Passenger Vessels

Passenger vessel activity is generally low throughout both Scottish and English waters (see Figure 13-13). In Scottish waters a band of passenger vessel activity routes around the Scottish coastline between KP4 and KP15, which includes the NorthLink ferries MV Hrossey (MMSI 235448000) and MV Hjaltland (MMSI 235450000) which run between Aberdeen and Orkney and Aberdeen and Shetland. In English waters passenger vessel activity mainly relates to the regular ferry route of Newcastle to Ijmuiden, as mentioned previously in this section, which comprises the Princess Seaways (MMSI 220489000) and King Seaways (MMSI 220449000) vessels run by DFDS.

Recreational Vessels

In Scottish waters recreational vessel activity is focussed on Peterhead Port, with vessels transiting to and from the port and routeing along the Scottish coast between approximately KP1.5 and KP7.

Bridlington Harbour in English waters shows recreational vessel activity routeing to and from its harbour, in particular to the north of the Marine Installation Corridor, as well as recreational traffic routeing along the coast which crosses the Marine Installation Corridor between KP411 and KP427 (Figure 13-13).

Offshore Industry Vessels

Offshore industry vessel traffic in Scottish waters is likely related to the high concentration of offshore oil and gas activity in the region to the east of the Marine Installation Corridor, as shown in Figure 13-5. As Section 13.5.2.1: Ports and Navigational Features notes, Peterhead Port is a major offshore energy hub and traffic from its port crosses the Marine Installation Corridor, from KP1.5 onwards. Additionally, offshore industry vessel activity radiates out from Aberdeen, contributing to the high concentration of offshore industry vessel tracks between KP2 and KP70.

In English waters, offshore vessel activity is present throughout much of the Study Area but is highest towards the south of the study area between KP340 and KP425.

Other Vessels

In Scottish waters, other type vessels show a high concentration of vessel activity between KP2 to KP27 (Figure 13-13). In English waters, a band of other type vessel tracks is present between KP260 and KP302, relating to research and survey vessels routeing offshore. Other type vessels crossing the Marine Installation Corridor at approximately KP380 relate to surveying conducted by unmanned vessels associated with the proposed Northern Endurance Partnership (NEP) carbon capture pipeline routed from Teesside (BP Exploration Operating Company Ltd, 2021). Additionally, surveying can be seen within the study area and intersecting the Marine Installation Corridor between approximately KP423 and KP434 which may be associated with the export cable for the Hornsea 4 windfarm (Orsted, 2021). Other vessel traffic is high within the UK Territorial Sea limit in English waters, in particular intersecting the Marine Installation Corridor between KP410 and KP426

13.5.5.3 Vessel Size and Status

Vessel Length

AIS data contains information on vessel length. As shown in Table 13-11 the majority of vessel tracks (73.3%) were associated with the smaller vessels of under 100 m, while only 1.8% of tracks were from vessels of over 200 m in length. The chart in Figure 13-14 shows that the vessel tracks associated to vessels of 1 m to 50 m length were mostly fishing vessels. ‘Recreational’ and ‘other’ vessels are also higher represented in this length class than in other vessel length classes. Cargo and tanker vessels dominated with tracks associated with vessels of over 100 m in length, with offshore industry vessel tracks comprising a significant portion of traffic from vessels of 50 m to 100 m in length.

Table 13-11: Vessel Length

Length (m)	Vessel Tracks	Percentage of Total
1 - 50	7,320	32.8%
50 - 100	9,039	40.5%
100 - 150	3,575	16.0%

Length (m)	Vessel Tracks	Percentage of Total
150 - 200	1,614	7.2%
Over 200	404	1.8%
Unknown	361	1.6%
Total	22,313	100%

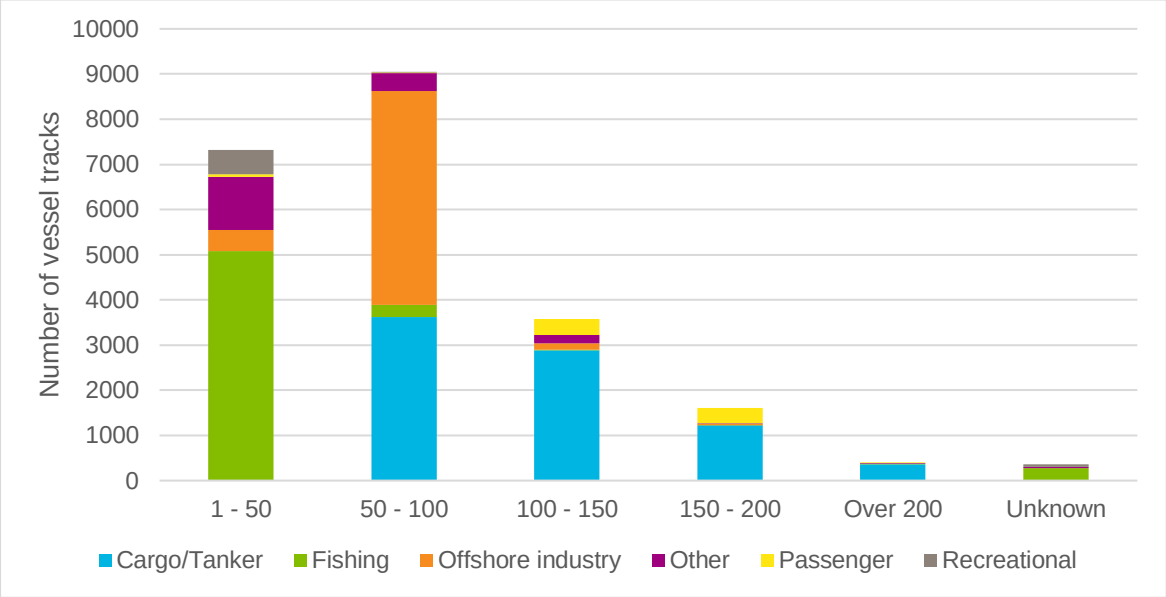

Figure 13-14: AIS Vessel Length by Vessel Type

The spatial patterns in vessel length are presented in Figure 13-15. In Scottish waters, there is a clear trend of medium and larger length vessels (over 100 m) routeing further offshore while only the smaller classes of vessel (<100 m in length) are present from KP0 to KP2. Vessels of the largest length class (over 200 m) are present generally from KP9 onwards.

In English waters smaller length class vessels (1 m to 100 m) are the dominant classes closer to shore between KP 420 to the English landfall, with vessels of between 50 m and 100 m routeing to and from Bridlington Harbour. Between KP355 and KP420 a concentration of tracks from vessels over 200 m in length can be observed.

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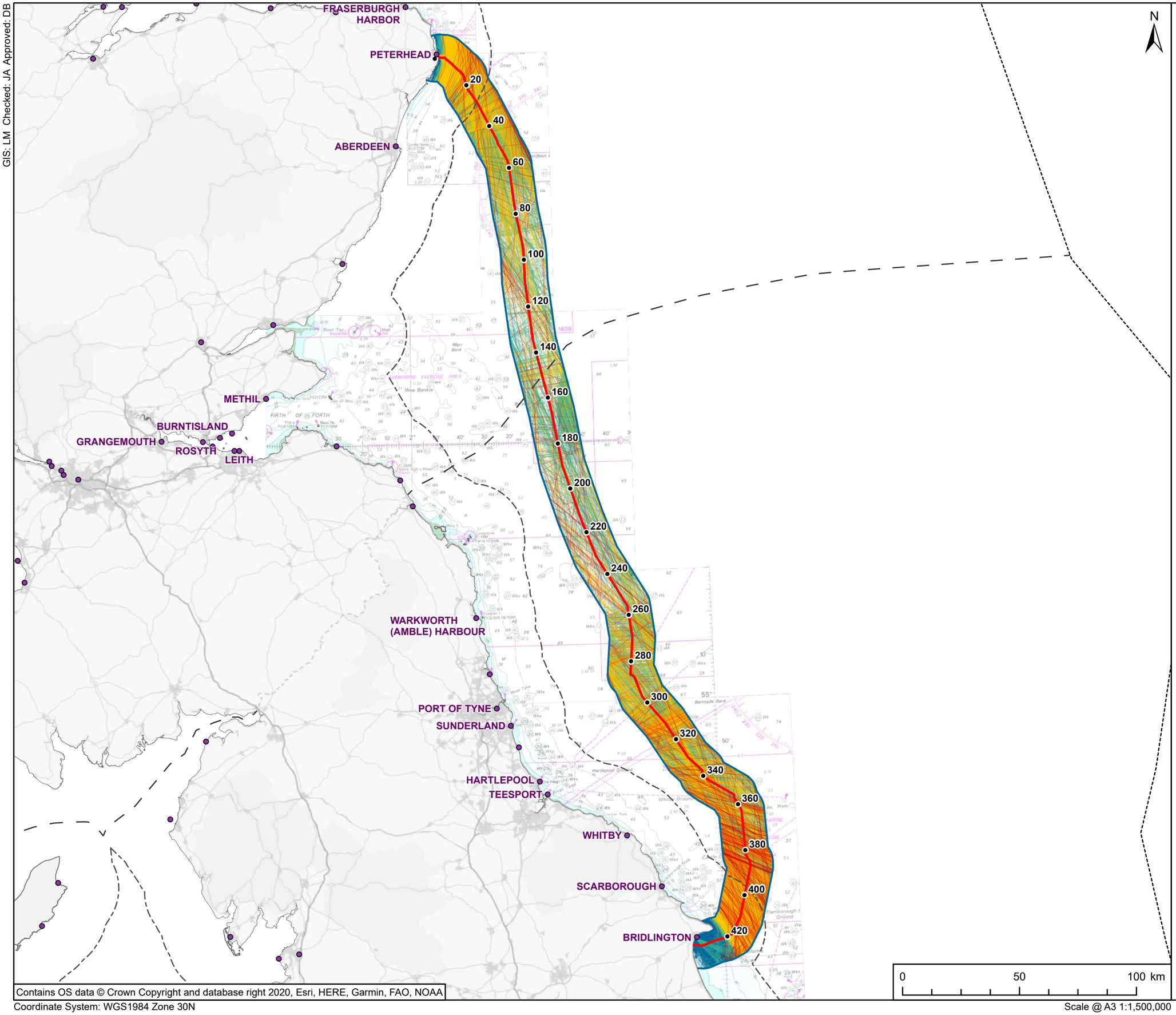

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KEY

- Kilometre Point (KP)
- Marine Installation Corridor
- 10 NM Shipping and Navigation Study Area
- Port
- UK Territorial Sea Limit
- Scottish/English Water Border
- UK Exclusive Economic Zone

Vessel length (m)

- Unknown
- ≤50 m
- ≤100 m
- ≤150 m
- ≤200 m
- Over 200 m

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Figure 13-15
Spatial Distribution of AIS Vessel Tracks by Vessel Length in Proximity to the Study Area

REFERENCE

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1 of 1	28/04/2022

Vessel Dead Weight Tonnage

DWT is an indication of vessel size as it refers to the carrying capacity of the vessel. There were 1,345 vessels missing DWT values in the AIS data for the study area, so a regression model[3] was used based on the available data for each vessel type to calculate the missing values.

The distribution of AIS vessel DWT is presented in Table 13-12 and shows that 31.3% of vessel tracks in the study area fell into the 2,500 to 5,000 DWT class and 30.6% fell into the 1 to 250 DWT class. The chart in Figure 13-16 shows that fishing vessels comprised most of vessel tracks in the smallest class of 1 to 250 DWT, with 'other' and recreation vessel tracks also present. Offshore industry vessel tracks dominate the 2,500 to 5,000 DWT class while cargo and tanker vessels dominate the larger classes of 5,000 to 50,000 DWT and over 50,000 DWT.

In terms of the spatial distribution, in Scottish waters closest to the shore from KP0 to KP1.5 tracks associated with vessels in the smallest DWT class dominate (see Figure 13-17). From KP1.5, the Marine Installation Corridor then intersects with vessel tracks of larger DWT routeing to and from Peterhead Port. From approximately KP13 to the border with English territorial waters tracks from vessels of over 50,000 DWT are present, mainly routeing from Aberdeen.

In English waters, tracks from vessels over 50,000 DWT are present throughout most of the Study Area, however from approximately KP241 to the English landfall, tracks from vessels from 1 to 250 DWT dominate.

Table 13-12: Distribution of AIS Tracks (DWT)

DWT (tonnes)	Vessel Tracks	Percentage of Total
1 - 250	6,832	30.6%
250 - 2,500	2,808	12.6%
2,500 - 5,000	6,988	31.3%
5,000 - 50,000	5,302	23.8%
>50,000	383	1.7%
Total	22,313	100%

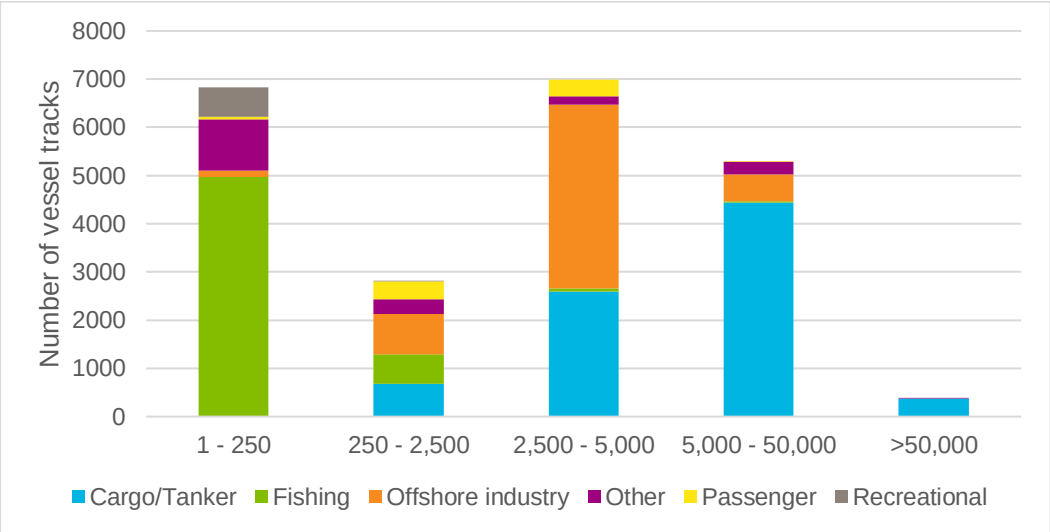

Figure 13-16: AIS Vessel DWT by Vessel Type

[3] The DWT regression model was run per unique vessel based on vessel MMSI number. The regression model predicts DWT values based on vessel type and vessel length. Regression analysis was applied initially per detailed vessel type; if this information was not available, then regression was run per summary vessel type, if this was unavailable then broad vessel categories were used.

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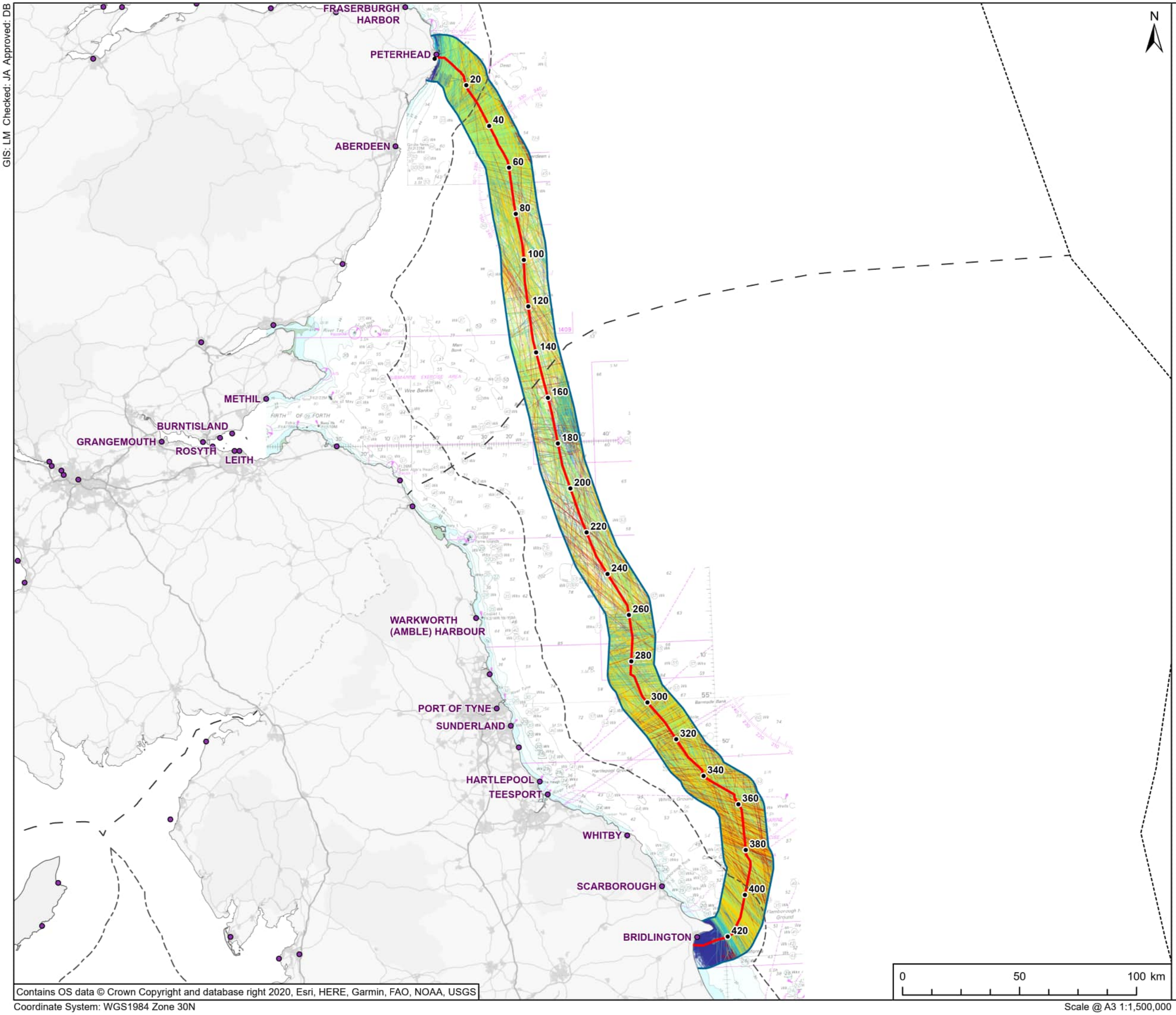

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Vessel Dead Weight Tonnage (DWT)
- ≤250
- ≤2,500
- ≤5,000
- ≤50,000
- Over 50,000

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TITLE
Figure 13-18
Spatial Distribution of AIS Vessel Tracks by Vessel DWT in Proximity to the Study Area

REFERENCE
EGL2_M_EAR_13-18_v1_20220502

SHEET NUMBER	DATE
1 of 1	02/05/2022

Vessel Draught

Vessel draught distribution within the study area is presented in Table 13-13, and shows that 42.9% of vessel tracks across the two seasons has a registered draught between 5 m and 7.5 m. Tracks from vessels with over 7.5 m draught only represented 6.1% of traffic across the two seasons.

Figure 13-18 presents the vessel draught classes by vessel type and shows that cargo vessels and tankers and offshore industry vessels were the two dominant vessel types across draught classes 2.5 m to 5 m and 5 m to 7.5 m. Cargo and tanker vessels represented the dominant vessel type in the 7.5 m to 10 m draught class. It should be noted that 23.7% of vessel tracks did not provide this draught information.

Table 13-13: Vessel Draught

Draught (m)	Vessel Tracks	Percentage of Total
0 - 2.5	817	3.7%
2.5 - 5	5,289	23.7%
5 - 7.5	9,578	42.9%
7.5 - 10	1,110	5.0%
Over 10	235	1.1%
Unknown	5,284	23.7%
Total	22,313	100%

In terms of the spatial distribution, similar to the trend seen with vessel lengths, in Scottish waters from KP0 to KP1.5 the majority of tracks are associated with vessels in the smallest draught classes, with under 5 m draught (Figure 13-19). Tracks from vessels with draught between 5 m and 10 m are present from KP1.5 to the border with English waters, and tracks from vessels in the highest draught class (over 10 m) are present throughout Scottish waters in the study area from KP5 onwards.

In English waters, tracks with a vessel draught of over 7.5 m are present from the Scottish waters boundary to approximately KP421. From KP421 to the English landfall, the smaller draught classes dominate, with tracks from vessels of under 2.5 m and 2.5 m to 5 m routeing to and from Bridlington Harbour and along the coast.

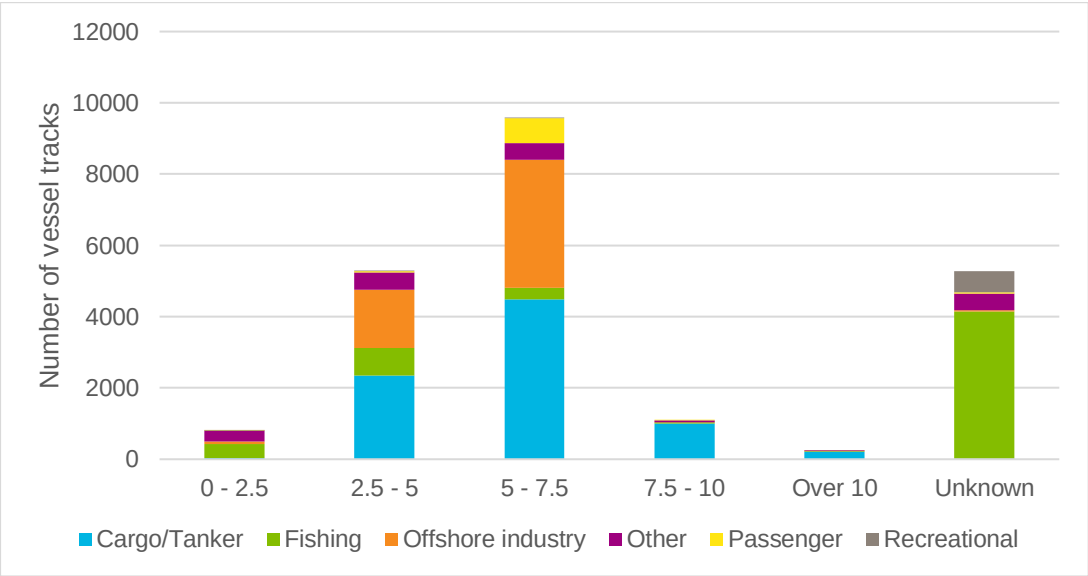

Figure 13-18: AIS Vessel Draught by Vessel Type

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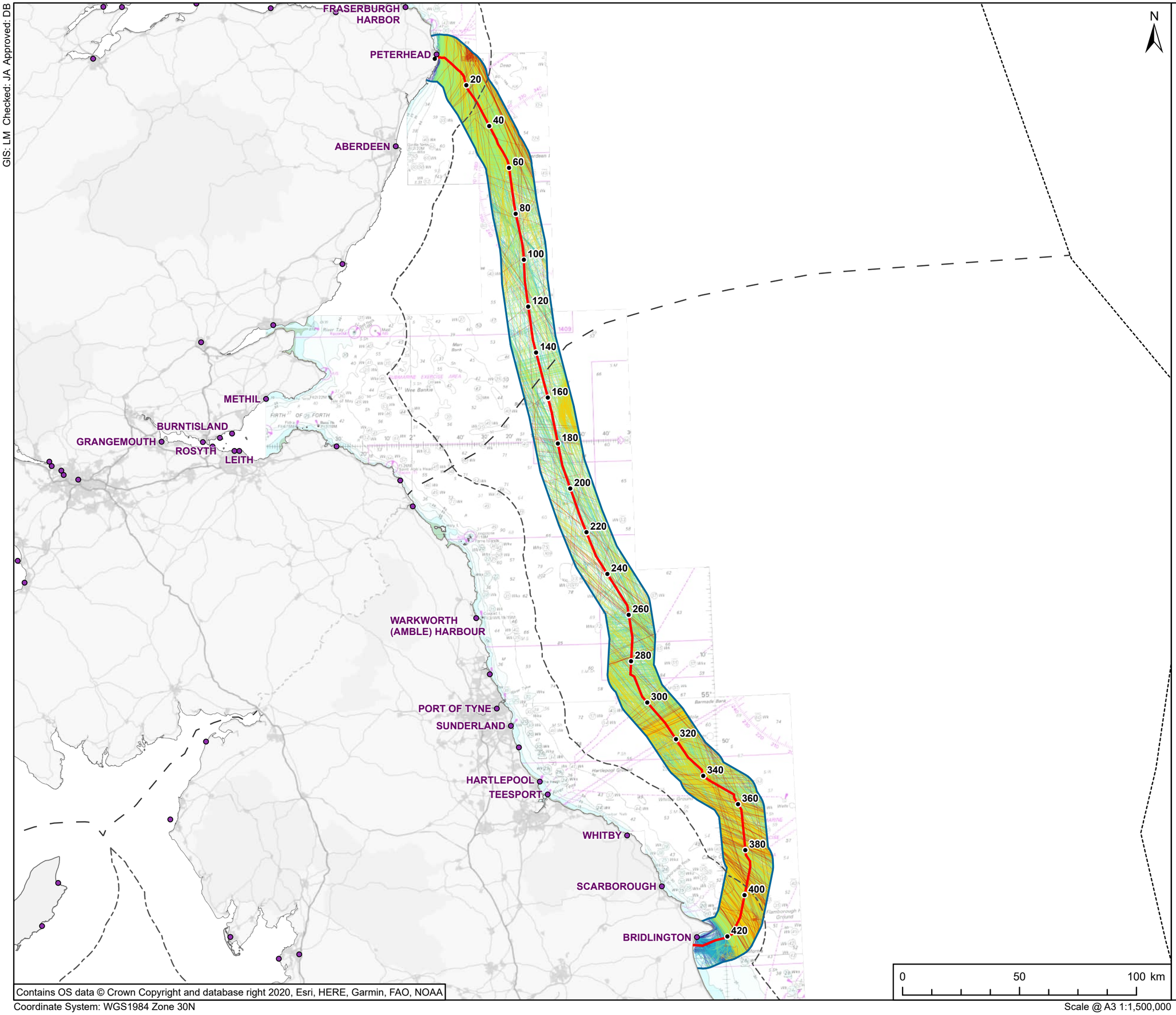

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Vessel draught registered (m)
- ≤2.5
- ≤5
- ≤7.5
- ≤10
- Over 10

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TITLE
Figure 13-19
Spatial Distribution of AIS Vessel Tracks by Vessel Draught in Proximity to the Study Area

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Vessels at Anchor

AIS data points contain information on a vessel's status, including if it is 'at anchor'. This status is manually set by the crew and is not always appropriately set but can give an indication of presences of anchoring vessels in the study area. Points with status set to 'at anchor' were filtered by speed, distinguishing between points which had a speed of <2 knots as likely to be anchoring, and points of speed >2 knots as more likely to have been erroneously set as 'at anchor'. Figure 13-20 shows some patterns of points of >2 knots in speed arranged in lines which can be assumed to be when the status on vessels was erroneously set to 'at anchor', and so can be disregarded from this analysis.

In Scottish waters, Figure 13-20 shows that anchoring vessels are only present within the UK Territorial Sea limit. A cluster of both winter and summer AIS points where vessel status was set to 'at anchor' and speed was <2 knots is present to the north of the Marine Installation Corridor, within the breakwaters of Peterhead Bay, and most likely represent vessels berthed in Peterhead Port. The entrance to Peterhead Bay is approximately 880 m from the Marine Installation Corridor at KP2. There are also clusters of anchoring AIS points within the study area to the north of Peterhead Bay approximately 4.6 km from the Marine Installation Corridor at KP2, and a cluster of summer anchoring AIS points to the south of Peterhead Bay approximately. 5.6 km from the Marine Installation Corridor at KP1.5. From consultation with Peterhead Port, these are likely to be vessels sheltering from adverse weather.

In English waters, anchoring vessel AIS points are mostly concentrated within the UK Territorial Sea limit, however there is a cluster approximately 9 km east of the Marine Installation Corridor at KP311 from fishing vessels as well as a cluster approximately 3.2 km south west of the Marine Installation Corridor at KP333, which relates to oil tanker vessel activity. Within the UK Territorial Sea limit in English waters, clusters of anchoring vessel AIS points are present in both seasons within the study area. These fall within 3.5 km to the north of the Marine Installation Corridor from KP425 to KP431, centred around a charted anchorage location for Bridlington Harbour which is approximately 3.4 km from the Marine Installation Corridor at the closest point at KP427 (Figure 13-20). There are also clusters present within 2.4 km to the south of the Marine Installation Corridor from KP429 to the English landfall, these are also likely associated with Bridlington Harbour. A large region of anchoring AIS points is observed to the south of the Marine Installation Corridor between approximately 2.6 km and 9.6 km from the Marine Installation Corridor at the closest point at KP422 (see Figure 13-20).

13.5.5.4 Fishing Analysis

This section presents an analysis of fishing vessels in the vicinity of the Marine Installation Corridor, based on both AIS and VMS data. Commercial fisheries are discussed in further detail in Chapter 14: Commercial Fisheries. The AIS data provides detailed information on the specific trajectories of the vessels, but is likely to under-represent fishing activity, since fishing vessels under 15 m length are not obliged to carry an AIS transponder, (though many do voluntarily for safety). VMS data can provide a more comprehensive picture of fishing activity since vessels greater than 12 m are obliged to carry VMS equipment, however, it must be noted that the data are not publicly available in a format that allows reconstruction of trajectories, and vessels under 12 m will not be represented.

Three types of AIS vessel data have been used to gain insight into fishing activity in the study area:

- AIS fishing vessel tracks categorised by length;
- AIS fishing vessel tracks categorised by vessel subtype; and
- AIS data points with status set to "actively fishing".

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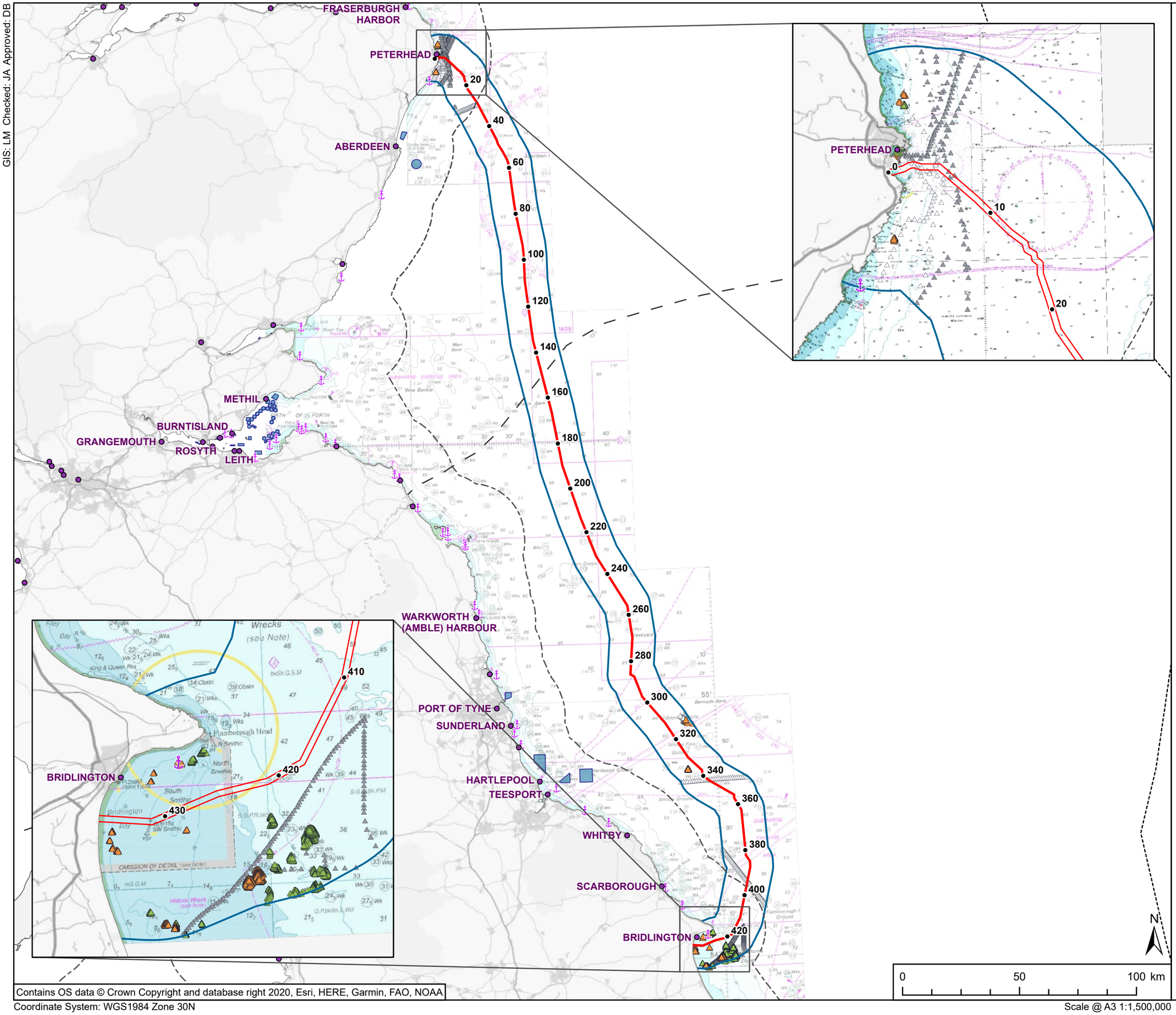

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KEY

- Kilometre Point (KP)
- Marine Installation Corridor
- 10 NM Shipping and Navigation Study Area
- Port
- UK Territorial Sea Limit
- Scottish/English Water Border
- UK Exclusive Economic Zone

Navigational features

- Anchorage area
- Anchorage
- Winter AIS points where vessel status is set to 'at anchor', speed <2 knots
- Summer AIS points where vessel status is set to 'at anchor', speed <2 knots
- Winter AIS points where vessel status is set to 'at anchor', speed >2 knots
- Summer AIS points where vessel status is set to 'at anchor', speed >2 knots

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Figure 13-20
Spatial Distribution of AIS Vessel Tracks by Vessels at Anchorage Points in Proximity to the Study Area

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As detailed in Section 13.4.2: Data Sources and Consultations, three sources of VMS data have been used to supplement the AIS data:

- Anonymised VMS point data during 2019, which has been processed to provide density information for the study area. This data provides no information on gear type or fishing status, however vessel speed can be used as a proxy for fishing status. Vessels travelling at speeds of <6 knots are considered likely to be fishing;
- MMO sightings data 2011 to 2019 representing vessels sighted on surveillance flights and patrols; and
- Fishing activity by ICES statistical rectangle distributed by the MMO. This data includes details about time spent fishing and gear type over the period 2016 - 2019, but is aggregated within each ICES statistical rectangle, so local patterns of activity cannot readily be discerned.

Additionally, information regarding fishing activity within the region from the North Sea (West) Pilot was noted.

Fishing Vessels in AIS Data

Fishing vessel tracks classified by length and by fishing vessel subtype are shown in Figure 13-21. In Scottish waters, fishing vessel tracks are concentrated close to shore within the UK Territorial Sea limit and are primarily smaller vessels of under 15 m and 15 m to 30 m in length, crossing the Marine Installation Corridor between approximately KP1 and KP20.

In English waters, most fishing vessel tracks are concentrated closer to shore within the UK Territorial Sea limit, where the fishing vessels are generally of the smaller length classes (under 30 m). A concentration of tracks from larger vessels of over 30 m and over 50 m in length is present to the east of the Marine Installation Corridor between approximately KP150 and KP189 (Figure 13-21).

In terms of fishing vessel subtypes, the most common type is “fishing vessel / fishing” with 84.5% of tracks in the study area. Trawlers represented 14.7% of tracks in the study area. In Scottish waters, trawler activity was present from KP2 when the Marine Installation Corridor crosses trawler traffic routeing to and from Peterhead Bay (Figure 13-21). In English waters tracks from trawler vessels were less widely spread, concentrated in the region of fishing vessel tracks east of the Marine Installation Corridor between approximately KP150 and KP189, as well as routeing along the coast and intersecting the Marine Installation Corridor between KP383 to KP421.

Fishing vessel AIS points that are likely to represent fishing activity based on speed and are displayed Figure 13-22. Those points from vessels travelling at >6 knots are assumed to be transiting rather than actively fishing. Actively fishing vessels in Scottish waters show a similar pattern in both winter and summer seasons of a concentration of likely actively fishing points inshore and close to Peterhead Port, between approximately KP1 and KP18. The summer season shows an additional concentration of these likely actively fishing AIS points to the west of the Marine Installation Corridor between approximately KP34 and KP46.

In English waters across both seasons, actively fishing vessel activity can be seen mostly towards the southerly end of the Marine Installation Corridor from approximately KP300 onwards, however actively fishing vessels were more geographically widespread in the summer season than in winter, with actively fishing AIS points present throughout the study area from approximately KP155 to KP300. In the winter season, a region of actively fishing vessel activity is present between KP302 to KP325 which is not present in summer. In summer, two regions of actively fishing activity are present which intersect the Marine Installation Corridor at approximately KP339 and KP380 which are not present in the winter season.

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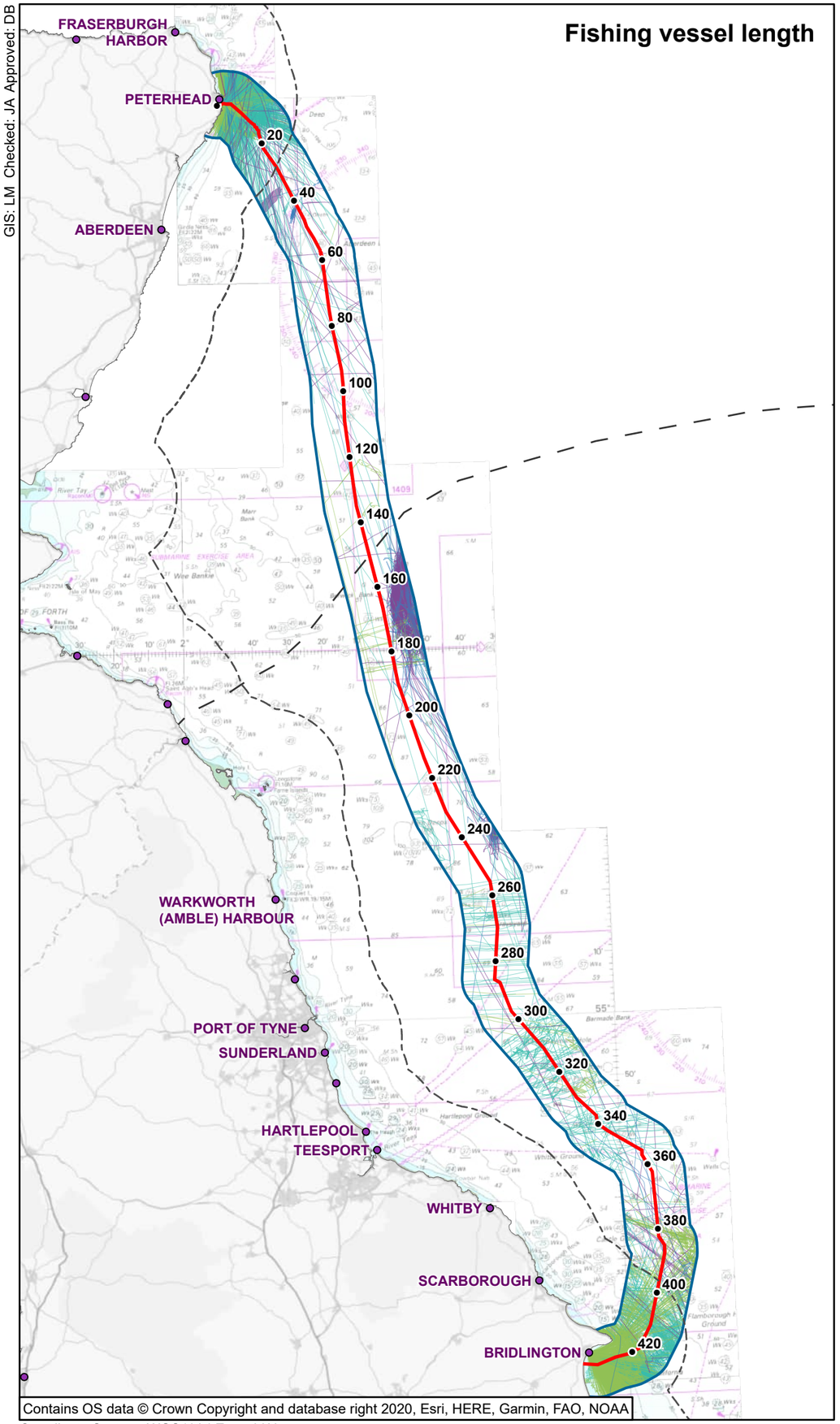

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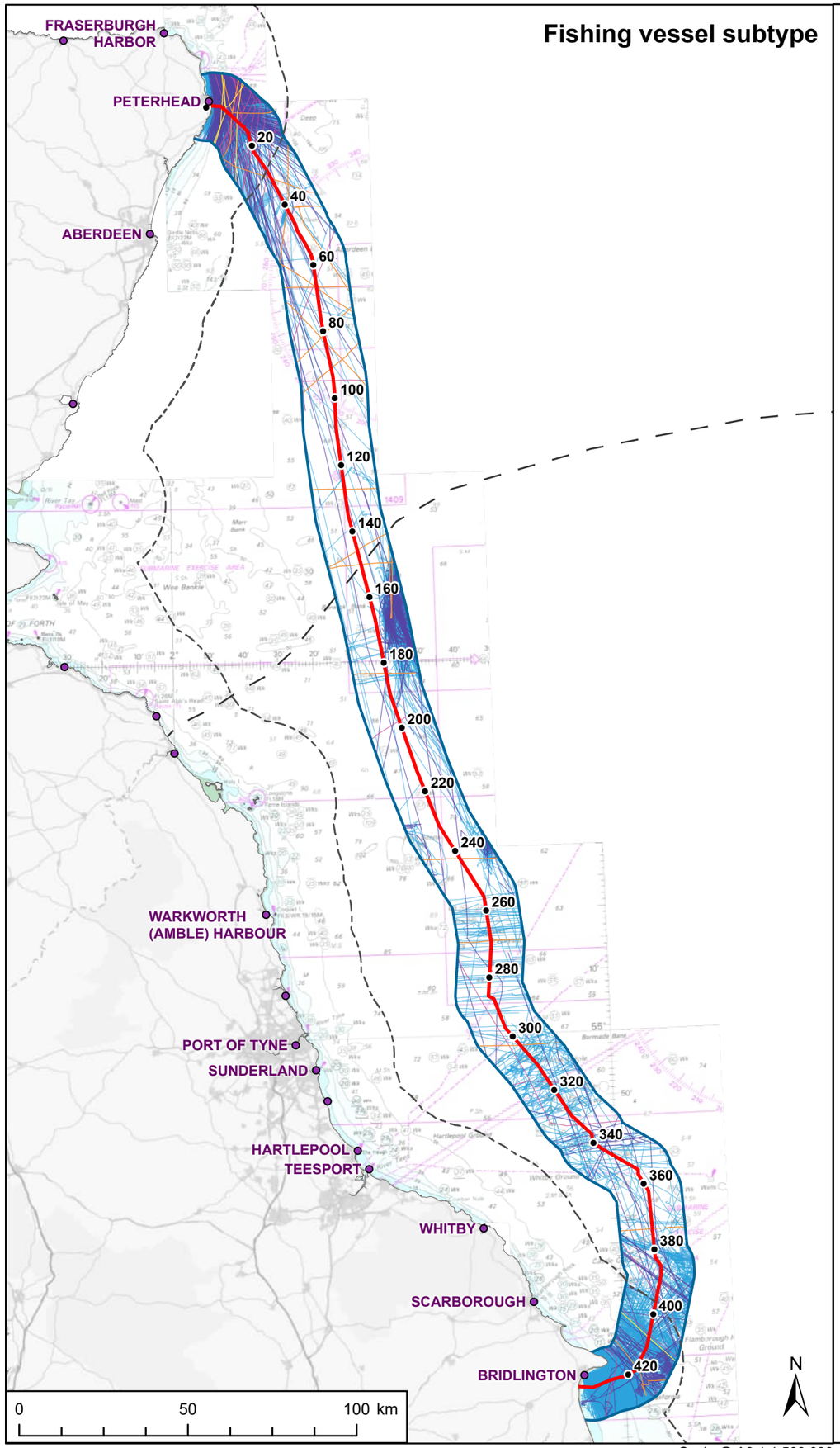

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Fishing vessel length (m)

- < 15
- 15 - 30
- 30 - 50
- > 50

Fishing vessel subtype

- Fishing or Fishing Vessel
- Trawler
- Fishery Patrol Vessel
- Fishery Research Vessel
- Fish Carrier

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TITLE
Figure 13-21
Spatial Distribution of Fishing Vessels AIS Records by Vessel Length and Subtype in Proximity to the Study Area

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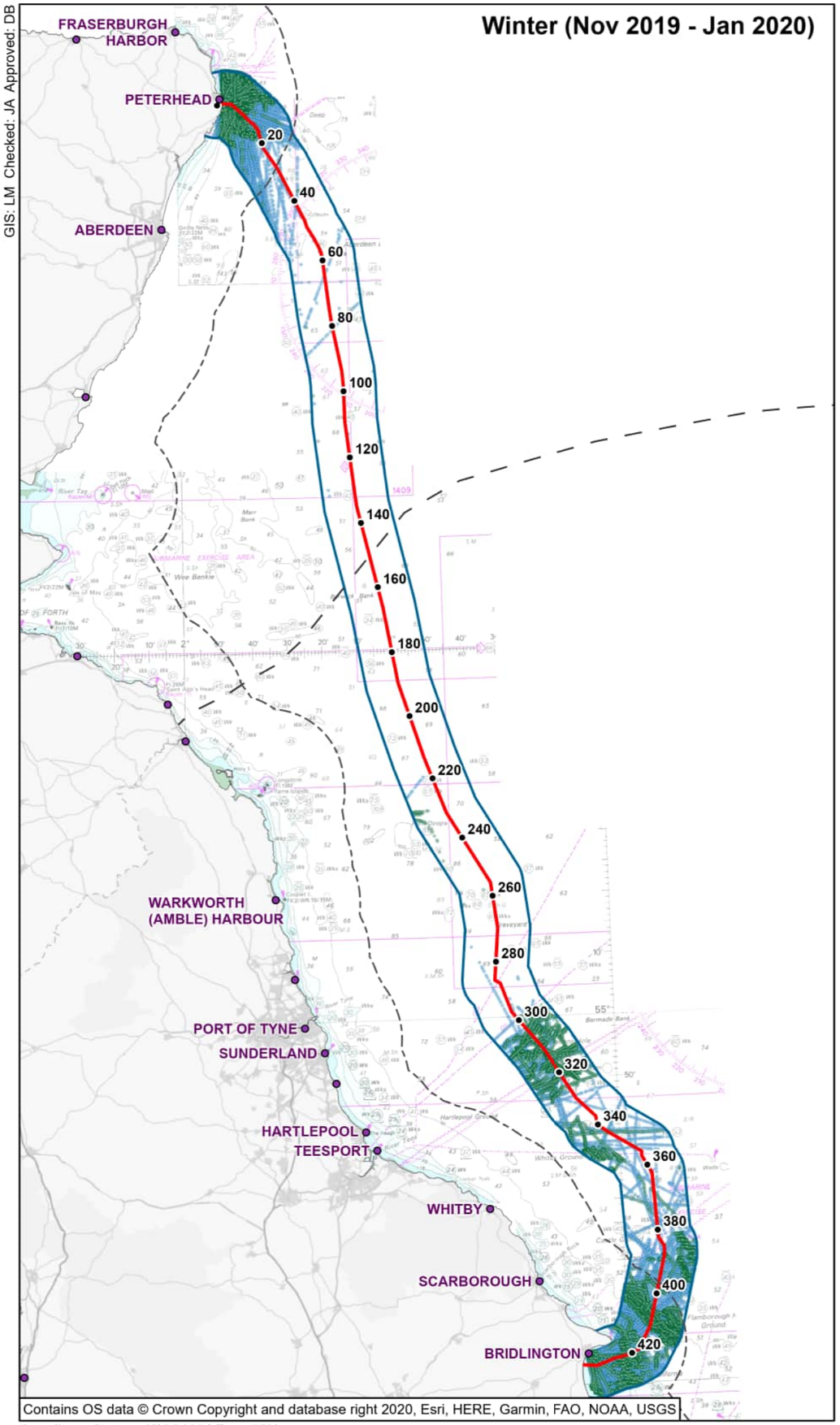

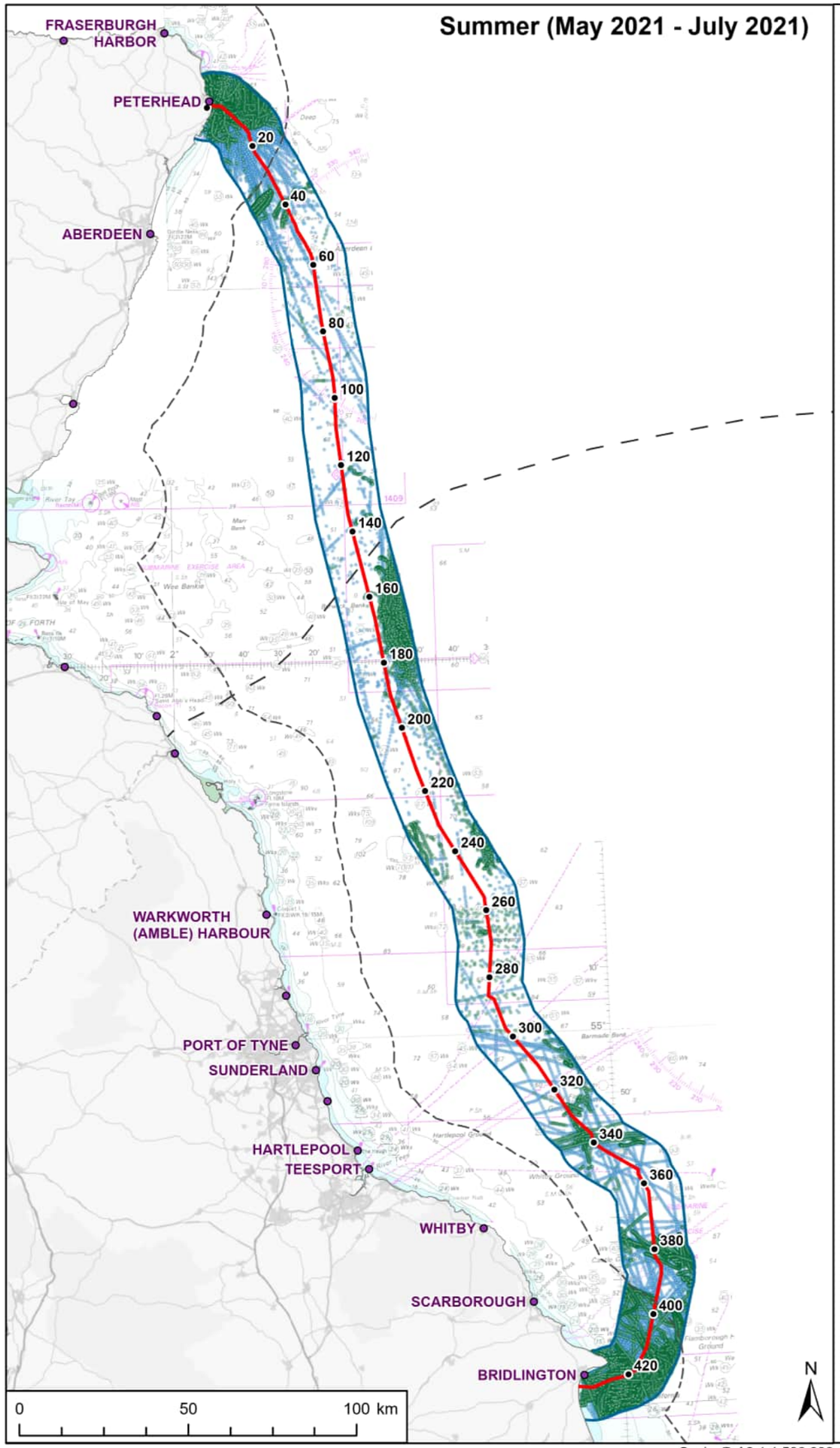

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KEY
- Kilometre Point (KP)
- Marine Installation Corridor
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- Scottish/English Water Border
- Fishing vessel AIS points where speed >6 knots (likely transiting)
- Fishing vessel AIS points where speed <6 knots (likely fishing)

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Figure 13-22
Spatial Distribution of Fishing AIS Data Points in Proximity to the Study Area

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EGL2_M_EAR_13-22_v1_20220502

SHEET NUMBER	DATE
1 of 1	02/05/2022

VMS Data Points Supplement

This section utilises the point VMS data to supplement the use of AIS data in studying fishing activity, using anonymised VMS points from the MMO to explore density of slow-moving vessels, and 2019 sightings points data from the MMO to study vessel types, as mentioned previously.

Vessel density of slow moving (<6 knots) vessels is displayed in the left panel of Figure 13-23, giving an indication of the presence of vessels which may be actively fishing. It can be assumed that those vessels travelling at more than 6 knots are not fishing and are likely to be in transit, whilst those travelling at less than 6 knots may be fishing or engaged in other activities (Lee, et al., 2010). Figure 13-23 shows higher density of vessels travelling at less than 6 knots in Scottish waters between approximately KP1 and KP18, and in English waters between approximately KP383 and KP484, lending weight to the similar pattern seen in the AIS data.

The right panel of Figure 13-23 presents MMO sightings data 2011 to 2019 representing vessels sighted on surveillance flights, classified by vessel type. The most common fishing vessel type sighted within the study area were 'scallop dredger (French/Newhaven)' vessels, which accounted for 11.2% of all sightings, and various types of trawlers together accounted for 6.7% of all sightings.

The MMO sightings data in Scottish waters indicates the presence of scallop dredgers as well as a variety of types of trawlers in the region, including demersal stern trawlers (Figure 13-23). In English waters 'potter/whelkers' and also 'scallop dredgers' are common within the UK Territorial Sea limit, in particular from between approximately KP392 to KP420.

VMS by ICES Statistical Sub-Rectangle Supplement

This section utilises fishing activity data available by ICES statistical sub-rectangle for four years over the period 2016 – 2019 obtained from the MMO. This data set provides summaries of fishing activity for UK commercial fishing vessels of 15 m and over in length that are deemed to have been fishing within a specified calendar year. This data has been aggregated to show the average annual time spent fishing by gear type from 2016 to 2019.

Figure 13-24 shows mean time spent fishing by demersal, pelagic and dredge gear types. Scottish waters see low levels of time spent fishing using demersal or pelagic trawl or seine. Time spent using dredges is moderate to high within the study area in Scottish waters from approximately KP6 to KP67, reaching a yearly average of over 5,000 minutes (approximately 83 hours) at KP40.

In English waters, time spent fishing using pelagic trawl or seine was low throughout the study area. Fishing using demersal trawl or seine shows some areas of moderate activity inshore from the Marine Installation Corridor between KP232 and KP269, as well as inshore from KP405 to KP425, but remains low throughout the rest of English waters. With dredges, the time spent is high between approximately KP396 to KP411, reaching a yearly average of over 5,000 minutes (approximately 83 hours).

Fishing Activity Information from the North Sea (West) Pilot

The North Sea (West) Pilot (UKHO, 2018) notes that:

- This region is fished extensively;
- Trawling is undertaken over this region throughout the year by vessels of all sizes;
- Seine netting is present throughout the region; and
- Potting and drifting are present throughout the region.

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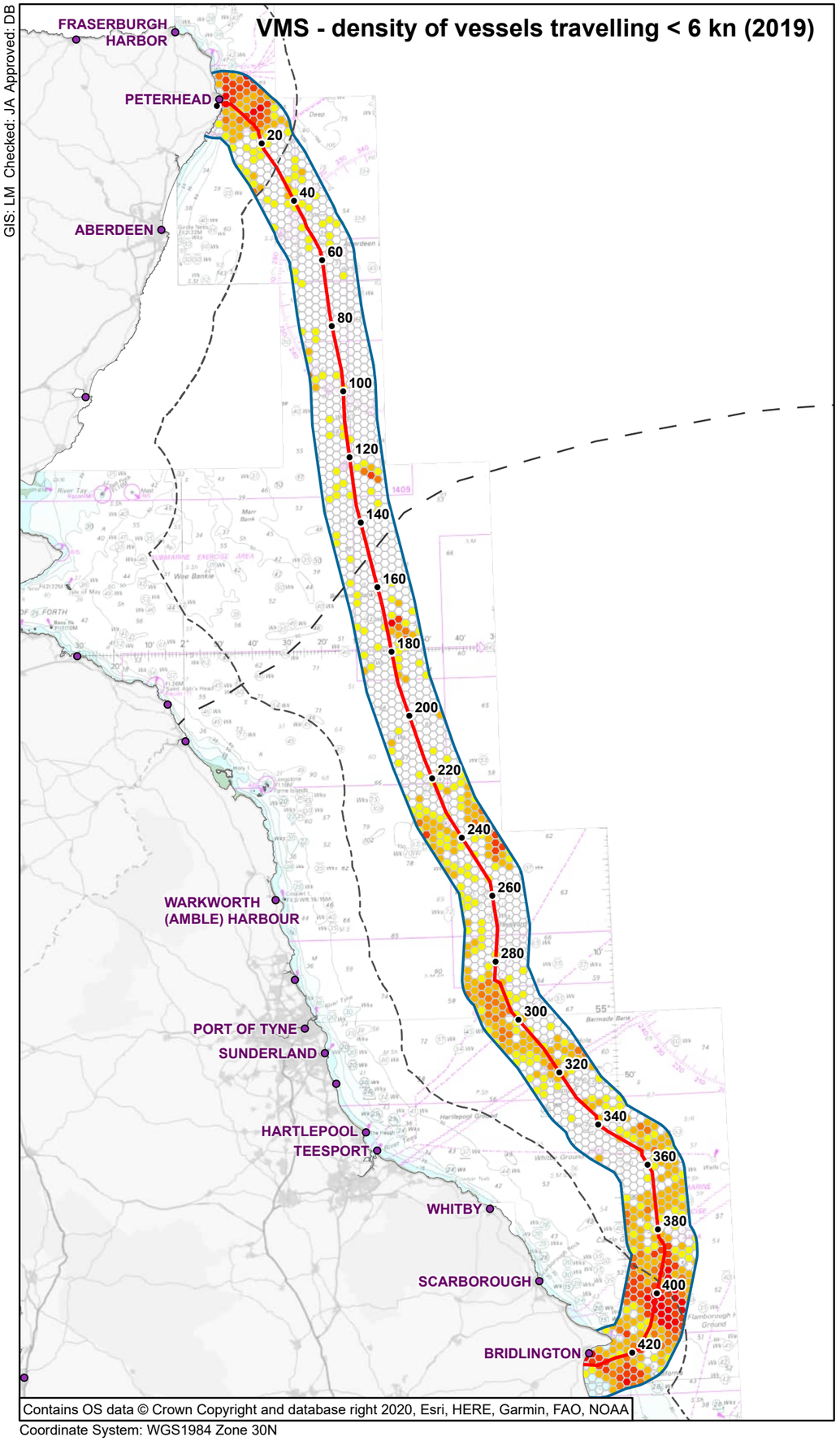

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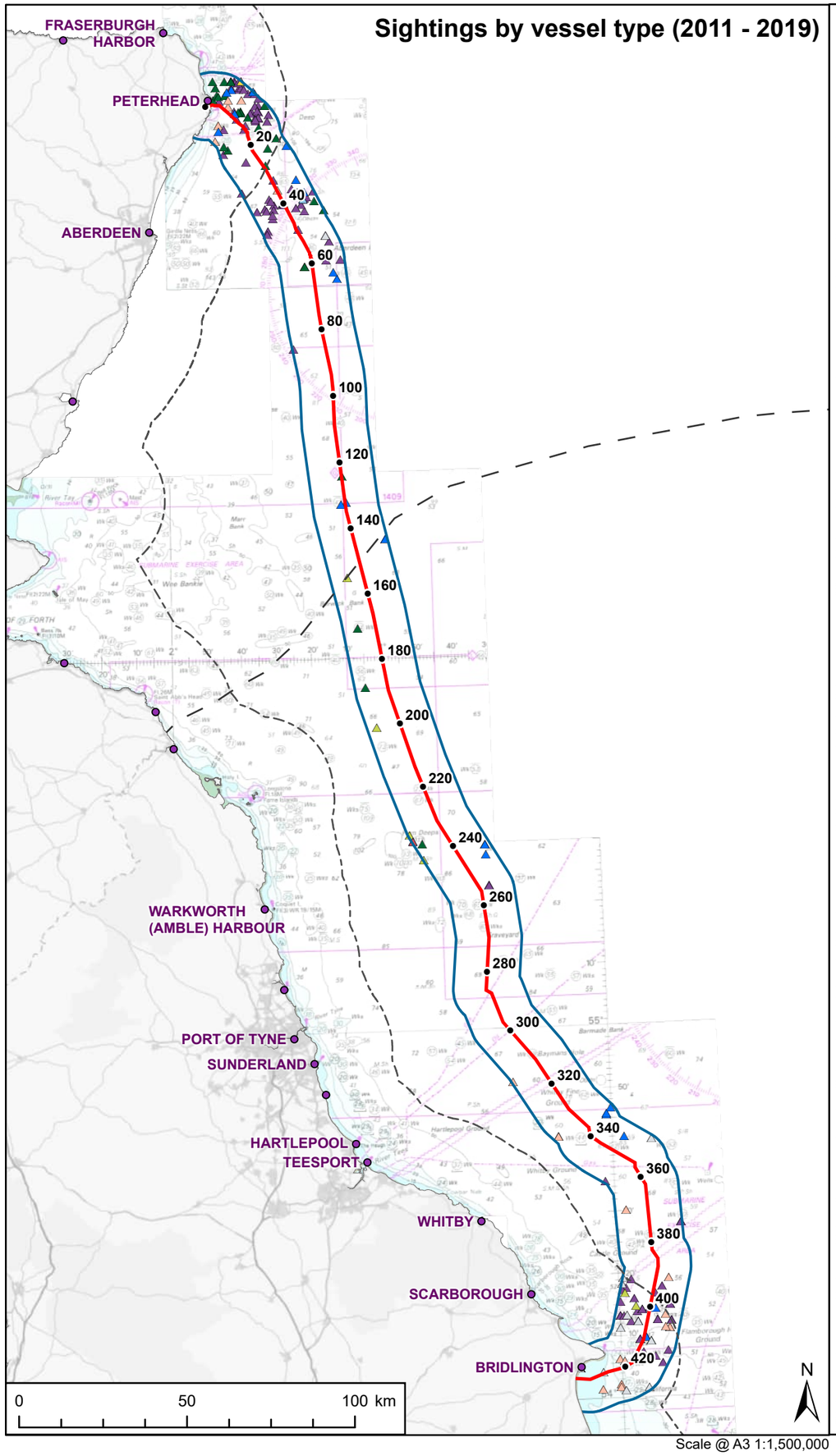

Scale @ A3 1:1,500,000

nationalgrid
Scottish & Southern Electricity Networks

PROJECT
Eastern Green Link 2

KEY

- Kilometre Point (KP)
- Marine Installation Corridor
- 10 NM Shipping and Navigation Study Area
- Port
- UK Territorial Sea Limit
- Scottish/English Water Border

VMS - density of vessels travelling < 6 knots (2019)

- 0
- 1
- 2 - 5
- 6 - 10
- 11 - 25
- > 25

Sightings by vessel type (9 years, 2011 - 2019)

- Scallop dredger (French/Newhaven)
- Demersal stern trawler
- Potter/whelker
- Other trawler
- Stern trawler (pelagic/demersal)
- Purse seiner
- Gill netter
- Other dredges (including mussel)
- Unknown

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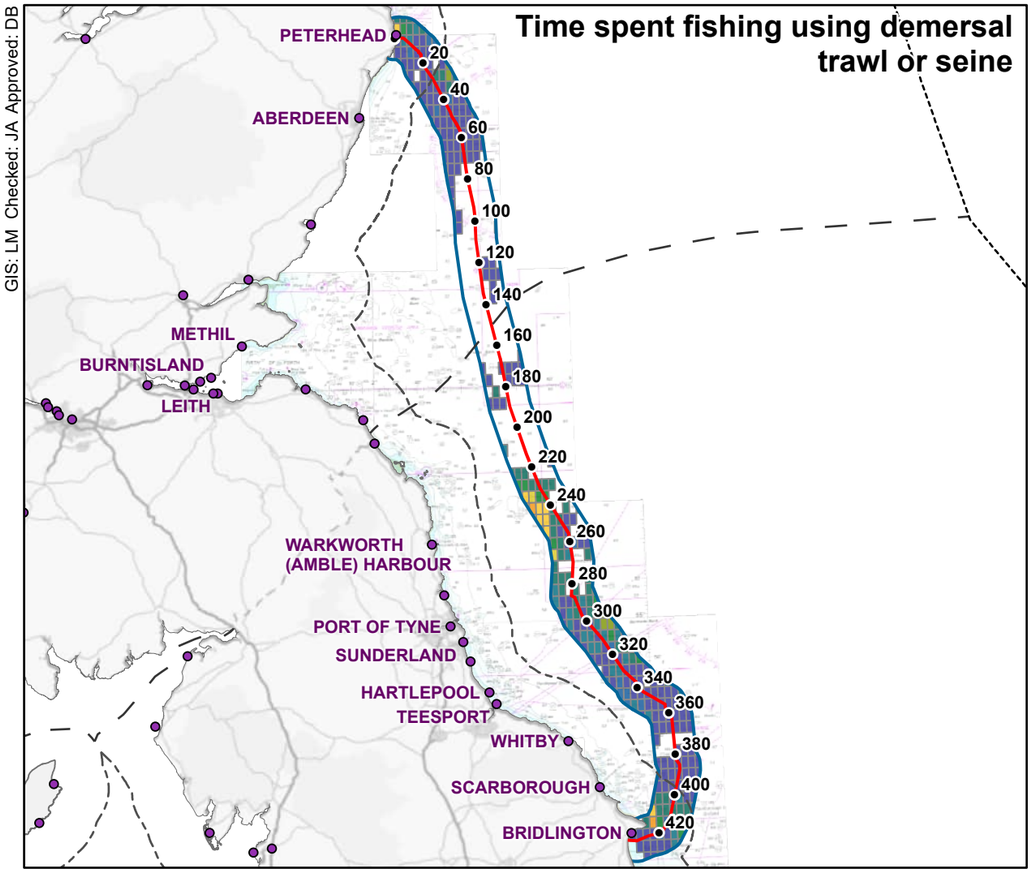
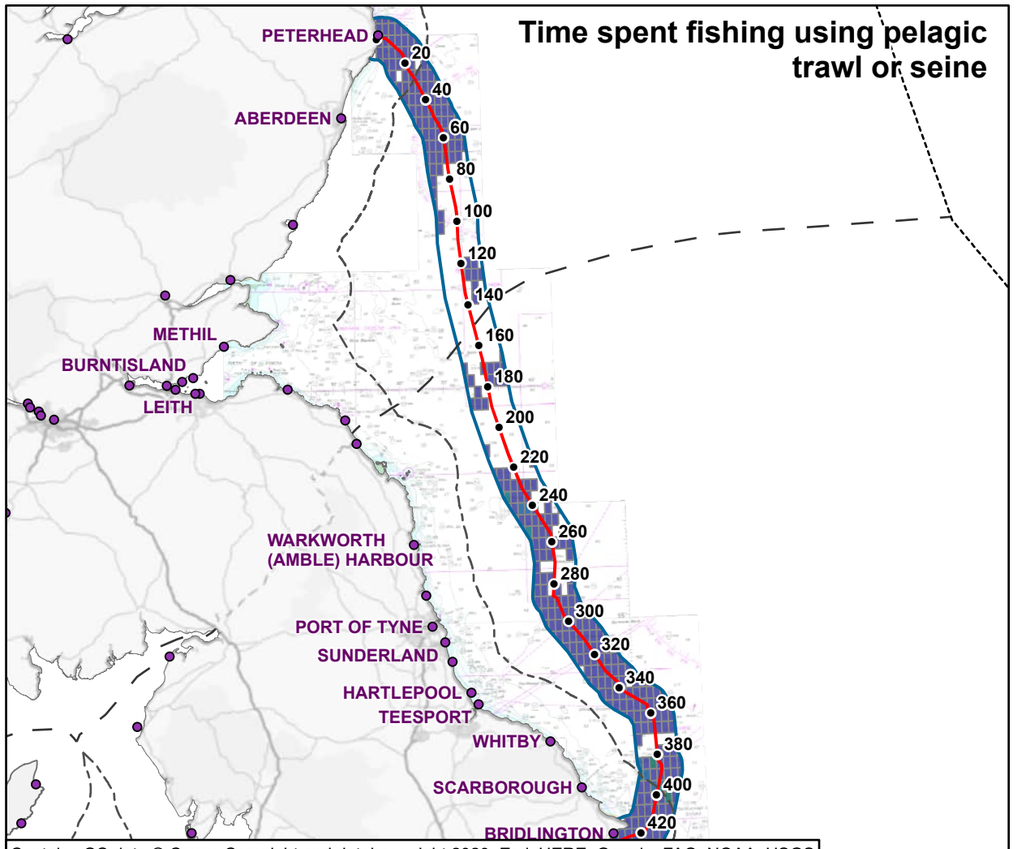
TITLE
Figure 13-23
Vessel Monitoring System Density and Sightings Data in Proximity to the Study Area

REFERENCE
EGL2_M_EAR_13-23_v1_20220428

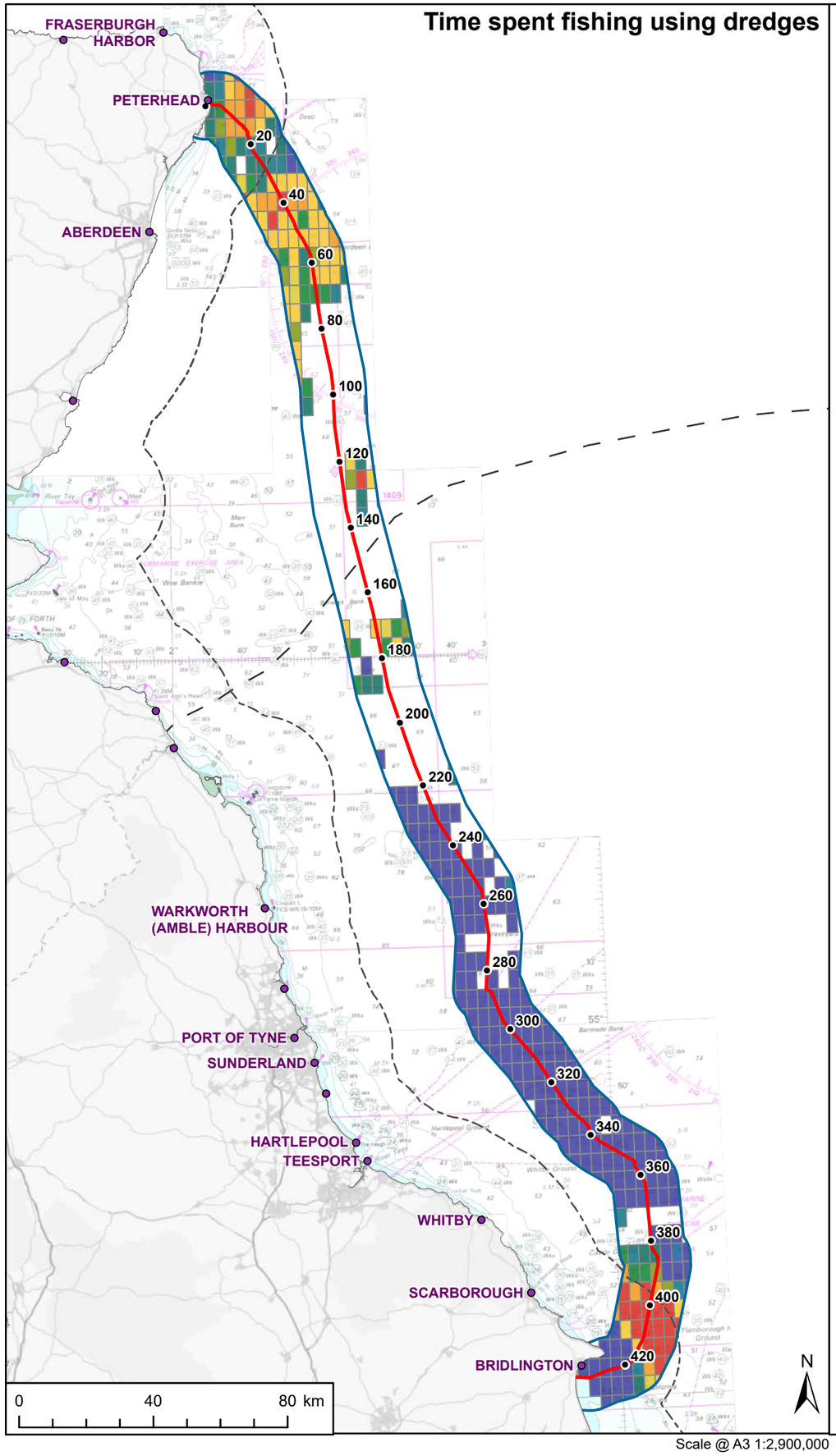
SHEET NUMBER	DATE
1 of 1	28/04/2022

GIS: LM Checked: JA Approved: DB





Coordinate System: WGS1984 Zone 30N



Scale @ A3 1:2,900,000

nationalgrid
Scottish & Southern Electricity Networks

PROJECT
Eastern Green Link 2

KEY

- Kilometre Point (KP)
- Marine Installation Corridor
- 10 NM Shipping and Navigation Study Area
- Port
- UK Territorial Sea Limit
- Scottish/English Water Border
- UK Exclusive Economic Zone

Fishing time (minutes) by ICES subrectangle (average 2016 to 2019)

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 250
- 250 - 500
- 500 - 750
- 750 - 1,000
- 1,000 - 3,000
- 3,000 - 5,000
- > 5,000

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MMO 2016 - 2019
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TITLE
Figure 13-24
Vessel Monitoring System Data by ICES Sub-Rectangle for Fishing Time by Gear Type in Proximity to the Study Area

REFERENCE
EGL2_M_EAR_13-24_v1_20220428

SHEET NUMBER	DATE
1 of 1	28/04/2022

13.5.5.5 Summer 2021 Validation

The AIS data associated with the summer 2021 has been cross-checked against the summer 2019 season to ensure that the summer 2021 season used as the basis for the NRA is suitably representative of vessel traffic in the region. Table 13-14 presents the difference between the numbers of vessel tracks for different vessel types between the two seasons.

The data show that cargo and tanker vessels had very similar levels of traffic between summer 2019 and summer 2021 (Table 13-14), as well as a similar geographic distribution in both Scottish and English waters as shown in Figure 13-25.

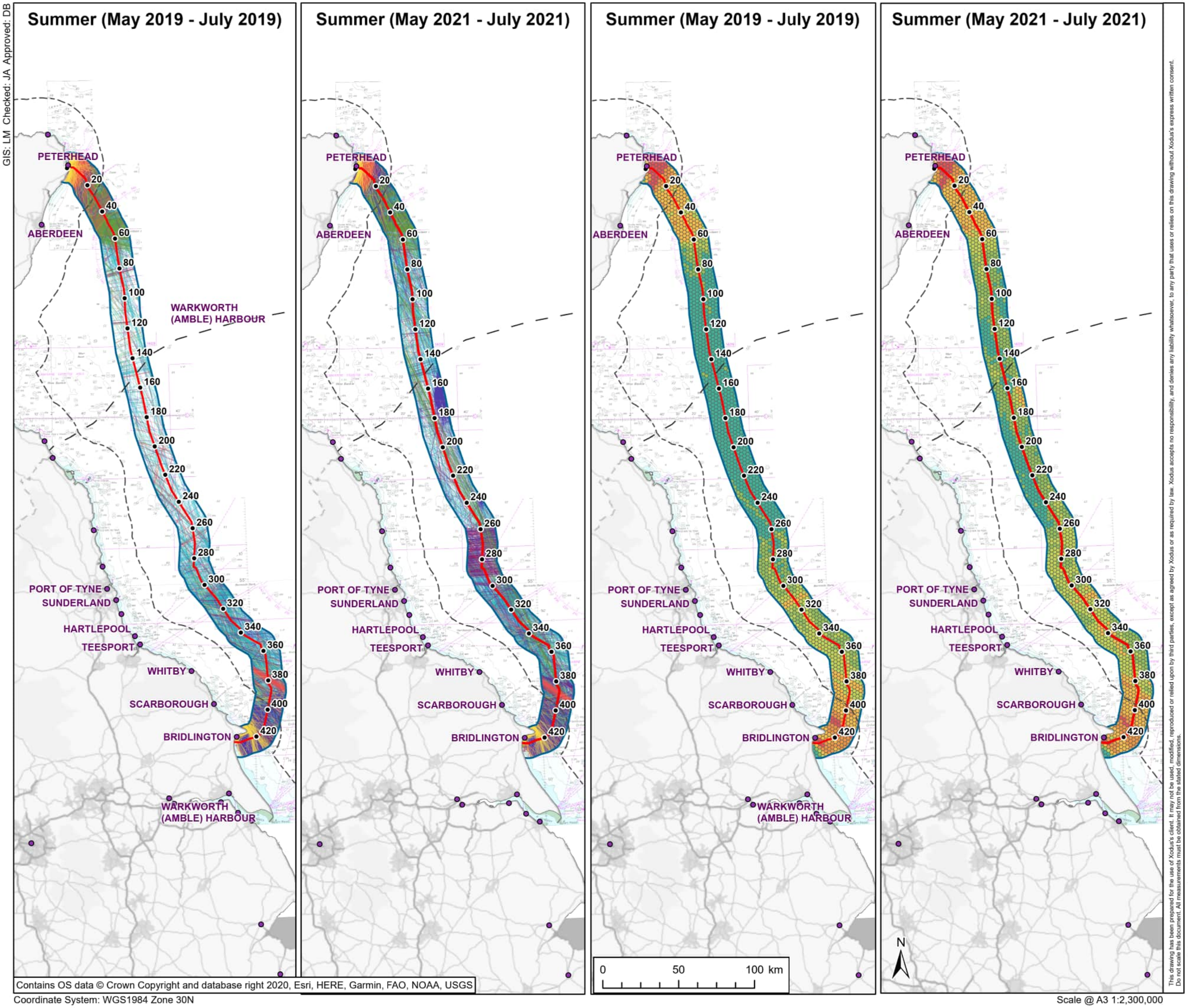
Table 13-14: Summer 2019 and Summer 2021 Comparison

Vessel Category	Summer 2019 tracks in Study Area	Summer 2021 Tracks in Study Area	Difference in Number of Tracks (2019 to 2021)	Percentage Change	Difference Summary
Cargo/ Tanker	4,210	4,158	-52	-1%	• Similar numbers of tracks, similar geographic distribution
Fishing	3,409	3,347	-62	-2%	• Similar numbers of tracks • Additional fishing vessel areas present in summer 2021
Offshore industry	3,201	2,632	-569	-18%	• Difference may be due to COVID-19 or Brexit effects
Passenger	559	441	-118	-21%	• Possible COVID-19 or Brexit effects
Recreational	733	571	-162	-22%	• Likely COVID-19 restrictions had suppressive effects
Other	996	1,153	157	+16%	• Increase may be due to survey or research activities for offshore infrastructure in summer 2021
Total	13,108	12,302	-806	-6%	• Overall similar level of vessel activity in study area between the two summer seasons

Fishing vessels also showed a similar level in the number of tracks present within the Study Area, with only a -2% change from summer 2019 to summer 2021. However, the geographic spread showed a slightly different geographic pattern with the addition of an area of fishing vessels to the east of the Marine Installation Corridor in English waters between KP150 and KP189 in summer 2021.

Summer 2021 showed a decrease in the presence of offshore industry traffic compared to summer 2019 (-18%) however it shows a very similar spatial distribution across the study area between the two summer seasons. This decrease may be due to possible COVID-19 or Brexit effects on the offshore industry in summer 2021.

GIS: LM Checked: JA Approved: DB



Coordinate System: WGS1984 Zone 30N

Scale @ A3 1:2,300,000

nationalgrid
Scottish & Southern Electricity Networks

PROJECT
Eastern Green Link 2

KEY

- Kilometre Point (KP)
- Marine Installation Corridor
- 10 NM Shipping and Navigation Study Area
- Port
- UK Territorial Sea Limit
- Scottish/English Water Border
- UK EEZ

Vessel tracks by vessel type

- Cargo/Tanker
- Offshore industry
- Fishing
- Passenger
- Recreational
- Other

Seasonal vessel track density per 1sqkm

- 0 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- > 500

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TITLE
Figure 13-25
Spatial Distribution of Summer 2019 and 2021 AIS Data in Proximity to the Study Area

REFERENCE
EGL2_M_EAR_13-25_v1_20220502

SHEET NUMBER	DATE
1 of 1	02/05/2022

Recreational vessel traffic shows a decrease in summer 2021 compared to summer 2019 (-22%), which is likely due to COVID-19 restrictions especially at the start of the season but shows a similar spatial distribution of being primarily concentrated close to shore and routeing along the coast. Passenger vessel traffic likewise shows a decrease in intensity (-22%), possibly relating to COVID-19 and Brexit effects, but spatial patterns remain broadly similar between summer 2019 and summer 2021.

Other type vessels see a 16% increase in the number of tracks within the study area between summer 2019 and summer 2021, as well as differing spatial distribution in English waters, which may relate to the presence of survey or research activities for offshore infrastructure which were identified in summer 2021, including the proposed NEP CCUS pipeline (BP Exploration Operating Company Ltd, 2021) and Hornsea 4 (Orsted, 2021) as mentioned in Section 13.5.5.2: Vessel Type.

Overall, there was a similar level of vessel traffic between the two summer seasons (Table 13-14), however vessel activity in summer 2021 had a greater geographic spread in both Scottish and English waters as the density panels in Figure 13-25: Spatial Distribution of Summer 2019 and 2021 AIS Data in Proximity to the Study Area show. As such, there is no reason to suggest that 2021 data underrepresents vessel traffic, and it is deemed to be a fit basis for this NRA.

13.5.6 Future Baseline

This shipping and navigation baseline has used current and existing information to form this appraisal. Due to uncertainties including the possible future effects of Brexit and the COVID-19 pandemic, it is difficult to predict how this current baseline may change in terms of the magnitude and spatial distribution of shipping activity, and in terms of different types of shipping activity such as fishing or recreation. In addition, further development of the marine region in terms of future offshore infrastructure including wind farms may affect the shipping and navigational movements and routes. Chapter 14: Other Sea Users should be referred to understand any potential future offshore developments which may be awarded and constructed in the region.

13.6 Appraisal of Potential Impacts

The following sections report the appraisal of impacts to shipping and navigation, following the FSA framework as part of the wider NRA methodology adopted for this EAR. Each potential impact is assessed using the definitions of likelihood and consequence severity against the risk matrix in Section 13.4.1 and assigned a risk ranking of ‘Broadly Acceptable’, ‘Tolerable’ or ‘Unacceptable’, considering embedded mitigations which are part of the design of the Marine Scheme. Where appropriate, additional risk reduction measures (RRMs) are identified and a residual risk ranking is assigned. The assessments are summarised in a table in the relevant subsections and collated in Appendix 13.1: Summary and Hazard Log.

13.6.1 Identified Potential Impacts

Baseline information provided in the MTS, combined with consultation responses and expert judgement/industry experience, was compiled to create a list of relevant impacts to marine navigation that then subsequently informed the FSA. The impacts are captured in Table 13-15. Each of the impacts is subsequently addressed in consideration of the existing or embedded mitigations which reduce the likelihood or severity of the identified impacts.

Table 13-15: Impact Summary

Phase	Activities	Sub Activity	Potential Impact
Installation	Pre-Installation	Survey	Vessel-to-vessel collision
		Sea Trials	Vessel-to-vessel collision
	Cable Installation	Route Clearance	Vessel-to-vessel collision
		Cable Laying and Trenching	Vessel-to-vessel collision
			Deviation from established and identified vessel routes and areas

Phase	Activities	Sub Activity	Potential Impact
			Interaction with vessel anchors and anchoring activity
			Interaction with fishing gear
Operations and Maintenance	In-situ cable	Survey	Vessel-to-vessel collision
		Maintenance Activities	Vessel-to-vessel collision
			Deviation from established and identified vessel routes and areas
			Interaction with vessel anchors and anchoring activity
			Interaction with fishing gear
			Reduction in under keel clearance
			EMF results in magnetic compass deviation.
Decommissioning			Comparable to Installation Phase

13.6.2 Embedded Mitigation

Table 13-16 contains a list of existing or embedded mitigations identified as ameliorating each impact from the list above. Commercial shipping is a heavily regulated industry, with a global framework of maritime safety regulations (primarily through the IMO) and additional maritime regulations originating from EU and UK legislation. This has been considered when compiling the mitigation measures that are embedded as part of the Marine Scheme.

The cable would be trenched, to a minimum depth of lowering[4] of 0.6 m where possible, and otherwise protected via a range of measures such as rock placement and mattresses as detailed in Chapter 2: Project Description. The Horizontal Directional Drilling (HDD) approach at both landfalls provides further effective trenching at both landfall terminations of the installation corridor. The cable trenching and protection elements provide a comprehensive set of embedded risk reduction measures which represent all reasonably practicable design measures that can be implemented to minimise seabed hazards. It should be noted that industry guidance relating to safe and responsible anchoring and fishing processes advises vessel operators against anchoring and fishing in the vicinity of cables. This is the principal embedded mitigation against the risk of hazardous interactions with fishing and anchoring gear. However, it is recognised that fishing and anchoring activity may nonetheless occur over the cables, either inadvertently or at the discretion of individual vessels. Therefore, the cables are suitably designed and protected to further reduce the risk of damage, to vessel gear and the cable itself. This shall be through trenching (the preferred method) or where not achievable, additional / other external protection, such as rock placement/berms. Where it is necessary to apply rock berms or other external protection, these shall be designed in accordance with best-practice and industry guidance to minimise snagging risks in so far as practicable. As built surveys of the cables will be conducted and their positions (including locations of external protection) will be reported to the UKHO and Kingfisher for inclusion on UKHO/KIS-ORCA charts, such that vessel operators are informed as to the locations of the submarine assets, and can take appropriate actions, in line with the maritime industry guidance.

All embedded mitigations relating to the project phases are captured in Table 13-16.

[4] Depth of Lowering refers to the calculated mean (vertical) distance between the asset and the level of the seabed. It is the minimum level of protection depth (i.e. before any lowering has occurred).

Table 13-16: Potential Impacts to Navigation and Embedded Mitigations

Impact	Embedded Mitigation
Vessel-to-vessel collision	• Navigational features such as charted or known anchorages, maintained channel depths and prohibited regions will be avoided during micro-routeing post consent; • All vessels will follow the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and the International Convention for the Safety of Life at Sea 1974 (SOLAS); • Notice(s) to Mariners (including Kingfisher Bulletins), Radio Navigational Warnings, NAVTEX and/or broadcast warnings will be issued prior to the commencement of installation works, to include the following as a minimum: – Notifications to the Northern Lighthouse Board, Trinity House, the Maritime and -Coastguard Agency and relevant harbour and port authorities; – Regular vessel operators (e.g., ferry operators); and – The Ministry of Defence (MoD) will be notified prior to commencement of Installation Phase activities within Military Practice and Exercise Areas; • All applicable vessels will broadcast their status on AIS at all times; • Guard vessels will use RADAR with Automatic RADAR Plotting Aid (ARPA) to monitor vessel activity and predict possible interactions, will be employed to work alongside the installation vessel(s) during installation and maintenance work; • A temporary 500 m Recommended Clearance Zone will be established around all vessels associated with the works; • All vessels will follow Port bylaws and General Directions, including VTS communications from ports (Peterhead); • Piloting of large vessels when entering or leaving Peterhead Harbour Area; and • Limits to wave height / wind speed conditions for operations / activities will be followed by all vessels.
Deviation from established and identified vessel routes and areas	• Navigational features such as charted or known anchorages, maintained channel depths and prohibited regions will be avoided during micro-routeing post consent; • Notice(s) to Mariners (including Kingfisher Bulletins), Radio Navigational Warnings, NAVTEX and/or broadcast warnings will be issued prior to the commencement of installation works, to include the following as a minimum: – Notifications to the Northern Lighthouse Board, Trinity House, the Maritime and -Coastguard Agency and relevant harbour and port authorities; and – Regular vessel operators (e.g., ferry operators).

Impact	Embedded Mitigation
Interaction with vessel anchors and anchoring activity	• It is advised that third-party vessel operators follow the longstanding maritime guidance regarding the avoidance of demersal trawling (and anchoring) in the vicinity of submarine cables. This guidance includes: – The Mariner's Handbook (P100) 12th Edition (UKHO, 2020); – All Admiralty charts; and – The recent Marine Guidance Note (MGN) 661 published by the Maritime and Coastguard Agency (MCA); • Navigational features such as charted or known anchorages, maintained channel depths and prohibited regions will be avoided during micro-routing post consent; • Berms will be designed to reduce snagging risk in so far as is practicable, with 1:3 slopes and flat crests in line with industry guidance; • A vessel able to undertake a targeted placement method will be used, such as one fitted with a flexible fall pipe; • Cables will be trenched to a minimum depth of lowering of approximately 0.6 m, with a target depth of lowering of approximately 1.5 m; • The use of external protection will be limited to areas where cables cannot be trenched to the minimum depth of lowering, at crossings with third-party infrastructure and in some limited areas at both landfalls (as required); • Notice(s) to Mariners (including Kingfisher Bulletins), Radio Navigational Warnings, NAVTEX and/or broadcast warnings will be issued prior to the commencement of installation works; • Guard vessels will use RADAR with Automatic RADAR Plotting Aid (ARPA) to monitor vessel activity and predict possible interactions, will be employed to work alongside the installation vessel(s) during installation and maintenance work (which will also minimise anchor disturbance on the seabed); • All vessels will be in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations and will therefore be equipped with waste disposal facilities onboard. The discharging of contaminants is not permitted within 12 NM from the coast to preserve bathing waters; • Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels; • Undertaking of interim and as-built surveys to confirm the trenching status of the cables, identify potential seabed hazards associated with installation, and, where appropriate and practicable, undertaking of rectification works; • As-built locations of cables and associated external protection will be supplied to UKHO and Kingfisher for inclusion in Admiralty and KIS-ORCA charts, respectively; and • As built details, including the locations, nature and extent of rock berms shall also be shared with relevant fisheries stakeholders.

Impact	Embedded Mitigation
Interaction with fishing gear	• Detailed route development and micro-routeing will be undertaken within the Marine Installation Corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints. This will include minimising the footprint as much as possible; • Berms will be designed to reduce snagging risk in so far as is practicable, with 1:3 slopes and flat crests in line with industry guidance; • A vessel able to undertake a targeted placement method will be used, such as one fitted with a flexible fall pipe; • Cables will be trenched to a minimum depth of lowering of approximately 0.6 m, with a target depth of lowering of approximately 1.5 m; • The use of external protection will be limited to areas where cables cannot be trenched to the minimum depth of lowering, at crossings with third-party infrastructure and in some limited areas at both landfalls (as required); • A Fisheries Liaison Officer (FLO) will be appointed for the Installation Phase. Good practice guidance on the approach to fisheries liaison and mitigation (e.g., FLOWW, 2014; 2015 as relevant to cable projects) shall be implemented as far as possible; • It is advised that third-party vessel operators follow the longstanding maritime guidance regarding the avoidance of demersal trawling (and anchoring) in the vicinity of submarine cables. This guidance includes: – The Mariner's Handbook (P100) 12th Edition (UKHO, 2020); – All Admiralty charts; and – The recent Marine Guidance Note (MGN) 661 published by the Maritime and Coastguard Agency (MCA); • Notice(s) to Mariners (including Kingfisher Bulletins), Radio Navigational Warnings, NAVTEX and/or broadcast warnings will be issued prior to the commencement of installation works; • Guard vessels will use RADAR with Automatic RADAR Plotting Aid (ARPA) to monitor vessel activity and predict possible interactions, will be employed to work alongside the installation vessel(s) during installation and maintenance work (which will also minimise anchor disturbance on the seabed); • As-built locations of cables and associated external protection will be supplied to UKHO and Kingfisher for inclusion in Admiralty and KIS-ORCA charts, respectively; • As built details, including the locations, nature and extent of rock berms shall also be shared with relevant fisheries stakeholders; • Undertaking of interim and as-built surveys to confirm the trenching status of the cables, identify potential seabed hazards associated with installation, and, where appropriate and practicable, undertaking of rectification works; and • Routine surveys and inspections of the submarine cables and associated protection measures will be conducted through the lifetime of the project, to ensure they remain in good condition, and adequately protected.
Reduction in under keel clearance	• Detailed route development and micro-routeing will be undertaken within the Marine Installation Corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimised localised engineering and environmental constraints. This will include minimising the footprint as much as possible; • Reduction in charted water depth to LAT limited to less than 5% where possible; • As-built locations of cables and associated external protection will be supplied to UKHO and Kingfisher for inclusion in Admiralty and KIS-ORCA charts, respectively; and • As built details, including the locations, nature and extent of rock berms shall also be shared with relevant fisheries stakeholders.
Interference with marine navigational equipment	• Detailed route development and micro-routeing will be undertaken within the Marine Installation Corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimised localised engineering and environmental constraints. This will include minimising the footprint as much as possible; and • Detailed engineering to minimise compass deviation as far as practicable.

13.6.3 Installation Phase

13.6.3.1 Vessel-to-Vessel Collision

The risk of vessel-to-vessel collision applies to the Installation Phase of the Marine Scheme, which requires the use of large slow-moving vessels that will be constrained by their operations and hence restricted in their ability to manoeuvre. Their presence of vessels associated with the Installation Phase within the Marine Installation Corridor would present an obstacle to all passing traffic, and hence may increase the risk of collision.

Throughout the year, a range of vessel types cross the Marine Installation Corridor in multiple locations. AIS and VMS data show that 'Cargo/Tanker' Vessels comprise most of this traffic with 'Fishing' and 'Offshore industry' vessel categories also contributing substantially. 'Recreational' vessels, which are less likely to be aware and prepared to navigate the installation vessel, comprise a smaller proportion of the total vessel volume. 'Passenger' and 'Other' categories also make up a smaller proportion of the total vessel volume. Due to embedded mitigation, such as Notice to Mariners and pre-operational consultations, the awareness of the operation among most of the vessels using the area will be raised. However, it cannot be presumed that all vessels approaching and exiting the area, or vessels otherwise using the area, will necessarily be aware of the presence of the installation vessels. The collision risk is likely to be greater in higher density sections of the Marine Installation Corridor and particularly from landfall at Peterhead to KP60 and KP380 to landfall at Fraisthorpe Sands. Within these sections of the Marine Installation Corridor traffic density is consistently elevated, as shown in Figure 13-9. In addition, the operation may occlude entry into Peterhead Port, particularly as the Marine Installation Corridor interests the leading line of entry into the harbour between KP2 and KP3. This represents a point of raised likelihood of vessel collision.

The severity of a collision with any vessel may result in a 'High' Severity/Magnitude consequence outcome (loss of crew member) among other consequences. However, the likelihood is considered to be 'Remote' (Never occurred during installation contractor's activities but has been known to occur in the wider industry) at any point along the Marine Installation Corridor. Appropriate promulgation of operational information, presence of guard vessels, use of the appropriate navigational lights and day light shape signals, limits to wave height / wind speed conditions for operations and utilisation of an RCZ all act as mitigation. These assessments combine to provide a '**Tolerable**' risk ranking (Table 13-17).

To reduce the risk to ALARP it is necessary to identify potential RRMs in addition to the embedded mitigation. Therefore, additional or increased collision avoidance measures and/or procedures will be employed specifically for installation activities which are located at the busiest or most densely trafficked sections of the Marine Installation Corridor (landfall at Peterhead to KP60 and KP380 to the landfall at Fraisthorpe Sands). The greatest recreational vessel activity within the Marine Installation Corridor is recorded from landfall at Peterhead to KP4. The cable laying operation procedure will therefore recognise and address the increase in collision risk in this area. Provisions will be captured in High Traffic Density Specific procedures and will include:

- Operational procedures explicitly identifying the increased collision risk, including the prevalence of recreational vessels between KP0 and KP60 and between KP380 and KP436 (established prior to commencement of works);
- Guard Vessel made aware of the increased collision risk at KP0 and KP60 and between KP380 and KP436 (established prior to commencement of works); and
- Prior reconfirmation with crew, that the installation vessels are entering the two areas of higher density traffic.

In addition, the further liaison with Peterhead Port Authority will further reduce the risk of collision for vessels entering or departing Peterhead Port.

Table 13-17: Impact Risk Summary (Vessel-to-Vessel Collision)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Vessel-to-Vessel Collision	High	Remote	Tolerable	High Traffic Density Specific procedures established Liaison with Peterhead Port Authority	ALARP

13.6.3.2 Deviation from Established Vessel Routes and Areas

Some disruption to routine vessel routeing and any otherwise scheduled activity may be expected during the Installation Phase. As detailed above, the vessels used during the Installation Phase will be restricted in their ability to manoeuvre. As such, their presence within the Marine Installation Corridor will present obstacles, and other vessels routinely operating in the area may be required to deviate from their planned routes in order to avoid them.

Throughout the year, a range of vessel types will cross the Marine Installation Corridor in multiple locations. Cargo/tanker vessels, fishing vessels and offshore industry vessels, which comprise most of this traffic, are unlikely to experience significant disruption in the case where they are required to navigate the Marine Scheme as this is standard navigational practise for these types of vessels. Passenger vessels, which comprise only a small proportion of the total vessel count, are likely to be aware and prepared to navigate clear of the installation vessels due to the embedded mitigations promulgating the operation (Notice to Mariners etc) and practicing good passage planning techniques and procedures. Similarly local boat clubs will also be notified of the installation operations in advance to permit rescheduling or relocating of any organised events. The UK Ministry of Defence will also be informed of the installation details. Nonetheless, some temporary disruption and subsequently required deviation from established routes may be required. In particular the Marine Installation Corridor intersects the leading line into Peterhead Port. The presence of the installation vessels and an RCZ may occlude the entry into the harbour during installation at that location. Larger vessels that require to enter the harbour may rely upon slack water making timing of the operations potentially more disruptive. It is also noted that the majority of the Marine Installation Corridor passes through military practice areas which may result in some disruption to military vessel activities.

Throughout most of the corridor, vessels making minor route deviation to avoid the RCZ will not suffer any significant operational impact, the severity of this consequence impact is considered to be broadly Negligible as deviations are expected to be temporary and localised. However, because of the possible occlusion and associated disruption at Peterhead Port the impact is assessed as 'Low'. The likelihood of some deviation is however assessed to be 'likely' which results in a risk outcome of '**Tolerable**' (Table 13-18).

To reduce the risk to ALARP, it is necessary to identify potential RRMs in addition to the embedded mitigation. The RRMs are focused on reducing impacts on Peterhead Port and the vessels either entering or leaving the facility, including:

- Liaison with Peterhead Port Authority to agree how interactions between Project vessels and routine traffic using Peterhead Port will be managed within the statutory port limits, including scheduling, clearance zones and communications between vessel masters, pilots and the VTS.

Table 13-18: Impact Risk Summary (Deviation from Established Vessel Routes and Areas)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Deviation from Established vessel routes and areas	Low	Likely	Tolerable	Liaison with Peterhead Port Authority to agree how interactions between Project vessels and routine traffic using Peterhead Port will be managed within the statutory port limits.	ALARP

13.6.3.3 Interaction with Vessel Anchors and Anchoring Activity

During the Installation Phase, there is a risk that a third-party vessel will drop anchor or lose its holding ground in adverse weather and subsequently drag its anchor, over a section of exposed cable (above seabed level) prior to cable trenching or protection being installed.

Vessel anchoring activities in the area of the Marine Installation Corridor are captured in Figure 13-20. The figure shows that the Marine Installation Corridor does not encroach on any designated anchorage areas. However, vessels are recorded at anchor at several locations within the Study Area including;

- Peterhead landfall (KP0) to the north and south of the Marine Installation Corridor, but not overlapping it;
- KP 315 and KP335, to the north east and south west of the Marine Installation Corridor respectively but not overlapping it; and
- From KP420 to Fraisthorpe Sands (KP436) there are numerous clusters of anchoring activity both to the north and south of the Marine Installation Corridor, but not overlapping it.

In the case of a snagging incident, it is possible that smaller vessels could suffer a risk of foundering should they not be able to free themselves; a severity of outcome of 'High' is therefore selected. The likelihood of anchor snagging is assessed as 'Unlikely' recognising that vessels will largely be aware of the operation and cable location. This is due to embedded mitigations covering industry guidance on safe anchoring practices, promulgation of information to sea users about both the location and installation of the cable, as well as through guard vessels monitoring sections of unprotected cable during the Installation Phase.

Likelihood and severity outcomes combine give a '**Tolerable**' risk ranking (Table 13-19). To reduce the risk to ALARP it is necessary to consider potential RRMs in addition to the embedded mitigation. Therefore, the duration between cable laying and associated trenching and protection works is minimised insofar as is reasonably practicable, to minimise the period when exposed cables are present on the seabed.

Table 13-19: Impact Risk Summary (Anchor Snagging)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Interaction with vessel anchors and anchoring activity	High	Unlikely	Tolerable	Duration of exposed / unprotected cable minimized	ALARP

13.6.3.4 Interaction with Fishing Gear

Fishing vessels' gear could become snagged on the cable where sections may be exposed prior to trenching or protection. Vessels may sustain extensive damage or suffer foundering during this phase of the Marine Scheme. A large number and variety of fishing vessels are seen in the baseline data, which include potting/creeling, demersal trawling and scallop dredging. Significant levels are seen at certain locations on the Marine Installation Corridor (See Figure 13-22, Figure 13-23 and Figure 13-25).

The appointment of a FLO for the duration of the cable installation, combined with Kingfisher notifications and Notices to Mariners, and other marine warnings as appropriate represents suitable and effective embedded mitigation by ensuring that fishermen using the area can be made aware of the potential seabed hazard prior to installation. Guard vessels will be used to monitor the area around sections of exposed cable between lay, trenching and protection works etc. which provides further risk reduction. Nonetheless, interaction with fishing gear is more likely where fishing activity is most dense; predominantly Scallop Dredging around Bridlington (KP420 to KP380) and Peterhead (Landfall to KP18 and around KP40). Some other sections also show lower concentrations of various types of fishing (KP160 to KP180 and KP300 to KP320) and with more apparently seasonality.

Given the prior promulgation of information on the Marine Scheme to fishermen via the FLO and other notices to mariners including the Kingfisher Bulletin, as well as the use of guard vessels between cable laying and protection works, the probability of interactions with fishing gear is already considered to be reduced. The likelihood of gear snagging is therefore assessed as 'Unlikely', assuming that sections of

the cable may be left unburied for a period of time, due to ground conditions or existing infrastructure, before cable protection is installed. The consequences of such an outcome can be severe and are assessed as 'High' due to the potential loss of crew member or vessel. This results in an overall '**Tolerable**' risk, which warrants further risk reduction (Table 13-20).

It is therefore necessary to consider potential risk reduction measures in addition to those assumed to be in place, so as to reduce the risk to ALARP. Therefore, the duration between cable laying and associated trenching and protection works is minimised insofar as is practicable, in order to minimise the period when exposed cables are present on the seabed.

Table 13-20: Impact Risk Summary (Fishing gear snagging or dragging cable leads to foundering)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Foundering due to fishing gear snagging or dragging cable	High	Unlikely	Tolerable	Duration of exposed / unprotected cable minimized	ALARP

13.6.4 Operation and Maintenance Phase

13.6.4.1 Vessel-to-Vessel Collision due to Maintenance Activities

There is a risk of vessel-to-vessel collision during the Operation and Maintenance Phase of the Marine Scheme due to a potential unexpected need for maintenance and repair. Vessels will be required to conduct periodic surveys to monitor the cable and perform any preventative maintenance. This may require large slow-moving vessels with restricted manoeuvrability. Their occasional presence across the Marine Installation Corridor will present an obstacle to all passing traffic which has limited capability to avoid the traffic. The risks are analogous to those identified and assessed for installation, but with a significantly reduced likelihood due to the reduced spatial and temporal extents of these activities.

Throughout the year, a range of vessel types cross the Marine Installation Corridor in multiple locations. Cargo/Tanker vessels comprise the majority of this traffic with Fishing and Offshore Industry vessel categories also contributing significantly. Passenger and recreational vessels comprise only a small proportion of the total vessel count, though it should be noted that the latter may be less aware and prepared to navigate around a maintenance vessel. The surface collision risk is likely to be greater in higher density sections of the Marine Installation Corridor and therefore in particular between KP0 and KP 60 and between KP 380 and KP 436, as shown in Figure 13-9. Due to embedded mitigations such as Notice to Mariners and pre-operational consultations the awareness of any maintenance activities among vessels using the area will be raised. However, guard vessels may not be in attendance, and it cannot be presumed that all vessels approaching and exiting the area, or vessels otherwise using the area, will necessarily be aware of the presence of maintenance activities.

A collision with any vessel could result in a 'High' Severity consequence outcome (loss of crew member) among other consequences such as personal injuries and vessel damage as with vessel collision in the Installation Phase. However, it is noted that no maintenance works are foreseen/scheduled throughout the life of the cable with only regular surveys and preventative maintenance considered. The likelihood is considered to be 'Remote' (Never occurred during Company's activities but has been known to occur in the wider industry) along the full length of the Marine Installation Corridor. These assessments combine to provide a '**Tolerable**' risk ranking (Table 13-21).

It is therefore necessary to consider potential risk reduction measures in addition to those assumed to be in place, so as to reduce the risk, to ALARP. Given that the nature, location, or duration of operation and maintenance activities cannot be determined in advance, it is not possible to provide specific risk reduction measures for these activities. However, operation and maintenance activities will be planned in line with industry best practice to minimise collision risk, with specific mitigation determined on a case-by-case basis, informed by the nature and location of activity to be undertaken.

Table 13-21: Impact Risk Summary (Vessel-to-Vessel Collision)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Vessel-to-Vessel Collision	High	Remote	Tolerable	Maintenance activities to be planned on case by case basis and in line with best industry practice to minimise collision risk	ALARP

13.6.4.2 Deviation from Established Vessel Routes and Areas due to Presence of Maintenance Vessels

Maintenance vessels conducting regular surveys to monitor the cable and perform any preventative maintenance may cause some disruption to routine vessel routeing, and any otherwise scheduled activity. As such, their periodic presence within the Marine Installation Corridor will present obstacles, and other vessels routinely operating in the area may be required to deviate from their planned routes to avoid them. The risks are analogous to those identified and assessed for installation, but with a reduced likelihood.

Throughout the year, a range of vessel types will cross the Marine Installation Corridor in multiple locations. Cargo/tanker vessels, fishing vessels and offshore industry vessels, which comprise the majority of this traffic, are unlikely to experience significant disruption in the case where they are required to navigate the Marine Scheme as this is standard navigational practise for these types of vessels. Passenger vessels, which comprise only a small proportion of the total vessel count, are likely to be aware and prepared to navigate clear of the installation vessels due to the embedded mitigations promulgating the operation (Notice to Mariners etc.) and practicing good passage planning techniques and procedures. Nonetheless, some temporary disruption and subsequently required deviation from established routes can be expected. The Marine Installation Corridor intersects the leading line into Peterhead Port. The presence of the maintenance vessels and an advisory 500 m safety zone may occlude the entry into the harbour during installation at that location. It is also noted that the majority of the Marine Installation Corridor passes through military practice areas which may result in some disruption to military vessel activities.

Due to the impermanence of the maintenance vessels, the severity of this impact is considered to be 'Low' as deviations are expected to be temporary and indeed short lived. The likelihood of some deviation is however assessed to be 'Unlikely' which results in risk outcome of '**Broadly Acceptable**' (Table 13-22).

Table 13-22: Impact Risk Summary (Deviation from Established Vessel Routes and Areas)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Deviation from Established vessel routes and areas	Low	Unlikely	Broadly Acceptable	NA	ALARP

13.6.4.3 Interaction with Vessel Anchors and Anchoring Activity

During the Operation and Maintenance Phase there is a risk that a third-party vessel will drop anchor or lose its holding ground in adverse weather and subsequently drag its anchor, over a section of exposed cable (above seabed level).

Vessel anchoring patterns in the area of the Marine Installation Corridor are captured in Figure 13-20. The figure shows that the Marine Installation Corridor does not encroach on any designated anchorage areas. However, vessels are recorded at anchor at a number of locations along the Marine Installation Corridor and in particular at KP0 to approximately KP6 and also around KP28. Additionally, during the summer period, three regions of clearly established anchoring patterns can be seen at KP340, KP395 and from KP410 to landfall at Fraisthorpe Sands (KP436).

In the case of a snagging incident, it is possible that smaller vessels suffer a risk of foundering should they not be able to free themselves. For larger vessels if the cable is recovered to surface it also poses an electrocution risk. A severity of outcome of 'High' is therefore selected. The likelihood of anchor

snagging is assessed as 'Remote' recognising that the cable is buried to a minimum target depth of lowering of approximately 0.6m, with greater depths prescribed where necessary to account for risk of interactions with anchors. Where this isn't practical exposed sections are protected and this protection is designed to minimise the risk of snagging in so far as practicable. Vessels will largely be aware of the cable location due to embedded mitigations covering industry guidance on safe anchoring practices and promulgation of information to sea users, about both the maintenance operations and the cable location itself. These combine to give a '**Tolerable**' risk ranking and the need to consider further risk reduction (Table 13-23).

However, the embedded mitigation; industry guidance on safe anchor and fishing practises, cable trenching where possible with protection measures where this is impractical, and provision of as-built locations of the cable and external protection to UKHO (Admiralty) and Kingfisher (KIS-ORCA) essentially represents all reasonably practicable measures to reduce snagging risks. No further design measures are therefore considered justifiable. The measures are considered to cover all practicable means and to reduce the risks to ALARP.

Table 13-23: Impact Risk Summary (Anchor Snagging)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Interaction with vessel anchors and anchoring activity	High	Unlikely	Tolerable	None Identified (Embedded Measures considered sufficient)	ALARP

13.6.4.4 Interaction with Fishing Gear

Fishing vessels whose gear becomes snagged on the cable may sustain extensive damage or suffer foundering during the Operation and Maintenance Phase of the project. Pre-lay ploughing may result in the creation of berms and rock displacement which presents additional seabed hazards to fishing gear. A large number and variety of fishing vessels are seen in the baseline data, which includes potting/creeling, demersal trawling and scallop dredging. Significant levels are seen at certain locations on the Marine Installation Corridor (See Figure 13-22, Figure 13-23 and Figure 13-25).

The cable would be trenched to a minimum depth of lowering of approximately 0.6 m where possible and otherwise protected using rock berms or other external protection measures as detailed in the Project Description. All external protection measures shall be designed to minimise the risk of snagging insofar as possible. However, industry guidance recommends avoidance of demersal fishing over cables and other safe practises relating to seabed hazards. This embedded mitigation, combined with the provision of as-built locations of cable and external protection to UKHO and Kingfisher (KIS-ORCA) represents substantial risk reduction. As such, the risk of snagging is considered to be suitably reduced, as with the risk of anchor snagging addressed in the previous section. In addition, the appointment of a FLO during the Installation Phase of the project provides substantial assurance that fishermen will be aware of the cable location following the installation.

The consequences of such an outcome can be severe and are assessed as 'High' – potential loss of crew member or vessel. However, given the cable trenching and protection measures, prior promulgation of information on the installation to fishermen via the FLO and via UKHO and KIS-ORCA, as well as other notices to mariners and the relevant industry guidance on fishing near cables and seabed hazards, the probability of snagging incidents is already considered to be minimized. The likelihood of gear snagging is therefore assessed as 'Remote'. This results in an overall '**Tolerable**' risk, which therefore warrants further risk reduction (Table 13-24).

It is therefore necessary to consider potential RRMs in addition to those assumed to be in place, to reduce the risk to ALARP. However, industry guidance on safe fishing practises combined with cable trenching where possible and protection measures where this is impractical, represents an extensive and comprehensive range of reasonably practicable snagging risk reduction measures. It is nonetheless recommended that post lay survey reports are disseminated to relevant fisheries organisations and other stakeholders to further increase awareness.

Table 13-24: Impact Risk Summary (Fishing gear snagging or dragging cable leads to foundering)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Foundering due to fishing gear snagging or dragging cable	High	Remote	Tolerable	Dissemination of post- lay survey to relevant organizations and stakeholders for information	ALARP

13.6.4.5 Reduction in Under Keel Clearance

The Marine Installation Corridor is generally in waters greater than 50 m LAT. Therefore, the slight reduction in effective depth between the keel of a vessel and the seabed topography (under keel clearance) is not considered to present a concern for the vast majority of the length of the Marine Installation Corridor. A depth of 50 m is reached within a kilometre of landfall at Peterhead and as the depth increases steeply moving away from land, depths of 10 m, 20 m and 30 m are reached within only a very short distance along the installation corridor. However at the English landfall, water depths of 10 m LAT extend some 10 km from Fraisthorpe Sands (KP436) only reaching 50 m depth at KP410, approximately 30 km from landfall (see Figure 13-1 and Figure 13-2).

Tracks from vessels with maximum registered draughts greater than 5 m are not seen in the shallower depths around Bridlington and Fraisthorpe Sands. Larger draught vessels (up to 10 m) are seen further out along the installation corridor (KP216) in depths of as low as 15 m at LAT, thought it should be noted that the maximum registered draught is typically larger than actual draught under normal operating conditions. At the North end of the installation corridor larger draught vessels (up to 10 m) are seen in shallow water within Peterhead Port and close to the Marine Installation Corridor however they tend to cross around KP2 in upwards of 20 m depth at LAT.

In line with MCA guidance, it is not planned to reduce the existing navigable water depth by more than 5% along any section of the Marine Scheme. It is therefore expected that under keel clearance is only reduced at a small number of locations, which are anticipated to be located close into shore in shallow water depths. Embedded mitigations of cable trenching and protections, post lay survey and provision of the as-built locations of cable and external protection to UKHO and KIS-ORCA increase awareness of the locations for all vessels also minimise the risk substantially. Additionally, the use of HDD to bring the cable to land from under the seabed limits the potential for reductions in under keel clearance to the exit pit locations. These are to be located within an area of minimum depth range of 5 m at Fraisthorpe Sands to 12 m at Sandford Bay, at LAT.

Reductions in under keel clearance increase the risk of Grounding with a rock berm or other protection feature, which may result in injury and or vessel damage consequences and is therefore assessed as being ‘Medium’. Vessels with deep draughts (relative to the depth of water that they are navigating in) are expected to exercise particular diligence and care through the adoption of good passage planning techniques and procedures. This, combined with consultations and communications identifying and raising awareness of the cable location, presents a likelihood of impact assessed as ‘Remote’. These combine to produce an overall assessment of ‘**Broadly Acceptable’** and no further risk reduction measures are therefore considered necessary.

Table 13-25: Impact Risk Summary (Reduction in Under keel Clearance)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
Reduction in Under Keel Clearance	Medium	Remote	Broadly Acceptable	Not applicable	ALARP

13.6.4.6 Interference with Marine Navigational Equipment

Given the transmission characteristics of the Marine Scheme, it is feasible that a significant zone of potential magnetic compass deviation from electro-magnetic field (EMF) effects could persist along the Marine Installation Corridor. A worst case of more than 5 degrees compass deviation for a large portion

of the route is foreseeable (Appendix 2.2: Eastern Link EMF and Compass Deviation Assessment) (National Grid, 2021). This may present disruption to navigation in the Operation and Maintenance Phase of the Marine Scheme.

Most commercial vessels use a range of instruments for navigation, particularly gyro compasses which are not affected by EMFs. However, some vessels may rely solely on magnetic compass navigation and may experience misrouting where traveling in the direction of the cable and where the interference is most pronounced i.e., in shallow water / inshore. Vessels relying solely on a magnetic compass for navigation are also likely to navigate by visual landmarks in shallow water and inshore areas. However, poor visibility and challenging sea states may nonetheless result in misrouting towards otherwise obscured hazards or objects.

Embedded mitigation such as optimising cable configuration and separation distances to minimise compass deviation, as far as practicable, will reduce the likelihood and severity of vessel misrouting. Additionally, magnetic compass deviation effects are limited to the immediate vicinity of the of the Marine Installation Corridor, so effects on the limited number of vessels expected to rely solely on magnetic equipment will be short lived, and only likely to result in minor course deviations. The consequence severity is nonetheless assessed as 'High' due to the increased hazard prevalence at inshore locations along the Marine Installation Corridor, where more pronounced and persistent deviation could occur. However, complete reliance on magnetic compass navigation is considered very unlikely for any vessel in a given situation and location. Additionally, as most of the cable will be laid in water deep enough to eliminate the EMF effects (50 m), the probability of disruption is assessed as 'Remote'. These combine to produce a '**Tolerable**' risk rating and the need to consider further risk reduction measures (Table 13-26).

It is therefore necessary to identify potential risk reduction measures in addition to those assumed to be in place, to reduce the risk to ALARP. Therefore, all reasonably practicable measures should be taken to minimise magnetic compass deviations through optimization of cable configurations to within acceptable limits. Where this may not be practicable further consultation with MCA should be undertaken to identify additional mitigation such as magnetic compass deviation survey and reporting to UKHO for inclusion in admiralty charts.

Table 13-26: Impact Risk Summary (EMF with Marine Navigational Equipment)

Impact	Consequence	Likelihood	Risk	Additional RRMs	Residual Risk
EMF with Marine Navigational Equipment	High	Remote	Tolerable	Consultation with MCA to Identify acceptable mitigation where compass deviation cannot be reduced to within acceptable limits through optimisation of the cable configuration.	**ALARP**

13.6.5 Decommissioning Phase

All impacts relating to the Installation Phase are considered to apply to the Decommissioning Phase. The potential risk reduction measures identified for the Installation Phase, in addition to those assumed to be in place, to reduce the risk to ALARP, will be applied during the Decommissioning Phase.

As such all residual risk is considered to be ALARP for all decommissioning impacts.

13.7 Residual Impacts

Across all phases of the Marine Scheme, all impacts were assessed to be 'tolerable' or 'broadly acceptable'. Following the implementation of the additional risk mitigation measures identified in Sections 13.6.3 and 13.6.4 and justified in Section 13.6, the residual impacts, from all phases of the Marine Scheme, can be considered **ALARP**.

13.8 Summary of Appraisal

This Section summarises the impact appraisal and includes the additional mitigation and monitoring measures that will be adhered to by the Marine Scheme to ensure best practice and alignment with relevant international statute. In accordance with the principles of ALARP, a cost benefit justification of recommended additional risk reduction measures is also used to determine their requirement for implementation. The recommendations resulting from the impact appraisal are also captured here.

13.8.1 Cost Benefit Considerations

The principle of gross disproportion is used to ensure that the risk reduction benefit is proportionate to the cost of implementing a given measure. This appraisal assesses the risk to navigation rather than the public, or individual workers, for example. Similarly, as risks to navigation generally are being assessed, numerical frequencies for consequence outcomes cannot be determined and therefore detailed or numerical cost benefit calculations cannot be made. Nonetheless each of the additional measures recommended in the section above is addressed in this section to provide a basic justification of their implementation, or otherwise. Table 13-27 shows the identified impacts to navigation, additional risk reduction measures that will be implemented and a qualitative justification to complete/provide a basic ALARP position against each of the impacts.

Table 13-27: Cost Benefit Considerations.

Impact	Additional RRM	Justification
Increased risk of vessel-to-vessel collision	High Traffic Density Specific procedures established for installation Liaison with Peterhead Port Authority Maintenance activities to be planned on a case-by-case basis to take due consideration of vessel traffic density in line with best industry practice to minimise collision risk	Procedural / administrative measures are considered to carry minimal associated cost compared to physical measures and are therefore justified.
Deviation from established and identified vessel routes and areas	Liaison with Peterhead Port Authority to agree how interactions between Project vessels and routine traffic using Peterhead Port will be managed within the statutory port limits, including scheduling, RCZs and communications between vessel masters, pilots and the VTS.	Procedural / administrative measures are considered to carry minimal associated cost compared to physical measures and are therefore justified.
Interaction with vessel anchors and anchoring activity	Duration of exposed / unprotected cable minimized	Minimizing duration of exposed cable is considered Procedural and carrying minimal associated cost therefore the measure is considered justified.
Interaction with fishing gear	Duration of exposed / unprotected cable minimized Dissemination of relevant post- lay survey information to relevant organizations and stakeholders awareness	Minimizing duration of exposed cable and dissemination of post lay survey information are not considered grossly disproportionate, carrying limited associated cost. Therefore, the measures are considered justified.
Reduction in under keel clearance	Not applicable	Not applicable

Impact	Additional RRM	Justification
Interference with marine navigational equipment	Consultation with MCA to identify acceptable mitigation where compass deviation cannot be reduced to within acceptable limits through optimisation of the cable configuration during detailed design following appointment of the installation contractor.	Procedural / administrative measures such as consultation are considered to carry minimal associated cost compared to physical measures and are therefore justified.

13.8.2 Recommendations

The following recommendations, resulting from the Shipping and Navigation appraisal have been made. The recommendations should be implemented to ensure that impacts to shipping and navigation from the Marine Scheme are reduced to ALARP. Where recommendations are not implemented justification should made and captured appropriately.

1) Cable laying operation procedures should include provisions which recognize and address the increase in collision risk at the most densely trafficked areas of the Marine Installation Corridor. Provisions should include:
    - Operation procedures explicitly identifying the increased collision risk, including the particular prevalence of recreational vessels, between KP0 (Landfall) to KP60 and between KP380 to KP436 (Landfall) and be established prior to commencement of works;
    - Guard Vessel procedures explicitly identifying the increased collision risk between KP0 (Landfall) and KP60 and between KP380 and KP436 (Landfall) established prior to commencement of works; and
    - Prior reconfirmation with crew, that the installation vessels are entering the two areas of higher density traffic.
2) Maintenance activities should be planned, on a case-by-case basis, to take due consideration of vessel traffic density, in line with best industry practice, to minimise collision risk.
3) Liaison with Peterhead Port Authority to agree how interactions between Project vessels and routine traffic using Peterhead Port will be managed within the statutory port limits, including scheduling, RCZs and communications between vessel masters, pilots and the VTS.
4) The duration between cable laying and associated trenching and protection works is minimised insofar as is practicable, in order to minimise the period when exposed cables are present on the seabed.
5) It is recommended that relevant as-built survey information is disseminated to relevant fisheries organisations and other stakeholders to further increase awareness.
6) Where compass deviation cannot be reduced to within acceptable limits through optimisation of the cable configuration, further consultation with MCA should be undertaken to identify additional mitigation such as magnetic compass deviation survey and reporting to UKHO for inclusion in admiralty charts.

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