

East Anglia THREE

Appendix 17.2

Archaeological Review of Geophysical and Geotechnical Data: Technical Report

Environmental Statement

Volume 3

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17.2 ARCHAEOLOGICAL REVIEW OF GEOPHYSICAL AND GEOTECHNICAL DATA TECHNICAL REPORT

17.2.1 Methodology

17.2.1.1 Data Sources

1. Wreck and obstruction data within the East Anglia THREE site and the offshore cable corridor (i.e. the Study Area) were supplied by SeaZone and a National Record of the Historic Environment (NRHE) search was carried out prior to the assessment. Any records located within study area were integrated with the geophysical results during the grouping stage outlined in section 1.2.4. Further background information was obtained previous archaeological investigations (Wessex Archaeology 2012).
2. Any sites, either previously recorded in these databases or identified during this geophysical assessment, which are located outside of the study area are deemed beyond the scope of the current project and are subsequently not included in this report.
3. The geophysical survey data comprised sidescan sonar, magnetometer, single-beam and multibeam echosounder and sub-bottom profiler data. The geophysical data used for this report were assessed for quality and each system rated using the following criteria:

Table 1.1 Criteria for assigning data quality rating

Data Quality	Description
Good	Data which are clear and unaffected by weather conditions or sea state. The dataset is suitable for the interpretation of standing and partially buried metal wrecks and their character and associated debris field. These data also provide the highest chance of identifying wooden wrecks and debris.
Average	Data which are affected by weather conditions and sea state to a slight or moderate degree. The dataset is suitable for the identification and partial interpretation of standing and partially buried metal wrecks, and the larger elements of their debris fields. Wooden wrecks may be visible in the data, but their identification as such is likely to be difficult.
Variable	This category contains datasets with the quality of individual lines ranging from good to average to below average. The dataset is suitable for the identification of standing and some partially buried metal wrecks. Detailed interpretation of the wrecks and debris field is likely to be problematic. Wooden wrecks are unlikely to be identified.

4. The sidescan sonar data have been rated as “Good” using the above criteria. The data quality and positioning was found to be of a generally high standard with some

lines showing signs of weather noise but on the whole suitable for archaeological assessment.

5. The magnetometer data were rated as “Variable” from an archaeological perspective using the above criteria. The magnetometer data appeared to be highly affected by the geological composition of the site. There are abundant sand waves, sand megaripples and sand banks that have affected the magnetometer data as background noise which has the potential to hide and mask smaller potential archaeological anomalies and thus made identification more difficult.
6. The multibeam bathymetry data have been rated as “Good”.
7. The sub-bottom profiler (sparker) data have been rated as “Average” using the above criteria. Good penetration was achieved with reflectors generally clearly visible, though a high degree of swell was identified on a number of lines which could not be completely removed during processing. However this did not detrimentally affect the data to a significant degree and it is still deemed suitable for archaeological interpretation.
8. WA processed and assessed all of the sidescan sonar and magnetometer data within the study area. The multibeam bathymetry data were processed and assessed over all wreck locations and sea bed features of potential archaeological interest identified in the sidescan sonar and magnetometer data. The sub-bottom profiler data were assessed on every 5th main line of data, giving 20% coverage of the study area. To aid in the interpretation of features and ensure consistency of interpretation between the main lines, cross lines were also interpreted over any identified palaeolandscape features of possible archaeological potential.

17.2.1.2 Geophysical Data – Technical Specifications

9. The geophysical datasets from East Anglia THREE were acquired by EMU Limited (EMU) and were obtained between 19th June and 4th September 2012 on board the survey vessel *MV Aurelia*. The datasets consisted of sidescan sonar, magnetometer, single-beam and multibeam echosounder, and pinger and sparker sub-bottom profilers (EMU Ltd 2013).
10. The sidescan sonar equipment used was an EdgeTech 4200-FS (600/300 kHz) with a range of 75m. The sidescan sonar data were digitally recorded and provided to WA as *.xtf* files.
11. The magnetometer equipment used was a Geometrics G-882 magnetometer initially, which was then later replaced by a Marine Magnetics SeaSPY magnetometer. On the 29th August the Geometrics G-882 magnetometer was found to be defective and

was deemed unusable for further survey operations. This was then replaced with the on-board reserve Marine Magnetics SeaSPY magnetometer. The magnetometer data were digitally recorded and provided to WA as .txt files.

12. The multibeam echosounder system deployed was a moon pool-mounted R2Sonic 2024 (300 kHz head). The multibeam bathymetry data were digitally recorded and provided to WA as ungridded .xyz files and gridded SD files.
13. The sub-bottom profiler equipment used were a Geo-Spark 200 source with 24 element single channel hydrophone receiver (sparker) and a SES digital sub-bottom profiler (pinger) system. The sub-bottom profiler data were digitally recorded and provided to WA as .sgy files. Only the sparker data were used for the archaeological assessment as, though lower in resolution, better penetration was achieved with this system.
14. Both the primary and secondary positioning used for the survey was a Fugro StarPack GNSS receiver with Starfix G2 differential corrections. All positions were recorded and expressed as WGS84 UTM Zone 31N.
15. Summaries of the geophysical equipment used during the East Anglia ONE and offshore cable corridor surveys can be found in Wessex Archaeology (2012).

17.2.1.3 Geophysical Data – Processing

16. The sidescan sonar data were processed by WA using Coda GeoSurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were initially scanned to give an understanding of the geological nature of the area and were then interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies within Coda by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference (Appendix 17.3).
17. A mosaic of the sidescan sonar data is produced during this process to assess the quality of the sonar towfish positioning. No separate corrected navigation files were provided as the .xtf files had already been merged with the corrected navigation POS files. The corrected navigation within the mosaic allows the position of anomalies to be checked between different survey lines and for the layback values to be further refined.
18. The form, size, and/or extent of an anomaly is a guide to its potential to be an anthropogenic feature, and therefore of its potential archaeological interest. A single, small, but prominent anomaly may be part of a much more extensive feature

that is largely buried. Similarly, a scatter of minor anomalies may define the edges of a buried but intact feature, or it may be all that remains of a feature as a result of past impacts from, for example, dredging or fishing.

19. The magnetometer data were processed by WA using Geometrics MagPick software in order to identify any discreet magnetic contacts which could represent buried metallic debris or structures such as wrecks.
20. The software enables both the visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. The data were first smoothed to try and eliminate the observed spiking. A trend was then fitted to the resulting data, and the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal variation in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies, and individual anomalies tagged and images taken in a similar process to that undertaken for the sidescan sonar data.
21. The magnetometer data was found to be highly affected by the geological properties of the Study Area as well as the highly mobile sand waves and ripples present across the survey area. These geological trends in the data created difficulties when trying to identify individual magnetic anomalies, particularly small isolated ferrous targets, which are indistinct against the high and often large background amplitude trends from natural features.
22. The multibeam bathymetry data were analysed to identify any unusual sea bed structures that could be shipwrecks or other anthropogenic debris. This was correlated with the sidescan sonar and magnetometer interpretation. The data were analysed using Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of sea bed anomalies. Data were gridded to 1m.
23. The sub-bottom profiler data were studied in order to detect any in-filled palaeochannels, ravinement surfaces and peat/fine-grained sediment horizons that may have archaeological potential. An initial interpretation comprising 20% of the collected lines was initially undertaken, with additional lines (specifically the cross lines) interpreted around any identified features of possible archaeological potential.
24. The sub-bottom profiler data were processed by WA using Coda Seismic+ software. This software allows the data to be visualised with user selected filters and gain settings in order to optimise the appearance of the data for interpretation. The software then allows an interpretation to be applied to the data by identifying and selecting a sedimentary boundary that might be of archaeological interest.

25. The sub-bottom profiler data were interpreted with a two-way travel time (TWTT) along the z-axis. In order to convert from TWTT to depth, the velocity of the seismic waves was estimated to be 1,600ms⁻¹. This is a standard estimate for shallow, unconsolidated sediments.
26. Any small reflectors which appear to be buried material such as a wreck site covered by sediment were also recorded, the position and dimensions of any such objects noted in a gazetteer, and an image of each anomaly acquired. It should be noted that anomalies of this type are rare, as the sensors must pass directly over such an object in order to produce an anomaly.

17.2.1.4 Geophysical Data – Anomaly Grouping and Discrimination

27. The previous section describes the initial interpretation of all available geophysical data sets which were conducted independently of each other. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different data sets and apparently overstating the number of archaeological features in the study area.
28. To address this fact the anomalies were grouped together along with the results of the desk-based study of known archaeological sites. This allows one ID number to be assigned to a single object for which there may be, for example, a UKHO record, a magnetic anomaly and multiple sidescan sonar anomalies.
29. For sea bed anomalies previously identified within the Study Area, the unique ID number has been retained from the 2012 ZEA assessment (*Appendix 17.3*) and is discussed in this report. Also, previously identified anomalies have been re-assessed based on the recent dataset.
30. For the palaeogeographic interpretation, only previously identified features that coincide with features identified using the more recent, higher resolution data have been included within the results. Any such features are recorded in *Appendix 17.3*.
31. Once all the geophysical anomalies and desk-based information have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. For anomalies located on the sea bed, these flags are ascribed as follows:

Table 1.2 Criteria Discriminating Relevance of Seabed Features to Proposed Scheme

Non-Archaeological	U1	Not of anthropogenic origin
	U2	Known non-archaeological feature
	U3	Non-archaeological hazard
Archaeological	A1	Anthropogenic origin of archaeological interest
	A2	Uncertain origin of possible archaeological interest

	A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly
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32. Similarly, the discrimination flags applied to shallow geological features of possible archaeological potential are ascribed as follows:

Table 1.3 Criteria Discriminating Relevance of Palaeogeographic Features to Proposed Scheme

Non-Archaeological	U2	Feature of non-archaeological interest
Archaeological	P1	Feature of probable archaeological interest, either because of its palaeogeography or likelihood for producing palaeoenvironmental material
	P2	Feature of possible archaeological interest

33. The grouping and discrimination of information at this stage is based on all available information and is not definitive. It allows for all features of potential archaeological interest to be highlighted, while retaining all the information produced during the course of the geophysical interpretation and desk-based assessment for further evaluation should more information become available.

17.2.2 Seabed Features Assessment

17.2.2.1 Introduction

34. The results of this assessment are collated in gazetteer format and detailed in *Appendix 17.3* and are illustrated in *Figures 17.13, 17.14 and 17.15*. Twelve UKHO records are located within the current Study Area.
35. A total of 2334 anomalies of archaeological potential have been identified within the East Anglia THREE area and along the entire proposed offshore cable corridor route. This includes 3 wreck sites that are located just outside of the study area boundaries, but at least part of the recommended 100m Exclusion Zones within the study area (see *Chapter 17, section 17.3.3, Table 17.5*).
36. It also includes 136 A1 and A2 anomalies that were identified during the ZEA phase of works that were assessed and grouped by WA (WA, 2012). On review of the 2013 geophysical data a number of these anomalies were re-classified as probable natural features. As the current dataset is of higher quality and has a greater coverage than previous surveys this was primarily used for the identification and archaeological discrimination of anomalies.
37. Additionally, this also includes 1457 anomalies that are located within the previous East Anglia ONE site and along the East Anglia ONE offshore cable corridor route.

These anomalies have been described within a previous report (Wessex Archaeology 2012) and as such are not dealt with in detail here. However, they are still included within the gazetteer in *Appendix 17.3* and illustrated within *Figures 17.13 to 17.15*.

38. Due to this, a total of 877 geophysical anomalies of archaeological potential are actually present within the East Anglia THREE site and offshore cable corridor. These have been classified as A1, A2 or A3 archaeological potential as per *Table 1.2*.
39. It should be noted that no sidescan sonar, magnetometer or multibeam bathymetry data beyond the immediate study area has been assessed and as such there is the potential for remains of archaeological interest to be present on the sea bed beyond the East Anglia THREE survey area that are not mentioned in this report.
40. For convenience, the discussion of anomalies has been divided by area into the East Anglia THREE site and the East Anglia THREE offshore cable corridor. As previously stated, any anomalies that are situated within the EA ONE site or along the East Anglia ONE offshore cable corridor are not discussed in this report, and instead are detailed in Wessex Archaeology (2012).

17.2.2.2 Summary Results – East Anglia THREE

41. A total of 412 anomalies of archaeological potential have been identified within the East Anglia THREE site, which are summarised below. The anomalies have then been divided into their classifications and described accordingly:

Table 1.4 Sites of Archaeological Potential – East Anglia THREE

Archaeological Discrimination	Number of anomalies	Interpretation
A1	8	Anthropogenic origin of archaeological interest
A2	400	Uncertain origin of possible archaeological interest
A3	4	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	412	

42. Furthermore, these sites of potential archaeological interest can be classified by probable type, which can further aid in assigning archaeological potential and importance:

Table 1.5 Types of Anomalies Identified – East Anglia THREE

Anomalies Classification	Number of Anomalies
Recorded Wreck/Obstruction	4
Wreck	8
Debris	70

Anomalies Classification	Number of Anomalies
Debris Field	27
Bright Reflector	1
Dark Reflector	72
Rope/Chain	7
Seafloor Disturbance	4
Magnetic Anomaly	217
Mound	2
Total	412

43. The gazetteers for all 412 features are included in **Appendix 17.3**. Locations of all features and example images of a variety of feature types are shown in **Figures 17.13 to 17.15**.

17.2.2.2.1 Recorded Wrecks

44. **71005, 71013, 71014, 71015** and **78160** are all categorised as A3 recorded wreck sites, which are historic records of possible archaeological interest where no corresponding geophysical anomaly has been identified in this phase or previous geophysical surveys.

17.2.2.2.2 Wreck 71012

45. This is the remains of the HMS *Fitzroy* identified on the central western edge of East Anglia THREE; this vessel is protected by the PMRA (**Figure 17.16**). The remains consist of hull and deck superstructure present as distinct hard edged dark reflectors with large shadows. The wreck appears to be chiefly intact and upright on an area of the sea bed with frequent sand waves and could be partially buried beneath mobile sediments. The wreck has dimensions of 70.5m x 15.3m x 5.5m.
46. There is large scouring present in the sandy sediments to the north and south of this vessel. The southern end of the vessel looks to be reasonably well intact, either the stern or bow end, visible as a hard edged thick linear anomaly in the sidescan sonar data. There is also a large amount of scattered debris surrounding the wreck (**76017, 76018, 76019, 76020, 76022, 76026** and **76027**). The wreck has an associated magnetic anomaly measuring 2409nT visible as a large distinctive dipole anomaly across survey two lines.
47. In the bathymetry data this wreck is discernible as possibly lying on its keel with some visible super-structure. It is orientated approximately north by south and located in an area of sand ripples. The UKHO records this vessel as a British minesweeper of 710 gross tons measuring 70.4m in length, 8.5m in beam and 2.1m in draught (SeaZone 11058). The HMS *Fitzroy* was built in 1919 and was sunk by a

mine off Great Yarmouth on the 27th May 1942. The remains of the wreck are described by the UKHO as being partially buried and partially broken up. This is recorded as a Live wreck.

17.2.2.2.3 Wreck 71016

48. **71016** is a very well preserved medium sized wreck located in the north western section of the East Anglia THREE site (**Figure 17.17**). This wreck was also identified in the ZEA. The wreck has easily visible and distinguishable hull and deck superstructure discernible in the sidescan sonar data. These appear as linear and rectangular dark reflector anomalies with shadows. The wreck appears to be well preserved and intact lying upright on the sea bed and orientated east to west. The dimensions of the vessel are 23.3m x 8.5m x 4.5m height. The southern edge of the hull is partially buried by the highly mobile sediments. The wreck itself and resultant sand banks have created a large and bright shadow in the sidescan sonar imagery.
49. There is a large amount of scouring associated with this wreck particularly to the north of the remains with a scour mark measuring over 100m recorded. The southern area of the wreck has a build-up of sediment and sand waves. These mobile sands could potentially be covering a large amount of associated wreck debris and cargo. The wreck is clearly visible in the multibeam bathymetry data. This vessel has a large magnetic dipole anomaly associated with it measuring 96nT which suggests that it is likely of metal construction or contains ferrous cargo.
50. The wreck is recorded in the UKHO database as an unknown wreck, first detected in 1995 (SeaZone 11266). The wreck is associated was a small magnetic deflection and survey data indicates that the wreck is intact and upright with site dimensions of 20m x 5m x 3.1m and a scour depth of 1.2m, comparable to the latest dataset. This wreck is recorded as a Live wreck.

17.2.2.2.4 Wreck 76056

51. **76056** is an unrecorded possible wreck remains identified in the north western section of the East Anglia THREE site in both the sidescan sonar and multibeam bathymetry datasets (**Figure 17.18**). The anomaly is visible as a set of linear hard edged dark reflectors with shadows, arranged in a 'cross' like formation. The anomaly has dimensions of 17.5m x 12.8m x 0.8m. There are smaller hard edged debris pieces within and around the main structural elements. The anomaly is located in between large sand waves and as such could be partially buried or has associated buried debris remains in the vicinity. There is no visible scouring associated with this wreckage and no magnetic anomaly has been identified in the vicinity of these remains which suggests it is not of ferrous construction.

52. This possible wreck looks to be moderately well preserved and intact with no obvious signs of dispersed debris. This is not recorded in either the SeaZone or historical records.

17.2.2.2.5 Wreck 71008

53. **71008** is an unknown recorded wreck comprising a large expanse of very broken up and dispersed structural and debris remains located in the central southern section of the East Anglia THREE site (**Figure 17.19**). This wreck was also identified in the ZEA dataset. The wreck has dimensions of 33m x 10.3m x 3m. From the sidescan sonar data, distinct, hard edged linear and curvilinear dark reflector anomalies with shadows are visible of various lengths and sizes. A possible hull edge is clear on one of the sidescan sonar survey lines. Smaller rectangular and circular possible structural debris and cargo anomalies can be seen both within the main expanse of the wreckage and also surrounding it in the sandy sediments up to 300m away to the south of the main wreckage (**76096; 76099; 76100; 76101; 76102; 76103; 76104** and **76105**). There is a very large negative monopole magnetic anomaly associated with this wreck measuring 346nT suggesting a ferrous construction.
54. This area of the sea bed has frequent large and mobile sand waves which could potentially be covering more pieces of debris and cargo associated with this wreck. The wreck is orientated NNE-SSW with no obvious scouring identified.
55. The UKHO records this as an unknown wreck first detected in 1995 with site dimensions of 40m x 8m x 4.9m (SeaZone 11260). The wreck is recorded as being associated with a strong magnetic anomaly and has a debris field in its southern extent. This is recorded as a Live wreck. The difference in dimensions between previously recorded data and the latest data may be due to subsequent burial by sea bed sediments.

17.2.2.2.6 Wreck 76145

56. This is a possibly unrecorded small spread of potential wreck remains located in the central section of the East Anglia THREE site (**Figure 17.20**). The remains have dimensions of 10.1m x 7.8m x 1.8m and are visible in the sidescan sonar data as a small group of hard edged dark reflector anomalies with bright shadows in a uniform alignment. Parallel and opposing hard edged linear dark reflectors are visible that may represent structural elements/remains. There is a possible associated debris field located immediately to the southwest of the wreckage (**76147**) comprising six hard edged small dark reflector anomalies, one with a shadow and the largest anomaly measuring 1.6m. There is also a possible piece of associated debris located 65m to the west of the wreck (**76146**). The full size and extent of the wreckage is not clear as it appears that it has either been highly degraded or buried by the

surrounding mobile sand sediments and sand waves. There is some slight scouring present to the north of the remains. There is no magnetic anomaly in the vicinity of this wreckage which suggests it is composed of non-ferrous material.

17.2.2.2.7 Wreck 70911

57. **70911** is a discreet wreck remain located in the northern section of East Anglia THREE (**Figure 17.21**). The remains appear quite diffuse in the sidescan sonar data comprising curvilinear dark reflectors with bright shadows. One side of the hull outline is visible as a diffuse anomaly; however the wreck looks to be partially buried by mobile sands and is located in a highly uneven area of the sea bed. The wreckage has dimensions of 31.3m x 8.1m x 1.1m. This has a medium-large magnetic anomaly associated with it measuring 49nT suggesting ferrous material is present. The wreck remains are visible in the bathymetry data as an elongated mound in area of sand ripples and is orientated approximately southwest by northeast.
58. The UKHO record this as an unknown wreck, first detected in 1995 (SeaZone 11268). Survey data indicates the presence of an entire wreck, intact and upright, with small areas of minor debris surrounding the wreck. The wreck is orientated NNE-SSW and has recorded dimensions of 35m x 5m x 1.4m, which is comparable to the latest dataset. A significant magnetometer deflection has been associated with this wreck and it is recorded as a Live wreck.

17.2.2.2.8 Wreck 71017

59. **71017** is the location of a wreck, but it is only observed as a seafloor disturbance in the geophysical data, this was also identified in the ZEA (**Figure 17.22**). This is a curious looking large seafloor disturbance anomaly on a very uneven and sand wave rich part of the sea bed which might conceal possible buried wreck remains. The anomaly has dimensions of 112.2m x 38.1m x 1.7m and comprises a scattering of small dark reflectors, some with shadows and some without. These are visible as hard edged anomalies on a rough and uneven part of the sea bed. There is a medium sized magnetic anomaly associated with these remains measuring 28nT which suggests ferrous material is present.
60. The UKHO describes this as an unidentified live wreck detected in 1995 with dimensions of 36m x 13m x 2.1m (SeaZone 11267). The survey data indicates that this is an entire wreck broken in two pieces lying some 20m apart and aligned southeast by northwest. The wreck is associated with a large magnetometer deflection.

17.2.2.2.9 Wreck 71020

61. **71020** is an unidentified wreck made up of dispersed remains located in the very northern extent of the East Anglia THREE site. The wreck remains comprise tens of hard edged and diffuse dark reflectors with shadows which are visible as individual structural elements making up the highly broken up and abraded remains on the sea bed. The wreck has dimensions of 58.7m x 24.7m x 1.6m. This area of the sea bed has frequent sand waves, which could be concealing more of the wrecks structure and possibly associated debris and/or cargo. There is a very large magnetic anomaly associated with this wreck measuring 7682nT.
62. The UKHO record this as an unknown wreck that was first detected in 1995 (SeaZone 11212). The vessel has recorded dimensions of 36m x 20m x 1.4 m and the survey data indicates the presence of an entire wreck lying approximately NE-SW to the south-west of a shoaler sand wave, the crest of which is generally 1m higher than the wreck. This is recorded as a Live wreck. The difference in dimensions between 1995 data and 2013 data could be due to exposure of the wreck due to mobile sea bed sediments.

17.2.2.2.10 Debris

63. There are **70** pieces of debris recorded within the East Anglia THREE site (see **Appendix 17.3**). All of these pieces of debris have been assigned an archaeological potential rating of A2 due to their anthropogenic appearance and characteristics. The anomalies vary in size and character and are described in **Appendix 17.3**. A selected range of these debris remains are described below.
64. The smallest piece of debris identified in the East Anglia THREE site is **76101** interpreted to be associated debris from recorded wreck **71008**. The debris has dimensions of 0.6m length, 0.5m width and no measurable height. This appears as a small, rectangular shaped dark reflector with no shadow in the sidescan sonar data and is interpreted as being likely wreckage or cargo swept away from the vessel, situated 50m from the remains. There are a number of pieces of debris inferred to be associated with this wreck identified within 100m of the remains (**76096**, **76099**; **76100**; **76102**; **76103**; **76104** and **76105**). Magnetic fluctuations have been recorded over this wreck site and as such some of these debris remains could be composed of ferrous material.
65. The largest piece of debris recorded on site is located in the central western extent of the East Anglia THREE site (**76083**). The debris remains have dimensions of 19.4m length, 1.3m width with no measurable height and is isolated on a rough and sand wave rich part of the sea bed. The remains are visible as a long and irregular shaped diffuse dark reflector with no shadow. The debris is located perpendicular to the sand waves and looks as though it could be broken up or partially buried by sandy

- sediments. This debris has a medium sized magnetic anomaly associated with it and as such could be made up of ferrous material.
66. There are 17 pieces of debris that are inferred to be associated with three separate wreck remains within the East Anglia THREE site as described above (**71008**; **71012** and **76145**).
 67. Eight further pieces of debris have been grouped with magnetic anomalies (see **Appendix 17.3**). **76060** is a curvilinear piece of debris that is possibly broken in two or partially covered by sand waves. This has dimensions of 5.3m length, 1m width and 0.5m height and has a small but distinct associated magnetic dipole measuring 17nT.
 68. **76155** has dimensions of 5.7m length, 1.3m width and a height of 0.1m. The debris appears as a hard edged, thick linear dark reflector with a 'hook' like end and short, discreet shadow in the sidescan sonar data. The debris is isolated on a sandy and sand wave rich area of the sea bed with a magnetic value of 14nT recorded suggesting ferrous material is present.
 69. **76185** looks to be a broken up piece of debris, visible as a hard edged, right angled linear anomaly with a bright shadow. The debris has dimensions of 7.7m length, 0.6m width and 0.3m height measurement and is isolated on a sand wave rich area of the sea bed. This anomaly has a small magnetic value of 9nT associated with it suggesting it may be ferrous debris.
 70. Five further debris remains have associated magnetic anomalies (**76138**; **76077**; **76096**; **70864** and **70901**). As above, little detail can be said of the characteristics of these remains, but due to their ferrous content they have all been classified as debris. The largest of these (**76077**) has a magnetic amplitude of 165nT visible as a thin and distinct large dipole anomaly present on one survey line in the magnetic profile. The dark reflector has dimensions of 2m length, 0.6m width and a height of 0.2m and is visible in the sidescan sonar data as a hard edged rectangular anomaly with a short and bright shadow. The dark reflector is anomalous to the surrounding sea bed and located in between sand waves and likely to be a ferrous object.
 71. **76138** is located in the centre of the East Anglia THREE site and appears as a hard edged rectangular object in the sidescan sonar data. The anomaly has a very short but bright shadow and has dimensions of 1.7m length, 0.4m width and a height of 0.1m. The magnetic anomaly grouped with this target has an amplitude of 22nT and could indicate the debris is made of ferrous material.

72. **76096** is possibly associated with wreck **71008** situated 190m to the southwest of the vessels southern boundary. Though this is some distance the debris could have become separated from the wreck during its sinking or resultant of the highly mobile currents in the area. The debris has dimensions of 2m length, 0.6m width and a height of 0.3m. The debris is a solid, hard edged oval anomaly visible as a dark reflector with a small shadow and is situated between sand waves with a magnetic value of 13nT indicating it could be ferrous material.
73. **70864** was originally identified in the ZEA phase of works on site and is located on the very western extent of the East Anglia THREE survey area. The anomaly has dimensions of 4.1m length, 0.9m width and 0.3m height with an associated weak magnetic amplitude of 14nT. The debris appears as a hard edged slightly linear shaped dark reflector with shadow that is isolated on an area of the sea bed with large sand waves present. There is some slight scouring and/or a depression located to the east and west of the remains.
74. **70901** is located in the centre of the East Anglia THREE site, the anomaly is visible as an irregular shaped linear dark reflector with height with dimensions of 12.6m length, 1.9m width and a height of 0.1m. This debris was identified in the ZEA phase of works and not in the most recent sidescan sonar dataset and could have since been buried by mobile sediments. There is a magnetic anomaly of 16nT associated indicating a possible buried ferrous feature.

17.2.2.2.11 Debris Fields

75. There are **27** debris fields identified within the East Anglia THREE site (see **Appendix 17.3**). The smallest of these is **76153** with dimensions of 5.4m length, 2.5m width and no measurable height. The debris field comprises five short and thick linear dark reflectors with no shadows that appear to be in a horizontal alignment. The remains look anthropogenic and are isolated on an area of the sea bed with frequent sand waves. There is no associated magnetic anomaly in the vicinity of these remains and they are not identifiable on the bathymetry data.
76. The largest debris field identified (**76095**) has dimensions of 90.5m length, 4.2m width and 0.3m height. This is a large expanse of seven hard edged dark reflector anomalies with shadows in a vertical alignment across sand waves, the majority of which are thick linear debris pieces. More remains of this debris field could be covered by the sandy sediments. There is a large magnetic anomaly associated measuring 46nT which would suggest some or all of the remains are ferrous material. Debris field **76094** is very similar in appearance and appears to be vertically aligned to the north of **76095** indicating that they could be possible extensions of the

same feature, the total length of which would be approximately 190m. This could be possible exposed cable remains.

77. Two debris fields have been associated with wreck remains (**76105** and **76147**). **76105** is tentatively related to wreck **71008** as it is located 140m south of the vessel. Given the highly mobile currents and sediment movement it is possible that this group of debris has come from the wreck remains. The debris field has dimensions of 12.1m length, 2.5m width and height of 0.5m and comprises three chief pieces of debris. All of these are irregular shaped hard edged dark reflectors with shadows.
78. **76147** is a spread of debris remains immediately adjacent to wreck **76145**. The debris field has dimensions of 25.6m length, 4.8m width and height of 0.1m and comprises approximately six hard edged small dark reflector anomalies, only one of which has a shadow present. The largest debris piece is 1.6m length and they all have a rectangular shaped appearance in the sidescan sonar data.
79. In addition to **76095** there are two debris fields that contain possible ferrous material (**76167** and **76123**). **76167** is a medium sized debris field with dimensions of 19.7m length, 12.6m width and 0.4m height and is located in the central northern section of East Anglia THREE. The debris appears to be in a rectangular arrangement and look to be partially buried on a rough and uneven area of the sea bed. The debris field is composed of a number of hard edged and diffuse dark reflectors with shadows of varying sizes, the largest of which has measurements of 12.5m length, 1.2m width and 0.4m height. A small magnetic anomaly is associated with these remains measuring 9.8nT which suggests that some ferrous material may be present.
80. **76123** is a large expanse of debris remains visible in the multibeam bathymetry data as a large mound feature. The debris field has dimensions of 34.4m length, 11.1m width and 2.4m height. The debris is made up of numerous hard edged and diffuse dark reflector anomalies with shadows in the sidescan sonar data with the largest debris piece measuring 7.2m length and 0.6m width. This is visible in the multibeam bathymetry data as an elongated mound composed of two linked rounded mounds located in an area of sand ripples and has a magnetic amplitude of 24nT indicating ferrous material.

17.2.2.2.12 Bright Reflectors

81. There is a single bright reflector anomaly identified within the East Anglia THREE site (**76120**). Bright reflectors are identified on the side-scan sonar data and are anomalies of low reflectivity. Bright reflectors indicate areas where little or no acoustic energy is returned to the side-scan sonar towfish and can be characteristic of material that absorbs the acoustic energy such as waterlogged wood. **76120** has

dimensions of 7.2m length and 2.5m width. The bright reflector is an irregular shape and slightly curvilinear with a diffuse looking appearance and located on a sandy and somewhat uneven part of the sea bed in the central southern area of the site.

17.2.2.2.13 Dark Reflectors

82. There are **72** dark reflectors have been identified within the East Anglia THREE site (see **Appendix 17.3**), and vary greatly in character and size. The smallest dark reflector anomaly (**76156**) is located in the central area of East Anglia THREE and has dimensions of 0.5m length, 0.5m width and a height of 0.2m. This very small anomaly is visible as a rectangular, hard edged dark reflector with short but bright shadow and looks anomalous to the surrounding sea bed. There is a small amount of sediment build up and scouring associated with this anomaly.
83. **76016** is the largest recorded dark reflector in the East Anglia THREE site and has dimensions of 8.9m length, 1.4m width and 0.5m height. This is identified as a hard edged, irregular shaped linear anomaly with a very small and faint shadow. This is located in the south western extent of the survey area on a very sandy and fairly even part of the sea bed.

17.2.2.2.14 Ropes & Chains

84. There are **7** anomalies identified to be possible rope/chain remains within the East Anglia THREE site (see **Appendix 17.3**). The smallest of these is **76061** which is visible as a discreet, bundled up possible rope/chain remain located in the central western extent of the survey area. This is a diffuse and thin, curvilinear dark reflector with shadow, which is isolated on an area of the sea bed with frequent sand waves. The anomaly has dimensions of 4.6m length, 2m width and a height of 0.3m. A lack of associated magnetic anomaly would suggest that this is a rope rather than chain remains.
85. The largest rope/chain remains recorded are **76107** with dimensions of 102.5m length, 1m width and 0.3m height. This is a broken up or partially buried long linear anomaly composed of hard edged and diffuse dark reflectors with shadows and orientated north-south. These remains also have a small magnetic fluctuation grouped with them measuring 14nT and indicate ferrous material is present. It is possible that this is the remains of decommissioned cable in the region.
86. Rope/chain remains **76041** and **76062** both have magnetic anomalies grouped with them. **76041** has dimensions of 55.8m length, a maximum width of 1.1m and no measurable height. The anomaly is a thick but diffuse looking dark reflector, orientated north-south and spread across large sand waves of varying height. The full extent and parts of this anomaly may be covered by mobile sand sediments.

There is a medium sized magnetic value of 31nT associated with this remain suggesting ferrous material is present. It is possible that this is the remains of decommissioned cable in the region.

87. **76062** is located on a rough and uneven part of the sea bed and is classified as rope/chain debris visible as a diffuse dark reflector with a small shadow. The linear anomaly has one hooked end visible and is orientated north-south with dimensions of 27.1m length, 0.4m width and 0.1m height. An irregular shaped medium sized dipolar magnetic fluctuation is grouped with these remains measuring 29nT. It is possible that this is the remains of decommissioned cable in the region.

17.2.2.2.15 Seafloor Disturbances

88. There are **4** seafloor disturbances recorded in the East Anglia THREE site (**70871**, **76080**, **76082** and **76112**). A seafloor disturbance is an area of sea bed that appears disturbed, potentially by a buried or partially buried wreck or debris of archaeological interest. These types of features may be groups of what is apparently debris or may be more ephemeral and consist solely of a patch of bright and dark reflectors distinct from the surrounding sea bed. The features vary in size from 7.5m x 1.6m x 0.6m (76080) up to 32.9m x 7.2m x 0.5m (76112). They generally are made up of multiple dark and bright reflectors, hard edged and diffuse anomalies that look anomalous and are spread across the sea bed. None of the recorded seafloor disturbances have associated magnetic anomalies.

17.2.2.2.16 Magnetic Anomalies

89. Two hundred and seventeen (**217**) isolated magnetic anomalies have been recorded across the East Anglia THREE survey area in total with any anomalies identified measuring over 5nT tagged as potential archaeological remains. The picking of the magnetic targets across the East Anglia THREE survey area was made difficult due to the composite geological nature of the site. The huge number of large and highly mobile sand waves creates large variations in the magnetometer data and as a result individual potential targets of possible archaeological potential are difficult to differentiate or can be masked by the fluctuations caused by the natural geology. Similarly, any linear trends interpreted to be recorded and unrecorded cables and pipelines have also been excluded from the interpretation.
90. The smallest magnetic anomalies tagged measure just 6nT (**76386**; **70937** and **70938**). All of these are isolated, weak magnetic anomalies with no corresponding geophysical anomalies present. The latter two anomalies were identified and classified as A2's in the ZEA phase of works but not picked by WA in the most recent magnetometer data as they were located within the noise limits of the dataset. These are all potential buried ferrous debris remains.

91. The largest magnetic anomalies identified across East Anglia THREE are associated with wreck remains as described above (**71012** and **71020**). 70872 is a very large isolated magnetic dipole anomaly identified in the north western corner of East Anglia THREE. This area of the sea bed has frequent magnetic fluctuations and noise caused by the large and frequent sand waves, however given its high magnetic value of 422nT it has been interpreted as a possible buried ferrous object. This target was also identified in the magnetic data for the ZEA phase of work.
92. **71018** is a large magnetic anomaly located in the central northern extent of East Anglia THREE that measures 57nT. This target has been recorded previously, first detected in 1969 as a magnetometer anomaly that was reported as representing notable debris (SeaZone 11089). No remains were observed in either the sidescan sonar or bathymetry data at this location which may indicate that potential ferrous debris remains are buried by sands.
93. A large number of the magnetic anomalies identified on site were not able to be cross referenced in any other of the geophysical datasets. Due to the geological nature of the site some of these may be natural geological fluctuations and/or noise, however unless this can be proven otherwise all of these 217 magnetic anomalies have been classified as A2 archaeological potential and interpreted to be possibly buried ferrous debris.

17.2.2.2.17 Mounds

94. Two (**2**) mound features have been identified in East Anglia THREE survey (**76452** and **70861**). **70861** was identified in the ZEA phase of works but not the latest dataset, however this was originally located on the edge of a sand wave and therefore may have since been buried. The mound was originally identified in both the multibeam bathymetry and sidescan sonar datasets and has dimensions of 12.6m length, 4m width and height of 0.2m. The mound is visible in the sidescan data as a linear dark reflector lying perpendicular to the crests of the surrounding sand waves. The bathymetry data shows it to be a linear mound joining two sand waves; it does not appear to be part of the sand waves themselves. It is aligned NE-SW and approximately perpendicular to the sand wave crests in a general depth of approximately 39 m.
95. **76452** is a mound feature located in the northern extent of the East Anglia THREE site and has dimensions of 5.2m length, 3.9m width and a height of 0.8m. The mound was identified in the multibeam bathymetry data only, discernible as a rounded mound in area of frequent sand ripples with a possible associated scour mark on its northern side. It is possible that this may represent buried anthropogenic material.

17.2.2.3 Summary Results – East Anglia THREE offshore cable corridor

96. A total of 465 anomalies of archaeological potential have been identified along the East Anglia THREE offshore cable corridor, which are summarised below. The anomalies have then been divided into their classifications and described accordingly:

Table 1.6 Sites of Archaeological Potential – East Anglia THREE offshore cable corridor

Archaeological Discrimination	Number of anomalies	Interpretation
A1	1	Anthropogenic origin of archaeological interest
A2	463	Uncertain origin of possible archaeological interest
A3	1	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	465	

97. Furthermore, these sites of potential archaeological interest can be classified by probable type, which can further aid in assigning archaeological potential and importance:

Table 1.7 Types of Anomalies Identified – East Anglia THREE offshore cable corridor

Anomalies Classification	Number of Anomalies
Recorded Wreck/Obstruction	1
Wreck	1
Debris	79
Debris Field	4
Bright Reflector	2
Dark Reflector	144
Rope/Chain	4
Seafloor Disturbance	7
Magnetic Anomaly	221
Mound	2
Total	465

98. The gazetteers for all 465 features are included in *Appendix 17.3*. Locations of all features and example images of a variety of feature types are shown in *Figures 17.13 to 17.15*.

17.2.2.3.1 Recorded Wrecks

99. **78160** is categorised as an A3 recorded wreck site, which is a previously recorded wreck (SeaZone 11002) of possible archaeological interest but has not been identified within the geophysical data. It is recorded as being a possible pile of wreckage, but the position is marked as being ‘unreliable’ and so the feature could lie elsewhere in the vicinity.

17.2.2.3.2 Wreck **70609**

100. **70609** is a wreck site located approximately 20m outside of the study area, but the recommended buffer of which extends to within the study area (**Figure 17.23**). It has previously been discussed as part of the East Anglia ONE report (Wessex Archaeology 2012), but the proximity of such a site to the current study area warrants its inclusion within this report. This is the only wreck identified within or immediately around the East Anglia THREE offshore cable corridor area. **70609** is a distinct and large preserved wreck orientated approximately north-south and measuring 48.7m x 10.6m x 2.9m. The wreck has an easily distinguishable hull and superstructure with some discernible internal features. These appear as linear and rectangular dark reflectors, some with shadow indicating height, running the length of the wreck. A distinguishable linear reflector with an irregular shadow is visible within the central part of the vessel suggesting that it remains upright. Many details of the internal structure have been distorted by the presence of the wrecks shadow on the sidescan sonar dataset. The wreck itself and resultant sand banks have created a large and bright shadow in the sidescan sonar imagery. The high sediment content of this region also suggests that the wreck has been covered by sediment.
101. Distinct north-south orientated scouring has occurred both to the north and south of this wreck, extending beyond a total of 100m in length. This vessel has a large asymmetrical magnetic dipole anomaly associated with it, measuring 85nT, which suggests that it is likely to be of metal construction and/or contains ferrous cargo.
102. The wreck appears to be well preserved and intact lying upright on the sea bed with some sediment coverage. The wreck is recorded in the UKHO database as the *Edinardu Antoinette* (UKHO 10979), a Belgian sailing/fishing vessel first detected in 1926 (SeaZone 10979). The UKHO recorded survey data also states that the wreck lies intact and upright with its bow towards the south with the recorded site dimensions as 48.7m x unknown x 7m. The difference in dimensions between previously recorded data and the latest dataset may be due to subsequent decay or an increased burial by sea bed sediment.

17.2.2.3.3 Debris

103. There are **79** individual pieces of debris interpreted to be present within the East Anglia THREE offshore cable corridor area (see *Appendix 17.3* for full list). These are irregular features that do not appear to be natural and so are possibly anthropogenic in origin. The largest piece of identified debris is 77282. This is a discrete area measuring 22.4m x 4.0m x 0.5m containing two distinguishable pieces of debris. The first is an oval feature containing several internal parallel curvilinear dark reflectors, whilst the second is a triangular shaped dark reflector with a distinct irregular

shadow suggesting some possible height variation. This anomaly appears to be a piece of non-ferrous debris partially buried in the sea bed sediments.

104. Of the 79 anomalies, nine (**76981**, **77004**, **77028**, **77343**, **77375**, **77380**, **77463**, **77494** and **77694**) have been associated with magnetic anomalies, ranging from 6nT to 56nT in amplitude, suggesting they are at least partially ferrous in nature. The remaining 70 pieces of debris are interpreted as being non-ferrous. All of these anomalies, with the exception of **77695**, are associated with magnetic amplitudes of <50nT, with most being 21nT or less. This suggests only relatively small pieces of ferrous debris.

17.2.2.3.4 Debris Fields

105. Four debris fields (**70224**, **70554**, **77021** and **77611**) have been identified within the East Anglia THREE offshore cable corridor, one of which (**70224**) has been associated with a 28nT magnetic anomaly. **70224** was identified during both the ZEA and current phase of work and was originally described as a seafloor disturbance. Measuring 16.1m x 10.4m x 0.9m, the debris field is situated amongst sand waves and has distinct irregular shadows. It consists of three principal hard edged dark elongated dark reflectors in a parallel formation; the largest is 6.4m in length. One irregular piece of debris appears to be broken. It is associated with a small magnetic anomaly measuring 28nT indicating that it is an area of ferrous debris.
106. The remaining debris fields are irregular areas of dark and bright reflectors measuring between 3.7m x 2.7m x 0.0m (**77611**) and 44.6m x 21.1m x 1.1m (**77021**). These are interpreted as possible areas of non-ferrous debris.

17.2.2.3.5 Bright Reflectors

107. There are two bright reflectors within the East Anglia THREE offshore cable corridor (**70842** and **70845**). Bright reflectors are areas of low acoustic reflectivity and can indicate materials that absorb acoustic energy, such as modern synthetic materials or waterlogged wood. Both **70842** and **70845** were identified during the ZEA phase and have not been observed during the current phase, possibly due to subsequent sediment coverage.
108. **70842** measures 15.7m x 2.7m, and is a curvilinear bright reflector situated amongst a sand wave dominant area. **70845** measures 2.4m x 1.1m and is elongated and distinct situated in a quieter region. Both could represent either debris or natural sea bed features.

17.2.2.3.6 Dark Reflectors

109. There are **144** dark reflectors (see **Appendix 17.3** for full list) within the East Anglia THREE offshore cable corridor, which range in size from 0.3m x 0.1m x 0.2m (**77073**) to 20.1m x 0.3m x 0.2m (**76912**). These dark reflectors are anomalies which are of a more uncertain nature, and could be debris or natural features.
110. Of the 144 dark reflectors, seven are associated with magnetic anomalies, ranging from 5nT (**77448**) to 134nT (**77169**) and as such could be ferrous debris, although this is unclear. Any debris present at the remaining locations is likely to be non-ferrous.

17.2.2.3.7 Ropes & Chains

111. Four anomalies within the East Anglia THREE offshore cable corridor (**70222**, **77030**, **77039** and **77310**) have been interpreted as possible lengths of rope of chain. These are curvilinear dark reflectors with small shadows, measuring between 7.0m (**77310**) and 48.9m (**77030**) long. **70222**, **77030** and **77039** are all associated with magnetic anomalies, ranging from 8nT (**70222**) to 39nT (**77039**).

17.2.2.3.8 Seafloor Disturbances

112. There are **7** seafloor disturbances (**70849**, **70850**, **70851**, **76991**, **77037**, **77312**, and **77314**) within the East Anglia THREE offshore cable corridor, ranging from 3.2m x 1.0m x 0.0m (**70849**) to 36.6m x 22.4m x 0.6m (**70851**) in size. These are areas containing irregular dark and bright reflectors that could be natural features, areas of scarring, or indicate the presence of debris material buried just beneath the sea bed.
113. **70849**, **70850** and **70851** were identified during the ZEA phase but not during the current phase; this may be due to the subsequent burial by the sea bed sediments. None of the seafloor disturbances were associated with any magnetic anomalies, and so any buried debris which may be present is expected to be non-ferrous in nature. .

17.2.2.3.9 Mounds

114. Two mound features (**70844** and **78153**) have been identified within the East Anglia THREE offshore cable corridor, which measure 5.7m x 3.7m x 0.2m and 15.0m x 7.0m x 0.5m respectively.
115. **70844** was identified in the ZEA phase of works but not the latest dataset, however this may have subsequently been buried. The mound was originally identified in the multibeam bathymetry, sidescan sonar and magnetometer datasets, and has a magnetic anomaly of 12nT suggesting the mound possibly covers ferrous debris.

116. 78153 was identified within the multibeam bathymetry dataset only, and could be a natural sea bed feature or represent buried non-ferrous debris.

17.2.2.3.10 Magnetic Anomalies

117. 221 individual magnetic anomalies (see **Appendix 17.2** for full list) have been identified within the East Anglia THREE offshore cable corridor. These range from 10nT (**77423, 77693, 77906** and **78112**) to 763nT (**77291**) in amplitude, although the majority are <100nT. None have been associated with an identified sidescan sonar or multibeam bathymetry contact.
118. Generally any distinct anomalies identified measuring over 5nT are tagged as potential anthropogenic features. The picking of magnetic targets across the northern region of the East Anglia THREE offshore cable corridor was made difficult due to the complex geological nature of the site. The significant number of large and highly mobile sand waves in this area creates large variations in the background magnetic field, and as a result individual targets of possible archaeological potential are difficult to differentiate, or can be masked by, the fluctuations caused by the natural geology.
119. Measuring 763nT in amplitude, **77291** is the single largest magnetic anomaly identified within the East Anglia THREE offshore cable corridor, and possibly represents a significant piece of buried ferrous debris. Anomalies **77701, 77250, 77828, 77836, 77623, 77639, 77636, 77704, 77719, 77717, 77726, 77418, 77402, 77617** and **77730** are all also anomalies measuring >100nT in amplitude, and as such all represent significant pieces of buried ferrous debris.
120. The remaining features are all likely to be individual, small pieces of debris, whilst the smallest anomalies could be buried debris or natural features.

17.2.2.4 Discussion & Recommendations

121. A total of **877** sea bed features of possible archaeological interest have been identified in the East Anglia THREE and East Anglia THREE offshore cable corridor. The most important of these are the wreck and possible wreck locations **70609, 71016, 76056, 71008, 76145, 70911, 71012, 71017** and **71020** have all been assigned an A1 rating and are considered of high archaeological potential. It is recommended that a 100m exclusion zone be implemented around each of these wrecks. All A3 wrecks of archaeological value should also be assigned a 100m exclusion zone as a precaution (**71005, 71013, 71014, 71015** and **78160**).
122. The remainder of the identified sea bed anomalies have been given an A2 rating and classified as of possible archaeological potential. No further work for these features

is recommended at this time, though further investigation may be required on a site by site basis should the proposed scheme directly impact upon these features. Of particular note are the debris fields which can cover a large area of the sea bed.

17.2.3 Palaeogeographic Assessment

17.2.3.1 Introduction

123. The palaeogeographic assessment of the East Anglia THREE site and offshore cable corridor comprised a review of the geophysical data in conjunction with the known geology of the area (Cameron et al. 1992), previous work undertaken during the ZEA (WA 2012) and previous survey reports (EMU 2013, Gardline Geosurvey 2011).
124. Two previous boreholes are present within East Anglia THREE (EA10-G-002 and EA10-G030) and one in East Anglia FOUR (EA10-G-006), the results of which were used to ground truth the geophysical interpretation. No boreholes have currently been acquired along the East Anglia THREE offshore cable corridor route. The assessment was undertaken with the aim of identifying features with archaeological potential within East Anglia THREE and along the offshore cable corridor route, namely indicators of past land surfaces.
125. As part of the palaeogeographic assessment, the geophysical (sub-bottom profiler and MBES) data were analysed for evidence of a number of specific features of archaeological interest. Definitions of these features are detailed in *Table 1.8*:

Table 1.8 Definition of Feature Types of Archaeological Interest

Feature type	Description
Channel	Channel cuts and associated infill deposits. May indicate extensions of present-day terrestrial system or now unconnected channels. May include both fluvial and estuarine environments. Can be described as filled, underfilled and unfilled. Archaeological potential for in situ and secondary context artefacts. Infill deposits may also be of palaeoenvironmental interest.
Gravel Terrace/Coarse Sediment Unit Bank	Features associated with the edge of channel features, or within channel features. Archaeological potential for in situ and secondary context artefacts
Cut and Fill	As channel features. Cut and fill is used as a descriptor when the feature of interest cannot be traced over distance. Generally used for isolated features. Can be described as simple (one phase of fill) or complex (multiple phases of infill)
Depression Fine-grained Unit	Small isolated infilled feature which may include remnant features formed by erosion or be associated with inter-tidal deposits. Potential for in situ and secondary context artefacts. Infill deposits may also be of palaeoenvironmental interest.
Peat Organic Matter	Indicator of former terrestrial land surface. Potential for in situ and secondary context artefacts. Deposits are of palaeoenvironmental interest. Generally associated with other features such as channels or cut and fill features.
Seismic Blanking	Gas blanking masks the seismic reflectors and is caused by the presence of shallow gas. Shallow gas may indicate the presence of organic matter/peat at a particular layer caused by microbial activity. Shallow gas can also be sourced from depth migrating to the surface along migration pathways. Discrimination is made during the assessment and only shallow gas thought to be associated with the presence of organic matter is recorded. Generally associated with channel infills, cut and fill features and erosion surfaces.
High Amplitude Reflector	May indicate either hard ground layer or layer containing organic matter.
Erosion Surfaces	These tend to be broad scale features associated with erosion during transgression and regression. May include ravinement surfaces (transgressive erosion surface resulting from nearshore marine and shoreline erosion associated with a sea level rise)

126. Only features thought to have formed during the period of human occupation of the study area were interpreted, i.e. from c. 970,000 BP to the last marine transgression.
127. The identified palaeogeographic features are discussed below, again split between East Anglia THREE and the offshore cable corridor route, with a full list and

description of each feature provided in *Appendix 17.3* and their distribution within East Anglia THREE site and along the offshore cable corridor route illustrated in **Figures 17.2** and **17.3**.

128. Any features which correlate with those interpreted during the previous ZEA stage are identified within *Appendix 17.3*) and their appropriate ID number referenced. However, this current interpretation is more detailed than that undertaken previously and as such some earlier identified features have been re-interpreted. As such, not all features identified during the ZEA stage are represented in *Appendix 17.3*.
129. As with the sea bed features assessment, only features present within the East Anglia THREE and East Anglia THREE offshore cable corridor route are discussed in detail in the following text. However, features previously identified within East Anglia ONE and along the East Anglia ONE offshore cable corridor route are presented in the gazetteer in *Appendix 17.3* and illustrated in the *Figures 17.2* and **17.3**. Detailed descriptions of these features are provided in Wessex Archaeology (2012).
130. 11 geological units have been identified in the geophysical data within the East Anglia THREE site and along the offshore cable corridor route. The units, ages, Marine Isotope Stages (MIS), typical geophysical and geotechnical characteristics, and archaeological potential are detailed in *Table 1.9*:

Table 1.9 Geological Units identified within East Anglia THREE and along the offshore cable corridor route

Geological Unit	Geophysical Characteristics ¹	Sediment Type ²	Archaeological Potential
Holocene Sea bed Sediments (post-transgression) (MIS 1)	Generally observed as a veneer or thickening into large sand wave and bank features up to 10m thick. Boundary between surficial sediments and underlying units not always discernible.	Gravelly sand with shell fragments, sand waves and ripples indicate sediment is mobile.	Low archaeological potential in areas of mobile sediments; basal contact may cover old land surfaces. Mobile sediment could cover wreck sites.
Holocene Sediments (pre-transgression) (MIS 2 - 1)	Small shallow infilled channels with either seismically transparent fill, or fill characterised by sub-parallel internal reflectors.	Unknown, but possibly fluvial deposits.	Shallow infilled depressions or channels have potential for in situ or derived artefacts if deposited during occupation.

			Preserved organic material of interest to palaeoenvironmental studies.
Brown Bank Formation (Lower Devensian) (MIS 5d - 3)	Observed as a blanket deposit across the whole area, generally acoustically transparent or characterised by relatively poorly defined sub-horizontal layered reflectors.	Clayey silty sand infilling channels or hollows and deposited in an intertidal/lagoon environment.	In situ Lower Palaeolithic artefacts may be protected; Middle Palaeolithic in situ and derived artefacts may be associated particularly with channel edges dependent on the age of the fill; palaeoenvironmental information; basal contact may cover old land surfaces.
Lower Brown Bank Formation/Eem Formation (Ipswichian or Lower Devensian) (MIS 5e - 5d)	Observed within large topographically controlled depressions. Characterised by low relief basal and either an acoustically transparent or well-layered fill.	Silty sand and sandy silt, possible intertidal or shallow marine deposits.	In situ Lower Palaeolithic artefacts may be protected; Middle Palaeolithic in situ and derived artefacts may be associated particularly with channel edges dependent on the age of the fill; palaeoenvironmental information; basal contact may cover old land surfaces.
Sand Unit (Pre-Devensian) (MIS 11 - 5e)	Acoustically transparent unit with well-defined base. Generally associated with the Lower Brown Bank Formation and definite boundary between the two often unclear. Possibility of gradual change to Lower Brown Bank Formation.	Unknown, but appears to be a relatively uniform sand unit.	Potential unknown due to uncertain age, though interpreted sandy lithology indicates potential for in situ artefacts and preserved organic material is low.

Channel Features (Yarmouth Roads or later, Lower to Middle Pleistocene) (MIS >13 - 5e)	Series of distinct channels generally characterised by sub-parallel internal reflectors, could be part of the upper layers of Yarmouth Roads Formation or be later features.	Unknown, but possibly fluvial deposits.	Precise potential unknown due to uncertain age, but infilled depressions or channels have potential for in situ or derived artefacts if deposited during occupation. Preserved organic material of interest to palaeoenvironmental studies.
High Amplitude Reflectors (Lower to Middle Pleistocene) (MIS >13)	Sub-horizontal high amplitude reflectors, located within the upper layers of the Yarmouth Roads Formation.	Unknown, possible highly organic clay and/or peat.	Possibility of in situ finds and preserved organic material such as plant debris, wood, peat and pollen.
Yarmouth Roads Formation (Lower to Middle Pleistocene) (MIS >13)	Thick unit either seismically chaotic or containing numerous areas of well-defined cross cutting channel complexes characterised by layered sub-parallel internal reflectors. Top of unit generally a well-defined regional erosion surface.	Silty sand with occasional shell fragments with occasional layers of clay. Generally becoming silty with depth. Sediments deposited as part of delta complex.	Possibility of in situ finds in later part of formation if not eroded. Contemporaneous with terrestrial Cromer Forest Bed Formation (Pakefield and Happisburgh). Has been found to contain plant debris, wood and peat in some areas of possible palaeoenvironmental importance. Potential greatest where associated with river valleys.
Smith's Knoll Formation (Lower Pleistocene)	Acoustically unstructured unit, difficult to distinguish from underlying Westkapelle Ground Formation.	Deltaic muddy sand with silty clay.	Pre-dates the earliest known human occupation of the UK
Westkapelle Ground Formation (Upper Pliocene to Lower Pleistocene)	Acoustically unstructured unit with a generally well-defined basal reflector. Difficult to	Deltaic silty clays and sands.	Pre-dates the earliest known human occupation of the UK

	distinguish from the Westkapelle Ground Formation and the Smith's Knoll Formation.		
Red Crag Formation (Upper Pliocene)	Acoustically unstructured unit, difficult to distinguish from overlying Westkapelle Ground Formation.	Marine shelly sand and gravels.	Pre-dates the earliest known human occupation of the UK
¹ Based on geophysics data ² Based on borehole data and Cameron et al. (1992)			

131. This interpreted stratigraphy is used as a framework for discussing the identified palaeogeographic features within both East Anglia THREE and along the offshore cable corridor route. Not all of the units outlined in **Table 1.9** were identified within each area.

17.2.3.2 Palaeogeography Assessment Results – East Anglia THREE

132. The shallow stratigraphic sequence identified within East Anglia THREE is relatively complex and, as outlined in *Table 1.9*, has been divided into 11 separate units for the purposes of this report (only eight of which are actually present within East Anglia THREE).
133. The oldest unit in the sequence, observed across the entire of East Anglia THREE, has been interpreted as the Yarmouth Roads Formation (YM). This unit generally appears as a series of large, well defined cross cutting channel features, though in some areas is less well-structured and appears acoustically chaotic (*Figure 17.4*). YM is interpreted as an extensive delta top deposit covering a large section of the southern North Sea, deposited during the Cromerian prior to the Anglian Glaciation (MIS >13) (Cameron et al. 1992). The boreholes indicate that the sediments comprise dense fine to medium silty sands, with increasingly silty and clayey layers present at depth, especially where channel features are present.
134. The upper layers of YM are interpreted as being contemporaneous with the Cromer Forest Bed Formation of East Anglia, within which the Lower Palaeolithic sites at Happisburgh and Pakefield have been (Parfitt et al. 2010, Parfitt et al. 2005). As such, there is the potential for both in situ and reworked archaeological and palaeoenvironmental material to be present within the upper layers of YM. The potential for archaeological material of this age within the offshore region is considered greatest where later YM deposits are associated with features cut into earlier Pleistocene or pre-Pleistocene formations. Due to the extensiveness and

complexity of the upper YM features have not been mapped individually, and the unit is interpreted as a delta-top rather than a single channel river system.

135. An area of High Amplitude Reflectors has been identified within East Anglia THREE. Although actually interpreted as being part of the upper YM, these features are of particular potential archaeological and palaeoenvironmental interest and so are described separately.
136. The High Amplitude Reflectors are represented by features **75529**, **75530**, **75532**, **75533** and **75534**, all of which are located in one area at the northern boundary of the East Anglia THREE site (*Figure 17.2*). These are generally strong, sub-horizontal reflectors cut in a number of places by later channels (described below), and possibly represent peat horizons or organic clay indicative of a buried terrestrial surface (*Figure 17.8*).
137. These deposits are considered of high archaeological potential, as they could contain and protect in situ Lower Palaeolithic archaeological artefacts and intact organic material suitable for high-resolution palaeoenvironmental analysis.
138. As previously mentioned, a series of Channel Features have been observed cutting through the High Amplitude Reflectors, and elsewhere across East Anglia Three, into YM. Although classified as Channel Features, this unit contains features classified as both Channels and Cut and Fills - features which could not be traced extensively between survey lines. The Channel Features are widespread across the East Anglia THREE site (*Figure 17.9*), though the two largest features (**75484** and **75497**, see *Appendix 17.3* for full list) are located towards the northern end of the area.
139. These features tend to be relatively well-defined and characterised by numerous internal sub-parallel reflectors (**Figure 17.9**), though a number of less well-defined features contain an acoustically chaotic fill have also been identified.
140. The Channel Features are interpreted as being possibly fluvial in origin, though their age is difficult to determine. The features are observed cutting into the upper layers of YM, and, since YM is often characterised by cross cutting channels, the Channel Features could be part of this internal structure (MIS >13). However, most of the Channel Features appear different in character to those generally observed within YM, and so could have originated at a later date.
141. The precise southern extent of ice during the Anglian Glaciation is uncertain (Limpenny et al. 2011), though it is likely that during this period (following the deposition of YM) the East Anglia Three area would have been covered by ice. Therefore, if the Channel Features do not date from the Pre-Anglian they possibly

date sometime between the Late Anglian glacial retreat and the Ipswichian (MIS 12 - 5e), within which were numerous global temperature fluctuations and alternating cold and warm periods.

142. This is a relatively broad date range for the Channel Features, which makes their archaeological potential uncertain. However, there were periods of human occupation of the UK within the interpreted date range, and so the potential remains for in situ and derived archaeological artefacts and palaeoenvironmental material to be associated with the Channel Features, though the confidence of this interpretation will remain relatively low until the date of the features can be better determined.
143. Directly overlying the YM/Channel Features in some areas of the site is what here is called the Sand Unit. This is an acoustically transparent unit with a generally well defined base (usually being the eroded top of YM), and is often associated with the later Lower Brown Bank/Eem Formation features (described below), the boundary between which is often uncertain and may be gradational (*Figure 17.5*).
144. The Sand Unit has not been sampled by boreholes, though the acoustic character suggests it is a large sand deposit. The age of the unit is also uncertain, though it is interpreted as being Pre-Devensian. Due to the interpreted sandy lithology, which is unlikely to preserve organic material, and the uncertainty of the age of the unit, the Sand Unit is not interpreted to have archaeological potential. As such, no features from within this unit have been mapped.
145. Generally associated with the Sand Unit (though not exclusively) is a series of large infilled depressions, the largest of which are features **75490**, **75499** and **75543** (see *Appendix 17.3* for full list) (see **Figure 17.5** for example). These largest features all trend approximately NNW - SSE, suggesting there is some regional underlying control on their form and distribution, and it is possible that they generally fill topographically controlled depressions within the eroded upper surface of YM.
146. These features are characterised by a generally well-defined, low relief basal reflector and fill comprising numerous sub-parallel internal reflectors. In some areas a secondary upper fill is identified, which is acoustically transparent (*Figure 17.5*). Borehole information from within a similar feature in East Anglia Four indicates the lower fill comprises sandy silt, and the upper fill silty fine sand.
147. The age of these features is uncertain, and they could belong to one of two BGS formations: either the Eem Formation (EE) or a lower unit of the Brown Bank Formation (BNB, which is present across most of the site and is described below). EE

- is Ipswichian in age, and is described as a shallow marine/intertidal deposit of shelly and muddy sands, whilst BNB is a lagoon deposit of Lower Devensian Age (Cameron et al. 1992). The features identified here could represent a gradual transition between EE and BNB, and be Upper Ipswichian or Lower Devensian in age (MIS 5e - 5d).
148. The archaeological potential of these features depends on their age. As a marine deposit, the archaeological potential of EE is considered relatively low, though the unit may cover and protect earlier land surfaces. The potential of BNB is interpreted to be higher, with the possibility of derived artefacts and intact organic material of palaeoenvironmental interest. However, human absence in the area during the development of the Lower BNB indicates the unit is unlikely to contain in situ artefacts. Further work would need to be undertaken to determine the precise age of these Lower Brown Bank Formation / Eem Formation infilled depressions.
 149. Situated above these features is a blanket deposit of BNB, present across the whole of East Anglia Three. This unit is characterised by poorly defined sub-horizontal internal reflectors, and has been found by boreholing to comprise silty clay and clayey silt, with an occasional upper layer of cleaner loose silt. As previously mentioned, this is interpreted as being a Lower Devensian (MIS 5d - 3) lagoon deposit. Dating of similar upper BNB sediments to the east indicate that the infill continued into the late Devensian (MIS 3) during the period of human re-occupation (Limpenny et al. 2011).
 150. The archaeological potential of this unit is variable, with in situ and derived artefacts possible where the unit forms channel features. However, no such features have been identified within East Anglia Three, besides the Lower Brown Bank Formation/Eem Formation features described previously, and so the potential for this blanket deposit is thought to be lower.
 151. However, large areas of seismic blanking, interpreted as representing accumulations of shallow gas, have been identified within BNB (*Figure 17.5*). These have been included within the list of palaeolandscape features (*Figure 17.2 and 17.3, Appendix 17.3*), as they suggest the presence of intact organic material within the sediment, and the most extensive are **75459** and **75544** (see *Appendix 17.3* for full list).
 152. The source of the gas may be uncertain, however. The largest accumulations of gas (**75459** and **75544**) appear to be generally associated with the largest of the Lower Brown Bank Formation/Eem Formation features (**75490** and **75543**), and are orientated along the same general NNW - SSE alignment. This possibly suggests the actual source of the gas may be within these earlier features, not in the BNB blanket

deposit itself. However, the correlation is not entirely consistent and this interpretation remains uncertain.

153. The post-Devensian (Flandrian), Holocene geology of East Anglia THREE comprises two units; a pre-transgression unit and post-transgression unit. The pre-transgression unit is represented by a series of small, scattered cut and fill and channel features cut into the upper layer of BNB. The largest of these are features **75454**, **75511** and **75517** though a number of smaller individual cut and fills are also present (*Figures 17.6 and 17.7; see Appendix 17.3 for full list*).
154. These are relatively small features, with poorly defined basal reflectors and either an acoustically transparent or well-layered fill (**Figure 17.5**). They have not been sampled by boreholes, but they are interpreted as fluvial features representing the remnants of the post-Devensian) land surface.
155. These features possibly date from the very Late Upper Palaeolithic and Mesolithic Periods (MIS 2 - 1, and as such have the potential to contain both in situ and derived archaeological artefacts, along with palaeoenvironmental material.
156. The post-transgression Holocene sediments are represented by a deposit of marine sediment, found by boreholing to comprise fine to coarse sand, which is silty and contains organic matter in some areas (probably reworked). This sediment varied in thickness from a thin veneer to sand banks up to 10m thick, and the boundary between it and the underlying BNB unit is often unclear. These sediments are not considered to be of archaeological potential in themselves, though they could periodically bury and expose sites such as shipwrecks in areas of mobile sediment, and thicker sand deposits could protect earlier land surfaces.

17.2.3.3 Palaeogeographic Assessment Results – East Anglia THREE offshore cable corridor

157. The shallow stratigraphic sequence identified along the East Anglia THREE offshore cable corridor route is relatively complex and, as outlined in *Table 1.9*, has been divided into 11 separate units for the purposes of this report (only eight of which are actually present within the offshore cable corridor).
158. The oldest three units in the sequence (Red Crag Formation (**RCG**), Westkapelle Ground Formation (**WK**) and Smith's Knoll Formation (**SK**), respectively) dominate the shallow geology in the south western region, where they all outcrop at sea bed. These three units are all generally structureless in acoustic character and it is difficult to distinguish between them; the exception being where the basal reflector of the Westkapelle Ground Formation is particularly well-defined.

159. These units are interpreted as shallow marine/deltaic sediments dating from the Upper Pliocene and the Lower Pleistocene, and as such are considered too old to be of archaeological interest as they pre-date the earliest known human occupation of the UK.
160. Present just below the superficial sea bed sediments across much of the central section of the East Anglia THREE offshore cable corridor is the Yarmouth Roads Formation (**YM**). This unit differs in acoustic character, being acoustically unstructured or chaotic in some areas and characterised by large, cross cutting channel features in others (though, due to the SBP data quality, these features are rarely well defined). **YM** is interpreted as an extensive delta top deposit covering a large section of the southern North Sea, deposited during the Cromerian prior to the Anglian Glaciation (MIS >13) (Cameron *et al.* 1992). The boreholes obtained from East Anglia THREE and East Anglia FOUR indicate that the sediments comprise dense fine to medium silty sands, with increasingly silty and clayey layers present at depth, especially where channel features are present.
161. As previously mentioned, the upper layers of **YM** are interpreted as being contemporaneous with the Cromer Forest Bed Formation of East Anglia, within which the Lower Palaeolithic sites at Happisburgh and Pakefield have been located (Parfitt *et al.* 2010, Parfitt *et al.* 2005). As such, there is the potential for both in-situ and reworked archaeological and palaeoenvironmental material to be present within the upper layers of **YM**. The potential for archaeological material of this age within the offshore region is considered greatest where later **YM** deposits are associated with features cut into earlier Pleistocene or pre-Pleistocene formations. Due to the extensiveness and complexity of the upper **YM** features have not been mapped individually, and the unit is interpreted as a delta-top rather than a single channel river system.
162. Within East Anglia THREE, a series of Channel Features have been observed cutting into the upper layers of **YM**. Only one such feature (**75644**) has been identified within the East Anglia THREE offshore cable corridor (*Figure 17.10*). Although classified as a Channel Feature, it is relatively small although was identified on a number of survey lines.
163. The feature is relatively well-defined (despite the data quality) and characterised by a single phase of acoustically unstructured fill. This Channel Feature is interpreted as being possibly fluvial in origin, though, as previously discussed, its age is difficult to determine. It could date from the Pre-Anglian (MIS >13) or from between the Late Anglian glacial retreat and the Ipswichian (MIS 12 - 5e).

164. Situated stratigraphically above the Channel Feature in some areas is a deposit of the Brown Bank Formation (BNB). This formation is present in two different forms within the East Anglia THREE offshore cable corridor. The first is a thick blanket deposit characterised by poorly defined sub-horizontal internal reflectors which mainly covers the eastern region and continues into East Anglia THREE, though it is also present associated with channel features within the central region (described below) (*Figure 17.2 and 17.3*). It has been found by boreholing in East Anglia THREE to comprise silty clay and clayey silt, with an occasional upper layer of cleaner loose silt.
165. As the form of **BNB** is variable, so too is the associated archaeological potential. The blanket deposit is considered to be of relatively low potential (hence no ID numbers have been applied to specific features), though it could contain palaeoenvironmental material. The presence of large accumulations of shallow gas identified within BNB in East Anglia THREE suggest organic material is present within the formation in certain areas, and a small area of possible shallow gas (**75649**) has been identified within **BNB** (*Figure 17.2 and 17.11*) in the East Anglia THREE offshore cable corridor.
166. This has been identified as a relatively high amplitude reflector within **BNB**, with some acoustic blanking apparent on some survey lines (*Figure 17.11*). It is possible that this represents an organic layer within the sediment, though it is present at the same level within the stratigraphy as the shallow gas identified within East Anglia THREE and so is also interpreted as shallow gas.
167. The shallow gas has been included within the list of palaeolandscapes features (*Figure 17.11, Appendix 17.3*), as they suggest the presence of intact organic material within the sediment which would potentially be of archaeological and palaeoenvironmental interest.
168. Although the archaeological potential of the blanket BNB deposit is considered relatively low, in situ and derived artefacts are possible where **BNB** forms channel features, and so the archaeological potential of these features is higher. This is the case for the channels themselves, and the areas immediately around the channel edges which could have formed the focus for past human activity.
169. These channel features are the second identified form of **BNB**, and are the previously mentioned channel features cut into the underlying units (generally **WK** or **YM**) which are located generally in the western and central regions (*Figure 17.2 and 17.3*). The channels are generally characterised by a relatively strong, often irregular, basal reflector with a single phase of fill characterised by sub-parallel

internal reflectors (**Figure 17.5**). Occasionally acoustically unstructured fills have been identified both above and below this main fill.

170. These channel features (**75604**, **75606**, **75612**, **75617**, **75618** and **75639**) are, with the exception of **75639** which appears to be a completely separate feature, interpreted as being currently disconnected parts of the same extensive fluvial system with surrounding possible sheet deposits (the previously described **BNB** blanket deposit). These features correlate with previous **BNB** channel deposits identified within East Anglia ONE (WA 2012).
171. **BNB** is interpreted as being a Lower Devensian (MIS 5d - 3) lagoon deposit. Dating of similar upper **BNB** sediments to the east indicate that that the infill continued into the late Devensian (MIS 3) during the period of human re-occupation (Limpenny *et al.* 2011).
172. The post-Devensian (Holocene) geology of the East Anglia THREE offshore cable corridor comprises two units; a pre-transgression unit and post-transgression unit. The pre-transgression unit is represented by a series of small, scattered cut and fill and channel features cut into the upper layer of **BNB**. The largest of these features is **75608**, which may be the remnant of a single fluvial channel.
173. These features are generally characterised by a relatively high amplitude basal reflector, possibly indicative of organic material, and a single phase of acoustically unstructured fill. They are also occasionally associated with other high amplitude reflectors which may indicate organic material (*Figure 17.7*).
174. The pre-transgression unit is interpreted as a series of fluvial features representing the remnants of the post-Devensian land surface. These features possibly date from the very Late Upper Palaeolithic and Mesolithic Periods (MIS 2 - 1), and as such have the potential to contain both in situ and derived archaeological artefacts, along with palaeoenvironmental material.
175. The post-transgression Holocene sediments are represented by a deposit of marine sediment, found by boreholing in East Anglia THREE and FOUR to comprise fine to coarse sand, which is silty and contains organic matter in some areas (probably reworked). This sediment varies in thickness from a thin veneer to sand banks >5m thick, and the boundary between the post-transgression Holocene sediments and the underlying **BNB** unit is often unclear. These sediments are not considered to be of archaeological potential in themselves, though they could periodically bury and expose sites such as shipwrecks in areas of mobile sediment, and thicker sand deposits could protect earlier land surfaces.

176. Another set of features yet to be described, and that do not fit into the outlined stratigraphy, are those classified as being of 'Unknown' age. These are features for which their age is poorly constrained, and attributing a broad age range to them is uninformative. In the south west of the East Anglia THREE offshore cable corridor, these features appear as channels and cut and fills cut into **WK**, and could range in date from the Upper Pliocene(if they are internal **WK** features) to the Holocene. They are generally characterised by a well-defined basal reflector and an acoustically unstructured fill.
177. In the central region the features appear similar, but are cut into **YM**, and as such could date from the Cromerian to the Holocene. These unknown features are possibly fluvial in origin, though due to the uncertainty in their age their archaeological potential is similarly uncertain at this time.

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Appendix 17.2 Ends Here