KEADBY
NEXT GENERATION
POWER STATION
Hydrogen-enabled flexible power

A collaboration between SSE Thermal and Equinor

The Keadby Next Generation Power Station Project

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The Keadby Next Generation Power Station Development Consent Order [year]

Environmental Statement (ES)

Volume II – Appendix 12C Navigational Risk Assessment

The Planning Act 2008

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

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GLOSSARY

Abbreviation	Description
ABP	Associated British Ports - UK port operator with a network of 21 ports across Britain.
ALARP	As Low as Reasonably Practicable
AIL	Abnormal Indivisible Load
AIS	Automatic Identification System - a maritime safety communications system.
COLREGS	The Convention on the International Regulations for Preventing Collisions at Sea 1972 – sets out a series of obligations and rules which apply to all vessels upon the high seas.
CSD	Cutter Suction Dredger
DCO	A Development Consent Order - made by the relevant Secretary of State pursuant to The Planning Act 2008 to authorise a Nationally Significant Infrastructure Project.
DfT	Department for Transport
DTI	Department for Trade and Investment
FSA	Formal Safety Assessment - a structured and systematic methodology, aimed at enhancing maritime safety.
GT	Gross tonnage
ICES	The International Council for the Exploration of the Sea - standardise the division of sea areas to underpin statistical analysis around the UK.

Abbreviation	Description
MAIB	Marine Accident Investigation Branch
MCA	The Maritime and Coastguard Agency - responsible for the administration of several statutory instruments with relation to the management of maritime safety.
MCAA	The Marine and Coastal Access Act 2009 - the basis upon which the Marine Management Organisation determine applications to undertake works – or 'licensable activities' – within English waters
MCMS	Marine Case Management System - the online portal provided by the Marine Management Organisation (MMO) where users can utilise an interactive assistance tool, search the marine licence public register and submit enquiries to the MMO.
MGN	Marine Guidance Note – a method of issuing technical advice to mariners administered by the Maritime and Coastguard Agency.
MIS	Marine Information System - an interactive tool for marine licensing applicants and decision makers, supporting marine plan implementation.
MMO	Marine Management Organisation - created in 2009 by the Marine and Coastal Access Act. MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs.
NAABSA	'Not Always Afloat But Safely Aground'; used to refer to a pocket on a tidal waterway where vessels may ground safely at low water for docking.
NRA	Navigational Risk Assessment - identifies and assesses the hazards and risks affecting vessel navigation.
OHL	Overhead Line
RYA	The Royal Yachting Association - the national body for dinghy, yacht and motor cruising, all forms of sail racing, RIBs and sports boats, windsurfing and personal watercraft.
SSC	Suspended Sediment Concentration

Abbreviation	Description
UNCLOS	United Nations Convention on the Law of the Sea (1982) - sets out a range of provisions to help manage and maintain all aspects of the marine environment.
VTS	Vessel Traffic Service – IMO standardised system used to track and monitor vessel movements.
WCS	Worst Credible Scenario - the highest consequence scenario identified that is considered plausible or reasonably believable.

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12C.1. Overview

12C.1.1. Keadby Next Generation Power Station (hereafter referred to as the 'Proposed Development') is described in **Environmental Statement (ES) Volume I Chapter 4**: The Proposed Development (**Application Document Ref. 6.2**) and **Chapter 5**: Construction Programme and Management (**Application Document Ref. 6.2**).

12C.1.2. The scope of this Navigational Risk Assessment (NRA) covers the proposed works associated with the Stainforth and Keadby Canal and navigational safety in relation to the use of Railway Wharf on the tidal River Trent for construction deliveries. This NRA has been prepared in support of **ES Volume I Chapter 12**: Water Environment and Flood Risk (**Application Document Ref. 6.2**).

12C.1.3. This NRA builds on the NRA previously undertaken for Keadby 3 CCS Power Station DCO ('Keadby CCS Power Station'), which assessed the same scale, nature and extent of works in the River Trent and Stainforth and Keadby Canal as the Proposed Development as well as additional potential works in the River Trent to create new abstraction infrastructure (which are not included as part of the present Proposed Development).

12C.1.4. SSE currently abstracts water from Stainforth and Keadby Canal for the operational Keadby 2 Power Station and has an agreement with the Canal and River Trust for the abstraction of additional water for the proposed Keadby CCS Power Station. As the Proposed Development is an alternative to Keadby CCS Power Station (with a slightly lower water demand), it is considered that the abstraction licence for Keadby CCS Power Station could be utilised for the Proposed Development. New abstraction infrastructure would need to be constructed in the Canal, which would involve the installation of a temporary cofferdam.

12C.1.5. During construction, the existing infrastructure associated with the Waterborne Transport Off-loading Area on the River Trent (Railway Wharf) would be used to facilitate offloading of Abnormal Indivisible Loads (AIL) as was undertaken for the construction of Keadby 2 Power Station. The use of Railway Wharf is aligned with strategic policy including The Highways England document 'Water preferred policy guidelines for the movement of abnormal indivisible loads' (Highways England, 2016), which states that it is government policy to avoid road transport as far as possible by using alternative modes, such as water. Railway Wharf has

also been demonstrated, through the construction of Keadby 2 Power Station, to be an effective means of bringing AIL to the area.

12C.1.6. No works are proposed in the tidal River Trent but the Proposed Development Site ('the Site') does include areas of the River relating to the use of existing infrastructure – the existing Keadby Power Station water discharge outfall and Railway Wharf river berth. Based on the anticipated scale, nature and extent of works and understanding of the area, a qualitative approach is considered to be appropriate and has been adopted within this NRA.

12C.2. Legislative Context

Legislation

Marine and Coastal Access Act

12C.2.1. The River Trent is tidal at Keadby and falls within the UK marine area. The Marine and Coastal Access Act 2009 (MCAA) (HMSO, 2009) is the basis upon which the Marine Management Organisation (MMO) determine applications to undertake works – or 'licensable activities' – within English waters.

12C.2.2. As the Proposed Development does not require works within the UK Marine Area under Section 42, MCAA, a Marine Licence is not required.

12C.2.3. The MCAA sets out the legislative framework for the application of Marine Plans to relevant planning decisions in the UK Marine Area. Specifically, decisions affected by marine policy documents include "*the determination of any application […] for authorisation of the doing of any act which affects or might affect the whole or any part of the UK marine area*" (Section 58, MCAA).

12C.2.4. Although the Proposed Development does not include works within the UK marine area, marine policy documents may be relevant to the determination process for the Proposed Development due to the inclusion of land within the marine environment within the Site boundary. The UK Marine Policy Statement (MPS) and its relevance to the Proposed Development is discussed within **ES Volume I Chapter 7:** Legislation and Planning Policy (**Application Document Ref. 6.2**) whilst Marine Plans are considered in further detail below.

12C.2.5. The East Inshore and East Offshore Marine Plans (Department for Environment, Food and Rural Affairs, 2014) establish the plan led system for the marine area in which the riverine parts of the Site are located.

12C.2.6. In Section 2, the vision and objectives for the East marine plan areas are stated; the vision for the East marine plan area is summarised below:

"By 2034, sustainable, effective and efficient use of the East Inshore and East Offshore Marine Plan Areas has been achieved, leading to economic development while protecting and enhancing the marine and coastal environment, offering local communities new jobs, improved health and well-being. As a result of an integrated approach that respects other sectors and interests, the East marine plan areas are providing a significant contribution, particularly through offshore wind energy projects, to the energy generated in the United Kingdom and to targets on climate change"

12C.2.7. The East marine plan contains a suite of policies designed to balance environmental, economic, and social objectives. A review of these policies of general relevance to the project are considered in full within **ES Volume I Chapter 7:** Legislation and Planning Policy (**Application Document Ref. 6.2**); key policies of relevance to the NRA are summarised below:

- **Policy ECO1**: Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation.
- **Policy GOV2**: Opportunities for co-existence should be maximised wherever possible.
- **Policy GOV3**: Proposals should demonstrate in order of preference:
  - that they will avoid displacement of other existing or authorised (but yet to be implemented) activities;
  - how, if there are adverse impacts resulting in displacement by the proposal, they will minimise them how, if the adverse impacts resulting in displacement by the proposal, cannot be minimised, they will be mitigated against or;
  - the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts of displacement.
- **Policy PS3**: Proposals should demonstrate, in order of preference:
  - that they will not interfere with current activity and future opportunity for expansion of ports and harbours;
  - how, if the proposal may interfere with current activity and future opportunities for expansion, they will minimise this;
  - how, if the interference cannot be minimised, it will be mitigated; and

– the case for proceeding if it is not possible to minimise or mitigate the interference.

12C.2.8. More widely, the East Marine Plan recognises the importance of Navigational Safety; Paragraph 247 - 248 state that:

"*Navigational safety is equally important beyond International Maritime Organization routes as well as port and harbour areas (which are addressed directly under plan policies PS1, PS3, and DD1 respectively) and has been particularly highlighted by stakeholders in the development of these marine plans* […] *Decision-makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation, and navigational safety and ensure that their decisions are in compliance with international maritime law* […] "

Convention on the International Regulations for Preventing Collisions at Sea

12C.2.9. The Convention on the International Regulations for Preventing Collisions at Sea 1972 – or 'COLREGS' – sets out a series of obligations and rules which apply to 'all vessels upon the high seas'; the overall objective of the COLREGS is to ensure the safe navigation of the mariner (International Maritime Organisation, 1972).

12C.2.10. The COLREGS contain a range of different technical rules which apply to the mariner in order to underpin safe navigation; it is for the mariner to ensure compliance with the COLREGS and the convention.

12C.2.11. The COLREGS, whilst having relevance to the wider topic of maritime safety, do not set out any explicit requirements for NRAs. An understanding of the COLREGS is however required to understand if - and if applicable how – any proposed works may interfere with the mariner's compliance to the COLREGS obligations.

United Nations Convention on the Law of the Sea (1982)

12C.2.12. The United Nations Convention on the Law of the Sea ('UNCLOS') (United Nations, 1982) sets out a range of provisions to help manage and maintain all aspects of the marine environment - "*an unprecedented attempt by the international community to regulate all aspects of the resources of the sea and uses of the ocean, and thus bring a stable order to mankind's very source of life*" (United Nations, 1998). There are several Articles within UNCLOS which relate to marine navigation and ultimately, the minimisation of risk at sea and the preservation of life.

The Humber Conservancy Act 1852 (and subsequent)

12C.2.13. The River Humber Conservancy Act of 1852 was the first of several Conservancy Acts for the Humber and wider surrounds. The initial 1852 Act created a body responsible for the management of the Humber and surrounds – the 'River Humber Conservancy Commissioners'. The Act also conferred powers to the River Humber Conservancy Commissioners; the broad purpose of these powers was to maintain and improve navigable areas within and around the River Humber.

12C.2.14. Section 9 of one of the 1899 Conservancy Act also provides a power for Associated British Ports (ABP) to grant licences for the execution of works such as landing stages, slipways, piers, jetties and also 'any protective or other works' (ABP, 2014).

12C.2.15. The areas of the River Trent included within the Site are entirely within the statutory harbour area managed by ABP Humber, being within the River Trent seaward (north) of the Stone Bridge at Gainsborough.

The Humber Navigation Bylaws 1990

12C.2.16. The Humber Navigation Byelaws ('The Byelaws') (ABP, 1990) provide a series of directions from ABP Humber, as the statutory harbour authority, focused on the management of a safe and efficient harbour area.

12C.2.17. The Byelaws are divided into five key sections:

- General duties of masters of vessels;
- Lights and signals;
- Mooring and management of vessels;
- Conduct of persons; and
- Penalty for contravention of byelaws, responsibility and defence.

The Merchant Shipping Regulations 2002

12C.2.18. The Maritime and Coastguard Agency (MCA) is responsible for the administration of several statutory instruments with relation to the management of maritime safety.

12C.2.19. Those with most relevance to this NRA are The Merchant Shipping (Safety of Navigation) Regulations 2002 (Maritime and Coastguard Agency, 2002). As with COLREGS, it is for the mariner to ensure compliance with these regulations, but a wider understanding of the Merchant Shipping Regulations is required as part of this NRA in order to understand how any proposed works may interfere with the mariner's compliance with them.

Guidance

MCA Marine Guidance Note (MGN)

12C.2.20. The MCA have released a series of MGN to help provide technical guidance on a range of different marine topics. MGN of primary relevance to this NRA are summarised below:

- MGN 699 (M) – Guidance on the merchant shipping (carriage of cargoes) regulations 2024 (MCA, 2024); and
- MGN 654 (M+F) Offshore Renewable Energy Installations (OREI) safety response (MCA, 2021).

12C.2.21. MGN 699 is focused on the safe planning, preparation, transport and management and unloading of bulk cargoes. The MGN also sets out specific expectations of alignment between the mariner/ bulk cargo operator and the eventual receiving facility (i.e. the port). As with the Merchant Shipping Regulations and COLREGS, it will be for any eventual contractor responsible for the AIL shipment and unloading process to adhere to the Merchant Shipping (Carriage of Cargoes) Regulations – and the MGN 107 directions – as appropriate. Notwithstanding, an understanding of these requirements is required as part of this NRA to ensure that the activities planned within the River Trent neither hinder or fetter the mariners compliance with relevant legislation and MCA direction.

12C.2.22. MGN 654 sets out a range of technical guidance surrounding the process of NRA; this has been used to help inform the development of this NRA. MGN 654 has a primary focus on Offshore Wind but in line with the MCA direction, may be of relevance to other power (and wider) development within 'United Kingdom internal waters'. The key elements of MGN 654 which are of relevance to this NRA are as follows:

- **Section 1** (Paragraph 1.2): recommendations provided within the MGN should be taken into account by developers seeking formal consent for marine works;
- **Section 2** (Paragraphs 2.2 and 2.4): provides signposting to relevant legislation;
- **Section 3** (Paragraph 3.1): encourages consideration of recommendations as part of the EIA process; and
- **Section 3** (Paragraph 3.2): sets out the expectation that developers should evaluate all 'navigational possibilities, which could be reasonably foreseeable.'

12C.3. Purpose and Scope of the Assessment

12C.3.1. The Site includes areas within both the UK Marine Area (Section 42, MCAA) and areas of the Humber within the control of ABP Humber as statutory harbour authority.

12C.3.2. In order to ensure a robust assessment of the likely significance of the environmental effects of the Proposed Development, the NRA has been undertaken adopting the principles of the 'Rochdale Envelope' approach, where appropriate. This involves assessing the maximum (or where relevant, minimum) parameters for the elements where flexibility needs to be retained (such as the building dimensions or operational modes for example).

12C.3.3. For the NRA specifically, the exact extent, nature and duration of activities within the River Trent and/ or the Stainforth and Keadby Canal cannot be determined in the absence of an appointed contractor(s). On this basis, a reasonable worst-case has been established for these working areas based on historical experience (including associated with the construction of Keadby 2 Power Station), professional judgment and technical feedback from relevant maritime stakeholders.

12C.3.4. Justification for the need to retain flexibility in certain parameters is outlined in this Appendix and also in **ES Volume I Chapter 4**: The Proposed Development and **Chapter 6**: Consideration of Alternatives (**Application Document Ref. 6.2**).

12C.3.5. This NRA is an appropriate and proportionate assessment of the risks to navigation associated with the Proposed Development. The objectives of the report are to:

- collect, review and present existing information relevant to the topic of navigational risk;
- consult with relevant navigational bodies in relation to expectations for navigational safety;
- assess the potential risks arising from activities in the marine environment required as part of the Proposed Development; and
- present any mitigating measures needed to minimise the risk of the Proposed Development causing either a disturbance to other legitimate users of the sea or a navigational risk.

12C.4. Marine Baseline

Vessel Density

12C.4.1. Automatic Identification System (AIS) data can be used to provide an insight into the average vessel density in the area surrounding the Site. AIS is a maritime safety communications system adopted by the International Maritime Organisation (IMO) in order to provide vessel information, primarily for maritime safety purposes; AIS also provides a source of information to spatially represent vessel movements to help inform planning.

12C.4.2. AIS signals can be broadly categorised as Class A and Class B; class A ('AIS-A') is carried by large, international ships with a gross tonnage (GT) of 300 tonnes or more and all passenger vessels. Class B ('AIS-B') is carried by smaller vessels and is typically found on small commercial vessels, some fishing vessels and recreational vessel users. Whilst useful to characterise high-level shipping trends, AIS does have limitations; most notably, AIS provides a characterisation of commercial shipping but omits commercial vessels <300GT, recreational vessels, fishing vessels as well as military and governmental vessels whilst on deployment.

12C.4.3. The Proposed Development is within a single vessel density grid – Grid ID 171732. Density grid '171203' is approximately 200m to the south of the Site whilst density grid '172261' is approximately 500m to the north.

12C.4.4. AIS data can represented visually as density grids 'or heat maps'. Publicly available AIS data from the MMO has been obtained for both 2018 and 2019 (MMO, 2023); this is reported in density grids (**ES Volume III Figure 12C-1:** Vessel Density Grids (**Application Document Ref. 6.4**)) and as anonymised AIS-derived transects (**ES Volume III Figure 12C-2:** Anonymised AIS Derived Track Lines (**Application Document Ref. 6.4**)).

12C.4.5. The Proposed Development is within a single vessel density grid – Grid ID 171732. Density grid '171203' is approximately 200m to the south of the Site whilst density grid '172261' is approximately 500m to the north.

12C.4.6. These figures show that the Humber Estuary itself – and approaches – feature a far greater vessel density than the River Trent; this is largely attributable to the nature of the Humber Estuary as a major shipping hub.

12C.4.7. The Port of Hull spans multiple individual locations along the north and south bank of the Humber Estuary and handles approximately 10 million

tonnes of cargo per year (ABP, 2025a). The Port offers a range of different services including:

- Agribulks;
- Bulk Energy;
- Construction;
- Containers;
- Cruise;
- Forest Products;
- Liquid Bulks;
- Offshore Wind;
- Project Cargo;
- Ro-Ro and Ferries; and
- Steel and other metals.

12C.4.8. DfT statistics indicate an average of ~10,500 vessel arrivals per annum over the past five years across all ports on the Humber, Hull and River Trent (DfT, 2025a). These figures only cover seagoing vessels and exclude “fishing, towing/pushing craft, other work vessels, non-seagoing ships, non-merchant ships, non-ship structures, vessels of unknown or unrecorded type”. A summary of this historical data across the relevant ports is detailed in Table 12C.1 below.

Table 12C.1: DfT Data on Historical Vessel Movements

Vessel arrivals					
Port	**2019**	**2020**	**2021**	**2022**	**2023**
Goole	618	534	583	495	420
Grimsby & Immingham	7325	6665	6759	6709	6667
Hull	3105	2510	2235	2004	1985
River Trent	498	386	429	424	392
Rivers Hull & Humber	474	374	361	332	351
Grand Total	**12020**	**10469**	**10367**	**9964**	**9815**

12C.4.9. The DfT statistics for vessel arrivals on the River Trent (DfT, 2025b) are presented in **Plate 12C.1**. This shows a general downward trend in seagoing vessel traffic on the River Trent. It is considered that this general downward trend may be explained (amongst other reasons) by industrial decline for core local industries (including steel).

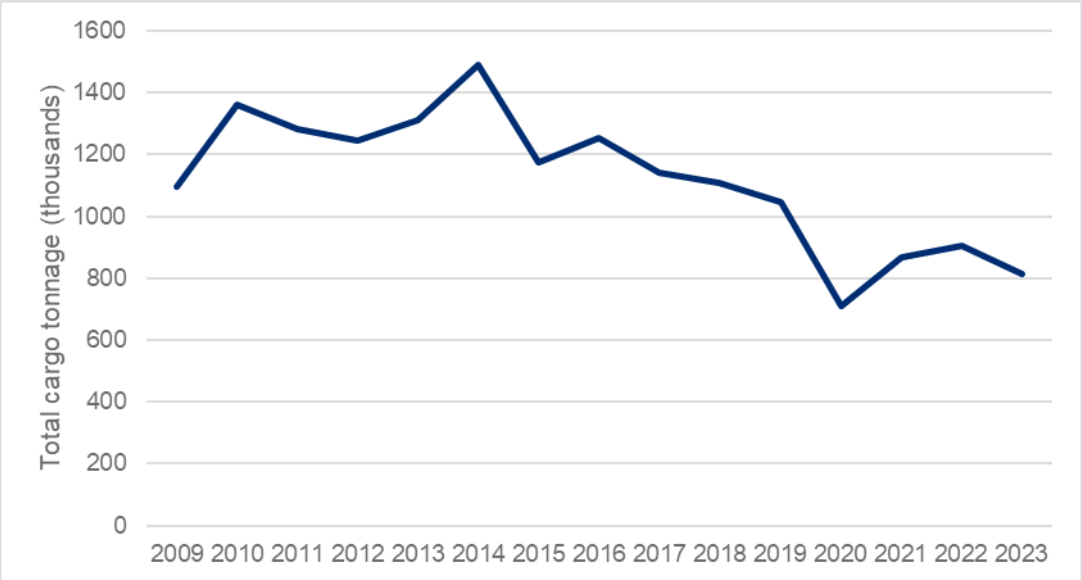


Plate 12C.1: Cargo tonnage on the River Trent

12C.4.10. ABP Humber data indicates an average of ~21,400 vessel movements per annum across their jurisdictional area. A summary of historical vessel

movements with this area is detailed in Table 12C.2 below (ABP, 2025b). Through engagement with ABP Humber, it is understood that commercial vessel traffic on the Trent is generally limited to Flixborough and Grove Wharf and traffic to Keadby and Gunness has been negligible over the past 12 months.

Table 12C.2: ABP Humber Data on Historical Vessel Movements

Type	2021	2022	2023	2024
ABP Acts	14,859	14,958	13,353	13,247
VLS Moves	928	987	887	913
Non VLS Moves	13,931	13,971	12,466	12,334
PEC Acts	7,661	6,995	7,424	7,169
Total Movements	**22,520**	**21,953**	**20,777**	**20,416**

12C.4.11. Data gathered by the MMO related to the movement of the following short-sea shipping types (MMO, 2021) has also been analysed:

- cargo vessels (general);
- non-port service craft;
- port service craft;
- recreational vessels; and
- tankers.

12C.4.12. Of these vessel types, ‘cargo vessels’ are the only vessel type which have been recorded navigating within the direct vicinity of the Proposed Development; the southernmost extent of this data is density grid ‘171203. ‘Tankers’ data was unavailable; however, based on assessment during the previous NRA, these vessels are understood to enter a much more limited area of the River Trent with the southernmost extent of this data being density grid ‘173849’. The vast majority of the other vessel types are recorded east of the Humber Bridge.

12C.4.13. Given the AIS and vessel density data limitations referenced above, further consideration is given to other mariners, such as commercial fishers and recreational mariners, below.

Port Activity

PD Ports

12C.4.14. The Site is within the direct vicinity and incorporates parts of Keadby, a port which is owned and operated by PD Ports. PD Ports operate a selection of individual facilities within their Humber cluster:

- Keadby (immediately adjacent to and partly within the Site);
- Grove Wharf/ Groveport (including Neap House Wharf) (1.5km north-east of the Site)
- Port of Howden (16.5km north-west of the Site); and
- Port of Immingham (35km east of the Site).

12C.4.15. A range of commodities are handled at these locations; this includes Agribulks, Dry Bulk Cargo, Forest Products, Offshore, Project Cargo and Steel/ Metals. Pre-application engagement for the previous NRA was carried out with PD Ports in March 2021, with responses helping to inform the content of the previous submission.

12C.4.16. Railway Wharf, owned by the applicant, includes the use of access through PD Ports assets.

RMS Ports

12C.4.17. RMS Ports operate the RMS Trent facility at Flixborough Wharf (3km north-east of the Site). RMS Ports previously operated the Gunness Wharf Port (700m south-east of the Site) which is understood to have since been sold to an unidentified company.

12C.4.18. A variety of different commodities are handled through these locations; including timber, bulks and packaged commodities, though there is a particular focus on steel-based cargo (RMS Ports, 2025).

12C.4.19. It is noted that RMS Ports previously operated a site at Althorpe Wharf (1km south of the Site), though this is now owned and operated by Rainham Steel

Rainham Steel

12C.4.20. Rainham Steel purchased Althorpe Wharf from RMS Trent in 2023 and is considering reintroducing river terminal use there (BusinessLive, 2023).

ABP Humber

12C.4.21. No publicly available information has been identified specifying the typical cargoes handled by this facility; however, previous engagement with ABP Humber has provided an indication that cargoes are typical of those handled at facilities operated by PD Ports and RMS Ports.

12C.4.22. On approaching the Humber, the master of a vessel must give notice to ABP Humber (i.e. Vessel Traffic Service (VTS) Humber) to provide details of the vessel's arrival at, departure from or movement within the Humber. Once within the Humber itself, there are a series of reporting points which the master of a vessel must report when passing (these are published via Notice to Mariners).

12C.4.23. There are a range of other reporting and safety requirements which are specified within the Humber Navigation Byelaws 1990.

12C.4.24. As well as AIS, ABP Humber Estuary Services (ABP HES), as the Competent Harbour Authority, operate a bespoke system to safely manage, monitor and control the safety of navigation on the river, which is called Port and Vessel Information System, or 'PAVIS' (ABP HES, 2025).

Marine Works

12C.4.25. Data published by the MMO via the Marine Case Management System (MCMS) and the 'Explore Marine Plans' database (or 'EMP database', formerly the Marine Information System), indicates the presence of several 'active' Marine Licences within the immediate vicinity of the Proposed Development (Marine Management Organisation, 2020a; 2020b):

- MLA/2014/00183/2 (SSE Keadby Power Station: Keadby Power Station Intake / Outfall Dredging and associated 'disposal to sea');
- MLA/2018/00547 (Environment Agency: Keadby TAO Trent Side Outfall Refurbishment); and
- MLA/2016/00207/1 (Severn Trent Water: Outfall Repairs at Gunness and Althorpe).

12C.4.26. Of these activities, MLA/2018/00547 and MLA/2016/00207/1 are relatively minor activities; these operation and maintenance (O&M) and refurbishment works are understood, from public records, to have been completed.

12C.4.27. MLA/2017/00312/2 is an active maintenance and dredging licence which is in place for the Keadby Power Station area along the River Trent; from approximately 100m south of the Development Site at its most southerly extent to 100m north of the Development Site at its most northerly extent. A review of the MLA and supporting documentation has been carried out, alongside relevant consultation responses to the MMO 'case'.

12C.4.28. **Plate 12C.2** shows that the River Trent has high Suspended Sediment Concentrations (SSC). This turbidity, and the nature of the Trent as a narrow, tidal River at this location leads to high levels of siltation – and potential fouling risk – at both the existing Keadby Power Station intake and outfall.

Plate 12C.2: Keadby 1 Power Station intake (left) and outfall (right) taken during outage

12C.4.29. Keadby Power Station periodically dredges a wide area of the River Trent and locally disposes of arisings. The license states that the dredging will utilise either the 'John M' Cutter Suction Dredger (CSD) barge, which is a maximum of 39m in length and 5.95m in beam, or the 'Rebecca M' barge with a $1m^3$ grab, which has a length of 37m and beam 10m.

12C.4.30. Based on previous engagement, Keadby Power Station also periodically maintains the intake and outfall areas using a combination of hand-based maintenance from shore (exploiting the use of the gantry system at the intake, for example) and river-based dive operations, again by hand. This activity typically involves the following vessel:

12C.4.31. Survey/ Workboat; Safety Vessel: a general-purpose, small single crew workboat. This is a non-specialist, general purpose vessel although typical dimensions are a length of 12m and a beam of 4.9m.

Recreational Sailing

12C.4.32. As noted above, there are several limitations to AIS; this includes the omission of most recreational vessels from the AIS datasets (AIS is not mandatory for the vast majority of recreational vessels). On this basis, the NRA has been informed by a qualitative review of available data, publicly available information on recreational sailing and engagement with the Royal Yachting Association (RYA) completed as part of the Keadby CCS Power Station DCO submission.

12C.4.33. The RYA UK Coastal Atlas of Recreational Boating provides a GIS dataset of recreational boating activity around the UK (Royal Yachting Association, 2019). The dataset provides spatial data which indicates intensity of recreational use, general boating areas, racing areas and cruising areas; it also provides the location of RYA clubhouses, training centres and marinas. The dataset was reviewed during preparation of the NRA previously undertaken for Keadby CCS Power Station DCO in 2021. The RYA have confirmed that the dataset has not been updated since 2019 and it has therefore not been reviewed again for this NRA.

12C.4.34. Based on the previous review, the Development Site is not within a 'General Boating', 'Cruising' or 'Racing' area; the closest RYA boating area ('General Boating') is at the mouth of the River Trent, approximately 11km to the north of the Site.

12C.4.35. There are several waterside marinas to the south of the Site, beyond the tidal reaches of the River Trent, at Newark. This includes Kings Marina, Newark Marina and Farndon Marina. In addition, there are a number of marinas west of the Site, along the Stainforth and Keadby Canal. This includes Blue Water Marina, Staniland Marina, and Thorne Cruising Club. These facilities provide a range of day, short trip, residential and wintering moorings.

12C.4.36. Whilst AIS datasets would appear to indicate a general lack of recreational activity within the immediate vicinity of the Site, the nature of these inland waterways (being linked to the wider Humber Estuary) and the presence of marinas on them means recreational passage is highly likely.

12C.4.37. A preliminary review of data available on berth usage suggests that the three closest marinas have a total of several hundred berths spanning recreational/ temporary, wintering and semi-permanent use. Vessel types vary but mostly appear to be day boats, barge craft/ narrow boats and other small recreational craft.

Other Recreational Activity / Other Mariners

12C.4.38. Approximately 60m to the south of the Site is a Boat Station; it is understood that this is an affiliated site between British Rowing and the Scunthorpe branch of the Sea Cadets. It is understood that this boat station is used for craft storage and limited periodic use.

Plate 12C.3: Keadby Boat Station on the Stainforth and Keadby Canal[1]

12C.4.39. The Canal and River Trust (CRT) describe the Stainforth and Keadby Canal as a 14.9-mile-long, three-lock waterway. Immediately adjacent to the Site at Railway Wharf (Waterborne Transport Offloading Area) is the Keadby Swing Bridge/ Keadby Lock which provides access to and from the (tidal) River Trent. (CRT, 2025).

[1] Image Credit: C Johnstone, 2021

Plate 12C.4: Keadby Lock where the Stainforth and Keadby Canal enters the River Trent

12C.4.40. At the time of this review, there were two live listings under CRT Notices and Stoppages for the Stainforth and Keadby Canal;

- Keadby Rail Bridge was out of order and closed to canal traffic while the repairs are being completed by Network Rail.
- Bramwith 'Big Lock' was out of order, though navigation is still possible through the little lock.

12C.4.41. British Canoeing list the Stainforth and Keadby Canal as a 15-mile-long accessible route for canoeists (noting that a licence is required which in this instance, is from CRT) (British Canoeing/GO Paddling, 2025).

12C.4.42. There is understood to be sporadic angling undertaken along the banks of both the River Trent and Stainforth and Keadby Canal; this includes leased fishing rights and activity associated with Scunthorpe Anglers who permit recreational day and night fishing along the south bank of the Stainforth and Keadby Canal (Scunthorpe Anglers, 2025).

Commercial Fishing

12C.4.43. The International Council for the Exploration of the Sea (ICES) standardise the division of sea areas to underpin statistical analysis around the UK; this is achieved through 'ICES Rectangles'. Each ICES rectangle is approximately 30 national miles by 30 nautical miles and has a unique identification reference; the Proposed Development is within ICES rectangle '36E9' (MMO; Dixon et al, 2018).

12C.4.44. Whilst there is a statistical rectangle covering the area of the River Trent which the Site overlaps, it is understood that commercial fishing activity at this inshore location is extremely limited owing to the lack of commercially-targeted species and distance from primary fleet fishing ground outside of the Humber Estuary. Any 'commercial fishing' activity at this inshore location on the River Trent is expected to be sporadic.

Industrial Features

12C.4.45. There are a range of industrial features surrounding the Proposed Development, as identified by **ES Volume III Figure 12C.3:** Industrial Data (**Application Document Ref. 6.4**). To the north of the Site, a single Overhead Line (OHL) bisects the Water Discharge Corridor before crossing the River Trent to the east. A further two OHL are directly north of the Water Discharge Corridor (both cross the River Trent west to east).

12C.4.46. Approximately 10m south of the Water Discharge Corridor is an Sluice Shoreline Construction; site walkover and historical mapping indicates that this is an outflow point from Sewer Drain to the west. Further south, is a Shoreline Construction (Wharf, Quay); this is the Keadby 1 Cooling Water System abstraction point. This feature includes stop sticks/ pontoons, course screens, an inspection/ maintenance gangway and the water intakes themselves (see **Plate 12C.5**, below).

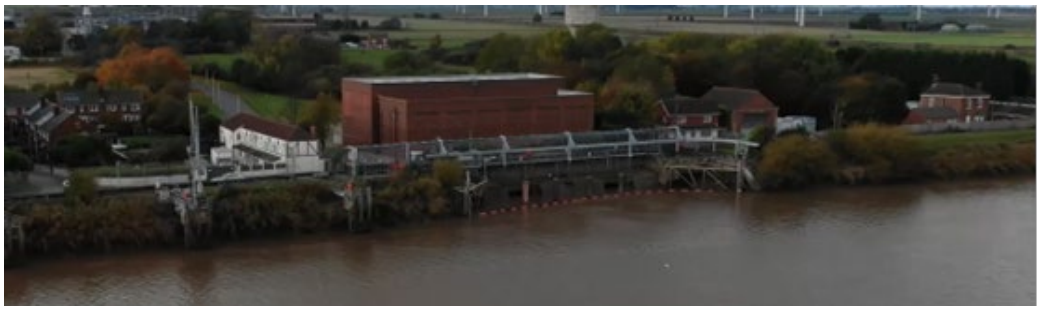


Plate 12C.5: Keadby 1 Power Station cooling water intake/ pump house

12C.4.47. The AIL Receiving Berth to the south is intersected from north to south with an Undefined Shoreline Construction; industrial mapping plots this as a single feature, approximately 500m in length, running from the Keadby 1 Power Station pump house to Railway Wharf, across the Stainforth and Keadby Canal and onward, to a point approximately 100m south of Keadby Pumping Station. This construction comprises several distinct components; from north to south, these are:

- fendering, mooring dolphins, gangways and associated infrastructure (including lighting and marking) with loading/ unloading of bulk product from PD Keadby;
- reinforced concrete quay (north of Keadby Canal) – Railway Wharf – owned by the Applicant and commonly used in conjunction with Keadby port facility (PD Ports);
- four sets of lock gates serving the Keadby Canal and westward, a swing bridge spanning the Keadby Canal which is owned and maintained by Network Rail; and
- riverside pumping/ discharge infrastructure associated with Keadby Pumping Station, an asset managed by the Environment Agency which serves to manage water levels within The Hatfield Drain, River Torne and South Drain (collectively known as the Three Rivers).

Historical Incidents

12C.4.48. Review of historical incident data can help to identify local incident trends, patterns and accident causation; this may form a useful indicator of potential sources of future navigational risk. Analysis of both Marine Accident Investigation Branch (MAIB) and ABP Humber data has been completed to help inform the NRA; this is summarised below.

MAIB Database

12C.4.49. The MAIB is an independent branch of the Department for Transport (DfT). Their core objective is to investigate accidents to determine the specific circumstances and causation with a view to this learning helping to reduce the incidence of marine accidents. The review of historical local data is aligned with the high-level principles of MGN 654 (refer to Section 2) and wider methodologies for assessment of Marine Infrastructure projects, such as those produced by the Department for Trade and Industry, DfT and MCA (MCA, 2023).

12C.4.50. In February 2021, during preparation of the NRA previously undertaken for Keadby CCS Power Station DCO, a data request was submitted to the of the DfT; a data response covering an area bounded by 53.13 to 53.72 degrees latitude and -0.83 to -0.67 degrees longitude was received in March 2021 (this was inclusive of the areas of the River Trent surrounding the Proposed Development) (DfT/MAIB, 2021). The previous NRA was cognisant of the incidents listed in this data.

12C.4.51. The latest published dataset on marine occurrences published by MAIB (MAIB, 2025) was reviewed for the present NRA. The data covers occurrences reported to MAIB from 01/01/2022 to 31/12/2024. A total of 12 occurrences within the area bounded by 53.13 to 53.72 degrees latitude and -0.83 to -0.67 degrees longitude were identified. All of these are listed either as “Marine Incident” or “Less Serious” and involved vessels merchant vessels >=100GT. Four incidents related to grounding/stranding, three to loss of propulsion power, two to damage to equipment, two to contact with shore objects, and one to collision between two vessels. The NRA is cognisant of these incidents.

12C.4.52. Both sets of MAIB incident data are shown in **ES Volume III Figure 12C.4:** Historical MAIB Data (**Application Document Ref. 6.4**).

ABP Humber Data

12C.4.53. In June 2025, an engagement meeting was held with ABP Humber. Subsequently, historical data was provided by ABP Humber in July 2025 (ABP, 2025b) to inform this NRA. Historical data regarding vessel incidents within ABP Humber’s jurisdictional area and the River Trent is summarised in **Table 12C.3** and **Table 12C.4** respectively.

Table 12C.3: Vessel Incidents (I of II)

	2021	2022	2023	2024
Impact with Structure	37	29	27	26

Temporary Grounding	7	14	10	3
Grounding Over A Tide	5	6	5	0
Collision Between Vessels	4	1	3	5
Contact with Floating Mark	2	2	1	0

Table 12C.4: Vessel Incidents (II of II)

Vessel Incidents (River Trent)					
	2016	2017	2018	2019	2020
Impact with Structure	0	0	1	0	0
Temporary Grounding	1	2	0	0	1
Grounding Over A Tide	0	0	0	1	0
Collision Between Vessels	1	0	0	1	1
Contact with Floating Mark	0	0	0	0	0

12C.4.54. Local (qualitative) information was also provided by ABP Humber; key matters to consider were related to moorings, safe access, hydrographic surveying and cargo unloading.

12C.4.55. A range of local information on the specific tidal conditions at Keadby, and likely risks, was also provided; this included confirmation of the possibility of a tidal bore at Railway Wharf ("the Trent Aegirs"). The NRA has taken into consideration this data and local knowledge.

12C.5. Proposed Development Activities in the Marine Environment

Overview

12C.5.1. **ES Volume I Chapter 4:** The Proposed Development (**Application Document Ref. 6.2**) and **Chapter 5**: Construction Programme and Management (**Application Document Ref. 6.2**) provide details of the activities and works that may be required for the Proposed Development. A brief summary of potential marine activities is detailed below within Table 12C.5.

Table 12C.5: Summary of Proposed Development Activities in the Marine Environment

Activity	Description
Canal Water Abstraction	CCGT cooling will require water abstracted from the Stainforth and Keadby Canal. An intake structure will be constructed within the Canal with equipment to comply with the Eels (England and Wales) Regulations 2009 (HMSO, 2009) ('the Eels Regulations'). It is expected that this may comprise 2mm eel screens, baffles and fish return system (similar to that approved by the Environment Agency and that has been constructed for Keadby 2 Power Station) together with intake pipework, a wet well pumping station and chlorination plant. A pipeline would be constructed from this inlet into the Main Site broadly following the route consented for Keadby 2 Power Station (see **Indicative Cooling Water and Effluent Discharge Connection Plans** (**Application Document Ref. 2.8**)). Construction activities include (but are not limited to): • pre-works survey(s) along the Keadby Canal wall; • installation of a cofferdam within Keadby Canal to provide a safe, dry and stable working area; • construction of hoarding, flood protection (where necessary) appropriate temporary hazard warning, screening, lighting and signage as well as removal and reinstatement of mooring points (comparable to

	that used on the recently constructed intake for Keadby 2 – see **Diagram 7**, below); • construction/ alteration works to install new intake infrastructure; • installation of screening system(s); • removal of cofferdam; and • completion of post-construction surveys, as required. Depending on the extent of construction works which are 'shore-led', this process would likely involve the use of a workboat or support barge (to act as a stable platform from which piling could be carried out). Smaller specialist workboats may also be required, comparable to those used for the construction of the Keadby 2 Power Station intake. The Site allows for a total working area of up to 20m ingress into the Keadby Canal for construction of the cofferdam (which is expected to be positioned approximately 10m into the Canal) and associated cofferdam installation and removal (comparable to the Keadby 2 Power Station intake construction, shown in **Plate 12C.6,** below); potential workboat locations are provided within **Figure 12C.5:** Indicative Workboat Location (**Application Document Ref. 6.3**)).

	 **Plate 12C.6: Cofferdam in-situ during Keadby 2 Power Station construction**
Water Discharge Corridor Outfall	The existing discharge outfall in the River Trent is shown on **Plate 12C.7**; it is anticipated that the existing outfall is suitable for re-use and no works are proposed to this existing infrastructure.  **Plate 12C.7: Existing Keadby 1 Power Station outfall**
Waterborne Transport	The existing berth at Railway Wharf will be used for the delivery of AILs. The exact number and size/ weight is not

Offloading Facility	known at this stage and is based on specific construction methodologies that will be confirmed during the detailed design stage. However, around 35 - 40 such deliveries are expected over a 12-month period. The components will then be lifted using a mobile crane onto a hauled trailer and transported to the Main Site along the existing temporary haulage route for assembly.

12C.6. Risk Assessment

Consultation

12C.6.1. To inform this assessment, consultation has been undertaken with relevant marine stakeholders; this is summarised below in **Table 12C.6**.

Table 12C.6: Consultation Summary

Organisation	Remit/ Role	Engagement
Associated British Ports Humber	Statutory harbour authority responsible for ensuring safe navigation within the Humber Estuary area; the appropriate Navigation Authority for the location of the Proposed Development on the River Trent.	Section 42 Consultation on Keadby CCS Power Station DCO (January 2021). Pre-Application engagement meeting for Keadby CCS Power Station DCO NRA (February 2021 and April 2021). Data request for Keadby CCS Power Station DCO NRA (February 2021). EIA Scoping for Proposed Development (June 2024) Section 42 Consultation on Proposed Development (January 2025). Consultation and data request for Keadby Next

Organisation	Remit/ Role	Engagement
		Generation Power Station DOC NRA (June 2025).
Canal and River Trust	Custodians of a large number of inland waterways in England and Wales; inherited the responsibilities of the state-owned British Waterways in 2012.	Section 42 Consultation on Keadby CCS Power Station DCO (January 2021). Pre-Application engagement meeting for Keadby CCS Power Station DCO (February 2021). EIA Scoping for Proposed Development (June 2024) Section 42 Consultation on Proposed Development (January 2025).
Department for Transport (DfT) Marine Accident Investigation Branch - MAIB	Document, record and manage historical incident reports arising from maritime accidents.	Data request for Keadby CCS Power Station DCO NRA (February 2021).
Keadby Power Station – Operations and Maintenance (O&M) Team	SSE's Keadby 1 O&M team periodically maintain the site-wide cooling water system intake and outfall infrastructure.	Engagement meeting (February 2021). SSE has confirmed (July 2025) that there have been no changes to the O&M team's role and activities since 2021.
Keadby Sea Cadets / British Rowing	It is understood that the Scunthorpe branch of the Sea Cadets use a Boat Station alongside the Stainforth and Keadby Canal; this is understood to be affiliated with both British Rowing and the Sea	Pre-Application engagement for Keadby CCS Power Station DCO NRA (February - April 2021).

Organisation	Remit/ Role	Engagement
	Cadets. This location is primarily understood to be a storage site.	
Marine Management Organisation	Responsible for the determination of a Marine Licence for the Proposed Development.	EIA Scoping for Keadby CCS Power Station DCO (June 2020). Section 42 Consultation for Keadby CCS Power Station DCO (January 2021). Pre-Application engagement meetings for Keadby CCS Power Station DCO NRA (January 2021). Confirmatory NRA meeting for Keadby CCS Power Station DCO NRA (March 2021). EIA Scoping for Proposed Development (June 2024). Section 42 Consultation on Proposed Development (January 2025).
Maritime and Coastguard Agency	Responsible for producing legislation and guidance on maritime matters and for working to prevent the loss of life on the coast and at sea.	EIA Scoping for Keadby CCS Power Station DCO (June 2020). Section 42 Consultation (January 2021). Pre-Application engagement meeting for Keadby CCS Power Station DCO NRA (February 2021). EIA Scoping for Proposed Development (June 2024).

Organisation	Remit/ Role	Engagement
		Section 42 Consultation on Proposed Development (January 2025).
Royal Yachting Association	National governing body for dinghy, yacht and motor cruising, all forms of sail racing, RIBs and sportsboats, windsurfing and personal watercraft; provides advice to help ensure disruption to recreational mariners is avoided.	Pre-Application engagement for Keadby CCS Power Station DCO NRA (February 2021 – March 2021).
Trinity House	Responsible for safeguarding shipping and seafarers; hold a statutory duty as General Lighthouse Authority to deliver a reliable aids to navigation service for all mariners.	Section 42 Consultation for Keadby CCS Power Station DCO (January 2021). Pre-Application engagement meeting for Keadby CCS Power Station DCO NRA (February 2021). Section 42 Consultation on Proposed Development (January 2025).

12C.6.2. Through the statutory and additional technical engagement undertaken during preparation of the DCO application for Keadby CCS Power Station DCO in 2021, the NRA has benefitted from the advice and guidance of a wide range of national stakeholders and local information.

12C.6.3. ABP Humber has reported that they were closely involved in the pre-planning and safe operation of Railway Wharf for AIL deliveries required during the construction of Keadby 2 Power Station. Similarly, PD Ports has reported that they have significant operating experience using the Keadby Port / Railway Wharf for the delivery of AIL; this includes support during the use of Railway Wharf for Keadby 2 Power Station AIL deliveries.

12C.6.4. For Keadby 2 Power Station, in collaboration with ABP Humber (for pilotage), PD Ports acted as Shipping Agency; use of Railway Wharf itself was agreed under licence. The CRT reported that they worked closely with ALE / Mammoet, (heavy lift contractor for Keadby 2 Power Station AIL deliveries), to ensure users of the Stainforth and Keadby Canal were notified of potential closures. Both PD Ports and ALE/Mammoet were engaged throughout the pre-application period (AECOM Pers. Comm, 2021); this historical experience and where available, data, has helped to inform the NRA.

Methodology

12C.6.5. There is currently no standardised formal UK guidance or prescribed methodology for how the assessment of navigational risk should be undertaken.

12C.6.6. The IMO Guidelines for Formal Safety Assessment 'MSC – MEPC.2/Circ.12/Rev 2' (FSA) set out a standardised process for the assessment of marine risk (International Maritime Organisation, 2013). Whilst not designed explicitly for the process of NRA, the FSA sets out five fundamental steps which may be used to structure a NRA:

- identification of hazards (a list of all relevant accident scenarios with potential causes and outcomes);
- assessment of risks (evaluation of risk factors);
- risk control options (devising regulatory measures to control and reduce the identified risks);
- cost benefit assessment (determining cost effectiveness of each risk control option); and
- recommendations for decision-making (information about the hazards, their associated risks and the cost effectiveness of alternative risk control options is provided).

12C.6.7. For the purposes of this assessment, the definition of 'hazard' and 'risk' are as follows:

- Hazard: A potential source of harm, loss or injury; and
- Risk: The probability of suffering harm or loss and is a measure of the frequency and consequence.

Identification of Hazards

12C.6.8. **Table 12C.7** below provides a summary of the key hazards associated with the Proposed Development that are considered relevant to the NRA.

Table 12C.7: Hazard Summary

Activity	Assessment
Canal Water Abstraction	There are several potential hazards associated with the construction of the Canal Water Abstraction Option: • **Workboat /Barge:** the construction and eventual removal of a cofferdam may involve the use of a barge or large workboat. The presence of workboat(s) may constrain vessel passage along the Stainforth and Keadby Canal and/ or act as a potential distraction to mariners. • **Cofferdam:** the presence of a cofferdam within the Stainforth and Keadby Canal may constrain passage and/ or act as a potential distraction to mariners.
Cooling Water Discharge Outfall	As no works are proposed to this existing infrastructure, no hazards have been identified and this is not considered further in this NRA.
AIL Movements	During the AIL deliveries associated with construction of the Proposed Development, potential hazards could include: **Vessel Passage[2]** • on final approaches to Railway Wharf, the presence of a large vessel (i.e. up to 82m in length and 12m in beam) may present a hazard to other mariners through collision. This may include another vessel or a fixed object, such as a mooring of wharf. **Vessel Presence** • presence of a large vessel may constrain the passage of other vessels using the River Trent; and/ or • operation of a large vessel may distract other mariners.

[2] The wider safe long-sea passage of the vessels involved in the construction of the Proposed Development will be the responsibility of the contractor(s) appointed to complete shipments and will be subject to standard international, national and local maritime code and regulation; it is not considered by this assessment. In order to adequately consider the potential effects arising from the construction of the Proposed Development however, the final approaches to the Site are considered.

Activity	Assessment
	Docking and Unloading • during final approach and docking, the manoeuvring of a large vessel and support craft (i.e. tugs) within the River Trent may constrain the passage of other mariners; • during use of the NAABSA[3] berth, depending on the condition of the riverbed, the vessel may not achieve a stable unloading position. Listing into the Trent may cause a hazard to other mariners; • the docking and unloading of a large vessel may distract other mariners, including through the use of wharf/ vessel illumination during hours of darkness, if required; • whilst docked, vessel mooring or docking failure(s) – "breakout" – may pose a hazard to both other mariners using the River Trent and neighbouring fixed objects; and • whilst docked, the presence of a vessel may pose a risk to users of the Stainforth and Keadby Canal particularly when attempting to navigate through the lock gates (noting that when docked at Railway Wharf, mooring lines are likely to be required across the canal entrance to secure larger vessels against reinforced mooring points at the Keadby Port platform on the south side of the canal).

Marine Users

12C.6.9. The marine users within the vicinity of the Site were grouped into categories within **Table 12C.8**, below.

Table 12C.8: Vessel Groupings

Reference	Classification	Description
MAR-A	Non-Vessel Users	Divers; swimmers; surfers.

[3] A NAABSA ('Not Always Afloat But Safely Aground') berth is a pocket on a tidal waterway where vessels may ground safely at low water for docking. It is typical that pre-berthing inspections are required to ensure that the soft sediment/ silt bed is even to support safe and stable docking.

Reference	Classification	Description
MAR-B	Sailing Vessel	Windsurfers; sailing dinghies.
MAR-C	Recreational Vessel (Small)	Small sail or motor yachts; canal boats; day trip cruisers.
MAR-D	Powered Vessel (Small)	Fishing vessels of 10m and under; small recreational powered craft such as jet skis or small Rigid Inflatable Boats (RIB); inshore lifeboat launches.
MAR-E	Unpowered Vessel (Small)	Sea kayaks; paddle boards; pedal boats.
MAR-F	Commercial Vessel (Small)	Fishing vessels of 10m and over; North Sea barges; work boats; pilot boats; harbour tugs; dive support RIB; windfarm O&M craft; small-medium dredging vessels; other miscellaneous support craft.
MAR-G	Commercial Vessel (Large – Very Large)	Bulk tankers; container and other very large freight transporters.

Assessment of Risks

12C.6.10. **Table 12C.9** below provides a summary of each identified risk has been assessed; this has been undertaken in a qualitative manner informed by existing data, professional judgment, and navigational stakeholder engagement.

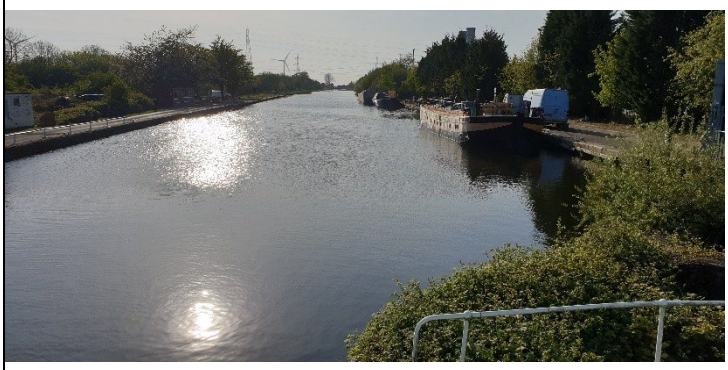
12C.6.11. A 'Worst Credible Scenario' (WCS) approach has been taken to identify and consider navigational risks. As informed by the IMO FSA guidance, basic terminology used in this risk assessment is as follows:

- **Probability:** 'The degree of confidence in the occurrence of an event, measured on a scale from 0 to 1. An event with a probability of 0 means that it is believed to be impossible; an event with the probability of 1 means that it is believed it will certainly occur';

- **Risk:** 'The combination of the frequency and the severity of the consequence'. For the purposes of this NRA, risk is classified as 'low', 'medium' or 'high'.

Table 12C.9: Risk Assessment

Activity	Assessment
Canal Water Abstraction	**Workboat/ Barge** The use of a workboat/ barge in order to construct the cofferdam will involve positioning and securing a vessel and completion of a piling campaign. Based on the anticipated size and maximum extent of the cofferdam, it is predicted that the construction of the cofferdam will take approximately three months. The use of a workboat/ barge within the Stainforth and Keadby Canal could present a risk to mariners (primarily, MAR-B and MAR-C vessel types) and also smaller unpowered craft/ recreational users (MAR-B and MAR-E vessel types). The use of a workboat/ barge will take place along the northern bank of the Stainforth and Keadby Canal. MAR-B and MAR-C vessel types at this location are predicted to be relatively small (maximum length of 20.9m and beam of 5.8m, based on the neighbouring lock constraints). Any potential workboats, if required, would be constrained by the same restrictions at Thorne Lock. On this basis and considering the remaining width of navigable water available within the Stainforth and Keadby Canal beyond the cofferdam, it is considered that there is a low risk of collision. The appointment of a suitably qualified contractor using appropriately maintained vessel(s) will reduce the likelihood of any collision risk. It is anticipated that Notices to Mariners/ local Canal Notices will be issued in order to ensure that mariners are aware of the planned activities.

Activity	Assessment
	Probability of incident arising (presence of workboat/ barge): **0.1** Risk: **low**. **Cofferdam Construction, Presence & Removal** The construction, presence and removal of a cofferdam within the Stainforth and Keadby Canal channel at the intake location may pose a risk to MAR-B and MAR-C vessel types; it is predicted that following construction, the cofferdam would be in-situ for the required construction period (estimated to be approximately 3 months) followed by a period of removal (estimated to be similar to the installation period). On the basis of the limited ingress into the Canal (up to 20m for the total working area), it is considered that the navigable area between the southernmost extent of the cofferdam and the opposite bank of the Stainforth and Keadby Canal would be adequate to allow safe passage of vessels. Once constructed, it is estimated that there will be approximately 25m of navigable channel; based on the small vessels which use the Canal, it is considered that there is a low risk of collision between mariners and the cofferdam wall. 

Activity	Assessment
	The appointment of a suitably qualified contractor using appropriately maintained vessel(s) is likely to ensure the risk of such a collision is low. In addition, it is anticipated that Notices to Mariners/ local Canal Notices will be issued in order to ensure that mariners are aware of the planned activities. Appropriate hazard warning, screening, lighting and signage will be installed, as required (comparable to the recently constructed intake for Keadby 2 Power Station). Engagement with the CRT would be undertaken to provide up-to-date information on activities planned along the Canal as was undertaken for Keadby 2 Power Station. Probability of incident arising from the presence of the cofferdam: **0.2** Risk: **low**.
Water Discharge Corridor Outfall	No works proposed so no risk identified.
AIL Movements	The use of Railway Wharf to support delivery of AIL has been proven safe to mariners during the construction of Keadby 2 Power Station with many lessons learned and relationships developed that will be used during construction of the Proposed Development to facilitate the safe delivery of AIL **Vessel Passage** On final approaches to Railway Wharf, the presence of a large vessel (i.e. of up to 82m in length and 12m in beam) may present a hazard to other mariners through collision. This may include other vessels or a fixed object, such as a mooring of wharf. This risk is likely to apply to the majority of vessels (i.e. MAR-B, MAR-C, MAR-D, MAR-E and MAR-F vessels) however, the potential risk for larger vessels (i.e. MAR-G) is potentially slightly higher owing to their beam and less nimble nature.

Activity	Assessment
	Prior to commencement of AIL deliveries, it is expected that the Navigational Authority – ABP Humber – would attend site with the heavy lift contractor, once appointed, in order to review access arrangements, moorings and final approach. This would be similar to preparatory activities undertaken for Keadby 2 Power Station and would help to plan for the smooth final approach and docking process for AIL barges; specifically, this would help to minimise the period of time that the navigable channel is constrained, through vessel manoeuvring etc. It is anticipated that ABP Humber would mandate pilotage and/ or use of supporting tug boats and support craft; this would further minimise risk on passage/ final approach. The appointment of a suitably qualified contractor using appropriately maintained vessel(s) is likely to minimise risk of vessel accidents e.g. through catastrophic loss of power/ control . As above, for vessels of the size and nature involved in AIL deliveries, it is anticipated that tug boats/ support vessels would be present for the duration of passage along the River Trent. Notices to Mariners will be prepared and requested for issue by the appropriate Navigational Authority in order to ensure that mariners are aware of the planned activities. Probability of an incident arising from the passage of vessels:**0.3** Risk: **medium**. **Vessel Presence** The presence of a large vessel may constrain the passage of other vessels using the River Trent and may distract other mariners. This risk is likely to apply to the majority of vessels (i.e. MAR-B, MAR-C, MAR-D, MAR-E and MAR-F) however, the potential risk for larger vessels (i.e. MAR-G) is potentially slightly higher owing to their beam and less nimble nature. Assuming mooring on the port side, once docked, approximately 45m width is available between the

Activity	Assessment
	starboard side of a vessel and the navigable channel. Whilst the presence of a large vessel will ultimately reduce the navigable channel available temporarily within the River Trent, it is considered that there would be adequate navigable room for all other vessel types likely to use this part of the River Trent. The preparation and issue of a Notice to Mariners will also help to provide awareness of the vessel presence. In terms of distraction, the Notice to Mariners will help to raise awareness of vessel deliveries and thereby reduce risk. Although the potential for unloading during the hours of darkness has been considered, following Stage 2 technical engagement discussions, it is not considered likely a viable option (consistent with Keadby 2 Power Station) given not only the additional health and safety risks that would ensue, but also the presence of a number of residential properties along Trentside which would be affected by significant illumination of Railway Wharf, to the extent necessary for night-time working. Although some temporary lighting on Railway Wharf may still be necessary, this will be focussed as set out in the **Outline Lighting Strategy** (**Application Document Ref. 5.11**). Probability of an incident arising from the presence of a delivery vessel:**0.2** Risk: **low**. **Docking and Unloading** During the final approach and docking itself, the manoeuvring of a large vessel and support craft within the River Trent may constrain the passage of other mariners. This risk is likely to apply to the majority of vessels (i.e. MAR-B, MAR-C, MAR-D, MAR-E and MAR-F vessels) however, the potential risk for larger vessels (i.e. MAR-G) may be slightly higher owing to their beam and less nimble nature. There is a site-specific higher risk of

Activity	Assessment
	some vessel types using the Stainforth and Keadby Canal (i.e. MAR-C); specifically, this relates to recreational traffic using the Keadby Lock for access to the Canal. Impact avoidance/ risk management protocols for docking and unloading would be as reported for 'passage' above, noting the likely pre-docking safety measures which are anticipated to be required by ABP Humber as Navigational Authority. During the use of the NAABSA berth, depending on the condition of the riverbed, the vessel may not achieve a stable unloading position; loss of stability or tilting to one side (listing) during docking may cause a hazard to other mariners. Consistent with the protocol established for Keadby 2 Power Station AIL deliveries, it is proposed that a pre-delivery inspection would be carried out with the appropriate Navigational Authority which may, if necessary, include a small extent of bed levelling in order to ensure a safe and stable NAABSA platform for docking. Consistent with Keadby 2 Power Station working methods and as discussed with the ABP Humber during preparation of the NRA previously undertaken for Keadby CCS Power Station DCO in 2021, it is anticipated that any preparatory levelling could, if required, be undertaken by the Navigational Authority under their own powers or under the MMO exemptions for small-scale dredging[4]. The docking and unloading of a large vessel may distract other mariners, including through the use of any localised wharf/ vessel illumination. In terms of distraction, the Notice to Mariners will help to raise awareness of vessel deliveries to reduce this risk. Unloading during the hours of darkness is not considered likely, as previously described.

[4] Section 75 of the Marine and Coastal Access Act 2009 (HMSO, 2009) sets out an exemption for dredging or the deposit of dredged material carried out by or on behalf of a harbour authority, subject to a number of conditions. Article 18A of the 2013 Exempted Activities Order (HMSO, 2013) also sets out provision for small-scale, 'low volume' navigational dredging of 500m3 (in a single campaign) and 1500m3 (over a 12 month period) without requirement for a Marine Licence.

Activity	Assessment
	Whilst docked, vessel mooring or docking failure(s) – "breakout" – may pose a hazard to other mariners using the River Trent and neighbouring fixed objects. The appointment of a suitably qualified contractor using appropriately maintained vessel(s) would reduce the risk of vessel accidents through breakout. During the course of unloading, the potential risk of users of the Stainforth and Keadby Canal colliding with vessels docked at Railway Wharf requires consideration. Consistent with deliveries for Keadby 2 Power Station, it is envisaged that it may be necessary to close Keadby Lock for short periods during certain larger AIL deliveries as it is not considered possible to operate the lock safely, for all mariners, whilst AIL are being delivered and unloaded. The indirect consequence[5] of this may be some planned and notified disruption to mariners using the Stainforth and Keadby Canal. Notices to Mariners ('Notices and Stoppages[6]') will be requested through CRT to provide mariners with forewarning of closures. Building upon lessons-learned from Keadby 2 Power Station AIL deliveries, notification of the schedule of AIL movements will be hosted by the Applicant in collaboration with the heavy lift contractor, once appointed; this will help to provide all mariners with information on any planned or required closures. Probability of an incident arising from the docking and unloading process:**0.1** Risk: **low**.

[5] For the purposes of NRA, this report considers the risks – both direct and indirect – to mariners. ES Volume I Chapter 12: Water Resources and Flood Risk (Application Document Ref. 6.2) considers impacts on other users of the canal.

[6] The Canal and River Trust is responsible for issuing and managing 'Notices and Stoppages' along the Stainforth and Keadby Canal; this is the equivalent of a Notice to Mariners.

Risk Control Options

12C.6.12. **Table 12C.10** below summarises the measures identified to mitigate against the identified risks.

Table 12C.10: Risk Controls

Activity	Risk Control/ Mitigation
Canal Water Abstraction	**Pre-Construction and Construction** • Engagement with the Canal and River Trust will be undertaken to help inform the planned programme for works at the Canal Water Abstraction Point; this will ensure that local working knowledge is used to inform the timing and delivery of works in order to minimise any risk to other mariners. • Notices to Mariners/ local Canal Notices will be issued in order to provide mariners with information on the planned activities; and • It is anticipated that appropriate hazard warning screening, lighting and signage will be installed, as required (given the similar scale of works, it is anticipated that this would be comparable to that used on the recently constructed intake for Keadby 2 Power Station).
Water Discharge Corridor Outfall	No mitigation required (no hazards or risks identified as no works are proposed)
AIL Movements	**Pre-Construction** • Engagement with ABP Humber, PD Ports and, where required due to planned closures of Keadby Lock, CRT would be undertaken to help inform the planned use of Railway Wharf; including use of local working knowledge to inform the timing and delivery of works and thereby minimise risks to other mariners within the River Trent and the

Activity	Risk Control/ Mitigation
	Stainforth and Keadby Canal, where this is relevant; • Navigational safety will be considered within the heavy lift contractor specification. Contractor proposals would be reviewed by appropriately qualified and experienced marine personnel. • Prior to commencement of AIL deliveries, it is anticipated that ABP Humber would attend site with the heavy lift contractor, once appointed, in order to review access arrangements, moorings and agree the final approach; • As previously described, the final CEMP would provide relevant stakeholders with the opportunity to review the measures proposed for the effective management of construction risks, including provision of a method statement; • Notices to Mariners will be prepared and requested for issue by the appropriate Navigational Authority in order to ensure that mariners are aware of the planned activities; and • Consistent with Keadby 2 Power Station AIL deliveries, it is anticipated that any preparatory levelling would be undertaken by the Navigational Authority (i.e. to provide a safe and stable NAABSA berthing pocket). **Construction** • It is anticipated that the appropriate Navigational Authority would mandate pilotage and/ or use of supporting tug boats and support craft. This would further ensure minimisation of risk on docking; • In terms of distraction, the Notice to Mariners will raise awareness of vessel deliveries to help reduce this risk. Where task lighting is required, light spill

Activity	Risk Control/ Mitigation
	will be minimised as far as reasonably practicable in accordance with the Outline Lighting Strategy (**Application Document Ref. 5.11**); • It is anticipated that some AIL deliveries may require the temporary closure of Keadby Lock. This will minimise risks to mariners using the Stainforth and Keadby Canal; • Notices to Mariners ('Notices and Stoppages') will be requested through CRT to provide forewarning to mariners of closures; and • Building upon lessons-learned from Keadby 2 Power Station, a shipping movement schedule will be maintained by the Applicant, in collaboration with the heavy lift contractor, once appointed providing information on the timing and nature of loads arriving.

Risk Management Summary

12C.6.13. A summary of the estimated baseline risk and level of risk after the implementation of mitigation discussed above is included in **Table 12C.11**, below.

Table 12C.11: Summary of estimated baseline and post-mitigation risk

Area	Activity proposed	Baseline Risk		Post-Mitigation Risk	
		Probability	Risk	Probability	Risk
Canal Water Abstraction	Workboats	0.1	Low	0.1	Low
	Cofferdam	0.2	Low	0.1	Low
Water Discharge Corridor Outfall	None	-	-	-	-

Area	Activity proposed	Baseline Risk		Post-Mitigation Risk	
		Probability	Risk	Probability	Risk
Waterborne Transport Offloading Area (Railway Wharf)	AIL Movements (Passage)	0.3	Medium	0.2	Low
	AIL Movements (Presence)	0.2	Low	0.1	Low
	AIL Movements (Docking)	0.1	Low	0.1	Low

Cost / Benefit Analysis

12C.6.14. All of the risk control options identified above are proposed to be carried forward; no further consideration is therefore given to the cost/benefit analysis.

Recommendations

12C.6.15. ABP Humber, as the statutory harbour authority, benefit from substantial operating experience of the River Trent, including the southernmost reaches of the River, close to Keadby. They also benefit from historical involvement in the use of Railway Wharf during its use for Keadby 2 Power Station. It is therefore recommended that ABP Humber is engaged as the detail available on the nature, extent and duration evolves; this will allow for the project design to benefit from local working knowledge of the port area.

12C.7. Summary and Conclusions

12C.7.1. A qualitative assessment of navigational risk has been undertaken that is proportionate with the anticipated scale, nature and extent of works and understanding of the area. A detailed baseline understanding of local marine activity has been established informed by desk-based research, engagement with relevant marine stakeholders.

12C.7.2. A 'Worst Credible Scenarios' approach has been used to understand the location and nature of any navigational risks; a variety of mariners have been considered ranging from small unpowered "vessels" and recreational craft to very large commercial vessels known to use the port approaches.

12C.7.3. Navigational risks at the canal water abstraction have been considered and assessed to be low risk. Mitigation measures have been identified (i.e. engagement with Canal and River Trust, Notices to Mariners and hazard warning screening, lighting and signage).

12C.7.4. The use of Railway Wharf for AIL deliveries and associated navigational risk has also been assessed. This has led to the recommendation for implementation of a range of mitigation measures including engagement with ABP Humber, PD Ports and the Canal and River Trust, a method statement to be included in the final CEMP, Notices to Mariners and use of pilotage and/or supporting tug boats. With these mitigation measures in place all risks are assessed to be low.

12C.7.5. No works are proposed within the River Trent.

12C.7.6. With the application of suitable mitigation, it is considered that all risks can be reduced to a level As Low as Reasonably Practicable (ALARP) and can be suitably managed by risk controls to reduce them to a fully acceptable level.

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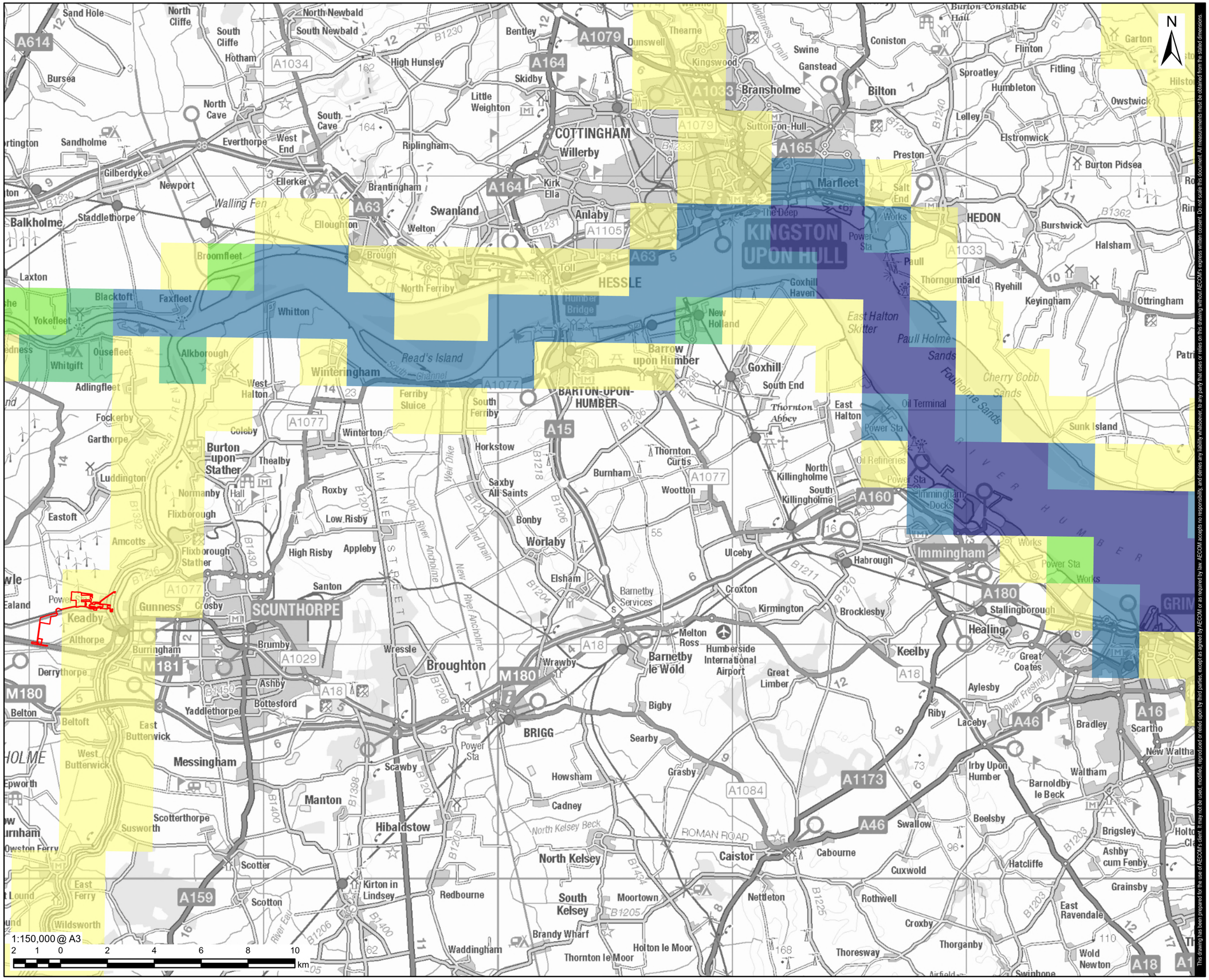

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LEGEND

- Proposed Development Site

Vessel Density Grid 2018 (MMO)

Total Vessels - Annual Average

- 0 - 200
- 200 - 500
- 500 - 1000
- 1000 - 10000
- > 10000

NOTES

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FIGURE TITLE

Vessel Density Grid 2018
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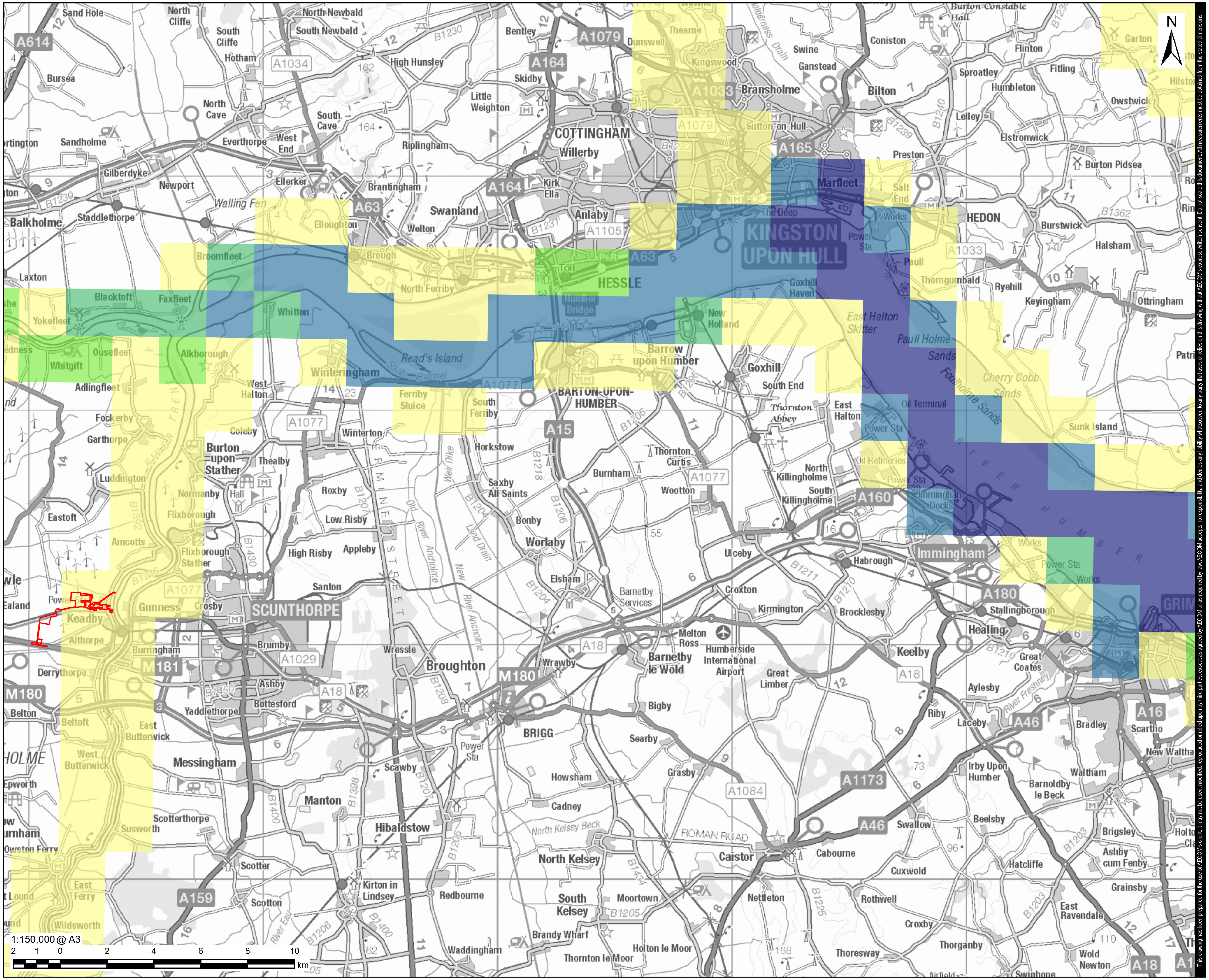
FIGURE NUMBER

Figure 12C.1



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Vessel Density Grid 2019 (MMO)

Total Vessels - Annual Average

- 0 - 200
- 200 - 500
- 500 - 1000
- 1000 - 10000
- > 10000

NOTES

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FIGURE TITLE

Vessel Density Grid 2019
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Figure 12C.1

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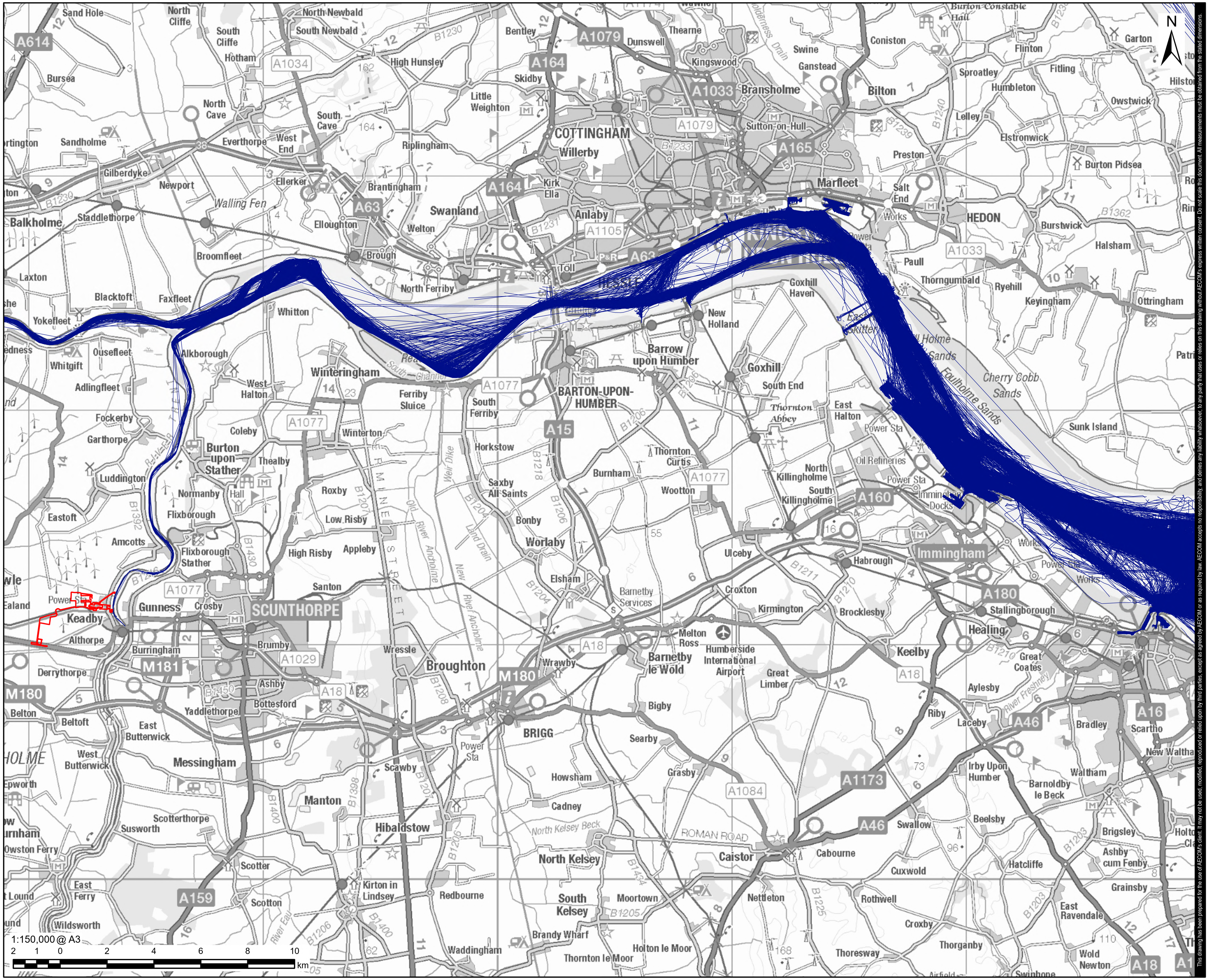

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Proposed Development Site
Anonymised AIS Derived Track Lines 2018

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FIGURE TITLE

Anonymised AIS Derived Track Lines 2018
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Figure 12C.2

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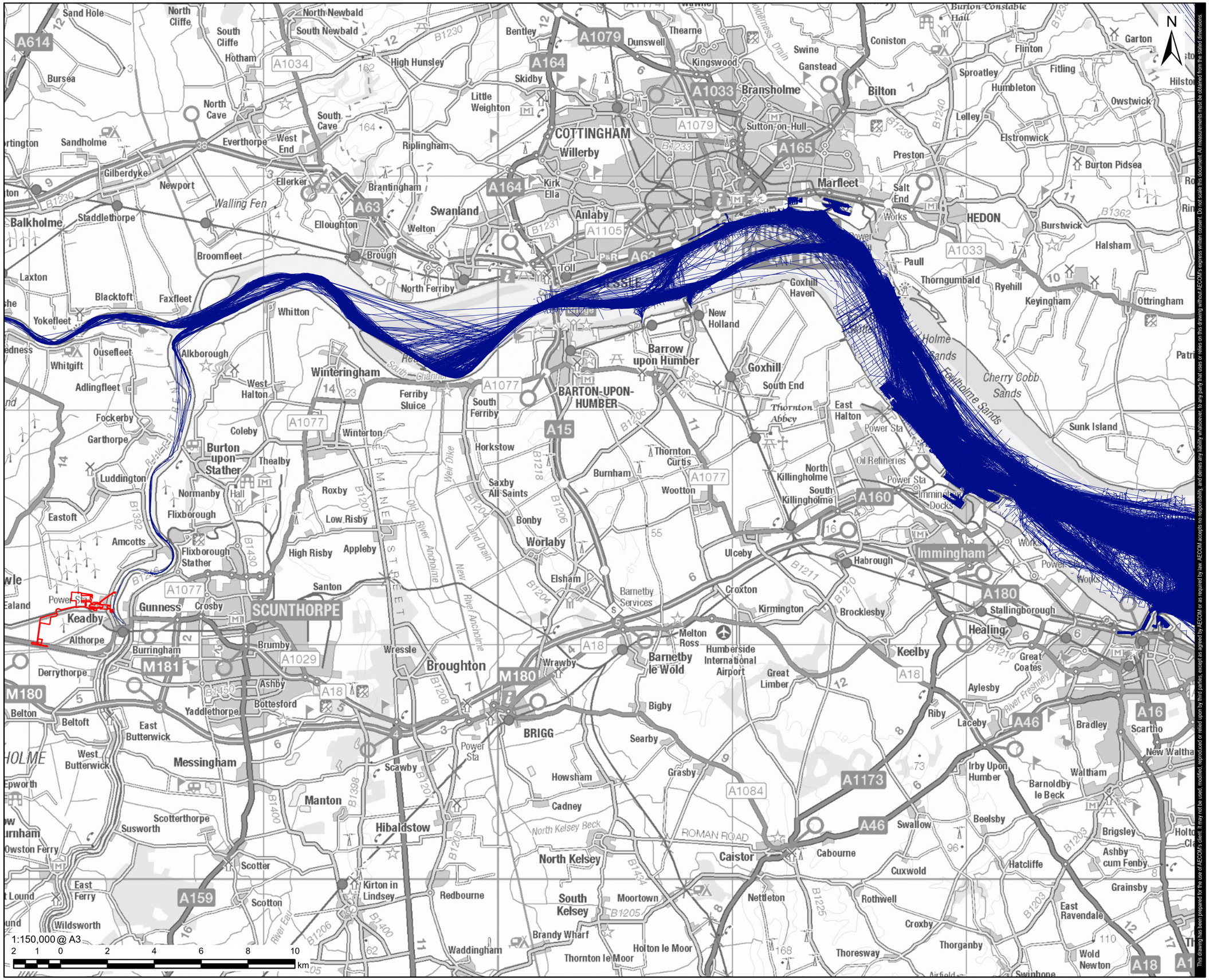

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LEGEND

- Proposed Development Site
- Anonymised AIS Derived Track Lines 2019

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FIGURE TITLE

Anonymised AIS Derived Track Lines 2019
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Figure 12C.2

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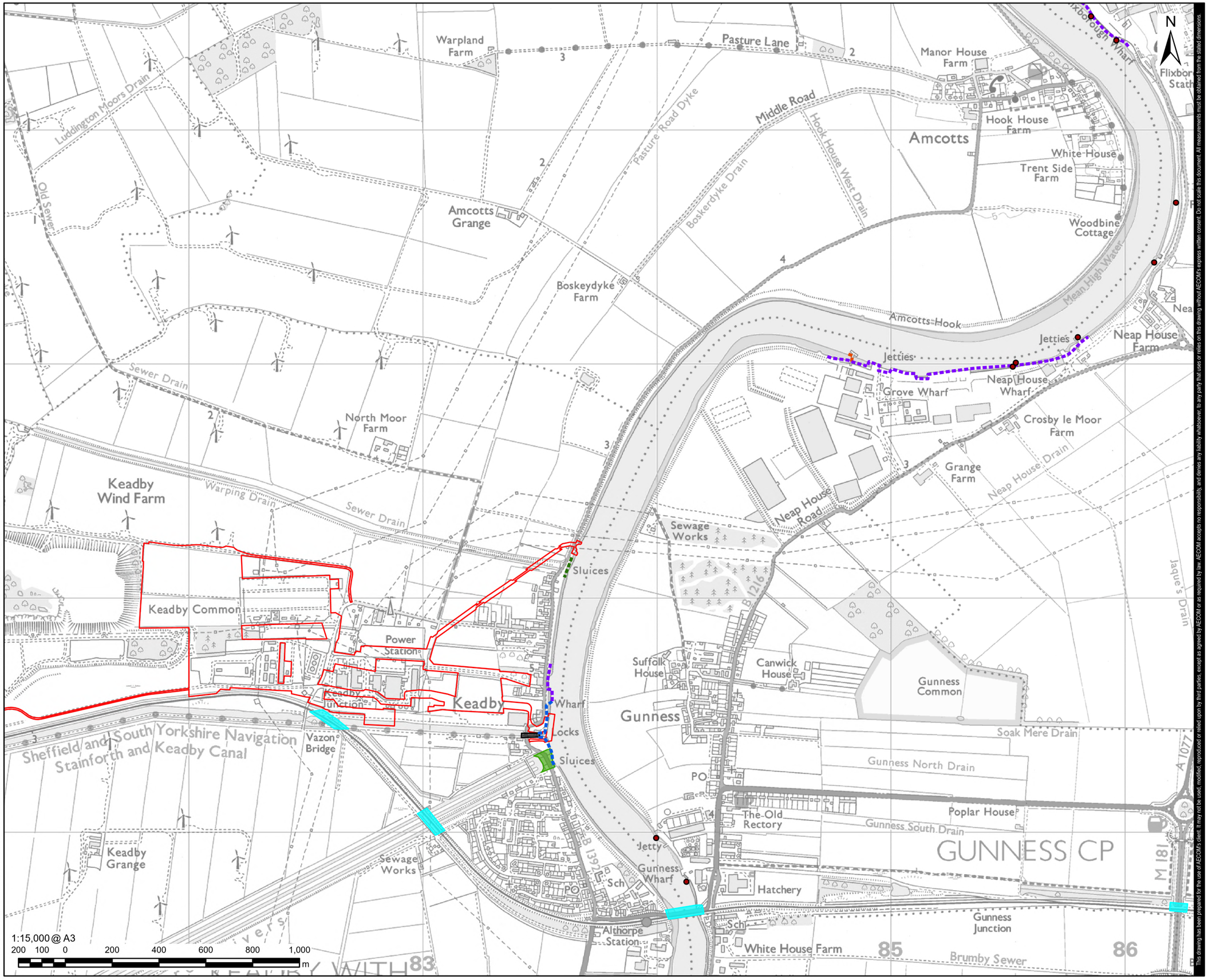

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LEGEND

- Proposed Development Site
- Pile
- Shoreline Construction, Undefined
- Shoreline Construction, Pier (Jetty)
- Shoreline Construction, Sluice
- Shoreline Construction, Wharf (Quay)
- Shoreline Construction, Bridge
- Shoreline Construction, Lock Gate
- Shoreline Construction, Sluice

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FIGURE TITLE

Industrial Features

FIGURE NUMBER

Figure 12C.3

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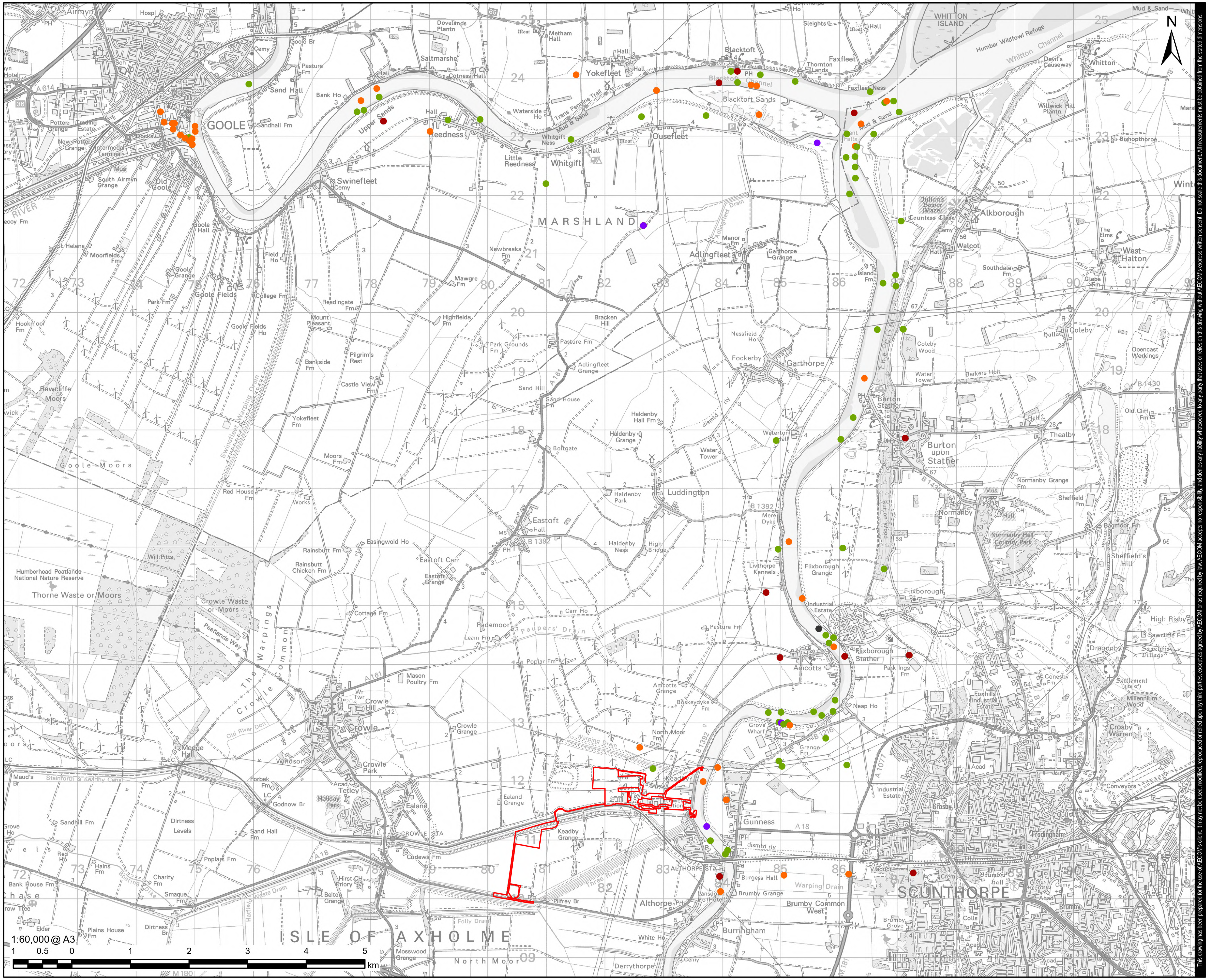

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LEGEND

Proposed Development Site

Historical Incident

Occurence Severity

- Less Serious
- Marine Incident
- Serious
- Very Serious
- No Severity Data

NOTES

Incident Data provided by Department for Transport – Marine Accident Investigation Branch (MAIB)

ISSUE PURPOSE

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FIGURE TITLE

Historical MAIB Data

FIGURE NUMBER

Figure 12C.4

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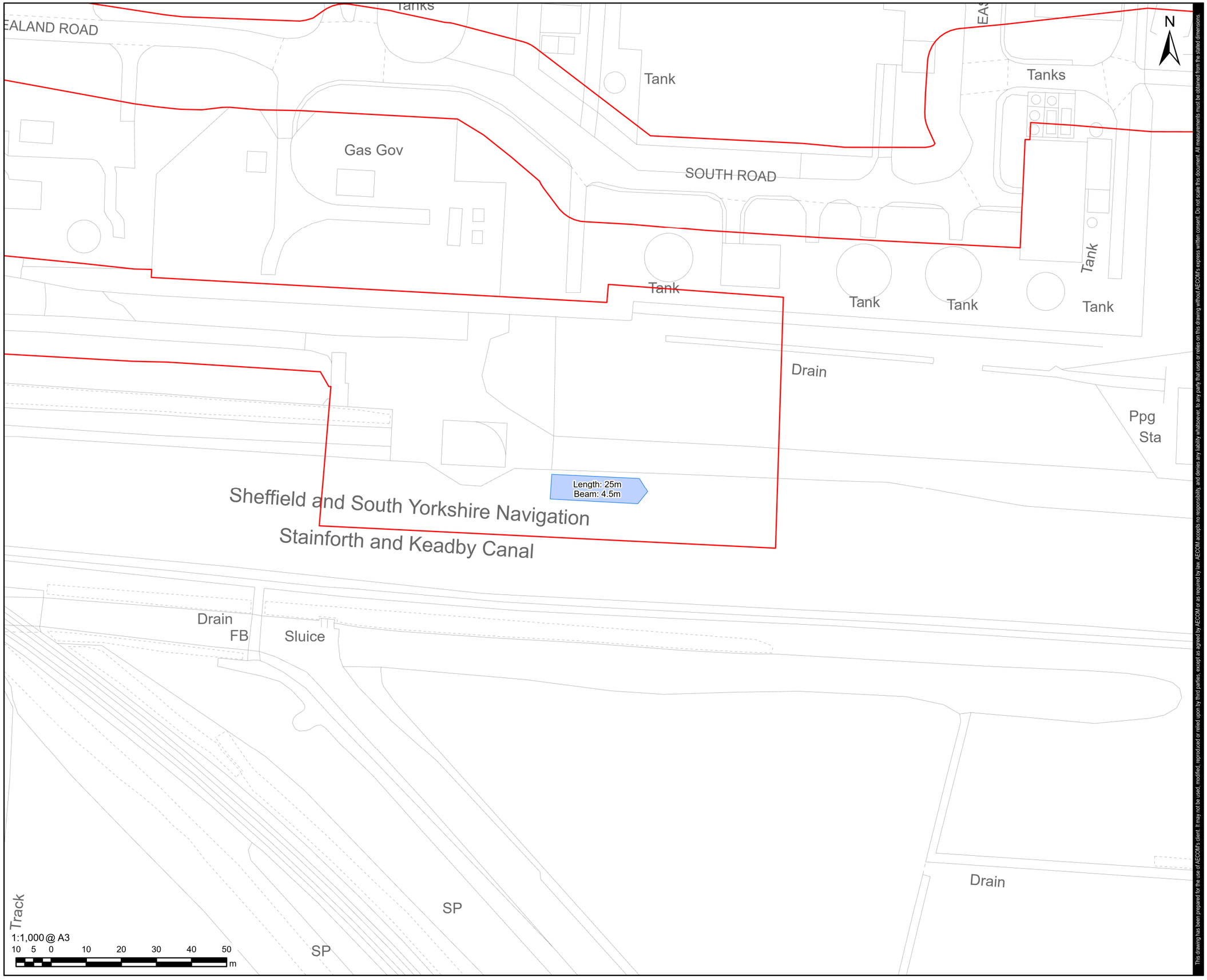

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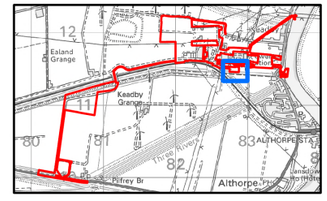
LEGEND

- Proposed Development Site
- Potential Workboat Location



NOTES

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60721867

FIGURE TITLE

Indicative Workboat Location - Keadby & Stainforth Canal

FIGURE NUMBER

Figure 12C.5

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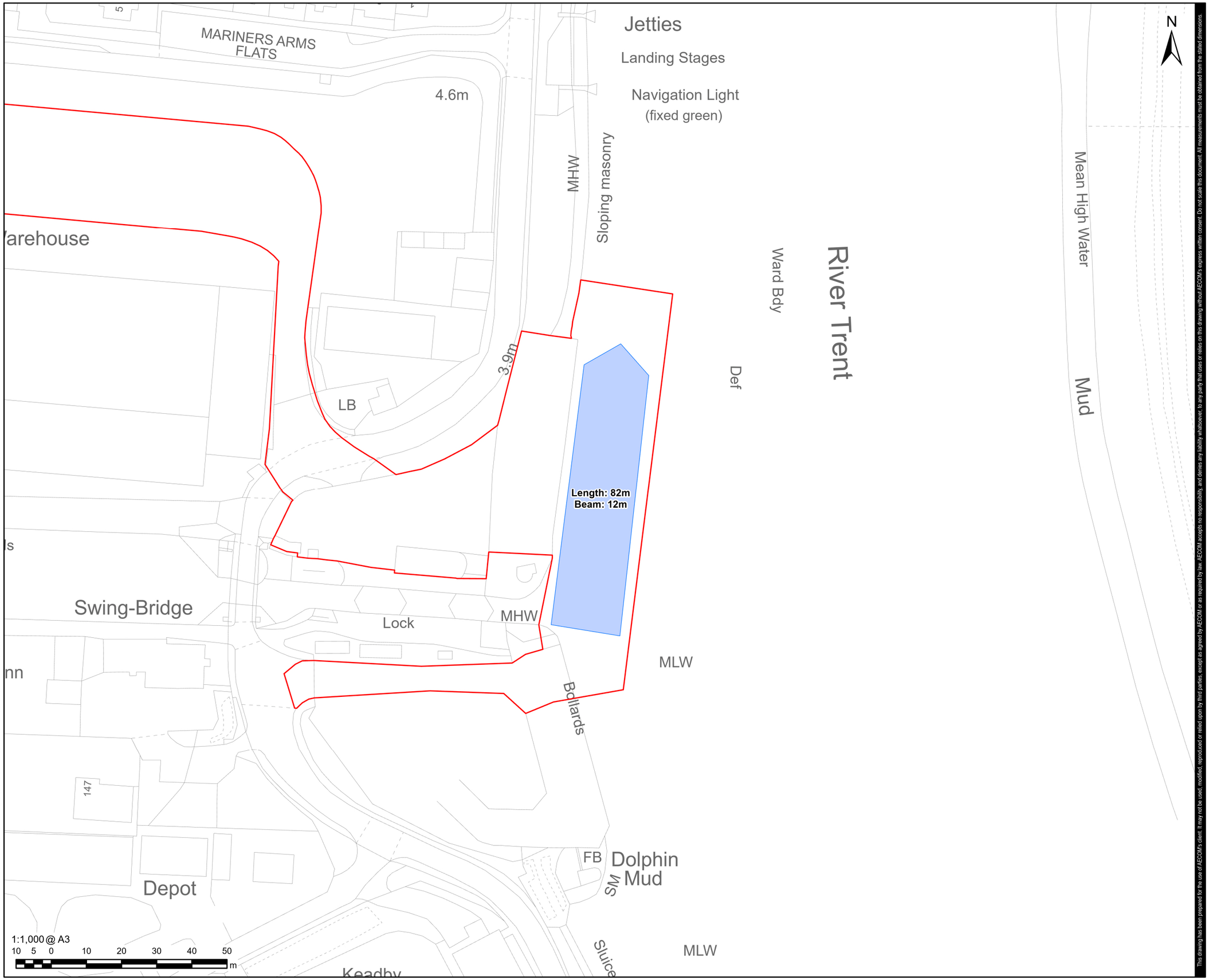

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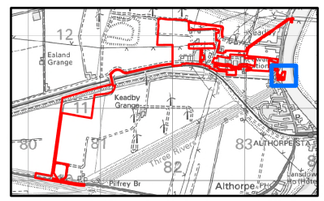
LEGEND

- Proposed Development Site
- Largest Potential Vessel



NOTES

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER

60721867

FIGURE TITLE

Indicative Vessel Mooring for AIL Management

FIGURE NUMBER

Figure 12C.6