

REPORT

Boston Alternative Energy Facility

Navigation Risk Assessment (Clean)

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Boston Alternative Energy Facility Navigation Risk Assessment

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Abbreviations Table

Abbreviation	Definition
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
BAEF	Boston Alternative Energy Facility
BFFS	Boston and Fosdyke Fishing Society
CBA	Cost Benefit Analysis
CHA	Competent Harbour Authority
COLREGS	International Regulations for Preventing Collisions at Sea
DfT	Department for Transport
FSA	Formal Safety Assessment
IMO	International Maritime Organization
M	Metres
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MSMS	Marine Safety Management System
NRA	Navigation Risk Assessment
NUC	Not Under Command
PMSC	Port Marine Safety Code
PoB	Port of Boston
SOLAS	Safety of Life at Sea
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UTC	Coordinated Universal Time
VHF	Very High Frequency

1 Introduction

Alternative Use Boston Projects Ltd (the ‘Applicant’) are intending to construct the Boston Alternative Energy Facility (BAEF). The Applicant submitted a Development Consent Order for the BAEF to the Planning Inspectorate on the 23rd March 2021, which included assessment of impacts to marine navigation within Chapter 18 of the Environmental Statement (ES) (Navigational Issues – Document Reference 6.2.18, APP-056) (BAEF, 2020).

The BAEF will include a wharf to be located on The Haven¹, which is a tidally restricted waterway providing access to the Port of Boston, which is operated by Port of Boston Ltd (PoB). There will be no means of turning vessels associated with the BAEF at the wharf itself, and therefore there will be a requirement to turn vessels either in the wet dock, or at the Knuckle point just outside of the wet dock (hereby referred to as the ‘swing hole’). The increased number of commercial vessels and time taken to turn may impact on existing fishing users of The Haven.

Anatec Ltd were commissioned to undertake a Navigation Risk Assessment (NRA) for the BAEF to assess the potential impacts within the vicinity of the swing hole on existing users of the waterways associated with the PoB and its multiple berths upstream of the BAEF. This NRA represents a draft version based on preliminary input from PoB intended to inform the relevant aspects of the Development Consent Order (DCO) examination process, and therefore focuses on the specific impacts to fishing vessels.

A final NRA including consideration of commercial vessels will be agreed with and produced in direct conjunction with PoB, noting that timelines on such updates will be agreed with PoB. Once PoB have approved this final NRA, it will be used to inform the drafting of a detailed Navigational Management Plan which will consider all river users. The Navigational Management Plan will be agreed between (and include direct involvement from) PoB and the Applicant, noting that under the Port Marine Safety Code (PMSC) PoB are responsible for determining how vessel movements are managed.

It is noted that relevant impacts have already been assessed within the ES (BAEF, 2020), and as such this NRA is designed to support in informing the examination process, as opposed to re-assessing impacts.

Assessment has been based on various data sources to ensure consideration is made to all vessel types and sizes. This includes 24 months of Automatic Identification System (AIS) data, noting that additional data sources and consultation have been considered to ensure a comprehensive understanding of baseline vessel activity including fishing vessels not broadcasting via AIS (which make up the majority of the fishing fleet associated at Boston).

¹Tidal river of Boston providing access for shipping from Boston Deepes in The Wash.

2 Regulatory Context

2.1 Port Marine Safety Code

This NRA has been drafted with due consideration to the Port Marine Safety Code (PMSC) produced by the Department of Transport (DfT) and Maritime and Coastguard Agency (MCA) in 2000, with the latest update published in 2016 (DfT/MCA, 2016) which sets out statutory requirements for United Kingdom (UK) harbour authorities. In the context of the BAEF, the Competent Harbour Authority² (CHA) as per the PMSC is PoB³. PoB is required to comply with the PMSC to ensure that marine operations are managed, and the necessary obligations are followed (see Section 1 ‘Accountability for Marine Safety’ within the PMSC). A summary of those obligations related to safety management are detailed below⁴:

- *Powers, policies, plans and procedures should be based on a formal assessment of hazards and risks and harbour authorities should have a formal Marine Safety Management System (MSMS) in place.*
- *The MSMS should be in place to ensure that all risks are controlled – the more severe ones must either be eliminated or reduced to the lowest possible level, so far as is reasonably practicable (that is such risks must be kept as low as reasonably practicable or “ALARP”).*
- *All parties involved in the safety of navigation must be competent and qualified in accordance with a minimum national standard.*
- *Organisations should monitor, review and audit the MSMS on a regular basis.*
- *Organisations should publish plans and an assessment of their performance in meeting their obligations at least once every three years.*

Of particular relevance to this NRA is a requirement for the MSMS to incorporate safety policies and procedures to “ensure there is proper control of vessel movements by regulating the safe arrival, departure and movement within the harbour of all vessels” (section 2.13 of the PMSC).

It is noted that as an operator of a “marine terminal, jetty or berth”, BAEF also have a duty (at a secondary level) under the PMSC to ensure adequate information is available to PoB and port users (Section 3 ‘General Duties and Powers’ of the PMSC):

Many of the duties and powers described in this section may only be applicable or relevant to statutory harbour authorities. However, other organisations are also encouraged to consider

² Defined under the Port Marine Safety Code as any authority with statutory pilotage duties as per the Pilotage Act 1987.

³ Duties and powers are contained in local Acts which are typically established by the incorporation or transposition into local Acts and Orders of provisions in the Harbours, Docks and Piers Clauses Act 1847. Other duties and powers are in general legislation – for example, the Harbours Act 1964, the Dangerous Vessels Act 1985, the Pilotage Act 1987 and the Merchant Shipping Act 1995.

⁴ Section 2 of the PMSC ‘Key Measures to Secure Maritime Safety’ (DfT/MCA, 2016)

this section to determine what guidance may be relevant to themselves and their organisations.

For example: A marine terminal, jetty or berth operator may not have any statutory powers or duties but will need to consider the appropriate interpretation and applicability of ‘conservancy duty’ or ‘environmental duty’ and their common law duty of care to all harbour users, etc. Users of port marine facilities should still be provided with adequate information about conditions at the facility (such as depths, navigation marks, any appropriate reporting requirements, marine or navigational information about the facility, etc).

2.2 PoB Standing Notice to Mariners

As per Section 2.1, PoB are the relevant CHA as per the PMSC (DfT/MCA, 2016). As such they are responsible for setting out procedural requirements for port users. On this basis, the aspects of their active Standing Notice to Mariners (PoB, 2021) deemed of relevance to this NRA are detailed in Table 2.1.

Table 2.1: Relevant Aspects of the PoB Standing Notice to Mariners

Aspect	Description
No 1: Collision Regulations	All Mariners are reminded that they should at all times comply with the rules contained within SOLAS Regulations (IMO, 1974) including the International Regulations for the Prevention of Collisions at Sea (COLREGS) (IMO, 1972/77). Special Directions ⁵ issued by the Harbour Master, his Assistant or Deputy will be issued if required and these Directions may overrule the COLREGS Owners and operators of any vessel that is covered by the COLREGS are reminded that contravention of these Regulations is a serious matter. Recent occurrences suggest that in some cases the person in charge of navigation is unaware of these Regulations particularly those relating to vessels constrained in narrow channels. It is pointed out that ignorance of the law is no defence and prosecution under both the Boston Harbour Act and the COLREGS will follow any serious contravention.
No 2: Contact Details	Mariners navigating the River Witham seawards of Grand Sluice and extending to the outer limits of the PoB Jurisdiction Area are to monitor VHF Channel 12. The Port Control Office at Boston, callsign ‘Boston Port Control’ can provide commercial traffic forecasts. Port Control Office contact numbers are 01205 362328 or 07966 244341, email portcontrol@portofboston.co.uk. The office is not manned 24 hours a day but only at tide times when commercial shipping movements are planned to occur. Details outside these hours may be obtained from the 24 hour Port of Boston telephone number, 01205 365571.

⁵ Under Section 52 of the Harbours Docks and Piers Clauses Act 1847, The Harbour Master, Assistants or his Deputy may give Special Directions to any vessel. These may be made verbally or in writing depending upon the circumstances of the case.

Aspect	Description
No 3: Pre Arrival Documentation and Defects Advice	Vessels should, wherever possible, provide 24 hours notice of arrival to their ships agents with a copy sent to portcontrol@portofboston.co.uk. [...]
No 6: Pilotage	Pilotage is compulsory for vessels over 30m LOA and for tug and tows with a combined length of over 30m. Pilot should be ordered through ships agents, giving 24 hours' notice wherever possible. Pilot boarding areas are at the Eastern End of the Freeman Channel or close to Number 9 Buoy. The Harbour Master reserves the right to require any vessel even if less than 30m LOA, within the compulsory pilotage area, to carry a pilot or pilots if he considers the circumstances require on the grounds of safety of life, navigation or environment.
No.14: 6 Knot Speed Limit	Attention of Mariners is drawn to the speed limit within The Haven. This speed limit is not set by the Harbour Authority but advised by the Environment Agency. The Harbour Authority considers safe speed to be more important and relevant to shipping and may monitor the speed of vessels having regard to such safe speed. If the Harbour Authority considers that excessive speed is causing a hazard to navigation or a danger to, or embarrassing other vessels, or causing excessive wash or risk damaging the flood defences, it will take necessary action. See also Rule 6 of the COLREGS.
No 15: Safe Navigational Watch / Stability	Attention is drawn to Marine Guidance Note Marine Guidance Note (MGN) 313(F) concerning Keeping a Safe Navigational Watch on Fishing Vessels (MCA, 2006).
No.16: Interaction	Several cases of interaction have been experienced in the river. (Interaction occurs mostly between vessels of different sizes). Interaction has occurred on occasions when fishing boats have attempted to pass commercial vessels usually at a time when the larger commercial vessel commences slowing down on their approach to the dock. There is a serious risk of interaction, sucking the smaller vessel into the larger vessel, turning the smaller vessel broadsides to the river and therefore causing risk of collision and capsizing. In all cases it is highly recommended that overtaking in the river is only acceptable after clear consultation and agreement between the two vessels.
No 17: Small Craft in Tidal Waters	[...]. It is a local requirement of the Port of Boston, that all vessels navigating within the Ports waters have adequate means of communications which will normally mean carrying a Marine Band VHF Radio capable of receiving and transmitting on VHF channel 12. [...]
No.24: General	The Port of Boston complies with the PMSC. [...]

Under item number 24 it notes that all 'vessel owners (including owners of fishing vessels), Agents, Charterers, Yacht Clubs, Marina Operators and Lock Keepers should ensure that the contents of these Notices are made known to the masters and skippers or persons in charge of vessels using the waters within the Port of Boston jurisdiction area'.

2.3 Regulation of Vessels

2.3.1 Navigation within a Narrow Channel

The International Regulations for Preventing Collisions at Sea (COLREGS)⁶, (IMO, 1972/77) prescribes to all vessel's (e.g., commercial vessels, fishing vessels) responsibilities with regards to safe navigation. Rule 9 details navigation within Narrow Channels (such as that within The Haven) including keeping to starboard as well as navigation with regards to crossing other vessels, overtaking and navigating around a bend (including necessary sound signals if deemed appropriate (9f)). Part 9b requires that 'A vessel of less than 20 metres in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway'.

2.3.2 SOLAS V

Whilst vessel regulation varies from nationality (flag), size and area operations all vessels are required to comply with elements of SOLAS V⁷. In particular regulation 34 - Safe Navigation and Avoidance of Dangerous Situations. Regulation 34 states:

Prior to proceeding to sea, the master shall ensure that the intended voyage has been planned using the appropriate nautical charts and nautical publications for the area concerned, taking into account the guidelines and recommendations developed by the Organization⁸

The voyage plan shall identify a route which:

- takes into account any relevant ships' routing systems
- ensures sufficient sea room for the safe passage of the ship throughout the voyage
- anticipates all known navigational hazards and adverse weather conditions; and
- takes into account the marine environmental protection measures that apply, and avoids, as far as possible, actions and activities which could cause damage to the environment

The MCA guidance notes for regulation 34 state that for small vessels the degree of voyage planning will be dependent upon the size of vessel, its crew and the length of the voyage. However, the MCA expects all mariners to make a careful assessment of any proposed voyage taking into account all dangers to navigation, weather forecasts, tidal predictions and other relevant factors including the competence of the crew.

⁶ Merchant Shipping Notice 1781 (MCA,2004)

⁷ See MGN 610 (MCA, 2020).

⁸ Refer to the Guidelines for Voyage Planning, adopted by the IMO by Resolution A.893(21)

3 Methodology

3.1 Impacts Assessed

This NRA undertaken for the BAEF is focussed on the specific question **of the BAEF vessels (herein referred to as project vessels) transits and turns and what if any impact this may have on the Boston fishing fleet.** It does not consider impacts associated with the BAEF itself which have been addressed separately in the application including within Chapter 18 (Navigational Issues) APP-056. It is noted that whilst this document builds on the information collated as part of the process it is a separate and independent assessment to look at the above highlighted question undertaken by Anatec Ltd at the request of BAEF.

On this basis, potential impacts have been identified based on stakeholder concerns related to use of the swing hole including those raised by the local fishing vessels (see Section 4.2):

- Disruption / Delay caused by use of turning circle and transit of BAEF vessels;
- Increase in safety risk and subsequent commercial impacts; and
- Safety impact if BAEF vessels are unable to turn due to time or tidal constraints.

Impacts specific to the construction phase have been considered and assessed within Appendix B, noting that the NRA focuses on the operational phase.

3.2 Formal Safety Assessment

In line with standard approach to marine risk assessment, the International Maritime Organization (IMO) FSA process (IMO, 2018) as approved by the IMO in 2018 under Maritime Safety Committee – Marine Environment Protection Committee (MEPC).2/circ.12/Rev.2 will be applied to the impact assessment within this NRA.

The FSA process is a structured and systematic methodology based upon risk analysis and Cost Benefit Analysis (CBA) (if applicable) to reduce impacts to As Low as Reasonably Practicable (ALARP). There are five basic steps within this process as illustrated by Figure 3.1 and summarised in the following list:

- Step 1 – Identification of hazards (a list is produced of hazards prioritised by risk level specific to the problem under review);
- Step 2 – Risk analysis (investigation of the causes and initiating events and consequences of the more important hazards identified in Step 1);
- Step 3 – Risk control options (identification of measures to control and reduce the identified hazards);
- Step 4 – CBA (identification and comparison of the benefit and costs associated with the risk control options identified in Step 3); and
- Step 5 – Recommendations for decision-making (defining of recommendations based upon Steps 1 to 4).

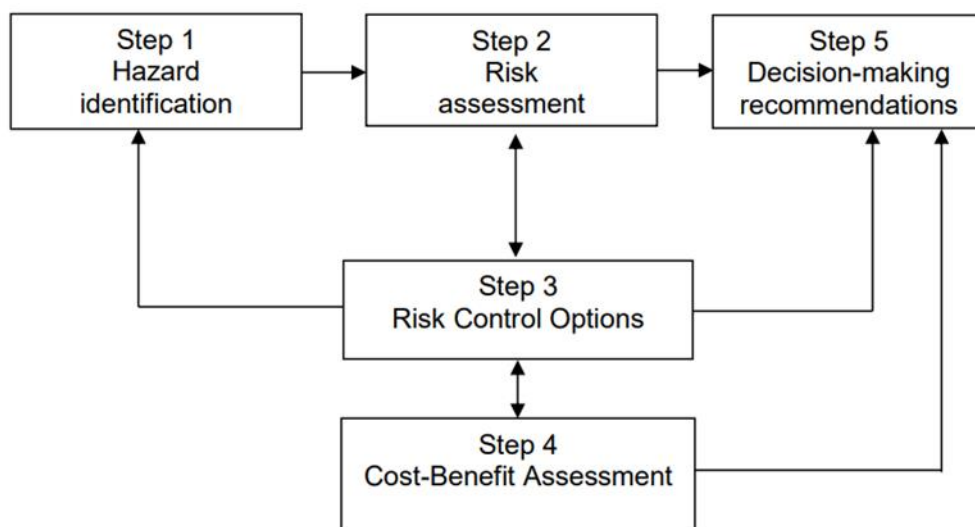


Figure 3.1: Flow Chart of the FSA Methodology (IMO, 2018)

The FSA process considers the relevant risk assessment aspects undertaken for each impact identified (see Section 3.1), and on this basis determines a “Frequency of Occurrence” and “Severity of Consequence” for each of these impacts. The associated definitions are provided in Table 3.1 and Table 3.2.

Table 3.1: Severity of Consequence Definitions

Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible impact.	No perceptible impact.	No perceptible impact.	No perceptible impact.
2	Minor	Slight injury(s).	Minor damage to property i.e., superficial damage.	Tier 1 local assistance required.	Minor reputation impact – limited to users.
3	Moderate	Multiple minor or single serious injury.	Damage not critical to operations.	Tier 2 limited external assistance required.	Local reputation impacts.
4	Serious	Multiple serious injury or single fatality.	Damage resulting in critical impact on operations.	Tier 2 regional assistance required.	National reputation impacts.
5	Major	More than one fatality.	Total loss of property.	Tier 3 national assistance required.	International reputation impacts.

Table 3.2: Frequency of Occurrence Definitions

Rank	Description	Definition
1	Negligible	< 1 occurrence per 10,000 years
2	Extremely unlikely	1 per 100–10,000 years
3	Remote	1 per 10–100 years
4	Reasonably probable	1 per 1–10 years
5	Frequent	Yearly

The severity of **consequence** and **frequency** of occurrence are then used to define the impact significance via a risk matrix approach as shown in Table 3.3. The tolerability of an impact is defined as Broadly Acceptable (low risk), Tolerable (intermediate risk), or Unacceptable (high risk).

Once identified, the tolerability of an impact will be assessed to ensure it is ALARP. Further risk control measures may be required to further mitigate an impact in accordance with the ALARP principles, noting that unacceptable risks are not considered to be ALARP.

Table 3.3: Tolerability Matrix and Risk Rankings

Severity of Consequence	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5
		Frequency of Occurrence				

	Unacceptable (high risk)
	Tolerable (intermediate risk)
	Broadly Acceptable (low risk)

3.3 Lessons Learnt

3.3.1 Sutton Bridge Grounding

There is considerable value to assessing lessons learnt from historic industry incidents and scenarios (including port and general marine incidents). Of particular relevance to this NRA is

the grounding of the general cargo vessel *Lagik* during a turn within the swing basin at Port Sutton Bridge⁹. This blocked the River Nene and closed the Port of Wisbech for 44 days. The Marine Accident Investigation Branch (MAIB) report (MAIB, 2001) into the incident found a key factor was the lack of a documented formal risk assessment for turning operations by the port and that no tug was standing ready for immediate use (noting other factors related to differing perceptions on the Bridge and action taken post grounding by the Master of the vessel). This is considered where appropriate within the NRA.

3.3.2 Boston Barrier Flood Protection

Following application in 2016 (Environment Agency, 2016), the Boston Barrier flood gate is now fully operational, with operation of the overarching flood protection project expected during 2022. Any relevant lessons learnt will be considered within the NRA, noting that the Boston Barrier project mitigation includes use of digital information boards to promulgate information to port users.

3.3.3 Wet Dock Expansion

As per Section 7.2, PoB are in preparations to expand the wet dock to facilitate larger vessels. While the expansion works are ongoing, the wet dock will be out of use and therefore all vessel turns will be required to be undertaken in the swing hole, and vessels will moor at the riverside berths. As required under the PMSC (see Section 2.1), PoB will risk assess this period in advance and on an ongoing basis to ensure appropriate procedures and resources are in place to manage the increased use of the swing hole and use of the riverside berths. It is assumed that any relevant lessons learnt by PoB during this period will be applied to future use of the swing hole including turns of BAEF vessels in line with the PMSC requirements.

⁹ As raised by representatives of the fishing community.

4 Consultation

This section details the consultation undertaken to inform the NRA, which includes meetings with PoB and with the Boston and Fosdyke Fishing Society (BFFS) which includes local fishing users in the Boston fleet. The consultation is considered a key input to the assessment; however it should be noted that an evidence based approach has been undertaken whereby information provided via consultation is considered against the available data and evidence to ensure the NRA inputs are robust.

4.1 Port of Boston

A meeting was held with PoB on the 21st September 2021. Key outputs of the meeting are summarised in Table 4.1, which includes reference to where the consultation has fed into the NRA.

Table 4.1: PoB Consultation Meeting – 21st September 2021

Point Raised	Where Addressed
Vessel arrivals at Boston are projected to be around 450 in total for 2021.	Commercial vessel counts are assessed in Section 8.2.1.
PoB indicated an hour transit between the chartered pilot boarding location and the wet dock was a reasonable estimate for commercial vessels.	Transit times are considered in Section 8.2.3.
PoB noted the swing hole has not been used for approximately six years, due primarily to construction of the Boston Barrier scheme and the temporary possession by the Environment Agency of the riverside quays.	Use of the swing hole is assessed in Section 9.3.
PoB stated that cockles was main fishery, which typically runs from June to November. Commercial fishing outside of this period is more limited (i.e., not a daily occurrence). It was estimated that cockle fishing occurs 100 days of the year.	Considered within the baseline assessment of fishing vessels (see Section 8.3.3).
PoB indicated that based on tidal conditions when a commercial vessel would be transiting, a fishing vessel passing should be possible anywhere on the river (other than when a vessel was turning in swing hole).	See Section 9.2 which considers passing on the river.

Point Raised	Where Addressed
<p>PoB stated the wet dock can accommodate five large cargo vessels and noted plans to expand to accommodate larger vessels. This includes refurbishment of existing riverside berths that are not currently in use.</p>	<p>See Section 7.2 which sets out the baseline in terms of PoB.</p>
<p>With regards to BAEF vessels, PoB advised that they would consider vessel turning within the wet dock (where safe and practicable) whenever the fishing fleet could be impacted by swinging in the river, and with a view to keeping the swing hole free for unladen swings if needed. Indicatively, PoB suggested that a 'loose estimate' was that there may be a 50/50 split between wet dock and swinging hole turning for BAEF vessels. PoB noted that where and when vessels were swung would depend on various factors including whether vessels were laden / unladen.</p>	<p>Number of potential turns is considered in Section 6.2.2, with associated impact assessment undertaken in Section 11.1.</p>
<p>Port Control is manned over the High Water period, but only when commercial vessels are moving on the river. Port Control will communicate with commercial vessels including to alert them to other vessels on the river, however communication with fishing vessels is limited, and would tend to be through the Pilots as opposed to Port Control.</p>	<p>See Section 7.1 which sets out the baseline in terms of PoB.</p>
<p>PoB stated there may be a need for additional pilots to accommodate increased traffic associated with BAEF, and that the need for other resources would be reviewed on an ongoing basis. It was noted that a review of the pilotage procedures will be carried out i.e., whether a tug is required to be available when a vessel is being swung in the hole or going on or off the wharf.</p>	<p>See Section 10 which sets out assumed embedded mitigation.</p>
<p>There are currently no formal priorities given to any vessel and passing etc are all managed via communications from Port Control.</p>	<p>Considered within impact assessment in Section 11.</p>

Point Raised	Where Addressed
In the event of a Not Under Command vessel, Port Control would be contacted and assist if possible via standby tug.	Considered within impact assessment in Section 11.
PoB indicated they would anticipate turns to take place in the hour before high tide.	See Section 6.2.
PoB stated where there was a “backlog” of fishing vessels behind a BAEF vessel, the pilot on board would seek to let as many as possible pass before turning.	Considered within impact assessment in Section 11.
PoB estimated turns would take 10-15 minutes (based on previous experience as well as extensive simulations) and noted fishing vessels may be able to pass at the start / end of the manoeuvre (in communication with Pilot).	Considered against available data in Section 9.3.
PoB indicated a possible mitigation would be the use of digital information boards either side of the swing hole (similar to those at the Barrier). Flashing lights either side of the swing hole may also be used. Very High Frequency (VHF) broadcasts could be made each time a vessel was about to move and be swung in the swinging hole. This would inform all vessels in the river of the operation.	Additional mitigation is considered in Section 11.4.

It is noted that PoB provided an email follow up on the 22nd September 2021 summarising their view after the meeting, stating that:

“The introduction of an additional 580 ships from our current number of 450 / 460 is a large increase and worthy of looking closely at how this will affect the daily movement of river traffic but as similar numbers have been experienced in the past, the Harbour Authority are confident this can be managed in a safe and efficient manner with little adverse effect on the fishing fleet or other river traffic.”

4.2 Fishing Users

A virtual meeting was held with the BFFS and associated representation via Microsoft Teams on the 29th September 2021. Key outputs of the meeting are summarised in Table 4.2, which includes reference to where the consultation has fed into the NRA. Additional feedback was

provided via email on the 2nd September 2021 (sent via Roy Thornes on behalf of BFFS), key points¹⁰ of which are detailed in Table 4.3.

Table 4.2: BFFS Consultation Meeting Summary – 29th September 2021

Point Raised	Where Addressed
BFFS indicated current fishing fleet comprises approximately 26 vessels.	Considered within the baseline assessment of fishing vessels (see Section 8.3.3).
BFFS noted the past 18 months are likely to be unrepresentative of fishing activity due to COVID and Brexit. However, grants are expected that would see the fishing activity increase, as well as potential new markets related to new trade deals.	Considered within the assessment of available fishing vessel data (see Section 8.3.3).
BFFS indicated departure / return times of fishing vessels will vary depending on a number of factors (e.g., conditions, quota, tide), but typically the “peak” period was +/- 2 hours around high tide.	Considered within the baseline assessment of fishing vessels (see Section 8.3.3) and assessment of transits relative to high tide (see Section 9.1.2).
BFFS stated typically fishing vessels may be able to pass commercial vessels one hour before and one hour after high tide but this would depend on spring/neap tides and the weather conditions. When or where a vessel can pass is not pre-planned and based on experience and conditions on the day.	See Section 9.2.
BFFS stated that the key concern is the BAEF vessels turning in the swinging hole and the impact this will have on existing users. Noted that this includes time for the BAEF vessels to transit to / from the wharf. It was estimated that delays could be 50 minutes in length. BFFS indicated concern that there would not be anywhere safe for fishing vessels to wait during this time.	This is assessed within Section 11.1.

¹⁰ Note minutes have not been agreed with BFFS therefore this table is a reflection of the meeting by the author.

Table 4.3: Email Correspondence – 2nd September 2021

Point Raised	Where Addressed
<p>Concerns raised over BAEF vessel transits between the facility and the swing hole before / after turning as it may not be safe to pass on the upper half of the river depending on the tide. Noted that there be approximately 26 vessels returning that may have to wait for the vessels to turn.</p>	<p>Associated impacts are assessed within Section 11.</p>
<p>Concerns that departing before or waiting until after BAEF vessels have turned may extend working hours.</p>	
<p>Concerns over scenario where a vessel grounds or breaks down during a turn.</p>	

5 Data Sources

This section details the key data sources used to inform the NRA, which are detailed in Table 5.1.

Consultation input from the PoB and local fishing representatives (see Section 4) has also been considered as a key input, noting that an evidence-based approach has been applied whereby the feedback and information received is considered against the available data to ensure the NRA inputs are robust.

Relevant information from Chapter 18 of the ES (Navigational Issues - APP-056) (BAEF, 2020) has also been considered where appropriate.

Table 5.1: Data Source Summary

Data Source	Description	Purpose
AIS Data	24 months of terrestrial AIS data 2019/2020.	To assess baseline vessel activity within The Haven.
	Additional historical AIS data assessed for specific days during 2013/2014 when use of the swing hole was identified.	To assess use of the swing hole.
DfT Port Arrivals Data (1994-2017)	Port arrivals data provided by the DfT detailing number of cargo and passenger arrivals at Boston between 1994 and 2017.	To assess long term fluctuations in commercial vessel callings at Boston.
Visual Survey Data	Visual logs of vessels transiting The Haven on the 18 th August 2020 and 21 st September 2021. AIS data was also assessed for these days to validate the findings.	To inform/validate the assessment of non AIS vessels.
Admiralty Sailing Directions (United Kingdom Hydrographic Office (UKHO, 2021)) and charts (UKHO, 2021).	Relevant UKHO Pilot Book and nautical charts.	To capture relevant port features and procedures.

5.1 AIS Data

As per Table 5.1, periods of AIS data has been utilised for the purpose of establishing the marine traffic baseline associated with the PoB. These include:

- 24 months of AIS data from 2019 and 2020;
- Historic AIS data from 2013 and 2014 (to assess use of swing hole); and
- AIS data from the 21st September 2021 to validate the 2021 visual survey data (see Section 5.2).

Regulation 19 of the International Convention for the Safety of Life at Sea (SOLAS) Chapter V requires AIS to be fitted aboard all vessels of 300 gross tonnage and upwards, engaged on international voyages, cargo vessels of 500 gross tonnage and upwards, not engaged on international voyages and passenger vessels irrespective of size, built on or after 1st July 2002. It also applies to vessels engaged on international voyages, constructed before 1st July 2002, according to the following timetable:

- Passenger vessels, not later than 1st July 2003;
- Tankers, not later than the first survey for safety equipment on or after 1st July 2003; and
- Vessels, other than passenger vessels and tankers, of 50,000 gross tonnage and upwards, not later than 1st July 2004.

An amendment adopted by the Diplomatic Conference on Maritime Security in December 2002 states that vessels, other than passenger vessels and tankers, of 300 gross tonnage and upwards but less than 50,000 gross tonnage, will be required to fit AIS no later than the first safety equipment survey after 1st July 2004, or by 31st December 2004, whichever occurs earlier. Vessels fitted with AIS shall maintain AIS in operation at all times, except where international agreements, rules or standards provide for the protection of navigational information.

On this basis, the AIS data is considered to be comprehensive for commercial (i.e., cargo, tanker) vessel movements within The Haven.

Fishing vessels of 15 metres (m) length and over are also required to carry Class A AIS.

5.2 Visual Surveys

In addition to the AIS data (see Section 5.1), visual observation data has been collected via surveyors stationed alongside The Haven on the following days:

- 18th August 2020; and
- 21st September 2021.

The 2021 survey involved two surveyors based at a location opposite the Riverside Industrial Estate. The first part of the survey commenced at 04:30 and ended at 08:50 to ensure vessel movements around the first high tide of the day (07:00) were captured. The evening survey commenced at 16:50 in advance of the second high tide at 19:38. The surveyors logged the following information for each vessel observed:

- Name;
- Vessel type;

- Direction (inbound or outbound); and
- Time of observation.

The 2020 survey was undertaken during the second incoming tide of the day and was held to gather preliminary data on fishing vessel activity relative to the tide. It is not considered comprehensive of all vessel movements.

5.3 Data Limitations

5.3.1 Non AIS Vessels

As per Section 5.1, there is no obligation for fishing vessels of less than 15m in length to broadcast via AIS. All fishing vessels within the Boston fleet are less than 15m in length, and as such are not required to transmit, however as shown in Section 8.3.1, a limited number do so on a voluntary and occasional basis.

It should therefore be considered that the AIS data alone would significantly underrepresent fishing vessel activity. The additional data sources assessed to ensure non AIS activity is captured include the visual surveys (see Section 5.2) and the input from the PoB and the local fishing representatives (see Section 4). It is also noted that while the AIS data will underrepresent activity, it does provide indication of how the overarching fleet may behave. Regardless, it should be considered when viewing the assessment set out in this report that based on the available data it is not possible to quantify fishing vessel behaviour to the same degree as the commercial vessel transits.

5.3.2 Coverage and Downtime

AIS coverage depends on a number of factors including atmospheric conditions, proximity of broadcast to receiver, location of transceiver on vessel, and class of AIS Unit. Coverage of The Haven was generally considered good, however it was noted that AIS transmission / collection frequency of certain transits of smaller vessels (pilots and lifeboats) was such that precise passage through The Haven was not captured (i.e., the AIS tracks had the appearance of the vessel crossing land). For clarity, these tracks have not been shown graphically within Section 8, however they have still been captured within the assessment of vessel counts, types, sizes and speeds. It is noted that this did not include the vessels of most relevance to the assessment (commercial vessels and fishing vessels) which were observed to have sufficient AIS transmission frequency to define passage through the river.

In terms of downtime, no vessels were recorded within the area for approximately 17.3% of 2019, and 17.6% of 2020. It is likely that a proportion of this is due to receiver downtime, however it should also be considered that a proportion may also be periods when there were no vessels present (a possibility noting effects of the tide on times when The Haven cannot be transited). To ensure a worst case within the assessment, it has been assumed that the entire period was receiver downtime, with analysis factored to account for this where appropriate. It is noted that vessel arrival estimations were validated against PoB consultation (see Section 4.1).

6 Project Overview

6.1 Infrastructure

The proposed site for the BAEF is located on the Riverside Industrial Estate in Boston and will include a wharf for use by project vessels positioned within The Haven. The Order Limits are shown in Figure 6.1, noting that this represents the area within which works will be undertaken as opposed to specific infrastructure locations.

Precise locations and dimensions of the wharf are yet to be defined beyond what is detailed in the Application Documents (Schedule 1 (Authorised Development) of the DCO and Indicative Wharf Plans, doc ref 4.11, APP-021), however it will be sited such that the wharf itself and berthed vessels are outside of the main channel. The riverbed profile is to be widened for the entire length of the wharf plus approach and exit slopes from the berthing pocket, and it is intended that there will be enough room for a full beam cargo vessel to pass a vessel berthed at the BAEF plus room for a fishing vessel to pass in between with 10m clearance either side of the widest extents of the fishing vessel.

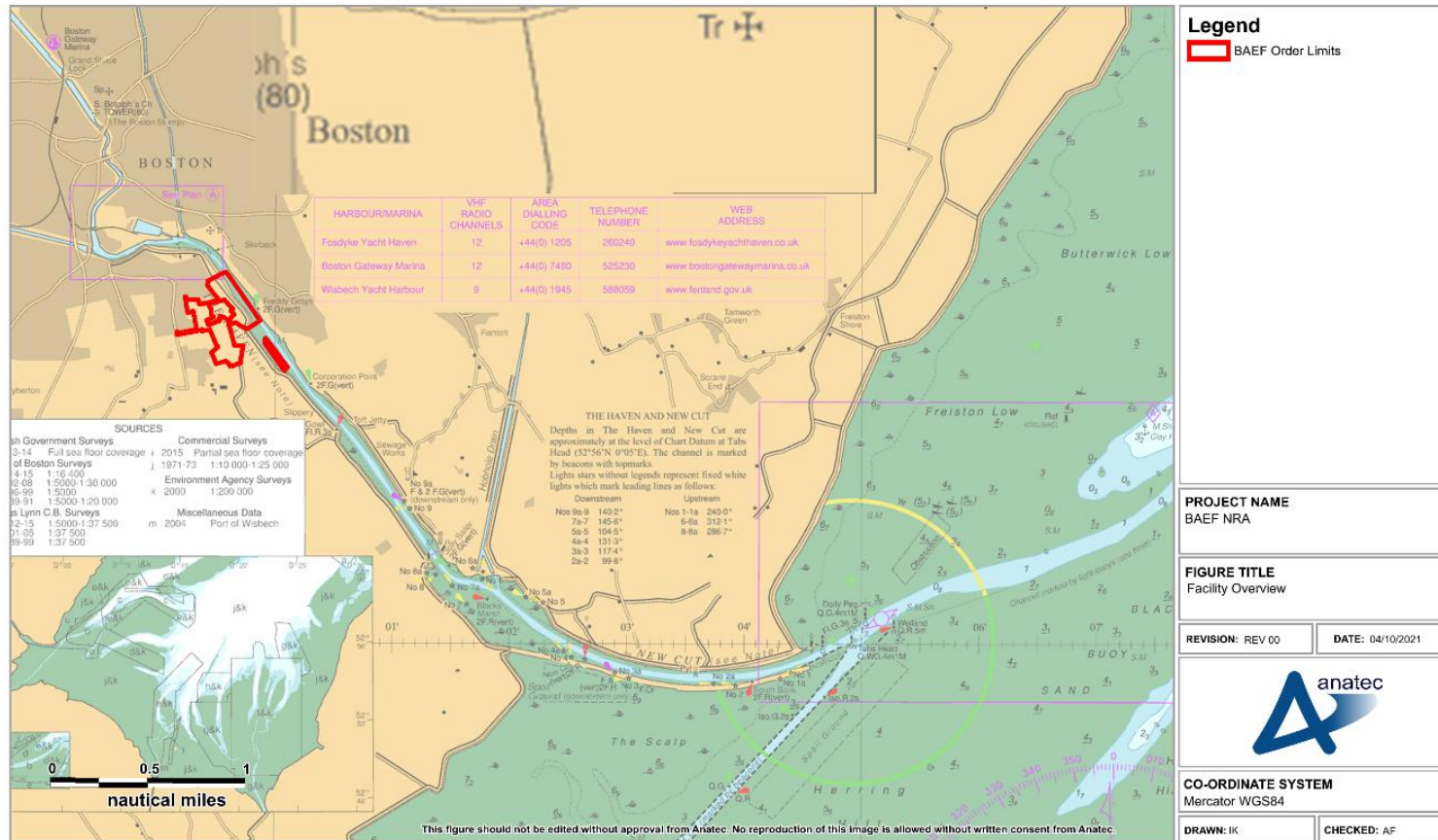


Figure 6.1: BAEF Overview

6.2 Vessels

Details of vessel activity associated with the BAEF is summarised for arriving vessels in Section 6.2.1, and departing vessels in Section 6.2.2. The precise vessels to be used will depend on current market conditions at the time of operation, however on an indicative basis and as per the Project Description included within Chapter 18 of the ES (Navigational Issues - APP-056 (BAEF, 2020)), it is anticipated that they will be between 90 and 100m in length, and between 3.5 and 4m in draught. It is anticipated that up to 580 vessels visits per year may be needed.

6.2.1 Arriving Vessels

Each arriving vessel will notify PoB in advance to request a pilot (see Section 7.4), stating estimated time and date of arrival. PoB will confirm the pilot, point of embarkation, date and time, noting that boarding could be while vessels are moving or while at anchor.

Following pilot boarding, the arriving (laden) vessels will either berth directly at the BAEF under direction of the pilot, or proceed to the swinging hole to turn, or would proceed into the wet dock to turn before berthing at the BAEF. As per Section 6.1, vessels berthed at the wharf will lie outside of the main channel.

6.2.2 Departing Vessels

BAEF will inform PoB of all planned departures in advance (minimum of 12 hours but precise requirements will be agreed in marine procedures with PoB). At the time agreed with PoB, the required number of pilots will board the berthed vessels at the BAEF. It is anticipated that typically 1-2 turns will be required per tide, with three required as a worst case.

PoB will be responsible for determining where turns should occur (i.e., the swing hole or the wet dock). Consultation with PoB indicated a proportion of turns of BAEF vessels will be undertaken in the wet dock, with the remaining turns undertaken in the swing hole. PoB estimated (on an indicative basis) that a minimum of 50% of turns of BAEF vessels would take place in the wet dock, with the remaining 50% in the swing hole. This equates to a maximum of one use of the swing hole per tide under typical circumstances.

7 Existing Environment

This section sets out the existing features of Boston deemed of relevance to the NRA. An overview of the BAEF relative to the swing hole, wet dock, and chartered pilot boarding point is given in Figure 7.1.

As per Section 2, PoB are the CHA responsible for managing movements within the river.

7.1 Port Control

The PoB Port Control is not manned on a 24 hour basis and is typically only manned around commercial vessel movements and therefore around high tide. However, a 24 hour contact is available, and the Port Control office can provide commercial traffic forecasts if requested.

Mariners navigating the River Witham seawards of Grand Sluice and extending to the outer limits of the PoB Jurisdiction Area are required to monitor VHF Channel 12¹¹. There are no specific priorities given to any vessel type, and all movements are therefore managed on a case by case basis in line with the PoBs Standing Notice to Mariners which includes reference to a six knot speed limit (see Section 2.2), noting that the PoB more generally enforce a “safe speed” limit.

It is noted that the Port Control does not have a dedicated AIS or Radar based vessel monitoring / management system but can access online live AIS systems.

¹¹ As well as internationally required Channel 16

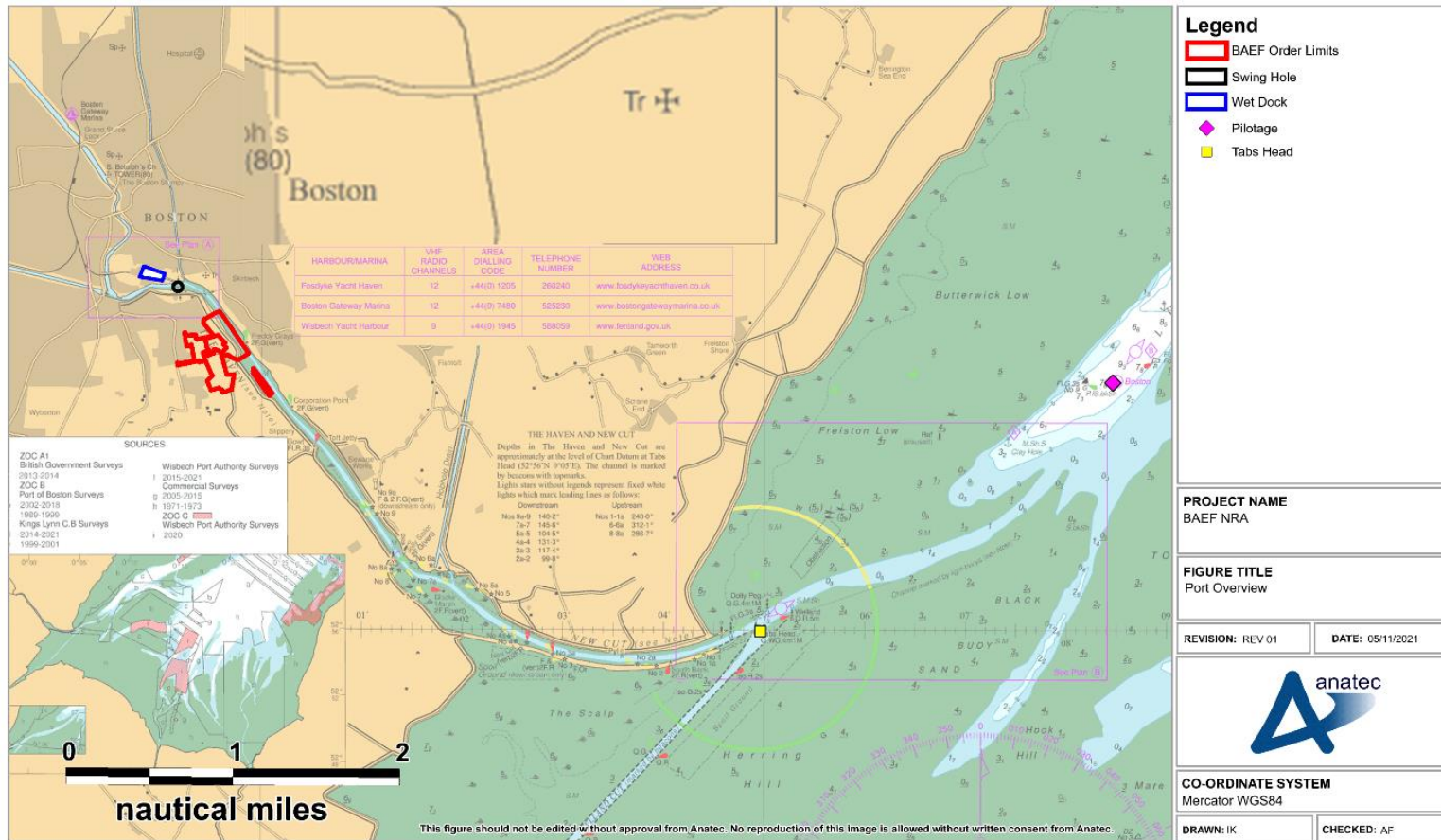


Figure 7.1: Existing Environment Overview

7.2 Wet Dock

A detailed overview of the location of the wet dock is shown in Figure 7.2. Based on consultation with the PoB, the wet dock can currently hold up to five large commercial vessels and can facilitate a vessel turning. However, it is noted that the wet dock is due for expansion (prior to the construction of the BAEF) to increase the size of vessels that can access the dock gates. This process will also include re-dredging of the swing hole (see Section 7.3), and the reestablishment and refurbishment of three riverside berths located further up the river.

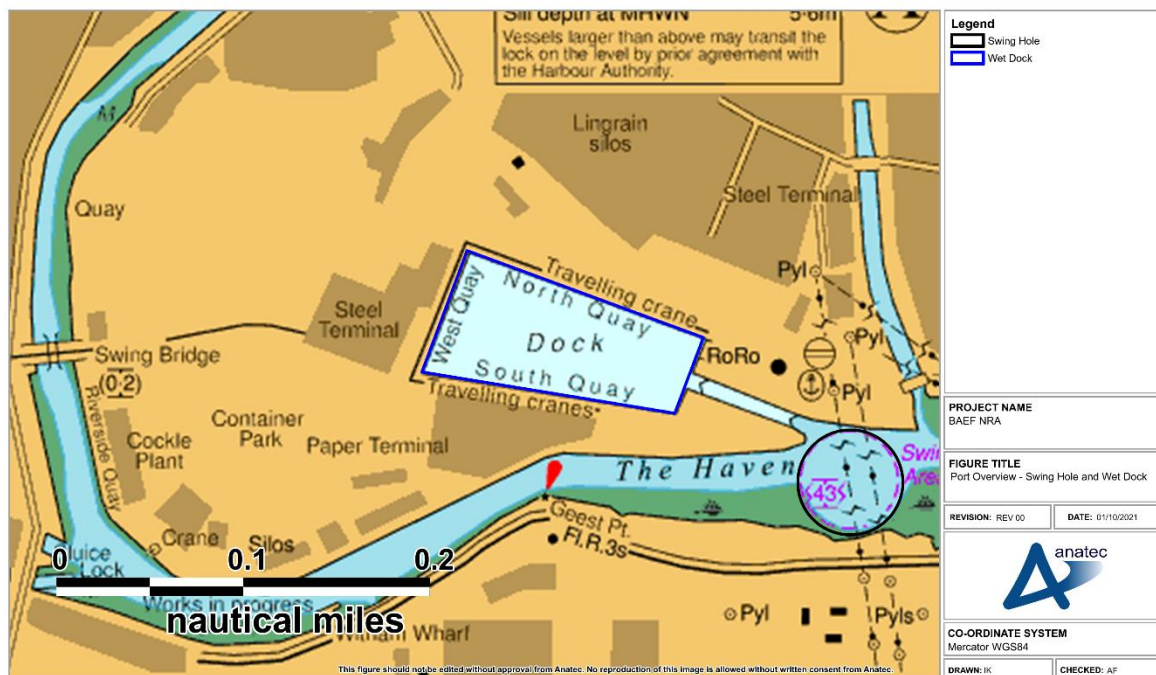


Figure 7.2: Wet Dock and Swing Hole

Currently, all commercial vessel turning takes place in the wet dock. However, during the dock gate expansion (estimated to take at least 14 months), it is anticipated that all turning will be undertaken in the swing hole, and commercial vessels will be berthed on The Haven.

7.3 Swing Hole

The swing hole is located directly outside the entrance of the wet dock, as shown in Figure 7.2. Based on AIS analysis (see Section 9.3) and consultation with PoB, the swing hole has not been used for turning for approximately six years, with all turning taking place within the wet dock (see Section 7.2) during this time.

As part of the Boston Barrier scheme, the swinging hole will be temporarily enlarged to facilitate turning of laden vessels up to 100m in length. Following re-opening of the reconstructed wet dock entrance and completion of the barrier project, dredging is likely to resume at similar to historic levels meaning vessels up to 90m in ballast (or laden) can be turned subject to draught and tidal height.

7.4 Pilotage

Pilotage is compulsory for any vessels over 30m in length, and for any tug and tows with a combined length of over 30m. However, PoB reserves the right to require any vessel within the compulsory pilotage area to carry a pilot if the circumstances require on the grounds of safety of life, navigation or environment.

The location of the charted pilot boarding point is shown in Figure 7.1.

Regardless of whether a vessel is or is not carrying a pilot all vessels are required by the PoB Standing Notice to Mariners to listen on VHF Channel 12 and any crossing, passing or overtaking (alongside regulations and requirements) would be (as normal procedure within narrow channels) discussed (using standard marine terminology) between the two vessels to prevent the risk of collision and interaction.

8 Marine Traffic Analysis

This section assesses the available marine traffic data to establish baseline activity in terms of users of the existing waterway, both in terms of fishing and commercial vessels. This includes consideration of long term AIS data, plus additional available data and consultation of relevance to non AIS vessels.

8.1 Overview of All Users

The vessels identified as transiting The Haven during the 24 months of AIS data are shown in Figure 8.1, colour coded by vessel type.

8.1.1 Vessel Counts

Based on the AIS data, an average of 3-4 inbound transits and 3-4 outbound transits were estimated per day (i.e., 6-8 per day in total). This is inclusive of all traffic including pilot vessels.

The busiest day in terms of number of AIS vessel movements was observed to be the 8th January 2020 with a total of 13 movements. These 13 movements are summarised as follows:

- Four outward cargo vessel movements;
- Four inward cargo vessel movements;
- One outwards tanker movement; and
- Four movements from a pilot vessel (two in / two out).

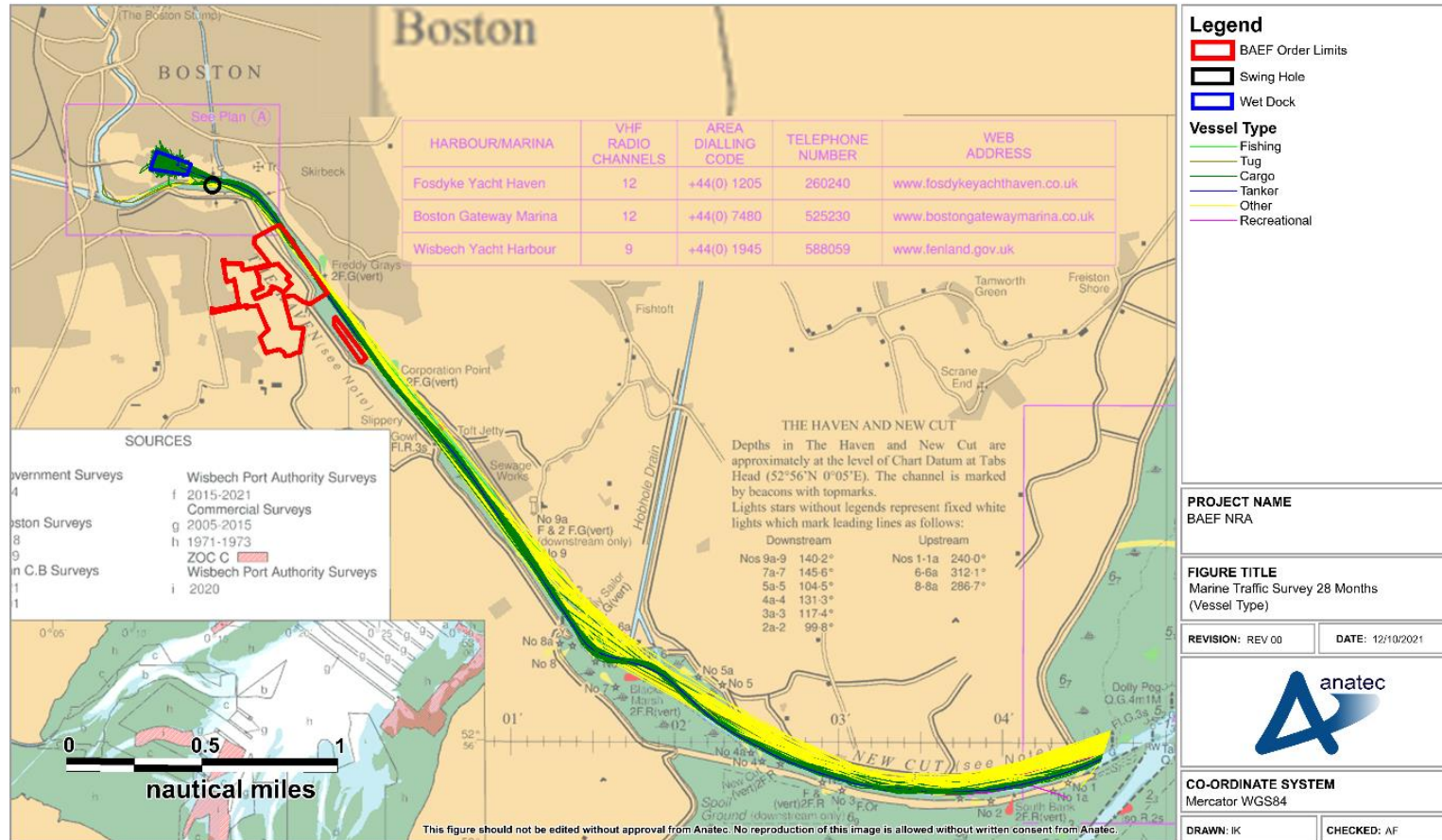


Figure 8.1: Marine Traffic Survey 24 Months (Vessel Type)

8.1.2 Vessel Type

From the breakdown of vessel types, cargo vessels were the most commonly recorded during the survey period, comprising 66% of all vessels recorded. “Other” vessels comprised 31%, and the majority of this category was made up of pilot vessels. Tankers (2%) were the next most commonly recorded, with fishing vessels (<1%) and tugs (<1%) also present.

Additional assessment of commercial and fishing vessels is given in Sections 8.2 and 8.3 respectively, noting that the AIS data will significantly underrepresent fishing vessel activity as per Section 5.3.1.

8.1.3 Vessel Size

8.1.3.1 Vessel Length

The AIS data is colour-coded by vessel length and presented in Figure 8.2. It is noted that vessel length could not be confirmed for <1% of vessels. These vessels have therefore been excluded from the distribution analysis.

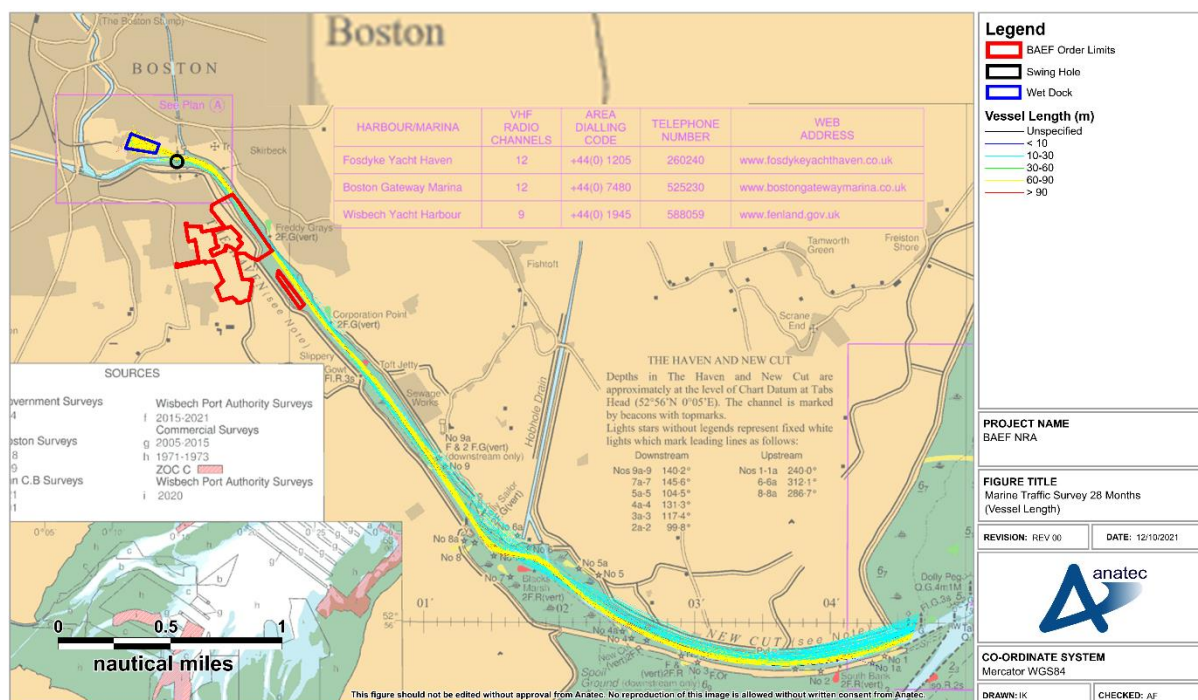


Figure 8.2: Marine Traffic Survey 28 Months (Vessel Length)

The majority of AIS vessels were either in the 10-30m range, or 60-90m range. The former was observed to be primarily pilot vessels, while the latter was primarily cargo vessels. Average vessel length recorded (excluding unspecified lengths) was 69m. The vessel of greatest length recorded during the survey period was a general cargo vessel of length 107m.

Additional consideration is giving to fishing vessels in Section 8.3 noting that the AIS data will significantly underrepresent fishing vessel activity as per Section 5.3.1.

8.1.3.2 Vessel Draught

The AIS data is colour-coded by vessel draught and presented in Figure 8.3. It should be considered that draught is a dynamic parameter, and as such a transmitted draught may not reflect actual draught of a vessel at any given time.

It is noted that vessel draught could not be confirmed for approximately 41% of vessels. These vessels have therefore been excluded from the distribution analysis. The majority of vessels of unspecified draughts were less than 30m in length and were largely comprised of 'other' vessels.

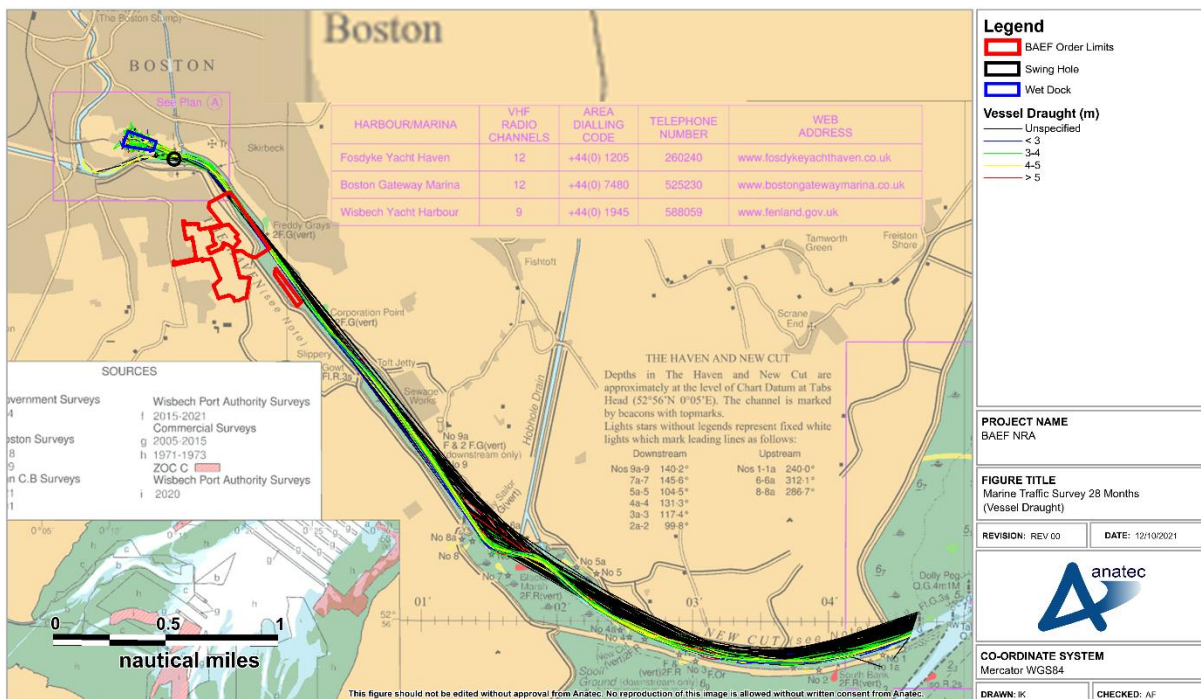


Figure 8.3: Marine Traffic Survey 28 Months (Vessel Draught)

Average vessel draught recorded (excluding unspecified draughts) was 3.9m. The largest vessel draught recorded during the survey period was a general cargo vessel with a transmitted draught of 6m.

Additional consideration is giving to fishing vessels in Section 8.3 noting that the AIS data will significantly underrepresent fishing vessel activity as per Section 5.3.1.

8.1.4 Speed

The AIS data for vessels in the channel only is colour-coded by vessel speed and presented in Figure 8.4. Following this, the distribution of these speeds is presented in Figure 8.5. For clarity, the individual vessel transmissions have been shown as opposed to the vessel tracks, and any transmissions from within the wet dock have been excluded.

It is noted that vessel speed could not be confirmed for <1% of vessels. These vessels have therefore been excluded from the distribution analysis.

As shown, the highest vessel speeds were recorded near The Haven entrance, while the lowest speeds were observed in or within the vicinity of the swing hole. Vessels passing the BAEF were generally in the 4-6 knot range.

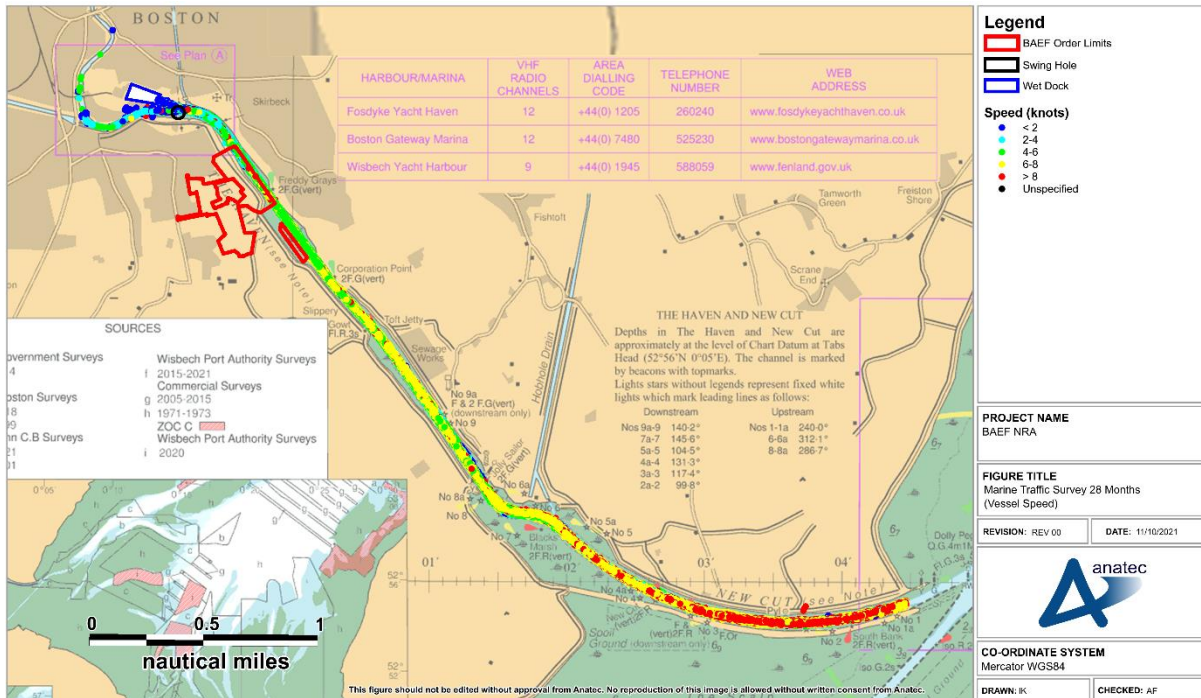


Figure 8.4: Marine Traffic Survey 28 Months (Vessel Speed)

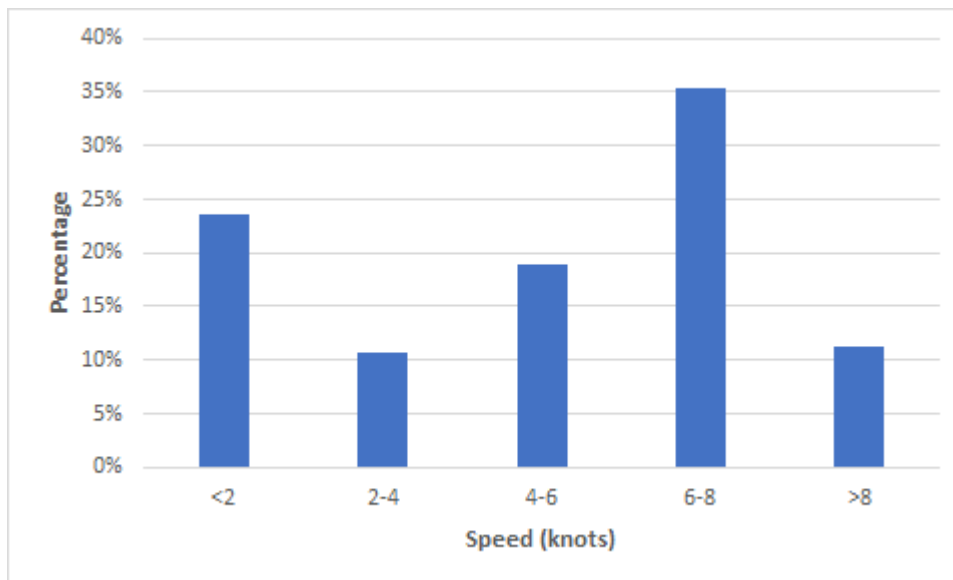


Figure 8.5: Distribution of Vessel Speeds

Average vessel speed recorded in the channel during the survey period (excluding unspecified draughts) was 5.4 knots. The fastest vessel speed recorded during in the channel during the survey period was a pilot vessel transiting at 22.4 knots travelling inwards at the entrance to the channel.

8.2 Commercial Vessels

Assessment of commercial vessel movements has primarily been based on 24 months of AIS data. As per Section 5.3, the use of AIS data is considered sufficient to assess commercial vessel movements, noting that DfT Port Callings data (DfT, 2021) has also been considered to ensure long term trends are captured and commercial vessel numbers observed from the data are validated.

The commercial vessels captured within The Haven during 2019 and 2020 are shown in Figure 8.6.

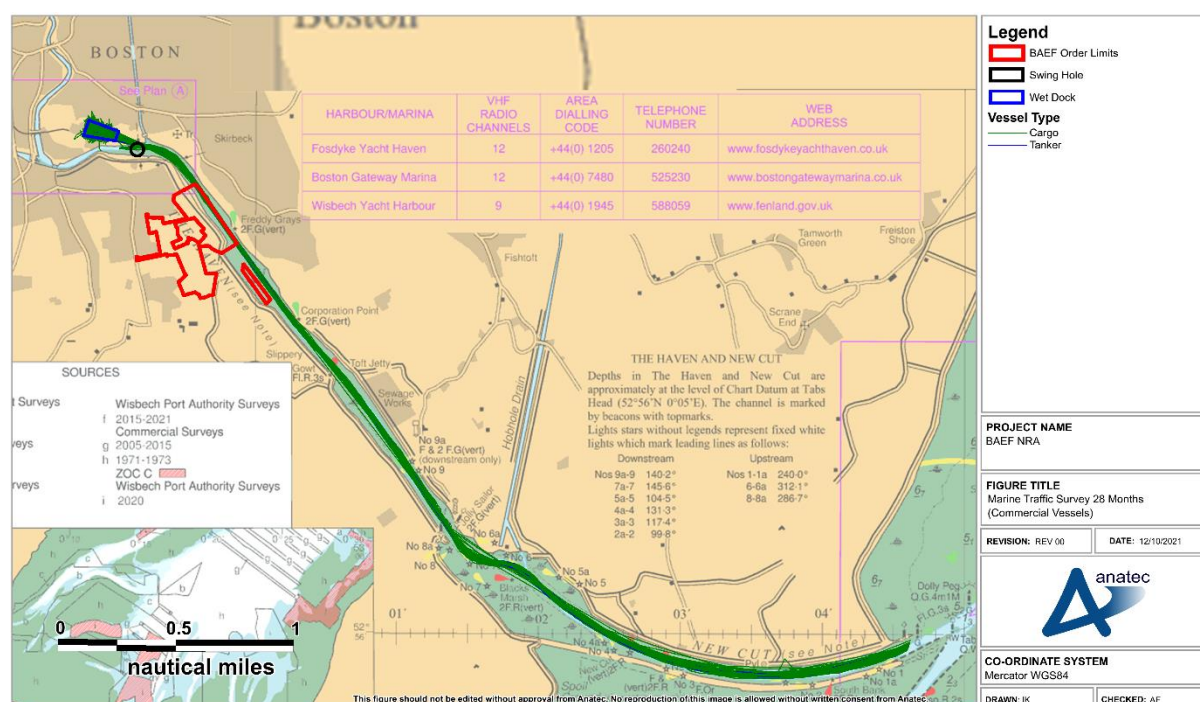


Figure 8.6: Marine Traffic Survey 28 Months (Commercial Vessels)

8.2.1 Vessel Counts

The estimated total number of inwards and outward transits per year from commercial vessels during 2019 and 2020 are given in Table 8.1, noting that the estimations take account of potential downtime in the data (see Section 5.3.2).

Table 8.1: Commercial Vessel Movements

Year	Inward	Outward	Total
2019	414	400	814
2020	412	400	812

In addition to the AIS assessment, port callings data (DfT, 2021) has been considered for the purposes of assessing longer term trends. The number of callings to Boston per year between

1994 and 2017 is given in Figure 8.7, noting that this only captures cargo and passenger vessels.

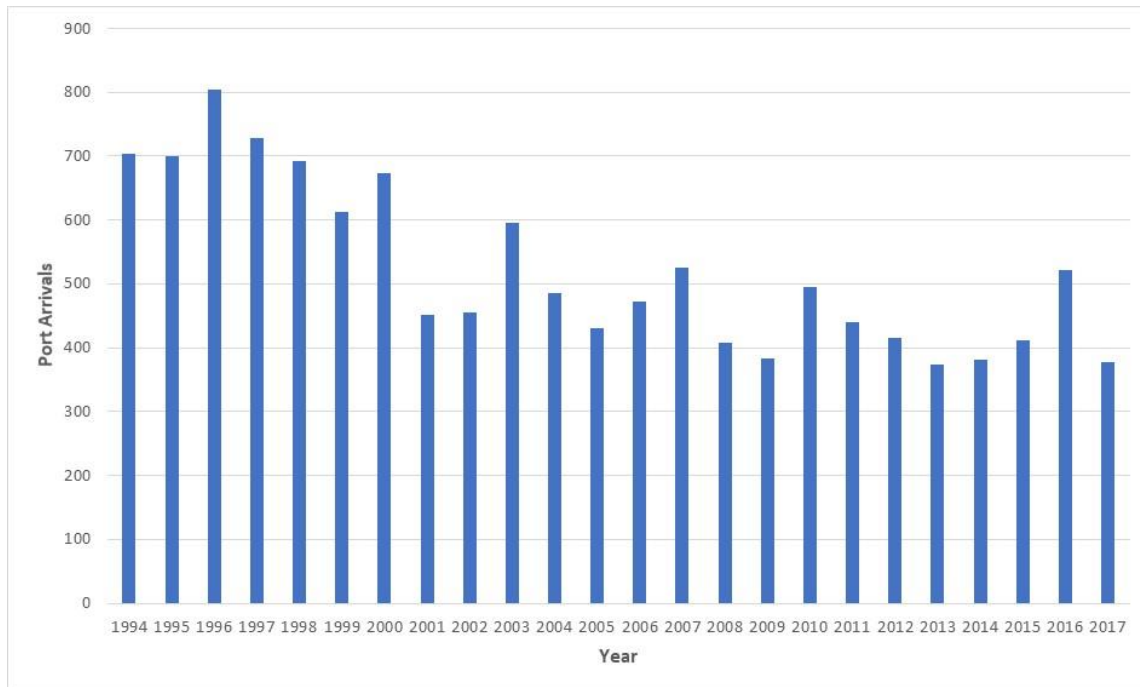


Figure 8.7: Cargo and Passenger Callings at Boston 1994-2017 (DfT, 2021)

Based on the DfT data, there has been a general downwards trend in commercial port callings over the period since 1994. Callings at Boston peaked in 1996 (804 callings in total), with a general decline then observed, with callings during 2017 the lowest on record (377 callings in total).

Comparing the most recent year of DfT data on record (2017) with the 2019/2020 AIS data indicates broad overall correlation with this trend in that vessel arrivals were estimated at approximately 400 vessels per year during both 2019 and 2020 (see Table 8.1). This aligns with input from PoB (see Section 4.1).

8.2.2 Vessel Size

From the AIS data of commercial vessels only, the average vessel length was 85m. The largest vessel length recorded during the study period was 107m, from a general cargo vessel.

It was noted that <1% of commercial vessels did not specify a vessel draught, and so were excluded from further analysis. The average commercial vessel draught recorded during the survey period was 3.9m, and the largest vessel draught was 6m.

8.2.3 Transit Times

The average transit times for commercial vessels between the PoB pilot boarding point (see Section 7.4), the BAEF, and the swing hole are shown in Table 8.2. These have been estimated

by assessing length of time between AIS transmissions at each of the three locations based on the 2019/2020 transits made by commercial vessels.

It is noted that timing associated with use of the swing hole based on AIS data from 2013/2014 are assessed in Section 9.3.

Table 8.2: Average Transit Times – Commercial Vessels

Transit	Average Time	
	Inbound	Outbound
Pilot Boarding to proposed BAEF	58 minutes	57 minutes
Proposed BAEF to Swing Hole	10 minutes	7 minutes
Total (Pilot Boarding to Swing Hole)	1 hour 8 minutes	1 hour 4 minutes

Overall, it was estimated that a commercial vessel would take approximately one hour to transit from the charted pilot boarding location to the wet dock, noting that these transits would be under pilotage. PoB noted during consultation (see Section 4.1) that an hour was a reasonable estimate.

8.3 Fishing Vessels

Baseline fishing vessel activity has been established via the available marine traffic data and consultation. The majority of the Boston fishing fleet is known to be non AIS, however the available AIS data has still been considered given that vessels are of a similar size, it allows for useful assessment of vessel speeds and transit times, and the assessment has been supplemented by the visual observation survey data (see Section 5.2).

8.3.1 AIS Analysis

A total of 14 fishing vessel movements from three unique vessels were recorded via AIS during 2019 and 2020. The corresponding AIS tracks are presented in Figure 8.8.

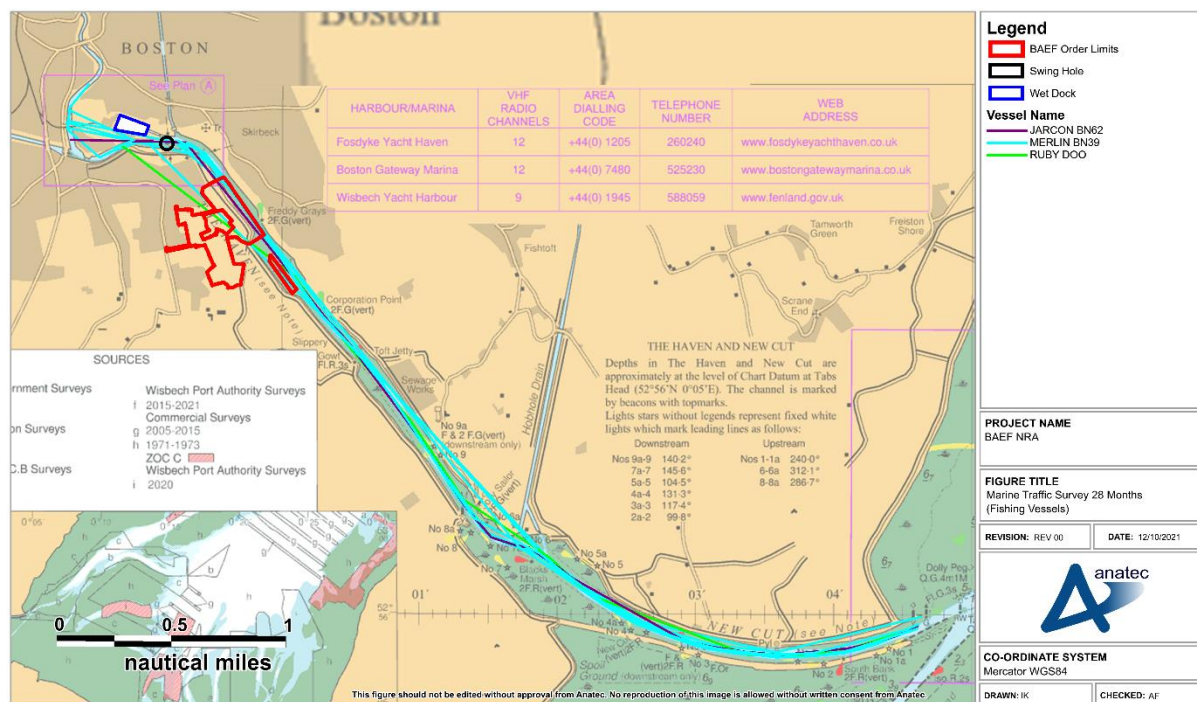


Figure 8.8: Marine Traffic Survey 28 Months (Fishing Vessels)

Details of the three fishing vessels recorded via AIS are given in Table 8.3. This includes the number of movements recorded, however it should be considered that it is not mandatory for these vessels to transmit via AIS based on their length, and therefore the number of movements recorded for each vessel may not be comprehensive.

Table 8.3: AIS Fishing Vessel Details

Name	Length (m)	Number of Movements
Jarcon BN62	13	1
Merlin BN39	12	12
Ruby Doo	14	1

It was estimated that fishing vessel takes an average of 40 minutes to transit from Tabs Head (i.e. close to the entrance to The Haven, see Figure 7.1) to the swing hole based on the AIS transmissions, noting that PoB also indicated that this was a reasonable estimate.

8.3.2 Visual Surveys

8.3.2.1 2021 Surveys

As detailed in Section 5.2, two visual surveys were held on the 21st September 2021 to log vessel activity at the first and second high tides on that day. Given commercial vessels are

considered to be comprehensively captured via AIS analysis, the primary purpose of the surveys was to capture non AIS fishing vessel activity.

The full survey logs are provided in Appendix A, however a summary of the key findings are included in this section.

A total of 25 vessel transits were recorded during the morning survey on the 21st September 2021, of which 18 were from fishing vessels. One inbound cargo vessel transit was recorded approximately half an hour before high tide, noting it was guided by a tug out of the wet dock. All fishing vessel transits occurred after this and within a 50 minute window, beginning 40 minutes after high tide (i.e., after the commercial vessel transits). The remaining transits all occurred prior to high tide and were associated with pilot vessels and a dredger.

A total of 20 transits were recorded during the evening survey on the 21st September 2021, 18 of which were from returning fishing vessels. The fishing vessels were all recorded within a one hour window ending forty minutes before high tide. The remaining two transits were from an outbound cargo vessel and a guiding tug recorded shortly after the last fishing vessel passed the survey location (i.e., all commercial transits occurred after the fishing vessel transits had occurred).

For validation purposes, AIS data for the 21st September 2021 was collected and assessed. This data is shown in Figure 8.9. Only one fishing vessel transit was recorded via AIS (an outbound transit from the *Jarcon*), which indicates none of the other fishing vessels were transmitting. However, there was good correlation overall in terms of the commercial vessel transits, with the two cargo vessels recorded visually reflected in the AIS data (the *Sea Riss* and the *Emma*). It is noted that one additional cargo vessel was recorded via AIS outbound after the evening visual survey ended.

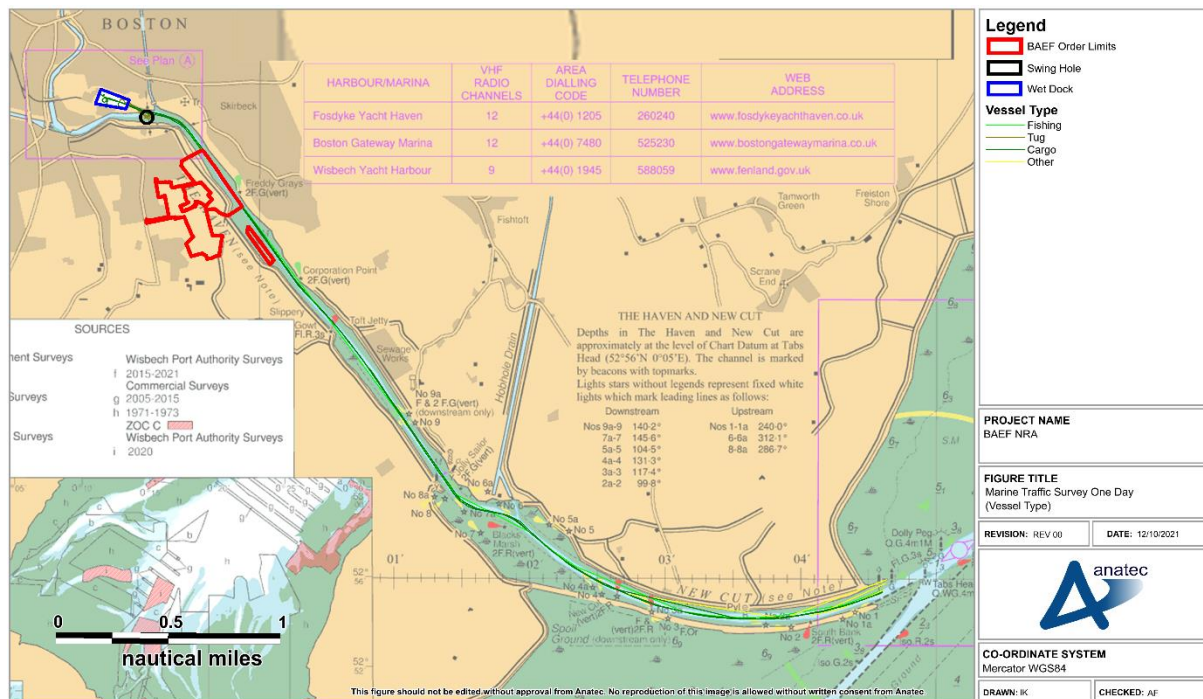


Figure 8.9: Marine Traffic Survey One Day (Vessel Type)

8.3.2.2 2020 Survey

It is noted that in addition to the 2021 surveys, a preliminary survey was undertaken on the 18th August 2020. A total of 17 fishing vessels were observed inbound on The Haven between 16:24 and 17:50, noting that high tide was at 18:50. No associated fishing vessel AIS transmissions were recorded on that day.

8.3.3 Consultation

Consultation with local fishing representatives (see Section 4.2) was undertaken to support the baseline establishment for fishing vessels. The following key points were noted:

- The fleet comprises approximately 26 fishing vessels;
- Cockles are the main fishery, with mussels and shrimps also fished;
- The “peak” period of fishing vessel activity is two hours before and two hours after high tide (this is assessed in Section 9.1.2);
- Typically fishing vessels may be able to pass commercial vessels one hour before and one hour after high tide but this would depend on spring/neap tides and the weather conditions (this is assessed in Section 9.2); and
- The fishing users stated that there was potential for grants that lead to increased levels of fishing activity out of the port.

9 Modelling

9.1 Tidal Assessment

This section assesses the available data to assess windows around high tide when commercial and fishing vessels will typically transit The Haven.

9.1.1 Commercial Vessels

The AIS transmissions from the busiest month during 2019/2020 in terms of average number of daily transits were assessed in terms of times relative to high tide. The busiest month was observed to be June 2019.

On this basis, each AIS transmission during June 2019 recorded within the area between the BAEF and the entrance to the wet dock were compared to the time of the nearest high tide on that particular day. The results are presented in Figure 9.1, which shows the number of transmissions from commercial vessels recorded within 30 minute ranges around high tide.

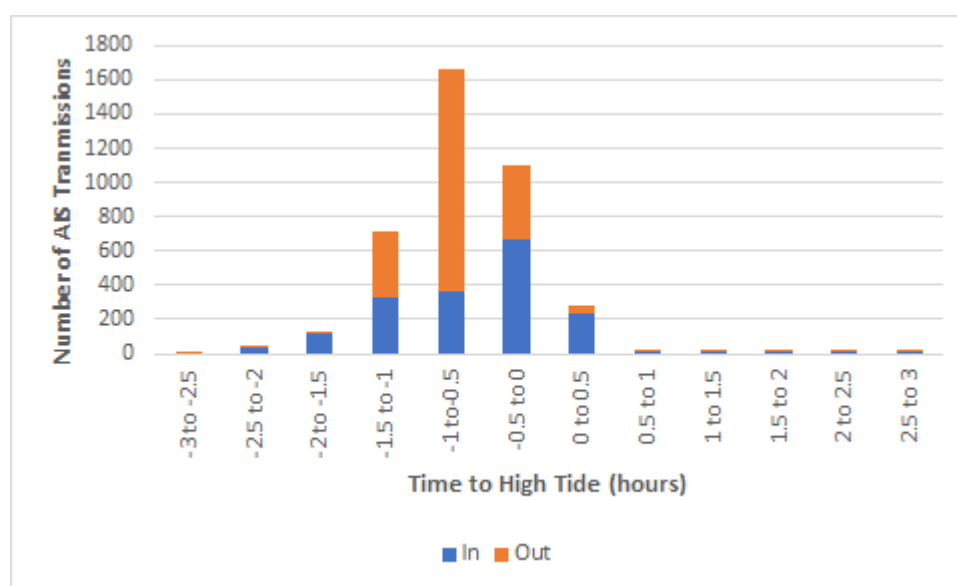


Figure 9.1: Tidal Assessment – Commercial Vessels

As shown, the majority of overall commercial vessel transits occurred within the hour before high tide. Of the AIS transmissions from vessels on “Outwards” transits, 72% occurred between an hour and half an hour before high tide. “Inwards” transits were more varied, with the most common bracket being the half hour before high tide which accounted for 37% of the associated transmissions.

9.1.2 Fishing Vessels

The available data (the AIS and visual survey data) has been assessed in terms of transit times relative to high tide. It is noted that the available data is limited in comparison to the corresponding commercial vessel assessment (see Section 9.1.1), however is still considered

as providing indication of periods when fishing vessels may transit. It is noted that the local fishing representatives indicated “peak” periods were typically between two hours before and two hours after high tide (see Section 4.2 and 8.3.3), noting that precise departure / arrival times would depend on a number of factors.

The transits through the river by fishing vessels recorded via AIS during 2019/2020 are summarised in Table 9.1. This includes details as to when each vessel passed the swing hole and Tabs Head, and what time high tide was on the day of each transit. It is noted that transmissions for certain transits were only available for either Tabs Head or the swing hole, but not both. In such instances, the times shown have been estimated based on the average time taken for fishing vessels to transit between the swing hole and Tabs Head (based on the instances when data was available for both terminus points) – any such instances are shown in *italics* in Table 9.1.

Times are given in Universal Coordinated Time (UTC).

Table 9.1: Tidal Assessment – AIS Fishing Vessels

Date	Name	Direction	Time at Swing Hole (UTC)	Time at Tabs Head (UTC)	Nearest High Tide (UTC)
11/04/2019	Merlin	Outward	07:33	08:10	09:57 (5.8m)
13/09/2019	Merlin	Inward	17:27	16:55	18:16 (5.74m)
15/09/2019	Merlin	Outward	07:12	07:49	06:39 (6.23m)
12/02/2020	Merlin	Outward	07:34	08:11	08:11 (6.68m)
25/02/2020	Merlin	Outward	06:18	06:55	07:30 (5.83m)
08/05/2020	Merlin	Outward	05:25	06:05	06:39 (6.87m)
23/05/2020	Merlin	Inward	07:59	07:18	06:29 (5.96m)
05/06/2020	Merlin	Outward	06:48	07:25	05:40 (6.54m)
06/07/2020	Ruby Doo	Inward	17:26	16:49	19:08 (6.15m)
07/07/2020	Ruby Doo	Outward	08:35	09:12	07:19 (6.47m)
20/10/2020	Merlin	Outward	08:19	08:51	08:10 (7.05m)
06/11/2020	Merlin	Inward	08:52	08:15	09:13 (5.55m)
08/12/2020	Merlin	Outward	10:22	10:59	11:57 (4.85m)
23/12/2020	Jarcon	Inward	12:20	11:42	13:34 (4.42m)

Of the 14 fishing vessel transits recorded via AIS (and noting certain times are projected), two passed the swing hole within a half hour either side of high tide. Five in total passed the swing hole within an hour of high tide. It is noted that transits passed the swing hole outside of an hour from high tide were recorded on the days when tides were less than 5m (the 8th and 23rd of December 2020).

This broadly aligns with the findings of the visual survey data (see Section 8.3.2), in that no vessels were recorded passing the survey location within 40 minutes of high tide:

- 2021 Morning survey: all fishing vessel transits occurred within a 50 minute window, beginning forty minutes after high tide and after transits from other vessels;
- 2021 Evening survey: the fishing vessels were all recorded within a one hour window ending forty minutes before high tide (and before transits from other vessels); and
- 2020 survey: A total of 17 fishing vessels were observed inbound on The Haven within a 90 minute window ending an hour before high tide.

On this basis the AIS data and visual observation data aligns with input from PoB and the local fishing users (see Section 4), in that activity tends to occur within a two hour window either side of high tide.

Draught information for fishing vessels was not transmitted via AIS, however minimum draft of the fleet is understood to be 1.4m (Environment Agency, 2016). On this basis the general findings of the NRA with regards to transits of fishing vessels align with finding of Chapter 18 of the ES (Navigational Issues - APP-056 (BAEF, 2020), in that the shallower draught of fishing vessels facilitates transit over a much wider tidal window than for commercial vessels.

It should be considered that the AIS data and visual observation data only represent a small proportion of overall fishing vessel transits. However, the available data is still considered as providing general indication of the tidal windows within which fishing vessels are comfortable navigating in.

9.2 Passing Vessels

Anatec's Encounter model was run for the purpose of identifying any encounter scenarios between fishing vessels and other vessels within The Haven. The Encounters software will assess input AIS transmissions to identify any cases where two or more vessels pass in close proximity.

The software is reliant on AIS data as input, and it should be considered that AIS transmissions from fishing vessels were limited (fishing vessels within the Boston fleet are less than 15m and as such are not required to transmit, see Section 5.3.1). However, the software did identify one instance of an outbound fishing vessel (the *Merlin*, 12m) passing an inbound cargo vessel (the *Paramar*, 90m) within The Haven at Jolly Sailor's Corner on the 25th February 2020.

The encounter is shown in Figure 9.2. Vessel outlines (based on vessel dimensions and course) are shown for context, however the track of the *Merlin* is also included noting lower transmission intervals than for the *Paramar*.

The vessels passed at approximately 06:39 UTC, noting that high tide was at 07:30.

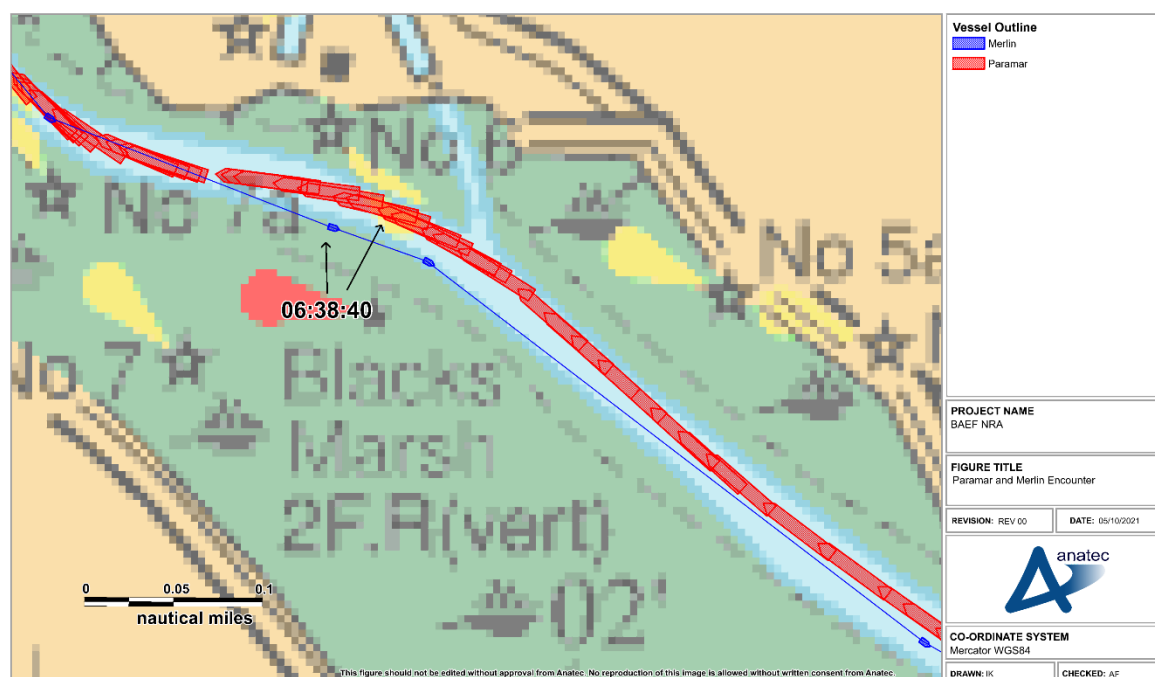


Figure 9.2: Merlin and Paramar Encounter – 25th February 2020

It is noted that while only one instance of a fishing vessel passing a commercial vessel was identified via the Encounters model, this is likely due to the limited number of AIS transmissions from fishing vessels, and it is assumed that more encounters did occur during 2019/2020 and these would have been managed through vessel communications on Channel 12 and compliance with COLREGs.

PoB indicated during consultation (see Section 4.1) that during the tidal window when commercial vessels movements would typically occur, passing should be possible anywhere along the river and this is evident from the experience of the pilots operating on the river. Based on an assessment of commercial activity relative to the tide (see Section 9.1.1), the significant majority of commercial transits occur within an hour of high tide, and it is noted that PoB indicated any turns of BAEF vessels would likely be undertaken in the hour before high tide.

Following review of the initial NRA draft, PoB provided additional input into passing behaviours on the river as follows:

“Commercial and fishing vessels pass each other in most places of the river without difficulty. Ships leaving the lock will either wait for fishermen to pass or request the fishing boat holds back until the commercial vessel is clear of the lock, or discuss a green to green pass. It is unusual for vessels travelling in the same direction to pass one another and then only by agreement. Note that passing vessels does not mean overtaking vessels, but occasions when vessels are headed in the opposite direction and pass. To also note that commercial vessels tend to remain in mid channel unless passing i.e., if they are only vessel in vicinity they will not stay on the starboard side of the channel.”

The local fishing input (see Section 4.2) was that there would typically be concern over passing a commercial vessel any earlier than an hour before high tide. Given the data and consultation indicates commercial vessel transits associated with BAEF are unlikely to occur outside of an hour from high tide, it is highly likely that fishing vessels will be able to pass commercial vessels in the river, noting that as per Section 7.4, any such manoeuvres would be undertaken in liaison with the pilots and that the obligation on safe passing is with the overtaking vessel as per COLREGS Rule 13. Also as per the active PoB Standing Notice to Mariners (see Section 2.2), PoB state that *“overtaking in the river is only acceptable after clear consultation and agreement between the two vessels”* noting the potential risk of interaction¹² discussed in MGN 199 (MCA, 2002) which give guidance on passing in narrow channels.

COLREGS Rule 9e(i) also states *‘In a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(ii) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34(d)’*.

As well as overtaking concern has also been raised about the crossing of vessels in particular BAEF vessels (which are on the starboard side of the channel inwards) if they are not to be swung prior to berthing (likely scenario). They will need to cross the channel potentially in front of outbound fishing vessels. Again, COLREGS Rule 9 states ‘A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway’¹³ so whilst a crossing vessel would have to ensure they do not impede a vessel constrained by the water depths as with previous passing scenarios it would be likely that the vessel pilot/Master would agree a safe option given the time taken to move from one side of The Haven to the other would be measured in minutes depending on the circumstances (i.e., outbound traffic would be a key consideration for the Master/Pilot to decide when/how to cross) and therefore negligible in terms of delay. Any outbound vessels will also be aware of the inward BAEF vessels approach well in advance of meeting¹⁴ and it is likely that they would discuss plans to berth directly especially if this was not common practice (this is based on common operating practices within ports, harbours and marinas).

It should also be considered that during the period when the wet dock is being expanded (see Section 7.2), all commercial vessel turns will occur in the swing hole, and all commercial vessel berthing will be on the riverside (at the refurbished riverside berths). It is therefore likely that

¹² When two vessels navigate close within an enclosed waterway/narrow channel or near a river bank the changes and irregular pressure distributions along the hull the smaller vessel can be pulled towards the larger vessel resulting in heel, increased squat, impacts on steering efficiency including being dragged towards the bow of the larger vessel.

¹³ Noting differences between navigable water and channel/fairway.

¹⁴ The Standing Notice to Mariners requires all vessels to monitor VHF Channel 12 and report movements to PoB. As per COLREGS (IMO, 1977/72) there are regulations in place that dictate vessel movements within narrow channels including those involving crossing vessels and deals with responsibilities in adverse weather conditions.

instances of fishing vessels encountering and / or passing commercial vessels on the river will be greater in frequency than during the operational phase of the BAEF. PoB will have appropriate risk assessment and procedures in place in advance of this period in line with PMSC requirements (see Section 2.1), and it is also assumed that any relevant lessons learnt during this period will be applied as appropriate to the management of vessel movements and turns during the operational phase of the BAEF.

9.3 Use of Turning Circle

This section assesses historic AIS data to identify instances of use of the swing hole (see Section 7.3) for turning by commercial vessels. Input from PoB was that the swing hole has not been used for turning in the past six years (see Section 4.1), and as such data from 2013 and 2014 was assessed. Instances of potential use of the swing hole were identified by assessing the AIS transmissions to determine cases where a vessel took longer than average to pass from one side of the swing hole to the other.

Three cases were identified, which are shown in Sections 9.3.1, 9.3.2, and 9.3.3. It is noted that this is not necessarily a comprehensive list of all uses of the swing hole during the 2013/2014 period, however the data does suggest the swing hole was not in “regular” use for turning during this period.

For the purposes of this assessment a “turn” is defined as the period of time required for the vessel to turn 180 degrees i.e., bow to stern.

9.3.1 Beaumonde

The *Beaumonde*, an 89m cargo vessel, was recorded turning in the swing hole on the 15th January 2014. As shown in Figure 9.3, the vessel began turning in the swing hole at 17:13 UTC, with the turn lasting approximately 13 minutes. The vessel then reversed to a riverside berth, arriving at 17:48 UTC.

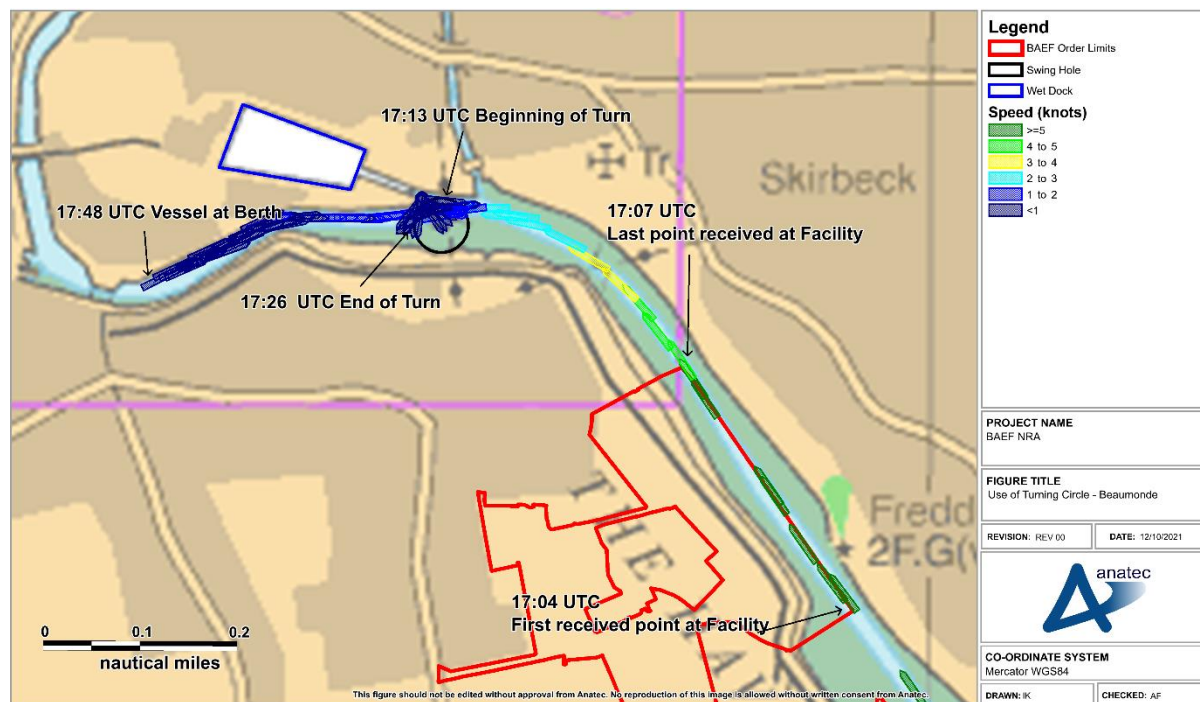


Figure 9.3: Use of Turning Circle – Beaumonde

9.3.2 Egon W

The *Egon W*, an 82m cargo vessel, was recorded turning in the swing hole on the 30th April 2014. As shown in Figure 9.4, the vessel began turning in the swing hole at 06:03 UTC, with the turn lasting approximately 12 minutes. The vessel then reversed to a riverside berth, arriving at 06:31 UTC.

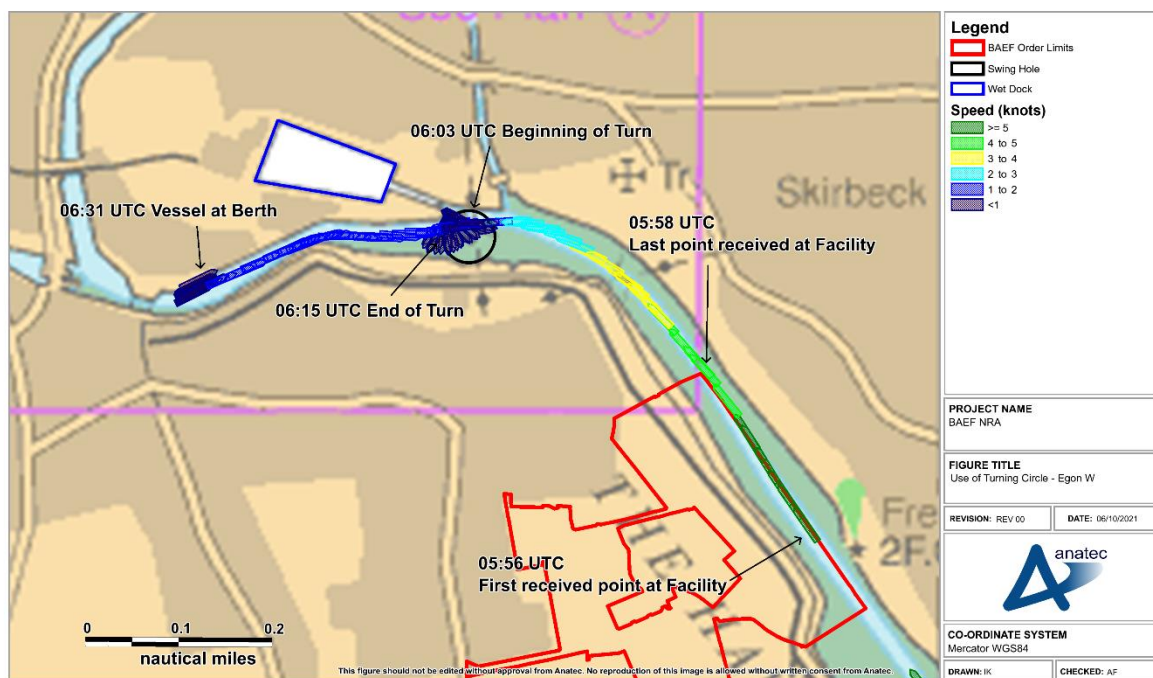


Figure 9.4: Use of Turning Circle – Egon W

9.3.3 Nikar G

The *Nikar G*, an 82m cargo vessel, was recorded turning in the swing hole on the 21st October 2013. As shown in Figure 9.5, the vessel began turning in the swing hole at 06:34 UTC, with the turn lasting approximately 12 minutes. The vessel then reversed to a riverside berth, arriving at 07:08 UTC.

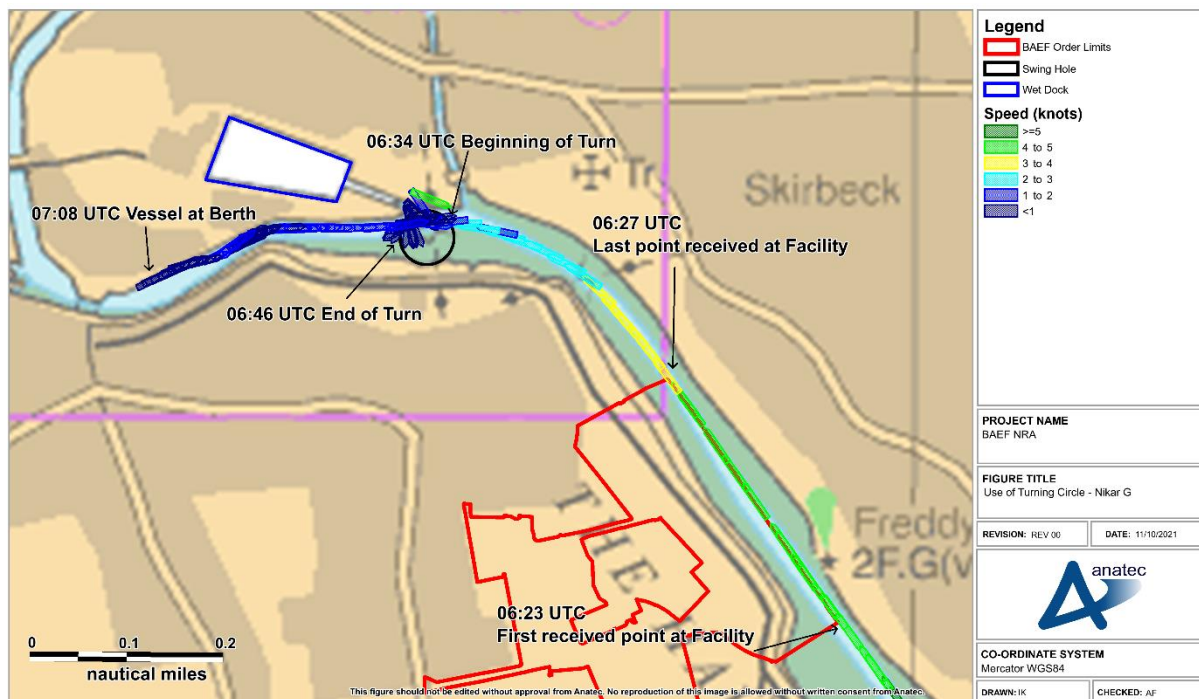


Figure 9.5: Use of Turning Circle – Nikar G

9.3.4 Summary of Turning Circle Use

Of the three instances of use of the swing hole identified, turns all took less than 15 minutes, which aligns with input from PoB (see Section 4.1), noting that PoB estimations are based on extensive simulation modelling as well as historical experience from the Harbour Master who also worked as a pilot at this time. Each case involved an inbound commercial vessel turning within the swing hole, and then mooring at one of The Haven berths.

Time taken to pass the BAEF, turn, and then moor on the existing riverside berths is estimated at approximately 45 minutes based on the available data. However, commercial vessels (BAEF or third party) that are intended to be swung in the river will come alongside the riverside quays immediately above the port entrance providing good opportunity to hold the vessel temporarily on the quays (before the actual swing, or potentially after the swing) whilst another vessel passes.

10 Embedded Mitigation

The FSA undertaken in Section 11 assumes certain embedded mitigation will be in place. The assumed mitigations are detailed below. It is noted that the FSA approach identifies the need for additional mitigation where appropriate, and this is detailed for the relevant impacts where appropriate and in Section 11.4.

- Continual assessment by PoB with regards to necessary resources, equipment, and personnel based on current and predicted traffic types and volumes in line with the PMSC (see Section 11.4 for specific recommendations);
- Ongoing risk assessment and review of port procedures by PoB including in relation to use of swing hole and Not Under Command (NUC) vessel scenarios in line with the PMSC (see Section 11.4 for specific recommendations);
- BAEF vessel movements undertaken under pilotage from experienced Pilots familiar with navigation within The Haven and its users, as well as compliance with COLREGS (IMO, 1972/77) and the PoB standing Notice to Mariners;
- Compliance with the relevant aspects of the PMSC by BAEF;
- Passage planning (using PoB standing Notice to Mariners) by all river users including BAEF vessels as per SOLAS V; and
- PoB will utilise tugs where appropriate and as required via risk assessment.

11 Impact Assessment

This section considers the relevant risk assessment aspects that have been undertaken in relation to the impacts assessed within the NRA. An FSA approach has been utilised for this purpose, full details of which are given in Section 3.2.

It is noted that the FSA assumes embedded mitigation will be in place as per Section 10. Potential additional mitigation is discussed in Section 11.4.

11.1 Impact 1 – Disruption / Delay caused by use of Turning Circle and Transit of BAEF Vessels

This impact considers:

- Disruption/delay to current transits for fishing vessels caused by vessels turning in the swing hole and vessels navigating to/from the BAEF berth.
- Disruption/delay to current transits for fishing vessels due to the increase in commercial vessel movements associated with BAEF.

As per Section 6.2.2, it is anticipated that a proportion of vessels associated with the BAEF will be turned in the swing hole. There is the potential that these turns could lead to delays or disruptions to inbound or outbound fishing vessels, given they would not be able to pass while turns are taking place.

Specific concerns from the local fishing representatives were in relation to the turns themselves, but also to the transits between the swing hole and the BAEF given that it may not be possible to safely pass a commercial vessel dependent on the time to / from high water. They expressed as a worst case and depending on tidal conditions, fishing vessels may have to wait for a vessel associated with the BAEF to transit to the swing hole, turn, and then depart (either to the wharf or departing The Haven).

It is noted that use of the term ‘wait’ is not considered an accurate reflection of what is anticipated to happen, a vessel is not able to wait in the same way a vehicle onshore is able to wait given the implications of tidal streams, wind etc. Therefore, as per SOLAS V the vessel would be expected to passage plan its journey using the available information to anticipate other vessel movements i.e., by reductions in speed where safe to do so.

The local fishing representatives also raised concerns about increased commercial vessel movements within The Haven due to BAEF and that whilst current operations allow commercial and fishing vessels to operate side by side the increase in numbers would cause delays which would impact on the viability of their operation.

11.1.1 Managing Traffic

In order to prevent significant disruption/delays to the fishing vessels (and other users of The Haven), BAEF will be required to inform PoB in advance of planned departure of any vessels. As the CHA and in line with the PMSC (see Section 2), PoB will be responsible for determining

when and where turns should take place based on the information provided by BAEF (as per the PMSC PoB must ensure “*proper control of vessel movements by regulating the safe arrival, departure and movement within the harbour of all vessels*”). However, typically only one BAEF vessel will be turned per tide (either in the wet dock or in the swinging hole, and either on arrival or departure). It is noted that turning in ballast on departure offers greater flexibility to the pilot to turn in the river, where appropriate. This means that management around this one turn can be facilitated by PoB to ensure any disruption/delays are minimised as per Section 11.1.2.

PoB have responsibility under the PMSC (see Section 2) for communicating with port users, and this should include intentions on planned vessel turns in the swing hole. However, BAEF have secondary responsibility to inform PoB of planned vessel movements associated with the BAEF (both inwards and outwards) with enough notice to ensure the information can be promulgated to port users by PoB. Therefore, communication plans and standard vessel procedures should be agreed between BAEF and PoB, noting that advanced notice of when and where turns are taking place will allow other port users to passage plan (as per SOLAS V) accounting for the turns if needed. This will ensure any delay or disruption is minimised.

11.1.2 Vessel Turns

The turn of a BAEF vessel is likely to take between 10 and 15 minutes based on PoB consultation (see Section 4.1) and assessment of historic use of the swing hole via AIS data (see Section 9.3). These turns would all be undertaken under pilotage, noting the pilots will be familiar with The Haven and its users. PoB also indicated the pilots would be aware of fishing vessels during the turn itself and also during the transits to / from the swing hole noting that under the standing Notice to Mariners all vessels are required to listen in to VHF Channel 12. Where there was a “backlog” of fishing vessel traffic, the pilots would look to allow as many of the vessels to pass as possible before undertaking the turn. It is noted that voluntary broadcast via AIS by fishing vessels when within the river would assist this process (see Section 11.4.4).

PoB indicated any use of the swing hole would likely take place in the hour before high tide, and based on consultation input (see Section 4) channel depths during this period should facilitate passing manoeuvres by fishing vessels within The Haven (other than when turns were taking place), noting that as required these would be undertaken in liaison with the pilots.

It should be considered that departure / return times of fishing vessels will be dependent on various factors including quota, season, tidal conditions and general weather conditions. The fishing representatives indicated concern over the window spanning two hours before and two hours after high tide, as this was the “peak” period for fishing vessel movements. Based on PoB input, it is likely that one turn will be undertaken in the swing hole per tide, and this will be in the hour before high tide. Therefore, it is likely that only fishing vessel transits occurring in the hour before high tide will be affected. As per Section 9.1.2, the available data indicates such transits (an hour before high tide) represent a minority of fishing vessel

movements, and it is noted that any delays are likely to be minor as discussed above given that passing will be facilitated (by the Pilot) outside of when turns are taking place.

As per Section 6.2, it is anticipated that on a typical day, one vessel will be turned per tide in the swing hole. However, given that multiple departures may occur per tide and noting that PoB will determine where turns take place, there may be tides where more than one vessel is turned in the swing hole (e.g., if the wet dock is at capacity). It is not considered likely that this will be a regular occurrence, noting that the wet dock can hold up to five vessels, and there will be further riverside berths available following the completion of their refurbishment (see Section 7.2). However, in the event that multiple turns in the swing hole are required on one tide, as above the tidal window when these turns are anticipated to occur is such that passing by fishing vessels outside of the turns is likely to be able to be facilitated in liaison with the pilot on board the BAEF vessel.

11.1.3 Increased Commercial Vessels Movements Associated with BAEF

Although BAEF will result in an increase of 580 vessel arrivals per year (worst case) when this is considered against peak commercial vessels arrivals within the recent port history (1990s) the actual increase would only be 0.5 vessels per day from 2.2 to 2.7 vessels per day (based on a peak of 800 vessels per day in 1996 (DfT,2021)). This is important because it demonstrates that a larger number of commercial vessels can operate safely with The Haven alongside the fishing community noting that year on year mitigations (i.e., use of AIS) and vessel operating standards continually increase and improve further facilitating safe navigation. It is noted that it cannot be confirmed how many vessels were turned in the swing hole in the 1990s however it is likely some of the vessels were. As a worst case only 50% of the BAEF vessels will be turned and therefore when considered against increased mitigations safe operations can be maintained without significant disruption/delay to any user.

It should also be considered that PoB are expanding the wet dock and that process includes the refurbishment of the riverside berths, meaning that more and larger commercial vessels will be able to be handled by PoB than is currently possible.

11.1.4 Significance

Noting that it is likely vessels will be turned within the swing hole on a daily basis, frequency of occurrence is deemed to be frequent. Given the potential for minor delays, severity of consequence is determined to be minor, noting that PoB will have responsibility for managing vessel movements in The Haven. On this basis the impact is assessed as being of **tolerable** significance.

In order for the impact to be ALARP, the following mitigation measures are recommended (see Section 11.4 for full details):

- Agreement of a Navigation Management Plan between PoB and BAEF that details standard vessel procedures, how BAEF will promulgate planned vessel movements to PoB, and how PoB will pass this information on to other port users (Section 11.4.1);

- Use of digital information boards either side of the swing hole to promulgate planned BAEF vessel movements to port users (Section 11.4.2);
- Use of flashing lights either side of the swing hole to alert users to use of swing hole (Section 11.4.3);
- AIS transmission from fishing vessels (Section 11.4.4); and
- Port Procedures and Vessel Traffic Monitoring (Section 11.4.5).

Assuming these mitigations are applied, the residual significance is **Tolerable with mitigation** and ALARP.

11.2 Impact 2 - Increase in Safety Risk and Subsequent Commercial Impacts

This impact considers:

- Increase in risk to fishing vessels transiting The Haven earlier in the tidal cycle to avoid BAEF vessel movements resulting in increased safety risks associated with water depths, grounds and encounters (including interactions).
- Limitations to safe operations could then subsequently impact on working hours and the viability of the fishing vessel operations.

The turning of BAEF vessels may lead to fishing vessels choosing to transit the river earlier in the tidal cycle to avoid the increased commercial vessel movements associated with the BAEF, noting waiting until after the turns, due to restrictions in passing/overtaking or delays associated with crossing traffic which may mean fishing for the day is unviable. This may lead to an increased risk to the fishing vessels based on reduced water depths in the channel, either through grounding risk or encounters with other vessels without sufficient channel width to pass.

It is noted that based on impact assessment for the use of the swing hole (see Section 11.1), it is not anticipated BAEF vessels will lead to significant delays or disruption for fishing vessels due to turning.

11.2.1 Underkeel Risk

As per Section 4.1, PoB have indicated any use of the swing hole would likely take place in the hour before high tide (Section 9.1.1). This aligns with assessment of AIS data which shows that the majority of commercial movements in The Haven tend to occur within an hour of high tide. Therefore, as a worst case it is expected that fishing vessels would need to leave within the hour preceding this (1-2 hours before high tide). Fishing vessel input was that the “peak” period of activity tended to occur between two hours before and two hours after high tide, and the available data showed that this included a notable proportion of transits outside of the hour preceding high tide. This aligns with findings of Chapter 18 of the ES (Navigational Issues - APP-056 (BAEF, 2020) in that the much smaller draught of fishing vessels in comparison to commercial vessels increases the tidal window within which they can transit the river.

Therefore, the available data and consultation input indicates that the window 1-2 hours before high tide is typically transitable by fishing vessels.

It is noted that PoB are responsible for determining when and where commercial vessels turn, and to communicate this to port users as per the PMSC (see Section 2.1). This will facilitate passage planning and inform when fishing vessels choose to transit the river, noting that this will include consideration of tidal states and general weather conditions. An inability to transit the river safely prior to a turn based on tidal state and weather is considered unlikely, however should such an instance arise, the most likely consequence is a fishing vessel choosing to wait until after the turn as long as safe to do so, or there is a low possibility that the vessel may deem it unsafe to transit and remain alongside. In this circumstance the impact is considered commercial as opposed to being associated with navigational safety (see Section 11.2.3) noting that weather constraints may currently prevent a vessel safely navigating The Haven in line with good seamanship practices.

11.2.2 Encounters

PoB will be responsible for determining when commercial vessels transit the river as per the PMSC (see Section 2.1), noting this would be under pilotage. As such, consideration of available channel width and depth should be made to ensure any encounters can be safely managed by the pilot including consideration of vessel interaction. Input from PoB was that the tidal window within which commercial movements of BAEF vessels will take place (the hour before high tide) is such that safe passing could be undertaken under directions of the pilot. It is noted voluntary broadcast via AIS by fishing vessels when within the river would assist this process (see Section 11.4.4).

11.2.3 Working Hours and Viability of Fishing

Concern was raised by the local fishing representatives over the potential for extensions to working days caused by a need to either depart before BAEF vessel movements or wait until the movements were completed. As a worst case, waiting until after commercial movements had taken place could lead to a shortened day of operations meaning the trip was unviable. However, based on assessment undertaken in Impact 1 and 2 there is no indication that vessels movements on the river are going to be impacted so as to prohibit safe access out with a small window of time.

As per Section 4.1, the period of time when movements would be restricted will be significantly less than an hour noting turns are anticipated to take between 10-15 minutes and following the turn departing fishing vessels would be able to either follow the departing vessel (noting commercial vessels are typically transiting toward the top end of the speed limit 4-6 knots) or pass in liaison with the pilot as per Section 11.1. On this basis it is not expected that working hours will increase to any great degree, and the loss of a day's fishing due to a need to wait is considered likely to be an infrequent event.

11.2.4 Significance

Noting the limited circumstances under which a fishing vessel would be unable to safely transit the river prior to a turn, frequency of occurrence is deemed to be remote. Severity of consequence is determined to be serious. On this basis the impact is assessed as being of **tolerable** significance.

In order for the impact to be ALARP, the following mitigation measures are recommended (see Section 11.4 for full details):

- Agreement of a Navigation Management Plan between PoB and BAEF that details standard vessel procedures, how BAEF will promulgate planned vessel movements to PoB, and how PoB will pass this information on to other port users (Section 11.4.1);
- Use of digital information boards either side of the swing hole to promulgate planned BAEF vessel movements to port users (Section 11.4.2);
- AIS transmission from fishing vessels (Section 11.4.4); and
- Port Procedures and Vessel Traffic Monitoring (Section 11.4.5).

Assuming these mitigations are applied, the residual significance is **Tolerable with mitigation** and ALARP.

11.3 Impact 3 - Vessels are unable to turn due to time or tidal constraints

This impact considers:

- An event where a BAEF vessel is unable to turn, leading to an obstruction in the river.

Scenarios where such a situation may arise include:

- A turn is left too late in the tidal cycle to be successfully completed;
- Adverse conditions are such that the turn cannot be completed;
- Mechanical failure of the vessel prevents a turn from being completed; or
- The turn is unable to be completed due to human error.

11.3.1 Responsibilities

As the CHA and in line with the PMSC (see Section 2.1), PoB will be responsible for determining when and where turns should take place based on tidal and weather conditions, other port activities, and laden status of the vessel being turned. Further, as required under the PMSC there will be documented risk assessments as part of the overarching MSMS in place for general use of the swing hole for turning, and procedures in place in the event that a turn is unable to be successfully completed (e.g., assistance from a tug, see Section 10).

All turns will be undertaken under pilotage and potentially with tug assistance (which PoB have available where needed) depending on the conditions and outcome of any risk assessments, as well as with a pilot familiar with the river and its users. The pilot will be responsible for assessing conditions on an ongoing basis during any transit, and for following the procedures put in place by PoB. As such, the likelihood of a failed turn is considered low.

11.3.2 Sutton Bridge Incident

Specific concern was raised by the local fishing representatives over a scenario whereby a turning vessel breaks down or grounds mid turn, as this would block the river. The grounding incident at Sutton Bridge in 2000 was referenced in this regard (see Section 3.3). In the event of an NUC vessel in the river, PoB as the CHA have responsibility under the PMSC (see Section 2.1) to ensure there are appropriate procedures in place, based on documented risk assessment. Consultation with PoB indicated their standard procedure in the event of an NUC vessel would be to assist with a standby tug, and it is noted that all turns would be undertaken under pilotage whereby a passage plan and risk assessment will have been completed to ensure all necessary mitigation are in place prior to a vessel being swung, or entering The Haven should the weather forecast be sufficiently poor.

11.3.3 Significance

Given the decision on when and where to make turns will be managed by PoB, and noting documented procedures will be in place, frequency of occurrence of an unsuccessful turn is deemed to be remote. Severity of consequence is determined to be serious given potential for an obstruction in the river should a turn fail. On this basis the impact is assessed as being of **tolerable** significance.

In order for the impact to be ALARP, the following mitigation measures are recommended (see Section 11.4 for full details):

- Agreement of a Navigation Management Plan between PoB and BAEF that details standard vessel procedures, how BAEF will promulgate planned vessel movements to PoB, and how PoB will pass this information on to other port users (Section 11.4.1); and
- Port Procedures and Vessel Traffic Monitoring (Section 11.4.5).

Assuming these mitigations are applied, the residual significance is **Tolerable with mitigation** and ALARP.

11.4 Additional Mitigation

Based on the findings of the FSA, the additional mitigation recommended to ensure all impacts assessed are within ALARP parameters are detailed in this section.

11.4.1 Navigational Management Plan

A key finding of the FSA was that there should be communication plans in place between BAEF and PoB to support obligations under the PMSC (see Section 2). This is for the purpose of ensuring that PoB are informed of planned commercial vessel movements with sufficient notice to plan when and where turns will take place, and also to allow time for this information to be promulgated to port users. It is recommended that this takes the form of a relevant section an agreed Navigational Management Plan which sets out:

- Plans for “standard” BAEF vessel movements and procedures on a general basis including how many BAEF vessels are anticipated to arrive and depart per tide;
- Plans for how and when BAEF will notify PoB of actual BAEF vessel movements;
- Details of how BAEF will keep PoB notified of any intended or anticipated long term changes to BAEF vessel movements or procedures to ensure PoB can review and update their own risk assessments and procedures in advance (including procedures for use of the swinging hole); and
- Plans for how PoB will pass on the information to port users.

11.4.2 Digital Information Boards

As per Section 4.1, it was raised during consultation that digital information boards either side of the swing hole could be utilised for the purposes of promulgating information associated with BAEF (in particular planned turns) to port users. Similar boards are currently used at the Boston Barrier project (see Section 3.3).

The importance of communicating with port users was a key finding of the FSA, and as such it is recommended that discussions on communication plans undertaken as part of the Navigation Management Plan (see Section 11.4.1) include consideration of the use of digital boards. It is noted that PoB will have ultimate say on whether these are appropriate.

11.4.3 Lighting and Marking

PoB suggested during consultation that the swing hole could be marked via flashing lights, designed to alert port users to active use of the swing hole. As per Section 11.4.2, it is recommended that planned use of the swing hole is promulgated in advance, however the use of lights during turns (and the lead up to turns) will provide additional warning that a turn is taking place, or will shortly be taking place. It is therefore recommended that discussions on communication plans undertaken as part of the Navigation Management Plan (see Section 11.4.1) include consideration of the use of lights, noting PoB will have ultimate say on whether these are appropriate.

11.4.4 AIS Transmission from Fishing Vessels

As per Section 8.3.1, fishing vessels do not regularly broadcast their location via AIS when within the river, noting there is no obligation for them to do so. However, should fishing vessels choose to do so on a voluntary basis (noting this may require additional equipment for certain fishing vessels), this would help inform pilots decisions and advice to vessel masters (e.g., letting a “backlog” of fishing vessels pass prior to undertaking a turn).

11.4.5 Port Procedures and Vessel Traffic Monitoring

As per Section 10, it has been assumed as embedded mitigation that PoB will review available resources (e.g., personnel, equipment) and procedures on an ongoing basis to ensure they are sufficient to manage current and anticipated traffic volumes and patterns of port users. In line with the PMSC (see Section 2) it is the responsibility of PoB to ensure such resources and procedures are in place, however based on the findings of the FSA the following measures could be considered by PoB for implementation:

- Additional monitoring capability via dedicated AIS and radar traffic monitoring systems at Port Control;
- Updated pilot and Port Control monitoring and communication procedures in relation to monitoring of port users including fishing vessels;
- Specific plans / procedures with regards to an NUC vessel or a vessel becoming grounded in line with the PMSC that required the MSMS to develop emergency plans and the exercise of such (see Section 2.1); and
- Use of tugs to assist during turns (e.g., during adverse conditions) or on standby to assist if necessary.

12 Summary

This NRA has assessed how use of the PoB swing hole to turn vessels associated with the BAEF will impact existing fishing users of the river. This included consideration of long term AIS data, visual observation surveys, and consultation input from PoB and local fishing representatives.

The general finding of the FSA was that the impacts associated with use of the swing hole were manageable assuming BAEF have procedures in place to inform PoB of planned vessel arrivals and departures to facilitate PoB responsibilities under the PMSC to safely manage vessel movements on the river. This aligns with consultation undertaken with PoB who indicated they were content the additional vessel movements associated with the BAEF could be safely managed.

On this basis, all impacts assessed were determined to be of tolerable significance under the FSA undertaken prior to the implementation of additional mitigation. The application of additional mitigation is deemed to bring the impacts to within ALARP parameters, and as such residual significance of all impacts is **tolerable with mitigation**.

Table 12.1: FSA Summary

Impact	Significance	Mitigation	Residual Significance
Disruption / delay caused by use of turning circle	Tolerable	<ul style="list-style-type: none"> ▪ Navigational Management Plan. ▪ Digital Information Boards. ▪ Lighting and marking. ▪ AIS transmission from fishing vessels. ▪ Port Procedures and Vessel Traffic Monitoring. 	Tolerable with mitigation (and ALARP)
Increase in Safety Risk and Subsequent Commercial Impacts	Tolerable	<ul style="list-style-type: none"> ▪ Navigational Management Plan. ▪ Digital Information Boards. ▪ AIS transmission from fishing vessels. ▪ Port Procedures and Vessel Traffic Monitoring. 	Tolerable with mitigation (and ALARP)
Vessels are unable to turn due to time or tidal constraints	Tolerable	<ul style="list-style-type: none"> ▪ Navigational Management Plan. ▪ Port Procedures and Vessel Traffic Monitoring. 	Tolerable with mitigation (and ALARP)

12.1 Next Steps

It is recommended under the FSA that BAEF liaise with PoB on production of a Navigational Management Plan that clearly sets out BAEF responsibilities in terms of informing PoB of relevant vessel movements. This should include:

- Plans for “standard” BAEF vessel movements and procedures on a general basis including how many vessels are anticipated to arrive and depart per tide;
- Plans for how and when BAEF will notify PoB of actual vessel movements;
- Details of how BAEF will keep PoB notified of any intended or anticipated long term changes to vessel movements or procedures to ensure PoB can review and update their own risk assessments and procedures in advance; and
- Plans for how PoB will pass on the information to port users.

It is noted that the draft Development Consent Order (document reference 2.1(1), REP1-022) sets out in the deemed Marine Licence Schedule 9, Part 4 (14) a requirement for the Applicant to submit a navigation management plan to the Marine Management Organisation (MMO) in consultation with the PoB and the Environment Agency.

13 References

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Appendix A Visual Survey Logs

This appendix presents the logs from the visual surveys undertaken on the 21st September 2021. The morning survey log is given in Table A.1, and the evening survey log in Table A.2. It is noted that full survey methodology is provided in Section 5.2.

Table A.1 Visual Survey Log – Morning (High Tide 07:00, 6.48m)

Name / PLN	Type	Time (AM)	Direction
Pilot	Pilot	05:01	Outbound
Pilot	Pilot	05:50	Inbound
North Stack / Holyhead Towing	Towing boat	06:14	Guiding cargo vessel (Emma) into the Port.
Emma	Cargo	06:28	Inbound
Dredging vessel	Dredger	07:10	Centre of The Haven
BN 444 - Molly P	Fishing	07:38	Outbound
BN 434 - Little Leer	Fishing	07:39	Outbound
BN 100 – Louie Lou	Fishing	07:44	Outbound
BN 3 – Ruby Doo	Fishing	07:45	Outbound
BN 109 - Medway IV	Fishing	07:47	Outbound
BN 438 – Patricia B	Fishing	07:49	Outbound
LO 243	Fishing	07:52	Outbound
BN 5 – Tracey Elaine	Fishing	07:53	Outbound
BN 445 – Seven Sisters	Fishing	07:54	Outbound
BN 86 – Vicky Ellen	Fishing	07:57	Outbound
BN 39 – Merlin	Fishing	07:58	Outbound
BN 80 - Lucy Marie	Fishing	07:59	Outbound
BN 429 – Tricia B	Fishing	08:00	Outbound

Name / PLN	Type	Time (AM)	Direction
BN 190 – Kathryn James	Fishing	08:02	Outbound
BN 62 – Jarcon	Fishing	08:06	Outbound
BN 430 - Cally Seranne	Fishing	08:07	Outbound
BN 23 – Jaime Louise	Fishing	08:10	Outbound
BN 19 – Sovereign	Fishing	08:25	Outbound

Table A.2 Visual Survey Log – Evening (High Tide 19:38, 6.16m)

Name / PLN	Type	Time (PM)	Direction
BN 19 – Sovereign	Fishing	17:57	Inbound
BN 23 – Jaime Louise	Fishing	18:03	Inbound
LO 243	Fishing	18:07	Inbound
BN 62 – Jarcon	Fishing	18:09	Inbound
BN 80 - Lucy Marie	Fishing	18:16	Inbound
BN 430 - Cally Seranne	Fishing	18:18	Inbound
BN 429 – Tricia B	Fishing	18:22	Inbound
BN 39 – Merlin	Fishing	18:26	Inbound
BN 109 - Medway IV	Fishing	18:27	Inbound
BN 190 – Kathryn James	Fishing	18:30	Inbound
BN 100 – Louie Lou	Fishing	18:35	Inbound
BN 445 – Seven Sisters	Fishing	18:36	Inbound
BN 86 – Vicky Ellen	Fishing	18:38	Inbound
BN 444 – Molly P	Fishing	18:44	Inbound

Name / PLN	Type	Time (PM)	Direction
BN 434 - Little Leer	Fishing	18:45	Inbound
BN 3 – Ruby Doo	Fishing	18:49	Inbound
BN 5 – Tracey Elaine	Fishing	18:50	Inbound
BN 438 – Patricia B	Fishing	18:58	Inbound
Holyhead Towing	Towing	18:59	Directing cargo vessel out of the port
Sea Riss	Cargo	19:00	Outbound