Immingham Green Energy Terminal

9.59 Summary of Issue Specific Hearing 4 (ISH4)

Infrastructure Planning (Examination Procedure) Rules 2010

Volume 9

May 2024

Planning Inspectorate Scheme Ref: TR030008

Document Reference: TR030008/EXAM/9.59

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1 ABOUT THIS DOCUMENT

1.1 Introduction

1.1.1 This document summarises the case put by Associated British Ports (the "Applicant"), at the Issue Specific Hearing ("ISH") 4 on 9 April 2024 focusing on marine side issues, including habitats regulations assessment matters and draft Development Consent Order for the Immingham Green Energy Terminal project (referred to as the "Project").

1.1.2 The hearing opened at 10:00 and closed at 12:40 on 9 April 2024. The agenda for the hearing [EV6-001] was published on the Planning Inspectorate's website on 3 April 2024.

1.1.3 In what follows, the Applicant's submissions on the points raised broadly follow the items set out in the Examining Authority's agenda.

1.2 Attendees on behalf of the Applicant

1.2.1 Hereward Phillpot KC, Counsel instructed jointly by Bryan Cave Leighton Paisner LLP (BCLP) and Charles Russell Speechlys (CRS), appeared on behalf of Associated British Ports, the Applicant. Also appearing on behalf of the Applicant were Natalie Frost, Director and Head of Environment at ABPMer, and Alan Lewis, Environmental Impact Assessment Lead at AECOM, Adam Varley, Project Development Manager for the Applicant.

2 APPLICANT'S SUMMARY OF CASE ON ITEM 3: MARINE ECOLOGY AND HABITATS REGULATION ASSESSMENT

2.1 Item 3 (Marine Ecology and Habitats Regulation Assessment)

Issue Discussed	Summary Of Oral Case
The ExA asked questions about matters still denoted as amber on the SoCG between the Applicant the MMO [**REP1-051**]	The Examining Authority ("**ExA**") confirmed it had queries on certain items regarded as amber but felt it more appropriate to address these later, at Item 5 (Flood Risk and Coastal Change), but the Applicant took away an action point, to ensure that the references used in the context of the SoCG between the Applicant and the MMO [**REP1-051**] are consistent.
Further clarification required on piling times and restrictions	The Applicant took away as a post-hearing action to update a table the Applicant displayed during Issue Specific Hearing 3 (submitted as page 203 of the Applicant's Responses to Relevant Representations **[REP1-021]**, as an Appendix to the Applicant's response to the Marine Management Organisation's ("**MMO**") Relevant Representation [**RR-016**]) and elsewhere, to refer to official data that is being used to define sunrise and sunset. This is provided in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**]. The ExA then asked for a clarification as to whether vibro-piling can be undertaken without being followed by percussive piling, which in response the Applicant clarified that vibro-piling would for this Project be followed by percussive piling, so that vibro-piling would not be undertaken alone. The Applicant took away a post-hearing action to further update the table provided within [**REP1-021**] as an appendix to amend the amber cells to indicate 'all piling' rather than just referring to 'percussive piling'. This is provided in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**]. *Post hearing note: Over-arching explanatory text has been added to the table to confirm that vibro piling in the marine environment will not occur in isolation of percussive piling.* In response to the ExA's request for further clarification around piling the Applicant informed the ExA that the reference to 196 hours over four weeks in relation to IGET alone will be removed, and that the maximum amount of percussive piling allowed on a typical working day for the IGET project would be limited to 270 minutes in one day, with a contingency period for exceptional circumstances (e.g. if a marine mammal entered the mitigation zone, adverse weather conditions or malfunction in equipment) allowing for time to repeat the soft-start process. The Applicant confirmed that discussions around this were ongoing with the MMO and that they were satisfied in principle with this approach provided the Applicant entered into a reporting protocol with them. The Applicant explained that the reference to 196 hours is proposed as a combined restriction for percussive piling in relation to both the IGET and the Immingham Eastern Ro-Ro Terminal ("**IERRT**"), functioning as an overall cap for a four-week period. The Applicant confirmed that the 196 hour cap per four-

	week period for both the IGET and the IERRT projects will be captured in the outline Construction Environmental Management Plan ("**CEMP**") that the Applicant will be submitting at Deadline 3. The Applicant also informed the ExA that the restrictions on piling times are secured via the CEMP and conditions in the Deemed Marine Licence ("**DML**") at Schedule 3 of the draft Development Consent Order ("**dDCO**"). The Applicant also took away as a post-hearing action to provide an unambiguous explanation around combined piling times (for both IGET and IERRT) with justification for them, also addressing points around the numbers of piling rigs for both IERRT and IGET at Deadline 3. This also included confirming the proposed piling restrictions both alone and in-combination with IERRT. This is provided at in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**].
The ExA asked questions about matters still denoted as amber in the SoCG between the Applicant and Natural England [**REP1-052**]	As Natural England did not make a submission at Deadline 2 and indicated they would want to submit a comprehensive response at Deadline 3, the Applicant was asked to give a brief update regarding whether there were any principal outstanding areas of disagreement with Natural England. The Applicant confirmed that the intention was to cover off any areas of disagreement by close of Examination and that the reason for issues categorised as amber in the SoCG was largely due to Natural England not having had time to review yet.
Confirmation of progress on HRA and position of the Applicant on its status	The Applicant gave an overview of the changes made to the Shadow Habitats Regulations Assessment ("**Shadow HRA**"). A Shadow HRA was initially submitted with the DCO Application [**APP-238**], being the Applicant's Stage 2 report to inform the Appropriate Assessment ("**AA**") to be undertaken by the Secretary of State (as the Project was screened in for HRA at Stage 1). The Applicant confirmed that an updated Shadow HRA was submitted at Deadline 1 (clean **[REP1-012]** and tracked **[REP1-013]**), updated to reflect changes to the IERRT application in the in-combination assessment, and also to address points raised by Natural England on the original Shadow HRA submitted with the Application [**APP-238**]. The Applicant also confirmed that there will be a further update to the Shadow HRA submitted at Deadline 3, to cover the Applicant's Change Application that it is also intending to submit at Deadline 3, as well as updates to noise monitoring and air quality requested by Natural England. The Shadow HRA concludes that the Project will not have an adverse effect on integrity ("**AEOI**") on the European sites, either alone or in combination with other plans or Projects. Although on the basis of the Shadow HRA's conclusion of no AEOI, the need for derogation (HRA Stage 3) would not be engaged, as Natural England (being the appropriate statutory nature conservation body) has not yet formed a view as to whether AEOI from the Project can be ruled out, the Applicant also submitted a Without Prejudice Report to inform Habitats Regulations Assessment Derogation (the "**Derogation Report**") (original version submitted with the Application [**APP-235**]. An updated Derogation Report also submitted on a without

	prejudice basis was submitted at Deadline 1 (**[REP1-008]** (clean) and **[REP1-009]** (tracked)) to: (a) reflect updates to the Shadow HRA as a result of changes to the IERRT application; (b) respond to questions raised by the ExA on the alternative jetty designs considered; and (c) clarify points in the IROPI case following discussion at the first round of ISH. The Applicant confirmed that a further update to the Derogation Report will also be submitted at Deadline 3, updated to cover the Change Application for the Project. The Applicant further noted that the Shadow HRA may require further updates during the Examination if so required by Natural England. The Applicant then referred to the fact that the Secretary of State as Competent Authority under the Habitats Regulations will be required to undertake an AA of the effects of the Project, taking into account what is in the Shadow HRA, the views of Natural England, and others, and that if the Secretary of State comes to the conclusion that AEOI on European sites cannot be ruled out, then the Derogation Stage (i.e. HRA Stage 3) will be engaged, in relation to which the Applicant's Derogation Report would inform the Secretary of State's assessment and conclusions at each of the stages required for a derogation. The Applicant informed the ExA that a Section 106 Unilateral Undertaking ("**UU**") is currently being prepared to secure compensation referred to in the Derogation Report, which will be binding if the Secretary of State decides that it is necessary for a derogation to be made to grant consent. The Applicant will submit a draft of the UU at Deadline 3. The Applicant confirmed in relation to the ExA's questions around the Shadow HRA that potential effects on two receptors (birds and fish) could be reduced to negligible through mitigation. The Applicant confirmed that it was satisfied it has provided sufficient evidence that all pathways that could potentially affect the receptors could be successfully mitigated to avoid potential AEOI.
Clarification of information requested on the Outstrays to Skeffling Managed Realignment Site	In relation to the ExA's points around the Outstrays to Skeffling Managed Realignment Site ("**Skeffling**"), the Applicant took away an action point to provide the Environmental Action Plan (referred to at Appendix 1.2 of **[REP1-027]** and provide an overview of the document with signposting to the relevant sections of the Skeffling materials (both the Environmental Action Plan and the Environmental Statement) for the ExA's attention. This is provided in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**].
Discussion on requirements for and means of securing the additional compensatory habitat	The Applicant confirmed that regardless of the Secretary of State's findings in relation to AEOI, the habitat at Skeffling would still be delivered. In a scenario where for example the SoS agreed with the Applicant's assessment that the intertidal loss predicted from the project is not at a scale that would result in AEOI, the habitat being delivered as part of the Skeffling scheme would still be delivered but would be enhancement rather than compensation. The Applicant confirmed that the UU which it will submit at Deadline 3 will contain a

	mechanism for differentiating between how habitat will be allocated (i.e. either as enhancement or compensation). The Applicant explained the background to the Skeffling scheme, clarifying that it was being undertaking in joint partnership with the Applicant and the Environment Agency as a habitat bank that can be allocated to particular projects to be drawn upon in the future as compensation or enhancement. The Applicant explained that this is a logical expedient where it is desirable to have compensation in place as far as possible ahead of impacts occurring, so it is best practice to provide such measures in anticipation. The Applicant made reference to where similar practice has been incorporated in other projects (e.g. Sizewell C, and by the Environment Agency in relation to flood defences). The Applicant undertook to provide a note at Deadline 3 addressing enhancement and compensation and explaining the principle of habitat banking, in relation to both Skeffling and other examples of where the practice has been carried out before. This is provided at Appendix 1.

3 APPLICANT'S SUMMARY OF CASE ON ITEM 4: MARINE ARCHAEOLOGY

3.1 Item 4 (Marine Archaeology)

Issue Discussed	Summary Of Oral Case
Update on progress of laboratory testing of samples from the archaeological fieldwork	The Applicant confirmed that sampling has already taken place in September 2023, and analysis and assessment of the samples was undertaken by Wessex Archaeology, the results of which the Applicant will submit at Deadline 3. This is provided at Appendix 2. The Applicant confirmed that Historic England would be provided with a copy of the report produced from the analysis, and that the value of these studies comes from their contribution to the underlying evidence base, improvement of archaeological knowledge and understanding of a particular area.

4 APPLICANT'S SUMMARY OF CASE ON ITEM 5: FLOOD RISK AND COASTAL CHANGE

4.1 Item 5 (Flood Risk and Coastal Change)

Issue Discussed	Summary Of Oral Case

Clarification whether the Applicant's assessment of ordinary watercourses is sufficient, in the context of NELC's response **[REP1-071]** to the ExA's written question **[WQ1, Q1.8.1.2]**	The Applicant informed the ExA it had recently made direct contact with the North East Lindsey Drainage Board ('NELDB') to seek clarity on their position in relation to the ordinary watercourses, and that they had confirmed they were not yet satisfied they had sufficient information. As a result the Applicant was liaising with the NELDB to set up a meeting to agree a way forward to determine if there is need for further assessment. The Applicant took away as an action point to arrange a meeting with NELDB and NELC to reach a position on the ordinary watercourses assessment. An update on this is provided in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**].

5 APPLICANT'S SUMMARY OF CASE ON ITEM 6: APPLICANT'S INTENDED CHANGE REQUEST

5.1 Item 6 (Applicant's Intended Change Request)

Issue Discussed	Summary Of Oral Case
The ExA will ask the Applicant to briefly outline its request for a change to the application	The Applicant gave a brief outline of its change request the notification of which it submitted at March 26, Deadline 2 **[REP2-027]**, and confirmed that subject to responses received in the consultation carried out from 26 March to 23:59, 24 April 2024 its intention was to submit the formal Change Application and the required accompanying information 3 May 2024. The Applicant pointed the ExA to Section 7 of the Proposed Changes Notification Report ("**PCNR**") [**REP2-024**] for further details on the timetable and scope of consultation. The Applicant briefly outlined the four minor changes identified in the PCNR and noted that further detail on the changes was in Section 2 of the PCNR: - Proposed Change 1 is a change to the number of monopiles forming part of the IGET jetty berth to be constructed as part of Work No. 1 from two to four; - Proposed Change 2 is a change to the diameter of the piles supporting the approach jetty (also part of Work No. 1), from 1.2m to 1.575m to support the loading from the piperacks. As a result of the increase in pile diameter, a concomitant increase in distance required between the piles, and a slight increase in the width of the approach jetty from 14m to 16;

	- Proposed Change 3 is a minor change to the red line boundary in the vicinity of Work No. 7 to include additional land for temporary construction purposes, and a minor change to the northern access from the A1173 to Work No. 7; and - Proposed Change 4 is a change to the Works Plans **[AS-002]** to add visual detail to Work No. 1(a) (being the approach jetty and topside infrastructure) to show the walkways linking the jetty head to the mooring dolphins. The Applicant noted that these walkways were already described in Schedule 1 (Authorised Project) and Schedule 3 (Deemed Marine Licence) of the dDCO **[REP1-016]**. The Applicant ran through the rationale behind requesting each of the Proposed Changes noting that this was described in more detail at Section 3 of the PCNR: - Proposed Change 1 reflects the need for a floating, rather than a fixed fender system, as a result of further detailed design development, and the floating fender system requires two monopiles for each panel, resulting in the overall increase in monopiles from 2 to 4. - Proposed Change 2 reflects the increased pipe rack loads and greater diameter needed to accommodate increased loads, which in turn also leads to the increase in spacing between the piles, and the slight increase in width of the pipe racks and access walkways, and overall width of the jetty. This has also resulted from further detailed development of the design. - Proposed Change 3 reflects discussions with Cadent Gas as to the constraints which will be required to protect Cadent's existing high pressure gas pipeline which crosses Work No. 7, meaning that the likely layout of the hydrogen production facility will need to move approximately 10-15m northwest of the gas pipeline, which has knock-on consequences for Access AB (moving 10 – 15 metres north west), and the land needed temporarily during construction for the laydown of the pipelines, pipeline sleeves and cables ahead of installation as part of Work No. 6. - Proposed Change 4 is just to provide clarification as to an aspect of the development which is already part of the development as applied for and remains unchanged. The Applicant then reiterated its confirmation that the Compulsory Acquisition Regulations are not engaged by the Proposed Changes, for the reasons detailed in Section 4 of the PCNR, but that regardless for completeness, the consent of the landowner affected by Proposed Change 3 has been obtained and will be provided along with the formal Change Application.

	The Applicant also confirmed that the Proposed Changes have not been assessed (either alone or in-combination) as causing any new or materially different environmental effects, and that no new mitigation measures will be required (explained in section 5 of the PCNR). The Applicant confirmed its confidence that any issues arising as a result of the Proposed Changes could be accommodated within the Existing Examination timetable for those reasons set out in Section 6 of the PCNR.
The ExA may ask questions on this matter	In relation to Proposed Change 1, the Applicant replied to the ExA's query as to whether other than the monopiles the total number of piles was changing that other than the 2 new monopiles the number of piles was not changing, and that it is not every pile on the approach whose width was increasing, only those supporting the piperack. The Applicant also confirmed that in relation to its assessment of the new or different environmental effects caused by the Proposed Changes, Wessex Archaeology had been involved in the preparation of the PCNR and were satisfied that the Proposed Changes did not change its original assessments or conclusions and confirmed that the Report submitted with the formal Change Application would specifically refer to Wessex Archaeology's involvement in the Assessment. The Applicant confirmed that the Shadow HRA would be updated to take into account effects of the Change Application, e.g. with respect to seabed being lost. The Applicant also confirmed that its formal Change Application would indicate how responses to the consultation on the Proposed Changes were taken into account and responded to, as well as engagement taking place alongside the formal consultation (i.e. discussion with the landowner whose land would be affected by Change 3 (the change to the Red Line Boundary near Work No. 7).

6 APPLICANT'S SUMMARY OF CASE ON ITEM 7: DRAFT DEVELOPMENT CONSENT ORDER, FOCUSSING ON THE DRAFT DEEMED MARINE LICENCE

6.1 Item 7 (Draft Development Consent Order, focussing on the Draft Deemed Marine Licence)

Issue Discussed	Summary Of Oral Case

Discussion around MMO suggested changes and Applicant's amended wording to Article 46	The Applicant informed the ExA that its view was that it is unlikely that it and the MMO would reach common ground with regard to the wording of Article 46 (Benefit of Order), and that it expected this ultimately would be an issue on which the Secretary of State would have to take a decision. The Applicant explained how Article 46 would work as a result of the Applicant's amended wording to Article 46: - Paragraph 10 provides the undertaker with the general ability to transfer the benefit of parts of the DCO to any person, except for land-related provisions which are dealt with separately. The Applicant has changed it to exclude the deemed marine licence ("**DML**") also from the effect of these provisions, so that transfer of the DML can also be dealt with separately in Paragraph 12. - Paragraph 12 enables the benefit of the DML to be transferred with the consent of the Secretary of State (provided the Secretary of State consults with the MMO before granting consent). - Paragraph 13 would enable transfer of the benefit of the DML also pursuant to the provisions of the Marine and Coastal Access Act 2009 (the "**MCAA 2009**") (i.e. the normal transfer provisions if the DML were a regular marine licence granted pursuant to procedure in the MCAA 2009 via an application to the MMO). The benefit of the DML would therefore be transferrable via either application to the Secretary of State (under Paragraph 12 of Article 46 of the DCO) or to the MMO (under MCAA 2009). The Applicant referred to the fact that Article 46 requires a further tweak (made in the dDCO submitted at Deadline 3 and based on precedents) to make clear that the prohibition in S72(8) MCAA 2009 on the transfer of deemed marine licence except by way of S72(7) of the MCAA 2009 would not apply to transfers under the DCO. The Applicant summarised its understanding that the MMO's position as set out in its Responses to Relevant Representation [REP1-079] is that the Secretary of State should have no role in the transfer of DMLs included in DCOs made by the Secretary of State, even if the Secretary of State consults with the MMO. Rather, this should be an area in which the MMO should have exclusive control. The Applicant referred to the position it set out in its response **[REP2-012]** to the MMO's response to the ExA's First Written Questions (WQ1.18.3.16) in **[REP1-079]**, where it explained that the effect of the MMO having such exclusive control would mean that unlike in respect of the rest of the DCO, the Secretary of State would have no involvement in any decision to transfer the benefit of the DML, and there would instead have to be an application to the MMO with no appeal available against refusal. This

	would also mean that a transfer of the whole of the DCO would be in the hands of two different decision makers. Even if the Secretary of State thought it appropriate for the DCO as a whole to be transferred, the MMO could withhold its consent for the transfer. It is the Applicant's view that this outcome would be contrary to the public interest, and provided in its response to the MMO's Deadline 1 Submissions **[REP2-012]** reference to five recent examples (drawn from 2019 to 2022) of previous occasions where the Secretary of State rejected the MMO's views on this point, and included provision along the lines the Applicant is seeking in a made DCO. The Applicant set out that the benefit of the provision made in the Article 46 as proposed by the Applicant, is that it would require only a letter of approval from the Secretary of State, who is best-placed to make a judgment on whether the transfer would be appropriate in the public interest. The Secretary of State is no less well-placed in respect of the transfer of the DML than they are in respect of other elements of the DCO, as it is the Secretary of State Secretary of State, informed by the ExA's report and recommendations, who is called upon to make a decision as to whether a DML should be granted in the first place, and on what terms. The Applicant's suggestion is therefore that the Secretary of State is capable of forming a view on whether it is appropriate to transfer the benefit of the DML, just as much as the Secretary of State can determine whether it is appropriate to grant the Applicant the DML in the first place. As a result, the process the Applicant has included in Articles 46(12) – (14) is straightforward, time-efficient and leaves no gaps or deficiencies in terms of protection of the public interest. The Applicant confirmed that it is of the view that nothing in the submissions made by the MMO thus far suggests otherwise. Nor does anything in them justify a different view being taken by the SoS in this case to the one taken in the other cases referred to. The Applicant also noted that engagement is ongoing with the MMO on a range of matters but, as the MMO's position on this matter is a position they have taken consistently in other Examinations, the Applicant expects that they may well retain their position in relation to this Article. So the Applicant ultimately expects this to be a matter on which the Secretary of State will have to take a decision.
Discussion around MMO comments on the process set out in Schedule 17	The Applicant began by confirming that it expects that this may be a similar situation in relation to Article 46, in respect of which it expects that this will be one where the ExA and the Secretary of State will have to take a decision after having heard both sides. This is on the basis that this is another point on which the MMO seems to have taken a consistent view in other DCO examinations. The Applicant referred to where it set out its position **[REP2-012]** in response to paragraphs 3.17 – 3.22 of the MMO's response to WQ1.18.3.16 **[REP1-079]**. The Applicant set out how Schedule 17 (Procedure Regarding Certain Approvals, etc) of the dDCO functions, providing a procedure for discharging Requirements and DML conditions under the DCO, including timescales for the determination of applications for those discharges and an appropriate appeal mechanism in the event that those timescales

	are not met. The Applicant confirmed that Schedule 17, and its equivalent provision in other DCOs, satisfy the need for urgently needed nationally significant infrastructure projects to have a predictable and efficient system of dealing with approvals linked to their delivery, including settling disputes that might emerge as to the merits of those approvals. The Applicant noted that the Planning Act 2008 is silent on how DCO requirements and DML conditions are to be discharged, meaning it becomes a matter for each individual DCO to make appropriate provision. This is therefore a matter in respect of which the Secretary of State must exercise their discretion in each case. The Applicant also touched upon the MMO's assertion of inconsistencies between Schedule 17 as proposed by the Applicant and the Planning Inspectorate's Advice Note Eleven (working with public bodies in the infrastructure planning process) Appendix B (the Marine Management Organisation) (the "**Advice**"): the Applicant identified that the Advice anticipates that the MMO would be the party to whom any application for the discharge of conditions is made in the first instance but does not stipulate that only the MMO can have the ultimate say on such discharge. In any case, the Applicant noted, the Advice is simply guidance, which must be applied on a case-by-case basis depending on the circumstances of each case. It does not provide an answer to the disagreement between the Applicant and the MMO on this matter. The Applicant set out that the same underlying public interest justification it referred to in its comments in relation to Article 46 of the dDCO applied equally in relation to Schedule 17 of the dDCO – i.e. the public interest in having a predictable and efficient system such as that provided by Schedule 17. Further, the underlying public interest justification is no different whether one is concerned with the discharge of DCO requirements or DML conditions, as there is nothing inherently more or less complex about matters covered by DMLs and their conditions as opposed to DCO requirements (reflected in commonly seen mirror image provisions (DML Condition and Requirement 6, requiring the CEMP to be approved in both cases)). As the system of determining whether to grant a DCO under the Planning Act 2008 empowers the Secretary of State and those appointed by the Secretary of State to examine and make recommendations on the making of a DCO (including the DML), these individuals are suitably qualified to sit in the shoes of the MMO in determining whether and on what terms to approve the discharge of DML conditions. The Applicant explained that, in its view, the effect of carving out the DML conditions from Schedule 17, as requested by the MMO, would mean that there would be no timescales for determination of any applications for approval under the DML, and no opportunity to appeal in the event of either non-determination or a dispute as to the merits or adequacy of the material submitted. The internal MMO complaints procedure and availability of judicial review pointed to by the MMO are no alternative to Schedule 17. They do not provide for determination timescales. Nor do they provide for an independent

	appeal on the merits of an MMO decision. The scope of judicial review is limited to errors of public law. The MMO adjudicates its own decisions in its complaints procedure. The Applicant considered that the MMO's comparisons with the position under the MCAA 2009 for marine licences is misconceived. A purpose of the development consent regime, as legislated by Parliament in the Planning Act 2008, is to ensure that nationally significant infrastructure projects do not have to obtain marine licences under separate legislation. Parliament has decided that it would not be in the public interest for such schemes to have to be subject to the provisions of the MCAA 2009, and they can instead take advantage of the benefits of the "one-stop shop" and streamlined system under the PA 2008 to enable the more rapid authorisation and implementation of such projects. The Applicant cited examples of where these same issues have arisen in other Examinations. In the Thames Tideway Tunnel DCO, the discharge of DML conditions was decided to be dealt with in the manner proposed by the Applicant, but the issue was decided the other way in relation to Sizewell C. The Applicant summarised how this was dealt with in each. The Applicant suggested that, in reviewing the relevant extracts of the Recommendation Report and Decision Letter for Sizewell C, the ExA may find (as the Applicant does) that neither Sizewell C document provides a satisfactory precedent. This is because they do not adequately grapple with the arguments which the Applicant is making in this case. It is also because the Secretary of State in that case failed to grapple adequately with the matters left to them on this subject by the ExA. The ExA agreed that a timescale for determination of DML conditions was needed, rejected the Applicant's proposals for an appeal mechanism (without adequately grappling with the implication that this rendered the timescale useless) and suggested that this lacuna was one for the Secretary of State to resolve. The Secretary of State, however, failed to grapple adequately with the matters left to it by the ExA. They simply removed the timescale for determination entirely because the ExA had not itself included an appeal mechanism, without engaging or attempting to address the difficulties that inevitably arise if there is no timescale. The Secretary of State gave no reasoned conclusions on the matter: they did not state that they did not expect difficulties to arise without timescales and an appeal mechanism, nor that the difficulties did not matter, and also did not explain why an independent inspector could not determine disputes in this context in the same way that equivalent disputes are determined by inspectors in complex planning and related appeals. The Applicant explained how in the case of the IGET project there is urgency in the delivery of the infrastructure, so implementation must occur rapidly after any decision to grant the DCO. This strengthens the public interest justification in having a predictable and efficient system to obtain approval of

	outstanding matters, deal with any disputes that arise on the merits, and highlights the harm to the public interest that could arise in the absence of such a process. The Applicant took away as a post-hearing action point to submit by Deadline 3 the relevant extracts from the Sizewell C Project, in respect of the Applicant's, MMO's, ExA's and Secretary of State's submissions in respect of whether the DML conditions can be made subject to Schedule 17 (or its equivalent). This is provided in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**]. The MMO expressed a concern in paragraph 3.23 of [**REP1-079**] that Paragraph 5 of Schedule 17 could cause confusion and ambiguity and undermine its regulatory role. The Applicant set out why this was not well-founded. As a starting point the paragraph refers to compliance with requirements in Schedule 2, rather than DML conditions in Schedule 3, and so does not have anything to do with the MMO. Paragraph 5 is a common provision found in made DCOs. It simply makes clear that the relevant planning authority is able to take into account steps taken to discharge a requirement prior to the DCO coming into force when making a decision on an application to discharge a requirement. Where there is an urgent need for infrastructure, developers will commonly liaise with the relevant authority to prepare the ground for rapid discharge e.g. by providing information in advance of the grant of the DCO. Paragraph 5, the Applicant explained, merely makes clear that it is lawful for the planning authority to take such steps into account towards compliance. It does not bind them to any particular decision. The Applicant took away an action point to update the Explanatory Memorandum with reference to supporting precedents for the drafting of Paragraphs 5 of Schedule 17, which the Applicant is submitting at Deadline 3.
Explanation of relationship with DML conditions and DCO Requirements. ExA to ask questions on the process and potential areas of cross-over	The Applicant provided a general overview of how the DML conditions and the DCO requirements dovetail together, specifically in relation to the CEMP. As a preliminary point, the Applicant stated that if the ExA and Secretary of State agree that the discharge of the DML conditions should be within the ambit of the process set out in Schedule 17, then Part 3 of Schedule 3 of the dDCO would need to be deleted. The Applicant accepted that otherwise there is a mismatch in the drafting of the version of the dDCO submitted at Deadline 1 because Schedule 17 and Part 3 of Schedule 3 of the DCO reflect competing approaches to how the DML conditions should be discharged. To rectify this the Applicant will provide an updated dDCO at Deadline 3 showing clearly labelled alternative drafting in square brackets for the ExA to include or delete depending on how it, and Secretary of State, determine that the issue of timescales and appeals is to be resolved.

	The Applicant then went on to provide a general overview of the relationship between the DML conditions and the DCO requirements, explaining that the entirety of the DCO, including the DML and its conditions is under the Secretary of State's jurisdiction. The DML is equivalent to a full marine licence granted under the MCAA 2009, but as a matter of law, it is also part of the DCO. However, it is conventional and sensible for the division of responsibility for applications made in the first instance to discharge conditions to follow the demarcation that would arise without the DCO in place. Matters above mean high water springs are governed by Requirements and discharged by the relevant planning authority. Below mean high water springs they are governed by DML conditions and discharged by the MMO. The Applicant used Requirement 6 of Schedule 2 as an example of this approach, which deals with Work No. 1, part of which is within the U.K. marine area (the definition included in Article 2 of the DCO mirroring the definition of 'U.K. marine area' in Section 42 of the MCAA 2009) and part of which is not. Requirement 6(1) is clear on its face that it is only dealing with that part of Work No. 1 that is outside of the U.K. marine area (i.e. onshore). This formulation of wording, specifically clarifying that a Requirement relates only to the parts of Works outside of the U.K. marine area, is also seen in Requirement 7, for example. There it provides that no part of the authorised project outside of the U.K. marine area may be commenced until the Construction Traffic Management Plan for that part has been submitted to and approved by the relevant planning authority. Further examples of this formulation are also to be found in Requirements 11, 12, 13 and 16. They all either implicitly or explicitly apply to Work No. 1 but, in each case, make clear that they relate only to the part of that Work outside of the U.K. marine area. That part of Work No. 1 within the U.K. marine area, where appropriate, is then addressed in the DML conditions. The Applicant touched upon an example of drafting aimed at consistency between a specific DCO Requirement and DML condition: Requirement 6(1) and DML Condition 8(2). These allow for the CEMP to discharge both the Requirement and the Condition to be comprised in the same document, albeit the Applicant clarified that at this stage it envisages the likelihood of there being at least three CEMPs: one for marine works, one for the initial phase of land side works and one (or more) in due course for later phases of landside works. The ExA asked how construction-related controls (e.g. lighting, noise, working hours), clearly provided for in DCO Requirements in Schedule 2, are dealt with in the DML. The Applicant agreed that it would provide a brief note clarifying where the DML deals with such construction-related conditions. This is provided at in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**].
ExA to ask questions on the approval process for DML conditions, in particular the wording of Condition 26 of the DML	The ExA asked whether it was sufficiently clear on the face of the dDCO that Article 63 (Procedure regarding certain approvals, etc.) applies to the DML and Schedule 17.

	The Applicant confirmed that Article 63(1), relating to reasonableness and the need for written approvals, is framed in terms of a request or application made to or of any authority, body or person under any of the provisions of the Order. This is broad enough, and will be readily understood in terms of legal interpretation, to embrace the DML and Schedule 17. The Applicant confirmed that Article 63(2)(b), constraining approvals pursuant to requirements in Schedule 2 if they would give rise to materially new or different significant effects on the environment not assessed, is clear on its face that it applies to Requirements, and thus to Schedule 17. The equivalent provision in relation to the DML is at Paragraphs 6(1) and 6(2) of Part 2 of Schedule 3, so Article 63 does not need to refer to the DML in this regard. The Applicant agreed it would be helpful to include wording on the face of the DML that Schedule 17 applies to it (in the event that the ExA and Secretary of State agree with the Applicant that this is appropriate). This appears in the dDCO submitted at Deadline 3 at paragraph 28 of the DML. The Applicant took away as a post-hearing action to provide a note clarifying the relationship between Article 63 and Schedule 17. This is provided in the Applicant's Response to the Examining Authority's Action Points from Issue Specific Hearing 4 [**TR30008/EXAM/9.53**].

7 APPENDIX 1

7.1 Note on enhancement and compensation and explain principle of habitat banking

Note on enhancement and compensation, explaining principle of habitat banking

The Applicant maintains that the intertidal losses predicted from the Project are not of a scale that would result in an adverse effect on integrity (AEOI) on any of the European Sites either alone or in combination with other plans and projects. However, in case the Secretary of State concludes that an AEOI from the Project on the European Sites cannot be ruled out and therefore the derogations stage of the Habitats Regulations Assessment ("HRA") is engaged, compensatory habitat has been identified at the Outstrays to Skeffling Managed Realignment Scheme (Skeffling). In this instance a proportion of the 1 hectare of the Skeffling site that has been identified to provide enhancement for the Project [**paragraph 7.5.27** of the **Planning Statement [APP-226]** would be assigned as compensatory habitat. A without prejudice derogation report **[APP-238]** confirming this position was submitted as part of the application for the Project and was updated at Deadline 1 **[REP1-008]**.This report has been further updated at Deadline 3 **[TR030008/APP/7.3]**.

Skeffling is a joint initiative developed by the Environment Agency and Associated British Ports (ABP) (The Applicant) using a managed realignment approach to create new compensatory habitats for wildlife on the north bank of the Humber Estuary. ABP own approximately 80 ha of the site which has been designed to create new intertidal habitat to compensate for future anticipated habitat losses at their port complexes. This objective is clearly stated within the respective **Environmental Statement** [**Section 1.4.3,** REP1-027]. Similarly, the Environment Agency's main objective of the Skeffling scheme is to compensate for intertidal habitats likely to be lost from the Humber Estuary as a result of implementing the Humber Flood Risk Management Strategy (2008). These habitat losses are the result of rising sea levels against existing flood defences and from works to maintain and improve existing defences as set out in the **Strategy's programme [Section 1.4.2, REP1-027]**. These objectives were clearly communicated to Natural England throughout the application phase of the Skeffling project.

Natural England has also recently (15 April 2024) confirmed that they understand that the underlying objectives of the Skeffling scheme, from an ABP perspective, are to create new intertidal habitat to compensate for future anticipated habitat losses at their port complexes **[TR030008/EXAM/9.17]**. They have also confirmed that Skeffling would provide suitable compensatory habitat for the Project should this be required. The proposed 3:1 ratio of habitat compensation to loss is also considered appropriate **[TR030008/EXAM/9.17]**.

To date only 1 hectare of the ABP owned area has been allocated for this purpose for the Immingham Eastern Ro-Ro Terminal (IERRT) as enhancement, or compensation if needed (subject to the DCO being granted). Approximately 79 ha of the ABP-owned site therefore remains unallocated and therefore available for the provision of enhancement and/or compensation as required. A portion of the

Environment Agency owned part of the Skeffling site has also been allocated to compensate for future losses associated with the Environment Agency's Stallingborough Phase 3 Flood Alleviation Scheme (part of the Humber Flood Risk Management Strategy).

The delivery of compensatory habitat in advance of the losses occurring seeks to ensure that the created habitats are in place in time to provide the ecological functions that they are intended to compensate for. This process also helps to mitigate the challenges of identifying, securing and implementing compensation at the scale of individual projects. Such strategic approaches to the delivery of compensation are therefore not uncommon in coastal environments where there are limited options for providing such habitat. Such schemes are set up with the specific objective of delivering habitat compensation in advance of development coming forward. These schemes are additional to the normal practices required for the protection and management of the habitat in question (e.g. measures being taken by government bodies to ensure the site is in favourable condition) but instead are being provided to deliver compensation ahead of impact from future development projects. For the purposes of the derogations stage of the HRA this habitat is therefore properly to be regarded as compensation and satisfies the requirement of additionality.

A further example of where such "habitat banking" has been employed includes the Aldhurst Farm habitat creation scheme which was developed by EDF Energy ahead of and in anticipation of its application to build Sizewell C. The purpose of Aldhurst Farm is to compensate for the impact the power station could have on wildlife, particularly in the Sizewell Marshes area and in particular the loss of 3ha of the SSSI. The proposals were developed in consultation with Suffolk Coastal District Council, Suffolk County Council, the Environment Agency, Natural England, Suffolk Wildlife Trust and the Royal Society for the Protection of Birds. The planning application was submitted in December 2014, granted in March 2015 and the scheme completed in 2016. The overall approach to the delivery of this compensation scheme in advance of the construction of Sizewell C was considered acceptable by Natural England, the Examining Authority and the Secretary of State as stated in Paragraphs 4.201-4.202 of the respective Decision Letter and Paragraphs at 5.6.103-5.6.104, 5.6.116 and 5.6.432 of the Examining Authority's Report.

The strategic delivery of intertidal habitat compensation to offset current and future habitat losses arising through coastal squeeze is also an approach commonly used by the Environment Agency. Project examples include Paull Holme Strays (on the Humber Estuary), Steart (Parrett), Medmerry (West Sussex), Lower Otter Restoration (Otter Estuary) and as outlined above, Skeffling.

In addition to Skeffling, the Applicant has other sites identified within its portfolio of land holdings for the purposes of providing ecological solutions for compensation and enhancement for future port developments. In addition, ABP is in the process of undertaking a strategic review of land within its ownership to identify areas that could potentially be used for enhancement, mitigation and compensation purposes. This is part of an ongoing review process to identify and secure such opportunities.

8 APPENDIX 2

8.1 Stage 1 & Stage 2 Geoarchaeological Assessment of Geotechnical Data

Immingham Green Energy Terminal
Port of Immingham
North East Lincolnshire

Stage 1 & Stage 2 Geoarchaeological Assessment
of Geotechnical Data

Ref: 266162.02
April 2024

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Document Information

Document title	Immingham Green Energy Terminal, Port of Immingham, North East Lincolnshire
Document subtitle	Stage 1 and 2 geoarchaeological assessment of geotechnical data
Document reference	266162.02
Client name	Associated British Ports
Address	Port Business Services Port House Northern Gateway Hedon Road Hull HU9 5PQ
Site location	Port of Immingham
County	North East Lincolnshire
National grid reference	522128 416093 (TA 22128 16093)
WA project name	IGET: Marine Geoarchaeological Assessment
WA project code	266162
Project management by	Daniel Young
Document compiled by	Hayley Hawkins and Liz Chambers
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Quality Assurance

Issue	Date	Author	Approved by
1	17/11/23	HH/LC	DSY
2	30/04/24	HH/LC	AB

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Summary

Wessex Archaeology (WA) have been commissioned by Associated British Ports (ABP) ('the Client') to undertake a Stage 1 and Stage 2 geoarchaeological assessment of geotechnical data acquired during a survey undertaken in September 2023 by Causeway Geotech Ltd. for marine works relating to the Immingham Green Energy Terminal (IGET) (the 'Project'), located in the Port of Immingham in the Humber Estuary, northeast Lincolnshire.

A total of 15 geotechnical borehole logs were initially reviewed to identify deposits with geoarchaeological potential, assigning high, medium, and low status accordingly. Following the preliminary review, a series of sub-samples assigned high or medium geoarchaeological priority were recommended for Stage 2 recording. These sub-samples were visually corroborated by a trained geoarchaeologist, with detrital organic material observed in many deposits of alluvium. Stratigraphic boundaries and sediment structures were not described during the Stage 2 recording as deposits were retained as bagged sub-samples.

Based on the Stage 1 review and Stage 2 geoarchaeological recording, a total of five lithostratigraphic units were identified. The evolution of the Humber Estuary is closely linked to ice sheet fluctuations during the last glaciation (Weichselian) results in the deposition of glacial sediments, including glacial till, glacial sands and glaciofluvial deposits. These Pleistocene sediments collectively assigned to the Bolders Bank Formation, are stratigraphically overlain by a blanket deposit of fine-grained Holocene alluvium frequently containing pockets of organic material. In a single borehole (BH01), a thin unit of *in situ* peat was recorded and was assigned high geoarchaeological priority.

The results from the Stage 1 review and Stage 2 geoarchaeological recording were used to produce a deposit model to outline the character, extent and depth of deposits within the Project. A single transect was constructed, incorporating 13 borehole records from the offshore and onshore extents of the Project. The upper surface of the peat and alluvial deposits were illustrated at broadly equivalent elevations in the cross section and could suggest similar ages of deposition.

Glaciofluvial deposits, glacial sands and glacial till, were collectively assigned a low priority status given deposition likely occurred when ice covered the landscape during the late Weichselian. The alluvium recorded in the majority of geotechnical boreholes was assigned medium priority status, with the organic material interpreted as detrital in nature and likely reworked from more marginal environments in the Humber Estuary. The *in situ* peat recorded in BH01 was assigned a high priority status.

Geotechnical boreholes containing deposits assigned high and medium geoarchaeological priority have the potential to preserve inorganic and organic microfossils suitable for palaeoenvironmental assessment and radiocarbon dating. However, it was noted during the assessment that alluvial deposits appeared reworked. Based on the mitigation approach proposed within Chapter 15: Historical Environment (Marine) of the Environmental Statement (ES) **[APP-057]**, no further works on the recovered sample material is recommended.

Acknowledgements

Wessex Archaeology would like to thank ABP for commissioning the report. Neil Haggan from Causeway Geotech Ltd. is also thanked for dialogue throughout the offshore survey campaign, providing geotechnical data for review and support securing sub-samples for archaeological purposes. The report was compiled by Hayley Hawkins and Liz Chambers and reviewed by Daniel Young. Illustrations were prepared by Amy Wright. The project was managed for Wessex Archaeology by Daniel Young.

Immingham Green Energy Terminal, Port of Immingham, North East Lincolnshire

Stage 1 and 2 geoarchaeological assessment of geotechnical data

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) have been commissioned by Associated British Ports (ABP) ('the Client') to undertake a Stage 1 and Stage 2 geoarchaeological assessment of geotechnical data acquired during a survey undertaken in September 2023 by Causeway Geotech Ltd. for marine works relating to the Immingham Green Energy Terminal (IGET) (the 'Project'). The Project is located in the Port of Immingham, northeast Lincolnshire and centred on NGR 522128 416093 (TA 22128 16093) (**Figure 1**).

1.1.2 The Terminal would comprise the construction of a new jetty located in the Humber to the east of the existing Immingham Oil Terminal jetty. A new in-river jetty with one berth, including topside infrastructure, is proposed that would have the capacity to facilitate the import and export of liquid bulk products. A capital dredge of approximately 4,000 m^3 will be required for the berth to a depth of 14.5 m below Chart Datum (m CD). The need for future maintenance dredging within the new berth pocket is expected to be very limited (if required at all).

1.2 Scope of work

1.2.1 To help frame geoarchaeological investigations of this nature, WA has developed a five stage approach, encompassing different levels of investigation appropriate to the result obtained, accompanied by formal reporting of the results. The stages are summarised below (**Table 1**).

1.2.2 This report outlines the combined results of a Stage 1 and Stage 2 assessment of geotechnical boreholes from the Project acquired during a survey undertaken in 2023, with recommendations made for further geoarchaeological work, if deemed necessary.

Table 1 Staged approach to geoarchaeological investigations

Stage	Description
Stage 1: Geoarchaeological review	Desk-based review of geotechnical and geological data. Establish likely presence/ absence/ distribution of archaeologically relevant deposits. Identify deposits or samples for Stage 2 works.
Stage 2: Geoarchaeological recording/monitoring	Target deposits or samples identified in Stage 1. Describe the sequences recovered and undertake deposit modelling (if suitable). Interpret depositional environment (if possible). Identify if suitable deposits are present for Stage 3 works.
Stage 3: Palaeoenvironmental assessment	Sub-sample deposits of archaeological interest for paleoenvironmental assessment (e.g. pollen, plant macrofossils, foraminifera, ostracod and diatoms) and associated scientific dating. Provide an outline interpretation of the archaeological and palaeoenvironmental context.

Stage	Description
	Any recommendations for Stage 4 works will depend on the potential for further analysis and the project research objectives.
Stage 4: Palaeoenvironmental analysis	Full analysis of samples and additional scientific dating as specified in Stage 3, together with a detailed synthesis of the results, in their local, regional or wider archaeological and palaeoenvironmental context. Publication would usually follow from a Stage 4 report.
Stage 5: Publication	Publication of the results of Stage 1-4 works for submission in a peer reviewed journal, book or monograph, depending on the archaeological significance of the work. The scope and location of the final publication will be agreed in consultation with the client and regulatory bodies where appropriate.

2 GEOARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 Geoarchaeological assessments are typically undertaken with reference to geological periods (e.g. Quaternary), epochs (e.g. Pleistocene) and sub-epochs (e.g. Weichselian) that reflect major climate sea-level and/or environmental changes. Here we adopt standard European nomenclature correlated to the marine isotope stage (MIS) record to distinguish between different climatic periods, with dates given in ka (thousands of years before present). Marine isotope stages are deduced from marine palaeoclimatic records and reflect alternating warm (interglacial and interstadial) and cold (glacial and stadial) periods throughout the Quaternary.

2.2 Previous investigations

Wessex Archaeology 2022a – Immingham Eastern Ro-Ro Terminal, Marine Archaeology Technical Report

2.2.1 A marine archaeological technical report incorporating geophysical and geotechnical assessments was undertaken for Immingham Eastern Ro-Ro Terminal from which the shallow stratigraphy was established, comprising glacial till, channel deposits, alluvial sediments and peats.

2.2.2 A total of 25 palaeogeographic features of archaeological potential were identified within the sub-bottom profiler (SBP) data, with lowermost sediments interpreted as Late Weichselian (MIS 5d-2) glacial till. A possible complex channel system comprising two distinct channels was identified cutting across the central and western extent of the site. Features **75007** and **75012** were defined as lower cut and fills and interpreted as older channel systems, with other isolated cut and fill features (**75008** and **75013)** cutting into these lower channel features. The fill of the latter two features comprised sub-horizontal parallel reflectors and high amplitude reflectors (at the base of channel feature **75013**) interpreted as low-energy layered sediments and possible organics and/or peats, respectively.

2.2.3 Unit 3, described as silty, clayey sands, was identified in a number of individual palaeogeographic features. The associated features could not be definitively interpreted as palaeochannels and were therefore defined as simple cut and fills. Five features (**75006**,

75010, **75016**, **75020** and **75021**) were also characterised as containing high amplitude reflectors of possible organics and/or peats. . .

Wessex Archaeology 2023a – IGET Marine Geophysical Investigation

2.2.4 An independent geophysical survey was also undertaken for the Project. Given the close proximity of the Project to the proposed Immingham Eastern Ro-Ro Terminal (to the west), an identical Quaternary sequence was established (**Table 2**). Glacial till interpreted as the Bolders Bank Formation, with possible channel features interpreted as Holocene in age cutting into the underlying stiff clays and gravels has been identified in the locality of the Project.

2.2.5 Channel feature **7502** represents an earlier phase of channelling, with **7500** representing a later channel cutting phase (see **Figure 4**). A separate unit was identified across the margin of these two channel features, shown in the SBP data as areas of possible gas typically indicative of preserved organic sediments and/or peats. If preserved in situ, such deposits are considered to be of high archaeological and palaeoenvironmental interest.

Table 2 Shallow stratigraphy of the Project with assessment of potential

Unit	Unit Name	Geophysical Characteristics [1]	Sediment Type [2]	Archaeological Potential
4	Holocene riverbed Sediments (Marine Isotope Stage (MIS) 1)	Generally observed as a veneer or infilling depressions. Boundary between surficial sediments and underlying units not always discernible.	Alluvium deposits comprising soft silts, sand and clay. Possibly contains organic material and/or peat.	Potential to contain *in situ* and derived archaeological material, and palaeoenvironmental material.
3	Holocene Sediments (Pre-transgression) (MIS 2 to 1)	Small shallow infilled channels with acoustically chaotic fill	Fluvial, estuarine and terrestrial deposits.	Potential to contain *in situ* and derived archaeological material, and palaeoenvironmental material.
2	Glacial till (Late Devensian; MIS 5d - 2)	Acoustically unstructured unit with occasional internal reflectors.	Stiff, gravelly, sandy clay.	Unlikely to be of archaeological potential as deposited under an ice sheet, although upper layers could have been a land surface.
1	Upper Cretaceous chalk	Acoustically unstructured unit with a generally well-defined basal reflector.	Chalk	Pre-Earliest occupation of the UK

[1] Based on geophysical data

[2] Based on ABPmer 2023 and Wessex Archaeology 2022a

Wessex Archaeology 2023b – Onshore Geoarchaeological Borehole Survey

2.2.6 A programme of geoarchaeological borehole survey and deposit modelling, alongside an archaeological watching brief, was undertaken in the vicinity of the onshore elements of the

Project. Overlying bedrock, the sequence of superficial deposits recorded at the site comprised Pleistocene glacial till, overlain by a sequence of Holocene alluvium, which was occasionally interbedded with peats and organic-rich units. Minerogenic alluvium was shown to be widespread across the marine footprint of the Project, generally present between c. 1.0 and 2 m above sea level (Ordnance Datum (OD) in the west and between 0.5 and 4 m OD in the eastern areas of the Project. Peat, generally present in thicknesses of less than 1 m was recorded at elevations between c. -3 and -5 m OD across the western area of the Project (see Figure 5).

2.3 Geological baseline

2.3.1 Situated in the Humber Estuary, the bedrock geology at the Project is dominated by Cretaceous chalk of the Flamborough Chalk Formation, with formation having occurred between 86.3–72.1 million of years ago. Bedrock geology across both the Humber Estuary and wider southern North Sea is unconformably overlain by considerable thicknesses of Pleistocene and Holocene sediments (Cameron *et al* 1992), dominated by glacial till and marine sands, overlain by Holocene age fluvial, semi-terrestrial and lacustrine sediments, and post-transgression marine sands.

2.3.2 The Pleistocene geological history of the North Sea basin is dominated by repeated glacial/interglacial cycles, resulting in rising and falling sea levels (**Figure 3**) and the deposition of terrestrial, marine, and glacial sediments. Within the Humber Estuary, there is evidence of at least three phases of glaciation, which occurred during the Elsterian (478,000–424,000 years before present (BP); MIS 12), Saalian (370,000–130,000 years BP; MIS 8-6) and Weichselian (110,000–13,000 years BP; MIS 2) when ice extended into the southern North Sea (Cameron *et al* 1992; Emery *et al* 2019; Eaton *et al* 2020).

2.3.3 The southern extent of the Elsterian glaciation is debateable, however, bathymetric data suggests a southernmost extent of Felixstowe (Emu 2009). Alternatively, Dix and Sturt (2011) argue for an Elsterian glacial origin for over-steepened valleys (tunnel valleys) identified within the Outer Thames Estuary. Based on geomorphological mapping, the southern extent of the Saalian glaciation is defined as immediately north of the Wash (Eaton, *et al* 2020). The maximum extent of the Weichselian glaciation has been mapped along the North Norfolk coast and is suggested to have extended offshore based on stratigraphic correlation to the Bolders Bank Formation (Roberts *et al* 2018). The Weichselian ice sheet is suggested to have reached its maximum extent by around 27,000 years ago in North Norfolk (Clark *et al* 2012; Roberts *et al* 2018).

2.3.4 Due to repeated glaciations, the preservation of Quaternary sequences including former land surfaces in the southern North Sea is rare, with all superficial sediments with the exception of glacially-derived material post-dating the retreat of the Weichselian ice sheet. Across the Humber Estuary, Holocene deposits largely comprise sediments of marine origin, reflecting the final marine transgression and the formation of estuarine to brackish environments in response to sea-level rise (Rees *et al* 2000).

2.3.5 During the Mid-Holocene, slower rates of relative sea-level rise resulted in the formation of peats and establishment of wetland environments (Waller and Kirby 2021). Based on both palaeoenvironmental (i.e. diatoms analyses) and chronological assessment, the latter of which focused on the radiocarbon dating of peats, sea-level index points were established for the Humber Estuary, with the expansion of intertidal settings reaching its maximum at around 3000 cal years BP (Metcalfe *et al* 2000). This is supported by palaeoenvironmental analysis undertaken at two locations in the Humber Estuary, which indicate a complete submergence of wetlands after c. 4000 cal years BP (Best *et al* 2022).

2.3.6 A series of peats indicating multiple phases of development were recorded west of Immingham at Brough and Hook Lane (Best *et al* 2022). The earliest phase of development was dated to c. 7800 cal years BP, demonstrating the potential for the preservation of Late Mesolithic to Early Neolithic artefactual remains. By the Bronze Age, the wetlands of the Humber would have reached their maximum extent, dominated by estuarine mudflats and saltmarsh habitats. Consequently, where peat deposits are present, they are likely to date between the late Mesolithic and middle Bronze Age. As such, the peats are considered to be of high geoarchaeological potential, preserving a range of palaeoenvironmental remains and material suitable for radiocarbon dating.

2.3.7 The numerous pollen studies from across the Humber wetlands demonstrate that clearance of woodland on the associated dry ground occurred from the late Bronze Age. Prior to this, the dryland vegetation would have been a mix of woodland habitats that developed over the course of the Holocene. From around 10 thousand years ago this will have been characterised by a mixed oak, hazel, elm, lime and alder woodland, with alder dominating the wetlands and lime more prevalent on drier free-draining soils. Although woodland clearance is apparent in pollen sequences from the Neolithic, they are mostly small-scale and impermanent, and support the archaeological evidence reflecting temporary and seasonal activity within the wetlands at that time.

2.4 Archaeological record

2.4.1 The Humber region occupies a nationally significant area on the western margins of Doggerland, a bathymetric high in the North Sea, providing a suitable gateway for the migration of humans, with the low-lying landscape of the Humber Estuary forming an attractive setting for hunter gatherers (Coles 1998).

2.4.2 The earliest evidence of human occupation in the Humber Estuary is predominantly associated with isolated prehistoric finds, with persistent land use becoming much more evident in the Neolithic and Bronze Age. Such finds include a mammoth tusk reported as part of dredging activities from Marine Aggregate Licence Area 408, located east of the Humber Estuary, which produced a Mid-Devensian (MIS 3) date of c. 44 ka (Allen *et al* 2008). Direct evidence of occupation is also present in the nearshore area, with recent seabed investigations demonstrating the potential for Mesolithic archaeology with the recovery of a possible hammerstone fragment associated with now submerged palaeochannels (Missiaen *et al* 2021).

2.4.3 The survival of both Neolithic and Bronze Age burial mounds and earthworks is evident across the margins of the estuary and typically overly isolated outcrops of glacial till. Significant archaeological finds recovered from the Humber wetlands include several timber trackways (Fletcher *et al* 1999) and fragments of three sewn plank boats from North Ferriby (Wright *et al* 2001). Such finds confirm the persistence of humans in marginal settings across the Humber.

2.4.4 Sea-level index points indicate that the Humber Estuary was fully submerged by approximately 4000 cal years BP (Best *et al* 2022). Although these dates have been reconstructed for the inner Humber, it is likely the Project at Immingham was inundated at a broadly equivalent date. Any associated archaeology is therefore assumed to be reworked from the margins of the estuary, with *in situ* archaeological remains predating the Bronze Age.

3 AIMS AND OBJECTIVES

3.1 Aims

3.1.1 The principle aim of the Stage 1 and 2 geoarchaeological assessment was to assess the archaeological potential of deposits recovered in boreholes from the Project.

3.2 Objectives

3.2.1 This aim was achieved by undertaking the following objectives;

- Review geotechnical borehole logs to identify deposits of potential archaeological interest, assigning high, medium and low priority status;
- Laboratory description of borehole samples assigned medium and high priority status;
- Model the character, extent and depth of deposits;
- Interpret the probable environments represented;
- Determine the importance of the deposits, with regard to their archaeological and palaeoenvironmental potential, and;
- Make recommendations for dating and palaeoenvironmental assessment as appropriate, with reference to key research questions and regional/national period specific and maritime research agendas.

4 METHODOLOGY

4.1 Co-ordinate system

4.1.1 All location information and figures are presented as projected coordinates in OSGB 36 British National Grid (BNG) Eastings and Northings and heights above OD (Newlyn), as defined by OSTN15 and OSGM15 with a three-dimensional accuracy of at least 50 mm. Location data for boreholes is presented in **Appendix 1**.

4.2 Geotechnical coring strategy

4.2.1 A total of 15 boreholes were acquired during the geotechnical survey. Boreholes were acquired using cable percussion through the superficial sediments and recorded by a geotechnical engineer offshore. All samples were stored in bags and selected tube sampler (UT, Appendix 3) core samples, and transported to the laboratory of Causeway Geotech Ltd in Ballymoney, Northern Ireland. Geotechnical logs were provided to Wessex Archaeology for review and geoarchaeological assessment.

4.3 Stage 1 review of geotechnical boreholes

4.3.1 A preliminary Stage 1 review of geotechnical data was undertaken on engineering borehole logs directly following the survey to highlight any deposits of high to moderate archaeological potential, with the intention of progressing to Stage 2 geoarchaeological recording, if necessary. Following the preliminary review, all borehole descriptions and interpretations were tabulated.

4.3.2 The deposits recovered were assigned either a high, moderate or low priority status based on their perceived geoarchaeological significance as itemised in **Appendix 2**. Sub-sample

photographs were not available during the Stage 1 review and as such, interpretations were made based on borehole logs alone.

4.4 Stage 2 geoarchaeological recording

4.4.1 The Stage 2 geoarchaeological recording of high to moderate priority boreholes was undertaken by a suitably trained geoarchaeologist at the laboratory of Causeway Geotech in October 2023. Typically, Stage 2 recording is undertaken for complete vibrocores/boreholes retained in opaque liners. However, superficial sediments were extracted using a cable percussion rig and were therefore retained as individual bagged samples with a selection of UT core samples retained primarily for geotechnical testing.

4.4.2 All samples subject to Stage 2 geoarchaeological recording were photographed and described following Hodgson (1997) and COWRIE (2007) to include information such as:

- Depth;
- Texture;
- Composition;
- Colour;
- Inclusions;
- Structure (bedding etc.); and,
- Contacts between deposits (where visible).

4.4.3 Interpretations were made regarding the probable depositional environments and formation processes of the sampled deposits. This data is presented in **Table 3** and **Appendix 4.**

4.4.4 Deposits recovered in boreholes were interpreted in terms of their geoarchaeological potential. Of greatest geoarchaeological potential are sediments from former terrestrial depositional environments, as well as certain features or inclusions of possible archaeological and palaeoenvironmental interest, specifically:

- Peat layers;
- Deposits containing other organic material such as wood fragments, roots, dark organic staining etc.;
- Clay or silt deposits, especially those containing laminated features such as lacustrine varves or tidal rhythmites;
- Inorganic fossils (such as molluscs);
- Concentrations of charcoal;
- Individual artefacts such as pieces of flint or pottery (though finding these within core samples is rare), and;
- Any other feature thought to indicate a terrestrial depositional environment.

4.4.5 The list of boreholes selected for stage 2 recording is shown in **Appendix 3**.

4.5 Deposit modelling

4.5.1 The results from the review of geotechnical logs and geotechnical recording of selected samples were used to produce a deposit model using RockWorks v.20 to outline the character, extent and depth of deposits within the vicinity of the Project (**Figure 5**). The stratigraphic transect also includes borehole data from the onshore extent of the Project previously evaluated by Wessex Archaeology (2023b) to illustrate palaeolandscape development across the wider area. The location of the cross section is presented alongside the deposit model in **Figure 5**.

4.5.2 A total of 15 boreholes recovered from the offshore extent of the Project and four boreholes recovered from the connecting onshore area of the Project (Wessex Archaeology 2023b) were included in a single cross section to show the stratigraphic relationship between deposits. In order to avoid duplicate core identification numbers, project codes are used as prefixes in the transect (**Figure 5**) and text (e.g. 271001_BH15 and 266162_BH15).

5 RESULTS

5.1 Stage 1 review of geotechnical data

5.1.1 A total of 15 borehole logs from the geotechnical survey have been reviewed as part of the Stage 1 works, with the aim of identifying deposits of potential geoarchaeological significance with recommendations made for further geoarchaeological work, if necessary. Outline descriptions based on geotechnical logs are presented in **Appendix 2**, accompanied by an initial interpretation of the deposits.

Bedrock

5.1.2 The bedrock is described as structureless chalk and is encountered in all 15 boreholes, appearing at depths between -20.55 m OD (BH15) and -26.22 m OD (BH06). In most instances, chalk bedrock is overlain by either reworked chalk or glacial till.

5.1.3 A white clayey gravel/gravelly clay/gravel consisting of chalk and rare flint of varying roundness was recorded in five boreholes at depths of between 4.30 m below sea floor (mbsf) (BH12) and 17.50 mbsf (BH02). These deposits collectively overly structureless chalk and are interpreted as reworked bedrock. Both reworked and *in situ* bedrock are considered low archaeological priority as these deposits were laid down prior to the occupation of humans in Britain.

Glacial till

5.1.4 This deposit appears in all of the boreholes and consists of firm to stiff white, grey, grey/brown, brown sandy gravelly clay, gravelly sandy clay, gravelly sandy silty clay. The angularity of the gravel is typically described as subangular however both angular and subrounded clasts are also recorded. The clast lithology is variable and suggests that sediments have been transported over a long distance. These deposits range in thickness from 0.20 m (BH07) to 6.20 m (BH04) and are recorded at an elevation of between -8.57 m OD (BH03) and -22.69 m OD (BH01).

5.1.5 A single borehole (BH08) contains a c. 1.50 m unit of stiff greyish brown slightly gravelly sandy clay with rare pockets of grey silt and occasional shell fragments. The presence of fragmented shell is unique as it is typically representative of deposition in a marine environment. However, given the stiff nature and presence of gravel clasts, this deposit is interpreted as glacial till. Considering the heterogeneous and stiff nature of these

sediments, this deposit is interpreted as glacial till and is considered to be low archaeological potential.

Glaciofluvial deposits

5.1.6 Gravelly sands and sandy gravels of mixed lithologies were recorded in 13 boreholes between -10.17 m OD (BH03) and -21.60 m OD (BH11) and ranging in thickness from 0.50 m (BH15) to 4.50 m (BH01). Given the coarse nature and stratigraphic position of these sediments which are typically constrained by high strength and heterogenous glacial till, they are collectively interpreted as glaciofluvial deposits. It is unclear if these sands and gravels are associated with subglacial deposition, however, given their high energy depositional nature, these deposits have experienced a high degree of reworking. Therefore, the archaeological preservation of these glaciofluvial deposits is considered to be low.

Glacial sand

5.1.7 In six boreholes (BH06, BH07, BH08, BH10, BH11 and BH14) units of medium dense to loose brown silty fine to coarse sand, with occasional to frequent pockets and lenses of sandy clay and clay are recorded. These deposits appear between -15.73 (BH08) and -19.02 m OD (BH06) and range in thickness from 1.10 (BH06) and 3.50 m (BH14). Similar to glaciofluvial sands and gravels, these deposits are typically constrained by units interpreted as glacial till and are hence tentatively suggested as representing glacial outwash or lower energy deposition in a glaciofluvial environment. The archaeological potential of this unit is considered to be low, given that deposition likely occurred in a subglacial setting during the late Weichselian.

Peat

5.1.8 A 0.10 m thick brown to dark brown spongy pseudo-fibrous peat is recorded in BH01, appearing at -9.69 m OD. This deposit is stratigraphically constrained by very soft sandy silty clay interpreted as alluvium. Peat is assigned a high archaeological and geoarchaeological priority status.

Alluvium

5.1.9 Soft brownish grey to dark grey sandy and silty clay with occasional pockets of amorphous to pseudo-fibrous peat, lenses and laminae was recorded in 12 boreholes at depths of between -6.19 m OD (BH01) and -16.30 m OD (BH11). The presence of organic inclusions and fine-grained laminated sediments indicative of low-energy rhythmic deposition may suggest that deposits were formed in a shallow water or intertidal alluvial environment. Alluvium is assigned a medium priority status.

5.2 Stage 2 geoarchaeological recording

Introduction

5.2.1 Stage 2 geoarchaeological recording was undertaken on a selection of sub-samples requested following a Stage 1 review of geotechnical logs. A full list of sub-samples recorded for geoarchaeological purposes is presented in **Appendix 3** with descriptions presented in **Appendix 4**. A total of seven boreholes from the Project were assigned medium priority status as they comprised deposits interpreted during the Stage 1 review as Alluvium. A single borehole (BH01) contained a unit of peat and was assigned a high priority status.

Alluvium

5.2.2 All seven boreholes (BH01, BH02, BH05, BH06, BH11, BH13 and BH15) were assigned medium priority status as they comprised deposits interpreted as Alluvium.

5.2.3 In three boreholes (BH05, BH11 and BH13), soft dark brown to black silt was recorded between depths of seabed and 3.50 mbsf, with sediments becoming increasingly sandy with depth in BH11. Soft occasionally sandy silt was also recorded in BH01, BH02 and BH13, however, these deposits also contained occasional organic material including fragments of wood and complete leaves and stems. A lithologically identical unit was recorded in BH06, although the organic content was recorded as frequent in this borehole. Although reworked, the abundance of organic material which includes large wood fragments, suggests that *in situ* peats are situated in close proximity to this location as evidenced in BH01.

5.2.4 The alluvium recorded in BH02 between 2.00 and 2.50 mbsf is described as soft orange to light grey silt with occasional organic fragments. Possible laminations were recorded, however as the sub-samples were retained in bags the structure of the sediment was difficult to determine.

Peat

5.2.5 A single borehole (BH01) contained *in situ* peat and is suggested to have high geoarchaeological potential.

5.2.6 A thin (0.10 m) unit of fibrous black silty peat with frequent woody detritus, whole leaves and seeds was recorded in BH01 at between 3.50 and 3.60 mbsf. The abundance of fragments and clear structure indicates a low degree of decomposition with formation occurring in a stable, semi-terrestrial environment.

5.3 Deposit modelling

5.3.1 A single transect has been constructed, incorporating 13 borehole records from the geotechnical survey and four boreholes recovered during a geoarchaeological borehole survey undertaken within the onshore extent of the Project (Wessex Archaeology 2023b). The cross-section and the location of the transect is presented in **Figure 5**.

5.3.2 The transect has a northeast to southwest orientation across the area of the Project, covering the terrestrial (271001_BH15, 271001_BH16, 271001_BH17, 271001_BH18) and offshore (266162_BH01 to 266162_BH08, 266162_BH10 to 266162_BH12, 266162_BH14 and 266162_BH15) extents of the Project.

5.3.3 To the southwest, thick (<8 m) deposits of Alluvium are recorded. Although there is a considerable distance (>10 km) between the geotechnical survey areas, the alluvium is shown to gradually thin towards the northeast before becoming entirely absent in the borehole records (i.e. 266161_BH10 and 266161_BH12) with glacial sediments outcropping at seabed. The recovery of peat is fragmentary across the Project with deposits recorded in only three boreholes. The upper surface of the peat is recorded at a broadly similar elevation in both 271001_BH18 (-5.97 m OD) and 266161_BH01 (-7.81 m OD). The alluvium and peat are underlain by glacially-derived material, including glaciofluvial sediments and glacial till, in all locations. The glacial deposits have been grouped in the cross-section given the stratigraphic complexity associated with such sediments.

5.3.4 This cross-section illustrates the widespread deposition of alluvium across the former terrestrial landscape following the retreat of ice during the Early Holocene. The alluvium

which forms a blanket deposit covering glacial sediment is occasionally interbedded with peats indicative of stable low-energy, semi-terrestrial, conditions in either a wetland or floodplain environment.

6 DISCUSSION

6.1 Introduction

6.1.1 The results of the review and recording of geotechnical boreholes from the Project are consistent with the expected stratigraphy established during a previous geophysical investigation (Wessex Archaeology 2023a; **Table 3**). These deposits comprise a sequence of Pleistocene sediments characteristic of the Bolders Bank Formation, overlain by Holocene aged minerogenic alluvium and peats.

6.1.2 Due to the comparatively lower resolution of sub-bottom profiler geophysical data to geotechnical data, four separate units were identified which directly correlate to the Bolders Bank Formation. These deposits include glacial till, glacial sands and glaciofluvial sediments.

Table 3 Shallow stratigraphy of deposits within IGET with geological assignment

WA Unit Name	Description	Epoch	Formation
Alluvium and peat	Soft slightly sandy silty clay with occasional pockets of peat, and amorphous to pseudo-fibrous peat	Early to mid-Holocene	N/A
Glaciofluvial	Gravelly sands and sandy gravels of various lithologies	Weichselian	Bolders Bank Formation
Glacial till	Firm to very stiff slightly sandy gravelly clay		
Glacial sands	Medium dense to dense silty sand with occasional pockets and lenses of sandy clay		
Reworked chalk and chalk bedrock	Cream slightly clayey gravel and structureless chalk	Cretaceous	Flamborough Chalk Formation

6.2 Glacial deposits

6.2.1 In all boreholes recovered from the Project, the lowermost sediments are characteristics of deposition in a glacial environment. These deposits are collectively interpreted as the Bolders Bank Formation, a subglacial diamicton laid down by the British Irish Ice Sheet (BIIS) during the late Weichselian (Davies, et al. 2011). These units are generally considered to have low potential for preservation of geoarchaeological material as they are likely to have been subjected to reworking.

Glacial till

6.2.2 The majority of glacial sediments are described as firm to very stiff sandy clays with occasional to frequent chalk clasts, interpreted as glacial till. The micromorphological analysis of these sediments has revealed that the Bolders Bank Formation is associated with subglacial deposition (Carr et al. 2000) which occurred during the final major advancement of ice across the southern North Sea during the Dimlington Stadial (Davies

et al. 2011). A unique thin (1.50 m) deposit noted as a slightly gravelly sandy clay with occasional shell fragments was recorded in a single borehole (BH08). The presence of shells is typically indicative of marine processes. However, shell fragments are often captured within subglacial sediments as deposited material is entrained by ice and transported considerable distances across the landscape. Thus, it is likely this deposit is reworked and is interpreted as glacial till. These stiff gravelly clays are collectively interpreted as subglacial till and their geoarchaeological potential is considered low.

Glacial sands

6.2.3 Across the Project, glacial till is stratigraphically interbedded with dense sands also interpreted as the Bolders Bank Formation. This tripartite subdivision of the Bolders Bank Formation into upper, middle and lower units based on changes in lithology has been recognised across the southern North Sea and within its onshore equivalents, such as the Holderness Glacigenic Formation (Carr, et al. 2006; Evans and Thomson 2010). These arenaceous (sandy) layers intersecting high strength clay (Davies et al. 2011) are interpreted as glacial outwash sands and possibly represent ice-marginal deposits laid down in response to multiple phases of ice expansion and retreat during the Weichselian. Equivalent sediments are also evidenced offshore on Doggerbank (Wessex Archaeology 2022b) and south of the Humber in the Wash (Wessex Archaeology 2022c) with proglacial deposits intersecting glacial till.

6.2.4 Although associated with lower energy deposition, these dense sands were most likely deposited at a time when the North Sea would have been unsuitable for hominin occupation and are thus considered to have low geoarchaeological potential.

Glaciofluvial

6.2.5 A number of boreholes across the Project also record coarse gravelly sands and sandy gravels typically intersecting glacial till and have been correlated to the Bolders Bank Formation. The lithology of the Bolders Bank Formation is known to vary locally, with abundant gravel recorded in boreholes previously investigated across the Humber (Davies et al. 2011). These deposits are interpreted as high-energy glaciofluvial sediments. Although these sands and gravels may contain reworked archaeology, they are likely associated with either subglacial or proglacial deposition during the late Weichselian. Therefore, these coarse sediments have been assigned a low geoarchaeological priority.

6.3 Alluvium and Peat

6.3.1 Across the Project, Pleistocene glacial sediments are overlain by Holocene aged deposits, including localised peats and minerogenic fine-grained sediments, laid down at a time when the Humber Estuary was subaerially exposed prior to final sea-level transgression (Cameron, et al. 1992).

6.3.2 Based on interpreted of SBP data (Wessex Archaeology 2022a, 2023a) a series of palaeochannels have been mapped across the middle Humber Estuary, which likely incised into bedrock in a terrestrial landscape following ice retreat. In response to relative sea-level rise during the Early to Mid-Holocene, these channels likely became increasingly intertidal with estuarine environments forming. It is unclear based on the logs alone if these sediments represent floodplain deposition related to the mapped palaeochannel or alternatively are estuarine in nature.

6.3.3 The alluvium recorded in the boreholes was described in the geotechnical logs as containing frequent pockets of peat, which was further reinforced during the Stage 2 recording (**Appendix 4**). The presence of large fragments of wood suggests that these

deposits formed adjacent to a marginal environment, as evidenced through the *in situ* preservation of peats towards the southwest extent of the Project (this study; Wessex Archaeology, 2023b). Despite this, these fragments recorded in the alluvium suggests a high degree of reworking and thus there may be uncertainties regarding the security of dates produced through radiocarbon dating.

6.3.4 Although these deposits contain locally reworked organics, there is potential for the palaeoenvironmental assessment of organic and inorganic microfossils. Further, a sub-aerially exposed North Sea intersected by channels would have formed an attractive landscape for Mesolithic communities, with floodplain deposits possibly containing *in situ* archaeological material. As such, these alluvial deposits are assigned medium geoarchaeological priority.

6.3.5 An *in situ* peat unit was however recorded in BH01 between 3.50 and 3.60 mbsf and is considered to have high geoarchaeological potential. Peat deposits from the terrestrial cores are similar in thickness to that of BH01, with the exception of the peat in BH18 (c. 1.15 m), however are stratigraphically overlain by alluvium as opposed to intersecting alluvium. Radiocarbon dating of peats has been undertaken across the Humber region including at South Ferriby (c. 22 km upstream of Immingham) where peats at broadly equivalent elevations (c. -2 to -3 m OD) were dated to approximately 5000 cal BC (Van de Noort and Fletcher 2000).

6.3.6 Peat deposits have the highest potential for preserving material for radiocarbon dating, along with a range of palaeoenvironmental remains (e.g. pollen and plant macrofossils) suitable for reconstructing past landscape and environmental change, and investigating evidence for human activity during the Upper Palaeolithic and Early Mesolithic (e.g. evidence for burning). As such, they are considered to have high geoarchaeological and archaeological potential.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1.1 The lithostratigraphic framework defined based on deposits recovered from boreholes is presented in **Table 3**. Peat has been assigned high geoarchaeological potential and alluvium has been assigned a moderate geoarchaeological potential (see **Appendix 2** and **4**). No further palaeoenvironmental assessment is recommended for the following units which have low geoarchaeological potential: Bolders Bank Formation (including glacial sand, glaciofluvial sediments and glacial till) and the Flamborough Chalk Formation.

7.2 Peat

7.2.1 A single borehole (BH01) recovered in situ peat which was considered to have high geoarchaeological potential. This presented the opportunity for secure radiocarbon dating and palaeoenvironmental analysis to reconstruct the depositional history of the deposit. However, the material was retained as a disturbed sample and therefore, no further assessment is recommended on the existing samples.

7.3 Alluvium

7.3.1 A series of minerogenic deposits characterised by sand, silt and clay often with detrital organic material fragments, have been interpreted as alluvium deposited in either tidally influenced or fluvial environments. These deposits likely reflect a transition from a sub-aerially exposed southern North Sea to increasing marine conditions under the influence of early Holocene rising sea levels. Although these deposits have the potential to preserve organic and inorganic microfossils suitable for palaeoenvironmental assessment, the

presence of detrital organics suggests a high degree of reworking. Based on the mitigation approach proposed within the ES, to further the understanding of archaeological features within the area, no further works on the recovered sample material is recommended.

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APPENDICES

Appendix 1 – Borehole locations

BH ID	Eastings	Northings	Elevation (m OD)
IGET_BH01	521330.00	415568.00	-6.19
IGET_BH02	521440.00	415669.00	-6.96
IGET_BH03	521579.00	415757.00	-7.07
IGET_BH04	521714.00	415824.00	-7.28
IGET_BH05	521837.00	415891.00	-9.95
IGET_BH06	521974.00	415955.00	-10.32
IGET_BH07	522113.00	416020.00	-9.16
IGET_BH08	522184.00	416053.00	-9.13
IGET_BH09	522429.49	416049.75	-17.17
IGET_BH10	522203.28	416136.25	-16.50
IGET_BH11	522145.12	416154.57	-16.30
IGET_BH12	522270.47	416146.49	-18.38
IGET_BH13	522372.74	416065.98	-15.28
IGET_BH14	522124.00	415984.00	-9.59
IGET_BH15	521865.00	415842.00	-11.05

Appendix 2 – Stage 1 geotechnical review

BH ID	Depth from (m)	Depth to (m)	Description	Interpretation	Priority
IGET-BH01	0.00	3.50	Very soft dark grey slightly sandy very silty CLAY with occasional pockets of pseudo-fibrous peat	Alluvium	Medium
IGET-BH01	3.50	3.60	Brown to dark brown spongy pseudo-fibrous PEAT	Peat	High
IGET-BH01	3.60	4.50	Very soft grey mottled brown slightly sandy silty CLAY with occasional pockets of pseudo-fibrous peat	Alluvium	Medium
IGET-BH01	4.50	7.50	Firm dark grey slightly sandy gravelly to very gravelly CLAY. Gravel is angular to subangular of various lithologies	Glacial till	Low
IGET-BH01	7.50	12.00	Stiff to very stiff brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH01	12.00	14.00	Medium dense slightly gravelly silty SAND. Gravel is subangular to subrounded of mixed lithologies	Glaciofluvial	Low
IGET-BH01	14.00	16.50	Medium dense grey slightly sandy silty subangular to subrounded GRAVEL of mixed lithologies	Glaciofluvial	Low
IGET-BH01	16.50	18.00	Stiff light brown sandy gravelly CLAY. Gravel is subangular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH01	18.00	45.00	Structureless CHALK	Chalk bedrock	Low
IGET-BH02	0.00	2.00	Soft dark grey slightly sandy very silty CLAY with occasional pockets of pseudo-fibrous peat	Alluvium	Medium
IGET-BH02	2.00	2.50	Soft brown mottled grey thinly laminated slightly sandy CLAY	Alluvium	Medium
IGET-BH02	2.50	7.00	Firm dark grey slightly gravelly sandy CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH02	7.00	8.00	Loose brown gravelly silty fine to coarse SAND. Gravel is subangular to subrounded of mixed lithologies	Glaciofluvial	Low
IGET-BH02	8.00	11.00	Stiff dark grey sandy gravelly CLAY. Gravel is subangular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH02	11.00	14.00	Dense brown silty very sandy subangular GRAVEL of mixed lithologies	Glaciofluvial	Low
IGET-BH02	14.00	17.00	Very stiff dark grey slightly sandy gravelly CLAY. Gravel is subangular of mixed lithologies	Glacial till	Low
IGET-BH02	17.00	17.50	White clayey angular to subangular GRAVEL of chalk.	Reworked bedrock	Low
IGET-BH02	17.50	46.00	Structureless CHALK	Chalk bedrock	Low
IGET-BH03	0.00	1.50	Very soft dark grey slightly sandy SILT with occasional pockets of pseudo-fibrous peat	Alluvium	Medium
IGET-BH03	1.50	3.10	Soft to firm dark grey slightly sandy slightly gravelly CLAY. Gravel is very angular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH03	3.10	5.10	Medium dense light brown mottled grey very gravelly fine to coarse SAND. Gravel is very angular to subrounded of mixed lithologies	Glaciofluvial	Low
IGET-BH03	5.10	7.80	Firm to stiff grey slightly gravelly CLAY with rare cobbles. Gravel is very angular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH03	7.80	8.80	Loose brown silty fine to coarse SAND with occasional chalk fragments	Glaciofluvial	Low
IGET-BH03	8.80	10.80	Stiff grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded of mixed lithologies	Glacial till	Low

BH ID	Depth from (m)	Depth to (m)	Description	Interpretation	Priority
IGET-BH03	10.80	13.00	Medium dense light brown sandy angular to subrounded GRAVEL of chalk and flint	Glaciofluvial	Low
IGET-BH03	13.00	14.00	Very stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH03	14.00	18.10	Stiff greyish brown slightly sandy gravelly CLAY with rare pockets of silt. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH03	18.10	45.00	Structureless CHALK	Chalk bedrock	Low
IGET-BH04	0.00	1.50	Very soft brown mottled grey slightly sandy silty CLAY with rare organic plant remains	Alluvium	Medium
IGET-BH04	1.50	4.50	Stiff grey sandy gravelly CLAY with occasional lenses of gravelly sand. Gravel is subangular of various lithologies	Glacial till	Low
IGET-BH04	4.50	10.70	Firm to stiff grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH04	10.70	13.00	Brown very gravelly slightly silty fine to coarse SAND. Gravel is subangular to subrounded of various lithologies	Glaciofluvial	Low
IGET-BH04	13.00	18.50	Stiff to very stiff brown sandy gravelly CLAY. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH04	18.50	45.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH05	0.00	3.00	Very soft to firm brown mottled grey slightly sandy silty CLAY with occasional pockets of black amorphous peat	Alluvium	Medium
IGET-BH05	3.00	4.10	Stiff brown mottled grey sandy gravelly CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH05	4.10	7.50	Stiff brown mottled grey sandy gravelly CLAY. Gravel is subangular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH05	7.50	10.00	Stiff brown mottled grey sandy gravelly CLAY. Gravel is subangular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH05	10.00	13.00	Medium dense brown very gravelly silty fine to coarse SAND. Gravel is angular to subangular of chalk and flint	Glaciofluvial	Low
IGET-BH05	13.00	45.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH06	0.00	3.10	Soft to firm dark grey sandy silty CLAY with occasional pockets of pseudo-fibrous peat	Alluvium	Medium
IGET-BH06	3.10	4.10	Firm dark grey very gravelly sandy CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH06	4.10	8.70	Firm to stiff dark grey sandy gravelly CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH06	8.70	9.80	Medium dense brown silty fine to coarse SAND with frequent pockets of sandy clay	Glacial sand	Low
IGET-BH06	9.80	12.00	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular of chalk and flint	Glacial till	Low
IGET-BH06	12.00	13.50	Very stiff greyish brown slightly gravelly sandy CLAY with rare pockets of grey silt. Gravel is subangular to subrounded of mixed lithologies	Glacial till	Low
IGET-BH06	13.50	15.90	No recovery	N/A	N/A
IGET-BH06	15.90	45.00	Structureless CHALK	Chalk bedrock	Low
IGET-BH07	0.00	0.80	Very soft dark grey mottled light brown silty CLAY with occasional pockets of black organic amorphous peat	Alluvium	Medium
IGET-BH07	0.80	1.10	Soft grey slightly sandy silty CLAY with frequent pockets of dark brown pseudo-fibrous peat	Alluvium	Medium

BH ID	Depth from (m)	Depth to (m)	Description	Interpretation	Priority
IGET-BH07	1.10	2.90	Soft to firm dark grey sandy gravelly CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH07	2.90	5.50	Firm to stiff brown sandy gravely CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH07	5.50	7.90	Very stiff brown slightly sandy gravelly CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH07	7.90	8.90	Medium dense brown silty fine to coarse SAND	Glacial sand	Low
IGET-BH07	8.90	10.40	Medium dense brown silty fine to coarse SAND with occasional sandy clay lenses	Glacial sand	Low
IGET-BH07	10.40	11.10	Firm brown slightly sandy gravelly CLAY. Gravel is angular to subangular of mixed lithologies	Glacial till	Low
IGET-BH07	11.10	12.30	Medium dense white mottled cream sandy angular to subangular GRAVEL of chalk and flint	Glaciofluvial	Low
IGET-BH07	12.30	12.50	Stiff grey mottled brown gravelly CLAY. Gravel is angular to subangular of flint and chalk	Glacial till	Low
IGET-BH07	12.50	45.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH08	0.00	0.80	Very soft dark brown mottled light brown silty CLAY with occasional pseudo-fibrous peat	Alluvium	Medium
IGET-BH08	0.80	3.00	Soft to firm grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH08	3.00	6.60	Firm to stiff brown sandy gravelly CLAY. Gravel is angular to rounded of various lithologies	Glacial till	Low
IGET-BH08	6.60	10.00	Medium dense brown silty fine to coarse SAND with occasional lenses of sandy clay	Glacial sand	Low
IGET-BH08	10.00	11.00	Firm brown slightly gravelly sandy CLAY. Gravel is angular chalk	Glacial till	Low
IGET-BH08	11.00	12.50	Stiff greyish brown slightly gravelly sandy CLAY with rare pockets of grey silt and occasional shell fragments	Glacial till	Low
IGET-BH08	12.50	14.60	No recovery	N/A	N/A
IGET-BH08	14.60	45.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH09	0.00	0.90	Medium dense brown gravelly fine to coarse SAND. Gravel is angular to subrounded of various lithologies	Glaciofluvial	Low
IGET-BH09	0.90	3.70	Stiff to very stiff slightly gravelly sandy CLAY. Gravel is angular to subrounded of chalk and flint	Glacial till	Low
IGET-BH09	3.70	6.00	Stiff to very stiff slightly gravelly sandy CLAY. Gravel is angular to subangular of chalk and flint	Glacial till	Low
IGET-BH09	6.00	7.00	Stiff light grey slightly sandy gravelly CLAY with few cobbles. Gravel is angular to subangular of chalk and flint	Glacial till	Low
IGET-BH09	7.00	45.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH10	0.00	2.70	Very soft brown mottled grey silty fine to coarse SAND	Glacial sand	Low
IGET-BH10	2.70	5.20	Firm to stiff brown slightly gravelly sandy silty CLAY. Gravel is subangular to subrounded of various lithologies	Glacial till	Low
IGET-BH10	5.20	6.10	Medium dense greyish brown sandy very angular to subangular GRAVEL of mixed lithologies	Glaciofluvial	Low
IGET-BH10	6.10	7.00	Medium dense white very angular to angular GRAVEL of chalk and rare flint	Reworked bedrock	Low
IGET-BH10	7.00	30.50	Structureless CHALK	Chalk bedrock	Low

BH ID	Depth from (m)	Depth to (m)	Description	Interpretation	Priority
IGET-BH11	0.00	1.30	Very soft brown mottled grey silty CLAY	Alluvium	Medium
IGET-BH11	1.30	2.40	Soft brown slightly sandy CLAY	Alluvium	Medium
IGET-BH11	2.40	2.60	Soft brown silty CLAY	Alluvium	Medium
IGET-BH11	2.60	4.30	Loose brown silty fine to coarse SAND with occasional lenses of clay	Alluvium	Medium
IGET-BH11	4.30	5.30	Firm brown slightly gravelly sandy CLAY. Gravel is angular to subangular of chalk	Glacial till	Low
IGET-BH11	5.30	6.00	Light grey sandy angular to subangular fine to coarse GRAVEL of flint and chalk	Glaciofluvial	Low
IGET-BH11	6.00	7.00	Medium dense white clayey angular to subangular GRAVEL of chalk	Reworked bedrock	Low
IGET-BH11	7.00	8.00	Medium dense white clayey angular GRAVEL of chalk	Reworked bedrock	Low
IGET-BH11	8.00	30.00	Structureless CHALK	Chalk bedrock	Low
IGET-BH12	0.00	2.20	Firm dark reddish brown sandy gravelly CLAY. Gravel is angular to subangular of various lithologies	Glacial till	Low
IGET-BH12	2.20	4.30	Medium dense to dense yellowish brown very gravelly fine to coarse SAND. Gravel is angular to subrounded flint and chalk	Glaciofluvial	Low
IGET-BH12	4.30	6.50	Medium dense to dense white clayey angular to subrounded GRAVEL of chalk	Reworked bedrock	Low
IGET-BH12	6.50	30.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH13	0.00	2.00	Very soft grey sandy SILT	Alluvium	Medium
IGET-BH13	2.00	3.80	Firm dark grey slightly sandy slightly gravelly CLAY. Grave is angular to subangular of various lithologies	Glacial till	Low
IGET-BH13	3.80	6.00	Very dense grey sandy angular to subangular GRAVEL of chalk and flint	Glaciofluvial	Low
IGET-BH13	6.00	7.80	Very stiff white gravelly CLAY. Gravel is angular chalk and rare flint	Glacial till	Low
IGET-BH13	7.80	31.00	Structureless CHALK	Chalk bedrock	Low
IGET-BH14	0.00	0.50	Very soft dark grey mottled black silty CLAY with occasional pockets of pseudo-fibrous peat	Alluvium	Medium
IGET-BH14	0.50	1.00	Very soft grey slightly sandy silty CLAY	Alluvium	Medium
IGET-BH14	1.00	4.00	Firm to stiff dark grey mottled brown sandy gravelly CLAY. Gravel is angular to subrounded of various lithologies	Glacial till	Low
IGET-BH14	4.00	7.00	Medium dense sandy slightly clayey angular to subrounded GRAVEL of various lithologies	Glaciofluvial	Low
IGET-BH14	7.00	9.10	Loose becoming dense brown silty fine to coarse SAND	Glacial sand	Low
IGET-BH14	9.10	10.50	Loose brown silty fine to coarse SAND with occasional sandy clay lenses	Glacial sand	Low
IGET-BH14	10.50	12.00	Firm to stiff brown slightly sandy gravelly CLAY. Gravel is angular to rounded flint and chalk	Glacial till	Low
IGET-BH14	12.00	13.00	Grey mottled white sandy subangular to rounded GRAVEL of flint and chalk	Glaciofluvial	Low
IGET-BH14	13.00	30.50	Structureless CHALK	Chalk bedrock	Low
IGET-BH15	0.00	1.00	Very soft to soft slightly sandy silty CLAY	Alluvium	Medium

BH ID	Depth from (m)	Depth to (m)	Description	Interpretation	Priority
IGET-BH15	1.00	2.00	Very loose grey sandy silty angular to subangular GRAVEL of various lithologies	Glaciofluvial	Low
IGET-BH15	2.00	3.00	Soft to firm grey mottled black slightly sandy gravelly silty CLAY. Gravel is angular to subrounded of various lithologies	Glacial till	Low
IGET-BH15	3.00	5.50	Loose to medium dense grey sandy silty angular to subangular GRAVEL of various lithologies	Glaciofluvial	Low
IGET-BH15	5.50	6.00	Medium dense brown slightly sandy silty angular to subrounded GRAVEL of various lithologies	Glaciofluvial	Low
IGET-BH15	6.00	8.70	Medium dense grey mottled cream sandy angular to subangular GRAVEL of various lithologies	Glaciofluvial	Low
IGET-BH15	8.70	9.50	Stiff creamy white very gravelly CLAY. Gravel is angular chalk	Reworked bedrock	Low
IGET-BH15	9.50	30.50	Structureless CHALK	Chalk bedrock	Low

Appendix 3 – List of sub-samples requested for Stage 2 recording

Exploratory hole number	Sample depth - top (m)	Sample depth - base (m)	Sample type	WA review
IGET-BH01	0.00	0.50	B	Y
IGET-BH01	0.40		D	N
IGET-BH01	0.50	0.95	UT	Y
IGET-BH01	0.50	1.50	B	Y
IGET-BH01	0.95		D	N
IGET-BH01	1.50		D	N
IGET-BH01	1.50	2.00	B	Y
IGET-BH01	2.00	3.00	B	Y
IGET-BH01	2.50	2.95	UT	Y
IGET-BH01	2.95		D	N
IGET-BH01	3.50		D	Y
IGET-BH01	3.60	4.00	B	Y
IGET-BH02	0.00	0.50	B	Y
IGET-BH02	0.50	1.50	B	Y
IGET-BH02	0.50		D	N
IGET-BH02	0.60		D	N
IGET-BH02	2.00	2.50	B	Y
IGET-BH02	2.00		D	N
IGET-BH02	2.10		D	N
IGET-BH05	0.00	1.00	B	Y
IGET-BH05	0.50		D	N
IGET-BH05	1.00		D	N
IGET-BH05	1.00	2.00	B	Y
IGET-BH05	1.50		D	N
IGET-BH05	2.00	3.00	B	Y
IGET-BH05	2.50		D	N
IGET-BH06	0.00	1.50	B	Y
IGET-BH06	0.50		D	N
IGET-BH06	1.00		D	N
IGET-BH06	1.50		D	N
IGET-BH06	1.50	2.50	B	Y
IGET-BH06	2.50	3.10	B	Y
IGET-BH06	2.50		D	N
IGET-BH11	0.50		D	N
IGET-BH11	0.50	1.00	B	Y
IGET-BH11	1.00	2.00	B	Y
IGET-BH11	1.00		D	N
IGET-BH11	1.50		D	N

IGET-BH11	2.00		D	N
IGET-BH11	2.00	3.00	B	Y
IGET-BH11	2.50	2.95	UT	Y
IGET-BH11	3.00		D	N
IGET-BH11	3.00	4.00	B	Y
IGET-BH11	3.50		D	N
IGET-BH11	4.00		D	N
IGET-BH11	4.00	5.00	B	Y
IGET-BH13	0.00	0.60	B	Y
IGET-BH13	0.60		D	N
IGET-BH13	1.00	1.45	UT	Y
IGET-BH13	1.00	1.50	B	Y
IGET-BH13	1.45		D	N
IGET-BH13	2.00		D	Y
IGET-BH15	0.50	1.00	B	Y
IGET-BH15	1.00	2.00	B	Y
IGET-BH15	1.00		D	N
IGET-BH15	2.00		D	N
IGET-BH15	2.00	3.00	B	Y
IGET-BH15	3.00		D	N
Key: B - bulk sample; D - disturbed sample; UT - thin walled open tube sampler				

Appendix 4 – Stage 2 geoarchaeological recording

Site Code: 266162	Site Name: IGET MGA		Borehole ID: BH01		
Coordinates (NGR) X: 521330.00	Coordinates (NGR) Y: 415568.00		Level (top): -6.19		
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
1001	soft 7.5YR 2.5/1 SILT. occasional preserved organic material (brown woody detritus, whole stems) observed in 1.5-2, 2-3m bulk samples and in 0.95-1, 2.95-3m disturbed samples.	alluvium	0-3.50	-6.19 to -9.69	
1002	fairly friable fibrous black SILT. frequent woody detritus and whole leaves/seeds etc.	peat	3.50-3.60	-9.69 to -9.79	<1>
1003	as 1001, observed in 3.6-4m bulk sample.	alluvium	3.60-4.00	-9.79 to -10.19	

Site Code: 266162	Site Name: IGET MGA		Borehole ID: BH02	
Coordinates (NGR) X: 521440.00	Coordinates (NGR) Y: 415669.00		Level (top): -6.96	
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**
2001	soft 7.5YR 2.5/1 SILT. occasional to moderate preserved organic material (brown woody detritus and whole stems?) observed in 0-0.5, 0.5-1.5 bulk samples	alluvium	0-2.00	-6.96 to -8.96
2002	soft mixed mainly orange and some light grey SILT. occasional/moderate? preserved organic material (brown woody detritus and whole leaves?). possibly laminated only seen in this bag and D sample from 2.10m.	oxidised alluvium	2.00-2.50	-8.96 to -9.46

Site Code: 266162	Site Name: IGET Marine Geoarchaeological Assessment		Borehole ID: BH05	
Coordinates (NGR) X: 521837.00	Coordinates (NGR) Y: 415891.00		Level (top): -9.95	
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**
5001	soft 2.5Y 2.5/1 sandy (fine) SILT.	alluvium	0-3.00	-9.95 to -12.95

Site Code: 266162	Site Name:	Borehole ID: BH06

	IGET Marine Geoarchaeological Assessment	
Coordinates (NGR) X: 521974.00	**Coordinates (NGR) Y:** 415955.00	**Level (top):** -10.32

Context Number	Description	Interpretation	Depth m bgl	Depth m OD
6001	soft dark brown/black SILT. possibly laminated. firm orange SILT in 1m D sample.	alluvium	0-1.50	-10.32 to -11.82
6002	soft black SILT. frequent woody detritus and whole leaves, twigs/stems. organic woody smell.	alluvium	1.50-2.50	-11.82 to -12.82

Site Code: 266162	Site Name: IGET Marine Geoarchaeological Assessment	Borehole ID: BH11
Coordinates (NGR) X: 522145.12	**Coordinates (NGR) Y:** 416154.57	**Level (top):** -16.30

Context Number	Description	Interpretation	Depth m bgl	Depth m OD
11001	soft 7.5YR 2.5/1 SILT. becoming sandy (fine to medium) SILT with depth (3-4m bag is sandier). 1-2 and 2-3m bags seem to have lost a lot of sediment.	alluvium	0-3.50	-16.30 to -19.80
11002	firm brownish grey silty CLAY. occasional to moderate small to large subrounded pebbles and small to medium stones (chalk), occasional pea gravel. appears in 3.50m SPT and 4-5 bulk bag (3-4m bulk bag is very wet and doesn't have much sediment in it).	glacial till	3.50-5.00	-19.80 to -21.30

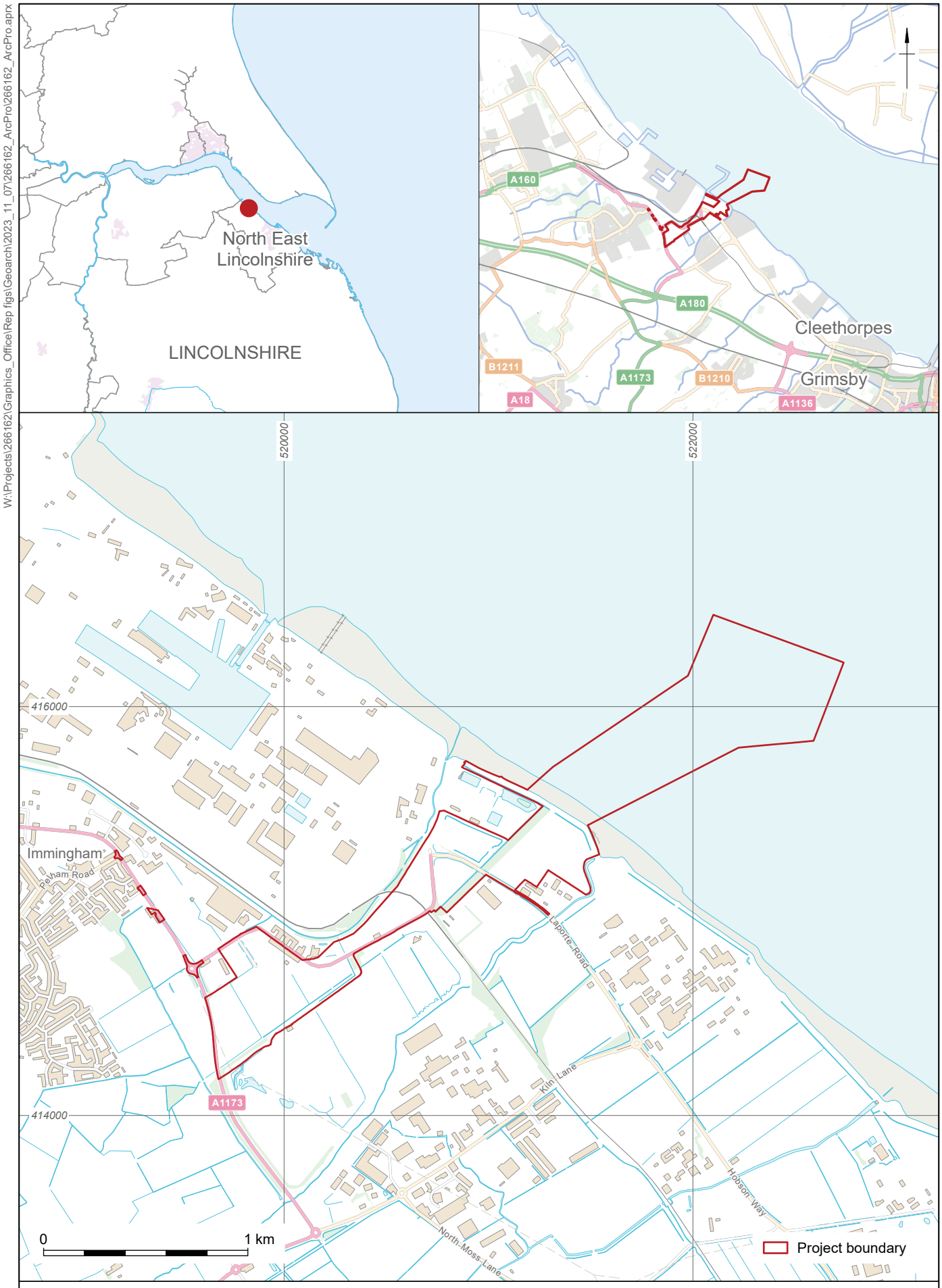
Site Code: 266162	Site Name: IGET Marine Geoarchaeological Assessment	Borehole ID: BH13
Coordinates (NGR) X: 522372.74	**Coordinates (NGR) Y:** 416065.98	**Level (top):** -15.28

Context Number	Description	Interpretation	Depth m bgl	Depth m OD
13001	soft 7.5YR 2.5/1 sandy (fine) SILT. occasional preserved organic material (woody detritus). sand might be pockets, impossible to tell from bags.	alluvium	0-2.00	-15.28 to -17.28

Site Code: 266162	Site Name:	Borehole ID: BH15

	IGET Marine Geoarchaeological Assessment	
Coordinates (NGR) X: 521865.00	**Coordinates (NGR) Y:** 415842.00	**Level (top):** -11.05

Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**
15001	soft 7.5YR 2.5/1 SILT.	alluvium	0-1.00	-11.05 to -12.05
15002	sticky dark grey/black silty CLAY. moderate to frequent small to large subrounded, occasionally subangular pebbles and stones (chalk and occasional quartz).	glacial till	1.00-3.00	-12.05 to -14.05



Coordinate system: OSGB 1936 British National Grid

Date: 13/11/2023	Created by: AW	Revision: 0	Scale: 1:25,000 at A4

Figure 1: Location of Immingham Green Energy Terminal (IGET) study area

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521500

522000

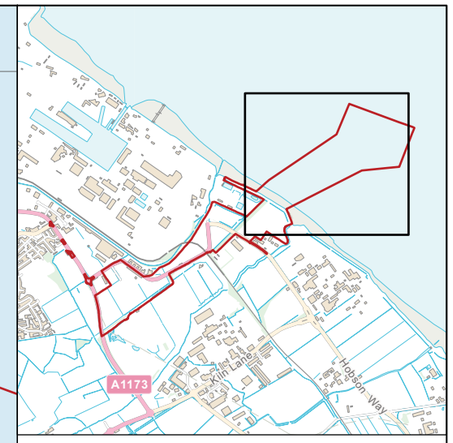
522500

416500

416000

415500

266162_BH11
266162_BH10
266162_BH12
266162_BH13
266162_BH08
266162_BH09
266162_BH07
266162_BH14
266162_BH06
266162_BH05
266162_BH15
266162_BH04
266162_BH03
266162_BH02
266162_BH01



Project boundary

Borehole locations

0 250 m

Date: 13/11/2023 | Created by: AW

Scale: 1:5,000 at A3 | Revision: 0

Figure 2: Location of boreholes

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521500

522000

522500

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416000

415500

266162_BH11

266162_BH10

266162_BH12

266162_BH13

266162_BH08

266162_BH09

266162_BH07

266162_BH14

266162_BH06

266162_BH05

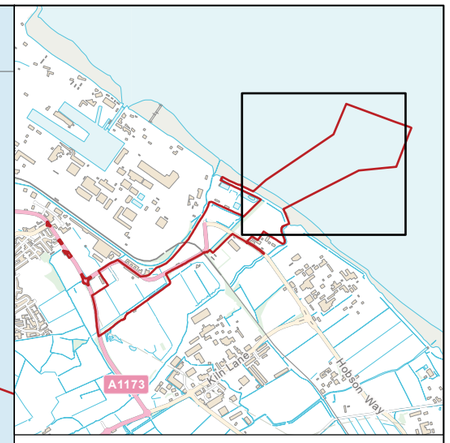
266162_BH15

266162_BH04

266162_BH03

266162_BH02

266162_BH01



Project boundary

Geoarchaeological priority

- High
- Medium
- Low

0 250 m

Coordinate system: OSGB 1936 British National Grid

Date: 13/11/2023	Created by: AW
Scale: 1:5,000 at A3	Revision: 0

Figure 3: Geoarchaeological priority

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521500

522000

522500

416500

416000

415500

266162_BH11
266162_BH10
266162_BH12
266162_BH13
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266162_BH07
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266162_BH06
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266162_BH02
266162_BH01

7500
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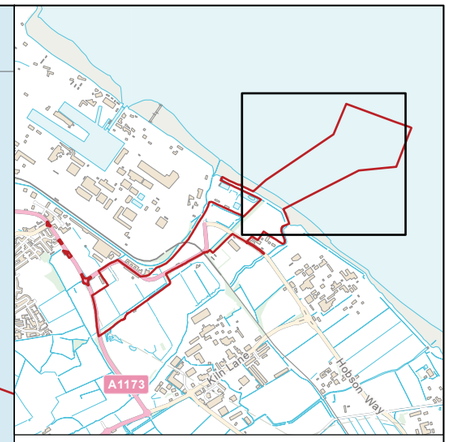
7502
7503



Project boundary
Borehole locations

Palaeogeographic Features
Channel (MBES)
Channel (SBP)
Peat outrop

0 250 m

Coordinate system: OSGB 1936 British National Grid

Date: 13/11/2023	Created by: AW	
Scale: 1:5,000 at A3	Revision: 0	

Figure 4: Interpretation of palaeolandscape features from sub-bottom profiles

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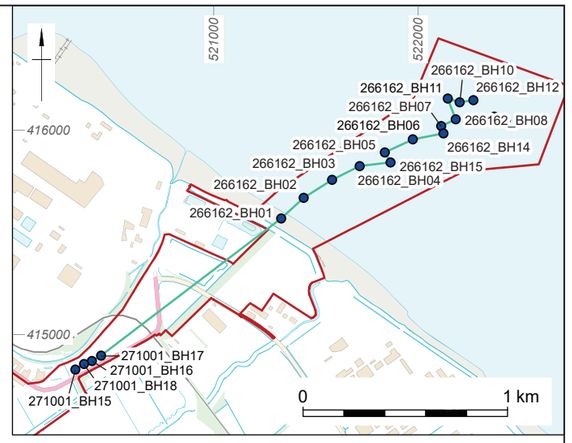
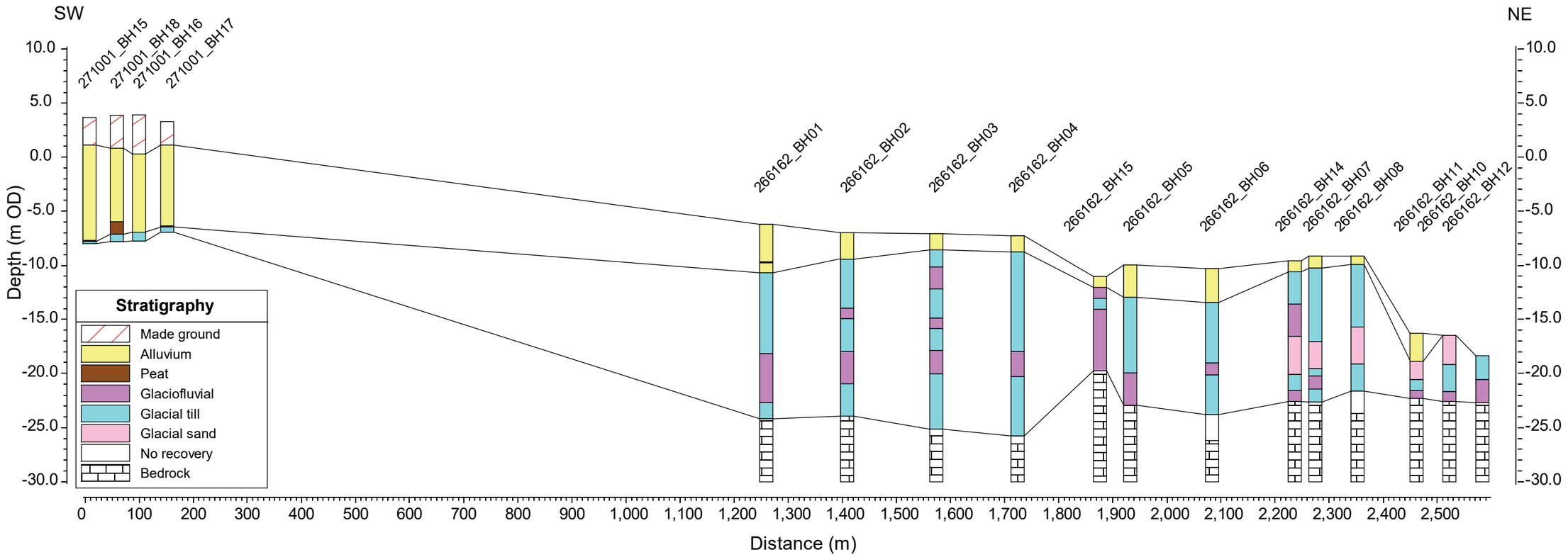


Project boundary
Borehole locations
Transect location



Date: 08/11/2023	Created by: AW	Revision: 0	Scale: Inset 1:30,000 at A3

Figure 5: Transect across the onshore and offshore extent of IGET

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