


# Program of Requirements

<b>Name project</b>		
<b>Location</b>	<b>NCP</b>	North Sea
	<b>Place</b>	North Sea (Dutch EEZ)
	<b>Toponym</b>	Hollandse Kust (zuid)
<b>Project</b>	<b>Wind Farm Zone Hollandse Kust (zuid) – Archaeological Field Survey</b>	

<b>Position within the Archaeological Process</b>
Prospective Field Survey (Geophysical stage)

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<b>Authority Approval</b>			
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1. Administrative data		
1	Project name	Hollandse Kust (zuid) - Archaeological Field Survey
2	Province	n.a.
3	Council	n.a.
4	Place	North Sea (NCP, Dutch EEZ)
5	Toponiem	Hollandse Kust (zuid)
6	Chart	1801-01
7	Coordinates (enveloping framework)	Geodetic datum: ETRS89/ Projection: UTM31N  Centre E 574286 N 5795646 Southwest E 561983 N 5780570 Northeast E 586589 N 5810722
8	ARCHIS-ozk melding / CIS-code	3985430100 (archaeological desk study)
9	Surface of Area of Interest	Total enveloping area including wind farm sites, safety zones and 100 meter buffer zone: 435 sq km  Individual sites excluding buffer and safety zones:  Site 1: 56 sq km Site 2: 48 sq km Site 3: 46 sq km Site 4: 63 sq km
10	Present use	Shipping lane, fishing and recreation, sand extraction
11	Oceanographic Parameters	Tidal currents, salt water, depth varying between 17 and 27 meter LAT; average 21.5 meter LAT
12	Area Administrator	Department of Waterways and Public Works - Team Sea and Delta
13	Authorities	Netherlands Enterprise Agency (RVO) advised by the Cultural Heritage Agency (Rijksdienst voor Cultureel Erfgoed, RCE)

2. Motive	
Objective	<p>The purpose of the archaeological assessment is to test the desk study based expectancy for archaeological remains in the area. The expectancy covers remains of shipping related objects (wrecks), airplanes from World War II and prehistoric settlements.</p> <p>The goals set for this assessment are:</p> <ul style="list-style-type: none"> <li>• To determine the historical or archaeological value of contacts found in the geophysical survey</li> <li>• The validate the locations of known wrecks</li> <li>• Assess the prehistoric landscape based on the seismic data</li> </ul>
Motive for this survey in relation to the activities planned	<p>The activities planned comprise the installation of the offshore wind farm Hollandse Kust (zuid). Cables interconnecting the foundations and connecting the wind farm area to shore will be trenched into the seabed. These activities can introduce an effect to archaeological remains. Also after installation of the wind farm scouring around the monopoles can lead to possible deterioration of archeological remains.</p> <p>Based on this aim legislation (Cultural Heritage Law, Wet op de Archeologische Monumentenzorg, WAMZ 2007) has been put in place which postulates that archaeological research shall be carried out in case a disturbance of the seabed is foreseen in the course of activities planned.</p> <p>The motive for the current survey stems from the aim to strive for <i>in situ</i> preservation of archaeological remains.</p> <p>From the desk study has come forward that ship wrecks, World war II related objects and prehistoric settlements are potentially under threat.</p>
Selection Decision	<p>The assessment of the survey data shall result in an advice with respect to potential further research in accordance with the criteria set by the Dutch Archaeological Quality Standard (in Dutch: KNA Waterbodems 4.0)<sup>1</sup></p>

<sup>1</sup> Dutch: Kwaliteitsnorm Nederlandse Archeologie Waterbodems (KNA-WB 4.0).

3. Previous research	
3.1 Administrative data	
Archaeological desk study	
Contractor	Periplus Archeomare
Period	2016
Publication	Brenk, S. van den, R. van Lil and E.A. van den Oever 2015: Desk study archaeological assessment Hollandse Kust (zuid) Periplus Archeomare rapport 15A024-01, Amsterdam.


3.3. Results archaeological desk study
<p>Within the investigated area of the wind farm zones there is a high expectation for the presence of (remains of) ship wrecks and WWII plane wrecks. Locally in situ remains of Late Paleolithic and Early Mesolithic camp sites might be present.</p> <p><b>Shipwrecks</b> A total of 19 shipwrecks are known in the area. Details like names, types and date of sinking are not known, nor are the exact locations. Further research is needed to determine the cultural-historical value.</p> <p><b>Plane wrecks</b> During World War II, many airplanes crashed into the North Sea. Several sources are ambiguous about the number of aircraft still missing. It is at least hundreds. Remains are found on a regular base by fishermen or during sand extraction. In the vicinity of the research area, four locations of plane wrecks are known. It is quite possible to expect plane wrecks within the research area.</p> <p><b>Prehistory</b> Remains of prehistoric camp sites are expected in situ in cover of sand dunes and ridges (Wierden Member), river dunes (Delwijnen Member) and river bank deposits (Wijchen Member) provided these units are un-eroded. Within the Basal Peat Bed well-preserved lost objects and dumps can be encountered. The archaeological levels of interest are located under a 0 - 5 meter cover of the Bligh Bank Member. Remains of Neanderthaler camp sites can be expected within lacustrine clays of the Brown Bank Member which is covered by the Kreftenheye Formation.</p> <p>At this stage little is known about the integrity of the Pleistocene landscape. The Pleistocene units are encountered at shallow depths. Therefore erosion of these units and archaeological remains therein seems likely. Locally the Basal Peat Bed might have protected the Pleistocene landscape against erosion. By means of subbottom profiling in combination with analysis of vibrocore samples the Basal Peat Bed and the underlying well-preserved archaeological level can be mapped. It is unlikely however that archaeological remains of Paleolithic and Mesolithic camp sites can be identified with sufficient certainty (based on the geophysical and geotechnical surveys) to impose restrictions on wind farm development.</p> <p>In accordance with the AMZ cycle it is advised to conduct a field investigation (in Dutch '<i>Inventariserend veldonderzoek opwaterfase</i>') in order to:</p> <ul style="list-style-type: none"> <li>• Map the locations of known wreck sites in great detail;</li> <li>• Make an inventory for the parts of the area which have not been covered in previous surveys</li> </ul> <p>In general, similar investigations carried out in the past consist of a geophysical survey with side scan sonar, magnetometer and subbottom profiler. The resulting data should be assessed after the general processing, interpretation and reporting has been performed by the survey contractor, if possible in combination with analysis of core samples. The archaeological assessment of the data has to be conducted by a geophysical specialist (KNA prospector Waterbodems).</p>

The data quality expected from the surveys need to match the demands for this archaeological assessment. To ensure compatibility between the site investigation and the required quality for this assessment a Program of requirements (In Dutch: '*Programma van Eisen*') has been defined in accordance with the Dutch Quality Standards for Archeology (hereafter referred to as 'KNA'; in Dutch: '*Kwaliteitsnorm Nederlandse Archeologie*'), to be authorized by the competent authority.

During the installation of the wind turbines and construction of the cables archaeological remains may be encountered that were fully covered by sediment or not identified as archaeological remains during the geophysical survey. In accordance with applicable legislation one is obliged to report those findings to the competent authority. This notification for archaeological finds should be included in the specifications or scope of work.

## 4. Archaeological expectation based on preliminary investigations

Maritime related finds	(Parts of) vessel construction, cargo, ballast materials, inventory and personal effects.
WWII related remains	Remains of airplanes and conventional unexploded ordinance
Prehistory	Drowned Prehistoric Human Habitats

## Goal and Research Questions

4.1 Goal	<p>The purpose of the archaeological assessment is to test the desk study based expectancy for archaeological remains in the area. The expectancy covers remains of shipping related objects (wrecks), airplanes from World War II and prehistoric settlements.</p> <p>The goals set for this assessment are:</p> <ul style="list-style-type: none"> <li>• To determine the historical or archaeological value of contacts found in the geophysical survey</li> <li>• To validate the locations of known wrecks</li> <li>• Assess the prehistoric landscape based on the seismic data</li> </ul>
4.2 Primary Question	Are any archaeological remains present within the Area of Interest and to what extent are these remains traceable?
4.3 Research Questions	<p>With respect to side scan sonar, magnetometer and multibeam survey:</p> <ul style="list-style-type: none"> <li>• Are there any phenomena visible on the seabed?</li> </ul> <p>If so:</p> <ul style="list-style-type: none"> <li>• What is the description of these phenomena?</li> <li>• Do these phenomena have a man-made or natural origin?</li> </ul> <p>If these phenomena can be designated to be man-made:</p> <ul style="list-style-type: none"> <li>• What classification can be attached?</li> </ul> <p>If these phenomena can be classified as archaeological:</p> <ul style="list-style-type: none"> <li>• Is it possible to interpret the nature of the archaeological objects?</li> </ul> <p>If these phenomena can be identified as natural:</p> <ul style="list-style-type: none"> <li>• What is the nature of these natural phenomena?</li> <li>• Based on the acoustic image is it possible to designate zones of high, middle or low marine activity on the seabed?</li> </ul> <p>If so:</p> <ul style="list-style-type: none"> <li>• How can these zones be interpreted?</li> </ul> <p>General:</p> <ul style="list-style-type: none"> <li>• What is the relation between the observed objects and the topography of the seabed? Based on this relationship can risk-prone areas be marked selectively?</li> <li>• If no acoustic phenomena can be observed, are there any clues that this is a consequence of either natural erosion, sedimentation or human interference?</li> </ul>

	<p>With respect to subbottom profiler- and sampling:</p> <ul style="list-style-type: none"> <li>Based on seismic profiles and geotechnical data is it possible to map the Pleistocene landscape?</li> </ul> <p>If so:</p> <ul style="list-style-type: none"> <li>What is the depth of the Pleistocene landscape compared to the present seabed?</li> <li>From Pleistocene to Holocene deposits is the transition gradual or instantaneous (erosive)?</li> <li>Can zones be identified where prehistoric settlement remains can be expected?</li> </ul> <p>If so:</p> <ul style="list-style-type: none"> <li>Could these expected settlement remains be effected by the installation of the cables based on their vertical position related to the seabed?</li> <li>Are there any indications observed on the seismic profiles for the presence of buried (man-made) objects?</li> </ul> <p>If so:</p> <ul style="list-style-type: none"> <li>Based on the presence of buried objects and its correlation with side scan sonar, magnetometer en multibeam data can something be said about the nature of these buried objects?</li> </ul>
4.4 Restrictions	Investigation 'with restrictions' is not applicable (for explanation, see: memoRIA 2 en 6 (Dutch Inspection Agency for Archaeology)).

## 5. Methodology and Techniques

5.1 Methodology and Techniques: strategy	<p>Generally the Dutch Archaeological Quality Standard (KNA wb 4.0) is applicable.</p> <p>For surface mapping the seabed of the area of interest is to be recorded fully covered by means of high-resolution side scan sonar and multibeam echosounder.</p> <p>For the mapping of ferro-metallic, buried or exposed objects a magnetometer is required. For the modelling of the subsurface a sub-bottom profiler is utilised. For the interpretation of the seismic profiles the results of the geotechnical sampling and CPS's are being used.</p>
5.2 Methodology and Techniques: execution	<p>For a standard inventory of the remains of airplanes, shipwrecks and maritime objects the following conditions are applicable:</p> <ul style="list-style-type: none"> <li>Frequency of the Side Scan Sonar minimally at 400 kHz;</li> <li>Maximum range setting of 50 meter for the side scan sonar;</li> <li>A vessel track distance of maximally 40 meters is allowed to ensure at least 100% overlay between adjacent lines</li> <li>A vessel track distance for the magnetometer of maximally 40 meter to ensure the detection of sizeable ferromagnetic (iron) wreck remains.</li> </ul> <p>For the reconstruction of the drowned prehistoric landscape the seismic profiles at least need to penetrate the seabed to the level of disturbance</p> <p>The survey vessel requires an accurate positioning system (preferably RTK). The possible offset between the GPS antennae and the sonar / magnetometer need to be verified through calibration relative to a fixed point of reference. Prior to and after the acquisition of data a sounding profile needs to be recorded to determine the velocity of sound in the water column. At a traveling speed of 4 knots the highest possible resolution of data is guaranteed.</p>

5.3 Restrictions	<p>Due to the sizeable extent of the area of interest (&gt;400 km<sup>2</sup>) and its location at sea it is practically not achievable to hold on to the above mentioned conditions for this field investigation.</p> <p>Therefore the proposition is to adhere to the following minimal conditions:</p> <ul style="list-style-type: none"> <li>• Fully surface covering multibeam data set conform IHO (2008) norm <i>special order</i></li> <li>• Fully surface covering side scan sonar records with a maximum vessel track distance of 100 meter and an overlap of minimally 100 % to ensure that all objects larger than 0.5 meter can be detected;</li> <li>• Provision of georeferenced side scan sonar images of all contacts;</li> <li>• Magnetometer records along the planned cable route with a vessel track distance between adjacent survey lines of maximal 100 meter;</li> <li>• Minimally one seismic profile along each planned cable route</li> <li>• The vessel speed should not exceed 6 knots</li> </ul> <p>Positioning using RTK may not achievable at sea.</p> <p>The presence of shallow gas, i.e. related to peat in the Holocene sediments, can result in acoustic blanking of the seismic signal. As a result the Pleistocene landscape will not be visible at these locations.</p> <p>The presence of boulders can make it difficult to distinguish buried wreck remains, unless phenomena such as scouring on the seabed are observed, that provide additional information about the dimensions and nature of the buried object. Also results from the magnetometer can add to the interpretation of the buried object.</p>
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6. Analysis	
6.1 Processing and analysis of geophysical data	The (comprehensive) data set must be processed and analyzed in order to provide answers the research questions posed. Geophysical data shall be analyzed by an experienced geophysicist (KNA status prospector maritime archaeology). A senior prospector maritime archaeology evaluates the data analysis and the reported results, conclusions and the advice.
6.2 Limitations	None

7. Final product: reporting and depositing	
7.1 deliverables	<p>A comprehensive report is part of the assignment. The final report shall be drawn up in accordance to KNA specification VS05wb. An English written report is to be delivered including a Dutch summary.</p> <p>The contractor produces a draft version of the report to the authority. The authority will review quality of the content of report delivered.</p> <p>Along with the final product a receipt of the delivery of documentation will be handed over by the receiving party.</p> <p>Along with the final report digital data carrier is delivered containing:</p> <ul style="list-style-type: none"> <li>• A listing of contacts of potential archaeological interest including positions and dimensions (in GIS format)</li> <li>• Images of all sonar and/or multibeam contacts of archaeological interest</li> <li>• Digital maps of the interpreted magnetometer, side scan sonar</li> </ul>

	<p>data, boreholes and subbottom profiler data</p> <ul style="list-style-type: none"> <li>Subbottom profiler and borehole data of archaeological interest</li> </ul> <p>If during the survey results in additional information with respect to objects known from the NCN-database or if man-made objects are encountered which have not been found before, this information shall be delivered digitally in a standard format to the area administrator (Department of Waterways and Public Works - Team Sea and Delta).</p>
7.2 Content final report	Refer to KNA VS05wb. For this project in particular side scan sonar, magnetometer, subbottom profiler and multibeam recordings play an important role in the interpretation of phenomena under water.
7.3 Publication and format of final report	The final report is issued by the contracting party. The report is part of the in house publication series of the contractor. The report is delivered to the Cultural Heritage Agency (digitally and analogue), the area administrator Department of Waterways and Public Works - Team Sea and Delta, the Royal Library and the digital archive DANS.
7.4 Deposition	Relevant results shall be registered in Archis within two months after completion of the standard report. Digital data will be handed over to the e-depot ( <a href="http://www.edna.nl">www.edna.nl</a> ) within two years after completion of the field survey.
7.5 Limitations	None

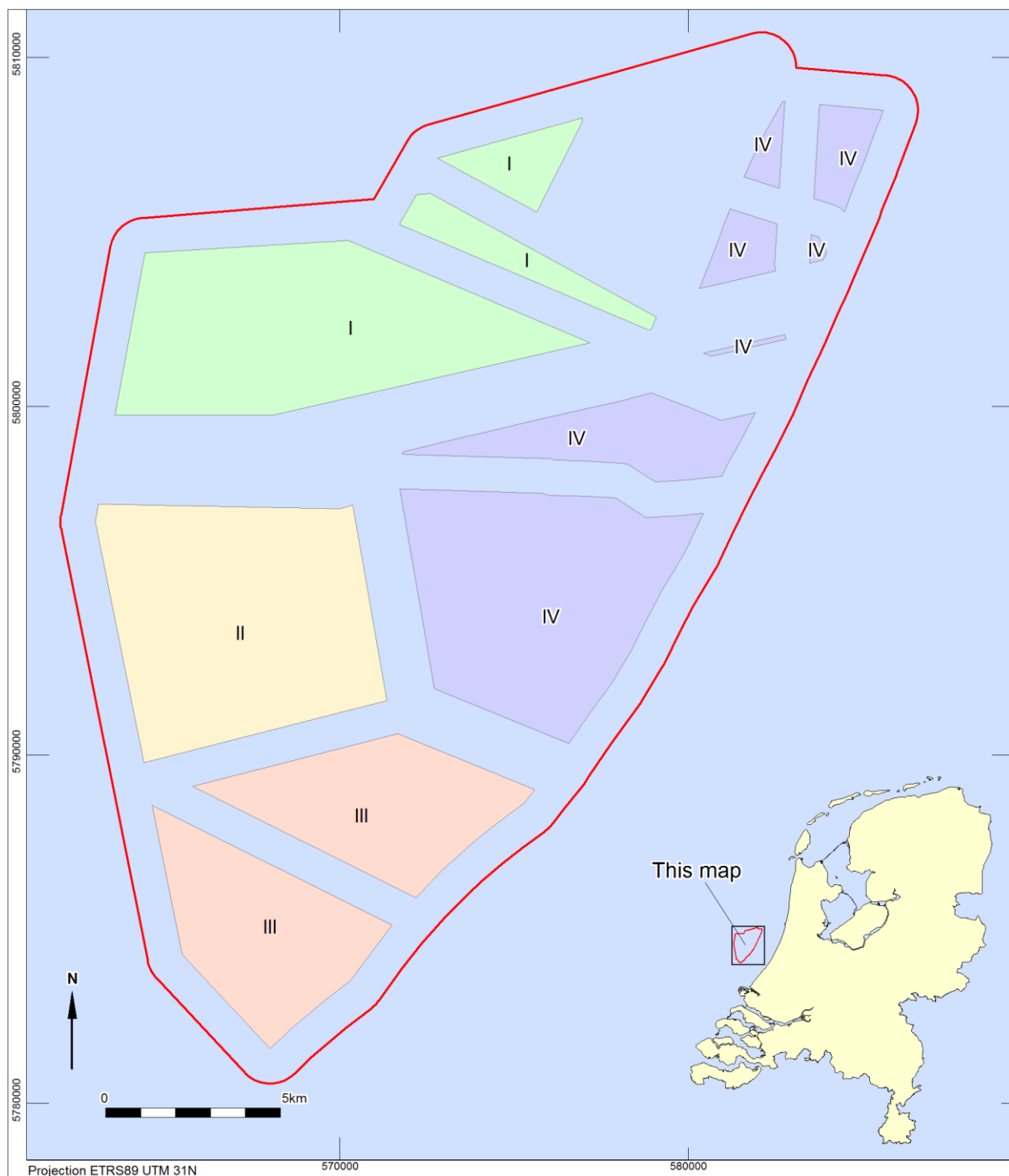
8. Prerequisites	
8.1 Personnel	The survey must be carried out or supervised by an archaeological company which is in the possession of a license to perform archaeological research in Dutch waters. The survey shall be supervised by a senior prospector maritime archaeology with a solid background in analogue projects at sea. Both for field work as for the analysis and reporting an experienced project leader with specific knowledge of the area is required.
8.2 Lead-time field work	In consultation with company
8.3 Work conditions	In agreement with ARBO law.
8.4 Quality control, supervision, consultation and evaluation	The Netherlands Enterprise Agency (RVO) and the Cultural Heritage Agency (RCE) supervise the process of archaeological research. Solely RVO and RCE are entitled to change the Program of Requirements.
8.5 Selection Procedure during field work	n.a.
8.6 Field work period; deadline draft report	Field work: July 2016 Draft report: August 2016
8.7 Procedure QC final product by authorities	The Netherlands Enterprise Agency (RVO), the Cultural Heritage Agency and the company review quality of the content of the draft version of the report. After finalizing the survey the period of time applicable for the QC is agreed upon.

9. Change of plans	
9.1 Changes during field survey	In consultation with the survey company and authorities.
9.2 Procedure for change after completion of field survey	Not applicable.
9.3 Procedure for change during analysis, reporting or conservation	In consultation with the survey company and authorities.

## 10. References

Literature	<ul style="list-style-type: none"> <li>• Brenk, S. van den, B.E.J. van Mierlo, en W.B. Waldus, 2008: Bureauonderzoek Aanleg Windturbinepark Tromp-Binnen en kabelroutes naar de Nederlandse kust. Periplus Archeomare rapport 08A014, Amsterdam.</li> <li>• Brenk, S. van den, R. van Lil, 2014: Offshore Exportkabeltracé Eneco Luchterduinen, een beknopte archeologische assessment. Periplus Archeomare rapport 13A029-01, Amsterdam.</li> <li>• Brenk, S. van den, R. van Lil, 2014: Bureauonderzoek en inventariserend veldonderzoek Offshore Windmolenpark en Exportkabeltracé Eneco Luchterduinen. Periplus Archeomare rapport 13A029-02, Amsterdam.</li> <li>• Brenk, S. van den, R. van Lil, 2014: Bureauonderzoek en inventariserend veldonderzoek Offshore windpark en exportkabeltracé Eneco Luchterduinen. Periplus Archeomare rapport 13A029-02, Amsterdam.</li> <li>• Brenk, S. van den, R. van Lil and E.A. van den Oever, 2015: Desk study archaeological assessment Hollandse Kust (Zuid). Periplus Archeomare rapport 15A024-01, Amsterdam.</li> <li>• Brenk, S. van den, en R. van Lil, Amsterdam, 2016: Desk study archaeological assessment Viking Link Interconnector. Periplus Archeomare rapport 15A038-01, Amsterdam.</li> <li>• Brenk, S. van den, R. van Lil and E.A. van den Oever, 2015: Archaeological assessment of geophysical survey data - Transmission stations and cable routes Windfarm Borssele. Periplus Archeomare rapport 15A028-01, Amsterdam.</li> <li>• Mulder, E. de, e.a., 2003: <i>De ondergrond van Nederland</i>, Groningen.</li> <li>• Deeben, J., D.P. Hallewas &amp; Th.J. Maarleveld, 2002: Predictive modelling in Archaeological Heritage Management of the Netherlands: the Indicative Map of Archaeological Values (2nd Generation), Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek 45, 9-56.</li> <li>• Erkens, G., Hijma, M.P., Peeters, J.H.M., van Heteren, S., Marges, V.C. en Vonhögen-Peeters, L.M., 2014. Proef Indicatieve Kaart Archeologische Waarden (IKAW) North Sea. Deltares rapport 1206731-000-BGS-0013</li> <li>• IMAGO projectgroep, 2003: Eindrapportage IMAGO: Samenvatting en conclusies, RDIJ rapport 2003-13a.</li> <li>• Lil, R. van, en S. van den Brenk, 2014. Archeologisch bureauonderzoek, Windturbinepark Q4 en kabelroute naar de Nederlandse kust. Periplus Archeomare rapport 14A021-01, Amsterdam.</li> <li>• Lil, R. van, 2014: Archeologisch bureauonderzoek, Kabelroute Wijk aan Zee - Beverwijk tbv. Offshore windpark Q4. Periplus Archeomare rapport 14A021-02, Amsterdam.</li> <li>• Louwe Kooijmans, L.P., 1970-1971. <i>Mesolithic Bone and Antler Implements from the North Sea and from the Netherlands</i>.- Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek, 20-21: 69-70.</li> <li>• Maarleveld, Th. J. en E.J. van Ginkel, 1990: Archeologie onder water, het verleden van een varend volk, Amsterdam.</li> <li>• Maarleveld, TH.J. , Almere 1998: Archaeological heritage management in Dutch waters: exploratory studies.</li> <li>• Rijdsdijk, K.F, S. Passchier, H.J.T. Weerts, C. Laban, R.J.W. van Leeuwen &amp; J.H.J. Ebbing, 2005: Revised Upper Cenozoic stratigraphy of the Dutch sector of the North Sea Basin: towards an integrated lithostratigraphic, seismostratigraphic and allostratigraphic approach. Netherlands Journal of Geoscience 84-2, p 129-146</li> <li>• Van Heteren, S., J.A.C. Meekes, M.A.J. Bakker, V. Gaffney, S. Fitch, B.R. Gearey and B.F. Paap, 2014. Reconstructing North Sea palaeolandscapes from 3D and high-density 2D seismic data: An overview</li> </ul>
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## Appendix 1. Location map



## Appendix 2. Known objects in the research area (from archaeological desk study)

