VikingCCS

Viking CCS pipeline

Preliminary Environmental Information Report Volume II

Main PEIR

Applicant: Chrysoar Production (U.K.) Limited,
a Harbour Energy Company
PINS Reference: EN070008
November 2022

Harbour Energy | AECOM

Chapter 2

Design Evolution and Alternatives

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2 Design Evolution and Consideration of Alternatives

2.1 Introduction

2.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) sets out the design development and alternatives considered during the evolution of the Viking CCS Pipeline (hereafter 'the Project') up to the stage of Statutory Consultation. The Environmental Statement (ES) will provide a full description, including any further changes in design as a result of this Statutory Consultation, ongoing stakeholder engagement, and design development.

2.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations 2017) (Ref 2-1) states, 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 EN1 (Ref 2-2) nor the Draft NPS EN1 from September 2021 (Ref 2-3) contains 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 Project which can be consented and is in line with relevant planning policy.

2.1.5 The design of the Project is currently preliminary and will continue to evolve up to the point of the DCO application submission in 2023. Further detailed design work will be undertaken once the Project 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 design parameters set by the DCO, including the limits of deviation for the pipeline, which are included to allow for any minor route changes to avoid previously unknown constraints, such as buried archaeology.

2.2 Project Need

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 technology is set to play a crucial role.

2.2.2 Carbon capture and storage is the process of capturing carbon dioxide 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 potential available in the North Sea region.

2.2.3 Carbon capture and storage is recognised by the Intergovernmental Panel on Climate Change (IPCC) (Ref 2-4) 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 2-5).

2.2.4 The proposed updates to National Policy Statement (NPS) EN-1 provides further evidence that the UK Government recognises that new CCS infrastructure will be essential to ensuring the transition to a net zero economy.

2.2.5 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 Project 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.

2.3 General Approach to Design Evolution and Alternative Assessment

2.3.1 The main objective underpinning the development of the new onshore Viking CCS Pipeline was to create a linkage between carbon dioxide emitters in the Humber industrial area at Immingham, to the existing LOGGS Pipeline at Theddlethorpe; thus, there is a defined start and end point. This would then allow for the captured carbon dioxide to be transported onwards through the offshore pipeline system to a storage area in the depleted gas fields of the Viking system in the North Sea.

2.3.2 The following guiding principles were used in the development of the design of the Project:

- Deliver a pipeline to enable the transportation of CO_2 to be undertaken in a safe and secure manner;
- Deliver a pipeline that is technically viable and constructable;
- Deliver a pipeline which emitters have the capability to feed into;
- Seek to utilise existing infrastructure or pipeline transit corridors wherever possible to help minimise impacts on the environment and minimise costs;
- Shorter, more direct routes will generally be of benefit/advantage compared with longer, less direct routes, as they are likely to have lower environmental, safety, sustainability, and cost implications (for comparable technology options); and
- Options that avoid environmental or socio-economic features will generally be of benefit/advantage compared with those that intersect them.

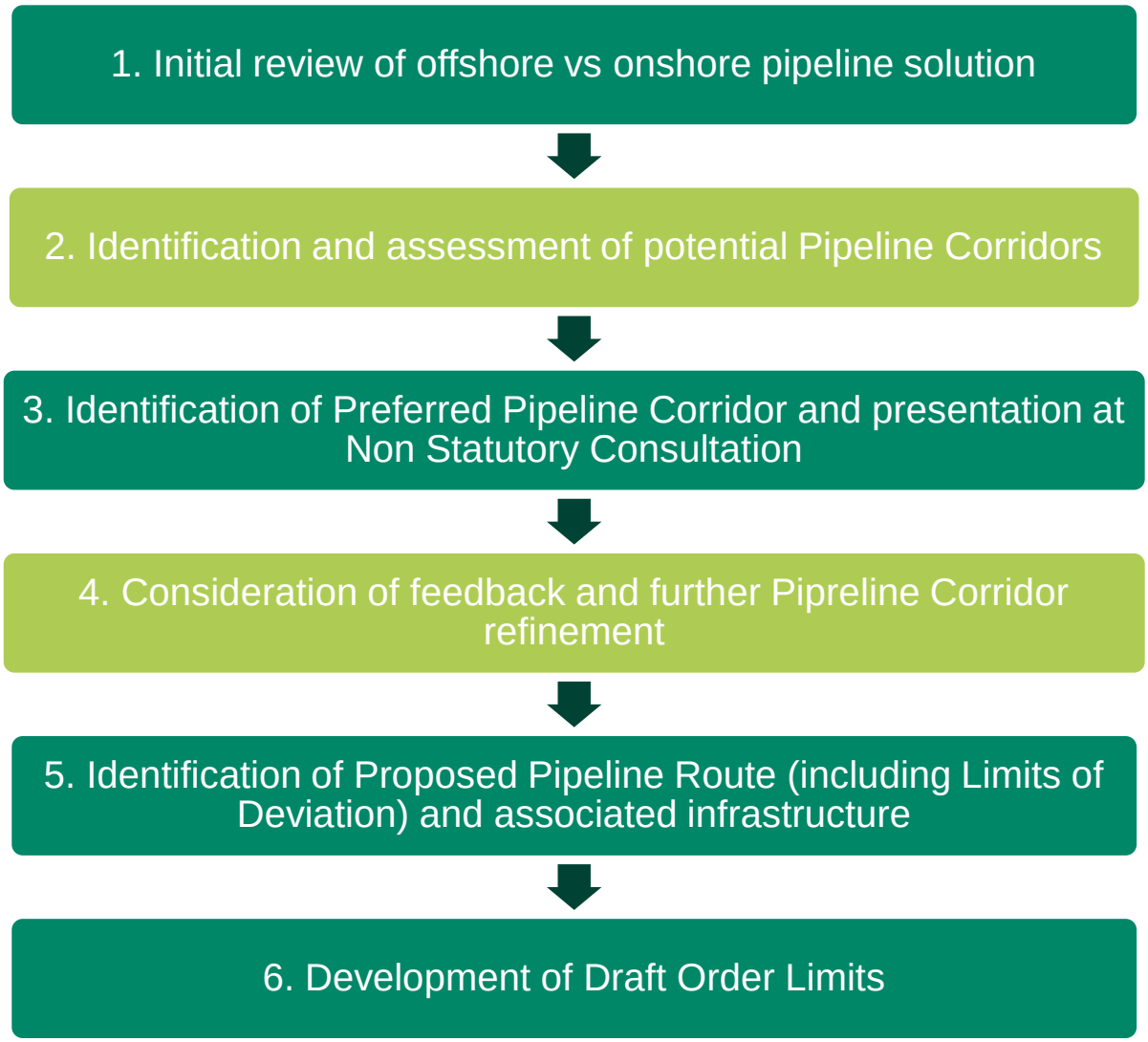
2.3.3 Key factors that were considered for the pipeline routeing work included:

- 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.

2.3.4 The design evolution has followed a six-step process and an assessment of the various alternatives has been made as the Project'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



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

2.4.1 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.

2.4.2 In May 2022, a back check and review of this decision was undertaken, to ensure it remained the right decision. This review included the assessment of a number of different offshore pipeline route options all leaving from Immingham to see if any were viable alternatives to an onshore pipeline.

2.4.3 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.

2.4.4 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.

2.4.5 Overall, the review concluded that an offshore pipeline from Immingham would be extremely challenging to get consent for 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 65 million tonnes of freight each year;
- The Estuary has dredged channels that would need to be crossed;
- Landfall at Immingham would have to cross the existing Sea Wall;
- Anticipated to be shipwrecks and unexploded ordnance in the area; 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., export cables) – all increasing the complexity of installation.

2.4.6 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 more viable than an offshore pipeline. Consequently, options for an onshore pipeline were then advanced as outlined in the sections below.

2.5 Step 2: Identification and Assessment of Potential Pipeline Corridors

Overview

2.5.1 A preliminary high-level routeing options assessment was undertaken by the Applicant 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 in 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.

2.5.2 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 to assess the various options whilst also developing pipeline corridors around these initial routes to enable greater flexibility in future detailed routing work.

2.5.3 **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 2021 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) b. Landscape and Views (EN-1 Section 5.9, Draft EN-1 Section 5.10) c. Historic Environment (EN-1 Section 5.8, Draft EN-1 Section 5.9) d. Water Environment (EN-1 Section 5.7 and 5.15, Draft EN-1 Sections 5.8 and 5.16) e. Soils and Geology (EN-1 Section 5.3 and 5.15, Draft EN-1 Section 5.4 and 5.16) f. Traffic and Access (EN-1 Section 5.13, Draft EN-1 Section 5.14) g. Land Use (EN-1 Section 5.4 and 5.10, Draft EN-1 Sections 5.5 and 5.11) h. Planning (EN-1 Section 5.10, Draft EN-1 Section 5.11)	i. Robust pipeline design for safety j. Utilisation of existing infrastructure k. Pipe content and operating conditions l. Terrain and geotechnical conditions, major road and river crossings, utilities, and other crossings m. Permanent access and maintenance n. Construction access and haul roads o. Security p. Operation and maintenance q. Site specific hazards e.g., wind turbines, electric cables or overhead electric cable crossings	r. Capital cost	s. Current and proposed land uses t. Requirement for additional third-party consents / approvals

2.5.4 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 Project; 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 material specification of the pipeline was deemed inadequate for use to transport carbon dioxide at high pressures.

Potential Pipeline Corridors – Alternative Assessment

2.5.5 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.

2.5.6 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.

2.5.7 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 are wider (approximately 1km wide) to provide additional routeing flexibility where fewer features and constraints are present. Wide corridors were identified, wherever feasible and appropriate, to ensure maximum flexibility for the later, more detailed routeing of the pipeline, its associated 30m working width and the anticipated limits of deviation of 100m.

2.5.8 Avoidance, where feasible, of the environmental and physical features and receptors identified formed the basis of the routeing principles. A key objective 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 Secretary of State in determining applications for development consent in those areas. Consent for development in the AONB may be granted in exceptional circumstances, where development is in the public interest.

2.5.9 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 the former TGT Site). 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.

2.5.10 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 corridor, several alternative pipeline corridors were identified along the route.

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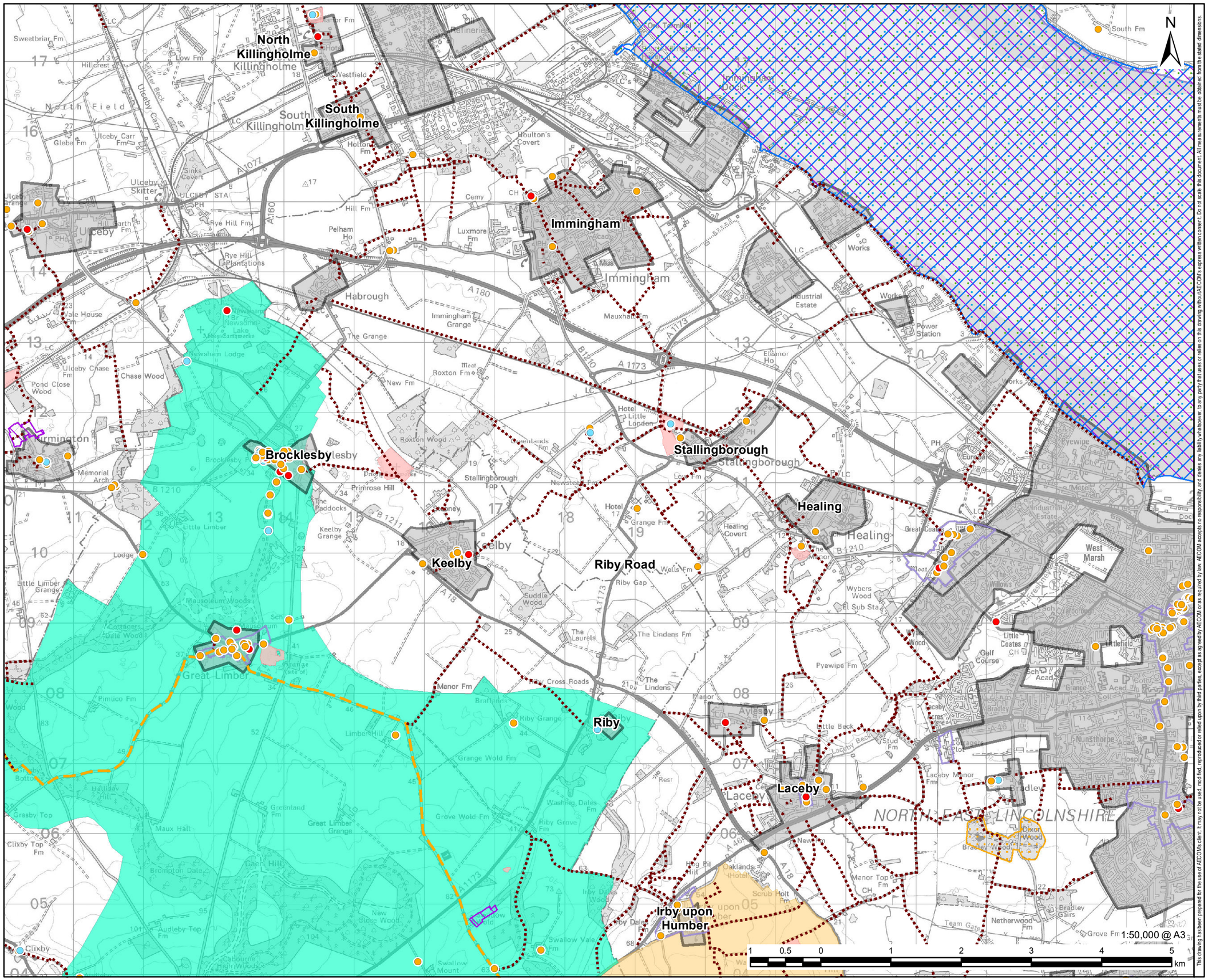

VikingCCS

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

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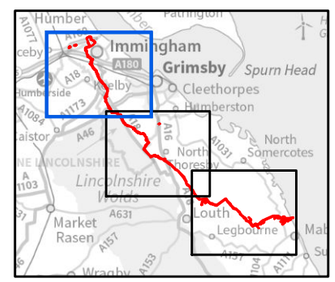

FIGURE TITLE

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

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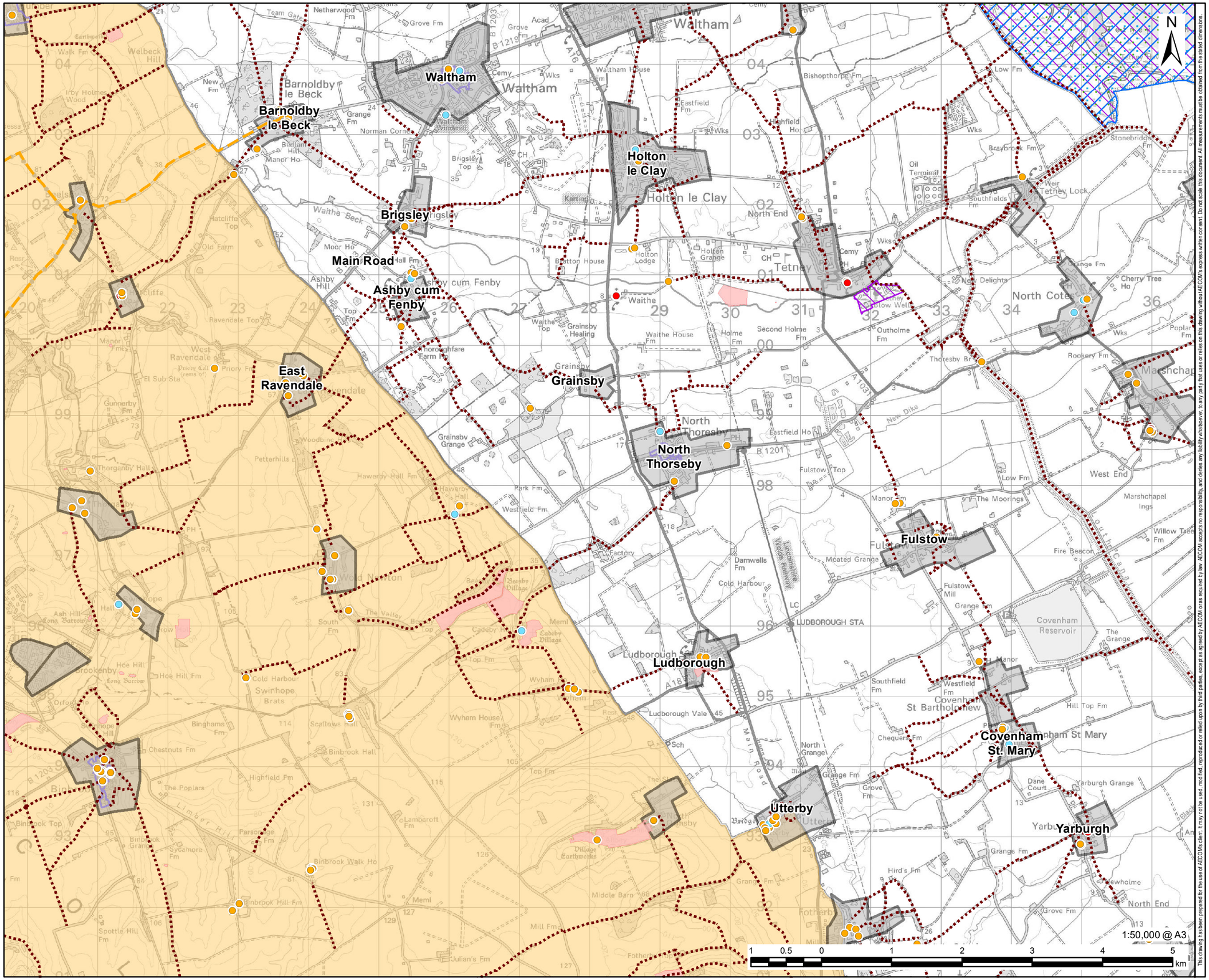

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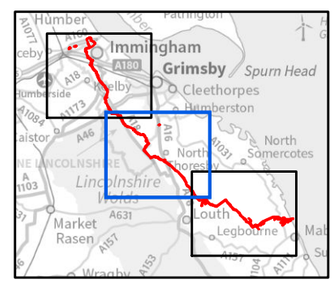

FIGURE TITLE

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

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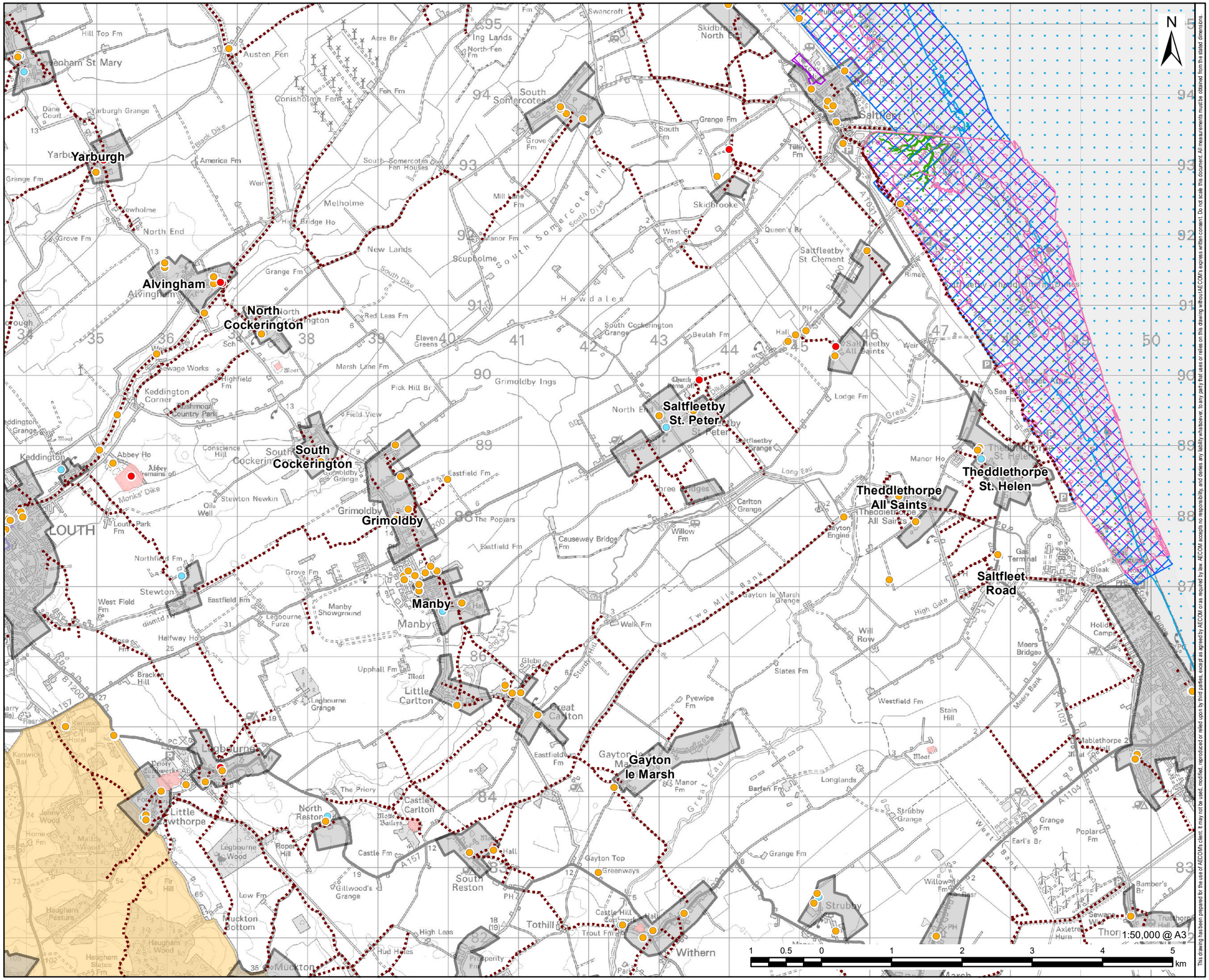

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PROJECT

Viking CCS Pipeline

LEGEND

- Public Right of Way
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- 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

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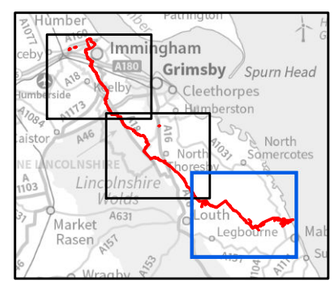

FIGURE TITLE

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

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2.5.11 A schematic of the various route options considered is provided in **Figure 2-3**.

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

2.5.12 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.

2.5.13 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

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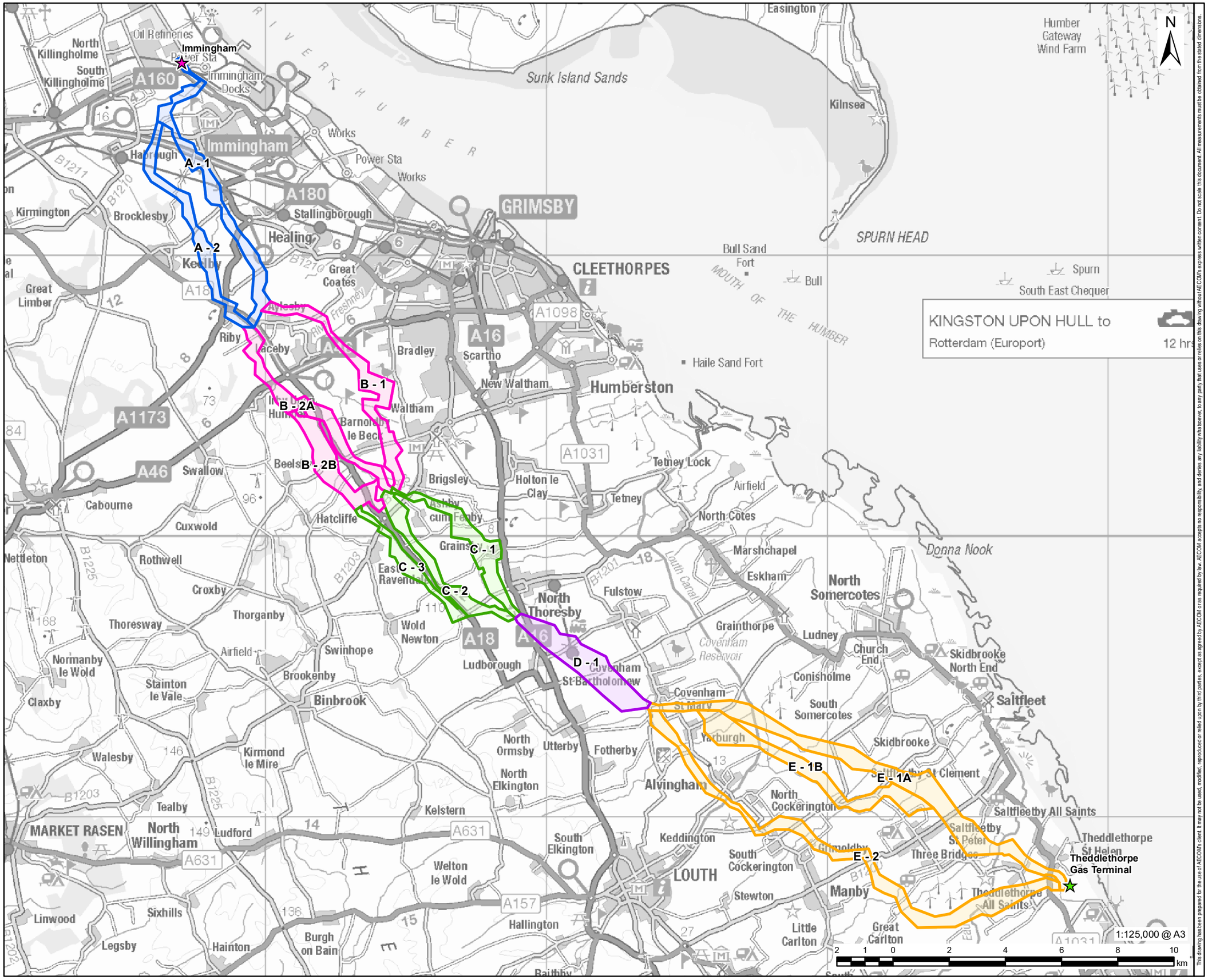

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LEGEND

- Connection Start
- Connection End

Route Corridor Option

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

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FIGURE TITLE

Figure 2-4
Study Area Sections and Route Corridor Options

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- 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.

2.5.14 The implementation of the five intersecting Sections had the effect of enabling the pipeline to 'move' 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 routeing. 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.

2.5.15 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).

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

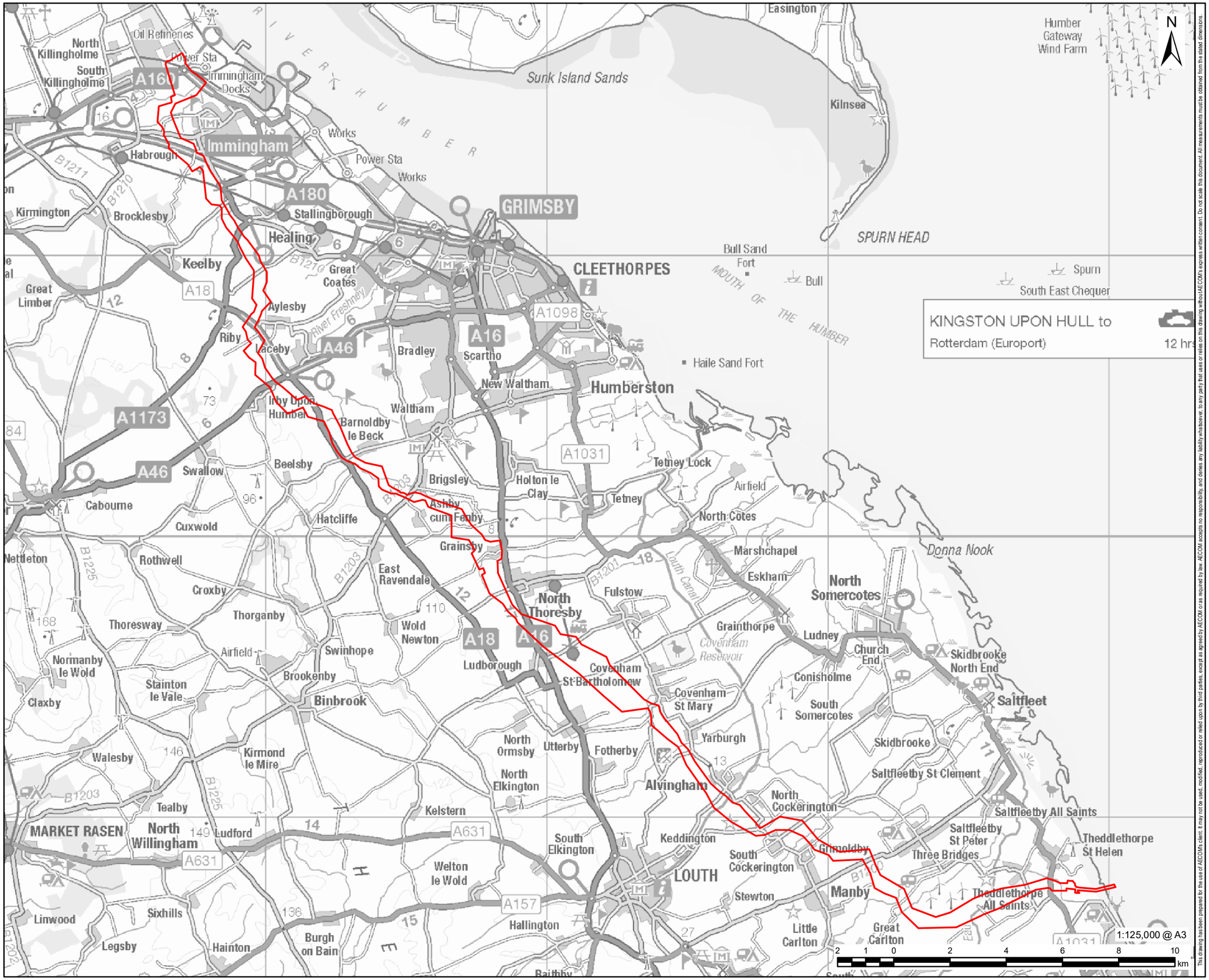
Pipeline Corridor Route Option Refinement

2.6.1 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 routeing 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.

2.6.2 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. Where no significant differentiators between corridors were identified, this was stated. Similarly, the preferred corridor in respect of the remaining four main 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.

2.6.3 Following this additional refinement work, a preferred pipeline corridor was identified between Immingham and Theddlethorpe, within which the pipeline route itself would be identified. 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.

2.6.4 **Figure 2-5** provides an overview of the initial preferred Pipeline Corridor.



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LEGEND

Initial Preferred Pipeline Corridor

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FIGURE TITLE

Figure 2-5
Initial Preferred Pipeline Corridor (Shown during Non-Statutory Consultation)

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

2.7.1 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 on the Project.

2.7.2 These are discussed in more detail in the sections below. Consideration was also given to the responses provided within the Scoping Opinion (*PEIR Volume IV - Appendix 5.2*).

Non-Statutory Consultation Feedback

2.7.3 Two rounds of Non-Statutory Consultation were undertaken on the Project. The first phase commenced on 26 April and ended on 7 June 2022.

2.7.4 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 Project.

2.7.5 *Chapter 4: Consultation* of this PEIR 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 feasible, 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

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

Design Change Process

2.7.7 *A design change process was undertaken, which allowed the Project team to scrutinise comments of the public 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.*

2.7.8 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;
- Moving the corridor further away from Grainsby and North Thoresby;
- Moving the corridor further away from Covenham St Mary, Covenham St Bartholomew, Yarborough, North End and Alvingham;
- Moving the corridor further to the east of Grimoldby; and
- Moving the corridor further away from Theddlethorpe Academy.

2.7.9 **Figure 2-6** provides a visual comparison of the revised Pipeline Corridor against the original Pipeline corridor consulted upon during the first round of Non-Statutory Consultation.

2.7.10 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 utilised the same hybrid approach as the first round.

2.7.11 There were no further changes suggested at this stage that required a change to the preferred pipeline corridor and, as such, the design moved on to route identification and selection.

2.8 Step 5: Identification of a Proposed Pipeline Route (including Limits of Deviation) and associated Infrastructure

Defining a Proposed Pipeline Route

2.8.1 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 due consideration of any localised environmental or social receptors and was based on the provision that the Pipeline Route would take up a working width of 30m for construction, which would be located within the 100m “limit of deviation”. Where the route needs to cross existing infrastructure such as roads, main rivers, utilities etc, where possible this has been perpendicular to the existing feature.

Above Ground Infrastructure and Construction Compounds

2.8.2 In addition to the establishment of a preferred pipeline route, design work was undertaken to identify suitable locations for other supporting 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 Project.

Revision: 2 Drawn: LC Checked: HT Approved: MW Date: 2022-10-31

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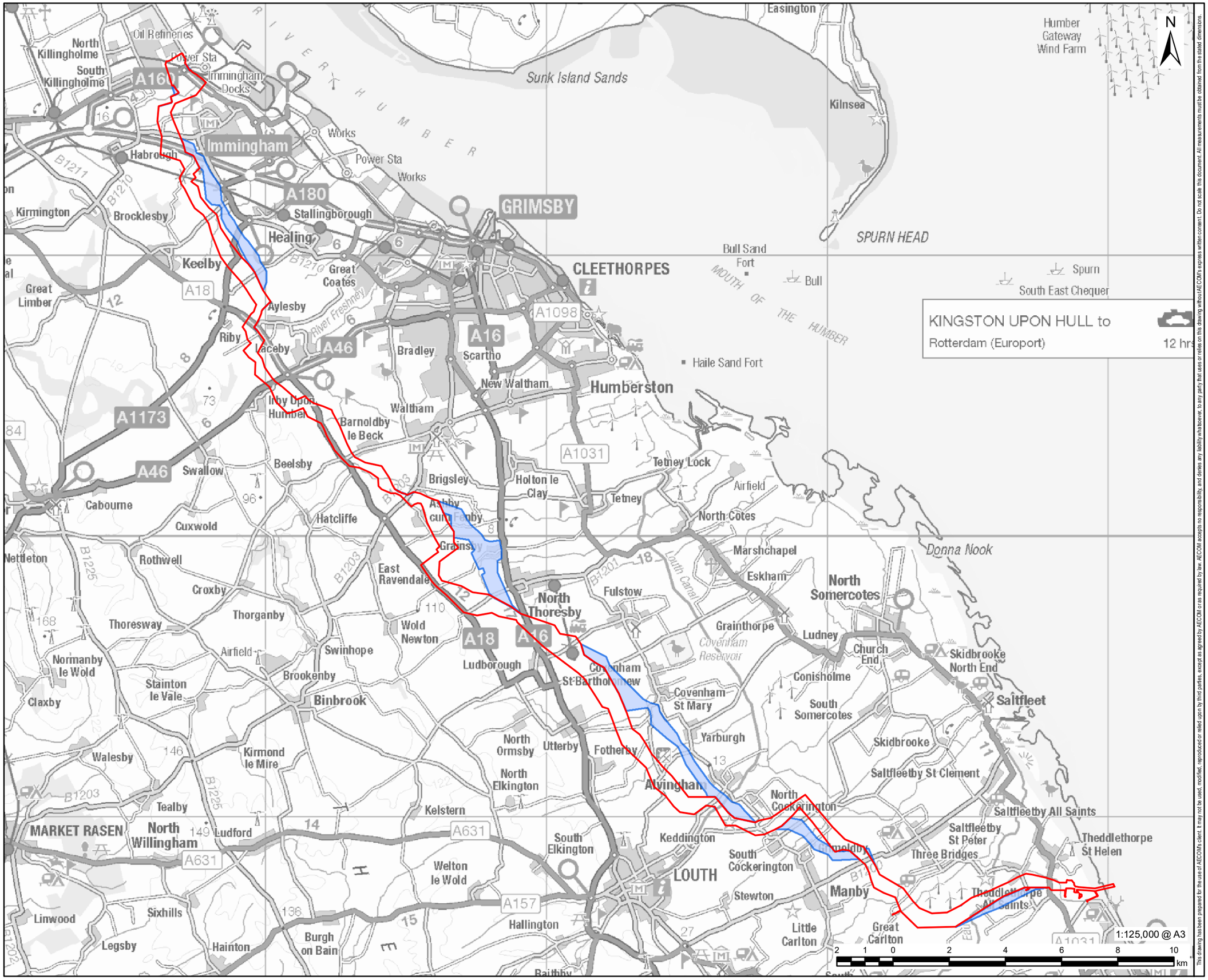

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- Updated Preferred Pipeline Corridor
- Initial Preferred Pipeline Corridor

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FIGURE TITLE

Figure 2-6
Comparison of Initial and Updated Preferred Pipeline Corridor

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Immingham Facility

Assessment of Alternatives

2.8.3 Through ongoing discussions with the site owners at Phillips 66, alternative locations for the Immingham Facility have been considered. The optimal location ties in directly to the works which are currently being developed by both P66 and VPI Immingham as they will be responsible for capturing and conditioning the CO_2 to required technical specifications within their own facilities, for onward transmission through the Viking CCS Pipeline.

Selection of preferred location

2.8.4 As a result of this ongoing work, 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. More information is presented in *Chapter 3: The Viking CCS Pipeline* of this PEIR.

Theddlethorpe Facility

Assessment of Alternatives

2.8.5 In addition to locating the Theddlethorpe Facility on the former TGT site, it was deemed appropriate to consider an alternative site. Consequently, in addition to the former TGT site (Option 1), five alternative sites were identified. Each was reviewed in terms of its existing environment, the viability of site access and its location in relation to the preferred Pipeline Corridor. Following on from this review, one additional site (Option 2) was selected as an alternative site to take forward.

Selection of preferred location

2.8.6 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. Further details are provided in *Chapter 3: The Viking CCS Pipeline* of this PEIR.

Block Valves

Assessment of Alternatives

2.8.7 The process of identifying suitable locations for block valves was ongoing as the location of the pipeline corridors evolved. Block valves were not considered a key driver in determining the location of the pipeline routeing itself due to the extensive availability of suitable land and their relatively limited footprint.

2.8.8 Through an initial engineering assessment, it was established that block valves would be required along the route to help optimise the safety of the Project and ensure that sections of the route could be isolated if required. Having confirmed the need for block valves, the next step was to identify the ideal spacing, which would, in turn, confirm the number of block valves that would be required.

2.8.9 Work was then undertaken to establish the optimum number of block valves required and their position along the proposed pipeline route. Once each general block valve search area was identified the engineering team searched for suitable sites in the vicinity which could both accommodate a block valve and provide suitable access, with three initial locations being selected.

2.8.10 Subsequent to this, additional engineering design work was undertaken to help refine and optimise the specific location for any block valves along the preferred pipeline route. This

work identified locations at approximately 13km, 24km and 39km along the pipeline route. The engineering team then searched for suitable sites in the close vicinity which could both accommodate a block valve and provide suitable access and the environmental team assessed the suitability of each chosen location.

Selection of preferred locations

2.8.11 The preferred locations for block valves are presented in section 3.8 of *Chapter 3: The Viking CCS Project* of this PEIR. The three locations selected are:

- Block Valve #1: Located on arable land south-east of Riby, adjacent to an existing access track off Barton Street (A18);
- Block Valve #2: Located on arable land south-east of Ashby cum Fenby adjacent to Thoroughfare minor road; and
- Block Valve #3: Located on arable land south-west of Alvingham, off Alvingham Road.

Construction Compound Areas

Assessment of Alternatives

2.8.12 A number of studies were undertaken to identify suitable locations for construction compounds for the Project. In all, 14 potential locations were identified that were suitable for construction compounds. **Figure 2-7** provides an overview of the preliminary locations identified for suitable construction compounds along the route.

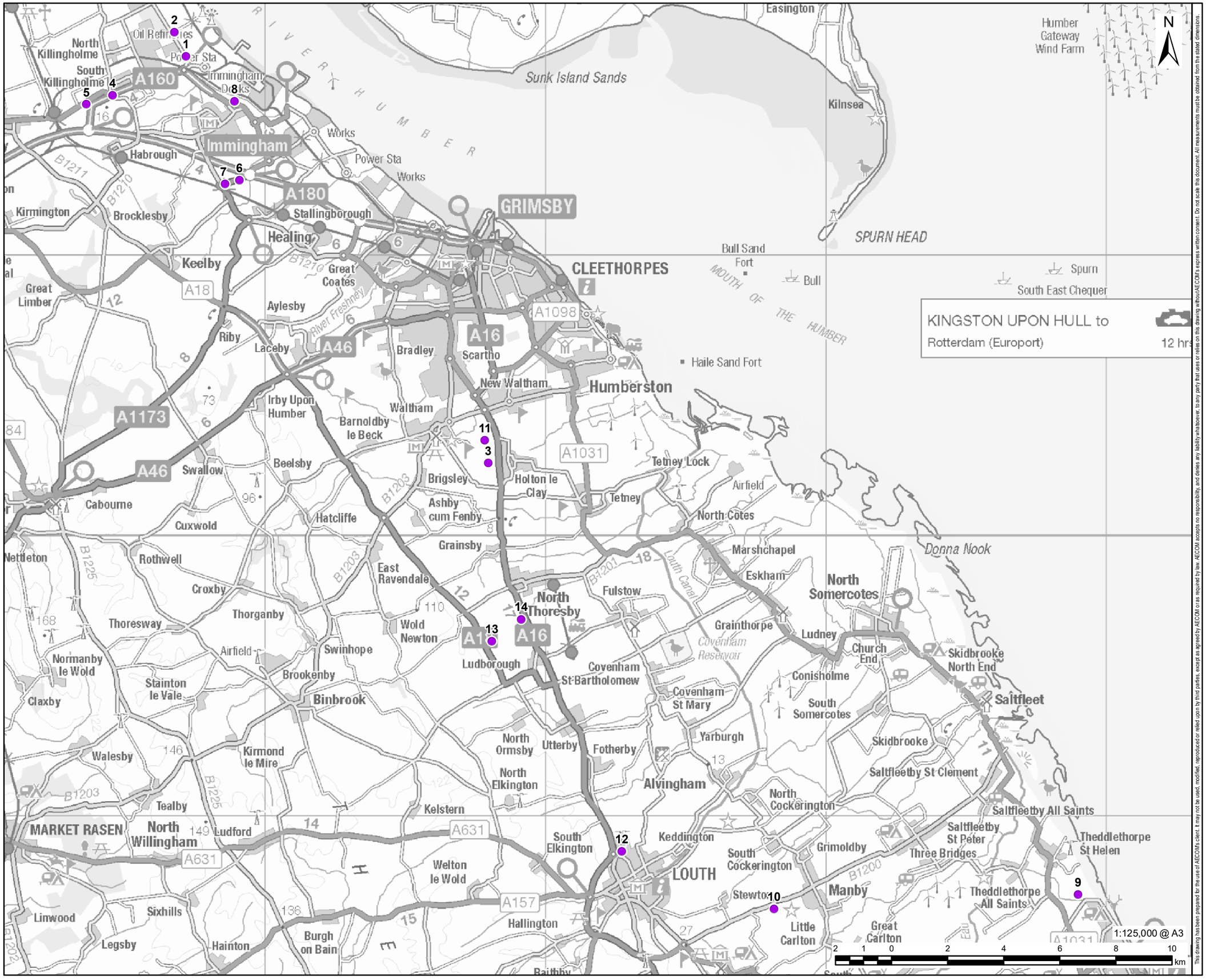
2.8.13 The 14 potential locations were assessed against environmental and construction factors. Key factors considered for each site included: any environmental designations; proximity to communities, previous site uses (especially if the sites had previously been used as a construction compound for other projects); the location along the Pipeline Corridor length; the distance from the Pipeline Corridor; the suitability and accessibility of identified land, including ease of site access.

2.8.14 As work progressed to identify suitable compound locations, the construction philosophy was also developed which helped in the refinement of suitable locations.

2.8.15 Based on the length of the pipeline, it was established that, from a logistics point of view, it would be beneficial to have a compound close to the northern end of the route, one in the central area and smaller back up one towards the south. Based on this philosophy, two preferred alternative sites were identified for both the northern compound and central compound, with one site identified for the south.

Selection of preferred locations

2.8.16 It was established that at least 3 main construction compounds would be required, with one located in the north of the route, one in the centre and one towards the south. Additional information is presented within in section 3.12 of *Chapter 3: The Viking CCS Pipeline* of this PEIR.



VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- Construction Compound / Pipe Dump Location

FIGURE TITLE

Figure 2-7
Alternative Construction Compounds

ISSUE PURPOSE

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2.9 Step 6: Developing Draft Order Limits

2.9.1 The Draft Order Limits were developed to incorporate the following permanent infrastructure:

- The Pipeline Route including Limits of Deviation;
- Block Valves;
- Immingham Facility;
- Theddlethorpe Facility;
- Cathodic Bed infrastructure;
- Electricity Connections from Distribution Network Operator's existing network; and
- Permanent access to the pipeline and facilities.

2.9.2 The Draft Order Limits 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.

2.9.3 A copy of the finalised Draft Order Limits, which have been used to inform the Statutory Consultation is included in Figure 3-5 of *Chapter 3: The Viking CCS Pipeline* of this PEIR.

2.10 Do Nothing Scenario

2.10.1 The Do Nothing alternative would mean that the Project would not be progressed. This would mean that the benefits that the Project would provide, by abating carbon emissions from industrial sources in the Humber and Lincolnshire area, would not be realised.

2.10.2 Additionally, 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 lower emissions and explore opportunities for carbon capture and storage.

2.11 References

Ref 2-1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/572/contents/made

Ref 2-2 Overarching National Policy Statement for Energy (EN1). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

Ref 2-3 Draft Overarching National Policy Statement for Energy (EN1). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf

Ref 2-4 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

Ref 2-5 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