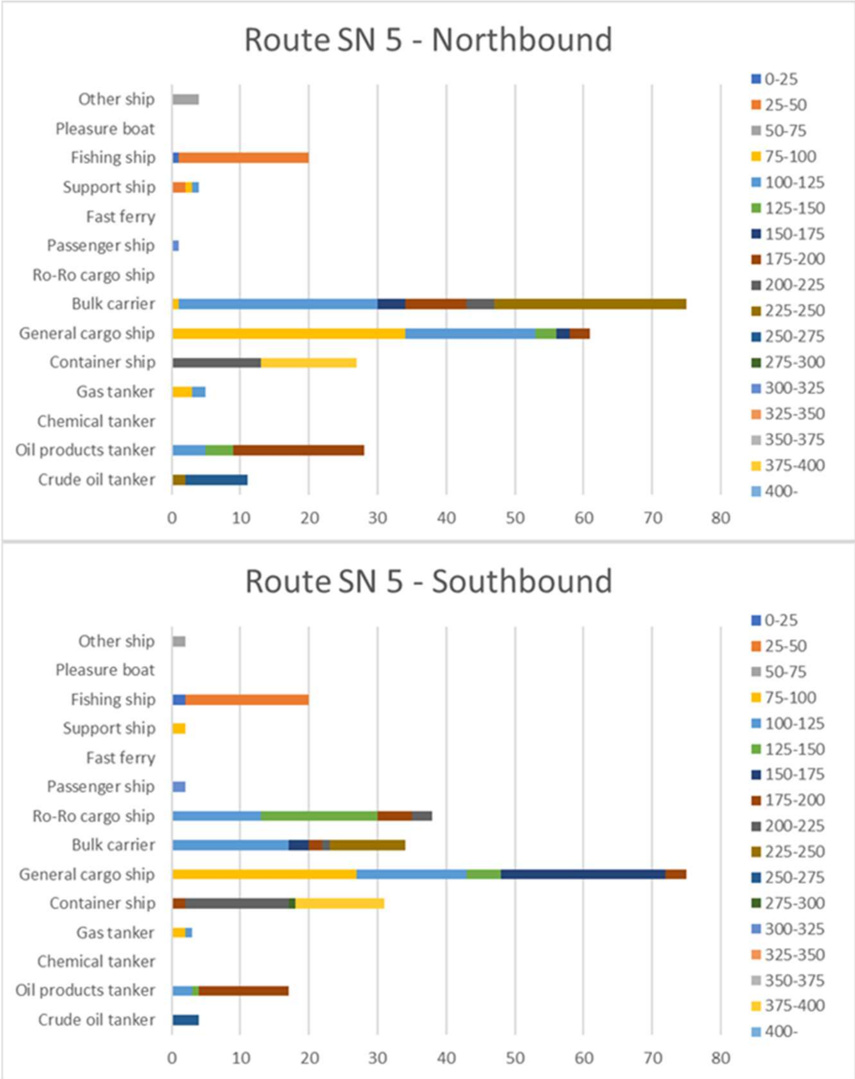

Figure 59: Traffic density and vessel size distribution of SN 5, German EEZ

With the future redirection of the traffic from SN 6 into SN 15, the traffic expected to use the area around EN 13-N based on current traffic volumes is presented in Figure 60.

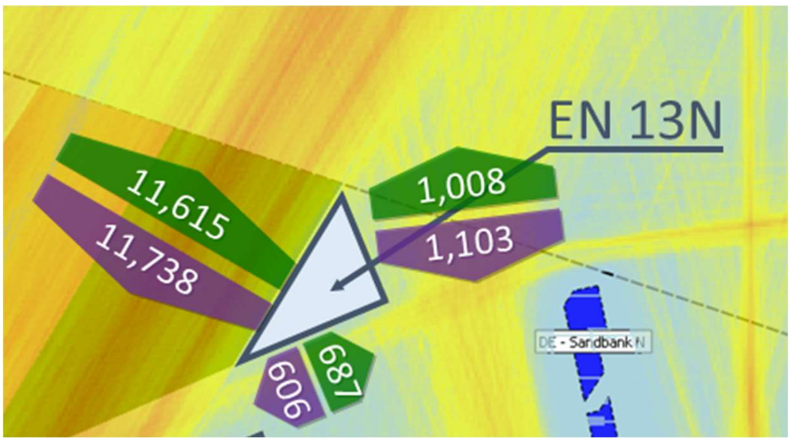

Figure 60: Expected traffic pattern around Route SN 13-N, German EEZ

9 ADDITIONAL TOPICS

9.1 Comments from Polish authorities

Further to the provision of the information requested for this study, Poland pointed out some issues they see with the changes to the German Maritime Spatial Plan (MSP).

The first is the spatial conflict between the ferry line connecting the ports of Swinoujscie (Poland) and Trelleborg (Sweden) with planned OWF Arcadis Ost 1 (in German territorial waters). This is regarding corridor ST that is discussed earlier in the report. The Polish authorities note that the operators of this line are Polish ferry company “Unity Line” and German ferry company “TT-Line”. Currently, ferries cross the area reserved for planned OWF Arcadis Ost 1 while after the building of this OWF they will be forced to transit on the west of the OWF area and enter the shipping corridor shown in MSP of Mecklenburg-Vorpommern (referenced as SKT in the present report).

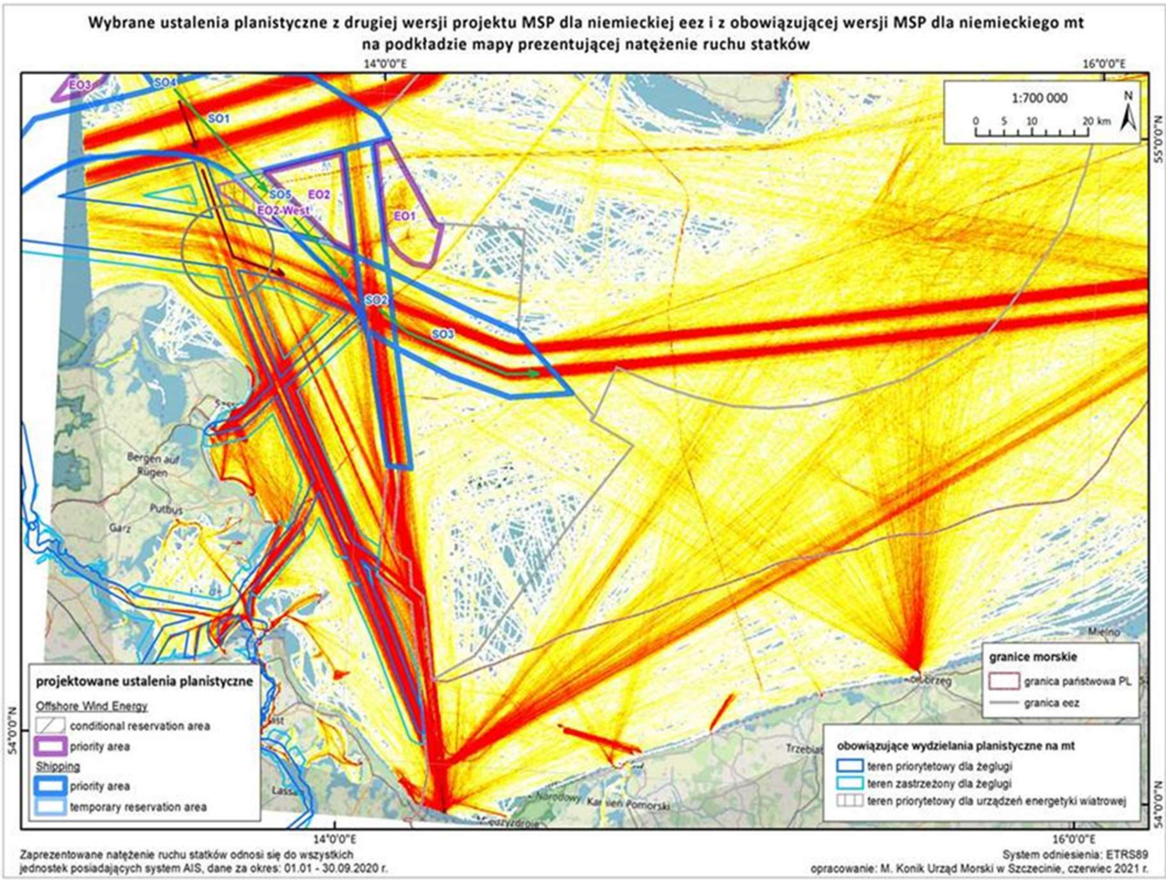

Figure 61: Figure provided by the Polish authorities

The second comment pertains to the shipping area marked as SO5 in Figure 61, laying between OWF Arcadis Ost 1 and OWF Baltic Eagle (area EO2 – in MSP for German EEZ, referred to as EO2-West in the present report) which will be used by vessels navigating from The Sound to Adlergrund TSS (traffic shown with green arrows on the map of Figure 61) may be changed into an area for OWF marked as EO2-West. This way the joint areas of OWF Arcadis Ost 1, EO2-West and EO2 will be the one area to be avoided by ships. In such a case, the Polish authorities assume that traffic from The Sound will move to the southwest to pass OWF Arcadis Ost on its west side (as shown with brown arrows on the map in Figure 61).

This raises the concern that these diversions may lead to a severe concentration of traffic from different directions in the area annotated by a grey circle: traffic on the route north of Rugen Island to Adlergrund TSS, traffic between Swinoujscie and the Danish strait, traffic from Swinoujscie to Trelleborg, and also described above traffic from The Sound strait do Adlergrund TSS. The Polish authorities, therefore, ask that this area is analysed, and countermeasures are proposed and taken if needed. Also, they would like low visibility conditions, impediments for using radar (radar shadow from OWF and Rugen Island), and rough weather conditions to be considered in the assessment.

The comments raised by Poland are fair and have already been discussed earlier in the report. In principle, the viability of merging the traffic into a single junction will be considered in the risk analysis stage of the assessment in the present report. Changes to the traffic will be incrementally considered, and the effect on the risk profile of the area, as well as beyond the point of interest will be evaluated. The results will provide the basis for the acceptance or not of the proposed changes regarding area EO2-West, and also if there is a necessity for the introduction of additional measures to promote navigational safety in the area.

APPENDIX A – Baltic Sea, Model Leg Parameters

Route description	Leg name	Width (m)	Length (m)
Bornholm to TH-Kattegat	B_TH_DN_01	10,000	24,569
Eastern Baltic to Kattegat	EB_KT_01	8,000	6,962
	EB_KT_02	8,000	21,000
	EB_KT_03	8,000	7,537
	EB_KT_04	10,000	7,042
	EB_KT_05	10,000	23,686
Eastern Baltic to Travemunde - Helsinki	EB_TH_01	11,000	78,328
	EB_TH_02	11,000	30,096
	EB_TH_03	11,000	29,562
	EB_TH_04	9,000	26,206
	EB_TH_05	11,000	7,321
	EB_TH_06	12,000	13,060
	EB_TH_07	12,000	9,113
	EB_TH_08	9,000	26,828
	EB_TH_09	8,000	23,655
Kiel to Klaipeda	KK_01	5,000	41,137
	KK_02	5,000	26,497
	KK_03	7,000	16,386
	KK_04	6,000	7,065
	KK_05	7,000	6,296
	KK_06	8,000	4,770
	KK_07	10,000	17,076
	KK_08	12,000	12,614
	KK_09	10,000	7,051
	KK_10	8,000	11,109
	KK_11	7,000	49,923
	KK_12	7,000	92,455
KK to Kattegat	KK_KT_01	11,000	10,952
	KK_KT_02	11,000	12,245
	KK_KT_03	12,000	11,100
	KK_KT_04	10,000	41,588
	KK_KT_05	8,000	20,091
KK to Eastern Baltic	KK-EB_01	14,000	135,888
KK to Sassnitz link	LINK_01	9,000	26,949
	LINK_02	7,000	16,576
Sassnitz to Bornholm	SA-BO_01	8,000	8,222
	SA-BO_02	8,000	2,570
	SA-BO_03	11,000	7,065
	SA-BO_04	13,000	13,341
	SA-BO_05	10,000	14,920
	SA-BO_06	5,000	22,874

Route description	Leg name	Width (m)	Length (m)
	SA-BO_07	5,000	23,857
SA-BO to Travemunde - Helsinki	SA-BO_TH_01	7,000	17,127
	SA-BO_TH_02	7,000	3,887
	SA-BO_TH_03	9,000	26,910
Swinoujscie to Eastern Baltic	SEB_01	10,000	171,096
Swinoujscie to Kattegat	SKT_01	9,000	39,329
	SKT_02	9,000	28,665
	SKT_03	8,000	957
	SKT_04	8,000	24,488
	SKT_05	8,000	7,836
	SKT_06	9,000	5,455
	SKT_07	14,000	6,489
	SKT_08	8,000	21,132
	SKT_09	10,000	22,073
Swinoujscie to Trelleborg	ST_01	5,000	43,395
	ST_02	5,000	3,310
	ST_03	5,000	14,151
	ST_04	4,000	12,792
	ST_05	4,000	6,119
	ST_06	4,000	6,348
	ST_07	8,000	28,704
	ST_08	7,500	9,815
	SY_01	5,000	27,371
	SY_02	10,000	47,978
	SY_03	10,000	10,247
	SY_04	10,000	12,944
	SY_05	10,000	8,530
	SY_06	10,000	6,390
	SY_07	10,000	21,457
	SY_08	10,000	23,865
SY to Swinoujscie - Kattegat	SY_SKT_01	6,000	15,040
Travemunde to Helsinki	TH_01	10,000	6,068
	TH_02	10,000	11,474
	TH_03	9,000	37,756
	TH_04	12,000	15,174
	TH_05	14,000	27,961
	TH_06	16,000	5,969
	TH_07	16,000	26,375
	TH_08	17,000	14,633
	TH_09	14,000	19,044
	TH_10	14,000	32,744

Route description	Leg name	Width (m)	Length (m)
	TH_11	12,000	83,473
TH to Kattegat	TH_KT_01	14,000	28,884
	TH_KT_02	14,000	40,174
	TH_KT_03	14,000	12,308
TH to Sassnitz	TH-SN_01	8,000	82,511
	TH-SN_02	6,500	18,412
	TH-SN_03	4,500	9,530
TH to Trelleborg	TH-T_01	12,000	38,830
	TH-T_02	12,000	20,430
	TH-T_03	12,000	20,708
	TH-T_04	11,000	2,831
	TH-T_05	11,000	2,575
Sassnitz to Wikinger OWF	WIK_01	6,000	2,846
	WIK_02	5,000	7,846
	WIK_03	5,000	8,923
	WIK_04	5,000	2,932
	WIK_05	5,000	6,908
	WIK_06	5,000	5,870

APPENDIX B – Baltic Sea, Model legs traffic

The traffic in the tables is reported in terms of annual frequency

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
B_TH_DN_01	W	1		27	12			1180	5	10	1		11	53	37	1		**1338**
B_TH_DN_01	E	1		15	1			988	1	5	1		7	39	39	1		**1098**
EB_KT_01	E	77	109	203	45	16	27	3	2	7		3	3	15		7		**517**
EB_KT_01	W	6	32	36	13	4	3	2		2			2	15		2		**117**
EB_KT_02	E	74	103	218	47	15	30	5		8	2	3	3	39		9		**556**
EB_KT_02	W	21	79	110	37	19	13	5		8	3	1	4	50		3		**353**
EB_KT_03	W	13	66	121	29	17	13	3		9	3		5	33		3		**315**
EB_KT_03	E	65	87	220	44	15	29	4		8	2	1	2	20		8		**505**
EB_KT_04	W	13	61	133	28	18	15	14		10	2	1	8	6	1	2		**312**
EB_KT_04	E	68	86	221	46	18	28	10		10	3	1	4	9		3		**507**
EB_KT_05	W	18	94	158	26	18	13	3		11	1	1	6	3	1	4		**357**
EB_KT_05	E	71	85	221	48	13	29	3		9	3	2	5	5	1	4		**499**
EB_TH_01	W	218	852	961	385	31	111	34	12	52	7	1	18	6	2			**2690**
EB_TH_01	E	310	822	1122	276	31	44	23	13	53	9		17	3				**2723**
EB_TH_02	E	315	841	1055	274	31	42	25	14	54	8	2	22	6	1	2		**2692**
EB_TH_02	W	221	860	944	409	31	106	36	12	53	7	1	24	2	5	2		**2713**
EB_TH_03	W	242	886	972	446	31	100	42	15	56	18	23	27	3	14	8		**2883**
EB_TH_03	E	325	860	1080	302	31	46	36	15	54	13	12	24	6	2	6		**2812**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
EB_TH_04	W	262	966	1007	444	31	102	46	14	53	16	73	20	19	9	8		**3070**
EB_TH_04	E	323	838	1030	305	27	37	41	20	50	16	94	21	7	8	8		**2825**
EB_TH_05	E	239	755	936	248	12	18	34	14	42	7	7	18	4	7	9		**2350**
EB_TH_05	W	229	895	978	411	24	100	42	13	49	5	2	18	11	10	9		**2796**
EB_TH_06	E	257	764	907	265	13	17	34	16	39	2		17	8	6	11		**2356**
EB_TH_06	W	222	838	810	397	12	82	32	12	37	3	1	11	4	10	8		**2479**
EB_TH_07	E	237	707	785	242	10	16	32	15	33	4		12	12	7	11		**2123**
EB_TH_07	W	193	793	803	373	8	75	34	12	37	2	1	11	13	10	7		**2372**
EB_TH_08	E	279	437	530	218	36	5	9	14	22	8	1	18	19	6	19		**1621**
EB_TH_08	W	217	809	1085	488	38	77	28	16	53	16	2	37	14	10	19		**2909**
EB_TH_09	E	279	485	579	238	40	5	9	15	29	13	2	20	1	8	10		**1733**
EB_TH_09	W	214	787	1085	477	35	69	19	15	56	17	2	36	2	9	16		**2839**
KK_01	E	1	281	2537	64		388	380	1	54	10		26	9	10	5		**3766**
KK_01	W		42	286			23	348		5	4		7	3	3			**721**
KK_02	E	1	115	1397	9		160	353		9			2	2	4			**2052**
KK_02	W			44			3	318		1			9	2	1	1		**379**
KK_03	E	3	6	288	1		12	335					4	10	3			**662**
KK_03	W			61	2		3	326					6	4	2	2		**406**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
KK_04	E			123	1		1	337					4	15	5			**486**
KK_04	W	2		66	2		1	319					5	14	3	1		**413**
KK_05	E			124	1		2	337					4	12	5			**485**
KK_05	W			71	1		1	319					6	11	2			**411**
KK_06	E			117	1		2	337					5	10	6			**478**
KK_06	W			67	1		1	324					7	13	4			**417**
KK_07	E			156	3		10	336		1	2		2	16	7			**533**
KK_07	W			81	1		1	326					3	13	5			**430**
KK_08	W			80	1		1	305			4		3	12	14			**420**
KK_08	E			96	1		1	312		1	15		1	13	14			**454**
KK_09	E	2	2	201	12		10	326		3	3		5	5	3	3		**575**
KK_09	W	6		283	21		10	326		3	1		2	13	9	2		**676**
KK_10	E	2		217	9		10	331		3	1		2	3	3	1		**582**
KK_10	W	7		305	17		10	323		3			2	9	7	2		**685**
KK_11	E			215	3		10	332		6			2	16	9	6		**599**
KK_11	W			244	8		12	335		7			2	8	8	1		**625**
KK_12	E			74			10	99										**183**
KK_12	W			136	3		11	223						8		1		**382**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
KK_KT_01	W	19	22	197	15		8	4		10	1		2	10	4	4		**296**
KK_KT_01	E	36	16	317	24		36	1		11	2		5	12	1	2		**463**
KK_KT_02	E	31	15	297	22		35	1		11	1		4	16	2			**435**
KK_KT_02	W	18	21	208	20		9			13	1		3	11	3	1		**308**
KK_KT_03	W	22	21	251	26		12			17	1		5	11	2	8		**376**
KK_KT_03	E	55	18	372	34		37			14	2		11	18	1	3		**565**
KK_KT_04	W	31	24	304	31		15			18	1		2	10	2	2		**440**
KK_KT_04	E	70	19	390	41		38			14	3		5	11				**591**
KK_KT_05	E	220	29	471	298	42	46	11	2	15	4	2	9	24	6	1		**1180**
KK_KT_05	W	31	22	302	34		15			16	2		7	13	2	1		**445**
KK-EB_01	W	38	48	376	35	2	10	2	3	16	2		2	5	1			**540**
KK-EB_01	E	42	36	399	31	2	36	2	3	11	3		1	4				**570**
LINK_01	E	12	315	899	59		11	25	8	51	12		40	12	6	8		**1458**
LINK_01	W		54	311	1		31	29		14	6		21	2	4	4		**477**
LINK_02	E	31	385	1206	89	3	11	24	10	115	29		100	42	50	18		**2113**
LINK_02	W		47	380	2		22	14	1	37	18		43	15	23	8		**610**
SA-BO_01	W			22				137		6	67	59	23	15		3		**332**
SA-BO_01	E	3		31				219	1	12	450	58	39	73	29	2		**917**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
SA-BO_02	E			11				203		4	481	54	29	49	28	3		**862**
SA-BO_02	W			8				202		3	496	53	30	47	42	1		**882**
SA-BO_03	E			3				208		5	413	42	25	33	23			**752**
SA-BO_03	W			7				206		3	398	34	14	21	36	2		**721**
SA-BO_04	E			4				202		3	401	49	10	22	22			**713**
SA-BO_04	W			7				204		2	347	48	8	17	41	1		**675**
SA-BO_05	W			6				203			199		3	8	41	1		**461**
SA-BO_05	E			5				203			249		3	11	29			**500**
SA-BO_06	S			1				206			1				43			**251**
SA-BO_06	N			1				207			1		2	1	38			**250**
SA-BO_07	N			2				209			1		5	5	46			**268**
SA-BO_07	S			5				210			1		2	2	43			**263**
SA-BO_TH_01	S			22		1							1	5	5			**34**
SA-BO_TH_01	N			29		1												**30**
SA-BO_TH_02	N			24		1								3				**28**
SA-BO_TH_02	S			25		1								2	1			**29**
SA-BO_TH_03	S			24		1								9				**34**
SA-BO_TH_03	N			12		1							1	20				**34**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
SB_S_01	W	6	44	209	44			1		14			10	1				**329**
SB_S_01	E	11	14	377	40		1	2		20			5					**470**
SKT_01	S	9	26	808	21		11	1406		101	3		40	8	65	1		**2499**
SKT_01	N	6	4	566	6		11	1226		97	3		31	5	54	1		**2010**
SKT_02	S	153	84	1265	132	44	16	1346	1	84	3		42	10	11	9		**3200**
SKT_02	N	76	102	922	154	43	14	1282	1	81	4		40	5	17	5		**2746**
SKT_03	N	84	100	1079	162	38	15	1175		79	10	2	58	29	30	5		**2866**
SKT_03	S	146	81	1388	134	37	15	1191	2	78	8	3	62	26	14	14		**3199**
SKT_04	N	85	97	917	154	37	16	1131	1	51	29	9	32	45	19	5		**2628**
SKT_04	S	148	66	1058	130	38	15	1317	5	34	25	8	32	35	6	8		**2925**
SKT_05	S	32	10	607	62	4	13	983	1	15	8	3	12	23	12			**1785**
SKT_05	N	19	26	357	29	6	11	872		20	6	3	3	30	21			**1403**
SKT_06	S	38	11	626	60	3	14	1193	1	14	6	3	12	20	14			**2015**
SKT_06	N	21	29	486	35	7	12	989		21	6	2	6	32	18			**1664**
SKT_07	N	22	38	512	33	5	13	383		26	24	2	8	29	24			**1119**
SKT_07	S	39	14	645	63	7	14	599	1	16	27	3	11	20	22			**1481**
SKT_08	N	25	46	530	31	6	14	15		31	4	2	9	25	17			**755**
SKT_08	S	46	21	679	62	11	16	31		19	6	3	13	18	11			**936**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
SKT_09	W	43	147	638	61	22	29	6		35	6	4	16	27	11			**1045**
SKT_09	E	107	107	866	112	27	44	2	1	30	8	5	17	21	13			**1360**
ST_01	S			5				528		1				5				**539**
ST_01	N		8	28	2		1	519		6				5	1			**570**
ST_02	N	1	5	20				499		3			4	11				**543**
ST_02	S	1		14		1		464			1		4	14				**499**
ST_03	N	2	6	21		1		630		2			1	1				**664**
ST_03	S	1		14		1		526		1			2	3				**548**
ST_04	S	4		11	2	1		827		1				2				**848**
ST_04	N	2	8	18	2	1		1060						4				**1095**
ST_05	N		11	7	4	1		762						1				**786**
ST_05	S	7		6	2			564		1		1	1	1				**583**
ST_06	S	2		9	2			242		1			1					**257**
ST_06	N	1	11	5	4	1		737		1		1		1	1			**763**
ST_07	S	3		3	2	1		1636							1			**1646**
ST_07	N	1		10	6	1		1834		1				2	3			**1858**
ST_08	N			5	1			1812							3			**1821**
ST_08	S							1800							4			**1804**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
SY_01	N	122	114	509	174	55	5	2282		23			101	7	5	56		**3453**
SY_01	S	156	59	621	151	57	6	2107		27			85	16	6	49		**3340**
SY_02	N	7		38	3	5		1552		3			3	9		1		**1621**
SY_02	S	11		47	10	4		1545		1			1	7		1		**1627**
SY_03	S	1		15		3		1495		1			1	18				**1534**
SY_03	N	1		15		4		1488		1			2	16				**1527**
SY_04	S			11		1		1502		8	9		4	17				**1552**
SY_04	N			8				1503		10	4		4	13				**1542**
SY_05	S			1				1565		1			1	4				**1572**
SY_05	N			1				1539					1	5	1			**1547**
SY_06	S			3				1568		2				3	1			**1577**
SY_06	N			1				1509						2	1			**1513**
SY_07	S							1625		2				1	5			**1633**
SY_07	N							1601							5			**1606**
SY_08	N			3				1637		1				2	16		2	**1661**
SY_08	S			2				1657		2				1	16		2	**1680**
SY_SKT_01	W	71	79	323	140	42	1	19		9			5	1	2	1		**693**
SY_SKT_01	E	157	58	534	142	50	5	1	1	18			8	3	1	5		**983**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
TH_01	S	2326	2873	6432	4066	276	1630	4575	180	204	155	10	204	26	50	85	2	**23094**
TH_01	N	760	2422	4681	2416	191	1031	2539	159	188	134	18	191	31	48	90	1	**14900**
TH_02	S	2031	2502	5497	3457	208	1424	3861	131	117	98	10	164	10	40	70		**19620**
TH_02	N	516	1939	2315	1968	152	850	4000	135	69	55	14	149	15	36	67		**12280**
TH_03	W	2254	2804	5621	3973	267	1535	587	137	98	90	9	102	11	22	68		**17578**
TH_03	E	706	2463	2866	2460	200	1043	472	158	75	90	17	82	15	21	68		**10736**
TH_04	E	392	1781	2173	2098	154	1099	482	107	42	16	8	38	2	16	50		**8458**
TH_04	W	1989	1991	4664	3344	232	1477	585	106	51	16	3	46	4	16	56		**14580**
TH_05	E	357	1841	2841	2105	151	1300	576	105	43	10	5	38	8	14	47		**9441**
TH_05	W	1951	1950	4625	3420	230	1482	590	104	50	12	2	51	8	12	54		**14541**
TH_06	E	339	1845	3734	2070	146	1397	583	103	51	10	5	34	25	24	43		**10409**
TH_06	W	1895	1904	4429	3335	223	1469	580	99	46	11	1	34	19	10	35		**14090**
TH_07	E	346	1872	3811	2088	148	1403	583	97	50	9	4	30	15	22	32		**10510**
TH_07	W	1913	1919	4468	3364	226	1473	581	100	46	11	1	29	15	12	28		**14186**
TH_08	W	1849	1869	4385	3308	224	1439	568	96	47	10	1	30	19	18	28		**13891**
TH_08	E	356	1845	3768	2082	150	1374	565	98	48	10	5	27	17	26	29		**10400**
TH_09	S	1875	1887	4440	2978	218	1442	482	96	45	12	4	32	25	8	25	1	**13570**
TH_09	N	383	1860	3925	1985	146	1398	571	98	51	11	5	32	16	12	23		**10516**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
TH_10	S	2119	2064	8807	4034	378	2195	701	133	125	40	25	107	207	20	50	2	**21007**
TH_10	N	1970	2189	8190	4278	380	2236	697	128	121	34	17	89	180	20	45		**20574**
TH_11	W	1839	1783	6886	3544	295	2017	442	113	86	21	13	37	95	10	23	1	**17205**
TH_11	E	618	1671	5586	2158	203	1984	297	55	88	11	5	22	61	8	11		**12778**
TH_KT_01	E	1576	315	4228	2377	231	825	448	22	79	22	10	61	218	32	17	3	**10464**
TH_KT_01	W	215	149	4253	1008	153	712	412	36	83	27	19	73	231	17	20		**7408**
TH_KT_02	E	1582	330	4355	2407	221	830	385	26	86	21	9	79	209	31	16	2	**10589**
TH_KT_02	W	222	170	4375	1013	154	714	497	35	93	27	19	89	224	28	21		**7681**
TH_KT_03	E	1411	316	4312	2110	186	816	367	25	92	20	8	80	230	46	19	2	**10040**
TH_KT_03	W	221	171	4386	1018	155	714	386	35	111	28	18	95	261	46	29		**7674**
TH-SN_01	E			356	4				3	92	29		84	47	24	19		**658**
TH-SN_01	W			287	2				1	88	27		81	47	27	16		**576**
TH-SN_02	E	7	24	590	11			17	5	90	123	1	66	47	44	9		**1034**
TH-SN_02	W		1	341	4			11	3	87	123		92	33	47	8		**750**
TH-SN_03	N			154	1			21		29	43		43	73	11	8		**383**
TH-SN_03	S	11	23	750	30	2	3	46	2	80	17	3	89	46	15	17		**1134**
TH-T_01	S	85	19	376	45		42	3860	23	19			26	1	20	12		**4528**
TH-T_01	N	81	55	277	22		62	3756	1	7			27		27	12		**4327**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
TH-T_02	N		1	14				2875		1		1	6		21			**2919**
TH-T_02	S			21				2779		2			5		29	1		**2837**
TH-T_03	N			5				1756			1				40			**1802**
TH-T_03	S			13				2509		1					53			**2576**
TH-T_04	N			5				2669			1				26			**2701**
TH-T_04	S			11				2613		1					38			**2663**
TH-T_05	N			6				2568			1				29			**2604**
TH-T_05	S			11				2682		1					41			**2735**
WIK_01	S			11				23	1	3	776	19	58	51	17	2		**961**
WIK_01	N			20	1			21		7	776	19	59	39	12	3		**957**
WIK_02	S			6				16		2	879	10	47	29	8	1		**998**
WIK_02	N			8				18		2	850	11	40	23	4	1		**957**
WIK_03	S			4				17			871	2	27	16	6	1		**944**
WIK_03	N			3				22		2	865	1	31	15	4			**943**
WIK_04	S			3				19		1	845		19	19	7			**913**
WIK_04	N			2				24		2	823	1	20	10	2			**884**
WIK_05	S			3				15		1	800		14	17	6			**856**
WIK_05	N			2				23		1	796		19	23	2			**866**

Leg	Direction	Bulk Carrier	Container	General Cargo Ship	Tanker	Gas Tanker	Ro-Ro Cargo	Ro-Ro/Pax	Passenger	Tug	OWF Service Vessels	Other Offshore	Other Work Vessels	Fishing	Pleasure Craft	Military/Law Enforcement	Other	Total traffic
WIK_06	N							11			536		2	9	2			**560**
WIK_06	S							14			627		3	7	2			**653**

APPENDIX C – The North Sea, Model Leg Parameters

Route description	Leg name	Tolerance angle (±°)	Width (m)	Length (m)
Esbjerg to Dan Tysk and Sandbank	Dan Tysk 01	4	4,000	48,874
	Dan Tysk 02	10	4,000	10,134
Traffic on DE/NL jurisdiction boundary, ‖ SN 3.	DENL_01	10	6,000	21,199
Esbjerg to Offshore Installations	ES-OS 01	4	4,000	28,135
	ES-OS 02	10	5,000	21,493
	ES-OS 03	10	5,000	4,176
	ES-OS 04	10	6,000	7,018
	ES-OS 05	10	7,000	13,421
	ES-OS 06	10	8,000	12,078
	ES-OS 07	10	10,000	8,551
	ES-OS 08	10	5,000	9,384
	ES-OS 09	10	12,000	25,344
	ES-OS 10	10	15,000	33,406
	ES-OS 11	10	15,000	31,702
	ES-OS 12	10	12,000	18,821
Route SN 2	SN_2 01	10	5,000	7,017
	SN_2 02	10	10,000	51,090
	SN_2 03	10	10,000	21,711
	SN_2 04	10	10,000	15,771
	SN_2 05	10	10,000	70,622
	SN_2 06	10	10,000	22,502
	SN_2 07	10	10,000	18,630
	SN_2 08	10	10,000	7,331
	SN_2 09	10	10,000	34,922
	SN_2 10	10	10,000	23,725
Route SN 3	SN_3 01	10	8,000	21,855
Route SN 4	SN_4 01	10	14,000	7,444
	SN_4 02	10	14,000	6,065
	SN_4 03	10	14,000	56,459
	SN_4 04	10	18,000	7,106
	SN_4 05	10	19,000	4,930
	SN_4 06	10	20,000	11,685
	SN_4 07	10	20,000	9,558
	SN_4 08	10	20,000	12,973
	SN_4 09	10	20,000	13,284
	SN_4 10	10	22,000	22,740
	SN_4 11	10	22,000	8,510
	SN_4 12	10	22,000	30,436
	SN_4 13	10	22,000	47,950
	SN_4 14	10	20,000	5,599
	SN_4 15	10	16,000	13,914

Route description	Leg name	Tolerance angle (±°)	Width (m)	Length (m)
	SN_4 16	10	16,000	43,033
	SN_4 17	10	16,000	18,046
	SN_4 18	10	16,000	43,181
	SN_4a 01	10	9,000	24,430
	SN_4a 02	10	10,000	9,027
Route SN 5	SN_5 01	10	9,000	26,911
	SN_5 02	6	9,000	22,276
	SN_5 03	6	10,000	14,883
	SN_5 04	6	10,000	9,595
	SN_5 05	6	12,000	9,425
	SN_5 06	10	18,000	43,058
	SN_5 07	5	20,000	20,302
Route SN 6	SN_6 01	10	16,000	42,669
	SN_6 02	10	14,000	35,063
	SN_6 03	10	10,000	23,257
	SN_6 04	10	9,000	14,743
	SN_6 05	10	7,000	15,250
	SN_6 06	3	7,000	12,202
	SN_6 07	3	7,000	15,375
	SN_6 08	3	5,000	22,628
	SN_6 09	4	8,000	13,421
	SN_6 10	4	8,000	51,508
Route SN 6, branch 2	SN_6a 01	5	20,000	33,979
	SN_6a 02	5	14,000	44,244
	SN_6a 03	5	10,000	16,978
	SN_6a 04	5	7,000	25,065
	SN_6a 05	4	7,000	7,638
	SN_6a 06	3	7,000	8,835
	SN_6a 07	3	5,000	5,488
	SN_6a 08	3	5,000	15,384
	SN_6a 09	3	2,000	21,765
Route SN 6, branch 3	SN_6b 01	10	15,000	8,794
	SN_6b 02	10	16,000	11,748
	SN_6b 03	10	16,000	9,399
	SN_6b 04	10	16,000	52,963
	SN_6b 05	10	16,000	8,591
	SN_6b 06	10	16,000	36,837
	SN_6b 07	4	7,000	17,295
	SN_6b 08	4	6,000	15,535
	SN_6b 09	3	5,000	21,814
	SN_6b 10	4	5,000	12,302

Route description	Leg name	Tolerance angle (±°)	Width (m)	Length (m)
Route SN 7	SN_7 01	10	7,000	8,842
	SN_7 02	5	10,000	56,428
	SN_7 03	10	10,000	18,297
	SN_7 04	10	16,000	6,332
	SN_7 05	10	16,000	7,538
	SN_7 06	10	20,000	40,063
	SN_7 07	10	20,000	20,978
	SN_7 08	10	20,000	31,351
Route SN 7, branch 2	SN_7a 01	4	10,000	58,276
	SN_7a 02	10	10,000	17,751
	SN_7a 03	10	10,000	4,367
	SN_7a 04	10	12,000	5,421
	SN_7a 05	10	14,000	39,025
	SN_7a 06	5	14,000	21,579
Route SN 8	SN_8 01	4	10,000	68,909
	SN_8 02	10	10,000	16,042
	SN_8 03	10	10,000	2,822
	SN_8 04	10	10,000	3,651
	SN_8 05	10	10,000	19,068
	SN_8 06	10	12,000	18,491
	SN_8 07	10	12,000	14,799
Route SN 9	SN_9 01	5	14,000	25,014
	SN_9 02	10	15,000	60,932
	SN_9 03	10	12,000	13,894
	SN_9 04	10	12,000	2,446
	SN_9 05	10	12,000	9,553
	SN_9 06	6	12,000	20,714
	SN_9 07	3	10,000	8,371
	SN_9 08	3	10,000	16,602
Route SN 10	SN_10 01	60	55,000	33,495
	SN_10 02	45	55,000	14,486
	SN_10 03	45	55,000	17,320
	SN_10 04	20	55,000	52,538
	SN_10 05	20	55,000	12,630
	SN_10 06	20	57,500	9,303
	SN_10 07	20	60,000	25,391
	SN_10 08	20	60,000	22,159
	SN_10 09	20	60,000	24,778
	SN_10 10	20	65,000	38,091
	SN_10 11	20	65,000	42,304
	SN_10 12	20	65,000	46,938

Route description	Leg name	Tolerance angle (±°)	Width (m)	Length (m)
	SN_10 13	20	65,000	36,490
Route SN 11	SN_11 01	10	8,000	20,482
Route SN 12	SN_12 01	10	9,000	42,286
Route SN 13	SN_13 01	10	8,000	43,899
	SN_13 02	10	9,000	11,229
	SN_13 03	10	8,000	12,513
	SN_13 04	10	8,000	11,234
	SN_13 05	10	10,000	27,453
	SN_13 06	10	12,000	5,477
	SN_13 07	10	14,000	45,096
	SN_13 08	10	22,000	42,043
Route SN 14	SN_14 01	10	8,000	26,281
Route SN 15	SN_15 01	10	8,000	9,458
	SN_15 02	10	8,000	15,715
	SN_15 03	10	8,000	17,354
	SN_15 04	10	7,000	29,793
	SN_15 05	10	7,000	14,815
	SN_15 06	10	7,000	6,393
	SN_15 07	10	7,000	28,152
	SN_15 08	10	7,000	30,364
	SN_15 09	10	7,000	10,871
	SN_15 10	10	6,000	6,929
	SN_15 11	10	6,000	7,473
	SN_15 12	10	5,000	15,408
	SN_15 13	10	4,000	5,679
	SN_15 14	10	4,000	5,896
	SN_15 15	4	4,000	47,955
Route SN 16	SN_16 01	10	5,000	24,133
	SN_16 02	10	7,000	11,388
	SN_16 03	10	7,000	10,582
	SN_16 04	10	7,000	6,655
	SN_16 05	10	7,000	28,342
Route SN 17	SN_17 01	10	22,000	11,125
	SN_17 02	10	22,000	40,908
	SN_17 03	10	26,000	12,089
	SN_17 04	10	28,000	18,168
	SN_17 05	10	45,000	43,190
	SN_17 06	10	45,000	48,034
Route SN 18	SN_18 01	6	14,000	30,045
	SN_18 02	6	14,000	12,144
	SN_18 03	6	14,000	7,428

Route description	Leg name	Tolerance angle (±°)	Width (m)	Length (m)
	SN_18 04	10	14,000	16,901
	SN_18 05	5	14,000	53,522
Route SN 18, branch 2	SN_18a 01	6	20,000	35,752
	SN_18a 02	6	20,000	22,604
	SN_18a 03	6	16,000	53,216
Route SN 18, branch 3	SN_18b 01	10	10,000	29,878
	SN_18b 02	5	10,000	63,966
Route SN 18, branch 4	SN_18c 01	10	35,000	33,610
	SN_18c 02	10	35,000	17,257
	SN_18c 03	10	35,000	47,013
Spurs towards the Northern Route	TO_NR 01	10	20,000	23,084
	TO_NR 02	10	10,000	30,234
	TO_NR 03	10	12,000	44,191
	TO_NR 04	10	12,000	57,091
	TO_NR 05	10	8,000	35,735
	TO_NR 06	10	7,000	38,161
	TO_NR 06a	10	10,000	35,215
Other supplementary legs	LEG_105	6	8,000	21,203
	LEG_106	10	8,000	28,126
	LEG_109	10	7,000	26,169
	LEG_118	10	8,000	9,378
	LEG_120	3	8,000	8,176
	LEG_159	10	30,000	40,416
	LEG_16	10	7,000	23,815
	LEG_160	10	35,000	18,066
	LEG_161	10	35,000	25,900
	LEG_172	10	5,000	53,753
	LEG_173	10	35,000	24,579
	LEG_204	10	18,000	21,522
	LEG_247	3	5,000	9,566
	LEG_274	10	10,000	19,162
	LEG_275	10	10,000	35,980
	LEG_276	10	25,000	14,859
	LEG_279	10	25,000	23,434
	LEG_280	10	25,000	27,361
	LEG_283	5	12,000	19,497
	LEG_284	5	12,000	28,427
	LEG_285	5	13,000	61,536
	LEG_291	10	9,000	27,969
	LEG_41	5	8,000	54,977
	LEG_42	5	14,000	18,784

Route description	Leg name	Tolerance angle (±°)	Width (m)	Length (m)
	LEG_44	10	20,000	21,037
	LEG_45	10	20,000	9,003
	LEG_46	10	20,000	13,245
	LEG_64	9	20,000	21,430
	LEG_88	10	8,000	78,891
	LEG_89	10	8,000	8,703
	LEG_90	6	8,000	9,004
	LEG_91	6	8,000	17,174
	LEG_92	6	8,000	7,710
	LEG_94	6	8,000	17,552
	LEG_95	3	7,000	8,708
	LEG_97	10	7,000	18,480
	LEG_98	10	8,000	12,031

APPENDIX D – The North Sea, Model legs traffic

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
Dan_Tysk 01	E						1	1			39	139	1		158	**339**
	W						1				37	146			168	**352**
Dan_Tysk 02	E						1				37	127			146	**311**
	W										39	132			154	**325**
DENL_01	N		1			1	6	1		1	4	97	172		5	**288**
	S		2				19		6	1		95	211		6	**340**
ES-OS 01	E		16	1			122	7	20			593	25		26	**810**
	W		38	3			159	11	48			631	17		21	**928**
ES-OS 02	E		1				35					407	5		15	**463**
	W		1				42					392			14	**449**
ES-OS 03	E						26					317	8		9	**360**
	W						36					306	4		7	**353**
ES-OS 04	E						24					356	9		9	**398**
	W						35					352	6		11	**404**
ES-OS 05	E						24					311	7		8	**350**
	W						36					307	3		6	**352**
ES-OS 06	E						23					349	4		7	**383**
	W						35					345	1		8	**389**
ES-OS 07	E						24					289	4		7	**324**
	W						22					293			5	**320**
ES-OS 08	E						13					226	2		2	**243**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	W						23					232			5	**260**
ES-OS 09	E						24					293	6		9	**332**
	W						25					346	3		6	**380**
ES-OS 10	E						20					278	7		6	**311**
	W						17					306	9		7	**339**
ES-OS 11	E						28					371	9		8	**416**
	W						42					415	7		9	**473**
ES-OS 12	E						10					148	12		6	**176**
	W						12					170	16		11	**209**
LEG_105	N						80	2				7	39		1	**129**
	S						82		3			4	40		3	**132**
LEG_106	N						86	1				5	35		2	**129**
	S		1				90		3			4	28			**126**
LEG_109	N						96	2				4	18		1	**121**
	S		1				105		5			1	16	1		**129**
LEG_118	N						75					3	22		2	**102**
	S		1				79	1	4			1	22	1		**109**
LEG_120	N						56					2	9			**67**
	S						44		3				8			**55**
LEG_159	E	14	46	2	56	44	74	31	2				23		1	**293**
	W	4	48	1	30	120	35	17	16			2	27		3	**303**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
LEG_16	E		38	4			109	13	7			237	8	1	8	**425**
	W		53	6	1		120	13	73			268	9		9	**552**
LEG_160	E	15	53	5	65	51	91	40	3			2	44		4	**373**
	W	4	62	1	61	150	53	27	26			5	45		3	**437**
LEG_161	E	17	67	7	71	59	110	47	4			2	58		5	**447**
	W	5	73	1	70	166	68	28	29			5	53		3	**501**
LEG_172	N	6			53		1								1	**61**
	S	13			42								1			**56**
LEG_173	E	20	73	6	77	57	113	58	7			4	65		7	**487**
	W	6	82	1	75	175	80	33	38			7	62		4	**563**
LEG_204	E						32	9	73		5	102	8		18	**247**
	W		1				25	3	68		3	108	10		18	**236**
LEG_247	N					5	64								1	**70**
	S					4	74									**78**
LEG_274	E	54	1932	142	317	2930	2966	617	847	129	5	716	27	17	381	**11080**
	W	57	2366	213	353	3304	5625	650	900	145	6	984	23	37	500	**15163**
LEG_275	E	41	1092	40	141	565	528	374	192	56		48	22	4	96	**3199**
	W	41	1240	46	180	451	585	370	181	54		57	21	5	89	**3320**
LEG_276	E		1			22	111	4	15			6	99			**258**
	W		5			15	99	5	4			6	100		1	**235**
LEG_279	E		2			20	114	3	15			3	91		1	**249**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	W		4			13	94	2	4			2	104			**223**
LEG_280	E		1			13	88	2	13				73			**190**
	W		2			10	77	1	3				62			**155**
LEG_283	N	138	145	3	136	1	41	62	1			20	38	1	9	**595**
	S		1		1		6	2				2	52		1	**65**
LEG_284	N	100	103	2	83		19	48				14	32		7	**408**
	S				1								37			**38**
LEG_285	N	1	7		11		2	2					21			**44**
	S	117	96	2	143		23	30				7	16		5	**439**
LEG_291	E	1	1				13	1				2	2		1	**21**
	W	1				1	19					2	1		2	**26**
LEG_41	N		9	2			53	3	76		5	116			17	**281**
	S		3				45	2	75		5	134	2		16	**282**
LEG_42	N		2				31	2	67		2	80	1		14	**199**
	S						26	2	65		2	93			14	**202**
LEG_44	E						41	3	79		4	115	4		17	**263**
	W		2				34	4	70		4	125	6		15	**260**
LEG_45	E						23	1	68		3	82	5		11	**193**
	W						17	2	56		2	99	6		12	**194**
LEG_46	N						28	2	69		4	106	10		15	**234**
	S						24	2	58		3	107	7		14	**215**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
LEG_64	N						22	8	70		3	75	9		9	**196**
	S						19	2	58		3	79	12		16	**189**
LEG_88	N				19	27	92		75			15	12		7	**247**
	S		1		7	21	35	3	13			14	25		4	**123**
LEG_89	N				19	30	102		88			20	11		8	**278**
	S				2	24	41		15			17	8		5	**112**
LEG_90	N				18	31	91	2	87			15	8		3	**255**
	S				4	23	32		14			18	5		2	**98**
LEG_91	N		4		26	44	98	5	87			18	8		5	**295**
	S		4		11	60	36		16			18	6		3	**154**
LEG_92	N		4		25	50	95	4	85			17	9		5	**294**
	S		4		10	64	36		14			22	7		4	**161**
LEG_94	N		4		21	41	81	4	64			13	7		5	**240**
	S		3		4	49	32		11			22	6		7	**134**
LEG_95	N		14				10	1	7			18			1	**51**
	S		5				13	3				22				**43**
LEG_97	N	2	23	2	4	71	18	22	10	1			20		4	**177**
	S		30	1	3	127	27	5	16	2			21		3	**235**
LEG_98	N	1	20		3	62	14	12	10				8		4	**134**
	S		28		2	102	48	5	13	2			9		2	**211**
SN_08 01	N	2	21	3	2	71	109	16	26			3	3		6	**262**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	S		21	3	2	55	109	8	26	1		3	4		3	**235**
SN_08 02	N	3	30	3	3	92	120	19	32	1		7	25		8	**343**
	S		29	5	4	142	169	12	33	4		5	19		5	**427**
SN_08 03	N	2	24	2	2	90	116	15	31	1		6	24		7	**320**
	S		25	5	4	127	164	10	31	3		5	19		4	**397**
SN_08 04	N		27	3	3	85	104	18	29	1		6	20		6	**302**
	S		28	5	4	135	154	9	29	4		6	19		4	**397**
SN_08 05	N	1	22	1	1	80	108	16	26	3		8	28		6	**300**
	S		21	3	3	106	155	9	31	4		6	20		5	**363**
SN_08 06	N		5			25	94	5	16	2		10	15		1	**173**
	S		2	4		18	113	5	16	1		7	12		1	**179**
SN_08 07	N		3			21	76	3	1	1		6	7			**118**
	S		1	3		8	90		13	1		6	4		2	**128**
SN_10 01	N	841	2625	136	778	1880	4080	2055	1455	95		309	560	38	210	**15062**
	S	839	2368	145	773	1758	3660	2367	1265	78		328	602	31	194	**14408**
SN_10 02	N	797	2419	120	709	1765	3659	1835	1306	79		184	369	26	179	**13447**
	S	748	2160	123	712	1576	3328	2175	1221	68		165	395	16	168	**12855**
SN_10 03	N	821	2493	118	700	1725	3314	1934	1257	76		145	232	20	180	**13015**
	S	803	2199	122	682	1453	2665	2178	1121	62		124	240	15	163	**11827**
SN_10 04	N	785	2254	115	618	1632	2823	1780	1107	64		109	126	12	149	**11574**
	S	740	1993	117	614	1406	2503	2067	1099	58		100	131	10	148	**10986**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_10 05	N	821	2203	91	578	1519	2475	1808	1122	67		107	98	13	149	**11051**
	S	800	2164	112	596	1396	2407	2130	1101	60		92	113	11	156	**11138**
SN_10 06	N	715	1741	91	507	1247	2124	1434	889	48		101	108	8	123	**9136**
	S	722	1625	92	504	1069	1704	1747	887	47		74	83	7	117	**8678**
SN_10 07	N	974	2456	105	682	1431	2540	1956	982	69	1	119	124	13	163	**11615**
	S	949	2387	118	690	1299	2467	2328	996	63		123	137	12	169	**11738**
SN_10 08	N	858	2151	102	435	1331	2184	1725	928	52	1	97	85	11	137	**10097**
	S	825	2103	100	449	1256	2028	2179	946	58		97	72	12	137	**10262**
SN_10 09	N	674	1862	85	389	1285	2135	1493	991	53		94	75	11	117	**9264**
	S	786	2156	109	443	1296	2294	2175	1031	57		105	78	10	151	**10691**
SN_10 10	N	668	2097	98	393	1619	2407	1718	1176	64	1	102	99	14	141	**10597**
	S	585	1706	89	354	1312	1991	1809	1077	57		89	72	13	116	**9270**
SN_10 11	N	645	2159	99	413	1761	2577	1812	1212	71		103	88	12	145	**11097**
	S	562	1949	105	396	1740	2490	2007	1249	69		102	83	12	147	**10911**
SN_10 12	N	725	2468	115	459	1874	2825	1939	1266	76		121	128	21	178	**12195**
	S	641	2214	122	456	1855	2739	2166	1324	73		119	101	19	182	**12011**
SN_10 13	N	728	2483	121	480	2078	2881	2007	1731	82		135	102	25	197	**13050**
	S	653	2340	121	488	2141	2815	2215	1640	77		122	99	21	208	**12940**
SN_11 01	N						6					10	63		10	**89**
	S						6					11	70		13	**100**
SN_12 01	N					1	15			1		9	284	1	18	**329**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	S		1			1	34	1	6			8	273		8	**332**
SN_13 01	N		30			3	34	17				12	44		11	**151**
	S		39			4	63	8	2			6	28		5	**155**
SN_13 02	N		33				13	11				3	47		4	**111**
	S		38			1	22	11	5			4	55		5	**141**
SN_13 03	N		33				6	3				2	34		2	**80**
	S		38				18	4	1			1	50		3	**115**
SN_13 04	N		22				5	1				1	26			**55**
	S		35				12	1	1			2	39		3	**93**
SN_13 05	N		25				2	1					27		1	**56**
	S		22				8	2				1	37		1	**71**
SN_13 06	N		11				4	2				3	26		1	**47**
	S		25				6		1				32		1	**65**
SN_13 07	N		32		2		5	4				1	35		1	**80**
	S		23				8	1	1			2	45		1	**81**
SN_13 08	N	61	138	10	224	68	295	137	29	9		28	115	3	13	**1130**
	S	42	104	8	248	40	140	81	4	2		19	110		11	**809**
SN_14 01	N	150	162	21	40	728	508	238	252	48		106	31	2	162	**2448**
	S	167	179	22	48	975	573	215	369	53		115	30	1	145	**2892**
SN_15 01	E		1				8	2	271				6			**288**
	W						4		293				4			**301**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_15 02	E		3				8	3	204			3				**221**
	W		1				6		214				2			**223**
SN_15 03	E						5	4	261			1	1			**272**
	W		1				4		294				3			**302**
SN_15 04	E						2	3	210							**215**
	W		1				1		174				1			**177**
SN_15 05	E						1	3	226							**230**
	W								244							**244**
SN_15 06	E							2	144				1			**147**
	W								135				1			**136**
SN_15 07	E						2	3	197							**202**
	W								227							**227**
SN_15 08	E						2	2	179			1				**184**
	W								176			3	1			**180**
SN_15 09	E							2	157			4				**163**
	W						1		211			2	2			**216**
SN_15 10	E						11	2	177			8	6			**204**
	W						6	1	173			4	8			**192**
SN_15 11	E				1		9	3	167			8	8			**196**
	W						4		209			8	7			**228**
SN_15 12	E		1		2		6	2	209			8	2			**230**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	W						4	1	263			9	1		1	**279**
SN_15 13	E		1		2		5	3	253			9	4			**277**
	W						3		266			10	2		1	**282**
SN_15 14	E		2		2		6	3	278			12	2		1	**306**
	W						3	1	268			14	1		1	**288**
SN_15 15	E		2		1		17	3	280			38	2		6	**349**
	W		1		1		9	1	271			22			6	**311**
SN_16 01	E						37		264				1		9	**311**
	W		2				36	1	241						7	**287**
SN_16 02	E						51		272				6		11	**340**
	W		2				54	1	228				4		9	**298**
SN_16 03	E		1				77	5	305				4		12	**404**
	W		2				88	4	286				4		11	**395**
SN_16 04	E		1				106	11	291				8		11	**428**
	W		2				116	10	281			1	8		10	**428**
SN_16 05	E		1				150	14	315				21		12	**513**
	W		2				173	12	297				19		11	**514**
SN_17 01	N	5	29	1	32	82	416	28	123	5		33	97	5	8	**864**
	S		31	2	37	112	493	24	123	6		29	120	2	9	**988**
SN_17 02	N	1	41		32	89	446	28	128	4		33	62	5	10	**879**
	S		23		34	100	465	14	108	4		26	68	3	4	**849**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_17 03	N		35		37	92	508	27	119	3		36	104	5	9	**975**
	S	1	28	1	45	101	521	16	118	5		31	124	6	13	**1010**
SN_17 04	N	1	38		29	95	476	28	126	2		36	63	6	9	**909**
	S		26	1	31	103	494	11	108	3		27	76	2	6	**888**
SN_17 05	N		58	1	63	144	844	45	219	5		79	144	7	14	**1623**
	S		35	2	52	123	684	17	144	7		49	162	4	10	**1289**
SN_17 06	N	1	64		52	117	668	22	186	3		51	100	5	12	**1281**
	S	1	32	2	55	125	678	16	138	5		38	120	4	10	**1224**
SN_18 01	N	78	78	1	82	11	45	41		1		5	19		5	**366**
	S	88	74	1	130	13	45	36				6	15		2	**410**
SN_18 02	N	82	96	2	100	7	52	47		3		6	13		6	**414**
	S	94	112	2	139	15	60	37				8	15		5	**487**
SN_18 03	N	85	95	2	96	13	56	47	7	1		7	19		3	**431**
	S	94	94	3	99	26	67	41	2			12	20		5	**463**
SN_18 04	N	114	119	1	126	21	80	75	1	3		16	42		8	**606**
	S	90	116	3	122	36	85	47				20	53		11	**583**
SN_18 05	N	59	119		62	18	98	73				11	18		5	**463**
	S	48	78		63	47	89	57		2		10	17	1	8	**420**
SN_18a 01	N	91	74		84	9	21	47	2			18	30		5	**381**
	S	6	38	2	14	32	27	10	1			10	38		2	**180**
SN_18a 02	N	80	74	1	46	6	9	43	4			17	16		4	**300**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	S	40	73	2	25	24	13	20	1			7	26		2	**233**
SN_18a 03	N	50	66		19	7	5	29	1			4	14		1	**196**
	S	49	79	3	22	30	20	21				13	18		1	**256**
SN_18b 01	N	14	7		28		26	12	2	1		7	8		6	**111**
	S	35	3		12	1	14	12	55	1		3	3		1	**140**
SN_18b 02	N	24	14	2	41		25	24				6	1		2	**139**
	S	13	16		13		9	15	61			3	2			**132**
SN_18c 01	N	72	92		81		93	109	7	29		38	21	2	14	**558**
	S	102	74	1	123	4	142	128	7	34		35	19		19	**688**
SN_18c 02	N	70	84		74		91	105	6	30		29	21	2	12	**524**
	S	100	83	1	119	5	145	126	4	34		30	19		16	**682**
SN_18c 03	N	91	120	2	164		133	115	6	37		43	11	3	16	**741**
	S	132	110	3	220	7	176	157	6	41		30	8	1	21	**912**
SN_2 01	E	11	492	13	66	122	63	74	46	2		9	6		11	**915**
	W		69	1	5	40	103	2	28			8	2		7	**265**
SN_2 02	E	92	926	34	144	624	270	225	138	9		54	8		64	**2588**
	W	54	1057	44	154	485	438	69	146	5		58	8		63	**2581**
SN_2 03	E	99	940	34	145	643	279	232	150	9		48	26		61	**2666**
	W	53	1058	44	155	500	442	68	155	2		48	26		54	**2605**
SN_2 04	E	98	926	35	145	635	256	231	151	7		26	38		42	**2590**
	W	51	1067	43	134	482	411	72	154	1		24	38		37	**2514**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_2 05	E	98	933	33	126	566	246	221	146	5		11	5		19	**2409**
	W	49	1051	39	119	465	384	65	162	1		18	3		12	**2368**
SN_2 06	E	99	869	32	123	183	233	182	171	2		13	16		14	**1937**
	W	47	1010	33	117	156	395	53	237	1		22	8		11	**2090**
SN_2 07	E	9	139	6	54	33	223	31	183			17	4		4	**703**
	W	50	1023	33	116	157	396	54	229	1		18	2		14	**2093**
SN_2 08	E	13	146	5	58	33	228	33	182			17	6		4	**725**
	W	31	173	5	49	79	378	20	229			14	15		6	**999**
SN_2 09	E	10	114	3	15	20	167	20	182			12	5		3	**551**
	W	41	162	4	29	64	375	19	184			14	5		5	**902**
SN_2 10	E	99	187	9	94	38	201	59	184	16		30	7		8	**932**
	W	67	174	4	31	62	368	27	187	3		11	6		5	**945**
SN_3 01	N		50			2	220	39	3		64	325	193		39	**935**
	S		51			3	263	38	31		61	321	169		43	**980**
SN_4 01	E	7	88	2	17	31	62	59	7	13		16	23	2	48	**375**
	W	28	210	6	33	90	159	197	28	21		24	27	5	49	**877**
SN_4 02	E	7	59	1	11	20	44	45	17	3		17	13	1	41	**279**
	W	41	117	1	19	82	101	139	23	18		33	27	2	54	**657**
SN_4 03	E	48	44	1	8	23	73	59	22	12		28	17		28	**363**
	W	51	51	1	7	83	93	77	7	11		19	12		35	**447**
SN_4 04	E	46	29	1	7	26	64	57	17	6		37	17		30	**337**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	W	46	41	1	6	75	75	66	6	9		25	19		23	**392**
SN_4 05	E	39	24		5	21	55	49	15	4		29	17		22	**280**
	W	36	36		6	74	74	58	4	7		27	15		21	**358**
SN_4 06	E	40	20	1	4	25	53	53	14	6		19	25		27	**287**
	W	36	28		4	72	68	54	3	5		13	22		22	**327**
SN_4 07	E	33	13		2	21	44	45	14	6		11	29		20	**238**
	W	33	17		1	72	59	50	2	4		9	33		16	**296**
SN_4 08	E	36	7			27	41	48	15	6		12	28		20	**240**
	W	31	18		1	74	56	48	3	3		10	28		17	**289**
SN_4 09	E	33	8			23	35	45	13	5		8	24		12	**206**
	W	29	9			72	52	42		3		8	26		15	**256**
SN_4 10	E	32	7			24	34	42	12	7		11	16		14	**199**
	W	30	10			69	49	45	3	5		10	11		12	**244**
SN_4 11	E	28	5			23	22	35	11	7		5	8		6	**150**
	W	24	8			60	34	34	1	3		7	4		10	**185**
SN_4 12	E	25	5			21	23	40	11	5		10	9		11	**160**
	W	27	4			82	31	48	3	6		8	5		12	**226**
SN_4 13	E	43	4		1	30	17	61	19	8		8	15		17	**223**
	W	35	6			93	35	62	2	7		9	8		19	**276**
SN_4 14	E	39	6			26	15	56	15	8		6	21		16	**208**
	W	30	4			87	33	60	3	4		6	15		13	**255**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_4 15	E	34	3			21	8	54	15	8		5	5		13	**166**
	W	22	4			81	22	54	2	4		6	10		7	**212**
SN_4 16	E	48	2			21	8	51	14	5		2	1		10	**162**
	W	20	1			76	23	44	2	3		5	3		2	**179**
SN_4 17	E	40	2			18	7	47	9	5		2			18	**148**
	W	17	1			73	18	40	1	3		5	1		11	**170**
SN_4 18	E	31	1			18	4	43	6	5		2			6	**116**
	W	13	1			69	17	36		3		6			1	**146**
SN_4a 01	E						6	1				1			2	**10**
	W						6									**6**
SN_4a 02	E					1	8					1	3			**13**
	W	1				1	9									**11**
SN_5 01	N		3				163	37	1		22	145	107		9	**487**
	S						123	3	8		23	143	104		10	**414**
SN_5 02	N		2				59	23				7	40		7	**138**
	S		1				60	7	15			5	51		7	**146**
SN_5 03	N		4				60	40	1				23		2	**130**
	S						68	20	28			1	33			**150**
SN_5 04	N		2				50	31				2	25		1	**111**
	S		1				64	16	27			1	24			**133**
SN_5 05	N		2				52	39	2				25		1	**121**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	S						64	22	33			3	26		1	**149**
SN_5 06	N	11	28		5	27	61	75		1		4	20		4	**236**
	S	4	17		3	31	75	34	38	2		2	20		2	**228**
SN_5 07	N	15	37			60	22	55	18	2			9		4	**222**
	S	4	41	2	1	68	32	22	28	2		1	13		2	**216**
SN_6 01	E		13	9		1	77	5	40			32	63		9	**249**
	W		6	11		2	80	4	2			39	40		12	**196**
SN_6 02	E		12	9			90	6	44			37	124		27	**349**
	W		2	11			74	3	2			32	98	1	27	**250**
SN_6 03	E		9	8			89	5	38			36	17		20	**222**
	W		2	10			73	3	2			37	20	1	25	**173**
SN_6 04	E		9	8			87	5	37			40	2		17	**205**
	W		1	8			71	2	2			37	1		17	**139**
SN_6 05	E		9	4			77	5	38			38			14	**185**
	W		3	2			58	2	3			34			15	**117**
SN_6 06	E		10	8			58	5	32			24			8	**145**
	W			4			46	2				25			10	**87**
SN_6 07	E		9	7			65	5	35			32	1		8	**162**
	W		1	2			50	2				30			10	**95**
SN_6 08	E		10	6			72	5	36			50			8	**187**
	W		3	3			54	3		1	1	31			8	**104**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_6 09	E		20	10			102	18	66		4	100			15	**335**
	W		9	9			102	33	32	1	2	94			16	**298**
SN_6 10	E		25	10			112	20	75		4	122	1		21	**390**
	W		11	11			117	33	33		4	108			21	**338**
SN_6a 01	E		2					4	1			3	3			**13**
	W	1	3				8	19				2	4		2	**39**
SN_6a 02	E		1				5	2	6			7	4		1	**26**
	W		1				10	15	5			3	9		1	**44**
SN_6a 03	E		7	1			17	11	7			21	9			**73**
	W		5	1			25	16				20	14		1	**82**
SN_6a 04	E		3				11	9	4			17			1	**45**
	W		3				17	16				14	2			**52**
SN_6a 05	E						9	9	2			15				**35**
	W		1	1			13	18				16	1			**50**
SN_6a 06	E			1			6	2	2			6	1		1	**19**
	W		1				11	13				4				**29**
SN_6a 07	E						2		1							**3**
	W		1	1			7	7				6	1			**23**
SN_6a 08	E		2				7	5	1			12				**27**
	W		1				13	16				15				**45**
SN_6a 09	E						1		2			5			1	**9**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	W											4			1	**5**
SN_6b 01	E		7				7	6	13		2	10	21		1	**67**
	W		1				7	12	11		2	11	16		1	**61**
SN_6b 02	E		4				6	3	13		2	7	3		1	**39**
	W		3				4	13	11		3	11	11		1	**57**
SN_6b 03	E		4				3	4	13		2	6	11			**43**
	W		2				7	13	11		2	9	11		1	**56**
SN_6b 04	E		1				8	5	14		3	12	13		2	**58**
	W		1				4	13	12		1	11	6		2	**50**
SN_6b 05	E		4				10	5	15		3	15	24		5	**81**
	W		1				5	17	29		4	14	21		3	**94**
SN_6b 06	E		2				7	7	16		2	13	5		2	**54**
	W		1				5	14	28		4	13	4		3	**72**
SN_6b 07	E						2	4	10		2	4	1			**23**
	W						2	16	15		2	4			1	**40**
SN_6b 08	E		1				6	5	15		1	2	2			**32**
	W							14	11			6	2		1	**34**
SN_6b 09	E						1	3	7			2				**13**
	W						3	7	10			2	1			**23**
SN_6b 10	E		1									1				**2**
	W															

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_7 01	N	112	61	5	19	264	123	155	98	29		15	13		48	**942**
	S	126	154	14	31	514	316	212	192	64		52	25	2	85	**1787**
SN_7 02	N	32	30		7	30	13	65	3	12			8		5	**205**
	S	33	38		4	24	18	31	9	15			8		7	**187**
SN_7 03	N	29	35	3	4	10	5	50	2	13			41		5	**197**
	S	30	37	1	7	14	17	25	5	16			15		7	**174**
SN_7 04	N	15	35	3	4	10	18	33	1	14		12	20		8	**173**
	S	21	22	1	2	4	17	10	3	4		8	24		11	**127**
SN_7 05	N	13	24	3		7	5	29		11			14		5	**111**
	S	16	12			2	13	6	1	2			12		8	**72**
SN_7 06	N	11	22	4		6	16	7	1	3			20		5	**95**
	S	20	17	1		2	12	6	1	3		1	17		9	**89**
SN_7 07	N	5	13	3		6	13	4		4			35		1	**84**
	S	14	11				19	4	1	2		1	41		3	**96**
SN_7 08	E	16	13			3	18	5		1		1	34		1	**92**
	W	6	13	6		5	22	6		3			30		1	**92**
SN_7a 01	N	44	77		9	174	73	132	36	18		3	6		7	**579**
	S	47	118	5	16	290	140	166	41	24		3	5		7	**862**
SN_7a 02	N	61	160	1	14	236	105	263	40	51		5	9		15	**960**
	S	46	189	8	18	312	194	238	50	45		2	15		11	**1128**
SN_7a 03	N	49	125	1	8	220	88	216	34	33		2	13		6	**795**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
	S	42	161	7	16	294	168	212	47	42		2	13		7	**1011**
SN_7a 04	N	48	113		9	211	89	195	31	31		3	10		10	**750**
	S	39	153	9	20	303	162	201	51	39		1	9		8	**995**
SN_7a 05	N	47	119	1	9	195	95	215	29	37		4	12		9	**772**
	S	30	139	8	15	251	146	188	44	41		1	7		5	**875**
SN_7a 06	N	9	18			32	52	71		12		1	3		1	**199**
	S	2	15	2	1	40	74	90		14		1			1	**240**
SN_9 01	N	1	9		3	69	102	13	30	4		4	4		7	**246**
	S		8			44	51	2	48			3	1			**157**
SN_9 02	N	1	42	3	15	292	275	61	167	8		13	17	2	28	**924**
	S		45	4	11	406	298	23	232	2		10	13		23	**1067**
SN_9 03	N		34	4	10	271	267	53	162	6		11	10	3	19	**850**
	S		38	4	12	390	300	25	250	2		10	8		18	**1057**
SN_9 04	N		33	4	9	268	272	55	164	6	1	22	11	2	23	**870**
	S		38	5	9	382	301	25	243	2		12	9	1	20	**1047**
SN_9 05	N		34	4	6	268	284	52	160	6	1	16	11	2	20	**864**
	S		35	4	10	368	294	26	245	2		12	13		18	**1027**
SN_9 06	N		29	3	5	258	211	48	159	3		13	12		16	**757**
	S		31	4	8	362	237	24	240	2		10	7		15	**940**
SN_9 07	N		17	3	3	161	127	32	136			13	3		5	**500**
	S		18	3	6	252	122	16	164			4	5		6	**596**

Leg	Direction	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship	General cargo ship	Bulk carrier	Ro-Ro cargo ship	Passenger ship	Fast ferry	Support ship	Fishing ship	Pleasure boat	Other ship	Total traffic
SN_9 08	N		22	1	3	185	140	26	129	1		9	8		8	**532**
	S		22	3	5	234	98	7	147	1		4	4		9	**534**
TO_NR 01	N	38	47		10		46	108		7		30	8	1	9	**304**
	S	5	3		5	1	28	9		1		10	5		4	**71**
TO_NR 02	N	36	40		55		69	29	5	10		15	8		4	**271**
	S	16	28		17		43	16	48	1		1	4			**174**
TO_NR 03	N	3	3				4	6				4	22			**42**
	S	133	166	5	154		29	41		1		11	21		6	**567**
TO_NR 04	N	139	149	3	146		63	68	1	1		35	50		12	**667**
	S		2				3						62			**67**
TO_NR 05	N	1	2		3	7	8	4				6	20			**51**
	S		18		8	51	47	16				31	26		4	**201**
TO_NR 06	N		11		4	3	28	10	2			1	22		1	**82**
	S		11		10	21	147	33	2			11	29		4	**268**
TO_NR 06a	N		13		7	6	38	16	2			7	25		1	**115**
	S		11		9	23	116	35	2			11	40		3	**250**