Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 2: The Project

Associated British Ports

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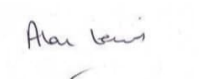
Signed		Date	20/12/2022
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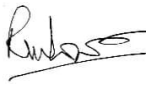
Signed		Date	20/12/2022
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2.1 Overview of the Project

2.1.1 The Project would comprise the construction, operation and maintenance of a terminal to facilitate the import and export of bulk liquids associated with the energy sector, together with associated development. The terminal consists of a jetty and associated loading/ unloading infrastructure, pipelines and metering systems.

2.1.2 Initially, the terminal would be used for the import and export of green ammonia to be converted to green hydrogen. To facilitate this, a hydrogen production facility, comprising associated ammonia handling equipment, storage and processing units would be constructed as part of the Project. Other proposed uses for the green energy terminal will come forward in due course as separate applications. It is anticipated that future users are likely to include customers in the carbon capture sector.

2.2 Purpose and Objectives

2.2.1 The objectives of the Project are:

a. To provide essential port infrastructure, capacity and resilience to support the growth and changing strategic needs of the energy sector to support decarbonisation within the Humber Industrial Cluster and the Humber Enterprise Zone.

b. To provide capacity to support the import and export of a range of bulk liquid energy products including (i) ammonia (NH_3) (to produce green hydrogen) to help decarbonise the United Kingdom's (UK) transport sector and (ii) carbon dioxide (CO_2) to facilitate carbon capture and storage, both of which will assist transition towards net zero.

c. To deliver and operate new port infrastructure, and its first user's hydrogen production facility, in a safe, efficient and sustainable manner by making effective use of available land, water, transport and utility connections which exist in and around the Port of Immingham.

d. To minimise adverse impacts on the environment and safeguard the health, safety and amenity of local residents.

e. To enhance both the local and regional economy through direct investment in and around the Port of Immingham and by partnering with the supply chain, providing opportunities for training, upskilling, apprenticeships and local employment.

2.2.2 An overview of the green hydrogen production process is provided in **Appendix 2.A** (PEI Report, Volume IV).

2.3 Project Site Description

2.3.1 The following sections describe the location, nearest sensitive receptors, features and elements associated with the Project Site (the 'Site') and the surrounding environment as illustrated on **Figure 2.1** (PEI Report, Volume III).

Project Location

2.3.2 The Site is located in North East Lincolnshire on the south bank of the Humber Estuary to the east of the Port. **Figure 1.1** (PEI Report, Volume III) illustrates the Project's location, which is approximately centred on National Grid Reference (NGR) E520783 N415271.

2.3.3 The land-side works fall within the administrative boundary of North East Lincolnshire Council (NELC), as illustrated on **Figure 2.2** (PEI Report, Volume III). The marine-side works, that extend seaward and fall beyond the local authority's boundary, will take place in the bed of the Humber Estuary, which is owned by the Crown Estate and over which the Applicant has the benefit of a long lease. The Project in its entirety covers an area of approximately 170.41 ha.

Parts of the Site

2.3.4 As illustrated on **Figure 2.3** (PEI Report, Volume III), the Project Site is split up into the following areas:

a. Terminal comprising a jetty and topside infrastructure;

b. Corridor between the jetty and Laporte Road to support a jetty access road, the ammonia import pipeline to the East site (and a reserved corridor for a future pipeline);

c. East Site on which the ammonia storage and hydrogen production will be undertaken;

d. West Site, where hydrogen production, storage and loading will be undertaken;

e. Pipeline corridor between the East and West Sites for the transfer of ammonia, hydrogen, nitrogen and utilities; and

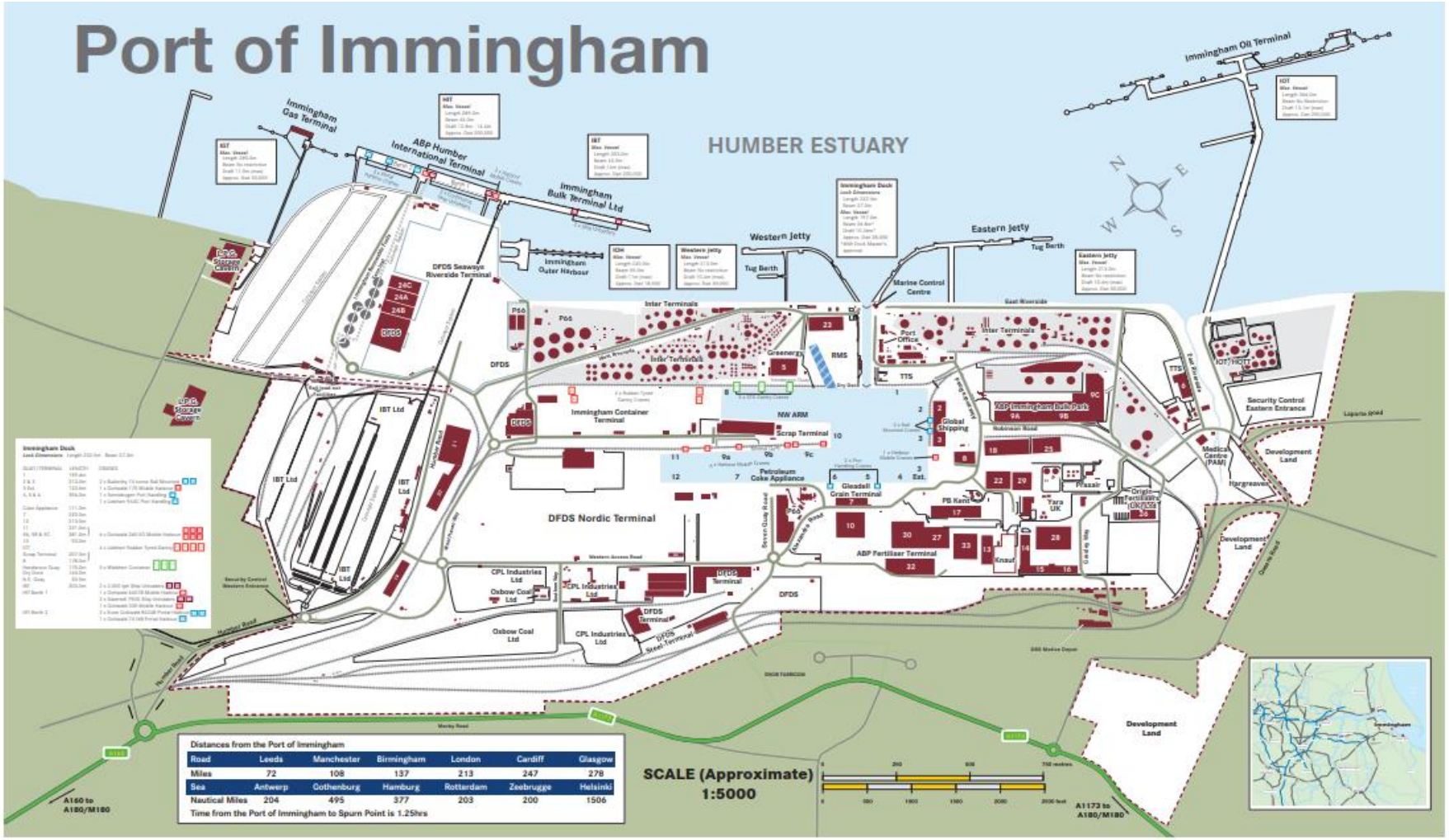
f. Temporary Construction Areas for laydown and construction compounds.

2.3.5 The Site is situated to the east of the Port and largely outside of the operational area of the Port, as shown in **Plate 2-1**. The area surrounding the Port is industrial in nature, being dominated by chemical manufacturing, oil processing and power generation facilities. Residential and commercial properties are present to the south of the Port on Queens Road and lie within, and adjacent to, the Site boundary. Beyond the industrial facilities, the wider area is largely agricultural. The nearest residential area is the town of Immingham approximately 1km from the western edge of the West Site.

2.3.6 The Port lies immediately adjacent to the main deep-water shipping channel which serves the Humber Estuary, thereby enabling access to the Port by some of the largest vessels afloat today. The Port is also well located for onward/inward transport of goods by road throughout the UK. It enjoys easy and

quick access for road haulage to the M180 Motorway and from there to the M1 Motorway or the A1, via the M18 Motorway. In addition, the Port has its own rail terminal, with some 25% of all rail freight in the UK originating from the Port. This primarily connects to local power stations and steel works moving circa 10 million tonnes of cargo per annum.

Plate 2-1 Plan of the Port of Immingham



Site History

2.3.7 Available historical maps from the Groundsure Report (Ref 2-1) for the Site have been studied to determine the previous land uses within the area surrounding the Project Site boundary. The mapping shows no notable development on the Site until 1930–31 when residential housing is shown on Queens Road adjacent to the West Site boundary. In addition, the L.N.E.R Grimsby District Electric Light Railway is shown through the centre of the proposed pipeline route. Within 500m of the Site boundary, a sewage works was also located.

2.3.8 No notable changes occur at the Site until 1951–56. At this time a Gypsum Disposal Bed is denoted partially on the West Site boundary and extends off-site to the southeast. In addition, the Railway is no longer shown in the proposed pipeline route. Buildings and railway lines associated with a Chemical Factory are denoted approximately 350m southeast from the northeast Temporary Construction Area.

2.3.9 In 1964, small buildings are denoted on the West Site, whilst electricity lines run through the East Site. At this time the Port begins to develop, including but not limited to the development of two jetties 235m north and 428m east from the Site boundary respectively, as well as an electricity sub-station. The Chemical Factory is denoted on the map as a 'Works' from 1964 onwards.

2.3.10 Up to the present day, no notable change has occurred within the Site aside from further electricity pylons being denoted through the West Site and a pipeline being denoted on the northwest site boundary in 1969–72. 500m from the Site boundary multiple changes occur between 1964 and the present day and the industrial landscape continues to build-up including but not limited to an Oil Storage Depot and associated infrastructure, structures associated with the sewage works, pipelines, and most recently in 2010 a Recycling Centre which is no longer shown in the 2022 map of the Project and surrounding area.

2.3.11 The 'Works', multiple railway lines and other infrastructure all become disused during the time between 1969 – present day. Despite this some infrastructure has remained, such as the jetties that were denoted on maps from 1964.

Existing Environment and Land Use

2.3.12 The proposed Terminal would extend seawards into the Humber Estuary and the Site is located to the east of the existing Immingham Oil Terminal jetty. This area falls within the boundaries of the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar Site, which collectively form the Humber European Marine Site (EMS).

2.3.13 The East Site comprises two parcels of land, which are bisected by Laporte Road. The first parcel of land consists of an area of hardstanding to the north of Laporte Road which is in use by the Applicant as a storage area. The second parcel of land is a triangular shaped area of brownfield land that is currently covered by gravel and various stockpiles, which is accessed via Queens Road (A1173) and lies to the south of Laporte Road. The Associated Petroleum Terminals works complex is situated to the north/north-east of the East Site, whilst to the south are various industrial facilities. To the west and north-west is

the Port and associated industrial facilities and the 'Immingham Dock East Gate' Port entry point from Queens Road. To the east the East Site is bordered by a woodland belt which is subject to a Tree Preservation Order (TPO), and through which a bridleway passes, connecting users to a coastal access path that follows the Humber Estuary east to Grimsby.

2.3.14 The West Site currently comprises three agricultural fields, which are bounded by linear hedgerows and drainage ditches. An electrical sub-station and a gas-fired power generator installation are situated to the north-west. The north west and western boundaries of the West Site are defined by Kings Road and the A1173. A landfill is located to the south separated by a landscape buffer strip. Queens Road forms the north-eastern boundary of the West Site with a number of residential and commercial properties included within the Site boundary. The east and south-eastern boundary is adjacent to another gas fired power generator installation, the community recycling centre and a large waste gypsum landfill. A short tarmac access road has been constructed from Kings Road into the West Site and a series of overhead power cables run across the middle and southern boundary of the site, with a buried mains water and a buried high-pressure gas pipeline also along the southern boundary. A proposed Pipeline Corridor connects the West Site to the East Site and extends to the Terminal. It crosses an area that has mostly already been impacted by industrial development alongside Queens Road and Laporte Road, and also crosses the Grimsby Docks Branch Line. At the eastern end, the Pipeline Corridor area includes a section of woodland known as 'Long Strip' between Laporte Road and the Humber Estuary that is subject to a Tree Preservation Order (TPO).

Utilities

2.3.15 Underground gas mains, water mains and overhead electricity transmission infrastructure cross the Site.

Potential Sensitivities / Receptors in the vicinity of the Site

Air Quality Receptors

2.3.16 There are no Air Quality Management Areas (AQMA) within the Site or surrounding area. Immingham itself has historically had an AQMA, close to the Port on Kings Road, due to elevated concentrations of PM_{10} concentrations that are now well below the relevant air quality objectives.

Ecological Receptors

2.3.17 The Site falls within boundary of the Humber Estuary EMS, which is a statutory designated site that encompasses the Humber Estuary SPA, SAC, RAMSAR and Site of Special Scientific Interest (SSSI) designations.

2.3.18 Laporte Road Brownfield Site Local Wildlife Site (LWS) is located approximately 150m south-east of the Site.

2.3.19 The mature broad-leaved deciduous woodland of Long Strip is within a corridor between the jetty and Laporte Road which is required to support a jetty access road, the ammonia import pipeline to the East Site (and a reserved corridor for a future pipeline). This area is subject to a TPO which applies to the whole

woodland block (including the area on the south side of Laporte Road, which is outside the Site boundary) as shown on **Figure 2.1** (PEI Report, Volume III).

Traffic and Transport Receptors

2.3.20 Access to the West Site would be using an existing access off Kings Road and a new access onto the A1173. Access to the East Site would be off Queens Road and Laporte Road. Further details are provided in **Section 2.4** below. Queens Road is a single carriageway road providing a link from the Port Area, crossing the Grimsby Docks Branch Line on a bridge and runs towards the A1173, where it becomes Kings Road. Kings Road is also a single carriageway, which forms a three-arm roundabout junction with the A1173, where Kings Road then continues to the north to form a link into Immingham and then to the A160 to the north. The A160 heads west and connects with the A180. A new permanent access point will also be required off Laporte Road for a Jetty Access Road (see **Section 2.4** and **Section 2.7** below). Temporary access points would be required during construction including one for the main Temporary Construction Area, accessed off Laporte Road.

2.3.21 From the three-arm roundabout junction with Kings Road, the A1173 continues south as a single carriageway to form a three-arm roundabout with Kiln Lane before continuing south to form a grade separated junction with the A180. The A180 is part of the strategic road network (SRN) and is maintained by National Highways. The A180 heads east to Grimsby and west towards the closest motorway (M180) and provides the link from the local area to the wider highway network within the region.

2.3.22 There is a bridleway/ Public Right of Way (PRoW) within the Site, which runs through the eastern edge of the strip of woodland described above at **paragraph 2.3.13** and which forms part of the proposed route for the improvements to the England Coast Path between the Humber Bridge and Easington (to the north of the Humber) and Mablethorpe to Humber Bridge (to the South of the Humber). Part of the proposed upgraded route is located within the Site. Pedestrian facilities are limited on the local road network in the vicinity of the Site, with a footway along one side of Queens Road and along the north side of the A1173 King Road providing a link into Immingham. It is anticipated that the bridleway would need to be temporarily diverted or closed during the construction phase of the Project but would be re-opened in the operational phase. This is considered in detail in **Chapter 23: Socio-economics**.

Residential Receptors

2.3.23 The nearest settlement is the town of Immingham, which is located approximately 460m west of the Site at its closest point.

2.3.24 Other settlements nearby include: Grimsby (approximately 5km) to the south-east; Healing (approximately 3.5km) and Great Coates (approximately 5.5km) to the south-east; Stallingborough (approximately 2.5km) to the south; Keelby (approximately 5km) to the south-west and Habrough (approximately 4.5km) to the west.

2.3.25 The closest residential receptors to the Site include:

a. Seven residential properties located on the west side of Queens Road (1-6 and 31 Queens Road) which are included within the Site boundary. These have been included within the Site as their continued residential use is unlikely to be compatible with the operation of the hydrogen production facility and storage on the West Site (see **Section 2.4** below and **Chapter 22: Major and Accidents and Disasters** for further information).

b. A large number of residential properties on the eastern edge of the Immingham residential urban area including Somerton Road, Dunster Walk, Ings Lane, Oakham Walk, Kendal Road, Chestnut Avenue, Waterworks Street and Spring Street, which at the closest point are located between approximately 460m and 480m west of the West Site.

c. Mauxhall Farm off Stallingborough Road, approximately 1km south-west of the West Site.

Business / commercial receptors

2.3.26 The Site also includes a number of business / commercial receptors comprising (so far as is known from investigations to date, with potential additions to be determined):

1. Sherwood Travel (Coach and minibus hire);
2. Queens Road Café;
3. Mark Ellis Motor Services (Mechanic);
4. European Welding Supplies Limited (Welding Supply shop);
5. Saybolt UK Ltd (Marine Surveyor); and
6. P&H insulation Services.

2.3.27 These have been included within the Site because, whilst it is considered possible that their continued use will be compatible with the operation of the hydrogen production facility, this requires further assessment which will be undertaken in connection with the application for Hazardous Substances Consent.

Consultation with owners and occupiers

2.3.28 Discussions with the owners and occupiers of the residential and commercial properties have commenced.

2.3.29 Air Products is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the Development Consent Order (DCO).

2.3.30 Whilst it is possible that powers to compulsorily acquire the commercial properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely.

Cultural Heritage Receptors

2.3.31 There are no World Heritage Sites, Scheduled Monuments, Grade I and II* listed buildings, conservation areas, registered parks and gardens, registered

battlefields, or protected wreck sites within 2km of the Site. There are a total of three Grade II listed buildings located within 2km of the Site, comprising of the Immingham War Memorial (NHLE 1455139), Churchfield Manor (NHLE 1161630) and the Iron Bungalow (NHLE 1391349).

Landscape and Visual Receptors

2.3.32 The existing landscape / seascape and visual baseline is heavily influenced by the existing industrial presence located around the deep-water-port. This includes several deep-water jetties for bulk cargo and terminals for oil and gas; the area is dominated by industrial works. The seascape of the Humber varies in quality and character along its length, with expansive areas of tidal mudflats and saltmarsh contrasting with more developed industrial areas. Visual receptors are relatively limited, with the main concentration being residents in the nearby settlement of Immingham. Existing views from most locations include the structures and infrastructure associated with the working port and other adjacent industrial development.

2.3.33 Part of the Site and landscape and visual study area fall within The Humber Estuary National Character Area (NCA). The character area is broadly split into two components, the largest being the expanse of water associated with the Humber Estuary, which discharges into the North Sea. Due to its strategic position, the estuary facilitates important and busy trade routes. The land adjacent to the coast is described as a *'low-lying estuarine landscape with extensive stretches of intertidal habitats'*. Due to these elements, the landscape has international significance as a Ramsar site, along with several other designations. The character area provides a varied landscape, with open and extensive views across remote and rural areas, contrasting with heavy industry associated with towns and ports.

2.3.34 The Site lies within Marine Character Area (MCA) 6: Humber Water, which is the second largest coastal plain estuary in the UK and is bound by intertidal mud and sand flats and saltmarsh. These habitats provide internationally important wildlife corridors. The character area contains the UK's largest port complex and views are dominated with an extensive and complex mix of industrial, commercial, agricultural, residential and tourism land uses. Shipping traffic using the local ports provide a dominant animated feature.

2.3.35 The Site is located within Regional Character Area (RCA) 3: The Northern Marshes, which is defined by the industrial features along the coast clustered around the deep-water Port of Immingham. The RCA is visually dominated by large and tall structures, such as Lindsay Oil Refinery, which are linked with the Port and heavy industry.

2.3.36 The Site is also within Local Landscape Character Area (LCA) A – Humber Estuary, as defined by the NELC Landscape Character Assessment (Ref 2-2). Area A – Humber Estuary is then subdivided into three Local Landscape Types (LLTs), which the Site and study area lie within:

a. LLT 1 Industrial Landscape;

b. LLT 2 Open Farmland; and

c. LLT3 Wooded Open Farmland.

Topography, Land Quality and Geological Receptors

2.3.37 The topography of the Site is low-lying and flat with many areas existing as historically reclaimed land. An extensive network of ditches artificially drains the land.

2.3.38 The Provisional Agricultural Land Classification Grade Map on MAGIC Map Application (Ref 2-3) indicates that the East Site and Pipeline are designated as Grade Urban, whilst most of the West Site is designated as Grade 3 but has not been subdivided into Grades 3a or 3b. The eastern half of the Temporary Construction Area adjacent to the Humber Estuary has also been designated as Grade 3 but has not been subdivided into Grades 3a and 3b, and the western half is designated as Grade Urban.

2.3.39 The solid geology across the entire Site is characterised by the Flamborough Chalk Formation. There are superficial deposits comprising Beach and Tidal Flat Deposits and Tidal Flat Deposits associated with the Humber Estuary. Made Ground is anticipated to be presented across the majority of the Site.

Hydrological and Flood Risk Receptors

2.3.40 The Humber Estuary forms the eastern boundary of the Site. North Beck Drain, Middle Drain and Habrough Marsh Drain are all located in the vicinity of the Site as shown in **Figure 18.1** (PEI Report, Volume III).

2.3.41 The Environment Agency Flood Map for Planning shows that Site is located entirely in Flood Zone 3. However, the Site is afforded protection from tidal flood defences that are in place along the entire south bank of the Humber Estuary. These tidal flood defences provide protection against a flood event with a 0.5% chance of occurring in any year, therefore the likelihood of a flood event occurring from overtopping or failure of the defences is considered to be low due to the presence of flood defences.

2.3.42 There are no historical flood records from groundwater flooding within the Site or the wider Port of Immingham area and the Site is also at very low to low risk of flooding from surface water sources.

2.3.43 Anglian Water asset mapping shows that there is no surface water drainage infrastructure operated by them within the Site. An Anglian Water foul sewer main and the Immingham Sea Outfall are located in proximity to the Site. Surface water from hard standing areas is generally discharged directly to the adjacent watercourses and ultimately to the Humber Estuary, or directly to the Humber Estuary.

2.3.44 Given the generally undeveloped nature of the Site, it is assumed that the land predominantly drains via natural infiltration processes to the land drains located within and adjacent to the Site. There is a possibility that historical drainage infrastructure is present beneath the East Site, however it is not known whether this part of the Site drains via natural processes or via a piped system.

2.4 Project Description

2.4.1 The design of the Project at this stage incorporates a degree of flexibility in the dimensions and configurations of buildings and structures to allow for the future selection of the preferred technology and contractor.

2.4.2 In order to ensure a robust assessment of the likely significant environmental effects of the Project, the Environmental Impact Assessment (EIA) is being 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 (building dimensions or operational modes for example). Where this approach is being applied to the specific aspects of the EIA, this is confirmed within the relevant chapters of this Preliminary Environmental Information (PEI) Report. This PEI Report is considered to represent a reasonable worst-case assessment of the potential impacts of the Project at its current stage of design.

Project Components

2.4.1 In summary, the Project would comprise:

a. On the marine side (the Nationally Significant Infrastructure project (NSIP)):
   i. A jetty, consisting of an approach trestle, approximately 1.1km in length, leading to up to two berths, including loading platforms and berthing and mooring dolphins with link walkways; and
   ii. Topside infrastructure on the jetty for the handling of bulk liquids, including loading arms and pipelines.

b. On the land side (the Associated Development):
   i. An access road to the jetty;
   ii. Two operational sites supporting hydrogen production facilities (an East Site and a West Site);
   iii. Pipework, pipelines and utilities (i) between the jetty and the green hydrogen production facility on the East Site and (ii) between the two green hydrogen production facility sites and (iii) between buildings and plant within the production operation facilities;
   iv. Refrigerated ammonia storage tank (on the East Site);
   v. Hydrogen production units that convert ammonia to produce the green hydrogen (on both East and West Sites);
   vi. Hydrogen liquefiers (on both East and West Sites) to liquify the hydrogen for temporary storage (on the West Site);
   vii. Loading bays to fill road tankers with liquified hydrogen which would then be distributed to hydrogen filling stations throughout the UK (on the West Site);
   viii. Ancillary buildings and works;
   ix. Access from the public highway to the two hydrogen production sites; and

x. Temporary construction areas.

2.4.2 Further details on these elements of the project are provided below as relevant.

2.4.3 **Figure 2.4** (PEI Report, Volume III) provides a site layout of the Project, which is provided for illustrative purposes only. The assessment undertaken to inform the EIA will be based on the parameters set out below and as indicated within individual topic chapters.

Marine Infrastructure (the NSIP or principal development)

Terminal

2.4.4 This would be a new jetty located to the east of the existing Immingham Oil Terminal jetty. A new in-river jetty with up to two berths, including topside infrastructure, is proposed that would have capacity to facilitate the import and export of bulk liquids associated with energy. Between them, the two berths would be capable of handling a variety of large vessels, of between 100m-250m in length and with draughts of up to 14m. The associated hydrogen production facility, to be operated by Air Products and described below, would be the first user of the jetty facility for the import of green ammonia to be converted to green hydrogen. The other bulk liquids are expected to include products such as liquefied CO_2 for the purpose of carbon capture and storage including via connection to proposed CO_2 transport infrastructure being developed close to the Port.

2.4.5 The proposed marine infrastructure would consist of:

a. An open piled approach trestle, approximately 1.1km in length, which would extend from the river frontage in a northerly direction leading to the jetty structures and which would provide access for vehicles and pipework to and from the shore to the berths. The approach trestle would be approximately 13m in width connecting to a jetty head of approximately 50m by 20m to provide the western berth (Berth 1). A jetty arm of up to 525m would connect to a second platform of approximately 50m by 20m to provide the berth (Berth 2). The jetty will involve the installation of approximately 380 steel tubular piles, which are estimated to be a maximum of 1,372 mm diameter in size.

b. Each jetty head would comprise structures including (un)loading platforms, two berthing dolphins with fenders and mooring dolphins (likely 12) linked by high level walkways to facilitate operational and maintenance access. The western berth (Berth 1) would support the largest vessels (with draught to 14m and with capacity of up to 55,000 tonnes) and the eastern berth (Berth 2) would support smaller vessels (with capacity of up to 25,000 tonnes).

c. Appropriate topside infrastructure installed on the jetty to load and unload vessels including marine loading arms, piping, maintenance access, wastewater collection and drainage and supporting utilities for handling liquid bulk shipments. The pipework would run along the jetty, over the existing seawall, to a connection point with the landside pipework.

d. A small capital dredge of approximately 100,000m^3 (based on the latest available site-specific geotechnical and geophysical information) would be

required to ensure accessibility and safe mooring for vessels on the western berth (Berth 1) at all states of the tide. It is envisaged that the required dredge depth would be approximately 16m below Chart Datum; however, this would be confirmed through the Project design process and further information will be provided in the ES. No capital dredging is expected to be required for the eastern berth (Berth 2).

e. Any dredge berth pocket would be optimised to include side slopes to ensure its stability, and it is envisaged that the dredged arisings (comprising of alluvial and glacial materials) if not suitable for beneficial reuse, would be disposed at licensed sites within the estuary as described in **Section 2.6** below.

f. Periodic maintenance dredging may be required and a reasonable worst case maintenance dredging scenario, an outline of the assumptions upon which this is based, will be set out in the ES. The implications of maintenance dredging for the marine environment will be assessed in the ES.

Landside Infrastructure (associated development)

2.4.6 The landside infrastructure associated with the Project for which consent is sought under this DCO Application would consist of the infrastructure necessary to import the ammonia from the jetty, store the ammonia and convert that ammonia into green hydrogen at the East and West Sites. The green hydrogen production facility would be the first user of the NSIP. The landside infrastructure would, in summary, consist of:

a. Pipework, pipelines and utilities required to link (i) the jetty and the green hydrogen production operations on the East Site, (ii) the hydrogen production operations on the East and West sites and (iii) buildings and plant within the production operation facilities.

b. A jetty access road connecting Laporte Road to the jetty, providing vehicular access to the jetty and also the ability to maintain the adjacent pipelines between the jetty and the East Site.

c. A control building on the landside, at the foot of the jetty, to accommodate personnel operating the jetty and maintenance vehicles.

d. An ammonia storage tank: the refrigerated liquid ammonia would be stored in a tank, up to 45m in height, at nearly atmospheric pressure at -33°C.

e. Up to six hydrogen production units (three on the East Site and three on the West Site). In the hydrogen production units, the liquid ammonia would be split into hydrogen and nitrogen (N) (nitrogen makes up 78% of the composition of ambient air). The core of the process is a catalytic bed. This reaction is endothermic i.e. it requires heat to take place, so the catalytic bed sits within a furnace, which would be fired using natural gas. The furnace output capacity is estimated to be less than 30MW during the initial phase of development (operation of the first three hydrogen production units) plus a similar output for the future phase (operation of up to six hydrogen production units in total) (see **Section 2.5**). It is anticipated that this process could be

further decarbonised in future by using alternative low carbon fuels, potentially including green or low carbon hydrogen or biomethane.

f. Hydrogen liquefaction (on both East and West sites) and storage facilities (on the West Site): the hydrogen in gaseous form coming from the hydrogen production units would be turned into liquid through a hydrogen liquefier, so it is easier to safely store and transport. The liquid hydrogen would be stored in horizontal storage vessels or tubes with up to 250 tonnes stored on the West Site.

g. Green hydrogen export facilities: road tanker loading bays for both liquid and gaseous hydrogen for distribution to the points of use throughout the UK.

h. The formation of new access roads and junctions into the Site as well as internal access roads around the hydrogen production facilities.

i. Grid connection: the site will be supplied with electricity from the local grid. Work is ongoing to determine the details of this supply. The voltage level of the required supply is most likely to be 132kV and further details will be provided in the ES.

2.4.7 The buildings and structures associated with these elements are described in greater detail below, as relevant.

2.4.8 The Associated Development will comply with the Environmental Permitting (England and Wales) Regulations 2016 (Ref 2-4) (EPR) under an Environmental Permit to be obtained from the Environment Agency as detailed in **Chapter 4: Legislative and Consenting Framework**.

2.4.9 The Site will be operated in line with appropriate standards and the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001. The EMS will outline requirements and procedures required to ensure that the Site is operating to the appropriate standard.

2.4.10 Sampling and analysis of pollutants will be carried out where required including monitoring of exhaust emissions levels using continuous emissions monitoring systems CEMS prior to discharge from the stacks, in accordance with the Environmental Permit.

2.4.11 Based on the volumes of hazardous materials to be stored on the Site, a Hazardous Substances Consent will be required from NELC. The hydrogen production facility will also be regulated through the Control of Major Accidents and Hazards Regulations (COMAH) and other legislation identified **in Chapter 22: Major and Accidents and Disasters**. As a result, the implications for land uses around the hydrogen production facility need to be carefully considered (see **Table 22.2 Relevant Legislation, Policy and Best Practice Regarding MA&D**). As mentioned in **Section 2.3** above, it is currently anticipated that the residential use of seven properties on the west side of Queens Road will need to cease as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. Discussions have commenced with the owners and occupiers to determine whether they wish to dispose of their interests. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

2.4.12 Further, as mentioned in **Section 2.3** above, a number of businesses are also present in the same area on the west side of Queens Road. Further assessment will be undertaken to determine the compatibility of these uses with the Project and discussions with the owners and occupiers have commenced. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely. The implications of loss of employment as a result of relocation or extinguishment of some of those businesses are assessed in **Chapter 23: Socio-economics** and reference is made to these properties as sensitive receptors in this PEI Report as relevant.

2.4.13 It is the strong preference of both ABP and Air Products to acquire all necessary interests in land for the construction and operation of the Project through negotiation and both parties aim to continue discussions with all affected parties during and after the Statutory Consultation. Any compulsory powers sought within the DCO will be carefully considered and explained by reference to the statutory tests and guidance.

East Site

2.4.14 The East Site would comprise an ammonia storage facility and hydrogen production units for the production of hydrogen from ammonia. Initially only one hydrogen production units would be constructed on the East Site in Phase 1 of the Project, with additional hydrogen production units (up to two) being added in future phases of development to make a total of three on the East Site when fully built out (see **Section 2.5**). One flare would be required per hydrogen production unit, therefore up to three flares would be required on the East Site. Each flare would be fitted with a shroud to minimise visibility of the pilot light. Use of the flares would be exceptional, i.e. for emergency use only and during start up and shut down.

2.4.15 The East Site would be linked to the jetty through the ammonia pipeline as well as communications and utilities links described above. The ammonia pipeline between the East Site and the jetty would be maintained from the Jetty Access Road immediately to the east of it which is described further at **Section 2.7**.

2.4.16 Offloaded refrigerated liquid ammonia from the jetty facility would be transferred to the ammonia storage tank at the East Site. The storage facility would include a refrigeration (boil-off gas) system, storage flare for emergency use only, and supply pumps for the hydrogen production units.

2.4.17 A list of key buildings and structures that would be required on the East Site is set out in **Table 2.1**. This information will continue to be developed through the design process and further details will be presented in the ES. However, these are the maximum dimensions envisaged in order to present a worst case for assessment purposes.

Table 2.1 East Site Key Buildings and Infrastructure – Indicative List

Building / Infrastructure Name	No. of Units (total)	Dimensions		
		Length (m)	Width (m)	Height (m)
Hydrogen production unit main stack	3	2	2	35
Hydrogen production unit	3	95	70	35
Hydrogen production unit flare	3	N/A	5m dia	45
Ammonia tank	1	N/A	70m dia	65**
Ammonia tank flare	1	N/A	1m dia	8
Piperack	1	45	10	15
Control / Security Building	1	40	30	6

** Includes Ammonia Tank flare, placed on top of NH_3 Tank

2.4.18 Access to the East Site from public roads is proposed via two new entrances, one from Queens Road and the other from Laporte Road, and an existing access taken via the Eastern Gateway into the Port. For details on operational traffic estimates see **Chapter 11: Traffic and Transport**.

2.4.19 East site utility / service connections and requirements are detailed in **Table 2.2**.

Table 2.2 East Site Utility / Service Connections

Utility / Service	Connection
Nitrogen	The East Site would receive nitrogen that is generated at the West Site via a connection pipeline in the main pipeline corridor described below.
Natural gas	Natural gas will be supplied from the local main gas network. Connection details are not yet available.
Power	The East Site will be supplied with electricity via a connection to the local grid from the West Site. Work is ongoing to determine the details of this supply. The voltage level of the supply is most likely to be 132kV.
Potable water	A connection to the local water mains network will be made. The local provider is Anglian Water.
Cooling water	A site-wide cooling loop will be required. The source of make-up water is to be confirmed.
Firewater	A firewater system within the site boundary is required, however the source of the firewater is not yet confirmed. At this stage it is assumed that it will be from the potable water source and will require a fire water tank. Care in design would be taken to ensure proper segregation from any drinking or welfare related use. An allowance would be made for the retention of

Utility / Service	Connection
	firewater (contaminated water from firefighting). It is anticipated that this would be a retention basin on site sized for the maximum fire case with allowance for storm conditions. This basin would also be able to act as a hold up for chemical spills and arrangements would be made to sewerage provided to collect spills
Wastewater	A site-wide drainage system would be required for surface run-off and is likely to include attenuation storage to mitigate the impact of introducing impermeable surfaces. The management of wastewater and its disposal from site will be considered during the development of the drainage strategy. Refer to **Chapter 18 Water Quality, Coastal Protection, Flood Risk and Drainage** for further details'

2.4.20 An operational access route to the Jetty will be required from Laporte Road to the jetty. The construction of the jetty access road and installation of the pipeline would lead to tree loss from the TPO area and this is considered in **Chapter 8: Nature Conservation (Terrestrial Ecology)** and **Chapter 13: Landscape and Visual**.

2.4.21 A plan illustrating indicative site components of the East Site is shown in **Figure 2.5** (PEI Report, Volume III).

West Site

2.4.22 The West Site would comprise up to four hydrogen liquefiers and the temporary storage of the hydrogen and its subsequent road transport. A site-wide cooling water system is also required for the Project and the cooling towers will be installed on the West Site. A nitrogen supply to the East Site would be provided via a pipeline connection from a nitrogen generator on the West Site. In addition, the West Site would also accommodate administrative offices and warehouse facilities associated with the operation of the facility as well as tanker loading bays associated with the bulk distribution of the green hydrogen.

2.4.23 Future phases of the Project would involve the construction of up to three hydrogen production units on the West Site, identical to those which will be established on the East Site. (see **Section 2.5**), making a total of six hydrogen production units across both sites, when fully built out. One flare would be required per Hydrogen Production Unit (HPU) and each flare would be fitted with a shroud to minimise visibility of the pilot light. Use of the flares would be exceptional i.e. for emergency use only and during start up and shut down.

2.4.24 Access to the West Site is proposed via two entrances, one from Kings Road and the other from the A1173. For details on operational traffic estimates see **Chapter 11: Traffic and Transport**.

2.4.25 An indicative list of key buildings and infrastructure that would be required on the West Site is set out in **Table 2.3**. This information will continue to be developed through the design process and further details will be presented in the ES. However, these are the maximum dimensions envisaged in order to present a worst case for assessment purposes.

Table 2.3 West Site Buildings and Infrastructure – Indicative List

Building / Infrastructure Name	No. of Units	Indicative Dimensions		
		Length (m)	Width (m)	Height (m)
Security and Visitor Building	1	15	20	8
Main Control Building	1	40	30	6
Workshop Building	1	40	30	10
Warehouse Building	1	45	30	10
Fire Pump House	1	5	3	5
Cooling Tower	1*	90	15	20
Main Incoming Station	1	30	10	10
Hydrogen Liquefier Compressor Building	4	60	45	25
Hydrogen Liquefier Vent	1	TBC	TBC	45
Piperacks	(overall length)	1600	10	15
Hydrogen production unit Flare	3	N/A	5m dia	45
Hydrogen production unit Compressor Building	3	20	20	20
Hydrogen production unit Main Stack	3	2	2	35
Hydrogen production unit	3	95	70	35
Hydrogen Trailer Filling Station	1**	120	30	8
Hydrogen Re-fuelling Station	1	72	53	8

*Consisting of 6 cells
** Dimensions are for 12 trailer filling points

2.4.26 West site utility / service connections and requirements are detailed in **Table 2.4**

Table 2.4 West Site Utility / Service Connections and Requirements

Utility / Service	Connection
Nitrogen	Nitrogen will be generated on the West Site and distributed to the East Site via a connection pipeline in the main pipeline corridor described below.
Natural gas	Natural gas will be supplied from the local main gas network. Connection details are not yet available.

Utility / Service	Connection
Power	A connection to the local grid from the West Site. Work is ongoing to determine the details of this supply. The voltage level of the supply is most likely to be 132kV. The main incoming substation will be located on the West Site. This will distribute to local power distributions centres as required by the electrical system design.
Potable water	A connection to the local water mains network will be made. The local provider is Anglian Water.
Cooling water	A site-wide cooling loop will be required. The source of make-up water is to be confirmed.
Firewater	A firewater system within the site boundary is required, however the source of the firewater is not yet confirmed. At this stage it is assumed that it will be from the potable water source and will require a fire water tank. Care in design would be taken to ensure proper segregation from any drinking or welfare related use. An allowance would be made for the retention of firewater (contaminated water from firefighting). It is anticipated that this would be a retention basin on site sized for the maximum fire case with allowance for storm conditions. This basin would also be able to act as a hold up for chemical spills and arrangements would be made to sewerage provided to collect spills
Wastewater	A site-wide drainage system would be required for surface run-off and is likely to include attenuation storage to mitigate the impact of introducing impermeable surfaces. The management of wastewater and its disposal from site will be considered during the development of the drainage strategy. Refer to **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage** for further details'

2.4.27 A plan illustrating indicative site components of the West Site is shown in **Figure 2.6** (PEI Report, Volume III).

Pipeline Corridors

2.4.28 A number of pipeline corridors are proposed within the Pipeline Area as described in the following paragraphs.

2.4.29 The first corridor includes the ammonia (NH_3) pipeline from the jetty to the East Site to deliver refrigerated liquid ammonia to the storage tank. The pipeline would be insulated and have emergency shutdown valves, thermal relief, expansion loops, and leak detection as required. The pipeline corridor would also include communications and utilities links. The pipeline would be above-ground and stacked vertically on a supporting rack/structure. It is assumed that the Jetty Access Road would run alongside this pipeline and this would allow maintenance to the pipeline as required. This area would also include a further corridor to the east of the Jetty Access Road reserved for a future pipeline, although this does not form part of the Project for which consent is sought.

2.4.30 For the purposes of assessment in this PEI Report, it is assumed that both the ammonia pipeline and the Jetty Access Road would run through the tree belt known as the Long Strip.

2.4.31 The second (or main pipeline) corridor would contain a series of pipelines, linking the East and West associated development Sites. These are expected to be parallel pipelines and would be installed underground. They are likely to be constructed using Horizontal Directional Drilling (HDD) or micro tunnelling techniques which minimises surface disturbance. The pipelines would include:

a. A hydrogen pipeline to allow the export of hydrogen from hydrogen production units installed on the East site to the liquefier(s) installed on the West Site.

b. An ammonia pipeline to allow the export of ammonia from the storage installed on the East site to the hydrogen production units installed on the West Site.

c. A nitrogen pipeline to supply nitrogen from a generator on the West Site for safety related purposes such as line purging or blanketing. A cathodic protection system would be installed to protect the pipeline(s) from corrosion.

d. A natural gas pipeline, which would be supplied from the local mains gas network located at the West Site, to supply the hydrogen production units installed on the East Site.

e. A cathodic protection system would be installed to protect the pipeline(s) from corrosion.

f. Utility connections would also be required in the Pipeline Corridor for the supply of communications links and electricity between the East and West Sites.

2.4.32 Additional pipelines and utility corridors would be needed between the various buildings and plant within the hydrogen production facilities.

Matters relevant to both East and West Sites

2.4.33 Permanent lighting requirements within the East and West Sites would be detailed within a Lighting Strategy, which will be prepared to accompany the DCO Application. The Lighting Strategy will outline measures proposed to avoid excessive glare and minimise spill of light to nearby receptors (including ecology and residents) as far as reasonably practicable.

2.4.34 Information on emissions to air and odour risk arising from the is the sites provided in **Chapter 6: Air Quality**.

2.4.35 Details regarding the disposal of solid waste are set out in **Chapter 20: Materials and Waste**.

2.4.36 Process safety and hazard management are addressed in **Chapter 22: Major Accidents and Disasters**.

Site Boundary and Design Evolution

2.4.37 The extents of land potentially required to implement the Project, referred to as the Site boundary, are illustrated on **Figure 1.1** (PEI Report, Volume III).

2.4.38 Since submission of the Scoping Report, the design of the Project has evolved to include up to two berths on the jetty (instead of a single berth) in order to enable a variety of vessels sizes of between 100m to 250m in length to be accommodated. This design change allows a greater range of vessel sizes to be accommodated at the Terminal to import and export different bulk liquids and builds in greater resilience to the proposed port infrastructure to enable it to remain responsive to the needs and demands of the energy and carbon capture and storage sectors. In order to incorporate this change, a minor extension to the proposed Site boundary within the marine environment has been included. The addition of the second berth to the Project is not considered to affect the EIA scoping as no new environmental effects would be created and the addition would not change the significance of any effect assessed.

2.4.39 Limited changes have also been made to the proposed Site boundary on the landside. The Pipeline Corridor, which connects the East and West sites in the Queens Road area has been widened to provide greater flexibility for the pipeline routeing in this area while access and the crossing of existing infrastructure are evaluated. The Site boundary has also been extended slightly along the southern boundary of the West Site due to the presence of a high-pressure gas pipeline in this location and the potential requirement for its relocation as a result of the Project. There would be no permanent above ground works in any of the terrestrial areas where the proposed Site boundary has been extended.

2.4.40 The changes to the Site boundary since submission of the Scoping Report are illustrated in **Figure 2.7** (PEI Report Volume III).

2.4.41 The proposed Site boundary has been based on the maximum anticipated area of land required either temporarily and/or permanently to construct, operate and maintain the Project.

2.4.42 The outcomes of statutory consultation, the EIA process and ongoing design modifications are expected to result in refinements being made to the Site boundary and the final proposed extent will be presented in the ES and the wider application as relevant.

2.5 Construction and Operational Phasing of the Project

2.5.1 Subject to the DCO being granted, there would be a phased approach to the construction of the Project. **Table 2.5** illustrates an indicative construction timeline for the Terminal. Under this scenario, the construction of the Terminal and first berth, and first phase of the green hydrogen production facility (including works on both the East and West sites as described above) is likely to start in early 2025. Construction of Berth 2 may commence in the final year of construction of Berth 1 but this will depend on a number of factors including (i) the size and frequency of ships serving the hydrogen production facility and (ii) market demands at that point in time. Construction of Berth 2 may take up to two years.

Table 2.5 Indicative Construction Timeline for the NSIP

Berth	Year 1	Year 2	Year 3	Year 4
Berth 1				
Berth 2			Earliest possible start year for Berth 2 (year 1)	

2.5.2 Following completion of the first phase of the hydrogen production facility, a further five phases would be constructed incrementally to increase the processing capacity as the market for green hydrogen increases. There would therefore be six phases of development in total, with each phase adding a hydrogen production unit (see also **Table 2.7** below).

2.5.3 For the purposes of this PEI Report, a development scenario has been defined for the Associated Development. This scenario is based on a six-phase construction timeline, likely to commence in early 2025, through to full completion of all phases over an indicative eleven-year period. This programme duration is likely to be a worst case in EIA terms as market demand could accelerate the programme, although Phase 1 would always represent the peak of construction, irrespective of the subsequent programme. This phasing is illustrated in **Table 2.6** and assumes that each phase of the Associated Development would become operational following its construction.

Table 2.6 Indicative Construction Phasing Timeline for Associated Development

Phase	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Phase 1											
Phase 2											
Phase 3											
Phase 4											
Phase 5											
Phase 6											

2.5.4 The start of construction of Phase 2 (here shown in Year 4), will depend on a number of factors including market demands for hydrogen at that point in time and the timing of subsequent phases would be subject to the same tests. Construction of Phases 2 – 6 may take up to eight years if built consecutively.

2.5.5 Each phase of the Project's development would involve construction of different buildings and infrastructure within each area of the Site, as presented in **Table 2.7**.

2.5.6 An indicative Project phasing plan is illustrated in **Figure 2.8** (PEI Report, Volume III) and further information will be provided in the ES.

Table 2.7 Anticipated Buildings and Infrastructure within the Site by Phase

Phase	Jetty	Pipeline Corridors	East Site	West Site
Phase 1 Construction: Y 1 – Y3	Jetty structure and Berth 1 Berth 2 (start) Jetty topside infrastructure	NH_3 pipeline from the jetty Jetty access road H_2 ,NH3 and Natural Gas pipelines between East and West Site Utilities and cabling to East and West sites	NH_3 tank One hydrogen production unit Internal access roads, drainage and utilities	One liquefier Tanker loading bays Administrative offices Other supporting building & facilities as listed in **Table 2.2** Internal access roads, drainage and utilities
Phase 2 Construction: Y4 – Y5 (TBC)	Berth 2 (complete)			One hydrogen production unit One liquefier
Phase 3 Construction: Y6 – Y7 (TBC)			One hydrogen production unit	One liquefier
Phase 4 Construction: Y8 – Y9 (TBC				One liquefier One hydrogen production unit
Phase 5 Construction: Y9 – Y10 (TBC)			One hydrogen production unit	
Phase 6 Construction: Y10 – Y11 (TBC)				One hydrogen production unit

2.6 Marine Construction Works

2.6.1 In the marine environment the structures would rest upon an open piled network of steel tubular piles likely to be driven by vibro and percussive piling techniques. The deck for the approach trestle and jetty would be supported by either concrete deck or precast and/or in-situ concrete deck. The topside pipework would be

fabricated off-site in modules and floated and/or craned into position. The high-level walkways between dolphins would be fabricated off-site and lifted into position. Over water working would be strictly controlled in accordance with Port safety procedures.

Capital Dredge

2.6.2 It has been determined that a capital dredge is required of the larger western berth. At this preliminary stage, the maximum spatial extent of the dredge is currently estimated at being approximately 45,000m^2, dredged into existing bathymetry which varies across the area between 5.5m below Chart Datum (CD) to 15.7mCD. The berthing pocket with appropriate side slopes would be dredged to a maximum of 16m below CD, including an allowance for overdredge. The indicative location of the dredge area that has been identified at this stage of the Project is shown on **Figure 16.4** (PEI Report, Volume III).

2.6.3 It is currently anticipated that dredging of approximately 100,000m^3 of material will be required and that this will comprise boulder clay and sand/silt, the proportions of which will be determined.

2.6.4 The exact capital dredge methodology has not yet been defined for this Project and further work will be undertaken in order to determine the most suitable method. However, it is anticipated that most of the dredging for the berth pocket would be undertaken by a backhoe dredger. Dredge operations would be continuous and operate 24 hours a day and seven days a week. This dredging method has been assessed as the worst-case scenario in terms of potential environmental effects in the relevant topic chapters of this PEI Report.

2.6.5 The Applicant acknowledges that it is under obligation, if possible and practicable, to identify a beneficial use for the dredged arisings. At this stage in the process, however, it is not considered that the dredged material will be of a quality suitable for alternative use, such as for reclamation purposes, although this will be kept under continuous review. If no beneficial use is identified it is anticipated that dredged material would be disposed of within licenced sites within the estuary, at Holme Channel disposal site (HU056) to dispose of in-erodible clay material, and Clay Huts disposal site (HU060) to dispose of alluvium material, subject to the dredge material being deemed suitable for disposal at sea by the Marine Management Organisation (MMO). A Waste Hierarchy Assessment (WHA), which will include a more detailed consideration of the alternative options for the dredge material, will be included as part of the ES (see **Chapter 4: Legislative and Consenting Framework**).

Sequencing of the Marine Construction Works

2.6.6 The exact construction methodology and sequencing for the marine works is being developed but is likely to involved the following ten steps:

Berth 1 – Site Establishment and Set Up

2.6.7 A temporary construction area would be created to serve as the temporary site base to mobilise and erect plant and store materials. The area would be approximately 200m by 100m.

Berth 1 – Approach Ramp

2.6.8 The approach ramp may be the first structure constructed using land-based plant and equipment. It would consist of a two abutment structures and a short bridge section that would span between them. The abutment structures would be constructed either side of the existing sea defence wall that runs along the frontage in this part of the port estate.

2.6.9 Precast reinforced concrete slabs/beams would then be used to form the bridge and a section final in situ concrete pour would seal the elements together. This would form the future roadway for traffic and pipework accessing the new berth.

Berth 1 – Approach Jetty and Berthing Trestle Approach

2.6.10 It is currently estimated that the approach jetty to support the berth(s) would be approximately 1050m in length and would consist of 42 piled traverse rigid frames and concrete decks with a 25m span between each frame.

2.6.11 Temporary works using portal gates would be set up for piling and then piles would be installed initially using vibro-piling to refusal. Percussive piling techniques may then be used to reach the final design level although appropriate mitigation measures may need to be deployed. This will be considered further as part of the ongoing technical assessments and reported in the ES.

2.6.12 Following completion of the piling, the piles would be prepared for the installation of the headstocks and precast decking, which as with the rear abutment above, would be sealed in situ with concrete to complete the deck and link between the approach ramp and the first traverse rigid frame.

2.6.13 This process would be repeated to construct each traverse rigid frame sequentially until the last frame is complete.

Berth 1 – Jetty Head

2.6.14 The approach jetty meets a jetty head which is approximately 50m by 20m long. At this stage, the preliminary design contemplates that the jetty head would be supported by 36 piles. Following completion of the piling for each finger pier, the precast headstocks would be installed, reinforcing fixed and then the in situ concrete troughs would be cast. Precast planks would then be installed between the troughs and sealed in situ with concrete to complete the deck structure, which would be followed by fender and bollard installation.

Berth 1 - Berthing and Mooring Dolphins

2.6.15 The jetty head would be supplemented by two berthing/mooring dolphins and a further eight mooring dolphins. At this stage, the preliminary design contemplates that the berthing dolphins would be supported by eight piles each and the mooring dolphins by four piles each. Following completion of the piling for each dolphin, the precast headstocks would be installed, reinforcing fixed and then the in situ concrete would be cast. One bollard and one fender would be installed on the mooring face of the berthing dolphins. The mooring dolphins would have one bollard each.

Berth 1 - Finishing works

2.6.16 Catwalks, pipe racking, fencing and screening would be installed following the above activities.

Berth 2 – Berth Trestle Approach

2.6.17 Following the completion of the Berth 1 infrastructure, the berthing trestle approach linking Berth 1 and Berth 2, including a Berth 2 approach trestle, would be constructed. It is currently estimated that this trestle would be approximately 525m in length and would consist of 23 piled traverse rigid frames and concrete decks with a 25m span between each frame.

2.6.18 Temporary works using the portal gates would be set up for piling and then three piles would be installed initially using vibro-piling to refusal and then percussive piling techniques may then be used to reach the final design level, although appropriate mitigation measures may need to be deployed as described above.

2.6.19 Following completion of the piling, the piles would be prepared for the installation of the headstocks and precast decking, which as with the rear abutment, would be sealed in situ with concrete to complete the deck and link between the approach ramp and the first traverse rigid frame.

2.6.20 This process would be repeated to construct each traverse rigid frame sequentially until the last frame is complete.

Berth 2 – Jetty Head

2.6.21 The works for the construction of the Berth 2 – Jetty Head would match those undertaken for Berth 1.

Berth 2 – Berthing and Mooring Dolphins

2.6.22 The jetty head would be supplemented by two berthing and eight mooring dolphins. At this stage, the preliminary design contemplates that the berthing dolphins would be supported by eight piles each and the mooring dolphins by four piles each. Following completion of the piling for each dolphin, the precast headstocks would be installed, reinforcing fixed and then the in-situ concrete would be cast. Two fenders would be installed on the mooring face of the berthing dolphins as well as two bollards. The mooring dolphins would have one bollard each.

Berth 2 – Finishing Works

2.6.23 Catwalks, pipe racking, fencing and screening would be installed following the above activities.

Marine Workforce and Construction Vessels

2.6.24 Based on comparisons with the Immingham Eastern Ro-Ro Terminal project construction workforce it is assumed within this PEI Report that the construction workforce for marine works would peak at approximately 250 personnel per day.

2.6.25 At this stage a combination of vessels is proposed to undertake the marine construction:

a. Jack-up barge (likely 1).
b. Floating barge containing a 500t crane (likely 2).
c. Multicats (likely 2).
d. Flat-top barges (up to 6).
e. Safety boat (likely 1).

Marine Working Hours

2.6.26 It is anticipated that core construction activities would be undertaken between 07:00 and 19:00, Monday to Sunday, but some activities, such as dredging, are assumed to be undertaken on a 24-hour basis and continue until completion for safety or quality reasons.

Sources of Noise and Vibration during Marine-side Works

2.6.27 Some noise and vibration can be expected during the construction of the approach jetty, jetty head and dolphins. Depending on the piling technique used, it is anticipated that some isolated, short-duration noise and vibration would be generated particularly during percussive piling. It is not proposed to use pre-cast driven piles.

2.6.28 Piling will be undertaken within the proposed working hours of 07:00 and 19:00, 7 days a week meaning there will be a minimum 12-hour continuous break in piling within each 24-hour period.

2.6.29 In order to reduce the level of potential impact associated with noise (underwater and airborne) and vibration during construction, a number of mitigation measures are being considered including the use of soft start procedures, the use of vibro piling where possible, seasonal working restrictions and the use of acoustic barriers and screening. These mitigation measures would be further developed if required through ongoing engagement with statutory authorities as part of the statutory consultation process and taking into account the final scheme design information and latest undertaken of potential effects which will be presented in the ES.

2.7 Landside Construction Works

Preliminary Works

2.7.1 The preliminary works required are the subject of on-going studies and would be confirmed in the ES that accompanies the Application but are likely to include:

a. Erection of site fencing and notices.
b. Environmental surveys and ground investigations including remedial work, if required.
c. Earthworks and site clearance.
d. Diversion and laying of services.

Temporary Construction Compounds and Laydown Areas

2.7.2 Construction compound and laydown areas would be required during construction. At this stage, laydown requirements have been estimated using conservative assumptions to ensure that the areas assessed in this PEI Report represent a worst-case.

2.7.3 **Figure 2.2** (PEI Report, Volume III) shows the indicative areas of land that are proposed for construction laydown and contractors' compound(s). Approximately 14.11ha of construction laydown area is required for materials and plant storage and laydown areas; field based fabrication and erection of components on-site, siting of concrete batching facilities; vehicle and cycle parking facilities; and construction offices and construction staff welfare facilities. The construction compound and laydown areas would be secured by security fencing and gates as appropriate.

2.7.4 The areas would be levelled to provide an even surface. No hazardous liquids would be stored un-bunded within the construction laydown areas.

Pipelines

2.7.5 The pipelines would be installed as a combination of above ground sections and below ground sections. Installation below ground would be used for the majority of the pipeline corridor linking the East and West Sites other than where these pipelines are within the sites themselves and connect into other above ground structures).

2.7.6 The pipeline installation would involve clearing of areas, preparation for pipeline installation and either Horizontal Directional Drilling (HDD) or micro tunnelling techniques.

2.7.7 Pipeline crossing of Queens Road, Laporte Road and the railway line will be required. It is envisaged that HDD would be used for these pipeline crossings.

2.7.8 The pipeline route would be marked with marker posts which would be set to ensure visibility. Cathodic protection posts would also be installed along the pipeline route.

2.7.9 It is assumed that part of the pipeline corridor connecting the East Site to the Jetty as well as the Jetty Access Road would be situated within the woodland belt, known as the Long Strip, protected by a TPO and if so removal of trees in this area would be unavoidable. This area would also include a further corridor to the east of the Jetty Access Road reserved for a future pipeline, although this does not form part of the Project for which consent is sought. The Applicant would select construction techniques and processes that seek to minimise encroachment into, and loss of, trees within the area by reducing the width of the necessary construction areas where practicable, for example by the vertical stacking of pipes on a supporting rack/structure in this location.

2.7.10 It is likely the bridleway through the TPO area would be temporarily diverted or closed during Project construction to protect the public for safety reasons. The bridleway would be reopened once the Phase 1 construction works are completed. This is considered in greater detail in **Chapter 23: Socio-economics**.

East and West Sites

2.7.11 The East and West Sites would require civil, mechanical and piping (M&P), and electrical and control (E&C) construction works.

2.7.12 Civil works would involve piling in the areas where the ground needs strengthening. Piling design is not yet complete but at this stage it is anticipated that this would likely be Continuous Flight Auger piles (CFA) to reduce noise and vibration during piling activities. The exact piling technique to be employed would be confirmed during the detailed design and further information would be presented in the ES.

2.7.13 The Project would use modularisation to reduce the on-site works and maximise the works completed in specialised fabrication facilities where practicable. M&P works would involve installation of large equipment and modules and would require heavy equipment such as cranes and transport vehicles. Coatings would be applied off-site with only coating touch up applied at site. An on-site fabrication facility would support the erection of steel and piping systems to complete any on-site modifications.

2.7.14 The E&C works would include the installation of modular electrical and control buildings which would be constructed off-site and assembled on site. There would also be buildings constructed on site in a "traditional" manner such as control buildings. The Project would be connected to the electricity transmission network via overhead and underground electricity transmission cables.

Ammonia Storage Tanks

2.7.15 The ammonia storage tank would be situated on the East Site and would be constructed by a specialist tank contractor. The tank is likely to be built by transporting large sections to site via the Port and then transported by the road network within the Port to the East Site for installation.

Drainage

2.7.16 The terrestrial area of the Site has existing drainage infrastructure that directs flow to ditches that cross neighbouring land before connecting to Internal Drainage Board (IDB) drains. To the west an existing culvert currently carries flow under the A1173 connecting to the Immingham Pump Drain. To the east, an existing ditch runs south, parallel with the River Humber and connects the Site to Stallingborough North Beck. The Immingham Pump Drain is pumped into Stallingborough North Beck which discharges to the River Humber. The development of the Site will make use of these existing connections to drain surface water, incorporating attenuation storage to mitigate the impact of introducing impermeable surfaces.

Site Access

2.7.17 Site access would be required for the delivery of construction materials and plant, and for general construction traffic. Due to the phased approach to the construction of the Project, multiple entrances/exits would be required. Access is proposed to be gained from the following roads:

a. Kings Road.

b. Queens Road.

c. Laporte Road.

d. A1173.

2.7.18 The creation of site accesses may require local modifications to create new and temporary site entrances / exits. These would be designed to minimise traffic disruption. Ongoing work will determine the optimum highways design for the necessary changes to the road systems and any temporary traffic restrictions while road work is being undertaken. This ongoing work will also inform the Project on the sequence of road works to reduce their impact.

2.7.19 Traffic management measures would be agreed with the local highways authority and employed during construction to ensure the safe movement of materials to working areas and laydown areas, reduce delays on other road users, and minimise interference with local traffic.

Construction Workforce and Construction Traffic

2.7.20 It is assumed that the construction workforce, across both the marine and terrestrial construction works, would peak at approximately 700 personnel per day. The largest daily development traffic trips (workforce and Heavy Goods Vehicles (HGVs)) are predicted to be generated in the first phase of construction (Year 2) and have been calculated to total approximately 1,500 two-way trips, with the majority of trips associated with workers commuting to and from the Site.

2.7.21 Construction traffic and the construction workforce are anticipated to travel to the Site via the A180 and A1173. Prior to the start of the construction phase, the contractor would prepare a Construction Traffic Management Plan (CTMP) to control HGV movements, as well as a Construction Worker Travel Plan (CWTP) to control the trips made by the construction workers (including encouraging car sharing) and thus reduce the impact of the workforce upon the highway network. The CTMP and CWTP would be based on, and incorporate, the contents and requirements of the Outline CTMP (OCTMP) and Outline CWTP (OCWTP) which will submitted with the DCO application.

2.7.22 These plans would set out measures and controls to limit the number of trips on the network in the peak hours, and as such would aim to limit the traffic impact of the construction phase as far as possible. Such plans would be implemented for the duration of the Project construction phase.

Construction Working Hours

2.7.23 Core construction working hours would be between 07:00 and 19:00 Monday to Friday and between 08:00 and 13:00 Saturdays. However, it is likely that some construction activities may need to be undertaken outside of these core working hours. This is partly because certain construction activities cannot be stopped, such as concrete pouring, but also to manage the construction programme. Where on-site works are to be conducted outside the core hours, they would comply with any restrictions agreed with the local planning authority, in particular regarding control of noise and traffic in accordance with the relevant requirements which would be secured by the DCO. The need for any such works

will be minimised where possible and will be carefully managed to reduce effects on local people.

Lighting

2.7.24 Construction lighting will be required in areas where natural lighting is unable to reach (sheltered/ confined areas) and prior to permanent lighting being installed. Lighting may also be required around the Site for night-time construction and during core working hours within winter months.

2.7.25 Artificial lighting would be provided to maintain sufficient security and health and safety for the Site. A Lighting Strategy will be prepared to accompany the DCO Application which outlines measures proposed to avoid excessive glare and minimise spill of light to nearby receptors (including local residents and some ecological receptors) outside of the Site as far as reasonably practicable.

2.7.26 The Outline Construction Environmental Management Plan (CEMP) will also set out standard best practice measures to minimise light spill including glare during construction. The contractor CEMP would be required to take these into account.

Commissioning

2.7.27 Commissioning of the hydrogen production facility would include testing and commissioning of the process equipment in order to ensure that all systems and components installed are in accordance with the requirements of AP and meets the requirement of the Environmental Permit. Commissioning of the processing equipment on the jetty topside would be handled in a similar way.

2.8 Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP)

2.8.1 The Applicant would require the contractor to produce and maintain a CEMP to control construction activities to minimise, as far as reasonably possible, impacts on the environment. This would include industry best practice measures and specific measures set out in this PEI Report. An Outline CEMP will be appended to the ES and accompany the Application. It will set out the key measures to be employed during construction of the Project to control and minimise impacts on the environment. It will describe how monitoring and auditing activities would be undertaken, in order to ensure that mitigation, management and monitoring measures are carried out and are effective. A Requirement of the DCO would ensure that the contractor's CEMP must be in accordance with the principles set out in the Outline CEMP and would specify, as a minimum:

a. A code of construction practice, specifying measures designed to minimise the impacts of construction works.

b. A scheme for the control of any emissions to air.

c. A soil management plan.

d. A sediment control plan.

e. A scheme for environmental monitoring and reporting during the construction of the Project, including measures for undertaking any corrective actions.

f. A notification scheme for any significant construction impacts on local residents and for handling any complaints received from local residents relating to construction impacts.

2.8.2 In order to manage and monitor waste, including any spoil generated on-site, a Framework SWMP will be developed and submitted as part of the Outline CEMP with the Application setting out how waste streams would need to be estimated and monitored and goals set with regards to the waste produced. The contractor's CEMP would be required to incorporate the principles of the Framework SWMP as appropriate.

2.8.3 The Applicant would require that the contractor segregates the waste streams on-site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from Project Site would be undertaken by licensed waste carriers and taken to licensed waste facilities.

2.8.4 Further assessment of impacts in relation to construction and operational waste is presented in **Chapter 20: Materials and Waste.**

2.9 Operational Phase

Terminal Operation

2.9.1 The Terminal will operate 24 hours a day, seven days a week and 365 days a year (though with lower activity at night compared to the day). The Terminal will have capacity to accommodate up to 400 vessel calls per year and it is anticipated that up to 12 of these calls will be associated with the hydrogen production facility. These vessel numbers have been assessed as the worst-case scenario in terms of potential environmental effects in the relevant topic chapters of this PEI Report. Operational staff numbers for the terminal, if both berths are fully utilised, are likely to be up to 40, with at least some staff working to shift systems.

Operation of the Hydrogen Production Facility

2.9.2 The hydrogen production facility is intended to be a continuous operation, although this will be dependent upon shipping frequency. The intention is therefore that the facility will operate 24 hours a day, seven days a week and 365 day a year.

2.9.3 Operational staff numbers and shift patterns will vary across the facility depending upon the duties being undertaken as illustrated in **Table 2.8**.

Table 2.8 Indicative Operational Staff Numbers and Shift Patterns

Role	Staff Numbers	Days	Base Location
Plant Manager	1	Mon – Fri	Site
Assistant Manager	1	Mon – Fri	Site

Role	Staff Numbers	Days	Base Location
Environment, Health & Safety Coordinator	1	Mon – Fri	AP Central Offices
Production Superintendent	1	Mon – Fri	Site
Shift Supervisors	4	7 days a week	Site (shift rotation)
Plant Operators	16	7 days a week	Site (shift rotation)
Jetty Operators (Topside infrastructure)	8	7 days a week	Site (shift rotation)
Clerks	1	Mon – Fri	Site
Plant Maintenance	4	7 days a week	Site
Drivers	50	7 days a week	Transient Work Force
Contractor	8	7 days a week	3rd party contractor
Janitor	2	Mon – Fri	3rd party contractor
Security	9	7 days a week	3rd party contractor
Other workers	14	5 days a week-	AP- Transient Work Force Based at the site but will travel outside the site
Total	120		

2.9.4 It is anticipated that once fully operational, a fleet of up to 50 tanker trailers and tractor units would operate in distributing the green hydrogen throughout the UK. This fleet is predicted to generate up to 98 daily movements (49 inbound, 49 outbound) and these movements would take place 24 hours a day.

Maintenance Dredging and Disposal

2.9.5 During operation of the Project, periodic maintenance dredging would be required. The overall volumes of the maintenance dredging associated with the Project would be smaller compared to that of the capital dredge. An estimate of the annual future maintenance dredge volume will be provided in the ES.

Hydrogen Production Facility Maintenance Requirements

2.9.6 The hydrogen facility will be designed and operated as a continuous operation high reliability plant with on stream >95%. The facility will have a planned preventive maintenance program. These will be a facility outage for several weeks for catalyst change every two years and other equipment will be taken offline for maintenance regularly without impacting facility operation In order to achieve the high availability, redundancy in equipment and controls will be provided.

2.10 Decommissioning

2.10.1 The landside elements of the Project have a design life of up to approximately 25 years although the operational life could be longer, depending on its integrity and market conditions at that time; when appropriate, this infrastructure would be decommissioned.

2.10.2 Decommissioning would be undertaken safely, in line with specific procedures and subject to risk assessment and permit to work schemes, and with regard to the environmental legislation at the time of decommissioning. The required licences and permits would also be acquired.

2.10.3 Decommissioning of the landside elements of the Project would likely involve leaving underground pipelines in situ and making them safe. All above ground infrastructure associated with the Project would likely be dismantled and all materials removed would be reused or recycled where possible or disposed of in accordance with relevant waste disposal regulations at the time of decommissioning. Land would be restored to a satisfactory state. If required and appropriate, refurbishment or replacement of specific plant would be performed to extend the life of the Project.

2.10.4 The Project does not make any provision for the decommissioning of the marine facilities of the Project. This is because the marine facilities would, once constructed, become part of the fabric of the Port estate and would, in simple terms, continue to be maintained so that it can be used for port-related activities to meet a long-term need. All plant or equipment on the jetty topside would likely remain in situ and repurposed where possible.

2.10.5 A Decommissioning Environmental Management Plan (DEMP) will be produced prior to decommissioning or demolition works being undertaken, which will detail measures to be implemented to avoid or reduce environmental impacts during the decommissioning of the landside elements. The provision of a DEMP will be secured by requirement of the DCO.

2.11 References

Ref 2-1 Groundsure. (2022).Enviro+Geo Insight Report (GS-9009838).

Ref 2-2 North East Lincolnshire Council (February 2010). Landscape Character Assessment.

Ref 2-3 Defra. (2022). MAGIC Maps. Available at: https://magic.defra.gov.uk/MagicMap.aspx (Accessed: August 2022).

Ref 2-4 UK Statutory Instruments. (2016). No. 1154. The Environmental Permitting (England and Wales) Regulations.

2.12 Abbreviations and Glossary of Terms

Table 2.9 Abbreviations and Glossary of Terms

Term	Acronym	Meaning
Ammonia	NH_3	Ammonia is a compound of Nitrogen and Hydrogen.
Associated British Ports	ABP	One of the UK's leading and best- connected ports groups, owning and operating 21 ports across England, Waste and Scotland.
Carbon Dioxide	CO_2	A colourless, odourless gas produced by burning carbon and organic compounds and by respiration.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Continuous Flight Augering	CFA	A continuous flight auger drill is used to excavate a hole and concrete in injected through a hollow shaft under pressure as the auger is extracted.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Electrical and Control	E&C	-
European Marine Site	EMS	European Marine Sites are areas at sea, partly or completely covered by tidal water, which are protected by European law.
Horizontal Directional Drilling	HDD	Horizontal Directional Drilling is a method of installing underground pipelines through trenchless methods.
Hydrogen Production Unit	HPU	Process where the ammonia is used to produced hydrogen via an endothermic catalytic reaction. Also called a "converter" or a "dissociator".

Term	Acronym	Meaning
Liquefaction	-	The process of making something, especially a gas, into a liquid.
Local Wildlife Site	LWS	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including: site of importance for natures conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Mechanical and Piping	M&P	-
National Grid Reference	NGR	A system of geographic grid references, distinct from latitude and longitude.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Nitrogen	N_2	Nitrogen is a colourless, odourless unreactive gas.
North East Lincolnshire Council	NELC	The site falls within the administrative boundary of the North East Lincolnshire Council.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of

Term	Acronym	Meaning
		habitats and species considered to be of European interest.
Special Protection Area	SPA	Site designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Trailer Suction Hopper Dredger	TSHD	Trailer suction hopper dredger are oceangoing vessels that can collect sand and silt from the seabed and transport it over large distances.
Tree Preservation Order	TPO	An order made by a local planning authority, under the Town and Country Planning Act 1990, in respect of trees or woodlands, The principal effect of a tree preservation order is to prohibit the cutting down, uprooting, topping, lopping, willful damage or willful destruction of trees without the local planning authority's consent.