

Navigation Committee

11 January 2024

Agenda item number 11

Pilotage review

Report by Head of Ranger Services

Purpose

To note the proposals within Section 5 on how the Broads Authority will manage pilotage under the Port Marine Safety Code, following a review by independent Consultants Marico Marine.

Broads Plan context

Broads Plan objective C4 includes an action to 'manage adherence to boat safety measures including up to date Safety Management System' which Pilotage is included within.

Recommended decision

To note the report.

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1. Introduction

- 1.1. The Broads Authority contracted Marine and Risk Consultants Limited (Marico Marine) to review the pilotage provisions which are currently in place on the Broads, but presently inactive.

2. Background

- 2.1. The Broads Authority is a “Competent Harbour Authority” (CHA) as defined by the Pilotage Act 1987. This arises from The Broads Authority (Pilotage Powers) Order 1991 which remains extant. The Authority has not issued any pilotage directions, and there is currently no demand for conventional pilotage.
- 2.2. There is no expectation that large freight vessels which may require pilotage will return to the waterways in the foreseeable future.
- 2.3. It should be noted that there are three locations on the Broads where “Bridge Pilotage” is provided to leisure vessels (hire craft). However, these pilots and services are not provided by the CHA, nor are they operating under the provisions of the Pilotage Act, and these services are not considered in this review.
- 2.4. The current pilotage arrangements are not sustainable, nor do they meet the requirements as set out in the PMSC, which is why this review was undertaken. Currently this risk is being managed using Special Directions which allow the Authority to put in place conditions on individual vessels to ensure the ‘ease, convenience or safety of navigation or the safety of persons or property in the navigation area’ (Broads Authority Act 2009).
- 2.5. No ships requiring pilotage have entered the Broads within the last 8 years.

3. Risk implications

- 3.1. A high-level navigation risk assessment was undertaken to support this review, by formally establishing the potential risks to navigation both with and without a pilotage service in place.
- 3.2. The risk assessment has produced the following conclusions:
 - All navigation hazards identified for vessels where it has been assumed a pilot would be required but scored without pilotage as a risk control measure were assessed to be in the ALARP or LOW risk bands.
 - A qualitative assessment of the risk reducing effectiveness of pilotage has shown that pilotage reduces navigation by only 5%; and
 - Pilotage is most effective at reducing the risk of the hazard “Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)”

4. Consultants Recommendations

- 4.1. Considering the current and expected future traffic profile of the Broads Navigation Area, and the result of the navigation risk assessment, the following recommendations are made to the Authority as set out in the report:

- Engage with Great Yarmouth Port Authority to confirm whether providing pilotage under a joint arrangement is feasible.
 - Assuming the above is not an option, undertake a full review of the Safety Management System to document formal arrangements for the discontinuation of any form of pilotage, while still maintaining the status of a Competent Harbour Authority.
 - Seek specialist marine legal advice to support the above review, including amending Vessel Dimension byelaws, or issuing a General Direction; and
 - Clarify the procedures which will be followed (based on full risk assessment) should any vessels of greater size than defined in the revised byelaws / Directions wish to enter the navigation area.
- 4.2. Alternatively, if there is no appetite for maintaining CHA status consider the formal removal of CHA powers by application to the Secretary of State.

5. Further information

- 5.1. In relation to the recommendations made in the report, as set out above, further investigations have been made as follows:
- Discussions with Peels Ports about sharing Pilotage have been made previously, 5 years ago and more recently last year. While the Port has not declined to provide a service, at an operational level there is very little appetite to take this forward. Training of Pilots and maintaining their competence in the Broads navigation area (as required under the PMSC and at a cost to the Broads Authority), when there is likely to be no, or extremely low, need for this service would not be cost-effective.
 - The issuing of a General Direction or the updating of the Vessel Dimension Byelaws, to restrict all vessels over 20m from entering the Broads would allow the Authority to remove the requirement for a pilot while still retaining the 'Competent Harbour Authority' status. The length of 20m is relevant as the Pilotage Act applies to vessels 21m and over.
 - It is not intended to stop vessels over 20m from entering the Broads, rather a risk assessment would need to be completed to determine what safety measures would be needed to allow safe passage for these vessels on a case-by-case basis. It is envisaged that any passage would be undertaken with a suitably qualified crew, or the vessel being escorted by a patrol launch, this is currently standard practice.
 - Vessels or types of vessels undertaking regular passages could be covered by one assessment which would be regularly reviewed or if circumstances changed.
 - This proposed method would allow time to put suitable measures in place, should larger vessels, which require a Pilot, to enter the Broads.

6. Open Port Duty

- 6.1. A possible objection to this recommended option is the often quoted “Open Port Duty” which applies to Harbour Authorities by virtue of the Harbours, Docks and Piers Clauses Act 1847. At the time of writing, we are seeking clarification on this clause as it is not clear if this section of the HDPC Act 1847 applies to the Broads Authority.

7. Conclusion

- 7.1. From the advice obtained (subject to clarification on the HDPC Act as above) the preferred option is to use a General Direction to limit the size of vessels entering the Broads to 20m, negating the need for a Pilotage service.
- 7.2. As set out in 5.1, a risk assessment for vessels over 20m would be carried out to ensure they could be safely accommodated. This would be on a case-by-case basis, in line with current practices.
- 7.3. While the Authority has the powers within the Broads Authority Act 2009, a General Direction, has not been used before, so further advice would need to be sought if this process was deemed necessary.
- 7.4. Under the proposals set out in 5 above the Authority would remain a Competent Harbour Authority, and could consider the re-introduction of pilotage, should future demand and risk assessment justify the issuing of new Directions.

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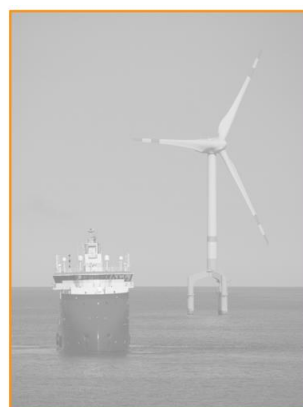
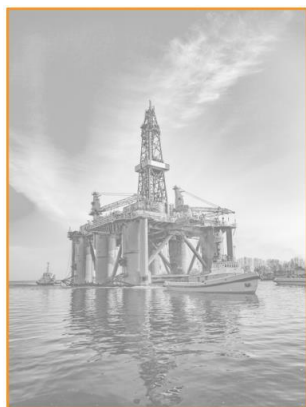
Date of report: 11 December 2023

[Broads Plan](#) strategic objectives: C4

Appendix 1 – Broads Authority Pilotage Review 2023

BROADS AUTHORITY

PILOTAGE REVIEW 2023



Report Number: 23UK1953
Issue: 01
Date: 16 November 2023

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Date	Release	Prepared	Authorised	Notes
10 Oct 2023	Draft A	WH		Draft for final comments
16 Nov 2023	Issue 01	WH	AC	Final Draft

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EXECUTIVE SUMMARY

The Broads Authority has contracted Marine and Risk Consultants Limited (Marico Marine) to review the pilotage provisions which are currently in place on the Norfolk and Suffolk Broads, but presently inactive.

This review considers pilotage provision by:

- Giving an overview of the Authority's responsibilities for navigation safety, and current levels of activity on the Broads;
- Undertaking a brief review of applicable legislation;
- Considering the historical and current requirements for the provision of a pilotage service, and possible options for the future of the service;
- Undertaking a simple navigation risk assessment to establish the effectiveness of pilotage as a risk control measure and identify additional or alternative mitigations; and finally
- Making recommendations to the Authority.

The Norfolk and Suffolk Broads are not a Statutory Harbour Authority, but the Broads Authority is designated a "Special Statutory Authority", affording the same level of protection as National Park status, but with tailor-made legislation relating to navigation. The Authority therefore balances the navigational duties and powers of a harbour authority with the conservation and recreational duties and powers of a National Park authority. These duties and powers are principally set out in the Norfolk and Suffolk Broads Act 1988.

Additionally, the Authority is a "Competent Harbour Authority" as defined the Pilotage Act 1987. This arises from The Broads Authority (Pilotage Powers) Order 1991 which remains extant.

The Authority has not issued any pilotage directions, and there is currently no demand for conventional pilotage.

There is no expectation that large freight vessels which may require pilotage will return to the waterways in the foreseeable future.

It should be noted that there are three locations on the Broads where "Bridge Pilotage" is provided to leisure vessels (hire craft). However, these pilots and services are not provided by the CHA, nor are they operating under the provisions of the Pilotage Act, and these services are not considered in this review.

It is clear that current pilotage arrangements are not fit for purpose and are due for review.

A high-level navigation risk assessment was undertaken to support this review, by formally establishing the potential risks to navigation both with and without a pilotage service in place.

The risk assessment has produced the following conclusions:

- All navigation hazards identified for vessels where it has been assumed a pilot would be required but scored *without* pilotage as a risk control measure were assessed to be in the ALARP or LOW risk bands;
- A qualitative assessment of the risk reducing effectiveness of pilotage has shown that pilotage reduces navigation by only 5%; and
- Pilotage is most effective at reducing the risk of the hazard “Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)”

Taking into account the current and expected future traffic profile of the Broads Navigation Area, and the result of the navigation risk assessment, the following recommendations are made to the Authority:

- Engage with Great Yarmouth Port Authority to confirm whether providing pilotage under a joint arrangement is feasible;
- Assuming the above is not an option, undertake a full review of the MSMS to document formal arrangements for the discontinuation of any form of pilotage, while still maintaining the status of a Competent Harbour Authority;
- Seek specialist marine legal advice to support the above review, including amending Vessel dimension byelaws, or issuing a General Direction; and
- Clarify the procedures which will be followed (based on full risk assessment) should any vessels of greater size than defined in the revised byelaws / Directions wish to enter the navigation area.

Alternatively, if there is no appetite for maintaining CHA status:

Give consideration to the formal removal of CHA powers by application to the Secretary of State.

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ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
CHA	Competent Harbour Authority
COLREGs	International Regulations for Preventing Collisions at Sea
FSA	Formal Safety Assessment
GtGP	Guide to Good Practice
GYPA	Great Yarmouth Port Authority
HMCG	HM Coastguard
IMO	International Maritime Organisation
LPS	Local Port Service
m	Metre
MAIB	Marine Accident Investigation Branch
Marico Marine	Marine and Risk Consultants Ltd
MCA	Maritime and Coastguard Agency
MSMS	Marine Safety Management System
NRA	Navigation Risk Assessment
PMSC	Port Marine Safety Code
RNLI	Royal National Lifeboat Institution
SHA	Statutory Harbour Authority
SPB	Self Propelled Barge
SUP	Stand Up Paddleboard
VTS	Vessel Traffic Service

1 INTRODUCTION

The Broads Authority has contracted Marine and Risk Consultants Limited (Marico Marine) to review the pilotage provisions which are currently in place on the Norfolk and Suffolk Broads, but presently inactive.

This review will consider the pilotage provision as follows:

- Give an overview of the Authority's responsibilities for navigation safety, and current levels of activity on the Broads;
- Undertake a brief review of applicable legislation;
- Consider the historical and current requirements for the provision of a pilotage service, and possible options for the future of the service;
- Undertake a simple navigation risk assessment to establish the effectiveness of pilotage as a risk control measure and identify additional or alternative mitigations; and finally
- Make recommendations to the Authority.

1.1 BACKGROUND

The Norfolk and Suffolk Broads are not a Statutory Harbour Authority, but the Broads Authority is designated a "Special Statutory Authority", affording the same level of protection as National Park status, but with tailor-made legislation relating to navigation. The Authority therefore balances the navigational duties and powers of a harbour authority with the conservation and recreational duties and powers of a National Park authority. These duties and powers are principally set out in the Norfolk and Suffolk Broads Act 1988.

Additionally, the Authority is a "Competent Harbour Authority" as defined the Pilotage Act 1987. This arises from The Broads Authority (Pilotage Powers) Order 1991 which remains extant.

Consequently, it would be reasonable to assume that the Authority should manage navigation in compliance with the UK Port Marine Safety Code as suggested in paragraph 3 of the Executive Summary of the Code – despite not being a statutory harbour authority. However, by virtue of the Competent Harbour Authority powers, it is clear that compliance with the Code is expected and indeed the Authority has clearly and publicly committed to compliance, with a statement on the website¹. As such, the Authority has undertaken a Navigational Risk Assessment and has developed a Marine Safety Management System based on the identified risks.

The Authority has not issued any pilotage directions, and there is currently no demand for conventional pilotage. There is only one "pilot" said to be able to provide pilotage, who has retired from the Authority but is retained to provide a Pilot service. One individual is said to be under training.

¹ <https://www.broads-authority.gov.uk/boating/navigating-the-broads/safety/port-marine-safety-code>

However, in the absence of Directions, sufficient qualifying experience and a formal authorisation process it is considered that the Authority would be unable to demonstrate that the two individuals concerned were “Pilots” under the meaning of the Pilotage Act. It is therefore probable that the individuals providing the advice would not be protected by the Pilots indemnity described in the Act.

There is no expectation that large freight vessels which may require pilotage will return to the waterways in the foreseeable future.

It should be noted that there are three locations on the Broads where “Bridge Pilotage” is provided to leisure vessels (hire craft). However, these pilots and services are not provided by the CHA, nor are they operating under the provisions of the Pilotage act (albeit the services may be useful mitigations to reduce navigational risk).

It would be ideal if these individuals were not referred to as Pilots, but it is accepted that this is unlikely to change given the long-standing use of the terminology.

1.2 GUIDANCE AND INFORMATION SOURCES

The following documents and information informed this review:

- The Norfolk and Suffolk Broads Act 1988
- The Broads Authority (Pilotage Powers) Order 1991
- The Pilotage Act 1987
- The Port Marine Safety Code (November 2016)
- A Guide to Good Practice on Port Marine Operations Prepared in conjunction with the Port Marine Safety Code 2016 (February 2018)
- “Broads Passage Plan External”
- Section 7 of the Broads Authority MSMS: Pilotage
- The Authority’s website: <https://www.broads-authority.gov.uk/>
- Information provided by, and discussions with, officers of the Authority.

2 NORFOLK AND SUFFOLK BROADS OVERVIEW

2.1 DESCRIPTION

The Broads are situated in the counties of Norfolk and Suffolk on the east coast of England and are managed and protected as one of the UK's 15 National Parks. The Broads were originally dug out in medieval times to provide peat for fuel. In the 14th century, these peat diggings flooded, creating the waterways we see today.

By the 19th century, the rich boating heritage of these waterways made them an obvious destination for those who enjoyed the increasingly popular pastime of pleasure boating. Today, the Broads is Britain's third largest inland navigation area and attracts around eight million visitors every year.

The following summary of management arrangements is taken from the MSMS:

- *The Broads is Britain's largest nationally protected wetlands, comprising rivers, broads, marshes, fens and carr woodland. There are over 200km of navigable waterways and over 25% of the area has a European designation, Special Area of Conservation or Special Protection Area, incorporating many National and Local Nature Reserves and Sites of Special Scientific Interest. The Broads is listed under the Ramsar Convention on Wetlands of International Importance, and are home to a diverse variety of rare birds, animals and plants.*
- *The Broads Authority ("The Authority") was established as a non-statutory body in 1978 following a report by the Nature Conservancy Council regarding degradation of the Broads.*
- *The Broads Authority was formalised as a statutory authority by the Norfolk and Suffolk Broads Act 1988 (Reference 1), ("The Broads Act"), and began operating as such in 1989, for the purpose of conserving and enhancing the natural beauty of the Broads, promoting the enjoyment of the Broads by the public, and protecting the interests of navigation.*
- *The Authority is designated a "Special Statutory Authority", affording the same level of protection as National Park status, but with tailor-made legislation relating to navigation. The Authority therefore balances the duties and powers of a harbour authority with those of a National Park authority.*

2.2 NAVIGATION AUTHORITY

The extent of the Broads Authority executive area is shown in **Figure 1**.

The Navigation area is defined in the Norfolk and Suffolk Broads Act 1988 as subsequently amended, and in summary includes:

- a. those stretches of the rivers Bure, Yare and Waveney, and their tributaries, branches and embayments (including Oulton Broad) which, at the passing of this Act, were in use for navigation by virtue of any public right of navigation;
- b. the banks of the waterways which make up those stretches; and
- c. Haddiscoe New Cut and its banks;
- d. Breydon Water and the Lower Bure;

- e. Mutford Lock and the adjoining land as defined in article 2 of the Broads Authority (Transfer of Mutford Lock) Harbour Revision Order 2021.

Figure 1: Broads Authority Executive Area



2.3 NAVIGATION AND VESSEL TRAFFIC

The Broads are exceptionally busy with vessel traffic, but this is predominantly leisure craft of all kinds (powered and unpowered), and including kayaks, SUPs, sailing and rowing dinghies, private yachts and motor vessels (**Table 1**). In addition, there are very significant numbers of hired craft using the waterway, including

small motorised day boats, motor cruisers and sailing yachts, many of which are under the command of, and crewed by, inexperienced and unqualified visitors (Table 2).

Table 1: Private Boat Numbers (Source, Broads Authority)

Class of Private Boats	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change	% Change
Motor Cruisers	4,967	5,059	5,091	5,086	5,110	5,079	5,083	5,004	5,237	5,142	-95	-1.81%
Auxiliary Yachts	1,166	1,168	1,152	1,127	1,132	1,093	1,107	965	1,048	1,024	-24	-2.29%
Day Launches	521	514	504	495	556	574	558	562	582	600	18	3.09%
Outboard Dinghies	1,043	1,062	1,016	962	1,064	1,060	1,058	1,051	1,140	1,185	45	3.95%
Workboats	188	180	172	156	158	156	153	144	142	166	24	16.9%
Passenger Vessel SPB	0	0	0	0	22	21	23	13	19	20	1	5.26%
Total Motor Boats	7,885	7,983	7,935	7,826	8,042	7,983	7,982	7,739	8,168	8,137	-31	-0.38%
Sailing Craft	1,214	1,230	1,191	1,107	1,076	1,081	1,023	844	920	861	-59	-6.41%
Rowing Craft	1,636	1,578	1,532	1,513	1,483	1,513	1,545	1,800	2,039	2,054	15	0.74%
Houseboats	33	27	33	45	45	49	52	49	52	67	15	28.85%
Total Unpowered Boats	2,883	2,835	2,756	2,665	2,604	2,643	2,620	2,693	3,011	2,982	-29	-0.96%
Total	10,768	10,818	10,691	10,491	10,646	10,626	10,602	10,432	11,179	11,119	-60	-0.54%

Table 2: Hire Boat Numbers (Source, Broads Authority)

Class of Hire Boats	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change	% Change
Motor Cruisers	869	842	821	789	802	806	801	734	729	673	-56	-7.68%
Auxiliary Yachts	46	47	43	44	45	46	44	39	45	45	-	0.00%
Total All cabin hire boats	915	889	864	833	847	852	845	773	774	718	-56	-7.24%
Day launches	289	299	290	295	290	301	297	261	326	363	37	11.35%
Outboard Dinghies	7	8	10	11	9	9	8	4	4	4	-	0.00%
Passenger Vessels MCA	11	10	10	6	6	6	6	5	6	6	-	0.00%
Passenger Vessels SPB	0	0	0	0	6	7	7	4	8	8	-	0.00%
Total Motor Boats	1,222	1,206	1,174	1,145	1,158	1,175	1,163	1,047	1,118	1,099	-19	-1.70%
Sailing Craft	109	110	108	102	101	95	87	74	88	73	-15	-17.05%
Rowing Craft	188	175	184	192	191	194	193	182	227	230	3	1.32%
Houseboats	16	16	16	16	28	26	26	27	27	28	1	3.70%
Total	1,535	1,507	1,482	1,455	1,478	1,490	1,469	1,330	1,460	1,430	-30	-2.05%

Overall traffic levels are assessed every four years through census² carried out over a three-day period in August. The 2018 census counted over 9,000 vessel movements on the northern rivers (where commercial activity would most likely occur) in the census period, confirming the very busy nature of the waterway.

Present day commercial traffic includes a small number of large vessels serving the leisure industry (excursions, traditional Wherrys) and commercial workboats engaged in waterway maintenance (dredgers, reed cutters, small tugs and barges etc). All of the above are generally restricted to the inland waterway.

The owners and operators of hire craft are subject to clear licencing procedures (<https://www.broads-authority.gov.uk/boating/owning-a-boat/hire-boat-licensing>), and these same procedures set the qualification standards for the “skippers” of passenger vessels (Less than 12 passengers must be qualified in accordance with The Merchant Shipping (Inland Waterway and Limited Coastal Operations) (Boatmasters’ Qualifications and Hours of Work) Regulations 2012; and vessels with 12 or more passengers are covered by MCA regulations MSN 1823 (M) Safety code for passenger ships - GOV.UK (www.gov.uk). None of these categories of vessel would be intended to be subject to pilotage.

While some leisure craft enter from seaward (and indeed are encouraged to do so: see <https://www.broads-authority.gov.uk/boating/owning-a-boat/bringing-your-boat-from-overseas>), it is understood that traditional freight carrying commercial traffic ceased approximately 15 years ago.

There are two points of access to the inland waterway system from the sea: Mutford Lock (Lowestoft) which is only suitable for recreational craft, or via Great Yarmouth which gives access to both the Northern and Southern Broads and is suited to larger craft.

Historically most commercial traffic would have been bound for Norwich on the River Wensum / Yare or Cantley Sugar Beet Refinery also on the River Yare. In practice, the vast majority of the Broads are not navigable by commercial freight vessels.

It is understood that none of the former commercial quays are either active, or suitable for accepting commercial vessels at the current time.

It is conceivable, however, that large vessels may seek to navigate on the waterway in the future, for example in connection with projects or new developments, however the MSMS states that *“In practice, such vessels are not usually piloted, but escorted by Broads Authority launches. These launches operate to their own published procedures”*.

² [Boat Census 2018 Report nc170119 \(broads-authority.gov.uk\)](#)

2.4 COMPETENT HARBOUR AUTHORITY AND “BRIDGE PILOTS”

As noted in **section 1.1** above, the Authority is a Competent Harbour Authority by virtue of the Broads Authority (Pilotage Powers) Order 1991. However, in the absence of published pilotage directions it is not clear which vessels pilotage applies to, nor in which area pilotage is provided / required.

Historically however, pilotage was “strongly recommended” for (or provided to) seagoing commercial vessels bound for any berth within the navigation area (usually Norwich or Cantley). As such vessels approached through the Great Yarmouth CHA area, the limits of the Broads are assumed to be the boundary with Great Yarmouth harbour area.

As also noted in **section 1.1** the term pilotage is widely used on the waterway to describe a service provided to hire boats navigating through two bridges over the inland waterways (at Potter Heigham and Wroxham).

The MSMS states in respect of these bridges:

“The Broads Authority believes that pilotage is not necessary for experienced helmsmen to safely navigate these bridges. However, it is accepted that the majority of hire vessels are helmed by novices. As such, the hire boat operators have provided pilotage services to protect their own assets and to assist their customers. The Broads Authority does not authorise or regulate these pilots”.

These services are not therefore pilotage under the meaning of the Pilotage Act, and while they do provide an effective risk mitigation for specific hazards, they will not be considered further in this review.

3 LEGISLATIVE REVIEW

This section details relevant national and local legislation relevant to this review as listed below:

3.1 NATIONAL LEGISLATION

There is a wide variety of legislation relevant to harbour operations, which is listed elsewhere (see the Port Marine Safety Code and associated Guide to Good Practice, for example) (**Sections 3.3.1 and 3.3.2** refer). The legislation briefly described below is most relevant to the provision of a Pilotage service by a Competent Harbour Authority.

3.1.1 Harbour Docks & Pier Clauses Act 1847

Relevant sections of the Harbour Docks & Pier Clauses Act are detailed below:

3.1.1.1 Section 52 (extract)

“The Harbour Master may give Directions for all or any of the following purposes:

For regulating the time at which and the manner in which any vessel shall enter into, go out of, or lie in or at the harbour, dock or pier, and within the prescribed limits, if any, and its position, mooring or unmooring, placing and removing, whilst therein;

For regulating the position in which any vessel shall take in or discharge its cargo or any part thereof, or shall take in or land its passengers, or shall take in or deliver Ballast within or on the harbour dock or pier;

For regulating the manner in which any vessel entering the harbour or dock or coming to the Pier shall be dismantled as well for the safety of such vessel as for preventing Injury to other vessels and to harbour, dock, or pier, and the moorings thereof;

For removing unserviceable vessels and other obstructions from the harbour, dock, or pier, and keeping the same clear; and

For regulating the quantity of ballast, or dead weight in the hold which each vessel in or at the harbour, dock, or pier shall have during the delivery of her cargo or having discharged the same.”

As the Broads Authority is not a Statutory Harbour Authority, a Harbour Master has not been appointed, but the Broads Act 1988 does make provision for the appointment of a “Navigation Officer” (and deputy). Section 19 of Schedule 5 of that Broads Act states in respect of “Seagoing Freight Traffic”:

(1) The navigation officer shall exercise his powers under this Part of this Schedule with the object of securing, so far as is reasonably practicable and consistent with the maintenance of safety, that any seagoing freight vessel which is in, entering or leaving the Norwich navigation has a safe passage and is given priority over other traffic.

(2) The navigation officer shall, in controlling the movement of any vessel, comply with any directions given (with the object mentioned in sub-paragraph (1) above) by the harbour master of Great Yarmouth unless he considers, in a particular case, that it is inadvisable on grounds of safety to do so.

In practice, Schedule 5 of the Broads Act 1988 gives the Authority many of the same powers as a Statutory Harbour Authority.

3.1.2 The Pilotage Act 1987

The Pilotage Act 1987 is an Act of Parliament that governs the operation of marine pilotage. The Act requires the CHA to keep under consideration what pilotage services are needed to secure the safety of ships and gives them powers to:

- Make pilotage compulsory within their pilotage district and levy charges for the use of a pilot;
- Grant PECs, to any bona fide deck officer of a ship, including its master or first mate, who may hold one provided the relevant competent harbour authority is satisfied that that person has the skill, experience and local knowledge, and sufficient knowledge of English for safety purposes, to be capable of piloting one or more specified ships within its harbour; and
- Authorise pilots within their district.

The CHA has a duty to keep under regular review the need for and implementation of Pilotage in the area for which it has responsibility. It has to set the level of Pilotage required, develop and promulgate Pilotage Directions, and satisfy itself that prospective Pilots for authorisation meet the required standards that it has determined, in respect of age, physical fitness, time of service, local knowledge, skill, and character.

With relevance to this study, Section 2(1) and 2(2) of the Act requires the CHA to keep under consideration whether:

- Any and, if so, what pilotage services need to be provided to secure the safety of ships navigating in or in the approaches to its harbour; and
- In the interests of safety, pilotage should be compulsory for ships navigating in any part of that harbour or its approaches. If so, for which ships under which circumstances and what pilotage services need to be provided for those ships. N.B. The Act states (Section 7 (3) that: *"A pilotage direction shall not apply to ships of less than 20 metres in length or to fishing boats of which the registered length is less than 47.5 metres"*.

3.1.2.1 Review of Pilotage Act 1987

In 1997 following the [Sea Empress](#) disaster in 1996, the [Department for Environment, Transport and the Regions](#) undertook a review of the Act which concluded that *"Pilotage should rightly remain the responsibility of the CHAs and become integrated with other port marine activity under the management and responsibility of one Statutory Authority"*. The principal recommendation of the Review was for the establishment of the [Port Marine Safety Code](#) (see **Section 3.3.1**).

3.1.3 The Marine Navigation Act 2013

The Marine Navigation Act 2013 amends legislation relating to pilotage, harbour authorities, the general lighthouse authorities and the manning of ships. With regards to pilotage the Act has addressed the problems as outlined below:

3.1.3.1 Clause 1: Power to remove harbour authorities' pilotage functions

Clause 1 amends the Pilotage Act 1987 to provide the appropriate national authority with power to specify by order that a harbour authority in England, Wales or Scotland is not a CHA within the meaning of that Act. Making such an order in respect of a CHA will mean it is no longer required to carry out certain duties set out in the Pilotage Act. The relevant duties include keeping under review whether any, and, if so, what pilotage services need to be provided for the safety of ships in its harbour or its approaches and whether pilotage should be compulsory. The appropriate national authority in this context is the Secretary of State as regards harbours in England and Wales and the Scottish Ministers as regards harbours in Scotland. In England and Wales, the order making power is subject to the applicable negative resolution scrutiny procedure.

3.1.3.2 Clause 2: Pilotage Exemption Certificates: grant

Clause 2 amends the Pilotage Act 1987 to remove the restriction whereby only the master or first mate of a ship may hold a pilotage exemption certificate. Any bona fide deck officer of a ship, including its master or first mate, may hold one provided the relevant CHA is satisfied that that person has the skill, experience and local knowledge, and sufficient knowledge of English for safety purposes, to be capable of piloting one or more specified ships within its harbour.

3.1.3.3 Clause 3: Pilotage Exemption Certificates: suspension and revocation

Clause 3 extends the circumstances in which a CHA can, by written notice, suspend or revoke a PEC. The authority may do this if:

- An event occurs that gives it reason to believe that the holder of the certificate no longer meets the requirements for holding a certificate;
- It thinks that the holder of the certificate has provided false information; and
- It thinks that the holder of the certificate has been guilty of professional misconduct while piloting the ship; or the certificate has been misused in circumstances where an act of pilotage is undertaken by an unauthorised person.

3.1.3.4 Clause 4: Pilotage notification

Clause 4 amends the Pilotage Act 1987 by substituting a new section 15(3) which makes it an offence by the master of a ship not to give a pilotage notification before the ship is navigated in an area for which a pilotage direction is in force. That notification must either request an authorised pilot or notify the authority that the ship will be piloted by a specified person in accordance with a pilotage exemption certificate.

3.2 LOCAL LEGISLATION

3.2.1 Harbour Legislation

The overarching legislation is the Norfolk and Suffolk Broads Act 1988, as amended. While this act covers all aspects of the Authority's constitution, duties and powers; specific reference is made to Navigation specifically:

- Part II – Navigation (includes: the navigation area, defines the navigation committee, describes functions of the Authority in relation to the navigation area);
- Part III – Finance refers to navigation charges;
- Schedule 4 - gives detail of the navigation committee; and
- Schedule 5 – gives detail on powers and duties in the navigation area.

3.2.2 Byelaws

Schedule 5, Part I, Byelaws, Paragraph 4 gives the Authority power to make byelaws for the purposes of ensuring safe navigation.

Four such byelaws have been made and are published on the website: <https://www.broads-authority.gov.uk/boating/navigating-the-broads/byelaws-and-speed-limits>

- Navigation Byelaws 1995
- Speed Limit Byelaws 1992
- Vessel Dimension Byelaws 1995
- Vessel Registration Byelaws 1997

None of the above byelaws refer to pilotage.

3.2.3 Pilotage District – Pilotage Directions

While the pilotage Act 1987 gives a Competent Harbour Authority powers to make directions, there is no compulsion on the CHA to do so. However, there seems little advantage in obtaining the legal powers to provide pilotage and make directions if there is no intention of the making use of those powers. Nevertheless, there is no evidence that the Broads Authority has ever made pilotage directions, and any pilotage that did

historically take place was not subject to formal direction. In effect the authority gained the necessary powers but has not formally made use of them. Following this review, it would be relatively easy to formally introduce directions, following appropriate consultation, as the legal framework is in place.

3.3 GUIDES AND CODES OF PRACTICE

There are two principal documents guiding the UK ports industry's compliance with legislation and good practice, as well as additional guidance published by the MCA.

3.3.1 Port Marine Safety Code

The Port Marine Safety Code (the Code) applies to all harbour authorities in the UK that have statutory powers and duties. The Code is primarily intended for "the duty holder" who is directly accountable for the safety of marine operations in their waters and approaches.

The current version of the PMSC is dated November 2016.

The Code establishes a national standard for every aspect of port marine safety and aims to enhance safety for those who use or work in ports, their ships, passengers and the environment.

It was developed following the grounding of the *MV Sea Empress* and a review of the arrangements for harbour pilotage under the Pilotage Act 1987 (see **Section 3.1.2**).

The Code applies the well-established principles of risk assessment and safety management systems to port marine operations. Ports and harbours (and other organisations with responsibilities for navigation) are required to produce a Safety Management System (SMS) based on the ALARP ("as low as reasonably practicable") principle - that is managing marine operations in harbours to reduce risk "as low as reasonably practicable".

The Code embraces some fundamental principles.

- The promotion of nationally agreed standards;
- Recognising that best practice is built on experience and is therefore evolutionary; and
- Focus upon those risks affecting the safety of life, property and the environment.

3.3.1.1 The Port Marine Safety Code and Pilotage

With regards to pilotage the Code states the following:

Pilotage and Pilotage Directions

4.11 Under the Pilotage Act 1987, a Competent Harbour Authority ("CHA") has a duty to assess what, if any, pilotage services are required to secure the safety of ships, and to provide such services as it has deemed necessary³¹. CHAs should determine these matters through risk assessment.

4.12 CHAs must issue pilotage directions if they decide, based on their assessment of the risks, that pilotage should be made compulsory. The pilotage directions must specify to which ships they apply and the area and circumstances in which they apply.

Authorisation of Pilots

4.13 A CHA may authorise suitably qualified pilots in its area. Authorisations may relate to ships of a particular description and to particular parts of the harbour. The CHA determines the qualifications for authorisation in respect of medical fitness standards, time of service, local knowledge, skill, character and otherwise. Qualifications of EEA State nationals must be recognised. The CHA may also – after giving notice and allowing a reasonable opportunity to make representations – suspend or revoke an authorisation in certain circumstances.

4.14 CHAs are encouraged to implement the international recommendations on the training and certification and operational procedures for pilots contained within International Maritime Organisation resolution A960.

Pilotage Exemption Certificates.

4.15 CHAs must grant a 'Pilotage Exemption Certificate' ("PEC") to a ship's deck officer (including the Master who applies for one if they demonstrate they have sufficient skill, experience and local knowledge to pilot the ship within the compulsory pilotage area.

The requirements for granting a PEC must not exceed or be more onerous than those needed for an authorised pilot.

4.16 A CHA may suspend or revoke a PEC if it ceases to be satisfied that the holder possesses the required skill, experience and local knowledge, or in cases of professional misconduct or the provision of false information.

3.3.2 A Guide to Good Practice on Port Marine Operations February 2018

This document is a supplement to the Code. It contains more detailed guidance on issues relevant to harbour authorities including pilotage. It is designed to provide general guidance and examples of how a harbour authority can meet its commitments in terms of compliance with the Code. The guidance applies to all harbour authorities in the UK that have statutory powers and duties.

Section 9 of the guide gives detailed guidance on the interpretation of the Code with respect to pilotage according to the following general principles:

- A. *Harbour authorities are accountable for the duty to provide a pilotage service; and for keeping the need for pilotage and the service provided under constant and formal review.*
- B. *Harbour authorities should therefore exercise control over the provision of the service, including the use of pilotage directions, and the recruitment, authorisation, examination, employment status, and training of pilots.*
- C. *Pilotage should be fully integrated with other port safety services under harbour authority control.*

- D. Authorised pilots are accountable to their authorising authority for the use they make of their authorisations: harbour authorities should have contracts with authorised pilots, regulating the conditions under which they work – including procedures for resolving disputes.*

3.3.3 MCA Guidance on Vessel Traffic Services and Local Port Services

Vessel Traffic Service (VTS) is a service implemented by a Harbour Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

MGN 401 (M+F) Amendment 3 Navigation: Vessel Traffic Services (VTS) and Local Port Services (LPS) in the UK, published by the MCA on 22 March 2022 gives full guidance to assist Statutory Harbour Authorities in considering the implementation of a VTS or LPS and in reviewing an existing VTS.

Not all harbours require a full VTS service, and Harbour Authorities should determine through a process of risk assessment what level (if any) of traffic management service should be provided within their geographic area of responsibility.

The Broads Authority does not operate any form of active traffic monitoring or control, but does provide advice and assistance through “Broads Control”, mobile rangers and information points and yacht stations (see **Figure 1** for locations).

There is therefore no direct interaction in real time between the navigation authority and pilotage that may take place, with the exception that any large vessels would routinely be provided with an escort by a ranger patrol launch, which could intervene upon the request of a pilot (e.g. in a developing close quarters situation).

4 REQUIREMENTS OF PROVIDING A PILOTAGE SERVICE

The Competent Harbour Authority (CHA) should provide the pilotage services it considers to be needed. This duty is not discharged simply by authorising one or more pilots: it includes the management of the service, ensuring that the person assigned as pilot to every vessel taking one is fit and appropriately qualified for that task.

The 1987 Pilotage Act requires that the pilotage service provided by any CHA should be based upon a continuing process of risk assessment. Operating a pilotage service will involve consideration of the following factors:

- Safety assessment;
- Agents and joint arrangements;
- Pilotage directions;
- Boarding and landing arrangements;
- Consultation;
- Pilotage regulations;
- Authorisation of pilots;
- Contracts with authorised pilots;
- Training;
- Rostering pilots; and
- Incident and disciplinary procedures.

4.1 SAFETY ASSESSMENT

Section 2(1) and 2(2) of the Pilotage Act requires CHAs to keep under consideration whether:

- Any and, if so, what pilotage services need to be provided to secure the safety of ships navigating in or in the approaches to its harbour; and
- In the interests of safety, pilotage should be compulsory for ships navigating in any part of that harbour or its approaches. If so, for which ships under which circumstances and what pilotage services need to be provided for those ships.

The hazards involved in the carriage of dangerous goods, pollutants or harmful substances by ship have to be particularly considered and are best addressed as part of an authority's overall risk assessment and safety management system.

An authority with the powers to provide an effective and efficient pilotage service must be satisfied that it can do so competently. This means, firstly, that the authority has the competence to assess and oversee authorised pilots, and those who may apply for pilotage exemption certificates; and secondly, that they will have sufficient pilotage work to maintain their skills adequately.

An authority which identifies the need to provide a pilotage service, incurs an obligation to find and maintain the resources and expertise.

The Authority has considered pilotage in its formal safety assessment, and by virtue of commissioning this report, is keeping those arrangements under review.

4.2 AGENTS AND JOINT ARRANGEMENTS

The Pilotage Act provides for a CHA to use an agent for pilotage services, and for formal joint arrangements between CHAs for the discharge of pilotage functions.

There are important limitations to the power to make such arrangements, and key functions must be retained by each CHA. It is especially important to have a robust agreement about the resourcing of any operations conducted jointly or through another undertaking.

Any delegation or joint arrangement should be subject to a formal contract with any other body used in this way (including another harbour authority) which fully recognises statutory obligations which cannot be delegated or shared. The contract should set out the decisions which the delegated or joint body may make, and any conditions to which this is to be made subject. There should be provision in such a contract to terminate the arrangement at any time in order to enable an authority to carry out delegated or joint functions itself, or to make some other permissible arrangement instead.

The Authority does not currently have joint arrangements.

4.3 PILOTAGE DIRECTIONS

Pilotage directions should specify how and to which vessels they apply, and in what circumstances. It may be that pilotage is appropriate for a class of vessels in some circumstances and not others.

There is no provision for pilotage directions, once given, to be waived or not applied - other than by the making of new directions by the authority, or by formally removing the harbour authorities' pilotage functions (see **section 3.1.3.1**).

The Authority has not issued Directions.

4.4 OTHER REQUIREMENTS

Of the remaining requirements listed above (Boarding and landing arrangements; Consultation; Pilotage regulations; Authorisation of pilots; Contracts with authorised pilots; Training; Rostering pilots; and Incident and Disciplinary Procedures), it is observed that the MSMS provides extremely limited detail, and it is not clear whether all of the requirements have been met.

5 CURRENT STATUS OF THE PILOTAGE SERVICE

5.1 CHALLENGES

As described in the introduction (**Section 1**) to this report, the Broads Authority is a CHA.

However, this status is providing several operational challenges to the Authority:

- In the absence of formal directions it is unclear as to which vessels or classes of vessels pilotage is intended to be applied to, nor is it clear to what standards, or how, pilots should be trained and authorised;
- Commercial traffic levels have fallen to such an extent that the requirement for vessels to take pilots has become extremely infrequent;
- It is not considered economically feasible to employ even one full time pilot, so the Authority is reliant on part time personnel who may require considerable notice periods to ensure availability (and who may not in fact be authorised Pilots under the Pilotage Act);
- It is not considered economically feasible to maintain required infrastructure such as a coded pilot vessel, although the nature of the pilotage district means this is not a significant consideration;
- The numbers of vessels requiring pilots has fallen to such an extent, that it is very difficult for existing personnel providing advice to maintain the required levels of competency through undertaking a minimum required number of voyages each year. (Although in the absence of Pilotage Directions these fundamental requirements are unclear);
- The Authority no longer employs any officers suitably qualified to train or assess new pilots or PEC applicants. It is considered that the current “pilot” would be unable to fulfil this function (noting age profile and local experience limitations), and it will therefore be difficult to authorise further Pilots in the future;
- Potentially, the level of pilotage actually undertaken cannot generate sufficient revenue to cover the ongoing costs incurred – but under the pilotage Act, cost is not a valid reason for not providing a service that has been assessed as necessary; and
- The Authority cannot demonstrate that it is currently meeting all of the requirements for providing a pilotage service as described in **Section 4** above.

5.2 OPTIONS

The high-level options open to the Authority are:

- 1) No change to current arrangements;
- 2) Continue to provide pilotage, but update arrangements to address the challenges listed above (section 5.1); or
- 3) Cease pilotage provision.

These options are discussed below.

5.2.1 Maintain Current Pilotage Arrangements

Maintaining current arrangements for pilotage is not considered a viable option for the reasons set out in **section 5.1** above and is not considered further.

5.2.2 Continue to Provide Pilotage Under New Arrangements

If Pilotage is to be continued, a fundamental review of how the service will be provided and maintained will be required. As a first stage a pilotage risk assessment must be undertaken (or reviewed if an existing one can be located) to establish whether pilotage is still an effective risk control for the harbour.

If Pilotage is to continue to be provided, the possible options (excluding maintaining current arrangements) are:

- Drafting Pilotage Directions to make the requirements for pilotage and authorisation clear (unlikely to solve fundamental issue, and not recommended without additional mitigations);
- Provide the service jointly with another authority, both for economy, and to provide greater opportunities for Pilot training and authorisation; or
- Introduce new procedures to address the challenges identified, while maintaining the future option to provide a pilotage service.

5.2.2.1 Issue Pilotage Directions

As noted above, issuing Pilotage Directions would be a relatively easy process given that the legislation is in place, and the Authority already has the necessary powers to do so. However, the Directions would need to be developed based on a contemporary risk assessment, to establish the current need for the service. The Directions would need to give due regard to the training and authorisation of suitable pilots, and the practicalities of actually delivering the service.

In practice, simply issuing Directions may only have the effect of formalising current arrangements as discussed in **section 5.2.1** above and would not address the fundamental issues identified in **section 5.1**.

Therefore, simply issuing Directions is not recommended, without additional actions being identified and put in place.

5.2.2.2 Joint Arrangements

The Pilotage Act provides for a CHA to use an agent for pilotage services, and for formal joint arrangements between CHAs for the discharge of pilotage functions (see **section 4.2**).

There are important limitations to the power to make such arrangements, and key functions must be retained by each CHA. It is especially important to have a robust agreement about the resourcing of any operations conducted jointly or through another undertaking.

Any delegation or joint arrangement should be subject to a formal contract with any other body used in this way (including another harbour authority) which fully recognises statutory obligations which cannot be delegated or shared. The contract should set out the decisions which the delegated or joint body may make, and any conditions to which this is to be made subject. There should be provision in such a contract to terminate the arrangement at any time in order to enable an authority to carry out delegated or joint functions itself, or to make some other permissible arrangement instead.

The only feasible local CHA with which such joint arrangements could be made is Great Yarmouth Port Authority. It is understood that approaches have been made to GYPA in the past, but informal discussions have not progressed.

Advantages of a joint arrangement may include:

- Financial economies;
- Coordinated provision of pilotage across neighbouring / overlapping pilotage districts (simplification for mariners);
- Opportunities for Pilots to gain more experience in arranging of vessels in different areas; and
- Greater resilience of the service for both parties, better pilot availability at short notice.

Disadvantages may include:

- Commercial conflicts between the two participating authorities (attracting vessels to each other's facilities);
- Unequal contributions / advantages gained from the arrangement;
- Contractual complexities of coming to an arrangement; and
- The practicalities of providing the service may be just as challenging for GYPA as they are for the Broads Authority.

5.2.2.3 Introduce New Procedures

Consideration may be given to managing the current situation more formally, while still maintaining the ability to provide pilotage in the future, should circumstances change. For example, subject to the requirements of Open Port Duty, it may be possible to disallow vessels over a certain size on the basis that no suitable facilities exist for them. This could be formalised through new or amended byelaws (such as the Vessel Dimension Byelaws 1995), although simply stating that vessels over a certain size cannot be accepted without additional consideration, may be sufficient.

5.2.3 Cease Pilotage Provision

The final option is to cease pilotage provision completely. This is not an option to be considered lightly and can only be pursued following risk assessment.

Should risk assessment show that pilotage is no longer a significant risk reduction factor, the Authority would then need to instigate the legal procedures necessary to remove the harbour authorities' pilotage functions. This option became realistic as a result of the Marine Navigation Act 2013 (**Section 3.1.3**). Clause 1 of that act amends the Pilotage Act 1987 to ease the removal of a harbour authorities' pilotage functions.

However, there is a requirement for consultation and approval by the Secretary of State.

Therefore, robust evidence will be necessary to demonstrate pilotage is no longer necessary (nor likely to be so in the foreseeable future). It should also be considered that having the powers (albeit in abeyance) may prove very useful, and save considerable future expense, should a currently unforeseen requirement for pilotage arise in the future.

The following section of this report comprises a high-level assessment of pilotage in the navigation area.

6 RISK ASSESSMENT

6.1 RISK ASSESSMENT OVERVIEW

The Broads Authority has recognised the challenges summarised in the preceding sections of this report and the need for an assessment to inform the preferred options for the future.

A full Navigation Risk Assessment undertaken in compliance with the recommendations within the PMSC and GtGP (following IMO Formal Safety Assessment methodology) is not within the scope of this report and considered unnecessarily onerous at this stage of pilotage service review.

Nevertheless, it is considered appropriate to review potential risks to safe navigation posed by those commercial vessels which would be expected to utilise a pilotage service, and to consider some of the risk mitigation which may be necessary if pilotage is unavailable or ineffective.

A full navigation risk assessment (focusing on the need for pilotage) would typically be broken down into five stages:

- Stage 1: Hazard identification:
 - Baseline risk assessment “without pilotage”;
 - Identify generic and local risk controls; and
 - Hazard definition.
- Stage 2: Quantify incident frequency:
 - Review of all available incident data and incident records; and
 - Consultation with local stakeholders.
- Stage 3: Consider pilotage effectiveness in respect of:
 - Grounding;
 - Collision; and
 - Contact.
- Stage 4: Hazard scoring:
 - Baseline assessment made in consultation with navigation officer / stakeholders; and
 - Review and adjustment of baseline assessment with Navigation Officer.
- Stage 5: Results of Risk Reduction Assessment:
 - Comparison between baseline and residual risk scores; and
 - Conclusions and recommendations.

A methodology for a full FSA compliant assessment is given at **Annex A**.

The following sub-sections consider the 5-stage assessment at high level, in order to draw meaningful conclusions, albeit in the absence of a detailed assessment informed by stakeholder consultation and quantifiable data.

6.2 STAGE 1: HAZARD IDENTIFICATION

Stage 1 seeks to identify navigational hazards within the Pilotage district, related to vessels that may be expected to take pilots. In practice, of course, the vast majority of navigational activity in the navigation area is undertaken by non-pilotage vessels (mainly leisure craft) and the hazards affecting those vessels have been separately assessed in the Authority's PMSC compliant NRA.

- Vessel types likely to require pilotage (if directions were in place):
 - Commercial (freight) vessels greater than 20m LOA; and
 - Fishing vessels greater than 47.5m LOA.

However, there is no expectation that large fishing vessels may use the waterway, and they will not be considered.

- As well as the (very remote) possibility of two freight vessels colliding, such vessels may also collide with other vessels using the waterway. For this assessment "other vessels" have been divided into two categories:
 - Leisure / fishing / workboat /vessel carrying more than 12 pax in CHA area; and
 - Leisure / fishing / workboat /vessel carrying less than 12 pax in CHA area.
- The relevant hazards (i.e. those most likely to be mitigated by the presence of a marine Pilot) for each of the above vessel types are:
 - Collision;
 - Grounding; and
 - Contact.

6.2.1 Generic Risk Control Measures

A baseline of risk control measures within the control of the harbour authority, as identified below, have been considered relevant for the assessment:

- Operations are to be planned to the extent necessary to ensure safety:
 - Updated vessel information;
 - Clear communications; and

- Passage plans.
- Operations are to be fully compliant with legislation, guidance and best practice;
 - Register of relevant legislation/guidance maintained.
- All those involved in operations to be competent persons;
- All the necessary information is provided to undertake the movement safely:
 - Updated charts; and
 - Relevant port information promulgated via Notice to Mariners, websites and other publications.
- All equipment provided is fit for purpose:
 - Vessel to declare defects prior to arrival; and
 - Procedure in place to postpone operation pending rectification of defect.
- All necessary resources are allocated to mitigate identified risks;
- Operations are undertaken in accordance with up-to-date written procedures:
 - Navigation procedures and policies regularly reviewed and updated; and
 - All those tasked with undertaking the operation are familiar with current policies and procedures.
- Any exceptions to safe practice are reported:
 - Reports reviewed and procedures/risk assessments reviewed accordingly.
- Incidents and near misses are investigated:
 - Incident/near miss reporting procedure in place; and
 - Incident investigation procedure in place.
- A planned response to emergencies is available:
 - Emergency plans maintained, exercised and updated.

When scoring the hazards it is assumed that the above risk control measures are in place – relevant plans and procedures have been seen to be maintained by the Authority, although given the very infrequent pilotage operations, it must be considered that some aspects such as incident response, passage planning and vessel handling are seldom practised.

6.2.2 Local Risk Control Measures

Local risk control measures in place that are solely attributed to the Broads Authority include (but may not be limited to) the following:

- Lighting and marking of channels;
- Regular hydrographic survey;
- Risk assessments undertaken by organisers of large recreational events; and
- Harbour / Ranger patrols during high periods of activity within the navigation area.

6.2.3 Hazard Definitions

The following sections define:

- Collision;
- Grounding; and
- Contact.

6.2.3.1 Collision

Vessel collision is the structural impact between two moving vessels (including vessels not under pilotage).

The main reasons attributed to collisions include:

- Officer of the watch failure to observe the Navigation Byelaws;
- Fatigue, particularly on smaller coastal vessels;
- Met ocean conditions;
- Propulsion/steering/navigation system failure;
- Non - adherence to the (Vessel) Company's Safety Management System; and
- A combination of inexperience and systematic failure in the shipboard organisation.

The primary mitigation measure against the hazard of vessels colliding with one another is the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs). This risk assessment, in considering measures to minimise the risk of collision in respect of navigation, makes the assumption that vessels will be compliant with the COLREGs. However, the COLREGs do not apply on the Broads, but for this purpose it is considered that the navigation byelaws have the same mitigating effect.

6.2.3.2 Grounding

Grounding is a type of marine accident that involves the impact of a vessel on the seabed, resulting in damage of the submerged part of her hull and, in particular, the bottom structure.

Grounding accidents can be attributed to the following scenarios as follows:

- Human error, i.e. poor decision making, fatigue; inexperience;
- Insufficient passage planning;
- Failure to alter course at a given turning point near a underwater obstruction;
- Taking evasive actions near the obstruction and consequently run aground or make contact with the underwater obstruction;
- Met ocean conditions;
- Loss of propulsion through unexpected problems with the propulsion/steering system that occur in the vicinity of the underwater obstruction; and
- Dragging anchor resulting in the vessel going aground.

The complex and tidal nature of the channels in the navigation area makes grounding a very real hazard, and one for which pilotage is likely to be a very effective mitigation.

6.2.3.3 Contact

Contact is defined as an event wherein a vessel hits a fixed object, such as a quay wall or fixed navigation mark (e.g. Pile or Perch). For such an event to happen one of two scenarios must have occurred. Either the vessel failed to detect the fixed object, or it was unable to avoid hitting and can be attributed to:

- Human error;
- Defective/mechanical failure;
- Inadequate propulsion or steering; and/or
- Adverse weather conditions.

Given the complex and constrained waterways, and infrequent passages, contact must be considered a probable occurrence.

6.3 STAGE 2: INCIDENT FREQUENCY

The likely frequency at which the assessed hazards might be realised in the future may be assessed by means of:

- A review of third-party incident data and incident records (for example, from the MAIB, RNLI, HMCG, Police);
- A review of Internal (broads Authority) incident data and incident records;
- Application of professional judgement; and
- Consultation with the navigation officer.

In practice, there have been so few relevant movements of “pilotage” vessels in the CHA area within the last 15 years, that incident data is effectively non-existent, with more historic data being unreliable. It is therefore necessary to rely on professional judgement when assessing risks, including knowledge of incident rates in similar harbours to benchmark the assessment of frequencies with which hazards may occur.

For the purposes of this assessment a baseline traffic density for commercial traffic has been assumed at one vessel arrival and departure per week.

Of course, the actual traffic density at present is zero – there are no commercial vessel movements at all, and therefore the risk associated with such movement is also zero. However, to realistically assess the requirement for pilotage – some level of vessel traffic has had to be assumed.

6.4 STAGE 3: EFFECTIVENESS OF PILOTAGE AS A RISK CONTROL

There should be a sense of increased confidence when the pilot comes on board the ship. Not only does the pilot bring local expertise that reduces the risk of navigating in constrained waters, but he should also add to the effectiveness of the bridge team.

The local knowledge, integration into the bridge team and expertise of the pilot may therefore contribute to a meaningful reduction in the “frequency” of a collision, contact or grounding event occurring.

However, it has been assumed that if the hazard is realised (a collision, grounding or contact occurs) pilotage will have a negligible effect in reducing consequence.

Given the lack of recent pilotage experience in the navigation area, it is difficult to quantify pilotage effectiveness locally, but the following paragraphs discuss effectiveness in general terms and propose realistic values for effectiveness.

6.4.1 Pilotage Effectiveness - Collision

Whilst in transit a pilot may be considered to reduce the likelihood of a vessel colliding with another vessel. The pilot will be aware of other shipping movements and any constraints they may have on his manoeuvre. He will also be familiar with local maritime activities in the waterway such as diving, fishing, maintenance activities and recreational vessel behaviours.

However, in consideration of the pilot's effectiveness, it should not be overlooked that a competent mariner navigating his vessel in the navigation area without the benefit of a pilot would still be well placed to command a vessel that he is likely to be experienced at handling.

The effectiveness of pilotage in reducing the frequency of collision events is therefore somewhat limited as long as the master of the vessel correctly adheres to the COLREGs and is competent.

The effectiveness of pilotage in reducing collision frequency has been estimated at 25% for this assessment.

6.4.2 Pilotage Effectiveness – Grounding

It is considered that a Pilot would be most effective in mitigating against grounding incidents in the complex tidal channels of the Broads. While other mitigations such as marking and lighting, survey and charting, availability of real time and predicted tidal levels, and passage planning may all be effective and useful, local knowledge and experience is probably the most effective mitigation available and would normally be available through advice from a pilot. A competent mariner should be able to undertake the passage without advice but, combined with the need to keep a good lookout, and the likely density of inexperienced leisure vessels, there is a danger of overload, and local advice would likely be very effective in mitigating against the possibility of grounding.

It is noted that historically, Broads pilots are locally known as “Mud Pilots” for good reason.

The effectiveness of pilotage in reducing grounding frequency has been estimated at 75% for this assessment.

6.4.3 Pilotage Effectiveness – Contact

The pilot will be familiar with the port and berth layout including mooring arrangements, any restrictions alongside, as well as important details such as the availability and contact details of linesmen. In the event that a tug or pushing assistance may be required the pilot should understand the characteristics and capabilities of the tug. The pilot may also have a broader range of ship handling experience. However, taking into consideration events which are outwith the pilots' control, such as engine or steering failure, human error (e.g. helmsman puts the wheel the wrong way), extremes of weather and tug error (and the very rare use of tugs), then the effectiveness of pilotage in reducing the frequency of “contact” may be somewhat limited.

The effectiveness of pilotage in reducing contact frequency has been estimated at 50% for this assessment.

6.5 STAGE 4: HAZARD SCORING

Notwithstanding the fact that a full NRA is not within the scope of this report, a high-level assessment is still considered useful and has been prepared using the principle outlined above.

A baseline risk assessment has been developed and scored jointly by Marico Marine navigation experts, with existing generic and local mitigation measures (see **Sections 6.2.1** and **6.2.2**) in place but *without* any allowance for pilotage as a risk control measure.

The exercise was then repeated but with the introduction of Pilotage as a control measure – with the effectiveness of pilotage in reducing the risk for each hazard using the figures given in **Section 6.4** above.

The Hazman II software used by Marico Marine to assess navigational risk allows risk reduction effectiveness to be applied to each hazard assessed, and thus calculates baseline risk (without pilotage) and residual risk (with pilotage implemented as a risk reduction measure). The user inputs to the calculation for each hazard being:

- Hazard frequency;
- Hazard consequence (to people, property, the environment and business reputation); and
- Additional control measure effectiveness (only pilotage is considered in this short assessment).

Five hazards have been assessed to test the effectiveness of Pilotage as a risk control measure (**Table 3**).

Detail of the scoring exercise is given at **Annex B**.

Table 3: List of Hazards Identified for Assessment

Hazard Title	Category
Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying more than 12 pax in CHA area	Collision
Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying 12 or less pax in CHA area	Collision
Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)	Contact
Commercial vessel greater than 20m collides with another commercial vessel underway within CHA area	Collision
Commercial vessel greater than 20m grounds in CHA area	Grounding

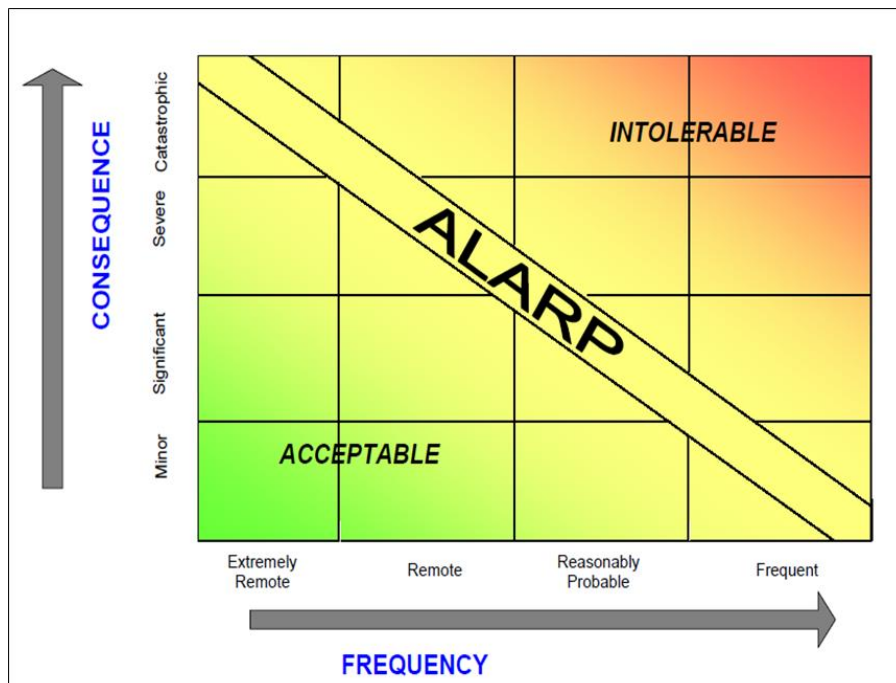
6.5.1 Interpretation of Risk Calculation Scores

A detailed methodology is provided in **Annex A**.

The combination of consequence and frequency of occurrence of a hazard is combined using a risk matrix (see **Figure 2**, below), which enables hazards to be ranked and a risk score assigned. The resulting scale can be divided into three general categories:

- Acceptable;
- As Low As Reasonable Practicable (ALARP); and
- Intolerable.

Figure 2: General Risk Matrix



The risk scores resulting from the assessment process are interpreted as shown in

Table 4, below:

Table 4: Risk Score Descriptors

Risk Number	Risk
0 to 1.9	Negligible
2 to 3.9	Low Risk
4 to 6.9	As Low as Reasonably Practical
7 to 8.9	Significant Risk
9 to 10.0	High Risk

6.5.2 Risk Ranked Summary – Without Pilotage

A summary of the ranked hazards, *without* pilotage as a control measure are detailed below in **Table 5**.

The two highest risks were collision with other vessels (either more or less than 12 passengers). The risk associated with these hazards are highest, chiefly due to the potential for injury – especially to those in smaller vessels (hire craft).

The risk of two commercial vessels colliding is lower, both due to the lower assessed consequence (particularly injuries), but mainly due to the very low likelihood (frequency) of this event occurring, even with the assumed traffic levels.

The assessment demonstrates that even without pilotage, all of the hazards fall within the “Low” or “ALARP” risk regions in terms of risk assessment and are therefore considered to be acceptable.

The highest scoring hazard was assessed to be a Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying more than 12 pax in CHA area, with an assessed score of 4.45.

Table 5: Ranked hazard List Without Pilotage in Place (Baseline).

Rank	Hazard Title	Category	Risk
1	Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying more than 12 pax in CHA area	Collision	4.45
2	Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying 12 or less pax in CHA area	Collision	4.05
3	Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)	Contact	3.06
4	Commercial vessel greater than 20m collides with another commercial vessel underway within CHA area	Collision	2.24
5	Commercial vessel greater than 20m grounds in CHA area	Grounding	2.07

6.5.3 Risk Reduction of Pilotage

By using the baseline risk assessment as a starting point (**Section 6.5.1**), the risk reduction values of pilotage and the methodology contained in **Section 6.4**, it was possible to calculate the residual risk with the pilotage risk control added.

The effectiveness of pilotage was deemed to have only a negligible (if any) impact upon the “consequence” of a hazard occurring and so only the “frequency” reduction is estimated, as effective pilotage will result in fewer incidents occurring. (See **Section 6.4** for discussion).

The results of the modified risk assessment are shown in **Table 6**.

The table shows the initial baseline/inherent risk without pilotage in place alongside the new residual risk with pilotage, and the difference between the two.

Table 6: Risk Reduction Effectiveness of Pilotage.

Rank	Hazard Title	Category	Risk		
			(Baseline / Residual)		Difference
1	Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying more than 12 pax in CHA area	Collision	4.45	4.34	-0.11
2	Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying 12 or less pax in CHA area	Collision	4.05	3.94	-0.11
3	Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)	Contact	3.06	2.78	-0.28
4	Commercial vessel greater than 20m collides with another commercial vessel underway within CHA area	Collision	2.24	2.22	-0.02
5	Commercial vessel greater than 20m grounds in CHA area	Grounding	2.07	1.85	-0.22

As expected, the addition of pilotage as a control measure does result in an overall reduction of assessed risk for each hazard; however the reduction is very low – and in fact close to negligible. This is chiefly the result of the very low level of traffic which requires pilotage, meaning the control, while potentially effective, is little used, combined with the fact that pilotage can only reduce the frequency, with little reduction in consequence, of any hazard being realised.

One of the hazard scores (Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying 12 or less pax in CHA area) changes from the ALARP to the Low risk region, but the difference is slight overall.

Similarly, the score for “Commercial vessel greater than 20m grounds in CHA area” falls from the low to negligible risk band, but again the overall difference is slight.

6.6 STAGE 5: RESULTS OF RISK REDUCTION ASSESSMENT

6.6.1 Comparison

A direct comparison of the risk for each of the identified hazards “with” or “without” pilotage in place can be made:

- Overall inherent navigational risk without pilotage – 15.87; and
- Overall residual risk with pilotage in place – 15.13.

These figures indicate that providing pilotage reduces the overall navigation risk by 5%. Therefore, for the identified hazards, pilotage is assessed as being only slightly effective at reducing the overall risk score when compared to operating without pilotage.

While pilotage is applicable to all the identified hazards it is evident that varying levels of reductions are spread across all hazards, with some hazards showing only slight reductions.

For all hazards, none of the risk scores exceeded “ALARP”, either with or without pilotage in place.

The highest scoring hazard, both with and without pilotage in place was “Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying more than 12 pax in CHA area”, with Pilotage reducing the risk by only 0.11 (a very small reduction).

The greatest reduction in risk achieved through the implementation of pilotage was only assessed to be 0.28 (again, a very small reduction) for the hazard “Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)”, which produced a score reduced to 3.06 from 2.78 after the pilotage control was applied.

6.6.2 Risk Assessment Conclusions

The risk assessment has produced the following conclusions:

- All navigation hazards identified for vessels that it has been assumed would require a pilot but scored *without* pilotage as a risk control measure were assessed to be in the ALARP or LOW risk bands;
- A qualitative assessment of the risk reducing effectiveness of pilotage has shown that pilotage reduces navigation by only 5%; and
- Pilotage is most effective at reducing the risk of the hazard “Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)”

It is emphasised that the apparent lack of effectiveness of pilotage as a risk control is very strongly driven by the frequency with which the control might be effective.

In simple terms, the control measure is expected to be so little used (due to the rarity of vessels requiring pilotage), that effectiveness is outweighed by other control measures which apply to all vessel types, including the majority which do not require pilots to be embarked.

It is also necessary to consider "perception" as well as risk. It is increasingly common that vessel Masters, company/owner and insurer are unlikely to be willing to commit vessels to challenging passages and harbour areas passage without a pilot being available. They will simply take business elsewhere.

It should be noted that this assessment has not attempted to undertake a cost-benefit analysis and has exclusively examined the comparative benefits on the safety of navigation of providing a pilotage service or not as the case may be.

6.6.3 Risk Assessment - Recommendation

The quantitative assessment of those hazards to navigation within the Navigation Area which could be realistically mitigated through the provision of pilotage as a control measure has demonstrated that:

- The baseline level of risk without Pilotage is ALARP or Low; and
- Pilotage only reduces the risk very slightly, still within the ALARP to Negligible risk bands.

While Harbour Authorities should always strive to reduce the level of risk associated with operations in their area to the lowest level practicable, there is no clear evidence that the current pilotage service (if used) would contribute significantly to a reduction of risk, all other control measures being maintained and remaining effective.

It is recommended that consideration should be given to formalising the current status of pilotage service as, despite the minimal contribution to risk reduction at present, the current arrangements are unsustainable.

However, it is considered that the ability to provide Pilotage may be useful in the future, and the Authority may wish to retain CHA powers (making clear that they are not currently used), to allow for the possibility that large vessels may wish to use the waterway in the future (e.g. a potential re-instatement of the Sugar Refinery wharf, given current policy to move freight from road to sea, or potential future large projects in the area which may require water based freight options).

Alternatively, the authority could apply to the Secretary of State to cease pilotage provision, and in the event of future need, re-apply to become a pilotage authority once again.

It is finally recommended (and required by the PMSC) that before any commercial vessel (over 20m loa) is permitted to use the waterway in future, the vessel / project should be subject to full navigation risk assessment taking into consideration realistic traffic densities, once they are known.

7 REVISED OPTIONS

Considering the risk assessment results and recommendations above, the three options for the pilotage service on the Broads identified in **section 5.2** of this report are reviewed below:

- No change to current arrangements;
- Continue to provide pilotage, but update; or
- Cease pilotage provision.

7.1 ADVANTAGES AND DISADVANTAGES OF OPTIONS

The following table (**Table 7**) shows the principal advantages and disadvantages of each of the options described above.

Table 7: Pilotage Options – Advantages and Disadvantages

Options	Advantages	Disadvantages	Recommendation
No change to current arrangements	The CHA retains autonomy on all pilotage matters.	Number of future pilotage acts is not considered high enough to maintain level of required competency.	Not recommended – unsustainable.
		Lack of suitable personnel.	
	No administrative burden associated with reviewing Directions.	Need to maintain formal training scheme and competence of pilot(s).	
		Direct and fixed employee costs unsustainable.	
		Administrative burden of maintaining service.	
		Pilotage has been shown to be a minimally effective risk reduction control	
	No legal costs.		
Continue to provide pilotage, but update arrangements	Entering a joint arrangement with another Harbour Authority <i>may</i> be a practical way to address the challenges of providing a pilotage service.	Not considered possible, as GYPC unlikely to enter into such an agreement.	Not recommended – not considered feasible – but GYPC might be approached formally to seek confirmation of this conclusion.
		Legal challenges and associated costs.	
		In practice, unlikely to be a workable solution	

Options	Advantages	Disadvantages	Recommendation
	<p>Reviewing Directions to clarify that while still a CHA, no pilotage is provided and no commercial vessels >20m loa are currently accepted on the waterway would clarify current situation.</p> <p>Would be a cost effective solution (no ongoing costs for a “sleeping” CHA).</p> <p>Would allow pilotage to be re-introduced with minimal costs in the future.</p> <p>No need to maintain pilots and training scheme while service not provided.</p>	<p>May require legal advice and confirmation.</p> <p>New guidance would need to be issued and potentially supported by amended byelaws</p>	Recommended Option
Cease pilotage provision	<p>Positively addresses all current challenges of providing service.</p> <p>Reversible decision – the PMSC requires the need for pilotage to be kept under review, so service could be re-introduced in the future if required.</p> <p>Would have no effect on navigational risk, while no vessels require pilotage</p>	<p>Does not allow re-introduction of service at short notice if trading conditions change</p> <p>Requires additional attention to ensure other controls remain effective.</p> <p>Legal process and significant associated costs to remove and /or reinstate CHA status.</p>	

7.2 PREFERRED OPTION

The results of this assessment have identified the formal updating and clarification of pilotage provision as the preferred option available to the Broads Authority.

If this option is pursued it will be essential to continue to keep all other risk control measures under review (as is required in any event to maintain compliance with the PMSC). In particular, those risk controls associated with management of marine traffic in the harbour area should be reviewed and, if possible, improved to raise effectiveness still further. However, pilotage should no longer be one of those control measures.

In order to achieve the objectives of this option, it is recommended that:

- The MSMS is updated to make clear that due to the lack of facilities for commercial freight traffic, and the consequent lack of demand, pilotage is not currently offered;

- The MSMS should explicitly state that Pilotage Directions are not currently made, and that this decision has been reached following formal risk assessment (this report);
- Similarly, it should be made clear that no officers are currently authorised to provide pilotage services;
- The maximum size of vessels permitted to enter the harbour should be defined (for example through byelaws or a General Direction) (See note in section 7.2.1 below);
- It should be made clear that the Authority remains a CHA, and will consider the re-introduction of pilotage, should future demand and risk assessment justify the issuing of new Directions; and
- The new status should be clearly and publicly promulgated – a suggested text (used by another UK Harbour Authority taking a similar approach to pilotage) is as follows: *“The Broads Authority is a Competent Harbour Authority (CHA) and has the authority to require pilotage. The Authority assesses the risk of the movement of shipping into and out of the harbour. With no large commercial traffic, there are no extant pilotage directions and any movements will be assessed on an individual basis”*.

7.2.1 Open Port Duty

A possible objection to this recommended option is the often quoted “Open Port Duty” which applies to Harbour Authorities by virtue of the Harbours, Docks and Piers Clauses Act 1847.

Section 33 of that act states that *“Upon payment of the rates made payable by this and the special Act, and subject to the other provisions thereof, the harbour, dock, and pier shall be open to all persons for the shipping and unshipping of goods, and the embarking and landing of passengers”*.

This clause is often taken to mean that a harbour must allow any vessel access under any circumstances – but clearly other constraints are in place, not least the facilities that the harbour can offer in terms of available berths and channel depths and dimensions.

It is therefore not only acceptable, but necessary to give clear guidance with regard to the maximum size of vessels a port can accept, and for the Broads this could be achieved through amendment to existing vessel dimension byelaws, or the issue of a General Direction (both of which would require consultation).

However, it is recommended that external and specialist legal advice be taken on these matters, especially as it is not certain that this section of the HDPC act applies to the Broads Authority.

8 RECOMMENDATIONS

Taking in to account the current and expected future traffic profile of the Broads Navigation Area, and the result of the navigation risk assessment forming Section 6 of this document, the following recommendations are made to the Authority:

- Engage with Great Yarmouth Port Authority to confirm whether providing pilotage under a joint arrangement is feasible;
- Assuming the above is not an option, undertake a full review of the MSMS to document formal arrangements for the discontinuation of any form of pilotage, while still maintaining the status of a Competent Harbour Authority;
- Seek specialist marine legal advice to support the above review, including amending Vessel dimension byelaws, or issuing a General Direction;
- Clarify the procedures which will be followed (based on full risk assessment) should any vessels of greater size than defined in the revised byelaws / Directions wish to enter the navigation area.

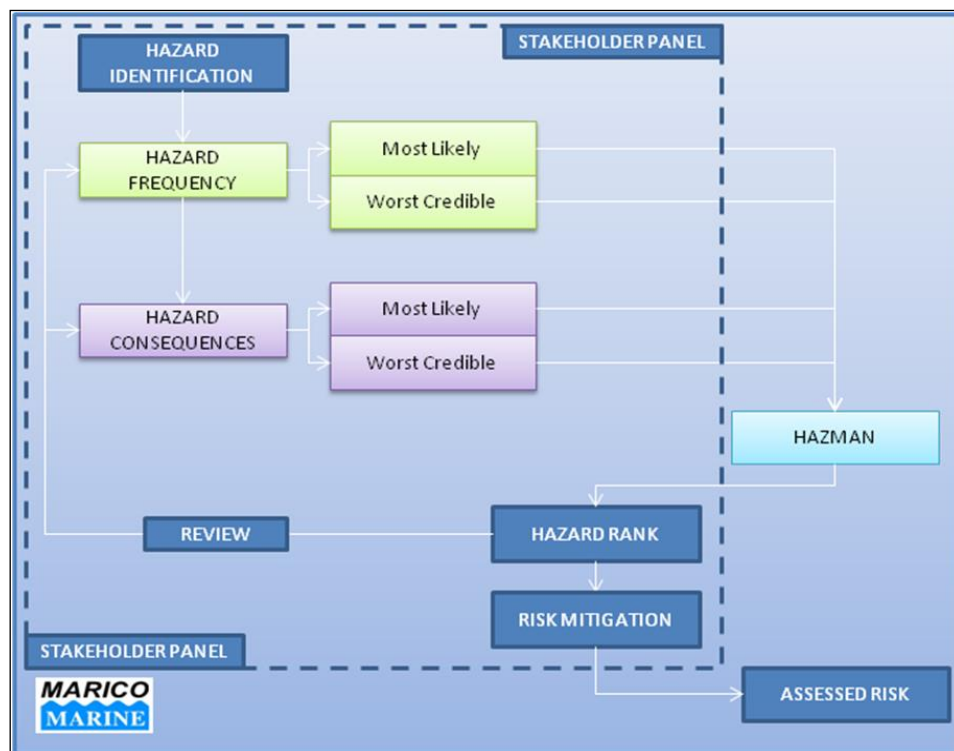
Alternatively, if there is no appetite for maintaining CHA status:

- Give consideration to the formal removal of CHA powers by application to the Secretary of State.

Annex A Risk Assessment Methodology

Risk Assessment Methodology

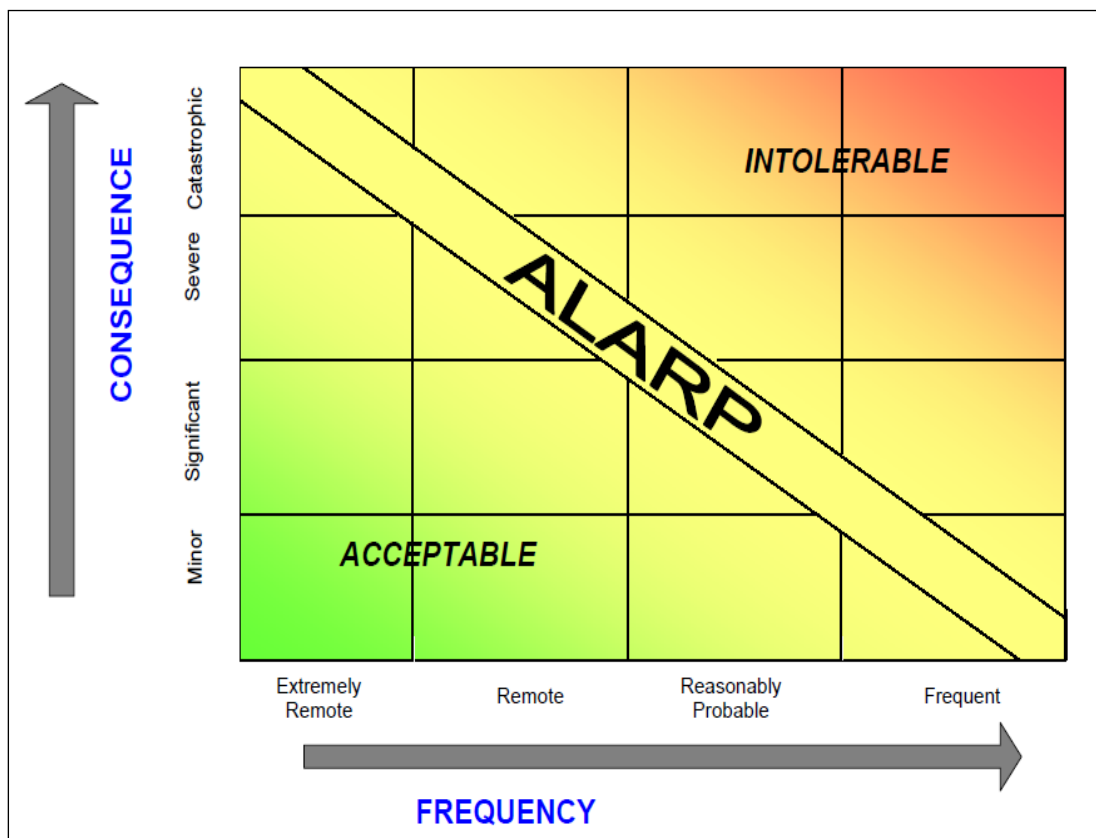
This Navigation Risk Assessment (NRA) identifies possible mitigation measures, where appropriate, and makes recommendations. The process starts with the identification of all potential hazards. It then assesses the likelihood (frequency) of a hazard causing an incident and considers the possible consequences of that incident. It does so in respect of two scenarios, namely the “most likely” and the “worst credible”. The quantified values of frequency and consequence are then combined using the Marico HAZMAN II software to produce a Risk Score for each hazard. These are collated into a “Ranked Hazard List” from which the need for possible additional mitigation may be reviewed.



Marico Marine hazard identification process

Criteria for Navigation Risk Assessment

Risk is the product of a combination of consequence of an event and the frequency with which it might be expected to occur. In order to determine navigational risk a Formal Safety Assessment (FSA) approach to risk management is used. International Maritime Organisation (IMO) Guidelines define a hazard as “*something with the potential to cause harm, loss or injury*”, the realisation of which results in an accident. The potential for a hazard to be realised can be combined with an estimated or known consequence of outcome. This combination is termed “risk”. Risk is therefore a measure of the frequency and consequence of a particular hazard.



General risk matrix

The combination of consequence and frequency of occurrence of a hazard is combined using a risk matrix (see above), which enables hazards to be ranked and a risk score assigned. The resulting scale can be divided into three general categories:

- Acceptable;
- As Low As Reasonable Practicable (ALARP); and
- Intolerable.

At the low end of the scale, frequency is extremely remote and consequence minor, and as such the risk can be said to be “acceptable”, whilst at the high end of the matrix, where hazards are defined as frequent and the consequence catastrophic, then risk is termed “intolerable”. Every effort should be made to mitigate all risks such that they lie in the “acceptable” range. Where this is not possible, they should be reduced to the level where further reduction is not practicable. This region, at the centre of the matrix is described as the ALARP region. It is possible that some risks will lie in the “intolerable” region, but can be mitigated by measures, which reduce their risk score and move them into the ALARP region, where they can be tolerated, albeit efforts should continue to be made when opportunity presents itself to further reduce their risk score.

Hazard Identification

Hazard identification is the first and fundamental step in the risk assessment process. In order to ensure that the process was both structured and comprehensive, potential hazards were reviewed using the incident categories identified as being relevant to this study:

- Collision
- Grounding; and
- Contact.

Risk Matrix Criteria

As indicated earlier, frequency of occurrence and likely consequence are both assessed for the “most likely” and “worst credible” scenario. Frequencies and consequences of occurrences were assessed using the same criteria as adopted by Dorset Council for other harbour assessments for consistency.

Frequency was assessed according to the levels set out in the table below.

Frequency criteria

Scale	Description	Operational Interpretation
F5	Almost Certain	More than once a month
F4	Likely	More than once in 6 months
F3	Possible	Once per year
F2	Unlikely	Less than once in 10 years
F1	Rare	Less than once in 100 years

Using the assessed notional frequency for the “most likely” and “worst credible” scenarios for each hazard, the probable consequences associated with each are assessed in terms of damage to:

- People
- Property
- Environment
- Business (Adverse publicity, impact on normal business activities and reputation)

The magnitude of each is then assessed using the consequence categories given in the table below.

Consequence Categories and Criteria.

Cat.	People	Property	Environment	Business
C1	Negligible			
	Very minor injury (e.g. bruising).	Very minor damage to property.	No effect of note. Tier 1 <u>may</u> be declared but criteria not necessarily met.	Very short-term disruption to services (1-2hrs) with ensuing loss of revenue.
		Costs <£10k	Costs <£10k	Costs <£10k
C2	Minor			
	Single minor injury.	Minor damage to property.	Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity.	Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities (<1 day).
		Costs £10k –£100k	Costs £10K–£100k	Costs £10k – £100k
C3	Moderate			
	Multiple minor or single major injury.	Moderate damage to property.	Tier 2 spill criteria reached but capable of being limited to immediate area within area.	Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions (1≥7 days).
		Costs£ 100k - £1M	Costs £100k -£1M	Costs £100k - £1M
C4	Major			
	Multiple major injuries or single fatality.	Major damage to property.	Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release.	Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.
		Costs £1M -10M	Costs £1M - £10M	Costs £1M -£10M
C5	Catastrophic			
	Multiple fatalities	Catastrophic damage to property.	Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity.	Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.
		Costs>£10M	Costs >£10M	Costs >£10M

Hazard Data Review Process

Frequency and consequence data are assessed for each hazard for both most likely and worst case scenarios.

Having decided in respect of each hazard which frequency and consequence criteria are appropriate for the five consequence categories in both the “most likely” and “worst credible” scenarios, ten risk scores are obtained using the following matrix (see below).

Risk factor matrix used for hazard assessment.

Consequences	Cat 5	5	6	7	8	10
	Cat 4	4	5	6	7	9
	Cat 3	3	3	4	6	8
	Cat 2	1	2	2	3	6
	Cat 1	0	0	0	0	0
	Frequency	Rare	Unlikely	Possible	Likely	Almost Certain

Where:

<i>Risk Number</i>	<i>Risk</i>
0 to 1.9	<i>Negligible</i>
2 to 3.9	<i>Low Risk</i>
4 to 6.9	<i>As Low as Reasonably Practical</i>
7 to 8.9	<i>Significant Risk</i>
9 to 10.0	<i>High Risk</i>

It should be noted that occasionally, a “most likely” scenario will generate a higher risk score than the equivalent “worst credible” scenario; this is due to the increased frequency often associated with a “most likely” event. For example, in the case of a large number of small personal injuries, the total number of accidents might be of greater significance than a single fatality at a lesser frequency.

Hazard Ranking

The risk scores obtained from the above process are then analysed further to obtain four indices for each hazard as follows:

- The average risk score of the four categories in the “most likely” set;
- The average risk score of the four categories in the “worst credible” set;
- The maximum risk score of the four categories in the “most likely” set; and
- The maximum risk score of the four categories in the “worst credible” set.

These scores are then combined in Marico Marine’s hazard management software “HAZMAN II” to produce a single numeric value representing each of the four indices. The hazard list is then sorted in order of the aggregate of the four indices to produce a “Ranked Hazard List” with the highest risk hazards prioritised.

Annex B Risk Data

Residual Risk Data: 23UK1953 Broads Pilotage Review

					Consequence Descriptions		Risk By Consequence Category											
							ML					WC						
Rank	Ref	Accident Category	Hazard Title	Possible Causes	Most Likely (ML)	Worst Credible (WC)	Frequency	Environment	People	Property	Reputational		Frequency	Environment	People	Property	Reputational	Risk Overall
1	5	Collision	Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying more than12 pax in CHA area	Avoidance of 3rd party vessel; Restricted visibility; communication difficulties; severe weather; mechanical failure; equipment failure; navigation error; failure to observe COLREGs; failure to keep a proper lookout; persons navigating under influence of drugs/alcohol; unlit vessel;	Negligible environmental impact; multiple minor or single major injury; minor damage to commercial, moderate to smaller vessel; Adverse regional publicity.	Minor environmental impact; multiple fatalities; minor damage to commercial, major to smaller vessel; Adverse international publicity.	3	1	3	2	3		2	2	5	4	5	4.34
2	3	Collision	Commercial vessel greater than 20m collides with a leisure / fishing / workboat /vessel carrying 12 or less pax in CHA area	Restricted visibility; communication difficulties; severe weather; mechanical failure; equipment failure; navigation error; failure to observe COLREGs; failure to keep a proper lookout; persons navigating under influence of drugs/alcohol; unlit vessel;	Negligible environmental impact; multiple minor or single major injury; minor damage to commercial, moderate to smaller vessel; Adverse regional publicity.	Minor environmental impact; multiple major injury or single fatality; minor damage to commercial, major to smaller vessel; Adverse national publicity.	3	1	3	2	3		2	2	4	4	4	3.94
3	10	Contact	Commercial vessel greater than 20m contacts harbour infrastructure (Quay, fixed navigation aid etc.)	severe weather; mechanical failure; equipment failure; navigation error; Inaccurate hydrographic information; persons navigating under influence of drugs/alcohol;	(Contact with a pile / nav aid or jetty). Negligible environmental impact, negligible injuries, minor damage (to pile), negligible reputational damage.	(Contact with a pile / nav aid or jetty). Tier 1 oil spill (minor); Single minor injury, moderate damage (to vessel and quay), adverse regional publicity	4	1	1	2	1		3	2	2	3	3	2.78
4	1	Collision	Commercial vessel greater than 20m collides with another commercial vessel underway within CHA area	Avoidance of 3rd party vessel; Restricted visibility; communication difficulties; severe weather; mechanical failure; equipment failure; navigation error; failure to observe COLREGs; failure to keep a proper lookout; persons navigating under influence of drugs/alcohol; unlit vessel;	Negligible pollution, Minor injury, Minor damages, adverse local publicity.	Tier 2 pollution; Multiple minor injuries or single major; Moderate damage to both vessels; Adverse Regional publicity.	2	1	2	2	2		1	3	3	3	3	2.22
5	7	Grounding	Commercial vessel greater than 20m grounds in CHA area	Avoidance of 3rd party vessel; Restricted visibility; communication difficulties; severe weather; mechanical failure; equipment failure; navigation error; uncharted obstruction; Inaccurate hydrographic information; persons navigating under influence of drugs/alcohol;	Negligible environmental effects, negligible injuries, negligible costs, negligible publicity	Tier 2 pollution (moderate), very minor injuries, major property losses, adverse regional publicity.	4	1	1	1	1		2	3	2	4	3	1.85