

Viking CCS Pipeline

**Environmental
Statement Volume II -
Chapter 2:
Design Evolution and
Alternatives -
Revision A - Clean**

Document Reference: EN070008/APP/6.2.2

Applicant: Chrysaor Production (U.K.) Limited,
a Harbour Energy Company
PINS Reference: EN070008
Planning Act 2008 (as amended)
The Infrastructure Planning (Applications: Prescribed Forms
and Procedure) Regulations 2009 - Regulation 5(2)(a)
Date: December 2023

PINS Reference	Document Reference	Document Revision	Date
EN070008	EN070008/APP/6.2.2	Revision A	December 2023

Prepared by	Verified by	Approved by
HT	MW	NP
Principal EIA Consultant	EIA Technical Director	EIA Technical Director

Prepared by:

AECOM Limited
Exchange Station
Tithebarn Street
Liverpool
Merseyside
L2 2QP

© AECOM Limited. All rights reserved.

Table of Contents

2	Design Evolution and Alternatives	2-1
2.1	Introduction.....	2-1
2.2	The Need for the Proposed Development	2-2
2.3	Do Nothing Scenario	2-3
2.4	General Approach to Design Evolution and Alternative Assessment	2-3
2.5	Step 1: Initial review of offshore vs onshore pipeline solution.....	2-5
2.6	Step 2: Identification and Assessment of Potential Pipeline Corridors.....	2-6
2.7	Step 3: Identification of Preferred Pipeline Corridor and presentation at Non-Statutory Consultation	2-15
2.8	Step 4: Consideration of feedback and a further Pipeline Corridor refinement	2-19
2.9	Step 5: Identification of a Proposed Pipeline Route (including degree of flexibility) and associated Infrastructure	2-22
2.10	Step 6: Developing Initial DCO Site Boundary/Draft Order limits for Statutory Consultation	2-27
2.11	Step 7 Consideration of Feedback Received During Statutory Consultation	2-27
2.12	Step 8: Development of DCO Site Boundary/ Order Limits for DCO submission	2-33
2.13	Conclusion.....	2-35
2.14	References	2-36

Figures

Figure 2-1: Viking CCS Pipeline Design Evolution Key Stages.....	2-5
Figure 2-2: Key Environmental Constraints between Immingham and Theddlethorpe	2-10
Figure 2-3: Schematic of Corridor Options and Indicative Preferred Corridor	2-13
Figure 2-4: Study Area Sections and Corridor Options.....	2-14
Figure 2-5: Initial Preferred Pipeline Corridor (presented within the Scoping Report and during Non-Statutory Consultation)	2-18
Figure 2-6: Comparison of Statutory Consultation Pipeline Corridor against original Pipeline Corridor used for Non-Statutory Consultation.....	2-21
Figure 2-7: Theddlethorpe Facility – Alternative Locations.....	2-25
Figure 2-8: Construction Compound Location options	2-26
Figure 2-9: Design revisions following Statutory Consultation.....	2-29
Figure 2-10: Area west of Aylesby (Design Revisions 3 and 4)	2-30
Figure 2-11: Design Revisions in Theddlethorpe area (Design Revisions 10 and 11)	2-31
Figure 2-12: Design Revisions in the Immingham Area.....	2-32
Figure 2-13: Comparison of Pipeline Corridor used for Statutory Consultation, against finalised Draft Order limits for DCO submission.....	2-34

Tables

Table 2-1: Viking CCS Pipeline Routeing Study: Criteria and Study Topics	2-7
Table 2-2: Appraisal of Pipeline Corridor Options: High-Level Summary.....	2-15

2 Design Evolution and Alternatives

2.1 Introduction

- 2.1.1 This chapter of the Environmental Statement (ES) sets out the design development and alternatives considered during the evolution of the Viking CCS Pipeline (hereafter referred to as ‘the Proposed Development’).
- 2.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations 2017) (Ref 2-1) state, in Section 14(2)(d), that an ES should include ‘a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment’.
- 2.1.3 Neither the existing NPS EN-1 (Ref 2-2) nor the Draft NPS EN-1 from March 2023 (Ref 2-3) contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option. However, it is noted (at paragraph 4.4.2 of EN-1) that “*applicants are obliged to include in their ES, information about the reasonable alternatives they have studied. This should include an indication of the main reasons for the applicant’s choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility*”.
- 2.1.4 The main consideration in the assessment of alternatives has been to avoid and/or reduce adverse environmental effects whilst ensuring a technically compliant, constructable and cost-effective design solution for the Proposed Development in accord with relevant planning policy. These alternatives have included alternative pipeline routes, alternative locations for above ground facilities and alternative crossing techniques.
- 2.1.5 The design of the Proposed Development has therefore evolved through a series of steps and design iterations (as outlined in **Figure 2-1**), that have been made in response to an array of relevant considerations including safety, environmental constraints, stakeholder feedback, and engineering design.
- 2.1.6 Further design development will be undertaken once the Proposed Development moves into the Front-End Engineering Design (FEED) stage, which is due to commence in 2023, although any changes that result from the FEED work will remain within the DCO Site Boundary and design parameters set out in *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.2.3)*, and assessed within each technical chapter.
- 2.1.7 The structure of this chapter is as follows:
- *Section 2.2: The Need for the Proposed Development* – Describes why the Proposed Development is required and how it aligns with and supports the UK’s Net Zero targets;
 - *Section 2.3: Do Nothing Scenario* – Describes the implications of not constructing the Proposed Development;
 - *Section 2.4: General Approach to Design Evolution and Assessment of Alternatives* – Explains the guiding principles that were used in the development of the design of the

Proposed Development and the key factors that were considered for the pipeline routeing work;

- *Sections 2.5 to 2.12* then detail the 8-step process that was followed, describing how the design evolution progressed and how an assessment of the various alternatives was made;
- *Section 2.13* provides a summary of the alternative assessment undertaken; and
- *Section 2.14* provides a list of the references referred to in the chapter.

2.2 The Need for the Proposed Development

The need for new infrastructure to get to net zero

- 2.2.1 The UK government has committed to a legally binding target of achieving Net Zero by 2050. To meet this target, the UK needs to transition towards cleaner sources of energy, while decarbonising existing infrastructure. That is where carbon capture, transportation and storage technology is set to play a crucial role.
- 2.2.2 In 2022, the Committee for Climate Change stated that there is no route to net zero by 2050, nor decarbonising industry while safeguarding jobs, without deploying Carbon Capture and Storage (CCS) at scale (Ref 2-4). Carbon capture and storage is the process of capturing carbon dioxide (CO₂) from industrial activity, transporting it, and then storing it in underground storage sites. In the UK, all prospective carbon dioxide storage sites are located offshore, with a large storage volume available in the North Sea region.
- 2.2.3 CCS is recognised by the Intergovernmental Panel on Climate Change (IPCC) (Ref 2-5) and the UK government as a vital step on the road to achieving Net Zero carbon emissions. The UK government has set out plans as part of the 6th Carbon Budget to capture and store between 20 and 30 million tonnes of carbon dioxide a year by 2030 (Ref 2-4).
- 2.2.4 The draft National Policy Statement (NPS) EN-1 (2023) recognises that there is an “urgent need” for new CCS infrastructure to support the transition to a net zero economy.
- 2.2.5 The UK has the potential to be a global leader in CCS, and the Proposed Development is well-positioned to play a key role.

The need for the Proposed Development

- 2.2.6 The Proposed Development is potentially transformational on the UK’s journey to net zero. Located in the Humber, the UK’s most industrial and CO₂-emissions-intensive region (Ref 2-6), it is uniquely placed to help the UK decarbonise and grow, by providing a gateway for investment and the development of a regional low-carbon hub.
- 2.2.7 Over 70% of the total carbon dioxide emissions from the Humber industrial area are located on the Lincolnshire side of the River Humber, where the Proposed Development is located. Decarbonising these industries is needed not only to meet the UK’s Net Zero goals, but also to preserve industry and the associated skilled jobs in the region.
- 2.2.8 With the Humber region emitting around 20 million tonnes of CO₂ per year (Ref 2-7), the Proposed Development can fulfil more than 50 per cent of the CCS requirement for the area, whilst also offering a route to deliver one third of the UK’s target of 30 million tonnes of CO₂ capture by 2030, enabling the large-scale decarbonisation of industrial and energy emissions.
- 2.2.9 Additional information on the needs case for the Proposed Development is included within the *Planning Statement (Application Document 7.1)*.

UK Governments Carbon Capture Cluster Sequencing

- 2.2.10 The UK government began a cluster sequencing process in 2020 with progression of two Track 1 clusters, an important first step in building the UK's CCS industry and decarbonising its economy.
- 2.2.11 In its Ten Point Plan, the UK Government committed to establish four industrial clusters for Carbon Capture Utilisation and Storage, with two clusters to be established by the mid-2020s and a further two to be established by 2030 (Ref 2-8).
- 2.2.12 Two clusters have been progressed through the previously awarded Track 1 process (where HyNet and East Coast Cluster were deployed). On July 31, 2023, the Viking CCS Project was awarded Track 2 status as part of the UK Government's cluster sequencing process. The announcement marked an important milestone for the Proposed Development.
- 2.2.13 The Viking CCS Project will develop the infrastructure necessary to transport Carbon Dioxide to secure offshore storage sites. The Proposed Development is potentially transformational on the UK's journey to net zero and target a reduction of 10 million tonnes of UK Carbon Dioxide emissions per year by 2030, and up to 15 million tonnes per year by 2035. This would meet up to one third of the UK's Carbon Capture Storage target.
- 2.2.14 The Proposed Development will provide safe, cost-effective, high-quality, high-volume Carbon Dioxide storage to meet the high demand that exists in the Humber region. The Proposed Development can make a fast and substantial difference in helping the UK to reach its net zero targets by 2050, achieve energy security and grow the economy of Humberside and Lincolnshire.

2.3 Do Nothing Scenario

- 2.3.1 The Do Nothing alternative would mean that the Proposed Development would not be progressed. This would mean that the benefits that the Proposed Development would provide, by abating carbon dioxide emissions from industrial sources in the Humber and Lincolnshire area, would not be realised.
- 2.3.2 The Do-Nothing scenario would be contrary to the UK's goal to achieve net zero carbon emissions by 2050. The Do-Nothing scenario would also be contradictory to Harbour Energy's drive to explore opportunities for carbon capture and storage.
- 2.3.3 As stated in the Draft NPS EN-1: "*alternatives to new CCS infrastructure for delivering net zero by 2050 are limited. Producing hydrogen through water electrolysis with low carbon power ('green' hydrogen) does not rely on CCS but the government's view is that this method alone will not achieve the scale of low carbon hydrogen production required for net zero. Alternative methods of decarbonising industry include improving energy efficiency, electrification of heat, and fuel switching to hydrogen or biomass as fuel or feedstock. However, these alternatives are limited as many emissions are process emission. CCS therefore has an essential role to play, either on its own or in combination with measures such as electrification and fuel switching*". Thus, the option to do nothing has to be discounted.

2.4 General Approach to Design Evolution and Alternative Assessment

- 2.4.1 The main objective underpinning the development of the new onshore Viking CCS Pipeline was to create a linkage between CO₂ emitters in the Humber industrial area to the north of Immingham, to the existing Lincolnshire Offshore Gas Gathering System (LOGGS) Pipeline at Theddlethorpe; thus, there are defined start and end points. This would then allow for the

captured CO₂ to be transported onwards through the offshore pipeline system to a storage area in the depleted gas fields of the Viking system beneath the North Sea.

2.4.2 The Planning Statement (*Application Document 7.1*) provides more details on the overarching objectives of the Proposed Development

2.4.3 The following guiding principles were used in the development of the design of the Proposed Development:

- Deliver a pipeline to enable the transportation of CO₂ to be undertaken in a safe and secure manner;
- Deliver a pipeline that is technically viable and constructable;
- Deliver a pipeline that emitters have the capability to feed into;
- Utilise existing infrastructure or pipeline transit corridors wherever possible to help minimise impacts on the environment and minimise costs;
- Deliver shorter, more direct routes where viable, as they are likely to have lower environmental, safety, sustainability, and cost implications (for comparable technology options); and
- Avoid environmental or socio-economic features where possible.

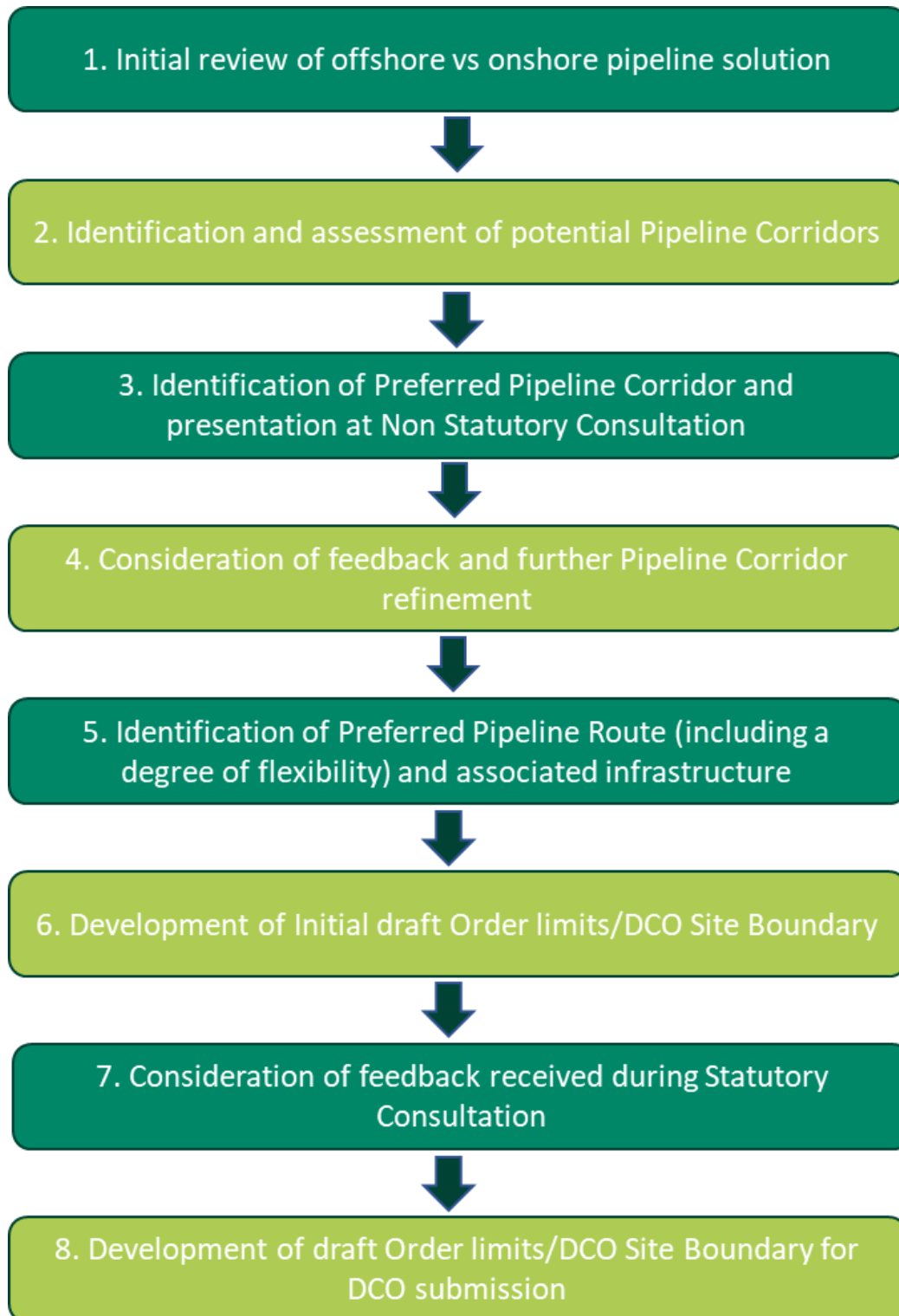
2.4.4 Key factors that were considered for the pipeline routeing work included:

- Proximity to local communities;
- Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB);
- Landscape, historic environment and heritage considerations;
- Ecological designations;
- Water environment, in particular flood zones;
- Existing planning permissions for other developments;
- Ease of access for construction; and
- Suitability of ground conditions.

2.4.5 Throughout the ongoing design process, consideration has been given to a range of design options. Design decisions have, where relevant, been informed by environmental appraisal and assessment work and by consultation with stakeholders, and the design has evolved through a continuous process of environmental assessment, consultation, and development.

2.4.6 Overall, the design evolution up to submission of the DCO application, has followed an eight-step process and an assessment of the various alternatives has been made as the Proposed Development's design has progressed. **Figure 2-1** outlines each of the key steps, whilst subsequent sections provide more information on each stage.

Figure 2-1: Viking CCS Pipeline Design Evolution Key Stages



2.5 Step 1: Initial review of offshore vs onshore pipeline solution

2.5.1 Initial consideration was given to the feasibility of an offshore pipeline from Immingham to Theddlethorpe, as an alternative to an onshore pipeline. The challenges associated with an offshore pipeline, from an environmental consents, construction and design perspective were considered to be too great to take this option forward.

- 2.5.2 In May 2022, a review of this decision was undertaken to ensure the conclusions still remained valid. This review included the assessment of a number of different offshore pipeline route options, leaving from Immingham to see if any were viable alternatives to an onshore pipeline.
- 2.5.3 The Humber Estuary is the second largest coastal plain estuary in the U.K., and it is internationally important for wildlife such that it is designated as a Special Area of Conservation (SAC) and a Special Protection Area (SPA) under the Conservation of Habitats and Species Regulations 2017 (Habitats Regulations). It is also considered an internationally important wetland under the Ramsar Convention. The Humber Estuary is also a Site of Special Scientific Interest (SSSI), and there are three National Nature Reserves (NNR) within the locality.
- 2.5.4 The Humber Estuary is a busy waterway for shipping and also contains several elements of key infrastructure which would need to be avoided or crossed.
- 2.5.5 Overall, the review concluded that an offshore pipeline from Immingham would be extremely challenging to consent or to construct, with key reasons being due to:
- The high number of designated environmental sites of national and international importance, leading to a high risk that consent would not be granted;
 - The high levels of shipping activity associated with the ports at Hull, Immingham, Grimsby and Goole, which handle over 74 million tonnes of freight each year (Ref 2-10);
 - The estuary has dredged channels that would need to be crossed which present complicated engineering solutions;
 - Landfall at Immingham would have to cross the existing Sea Wall defences without compromising them in any way;
 - Anticipated to be shipwrecks and unexploded ordnance in the area, leading to complicated routeing and siting work; and
 - Technical challenges would include an increased number of pipeline bends, extensive pre-lay dredging and post lay jetting, and the need to cross other infrastructure (e.g., other pipelines and cables) – all increasing the complexity of installation.
- 2.5.6 With due consideration of the factors listed above, and considering the relative lack of constraints in the terrestrial environment, it was concluded that an onshore pipeline solution linking Immingham to Theddlethorpe would be a more viable option than an offshore pipeline. Consequently, options for an onshore pipeline were then advanced as outlined in the sections below.

2.6 Step 2: Identification and Assessment of Potential Pipeline Corridors

Overview

- 2.6.1 A preliminary high-level routeing options assessment was undertaken on behalf of the Applicant in 2021 to gain an initial understanding of the constraints and opportunities for the routeing of the proposed Viking CCS Pipeline in a wide study area. Key to this work was the assumption that the pipeline would begin in the vicinity of Phillips 66 (P66) and VPI sites north of Immingham and that it would terminate at the former Theddlethorpe Gas Terminal (TGT) Site, in Theddlethorpe. This helped define an initial study area within which constraints could be reviewed.

- 2.6.2 These start and end points were selected due to a number of key, fundamental reasons. In Immingham, this location was selected as it was known available brownfield land was available and importantly that the starting point would be in immediate proximity to potential future emitters who were developing their own plans for carbon capture plants, which could then (subject to future agreement), feed directly into the Proposed Development. At Theddlethorpe, the former TGT site again offered brownfield land which was likely available (subject to future agreement), but also critically would provide for a connection point into the existing LOGGS pipeline, which currently finishes at the former TGT site.
- 2.6.3 This initial high-level routeing options assessment, undertaken by the Project engineers, identified a number of potential pipeline routes. Additional work was then undertaken by the wider Project team (including the environmental team) to assess the various options whilst also developing pipeline corridors around these initial routes to enable greater flexibility in future detailed routeing work.
- 2.6.4 **Table 2-1** below presents the topics and criteria that were considered as part of the alternative options analysis. The environment sub-topics are aligned with applicable requirements of Section 5 of the overarching National Policy Statement (NPS) for Energy (EN-1), including the 2023 draft version.

Table 2-1: Viking CCS Pipeline Routeing Study: Criteria and Study Topics

Environment	Technical	Cost	Lands
a. Biodiversity (EN-1 Section 5.3, Draft EN-1 Section 5.4)	i. Robust pipeline design for safety	r. Capital cost	s. Current and proposed land uses
b. Landscape and Views (EN-1 Section 5.9, Draft EN-1 Section 5.10)	j. Utilisation of existing infrastructure		t. Requirement for additional third-party consents / approvals
c. Historic Environment (EN-1 Section 5.8, Draft EN-1 Section 5.9)	k. Pipe content and operating conditions		
d. Water Environment, including Flood Risk(EN-1 Section 5.7 and 5.15, Draft EN-1 Sections 5.8 and 5.16)	l. Terrain and geotechnical conditions, major road and river crossings, utilities, and other crossings		
e. Soils and Geology (EN-1 Section 5.3 and 5.15, Draft EN-1 Section 5.4 and 5.16)	m. Permanent access for maintenance		
f. Traffic and Access (EN-1 Section 5.13, Draft EN-1 Section 5.14)	n. Construction access and haul roads		
g. Land Use (EN-1 Section 5.4 and 5.10, Draft EN-1 Sections 5.5 and 5.11)	o. Security		
h. Planning (EN-1 Section 5.10, Draft EN-1 Section 5.11)	p. Operation and maintenance requirements		
	q. Site specific hazards e.g., wind turbines, electric cables or overhead electric cable crossings		

- 2.6.5 With respect to the utilisation of existing infrastructure the following pipelines and their easements/routes were considered:

- 6" condensate pipeline (between Killingholme and Theddlethorpe). This pipeline was emptied, cleaned and decommissioned in 2018. However, the pipeline did not meet the minimum capacity requirements for the Proposed Development; and
- The 30" Killingholme Pipeline System (KIPS) which also runs between Killingholme and Theddlethorpe, was also considered with particular focus on crossing points and potential utilisation of existing easements. This was ruled out as the pipeline is currently in use and the material specification of the pipeline was deemed inadequate for use to transport carbon dioxide at high pressures.

Potential Pipeline Corridors – Alternative Assessment

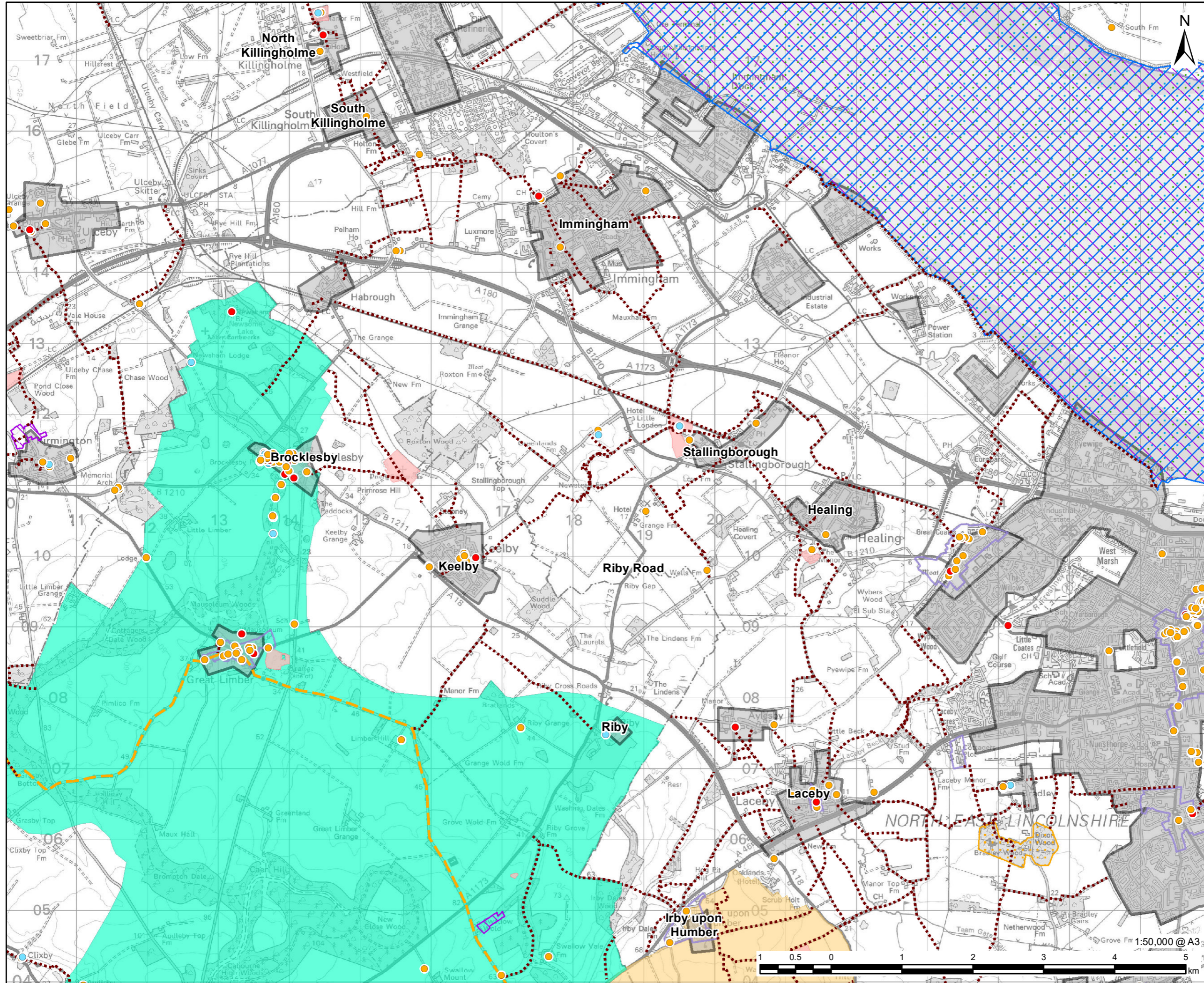
2.6.6 Using the guiding principles described in section 2.4.2 above, several pipeline corridors were identified providing an end-to-end connection between Immingham and the former TGT Site. As well as the guiding principles described above, further routeing principles were identified for each of the constraints data identified in the desk study (as displayed in Table 2-1); wherever feasible, these features and receptors were avoided to minimise the potential for environmental effects.

2.6.7 The initial options appraisal assessment process comprised the following:

- *The collation of relevant data for each topic area and identification of constraints (Figure 2-2).* Relevant data comprised desk study information on internationally, nationally, regionally, and locally important receptors and features (such as, but not limited to, urban settlements, Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Local Nature Reserves (LNR), Local Wildlife Sites (LWS), Areas of Outstanding Natural Beauty (AONB), Listed Buildings, Scheduled Monuments, Flood Zones 2 and 3, Main Rivers, Source Protection Zones (SPZ), Superficial Geology, Agricultural Land Classification (ALC), historic landfill sites, local plan allocations, planning and DCO applications, mineral safeguarding zones, existing infrastructure (including roads, railways and pipelines)). No surveys, such as ecological survey work, were considered necessary at this stage to support the routeing and siting work, however vantage point surveys were undertaken by pipeline engineers to provide essential input to the engineering aspects of routeing;
- *Appraisal of each pipeline corridor option to understand the potential for significant effects.* For each environmental feature or receptor, its nature, value or sensitivity and how it could be affected by the option has been considered, including details of how the effect could be avoided or mitigated and what the residual effects would be, noting whether effects are likely to be positive, negative or neutral; and
- *The estimated capital cost of the options,* based on broad assumptions regarding the technology to be used and the likely length of the pipeline, have been considered where this was pertinent to decision making.

2.6.8 Although avoidance (where feasible) of the environmental and physical features and receptors formed the basis of the routeing principles, one of the key objectives was to avoid routeing through the Lincolnshire Wolds AONB wherever feasible. NPS EN-1 states that AONBs have (together with National Parks and the Broads) the highest protection status with respect to landscape and scenic beauty, and their conservation should be given substantial weight by the Inspectorate in determining applications for development consent. Consent for development in the AONB may be granted in exceptional circumstances, where development is in the public interest. Applications should include an assessment of the need case, the cost and scope of alternatives, and the nature of any detrimental effect on the environment, landscape, and recreational opportunities and the extent to which they can be moderated.

- 2.6.9 Data layers were collated into an ArcGIS Online Geographic Information System ('WebGIS') database to allow them to be individually mapped, overlain and used to help in the identification and appraisal of potential pipeline corridor options.
- 2.6.10 It was not always feasible for the corridors identified to avoid all environmental and physical features and receptors present in the wide study area. This is particularly the case where the pipeline corridors were wider (approximately 1 kilometre (km) wide) to provide additional routing flexibility where fewer features and constraints were present. Wide corridors were identified, wherever feasible and appropriate, to ensure maximum flexibility for the later, more detailed routing of the pipeline, its associated 30 metre (m) working width and the necessary flexibility around this of 100m, which will form the basis of the future DCO Site Boundary/Draft Order limits.
- 2.6.11 Once broad corridor options were developed, it was clear that there were four locations where all corridor options could intersect (notwithstanding the start and end points at Immingham and Theddlethorpe). Corridor options could therefore be developed for five individual sections (A to E) of the initial routes, allowing for greater potential for avoiding key constraints.
- 2.6.12 Several alternative pipeline corridors were identified in each of the individual section, except for the area between North Thoresby and Covenham St Mary (see summary of 'Section D' below) where all initial routes fell within a single, albeit wide, corridor. A schematic of the various route options considered is provided in **Figure 2-3**.



VikingCCS

AECOM

PROJECT
Viking CCS Pipeline

LEGEND

- National Cycle Route
- Public Right of Way
- Grade I Listed Building
- Grade II Listed Building
- Grade II* Listed Building
- Scheduled Monument
- Conservation Area
- Local Nature Reserve
- Ramsar
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- Lincolnshire Wolds Area of Outstanding Natural Beauty
- Area of Great Landscape Value
- Urban Area

NOTES:

Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 © Historic England 2023. Contains Ordnance Survey data © Crown copyright and database right 2023.
 © Natural England material is reproduced with the permission of Natural England 2023. Contains public sector information licensed under the Open Government Licence v3.0.

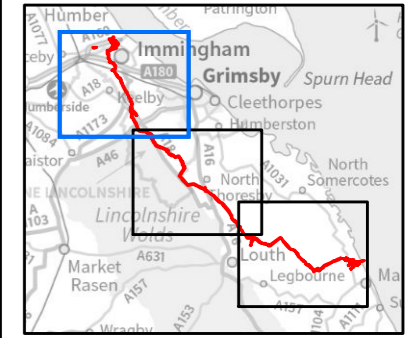


FIGURE TITLE

Figure 2-2 (1 of 3)
Key Environmental Constraints
between Immingham and
Theddlethorpe

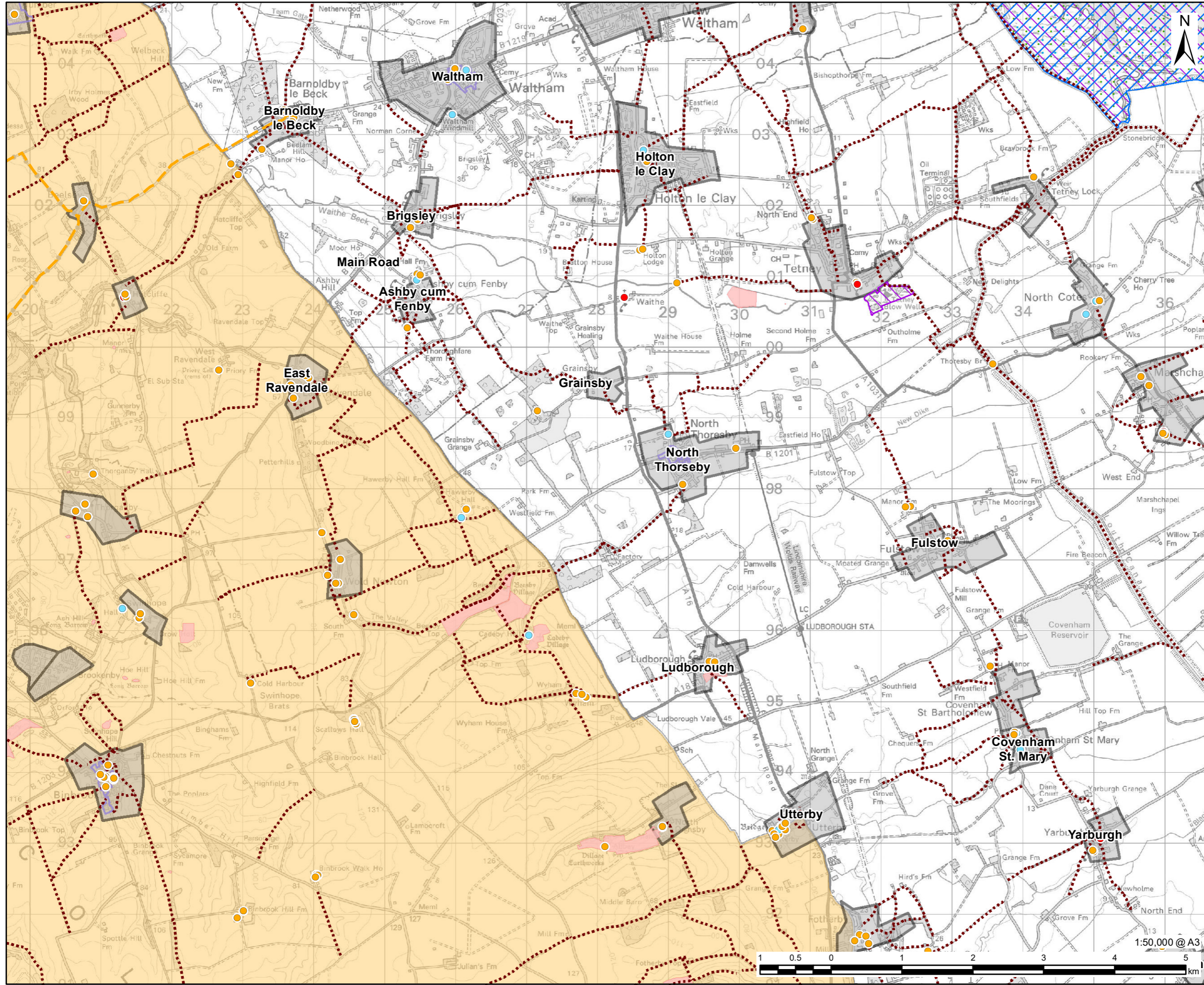
ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_2-2

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



LEGEND

- National Cycle Route
- Public Right of Way
- Grade I Listed Building
- Grade II Listed Building
- Grade II* Listed Building
- Scheduled Monument
- Conservation Area
- Ramsar
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- Lincolnshire Wolds Area of Outstanding Natural Beauty
- Urban Area

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 © Historic England 2023. Contains Ordnance Survey data © Crown copyright and database right 2023.
 © Natural England material is reproduced with the permission of Natural England 2023. Contains public sector information licensed under the Open Government Licence v3.0.

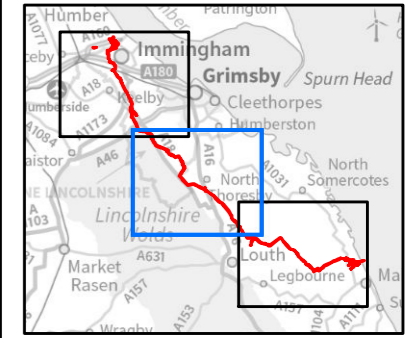
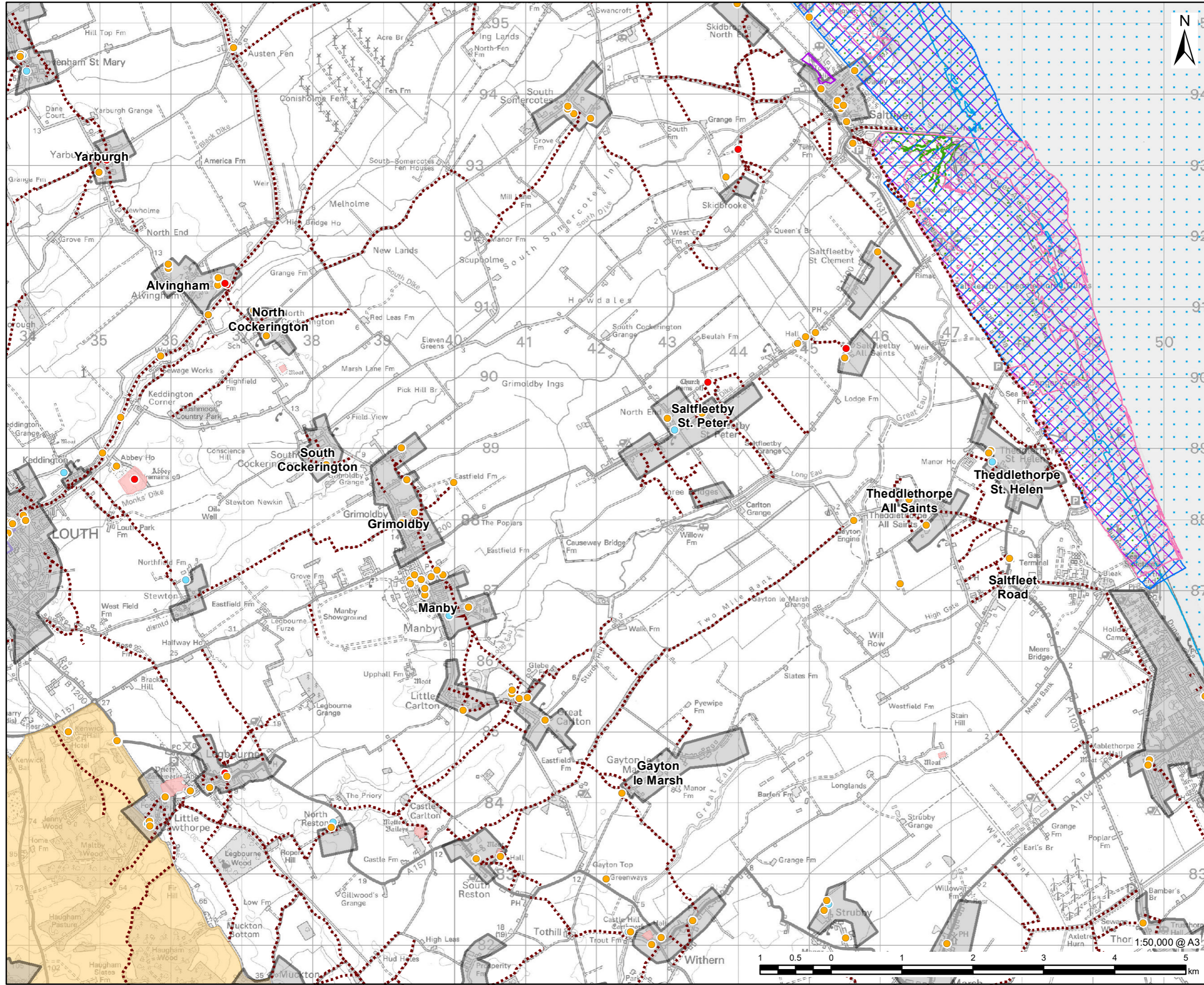


FIGURE TITLE
Figure 2-2 (2 of 3)
Key Environmental Constraints
between Immingham and
Theddlethorpe

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
 PROJECT NUMBER / REFERENCE
 60668955 / VCCS_230914_ES_2-2

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



LEGEND

- ⋯ Public Right of Way
- Grade I Listed Building
- Grade II Listed Building
- Grade II* Listed Building
- Scheduled Monument
- Conservation Area
- ♥ National Nature Reserve
- Ramsar
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- Lincolnshire Wolds Area of Outstanding Natural Beauty
- Urban Area

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 © Historic England 2023. Contains Ordnance Survey data © Crown copyright and database right 2023.
 © Natural England material is reproduced with the permission of Natural England 2023. Contains public sector information licensed under the Open Government Licence v3.0.

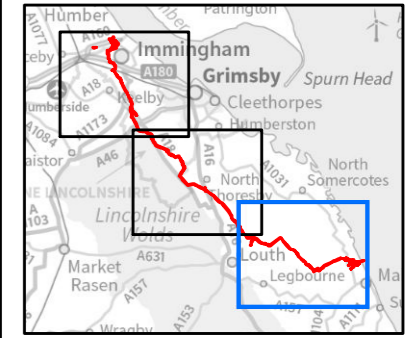
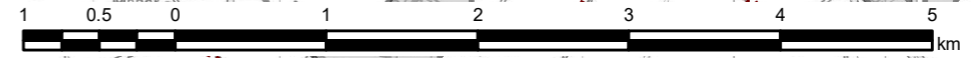


FIGURE TITLE
Figure 2-2 (3 of 3)
Key Environmental Constraints between Immingham and Theddlethorpe



This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

Figure 2-3: Schematic of Corridor Options and Indicative Preferred Corridor



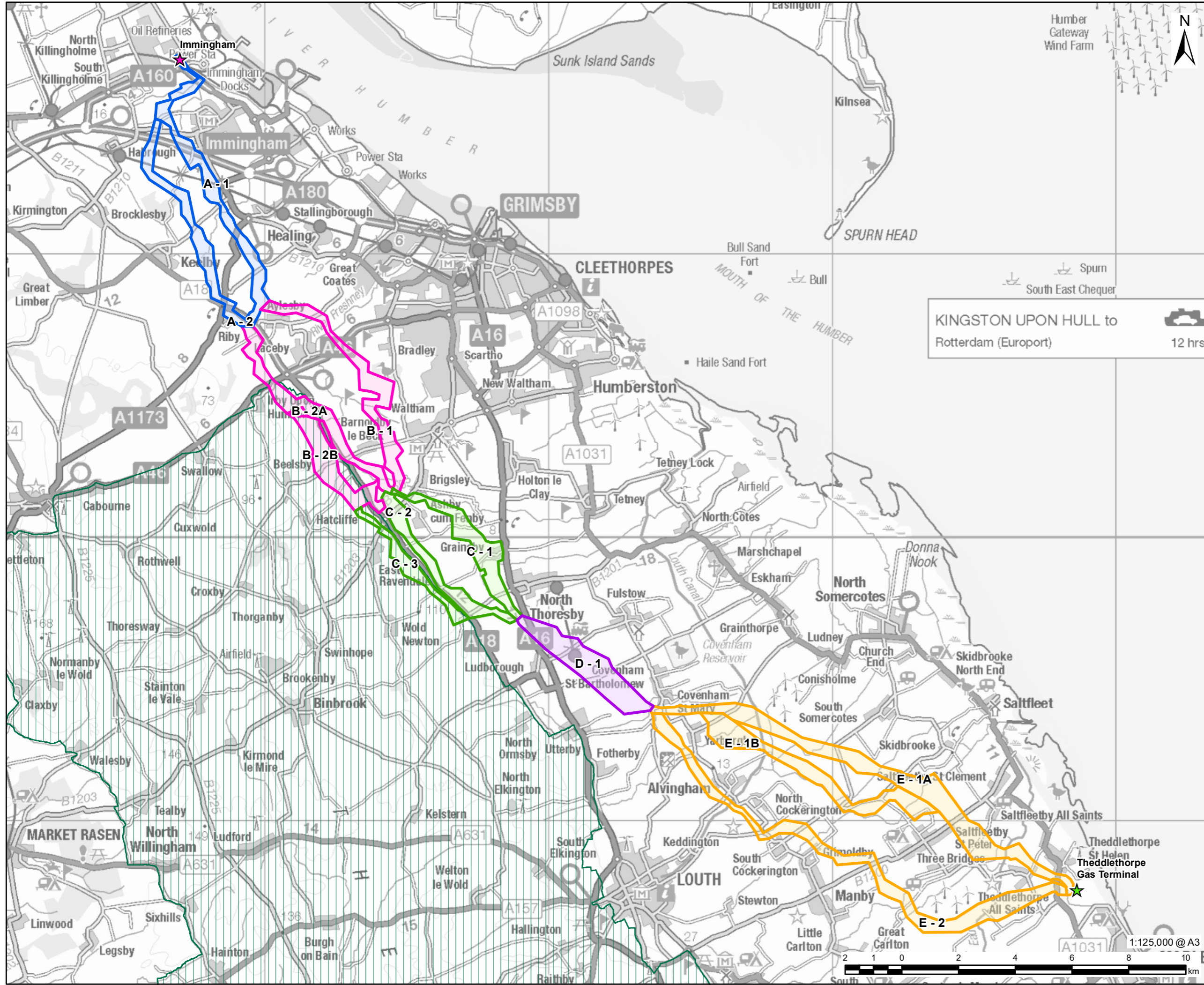
2.6.13 Except for the area between North Thoresby and Covenham St Mary (see summary of ‘Section D’ below) several pipeline corridors were identified, providing up to three different pipeline corridor options, depending on the geographical location in the Study Area.

2.6.14 The various corridor options identified within each of the five sections are described below and shown in more detail in **Figure 2-4**:

- **Section A** - Corridors A1 and A2;
- **Section B** - Corridors B1, B2A, and B2B;
- **Section C** - Corridors C1, C2, and C3;
- **Section D** - Corridor D1; and
- **Section E** - Corridor E1A, E1B and E2.

2.6.15 Where corridors have a suffix of ‘A’ or ‘B’ **after** the number, this is a sub-option providing a partial alternative to a main option. A brief overview of each section is provided below:

- In Section A, Corridors A1 and A2 provided alternative corridors to the east and to the west of the study area as the route moved from north of Immingham down towards Aylesby and Laceby;
- In Section B, Corridor B1 provided an alternative (outside of the AONB) to Corridors B2A (partially in the AONB) and B2B (more substantially in the AONB);
- In Section C, Corridors C1 and C2 provided alternatives (outside of the AONB) to Corridor C3 (wholly within the AONB);
- In Section D, the consistency and relative lack of environmental and physical constraints and receptors between North Thoresby and Covenham St Mary led to the identification of a single, wider corridor in this location; and



LEGEND

- ★ Connection Start
- ★ Connection End
- Lincolnshire Wolds Area of Outstanding Natural Beauty

Route Corridor Option

- Section A
- Section B
- Section C
- Section D
- Section E

KINGSTON UPON HULL to Rotterdam (Europort)

12 hrs

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673. Contains public sector information licensed under the Open Government Licence v3.0. © Natural England material is reproduced with the permission of Natural England 2023.

FIGURE TITLE

Figure 2-4
 Study Area Sections and Route Corridor Options

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_2-4

- In Section E, three options were identified, with Corridors E1A and E1B providing an option from near Covenham St Mary down to Theddlethorpe to the east, whilst Corridor E2 was further to the west.

2.6.16 The implementation of the five intersecting Sections had the effect of enabling the pipeline to transition from one corridor to another between the Sections; thus, increasing the flexibility of the options, providing further opportunities for optionality and therefore greater potential for avoiding constraints and minimising effects through routing. This was considered preferable to identifying full end-to-end corridor options. The appraisal of the corridor options was therefore undertaken on a Section-by-Section basis.

2.6.17 For all corridors, it was assumed that the pipeline would be installed in an open cut trench as the default installation method along most of the route; however, consideration was also given to the use of trenchless techniques at certain crossings to enable the pipeline to be installed beneath certain physical constraints (for example railway lines, A roads, main rivers, canals and priority habitats).

2.7 Step 3: Identification of Preferred Pipeline Corridor and presentation at Non-Statutory Consultation

Pipeline Corridor Route Option Refinement

2.7.1 Each of the corridor options identified was further appraised and refined to ensure an informed and robust decision could be made when selecting a preferred end to end corridor. The aim was to ensure that decisions regarding the routing of the Viking CCS Pipeline were based upon a thorough understanding of the implications of each option, using a wide range of appropriate criteria. The topics and sub-topics initially set out in **Table 2-1**, formed the basis of the appraisal.

2.7.2 Each of the eight sub-topics under the main topic of ‘Environment’ identified a preferred corridor (for each of the five Sections) where it was considered that there were meaningful differentiators between the options. **Table 2-2** provides a summary of the alternative assessment undertaken for the various corridor options which were analysed as part of the evolution of the Proposed Development’s design. A narrative is also included to help provide information to support the selected of particular corridor options.

2.7.3 Where no significant differentiators between corridors were identified, this was stated. Similarly, the preferred corridor in respect of the remaining topics of ‘Technical’, ‘Cost’ and ‘Lands’ were identified for each of the five Sections; again, if no significant differentiators were identified between the corridor options this was stated.

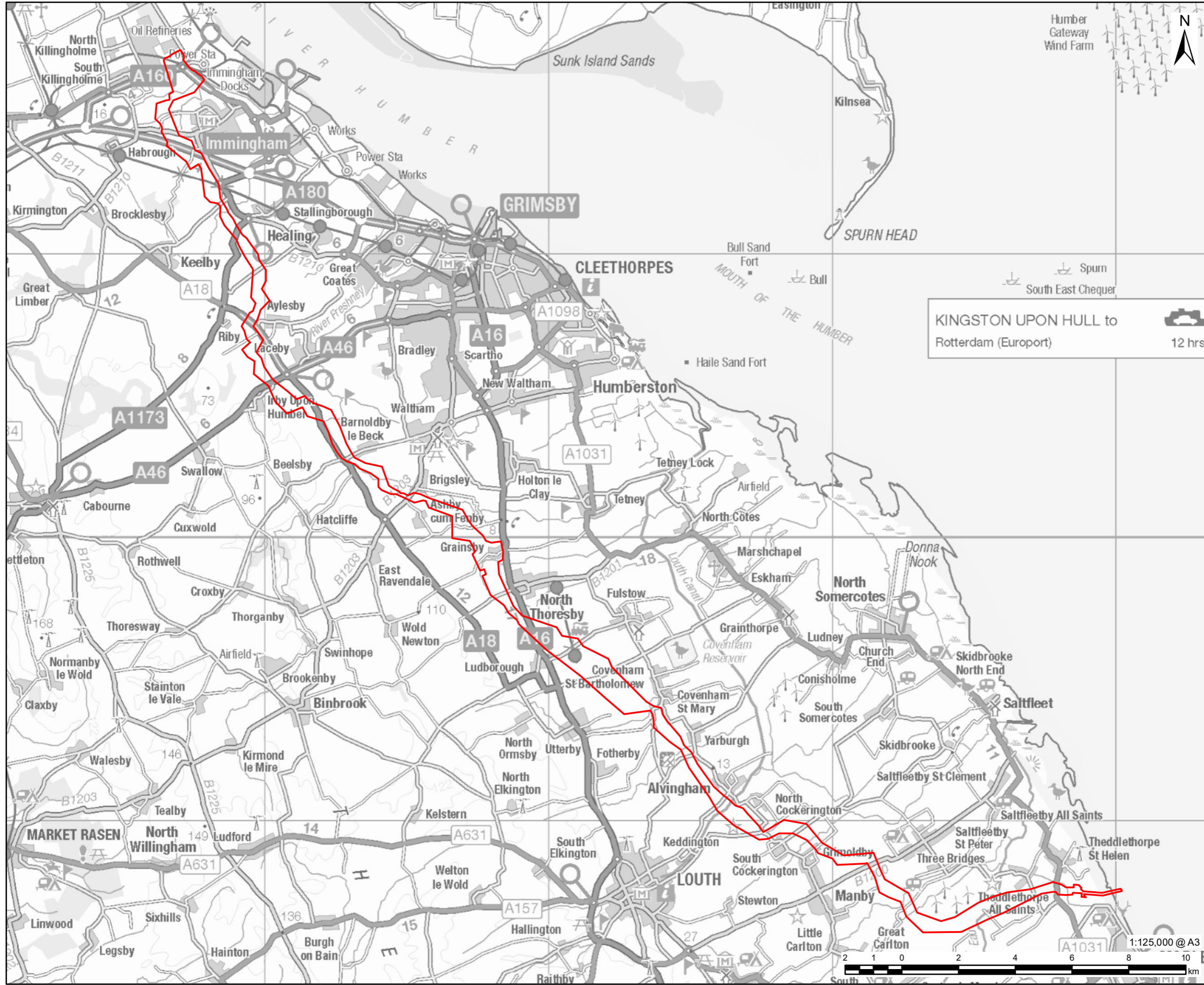
Table 2-2: Appraisal of Pipeline Corridor Options: High-Level Summary

Section	Preferred Corridor	Reasoned Justification
A	Corridor A1	<u>Environment</u> Corridor A1 is marginally preferred due to the excellent access to the existing road network compared to Corridor A2 which, in comparison, has relatively poor access. Corridor A2 was marginally preferred for three environmental sub-topics of historic environment, landscape and views, soils and geology, but preference is only very slight when compared to A1. For other environmental sub topics, either A1 was preferred, or there was no clear preference. It was determined that the small number of marginal preferences for Corridor A2 are not considered to

Section	Preferred Corridor	Reasoned Justification
		<p>outweigh the strong preference for Corridor A1 from a transport and access perspective.</p> <p><u>Technical and Cost</u> Corridor A1 is preferred as it is shorter in length (therefore would help to minimise cumulative disturbance) than Corridor A2 and has better access to and from the highway network. Corridor A1 also has the potential for fewer pipeline crossings. For these reasons, it is also expected to be marginally more cost effective than Corridor A2.</p> <p><u>Lands</u> There are no significant differentiators between either corridor.</p>
B	Corridor B2A	<p><u>Environment</u> - Corridor B1 is unsuitable due to the potential interaction (and associated impacts) with the granted solar farm planning permission south of Bradley Wood. For most of the environmental sub-topics, there are only marginal differences between Corridor B2A and Corridor B2B; however, Corridor B2A is preferred to Corridor B2B due to it being routed outside of the Lincolnshire Wolds AONB for most of its length.</p> <p><u>Technical and Cost</u> Corridor B1 is considered unsuitable as the development sought to site away from more densely populated areas. There are no significant differentiators between Corridor B2A or Corridor B2B and both have good access along their entire length via the A18.</p> <p><u>Lands</u> Corridor B2A or Corridor B2B would both avoid a potential impact on the granted solar farm planning permission, whilst B2A is preferred as it avoids the majority of the AONB.</p>
C	Corridor C1 (initially selected) before option C2 was selected	<p><u>Environment</u> Where an environmental sub-topic has identified a marginal preference, this is spread equally between all three corridors. However, from a landscape and views perspective, there is a slight preference for Corridor C1 due to it being routed outside of the Lincolnshire Wolds AONB and avoiding the well-established and tightly knit field boundaries, hedgerows, and tree groups (present in Corridor C2) which have the potential for landscape and biodiversity value.</p> <p><u>Technical and Cost</u> There are few differentiators between the corridors in Section C; of note is the potential for some difficulties routing around Grainsby in Corridor C1 (space, possibility for narrowing of installation corridor or trenchless crossing) and the marginally better potential for access via the A18 along most of the length of Corridor C2 and Corridor C3. Corridor C2 or Corridor C3 are marginally preferred.</p> <p><u>Lands</u> Corridor C1 was initially preferred as it has less impact on the Residential Waste Recycling facility at the southern extent, which</p>

Section	Preferred Corridor	Reasoned Justification
		could have potentially greater business disturbance claim on the alternate corridors (where both accesses are severed). However, following on from further design work and consultation, a route alignment more in line with corridor C 2 was selected. This is discussed in more detail in the next section of this chapter.
D	Corridor D1	Only one corridor was presented in Section D based on general lack of constraints in this area.
E	Corridor E2	<p><u>Environment</u> On balance, Corridor E2 is preferred due to most of the corridor being outside of the alluvium superficial geology and outside of Flood Zones 2 and 3, and the presence of fewer biodiversity priority habitats and planning applications. Where other environmental sub-topics have preferences for Corridor E1A or E1B, these are marginal, and are not considered to outweigh the overall preference and suitability of Corridor E2.</p> <p><u>Technical and Cost</u> Corridor E2 is preferred due to most of the corridor being outside of the alluvium superficial geology and outside of Flood Zones 2 and 3, making in theory for easier construction. There is better access from the local roads than for Corridors E1A and E1B and access for main river crossings (particularly canal crossings) is good. The difficulties of routing through the Saltfleetby area (Corridor E1A and E1B) are likely to result in additional cost and time (programme).</p> <p><u>Lands</u> Corridor E1B or Corridor E2 are preferred to avoid Saltfleetby B Gas Terminal.</p>

- 2.7.4 Following this additional refinement work, a preferred pipeline corridor was identified between Immingham and Theddlethorpe, within which the pipeline route itself would then be identified. This was selected via the alternative assessment process and due consideration of the evidence and input provided by the project team in relation to the key topics of environment, technical, cost and land considerations.
- 2.7.5 This corridor was included within the EIA Scoping Report which was submitted to Planning Inspectorate in March 2022 (referred to as the Scoping Boundary) and later presented at the Non-Statutory Consultation which was held from 26 April to 7 June 2022 and which encouraged feedback on the preferred corridor.
- 2.7.6 **Figure 2-5** provides an overview of the initial preferred Pipeline Corridor, which was presented within the Scoping Report.



VikingCCS

AECOM

PROJECT
Viking CCS Pipeline

LEGEND
 Initial Preferred Pipeline Corridor

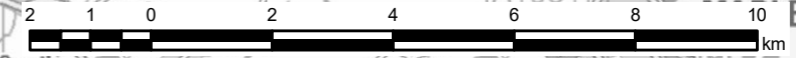
KINGSTON UPON HULL to Rotterdam (Europort)
12 hrs

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 Contains public sector information licensed under the Open Government Licence v3.0.

FIGURE TITLE
**Figure 2-5
 Initial Preferred Pipeline Corridor
 (presented within the Scoping
 Report and during Non-Statutory
 Consultation)**

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
 PROJECT NUMBER / REFERENCE
 60668955 / VCCS_230914_ES_2-5

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



2.8 Step 4: Consideration of feedback and a further Pipeline Corridor refinement

2.8.1 Following the Non-Statutory Consultation stage, additional changes were made to the preferred pipeline corridor based on two key factors:

- Amendments were made in response to feedback received from the public during the Non-Statutory Consultation; and
- Amendments were made in response to additional design engineering work undertaken for the Proposed Development.

2.8.2 These are discussed in more detail in the sections below. Consideration was also given to the responses provided within the Scoping Opinion (*ES Volume IV: Appendix 5.2 (Application Document 6.4.5.2)*).

Initial Non-Statutory Consultation Feedback

2.8.3 Two rounds of Non-Statutory Consultation were undertaken on the Proposed Development. The first phase commenced on 26 April and ended on 7 June 2022. The first round of Non-Statutory Consultation took a hybrid approach, consisting of both in-person and online public engagement events; numerous feedback channels were open to the public to provide their views on the Proposed Development.

2.8.4 *Chapter 4: Consultation* of this ES provides additional information about the consultation process and the feedback that was received. Each piece of feedback was considered by the Project team and, where agreed through a design change control procedure (see paragraph 2.8.7 below) changes were made to the proposals, including changes to the preferred corridor presented at the first Non-Statutory Consultation (See Design Change Process section below). The corridor presented at the first Non-Statutory Consultation is presented in **Figure 2-5**.

Design Engineering

2.8.5 During the design development, the Applicant made the decision to undertake additional technical studies to help further refine the proposed route of the Proposed Development. These studies were based on HSE guidance, which allowed the pipeline routing to be assessed against established criteria. This also included consideration of using thicker wall pipe for the entire length of the pipeline.

Design Change Process

2.8.6 A design change process was undertaken, which allowed the project team to consider design related comments provided by the public and other stakeholders and consider recommendations made by the design team in light of those comments. This allowed further analysis of environmental, social, safety, technical, cost and land considerations.

2.8.7 The design change process was managed through the development of a Design Change Register which logged all of the potential design amendments. Each entry in the register was supported by a technical note which considered each potential change in relation to environmental, engineering, technical (including safety) and land ownership related considerations. This then informed the decision as to whether the design changes were taken forward, or whether it was agreed that no change would be made.

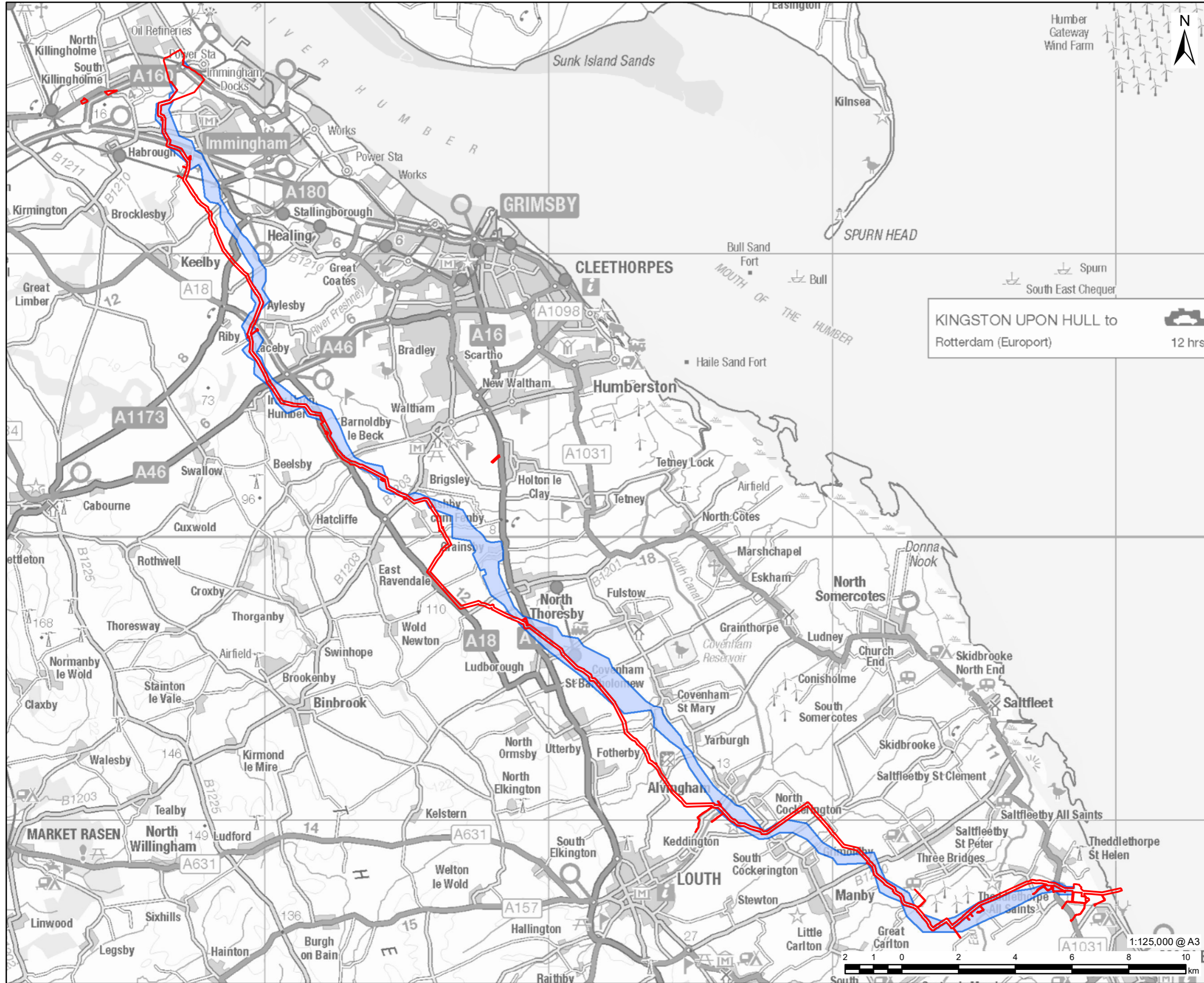
2.8.8 The key changes made to the Pipeline Corridor from that presented within the Scoping Report and at the Non-Statutory Consultation events included:

- Moving the corridor further away from Stallingborough, Healing, and the Stallingborough Grange Hotel. This change was made as a result of ongoing engineering safety design work;
- Moving the corridor further away from Grainsby and North Thoresby. This change was made following landowner feedback, taking account of current and proposed land uses. The proposed route change was predominantly on land owned by the same landowner. The new route was further away from the settlement of North Thoresby;
- Moving the corridor further away from Covenham St Mary, Covenham St Bartholomew, Yarborough, North End and Alvingham. This change was made as a result of ongoing engineering safety design work;
- Moving the corridor further to the east of Grimoldby. This change was suggested by a local resident and was further reviewed as part of ongoing engineering safety design work. This work confirmed it was a beneficial change from an environmental and technical perspective; and
- Moving the corridor further away from Theddlethorpe Academy and improving crossings of the KIPS and Condensate pipelines.

2.8.9 **Figure 2-6** provides a visual comparison of the revised Pipeline Corridor (which was used at the Statutory Consultation) against the original Pipeline corridor consulted upon during the first round of Non-Statutory Consultation.

Further Non-Statutory Consultation

- 2.8.10 As there were a number of changes to the original route corridor, a further round of non-statutory consultation was undertaken. This second round ran between 8 September and 6 October 2022 and it followed the same hybrid approach as the first round.
- 2.8.11 All responses received during the further Non-Statutory Consultation were reviewed, and it was determined that no further changes were required that would change the preferred pipeline corridor and, as such, the design moved on to route identification and selection of preferred location of supporting infrastructure.



LEGEND

- ▬ Statutory Consultation Pipeline Corridor
- ▬ Non-Statutory Consultation Pipeline Corridor

KINGSTON UPON HULL to Rotterdam (Europort)
 12 hrs

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673. Contains public sector information licensed under the Open Government Licence v3.0.

FIGURE TITLE
Figure 2-6 Comparison of Statutory Consultation Pipeline Corridor against Original Pipeline Corridor used for Non-Statutory Consultation

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE
 60668955 / VCCS_230914_ES_2-6

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

2.9 Step 5: Identification of a Proposed Pipeline Route (including degree of flexibility) and associated Infrastructure

Defining a Proposed Pipeline Route

2.9.1 The updated corridor was used as the starting point for further design and refinement work to establish an actual pipeline route. The development of the pipeline route took into consideration localised environmental or social receptors and was based a requirement for a working width of 30m for construction, which would be located within an approximately 100m wide corridor. Where the route needs to cross existing infrastructure such as roads, main rivers, utilities etc, where possible this has been shown as perpendicular to the existing feature (i.e. the pipeline route is at a 90 degree angle to the crossing point).

Above Ground Infrastructure and Construction Compounds

2.9.2 In addition to the establishment of a preferred pipeline route, design work was undertaken to identify suitable locations for other required infrastructure as discussed in the following sections. This included the assessment of alternatives for the following:

- Location of the Immingham Facility;
- Location of the Theddlethorpe Facility;
- Location of Block Valve Stations along the pipeline route; and
- Location of the temporary construction compounds to support the construction of the Proposed Development.

Immingham Facility

Initial Location options

2.9.3 From a technical perspective there were several options for the location of the Immingham facility; these included land to the east of Rosper Road and land to the south of the VPI facilities. These potential areas are on land owned by Phillips 66 and as such discussions were held to ensure that any future developments that Phillips 66 may wish to pursue were not compromised by the siting of the Immingham facility. Consideration also had to be given to the siting of the proposed VPI carbon capture plant. This plant would ensure the captured CO₂ is suitably conditioned and compressed ready for onward transmission.

Selection of Preferred Location

2.9.4 As a result of this ongoing work and continuing discussion with the land owner, the chosen location for the Immingham Facility is located within a currently unused section of land to the south of the existing VPI Immingham Power Station site. The identified location where the Immingham Facility could be located is larger than the land that is actually required to construct the Immingham Facility. This is in order to maintain some flexibility in its exact micro-siting, to ensure it is compatible with the final plans for the P66/VPI capture plants. However, environmental constraints over the parcel of land are consistent and the precise micro-siting of the facility is therefore unlikely to be determined through environmental considerations. More information is presented in *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.2.3)*.

Theddlethorpe Facility

Initial Location Options

2.9.5 A key factor in determining the site of the Theddlethorpe Facility is the location of the LOGGS pipeline, to which the Proposed Development needs to connect. Option 1 for

locating the Theddlethorpe Facility is therefore on the former TGT site where the LOGGS pipeline terminates, providing a tie-in location for the new onshore pipeline.

- 2.9.6 The former TGT site is owned by National Grid. In early discussions about the use of the site for the Proposed Development, the Applicant was advised by National Grid that they were exploring plans for its future development. The Applicant therefore considered it appropriate to consider alternative site options in the vicinity of the LOGGS pipeline.
- 2.9.7 Consequently, in addition to the former TGT site (Option 1), five alternative sites were identified close to the former TGT site for further consideration. These were considered in terms of their existing environmental constraints, technical feasibility, viability of site access, and their location in relation to the preferred Pipeline Corridor. This was included within a technical note prepared by the team engineers which reviewed the options. Following on from this review, one additional site (Option 2) was selected as an alternative site to take forward.

Selection of preferred location

- 2.9.8 The preferred location remains the former TGT site (Option 1). An alternative site (Option 2) is located approximately 275m west of the former TGT site. This alternative site is currently arable in nature and a suitable access has been identified that would be needed for both construction and permanent access. These alternative locations are shown on **Figure 2-7**.
- 2.9.9 Further details are provided in *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.2.3)*.

Block Valve Stations

Assessment of Alternatives

- 2.9.10 The process of identifying suitable locations for block valves was undertaken as the location of the pipeline corridors evolved. Block valves were not considered a key driver in determining the location of the pipeline routing itself due to the extensive availability of suitable land and their relatively limited footprint.
- 2.9.11 Through an initial engineering assessment, it was established that block valves would be required along the route to help optimise the safety of the Proposed Development and ensure that sections of the route could be isolated if required. Having confirmed the need for block valves, the next step was to establish the optimum number of block valves required, based upon spacing requirements, and their approximate position along the proposed pipeline route.
- 2.9.12 This work resulted in the identification of locations at approximately 13km, 24km and 39km along the pipeline route. The engineering team then searched for suitable sites at these approximate points along the proposed route that could both accommodate a block valve and provide suitable access off the public highway. These locations were reviewed by the environment team and feedback was provided to confirm that there were no environmental constraints that would preclude these locations being taken forward.

Selection of preferred locations

- 2.9.13 The preferred locations for block valves are presented in section 3.8 of *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.2.3)*. The three locations selected are:

- *Washingdales Lane Block Valve Station*: Located on arable land south-east of Riby, adjacent to an existing access track off Barton Street (A18);
- *Thoroughfare Block Valve Station*: Located on arable land south-east of Ashby cum Fenby adjacent to Thoroughfare minor road; and
- *Louth Road Block Valve Station*: Located on arable land south-west of Alvingham, off Louth Road.

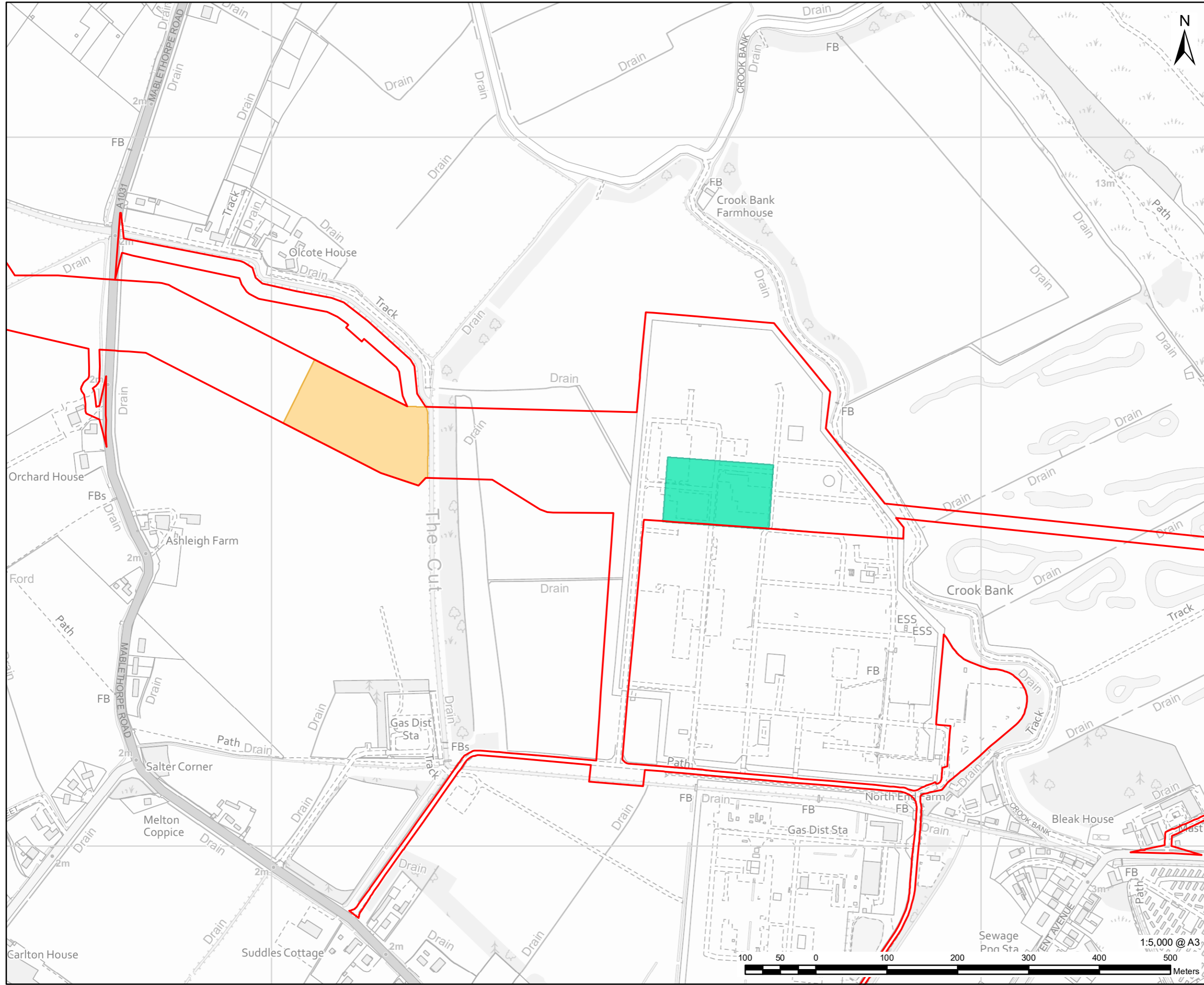
Construction Compound Areas

Assessment of Alternatives

- 2.9.14 A number of studies were undertaken to identify suitable locations for construction compounds to support construction of the Proposed Development. In all, 14 preliminary locations were identified that were considered to be suitable for locating construction compounds (see **Figure 2-8**).
- 2.9.15 The 14 potential locations were assessed against environmental and construction factors. Key factors considered for each site included: any environmental designations; proximity to communities, previous site uses (especially if the sites had previously been used as a construction compound for other projects); the location along the Pipeline Corridor length; the distance from the Pipeline Corridor; and the suitability and accessibility of each location, including ease of access.
- 2.9.16 As work progressed to identify suitable compound locations, the construction philosophy was also developed which helped in the refinement of suitable locations.
- 2.9.17 Based on the length of the pipeline, it was established that, from a logistics perspective, it would be beneficial to have three construction compounds; one close to the northern end of the route, one in the central area and one towards the south.
- 2.9.18 Based on this philosophy, preferred sites were identified, two for both the northern compound and central compound, with one site identified for the south.

Selection of preferred locations

- 2.9.19 The selection of the preferred construction compounds was made with due consideration to the initial analysis work that had been undertaken, along with further consideration about how accessible the sites were in relation to the DCO Site Boundary and how impacts could be minimised where possible by choosing locations closer to the pipeline construction corridor, and therefore minimising the movement of materials on the local road network.
- 2.9.20 Consequently, Site 4 was selected for the northern compound, whilst Site 13 has been selected as the central construction compound. Site 9 remains the preferred location for the southern construction compound. Additional information is presented within section 3.12 of *ES Volume II Chapter 3: Description of the Proposed Development* of this ES and the location of each compound is indicated on **Figure 3-30**.



- LEGEND**
- DCO Site Boundary
 - Theddlethorpe Facility - Option 1
 - Theddlethorpe Facility - Option 2

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.

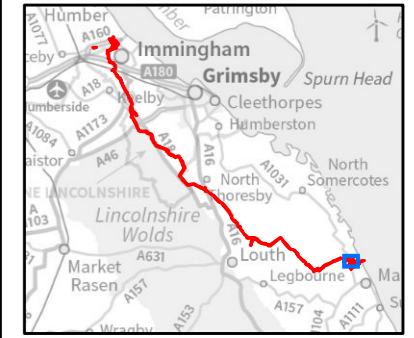
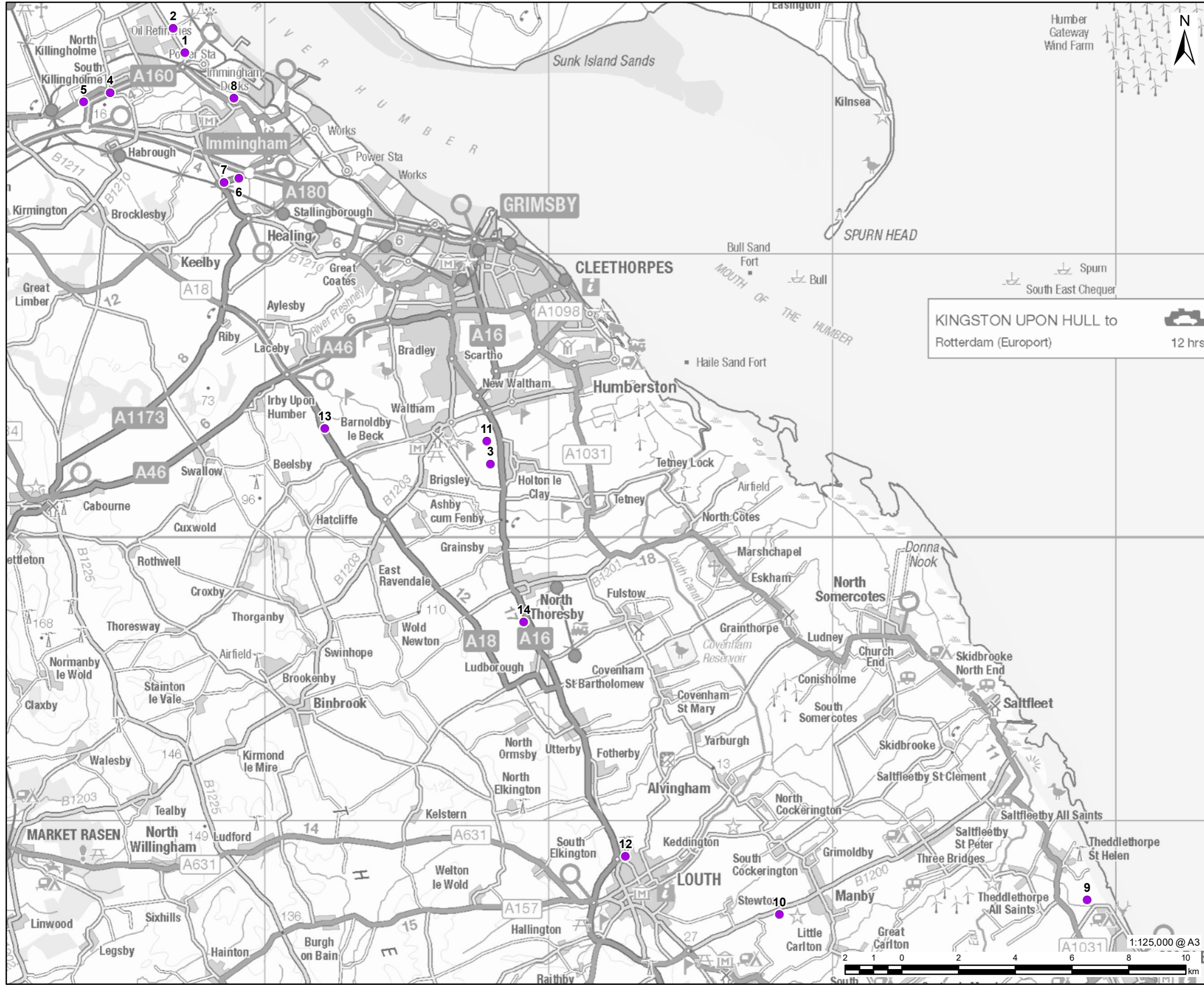


FIGURE TITLE
Figure 2-7
Theddlethorpe Facility - Alternative Locations

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
PROJECT NUMBER / REFERENCE
 60668955 / VCCS_231003_ES_2-7

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



VikingCCS

AECOM

PROJECT
Viking CCS Pipeline

LEGEND

- Construction Compound / Pipe Dump Location

KINGSTON UPON HULL to Rotterdam (Europort)
12 hrs

NOTES:
Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673. Contains public sector information licensed under the Open Government Licence v3.0.

FIGURE TITLE
Figure 2-8 Construction Compound Location Options

ISSUE PURPOSE
ENVIRONMENTAL STATEMENT
PROJECT NUMBER / REFERENCE
60668955 / VCCS_230914_ES_2-8

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

2.10 Step 6: Developing Initial DCO Site Boundary/Draft Order limits for Statutory Consultation

2.10.1 The initial DCO Site Boundary (also referred to as the Draft Order Limits in a number of DCO documents and figures) were developed to incorporate the following permanent infrastructure:

- The pipeline route including 100m flexibility;
- Block Valve Stations;
- Immingham Facility;
- Theddlethorpe Facility;
- Cathodic Bed infrastructure;
- Electricity Connections Distribution Network Operator's existing network; and
- Temporary and Permanent access to the pipeline and facilities.

2.10.2 The DCO Site Boundary would also include the following temporary infrastructure:

- Construction compounds;
- All temporary construction work locations for the pipeline, block valves, Immingham Facility and Theddlethorpe Facility; and
- Temporary access locations, including access bellmouths.

2.10.3 Statutory Consultation was held between 22 November 2022 and 24 January 2023. A copy of the DCO Site Boundary, which were used to inform the Statutory Consultation, along with a comparison of the finalised DCO Site Boundary presented within this application is shown later in this chapter on **Figure 2-13**.

2.11 Step 7 Consideration of Feedback Received During Statutory Consultation

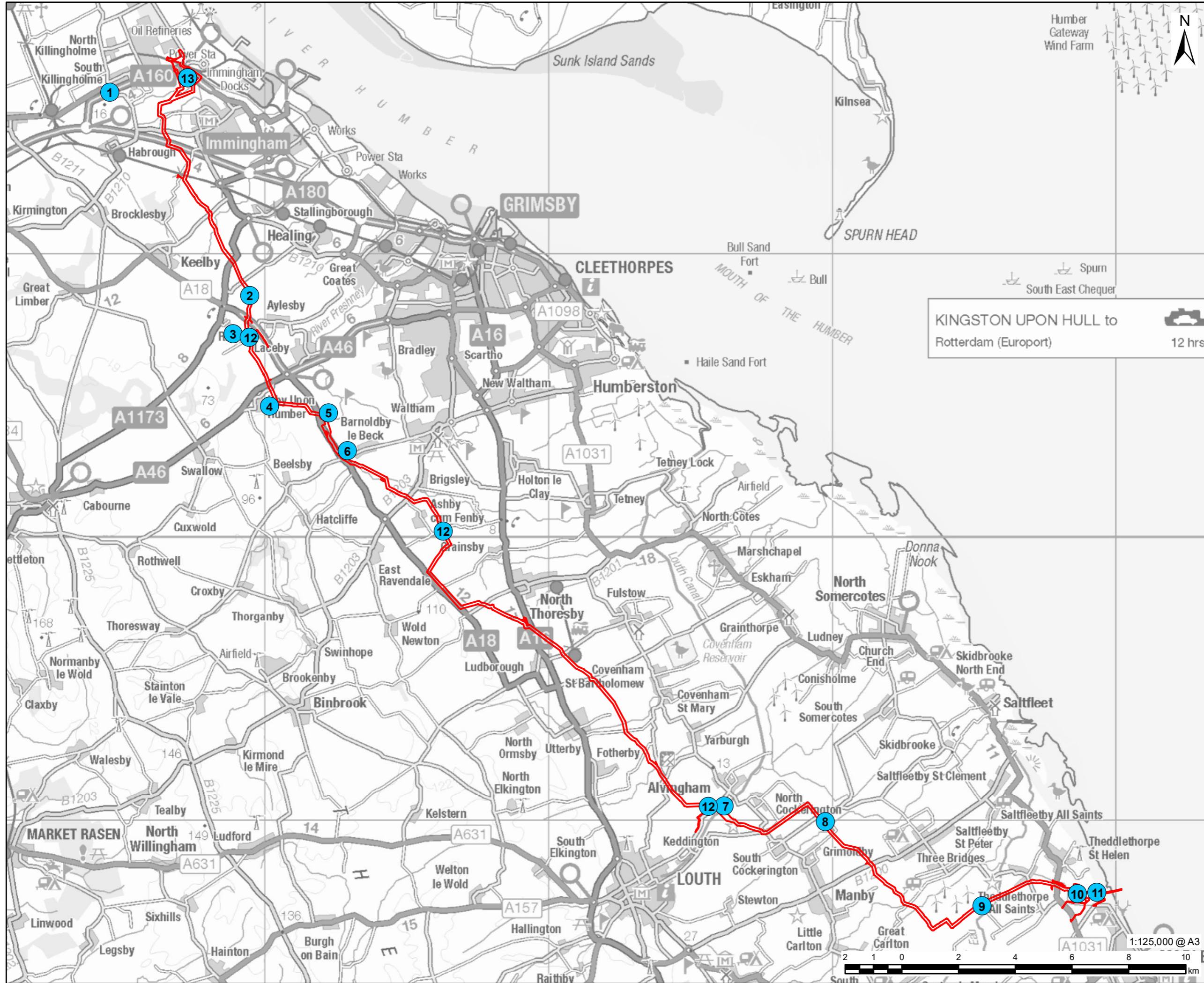
2.11.1 This step in the design's evolution was directly linked to two further phases of consultation. Firstly, the design evolved in response to comments received during the Statutory Consultation and secondly final minor amendments were made in response to further targeted statutory consultation, which was undertaken following subsequent minor changes to the Draft Order Limits. Further details about how these responses influenced the final design are included in the sections below.

Statutory Consultation – November 2022 to January 2023

2.11.2 During the Statutory Consultation held between 22 November 2022 and 24 January 2023, 223 responses were received. Further information on the overall approach to statutory consultation and the feedback received is provided in *ES Volume II Chapter 4: Consultation (Application Document 6.2.4)*. However, in summary all feedback received was considered and, where appropriate, further technical work was undertaken to assess proposed design changes.

2.11.3 This section outlines the 12 revisions made as a result of the consultation feedback, landowner discussions and further technical engineering work. The location of each of these design changes is shown on **Figure 2-9**; which are summarised below:

- *Design Revision #1 – Northern Construction Compound:* The DCO Site Boundary was expanded to enable the compound to be connected to a nearby electrical power supply;
- *Design Revision #2 – Area west of Aylesby:* The largest of the design changes, which has resulted in a change to the pipeline route and associated DCO Site Boundary, moving it further west away from another development which has recently been given planning permission. The change also allows for the use of an existing layby off the A18 Barton Street for temporary access. This change is also shown on **Figure 2-10**;
- *Design Revision #3 – Washingdales Block Valve Station 1 relocation:* Following discussions with the landowner, Washingdales Block Valve Station has been moved from its original location immediately north of Washingdales Lane, to a location immediately south of Washingdales Lane;
- *Design Revision #4 – Area east of Irby upon Humber:* Moving the DCO Site Boundary closer to the boundary of a field;
- *Design Revision #5 – Area near Welbeck Spring:* The DCO Site Boundary has been moved further away from Welbeck Spring;
- *Design Revision #6 – Central Construction Compound:* The size of the central compound has been reduced to move it further away from Welbeck Spring. Additionally, the DCO Site Boundary has been moved slightly to the west to run alongside the edge of the A18 to allow flexibility relating to access to the compound off the public highway;
- *Design Revision #7 – Area near Louth Water Recycling Centre:* The DCO Site Boundary has been widened in this location to provide greater flexibility to route and locate a suitable trenchless crossing;
- *Design Revision #8 – Area north of Grimoldby:* Minor amendment to move the DCO Site Boundary to the south west;
- *Design Revision #9 – Area south of Theddlethorpe All Saints:* Minor amendment to the DCO Site Boundary to exclude a residential property;
- *Design Revision #10 – Area west of the former Theddlethorpe Gas Terminal (TGT) site:* Two options for the siting of the Theddlethorpe Facility remain, with one being on the former TGT site and one being to the west of the former TGT site. Minor changes have been made to the DCO Site Boundary to accommodate two associated pipeline route options and to include a permanent access road and electrical connection;
- *Design Revision #11 – DCO Site Boundary over existing LOGGS Pipeline:* The extent of the DCO Site Boundary over the route of the existing LOGGS Pipeline have been reduced, so they are now at a width of 20 m in this location. This Change is also shown on **Figure 2-11**;
- *Design Revision #12 – Block Valve Stations:* The DCO Site Boundary has been extended at each of the Block Valve Stations to allow electrical connections to be installed in grass verges;
- *Design Revision #13 – Further changes were made to reduce the extent of the DCO Site Boundary Limits in the vicinity of the Immingham industrial area.* These reductions were in part as a result of feedback from Phillips 66 relating to areas where the DCO Site Boundary covered their operational site. Other changes were made following a workshop to review the draft land plans, during which it was recognised that some areas could be removed or reduced without affecting the ability for the Proposed Development to be constructed. These changes are shown on **Figure 2-12**.



VikingCCS

AECOM

PROJECT
Viking CCS Pipeline

LEGEND

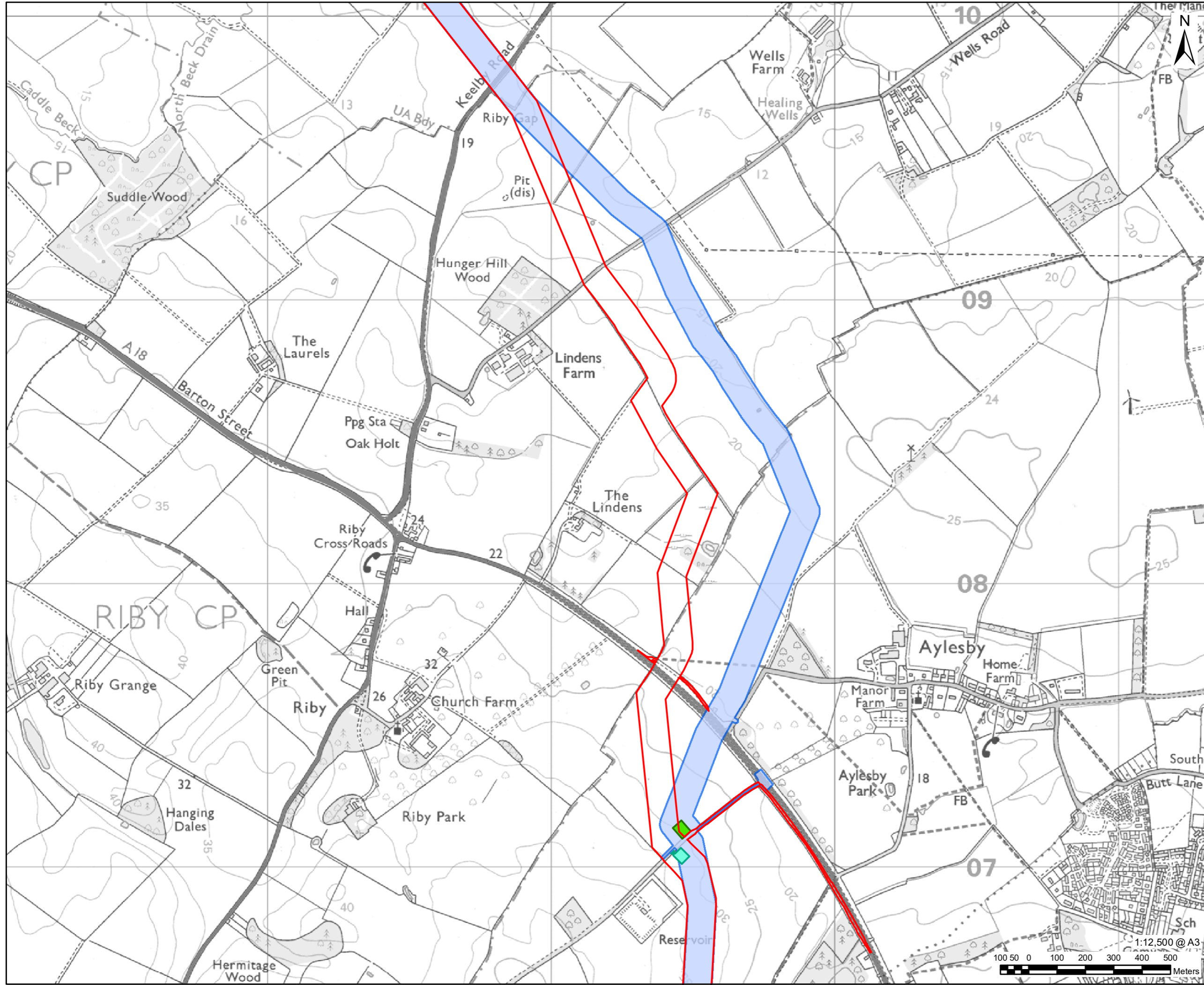
- DCO Site Boundary
- Design Revision Number

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 Contains public sector information licensed under the Open Government Licence v3.0.

FIGURE TITLE
Figure 2-9
Design Revisions following Statutory Consultation

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
 PROJECT NUMBER / REFERENCE
 60668955 / VCCS_231009_ES_2-9

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



- LEGEND**
- DCO Site Boundary
 - Statutory Consultation Pipeline Corridor
 - Previous Block Valve Station Location
 - Block Valve Station Location

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 Contains public sector information licensed under the Open Government Licence v3.0.

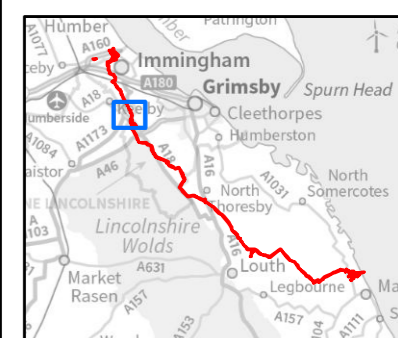
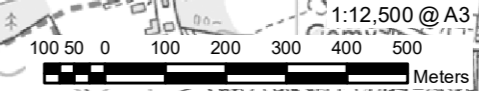
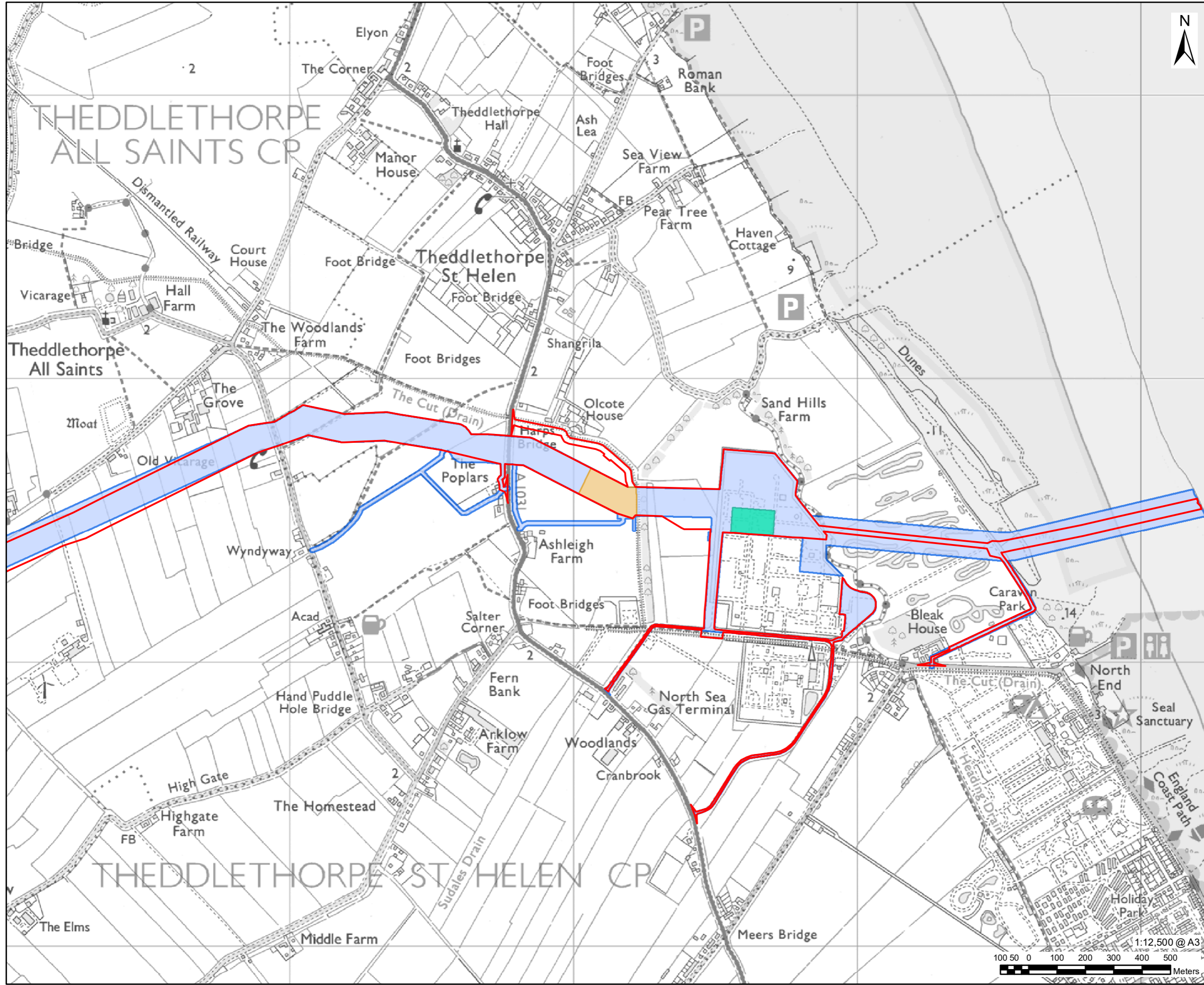


FIGURE TITLE
Figure 2-10
Area West of Aylesby (Design Revisions 3 and 4)

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
PROJECT NUMBER / REFERENCE
 60668955 / VCCS_230914_ES_2-10



This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



- LEGEND**
- DCO Site Boundary
 - Statutory Consultation Pipeline Corridor
 - Theddlethorpe Facility - Option 1
 - Theddlethorpe Facility - Option 2

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 Contains public sector information licensed under the Open Government Licence v3.0.

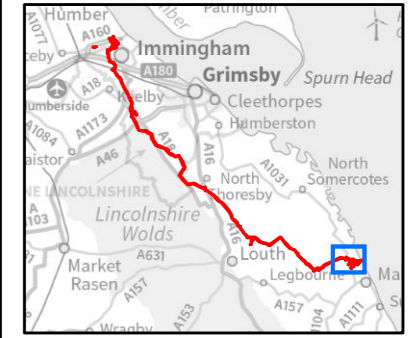
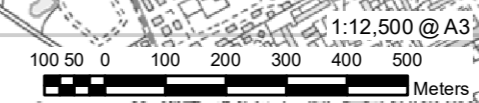
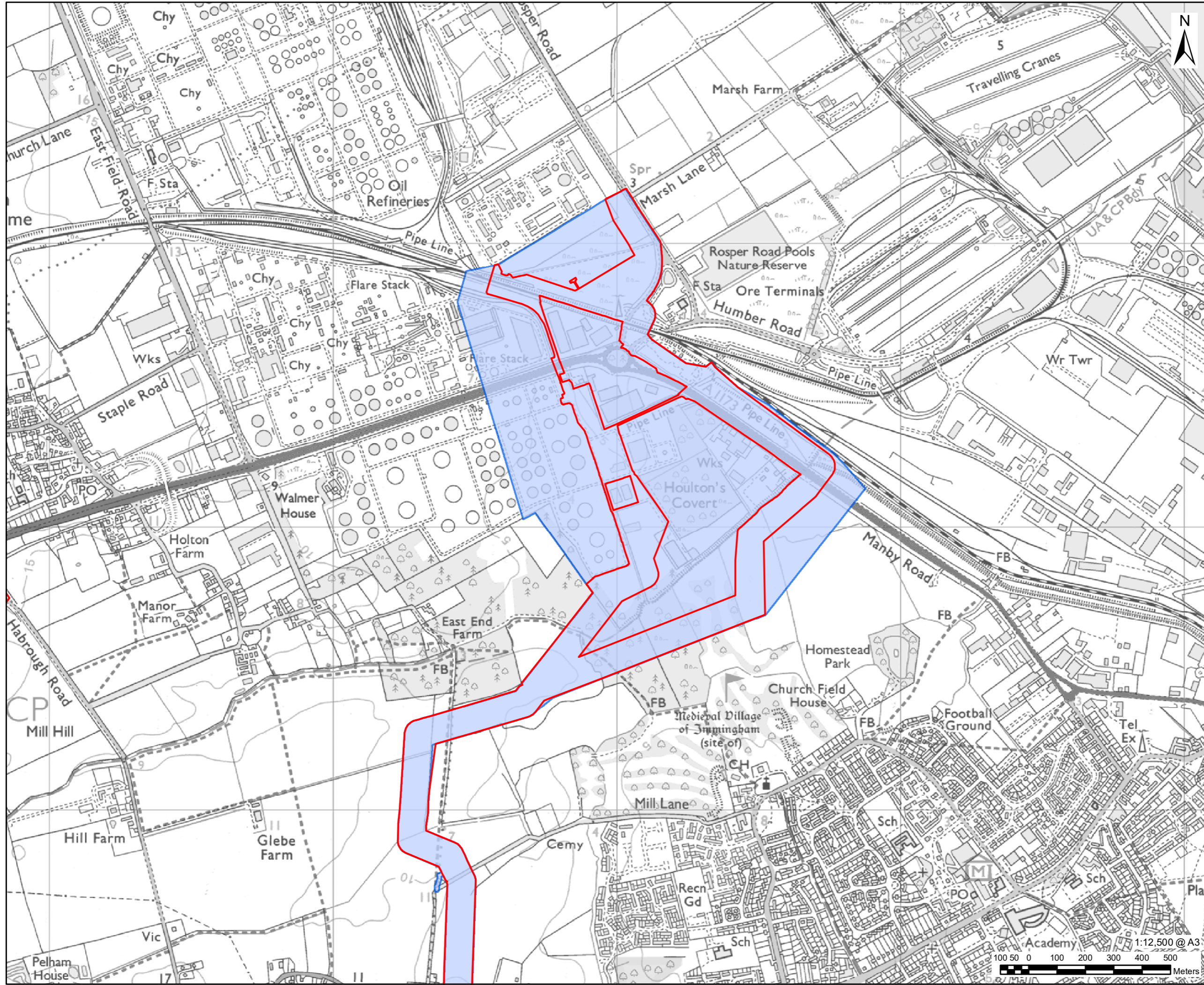


FIGURE TITLE
Figure 2-11
Design Revisions in Theddlethorpe Area (Design Revisions 10 and 11)



ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
PROJECT NUMBER / REFERENCE
 60668955 / VCCS_231009_ES_2-11



This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.



LEGEND

	DCO Site Boundary
	Statutory Consultation Pipeline Corridor

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.
 Contains public sector information licensed under the Open Government Licence v3.0.

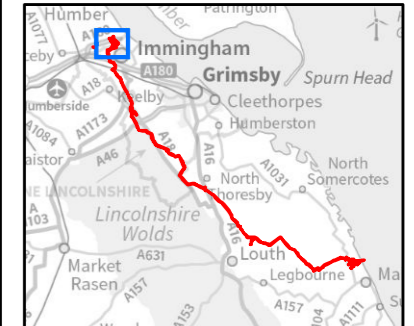
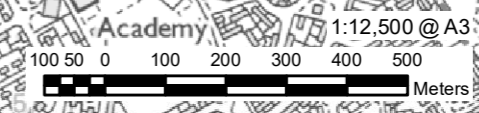


FIGURE TITLE
Figure 2-12
Design Revisions in Immingham
Area (Design Revision 13)

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT
PROJECT NUMBER / REFERENCE
 60668955 / VCCS_231009_ES_2-12



This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. All measurements must be obtained from the stated dimensions.

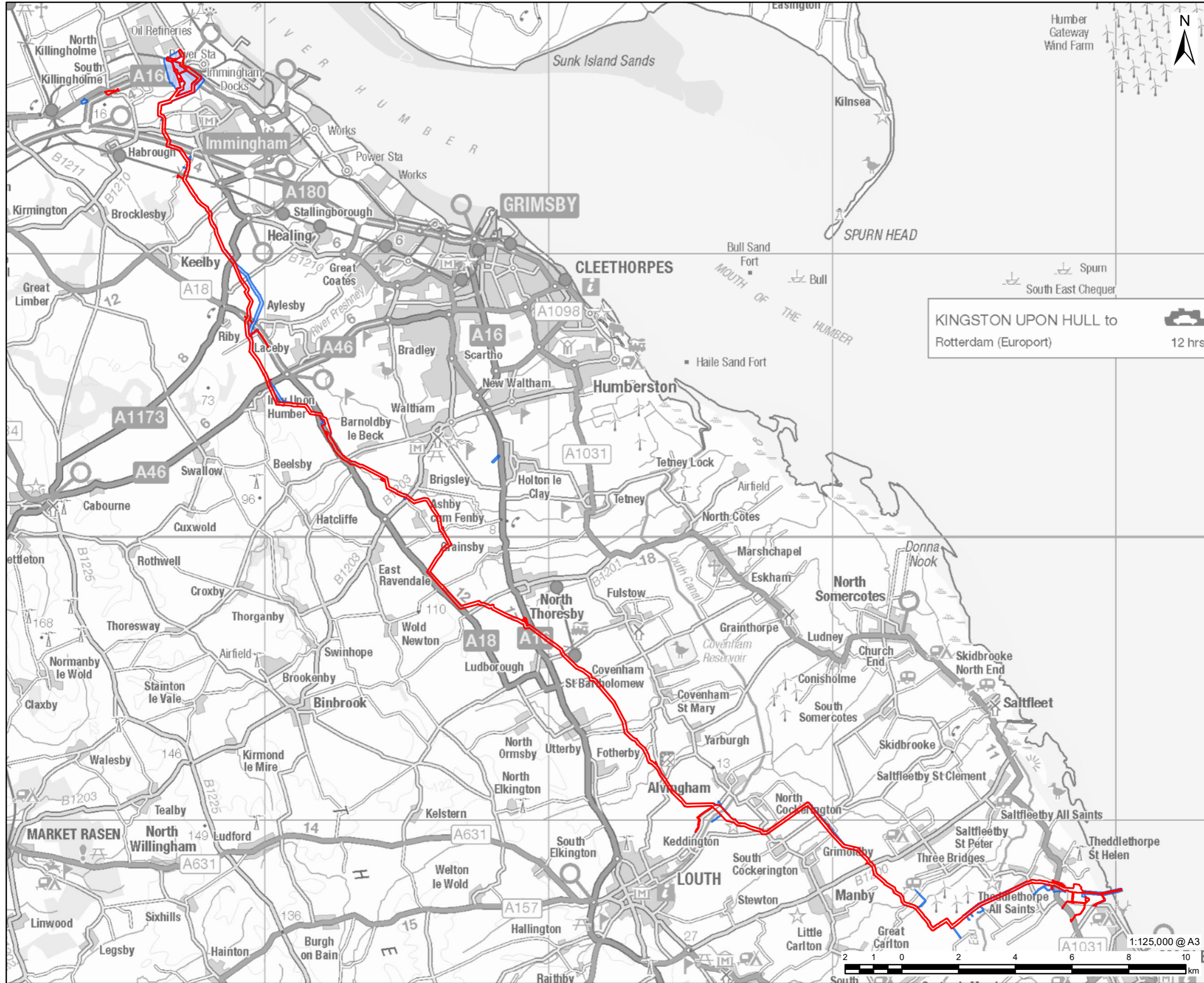
- 2.11.4 An initial assessment of these changes was undertaken by the project team and it was concluded that the findings of the Preliminary Environmental Information Report published to support the statutory consultation remain valid. No new or different significant environmental effects have been identified beyond those reported at the Statutory Consultation.
- 2.11.5 The findings of the EIA relating to the DCO Site Boundary is included within this ES.
- 2.11.6 Figure 2-14 contained in *ES Volume III: Figures for ES*, provides a detailed overview for all of the above design revisions made following on from the Statutory Consultation.

Follow up Targeted Statutory Consultation – April/May 2023

- 2.11.1 Following review of the statutory consultation feedback and the outcome of further technical work, the scheme design was reviewed and several revisions to the design were identified, as outlined above in paragraph 2.11.3. Where revisions led to an increase in the DCO Site Boundary, these were consulted on as part of a targeted consultation between 14 April and 14 May 2023.
- 2.11.2 In total, 78 responses were received to the consultation, all via email. The feedback received during this stage of consultation has been considered and reviewed in line with the development of the design.
- 2.11.3 **Figure 2-13** provides a comparison of the DCO Site Boundary presented at the initial statutory consultation, with the final DCO Site Boundary issued to accompany the DCO application.

2.12 Step 8: Development of DCO Site Boundary/ Order Limits for DCO submission

- 2.12.1 A visual representation of the DCO Site Boundary is included in Figure 3-3 within *ES Volume III: ES Figures*. Furthermore, the specific details of the Proposed Development were finalised and any parameters established, as outlined within *ES Volume II Chapter 3: Description of the Proposed Development (Application Document 6.2.3)*.



VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- Statutory Consultation Pipeline Corridor

KINGSTON UPON HULL to Rotterdam (Europort) 12 hrs

NOTES:
 Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673. Contains public sector information licensed under the Open Government Licence v3.0.

FIGURE TITLE
Figure 2-13 Comparison of Pipeline Corridor used for Statutory Consultation, against finalised Order Limits for DCO Submission

ISSUE PURPOSE
 ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE
 60668955 / VCCS_231009_ES_2-13

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as signed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that uses or relies on this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.

2.13 Conclusion

- 2.13.1 This chapter has provided a narrative to show how the design of the Proposed Development has evolved in response to feedback received and environmental, safety and engineering considerations. This has led to the development of the DCO Site Boundary which will be used for the DCO application.
- 2.13.2 The ‘Do Nothing’ scenario has been discounted on the basis that there is a clear need for the Proposed Development as outlined in Section 2.2 above and in more detail provided within the Statement of Need Case (*Application Document 7.3*) and Planning Statement (*Application Document 7.1*) submitted with the Application.
- 2.13.3 A number of alternative solutions have been considered as the design of the Proposed Development has evolved. Various routing options for the pipeline and alternative siting locations for Block Valve Stations and the Immingham and Theddlethorpe Facilities have also been considered.
- 2.13.4 As changes to the proposed development were made, due consideration was given to environmental factors, stakeholder feedback, safety, and engineering feasibility.
- 2.13.5 Mitigation by design was a fundamental guiding principal for the design of the Proposed Development and this has helped avoid or reduce a number of potentially significant effects. Further details on this are provided in *Chapter 3: Description of the Proposed Development* of this *ES Volume II (Application Document 6.2.3)*.

2.14 References

Ref 2-1 *HM Government, 2017. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Available at:*

<https://www.legislation.gov.uk/ukxi/2017/572/contents/made> Accessed July 2023.

Ref 2-2 *Department of Energy and Climate Change, 2011. Overarching National Policy Statement for Energy (EN-1). Available at:*

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37046/1938-overarching-nps-for-energy-en1.pdf Accessed July 2023.

Ref 2-3 *Department for Business, Energy & Industrial Strategy (BEIS), 2023. Draft Overarching National Policy Statement for Energy (EN-1). Available at:*

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf Accessed July 2023.

Ref 2-4 *Climate Change Committee, 2020. Sixth Carbon Budget. Available at:*

<https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf> Accessed July 2023.

Ref 2-5 *Intergovernmental Panel on Climate Change, 2022. Climate Change 2022, Mitigation of Climate Change. Available at:*

https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf Accessed July 2023.

Ref 2-6 *UK Research and Innovation, 2022. Humber Industrial Cluster Plan. Available at:*

[REDACTED]
[REDACTED] Accessed July 2023.

Ref 2-7 *UK Research and Innovation, 2022. Humber Industrial Cluster Plan. Available at:*

[REDACTED]
[REDACTED] Accessed July 2023.

Ref 2-8 *Department for Business, Energy & Industrial Strategy, 2021, Cluster Sequencing for Carbon Capture Usage and Storage Deployment: Phase 1. Available at:*

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/986007/ccus-cluster-sequencing-phase-1-guidance-for-submissions.pdf

Accessed July 2023.

Ref 2-9 *Department for Energy Security & Net Zero, 2023, Cluster Sequencing for Carbon Capture Usage and Storage. Track-2 Guidance. Available at:*

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1148026/cluster-sequencing-for-ccus-track-2-guidance.pdf Accessed September 2023.

Ref 2-10 *The Logistics Institute, University of Hull, 2020, Sea Ports: Humber Main Ports Characteristics Summary. Available at:* [REDACTED] Accessed

September 2023.