

Zaak IDnummer	Datum/ uitvoerder/ Type onderzoek	Resultaten
		archeologische begeleiding. Er geldt een hoge verwachting op resten uit de Late Middeleeuwen tot de Nieuwe tijd (Brattinga 2016).
2188931100	2008/ ArcheoPro/ Booronderzoek	Booronderzoek bij het Neeltje Snijdershof te Wijk aan Zee gemeente Beverwijk, geen rapport beschikbaar in Archis en DANS.
2331433100	2011/ RAAP/ Bureauonderzoek en booronderzoek	Op basis van het bureauonderzoek is vastgesteld dat voor het plangebied een hoge archeologische verwachting gold voor vindplaatsen (archeologische resten) uit zowel de periode Bronstijd t/m Vroege Middeleeuwen als de Late Middeleeuwen (-Nieuwe tijd). Aan de hand van de resultaten van het veldonderzoek is echter geconcludeerd dat de hoge archeologische verwachting voor vindplaatsen uit de periode Bronstijd t/m Vroege Middeleeuwen kan worden bijgesteld naar middelhoge. De archeologische verwachting voor vindplaatsen (archeologisch relevante sporen) uit de Late Middeleeuwen (-Nieuwe tijd) blijft hoog (Nales 2011).
2361655100	2013/ RAAP/ Archeologische begeleiding	Zie boven. Tijdens de begeleiding is er één werkput aangelegd van 61 x 7 m (427 m ²) op de Dorpsweide direct ten zuiden van de Verlengde Voorstraat. In het zuidelijke deel van dit vlak is een aantal grondsporen aangetroffen. Omdat deze sporen werden bedreigd door de aanleg van de leiding, zijn deze gedocumenteerd (getekend, beschreven, gecoupeerd en afgewerkt). De sporen liggen aansluitend aan en lijken verband te houden met de reeds bekende vindplaats uit de Nieuwe tijd, ten zuiden van het plangebied. Gezien de ligging aan de kust is de vindplaats als vissersnederzetting geïnterpreteerd (Ilson 2013).
2100291100	2005/ ADC/ Archeologische opgraving	Op de onderzoekslocatie wordt een infiltratiesysteem gerealiseerd. De ingreep in de bodem zal grotendeels reiken tot ongeveer 2 meter beneden het maaiveld, maar plaatselijk tot 3 meter diepte. Op het Julianaplein zijn tijdens vooronderzoek en opgraving zeven putten aangelegd. In put 2 zijn de noordelijke begrenzing van het kerkhof en de fundamenten van enige daarbuiten gelegen gebouwtjes vastgesteld. De oudste fundamenten kunnen uit de 18e of 19e eeuw dateren. De jongste horen bij een gebouw uit de 20ste eeuw. Het betreft waarschijnlijk een voormalig café. In de putten 3 – 7 zijn uitbraaksleuven, vloerresten en steunberen van het noordtransept van de kerk van vóór 1573 aangetroffen (Lohof en Ploegaert 2008).
4015512100	2016/ Hollandia/ Archeologische begeleiding	Archeologische begeleiding van de rioolwerkzaamheden aan de Middenweg-Julianaplein in Wijk aan Zee, gemeente Beverwijk (Salomons 2017). Rapport niet beschikbaar in Archis.
2064125100	2005/ NMF/ Bureauonderzoek	Bureauonderzoek naar de archeologische waarde van de locatie Julianaplein/Zwaanstraat te Wijk aan Zee. Geen rapport beschikbaar.
2073951100	2005/ ADC/ Proefsleuven	Zie 4015512100.
2240202100	2009/ NMF/ Bureauonderzoek	Rapport niet beschikbaar in Archis of DANS.
4021700100	2016/ RAAP/ Booronderzoek	Het betreft een mechanisch booronderzoek (inventariserend veldonderzoek verkennende fase) bij onderzoeksgebied Kroftenweg/Tata Steelterrein (Wijk aan Zee), gemeente Beverwijk. Tijdens het veldonderzoek is de verwachte bodemopbouw grotendeels bevestigd. Onder een recent verstoorde pakket is een intact landschap van Jong Duinzand op Oude Duin- en Strandzanden aangetroffen, waarbij in 6 van de 8 boringen het Jonge en Oude Duinzand van elkaar werden

Zaak IDnummer	Datum/ uitvoerder/ Type onderzoek	Resultaten
gescheiden door een zandige veenlaag. De hoge archeologische verwachting voor de aanwezigheid van archeologische vindplaatsen uit de Bronstijd t/m Vroege Middeleeuwen is gehandhaafd maar er is geen vervolgonderzoek geadviseerd (Boer en Warning 2017).		
2481957100	1969/ Particulier/ Archeologische opgraving	Deze onderzoeks melding is administratief aangemaakt ten behoeve van koppeling van data uit BonelInfo. De precieze onderzoeks locatie was niet in alle gevallen te achterhalen (Archis).
2454319100	2014/ Periplus/ Bureauonderzoek	Rapport niet beschikbaar in Archis of DANS.
3997451100	2016/ NMF/ Bureauonderzoek	Rapport niet afgemeld en niet beschikbaar in Archis of DANS.

5 CONCLUSIES EN AANBEVELINGEN

5.1 Conclusie en gespecificeerd verwachtingsmodel

Op basis van de landschappelijke situatie, historische ontwikkeling, archeologische beleidskaarten, informatie over bekende archeologische waarden en resultaten van eerder uitgevoerd archeologisch bureau- en veldonderzoek, is een overzicht gemaakt van de bekende archeologische waarden in het plangebied en is een archeologische verwachting opgesteld.

Ter plaatse van tracéalternatieven 1 en 2 zijn geen bekende waarden aanwezig. Bij tracéalternatief 3 liggen twee AMK-terreinen. Nummer 1869 is een terrein van hoge archeologische waarden. Hier liggen de funderingen van een vuurtoren uit de Late Middeleeuwen met een buitenwerk van circa 4 bij 4 meter. Het terrein is duidelijk zichtbaar als geëgaliseerd vlak in een vergraven duin. Nummer 13953 is een terrein van archeologische waarden gelegen in het Gaasterbos. Het betreft lunet nummer 25 (groot lunet) van de Linie van Beverwijk. Bij tracéalternatief 4 aan de Zeestraat ligt lunet 23 (groot lunet) van dezelfde linie, tevens een AMK-terrein van archeologische waarde (nummer 13952). Verder ligt bij de aanlanding van tracéalternatief 4 het recent aangetroffen scheepswrak van de stoomtrailer de Heemskerk die hier in 1923 voor de kust zonk.

De archeologische verwachting voor het plangebied valt te onderscheiden in verschillende categorieën (zie kaartbijlagen en Tabel 10). De moflocaties op het strand hebben allen een lage verwachting op archeologische waarden. De werkterreinen van tracéalternatief 4 en het meest westelijke werkterrein van tracéalternatief 1 zijn reeds onderzocht en vrijgegeven.

Voor de overige gebieden geldt een hoge verwachting op resten uit verschillende perioden:

- Voor een deel van het gebied waar het transformatorstation wordt gerealiseerd geldt een hoge verwachting op het aantreffen van resten van historisch erf Tussenwijk.
- In de noordwesthoek van de transformatorstationslocatie is in het Oud Duingebied een mogelijke vindplaats aangetroffen uit de Bronstijd-IJzertijd en mogelijk Romeinse tijd op een diepte van 0,3 tot 2,1 m +NAP (6,1 - 8,2 m onder maaiveld). Bewoning tot in de Vroege Middeleeuwen kan echter nog niet uitgesloten worden. Hier geldt dus een verwachting op een vindplaats uit de Late Bronstijd tot en met de Vroege Middeleeuwen.
- Voor de overige werkterreinen geldt een hoge archeologische verwachting op resten uit het Laat Neolithicum tot en met Vroege Middeleeuwen in het Oud Duingebied onder de Jonge Duinen.
- Ook kunnen bij een werkterrein op tracéalternatief 1/2 en 3 resten van de Tweede Wereldoorlog voorkomen, in het bijzonder van de Atlantikwall (Tabel 10).

In Tabel 10 is de gespecificeerde archeologische verwachting beschreven.

Tabel 10. Gespecificeerde archeologische verwachting.

Periode	Verwachting	Complextypen	Kenmerken	Diepteligging	Gaafheid
Laat Neolithicum tot Late Bronstijd	Hoog	Nederzettingsresten	Losse vondsten en vondst- en sporen niveau	Top van het Oud Duingebied	Wanneer afgedekt met een intakte veenlaag en Jong Duinzand goed
Late Bronstijd tot Vroege Middeleeuwen	Hoog	Nederzettingsresten	Vondst- en sporen niveau	Bij transformatorstation 6 tot 8 meter -Mv	Goed
Late Middel-eeuwen tot Nieuwe tijd B	Hoog, geldt alleen ter hoogte van Erf Tussenwijk	Historisch erf	Vondst- en sporen niveau, bouwmateriaal	Direct onder de bouwvoor	Slecht tot redelijk
WOII	Hoog	WOII elementen	Vondst- en sporenniveau	Direct onder de bouwvoor	Slecht tot redelijk

5.2 Advies

Het advies voor de verschillende gebieden valt te onderscheiden in een aantal categorieën.

- Voor de moflocaties op het strand, de werkterreinen van tracéalternatief 4 en voor het meest westelijke werkterrein van tracéalternatief 1 wordt **geen vervolgonderzoek** geadviseerd.

Voor de overige werkterreinen van tracéalternatief 1 t/m 4 d met een hoge archeologische verwachting gelden verschillende adviezen (kaartbijlage; advieskaart).

- Voor het deel van het gebied waar het transformatorstation wordt gerealiseerd met de hoge verwachting op een historisch erf wordt een **archeologisch proefsleuvenonderzoek** geadviseerd.
- Voor het deel van het gebied waar het transformatorstation wordt gerealiseerd met zowel een hoge verwachting op een vindplaats uit de periode Late Bronstijd tot en met Vroege Middeleeuwen, wordt een onderzoek geadviseerd in de vorm van een **karterend booronderzoek** en een **proefsleuvenonderzoek**.
- Voor de overige werkterreinen geldt een hoge verwachting op de periode Laat Neolithicum tot en met de Vroeg Middeleeuwen en wordt vervolgonderzoek geadviseerd in de vorm van een **verkennend booronderzoek**.

Het doel van het verkennend booronderzoek is om het gespecificeerde verwachtingsmodel te toetsen. Dit wordt getoetst door de bodem opbouw en/of bodemverstoringen gedetailleerd in kaart te brengen. Tevens moet het aantonen of er oude bewoningslagen aanwezig zijn.

Het doel van het karterend booronderzoek en het proefsleuvenonderzoek is om de aanwezigheid van archeologische resten te toetsen en eventuele vindplaatsen te karteren en waarderen.

Dit advies kan door de initiatiefnemer te worden voorgelegd aan het bevoegd gezag, in dit geval de gemeenten Heemskerk, Beverwijk en Velsen (afhankelijk van het uiteindelijk gekozen voorkeursalternatief). Het bevoegd gezag kan van het door Arcadis gegeven advies afwijken.

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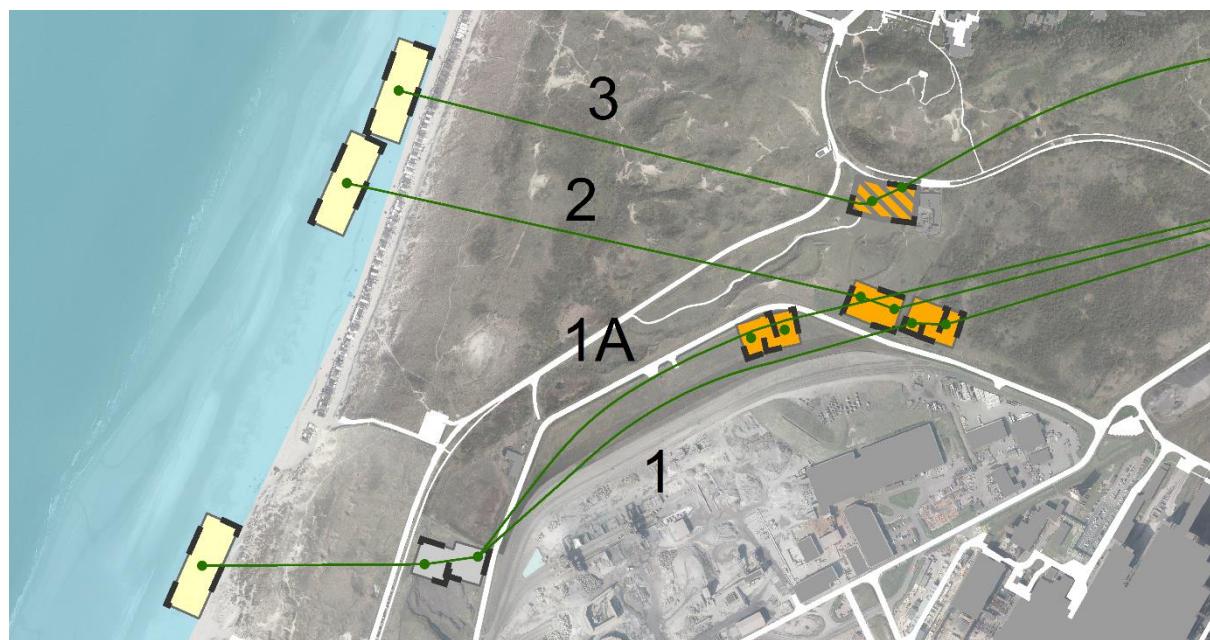
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KAARTBIJLAGEN

Kaart bekende archeologische waarden



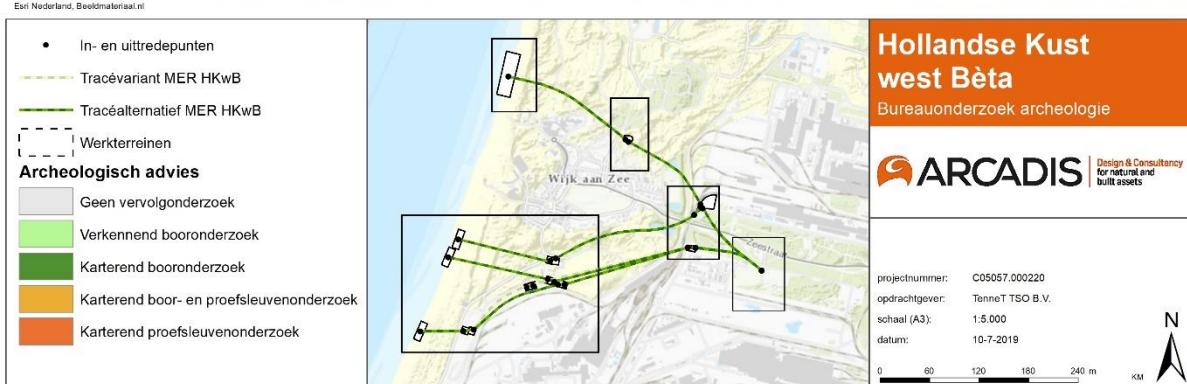
Kaart verwachte archeologische waarden

Archeologische verwachting

- Hoge verwachting op Laat Neolithicum tot Vroege Middeleeuwen
- Hoge verwachting op Laat Neo tot Vroege ME en WOII
- Hoge verwachting op Late Bronstijd tot Vroege Middeleeuwen
- Hoge verwachting op Late Bronstijd tot Vroege Middeleeuwen en een historisch erfgoed
- Hoge verwachting op historisch erfgoed
- Lage verwachting
- Onderzocht en vrijgegeven

Tracéalternatief MER HKwB

- In- of uitredepunt boring
- Werkterrein
- Tracé HKN/HKwA
- Transformatorstation HKN/HKwA
- Locatie transformatorstation HKwB

0 500 1.000 m.

Advieskaart

COLOFON

BUREAUONDERZOEK ARCHEOLOGIE HKWB
ARCADIS ARCHEOLOGISCHE RAPPORTEN 193

KLANT

TenneT TSO B.V.

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BIJLAGE VIII-A

ONDERZOEK NGE OP ZEE

Desk Top Study

Unexploded Ordnance (UXO)

Hollandse Kust (West Beta)

Export Cable Routes

RO-190149 Draft report version 0.1

Reference number Arcadis: C05057.000220.0231

7 August 2019



Desk Top Study

Unexploded Ordnance

Hollandse Kust (West Beta) Export Cable Routes

Client : Arcadis
Ref. number client : C05057.000220.0231
Label : 73556 / RO-190149 version 0.1 (Draft)
Place, Date : Riel, 7 August 2019
Author : Mr. K. Schuddinck, MA
Checked by : Mr. J. Kapel, Senior UXO Specialist
Approved by : Mr. M. Taks, Head of Advice Department

REASeurop

(Organization name)

Mr. M. Taks
Head of Advice Department

Contact Person
Function

Front page image: Fragment of oblique aerial photograph showing Bristol Beaufighter's of the North Coates Strike Wing attacking a small enemy convoy off Terschelling, Holland. The nearest trawler is being attacked with cannon gunfire, and also with rocket projectiles fired by the aircraft from which the photograph was taken. Source: Imperial War Museum.

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1 GENERAL INFORMATION

This chapter describes the cause for the Desk Top Study – Unexploded Ordnance (DTS-UXO). Furthermore the area of investigation, the area of analysis, the purpose and methodology are described. The chapter concludes with a general structure of the report.

1.1 INTRODUCTION

In order to connect the Hollandse Kust Wind Farm Zone with a power station on the Dutch mainland, TenneT intends to construct a cable route. Arcadis was commissioned by TenneT to investigate and design possible cable routes and alternative. Part of the investigation is a DTS-UXO. A DTS-UXO is a study in which the relevant war related events are analysed in order to determine if UXO possibly remain. The whole project consists of two parts: an onshore and an offshore part. The scope of this DTS-UXO is the offshore part. Both parts are shown in the figures below.

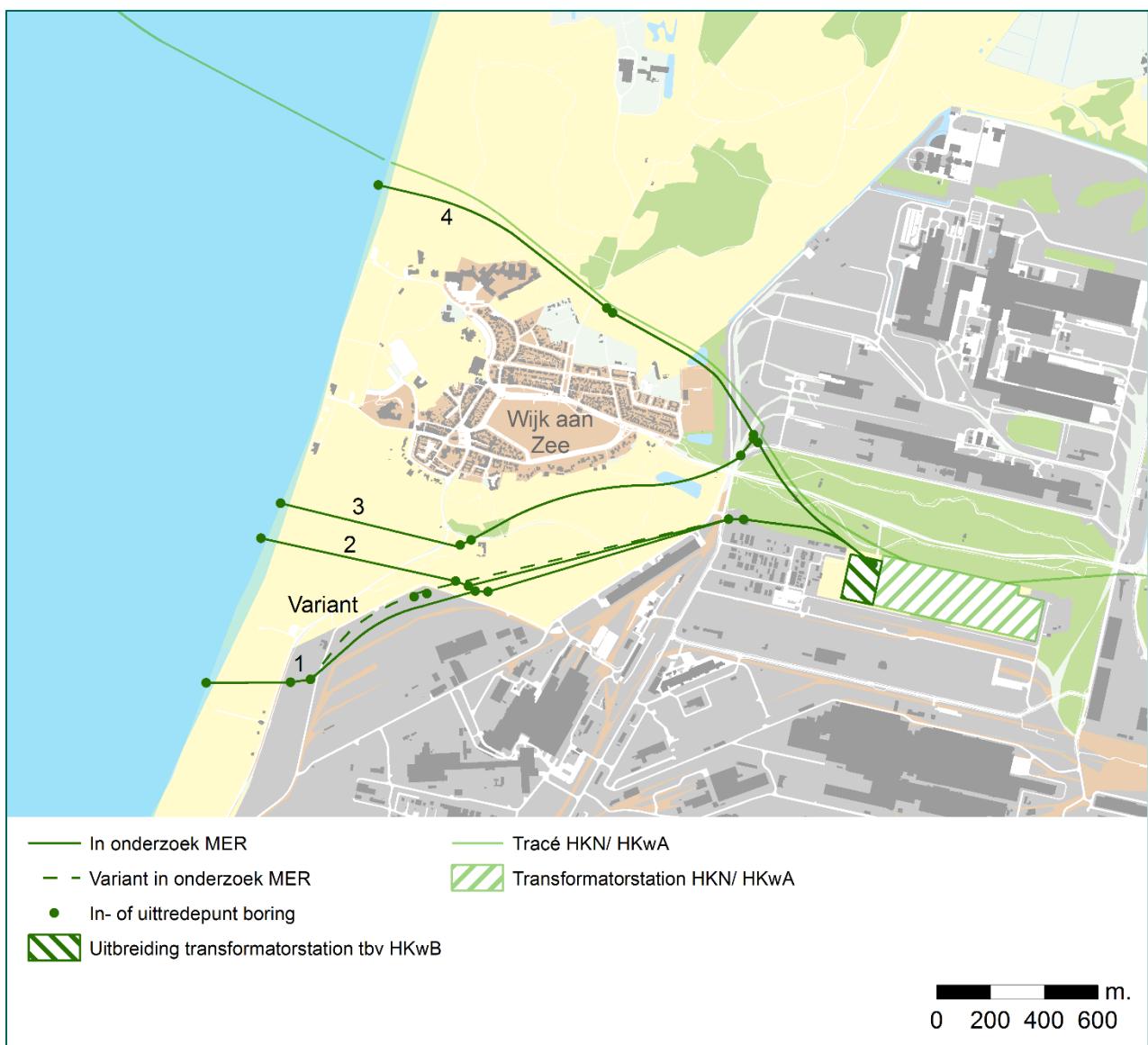


Figure 1: The onshore part. (Source: Arcadis).

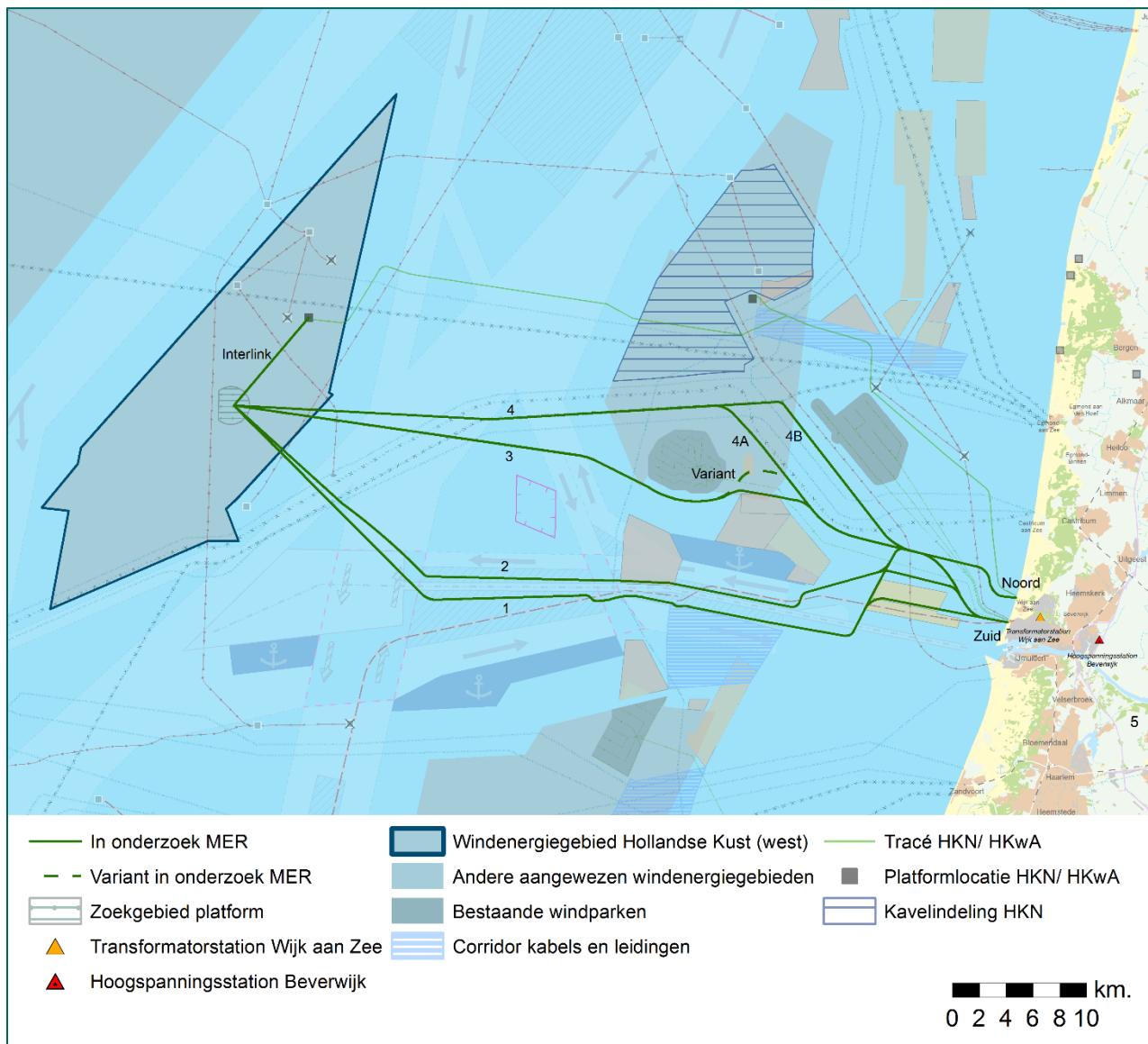


Figure 2: The offshore part, which is the scope of this DTS-UXO. (Source: Arcadis).

1.2 AREA OF INVESTIGATION AND AREA OF ANALYSIS

The area of investigation consists of a platform, an interlink cable and four cable routes with alternatives. The area of analysis is a 5,000 m radius around the area of investigation. This radius is necessary to gain full insight in the area of investigation during the First and the Second World War.

The given radius is based on the inaccuracies inherent to conducting offshore desk research. The positions of naval minefields, air strikes and crashes and convoy routes in historical sources are given only approximately, since navigation equipment was not nearly as accurate as modern systems. . The most common method of noting locations during the World Wars was based on decimal degrees, which were accurate down to 1 naval mile (1.852 meters). Another way positioning is found in German sources, which are based on the German Naval Grid (*Kriegsmarine Quadranten*), with a grid size of 6x6 nautical miles. Historical sources based on this grid thus position war related events in an area of 123 square kilometers.

Besides these inherent inaccuracies from historical sources, one must take into account the displacement of UXO on the sea bed. Bottom trawling and recent developmental activities may have caused this displacement. The working area and the area of investigation are shown in the figure below.

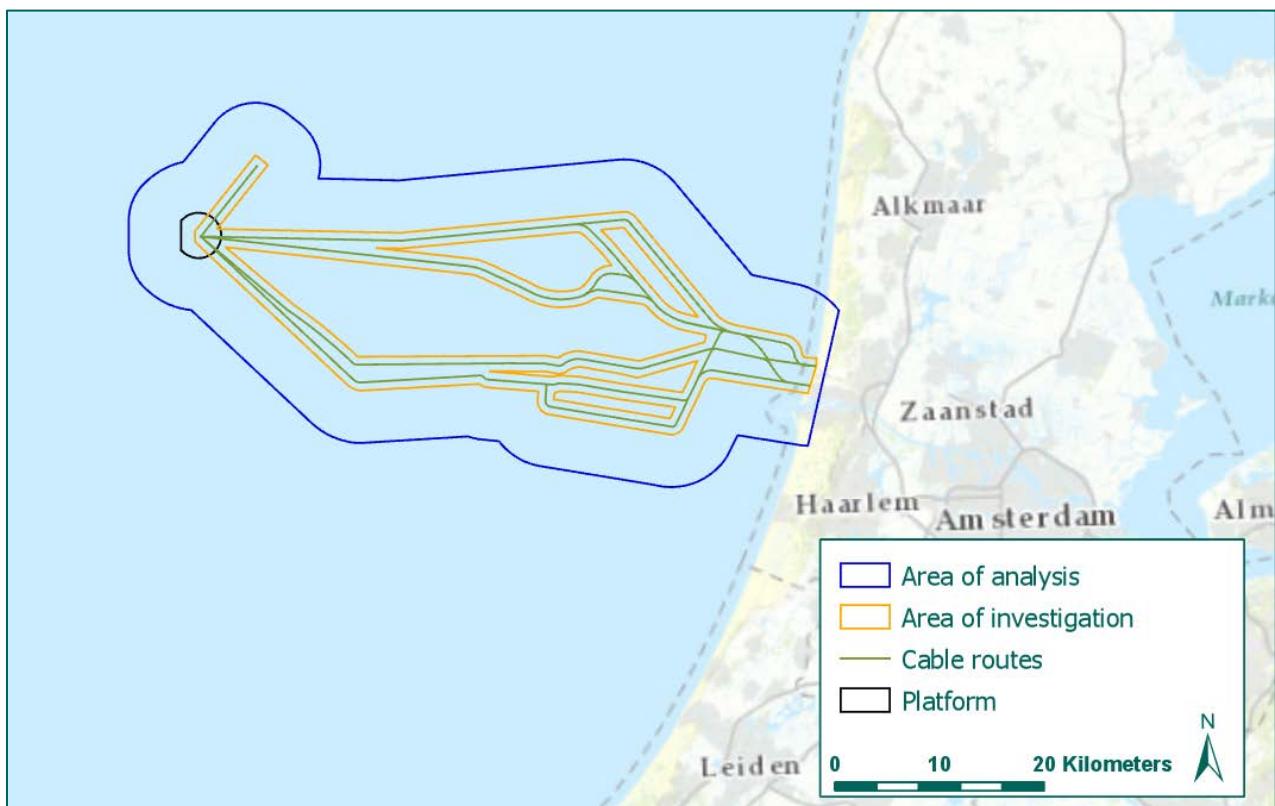


Figure 3: Area of investigation and area of analysis. (Source of base map: ESRI).

1.3 PURPOSE AND MAIN OBJECTIVES

The purpose of the UXO desk study is to answer the following questions:

- Could UXO remain in the area of investigation?
- What are the characteristics (the type, amount, and condition) of the expected UXO?

1.4 METHODOLOGY

The research report is conducted in accordance with the Dutch WSCS-OCE regulations for UXO research. The WSCS-OCE regulations are mostly applicable to land-based research. This desk top study thus departs from these regulations when necessary. Examples in which the WSCS-OCE cannot be applied are the demarcation of risk areas, obligatory sources and interpretation of aerial photography. Therefore additional requirements of Arcadis¹ for offshore research are applied.

War related events that took place in the area of analysis are derived from historical sources, and subsequently analysed. A solid analyse can be done on the condition that sufficient sources are available and the war related event can be located as precise as possible in the area of analysis. The outcome of the analysis is the determination if UXO are possibly left within the area of investigation.

This research is the result of a team consisting of a historian, a GIS-specialist and a Senior UXO expert. Page 1 of this report mentions the involved experts. ArcGIS Pro version 2.3.3² has been used as a tool to conduct this research. Historical maps and other information have been gathered and projected in this geographical information system for analysis. GIS is also used to position and clarify the relevant war related events mentioned in the list of war related events in chapter 3.

¹ These requirements are described in the document 'Voorwaarde vooronderzoeken CE versie 5.0'.

² Mentioned as 'GIS' throughout this report.

1.5 GENERAL STRUCTURE

Chapter 2 gives an overview of the consulted sources. A list with war related events – based upon the sources – is composed in chapter 3. War related events relevant for this project are analysed in chapter 4 in order to determine if UXO could remain in the area of investigation (horizontal demarcation). Contra-indications and the vertical demarcation are included in chapter 5. The conclusion and advice are given in chapter 6.

A glossary of terms is added in annex 1. The (historical) sources which are consulted, together with additional explanation are elaborated in annex 2 to 7. Annex 9 consists of a checklist. The drawings are added in annex 10.

2 SOURCES

This chapter gives an overview of the consulted sources. A more detailed elaboration of each source can be found in the annexes. The following table shows the obligated sources according to the WSCS-OCE regulations, and the sources consulted for this DTS.

Source	Obligated according to the WSCS-OCE	Consulted for this DTS
Literature	<input type="checkbox"/>	■
Dutch archives		
Municipal archives	<input type="checkbox"/>	N/A ³
Provincial archives	<input type="checkbox"/>	N/A
Nederlands Instituut voor Militaire Historie (NIMH)		■
NIOD Instituut voor Oorlogs-, Holocaust- en Genocidestudies (NIOD)		N/A
Nationaal Archief (NA)		■
Explosieven Opruimingsdienst Defensie (EOD)		
• UXO clearance reports	<input type="checkbox"/>	N/A
• Minefield map collection	<input type="checkbox"/>	N/A
• MMOD ⁴ -archives	<input type="checkbox"/>	N/A
Collections of Aerial Photography		
Wageningen University library	<input type="checkbox"/>	N/A
KadasterTopographical Department (Zwolle)		
• Aerial photography collection	<input type="checkbox"/>	N/A
• Allied military map collections		
The National Collection of Aerial Photography (NCAP, Edinburgh)		N/A
Luftbilddatenbank (Estenfeld)		N/A
International archives		
The National Archives (London, UK)		■
Bundesarchiv-Militärarchiv (Freiburg, DE)		■
National Archives and Records Administration (College Park (MD), US)		■
Library and Archives Canada (Ottawa, CA)		N/A
Sources specific to offshore research		
Royal Netherlands Navy Hydrographic service		■
Dutch Coast Guard		■
Map collection of the Dutch Navy Museum		■
Noordzeeloket		■
UK Hydrographic Office		■
Other sources		
Crash Database of the Studiegroep Luchtoorlog 1939-1945		■
Cultural Heritage Agency of the Netherlands		■

Table 1: Consulted sources.

Literature

An overview of used literature can be found in annex 2. A variety of local, national and international books were consulted. These books have been studied for descriptions and events which might be relevant to the area of investigation. The resulting events are shown in chronological order in tables. The references (book and page) for each event are included in the tables.

Crash Database

The Dutch Air War Study Group 1939-1945 (Studiegroep Luchtoorlog 1939-1945) maintains an online database of all military airplane losses in the Netherlands during WWII. This record is checked and the results are presented in Annex 2.

³ Not applicable sources are exclusively relevant for land-based research, and have thus not been consulted.

⁴ MMOD was the Mine and Munitions clearance service, one of the predecessors of EOD.

Nederlands Instituut voor Militaire Historie (NIMH) in Den Haag

The NIMH is the institute for military history of the Dutch armed forces. This institution maintains several archives concerning Dutch military history. The Collection 035: Volkers (coastal mines), 092: Navy Mongraphy and 575: German Defence Works have been checked for any relevant events in the area of investigation.

Nationaal Archief (NA) in The Hague

The Dutch National Archives have been consulted for more information on the dumping of explosives, naval minefields and minesweeping, shipwrecks and other relevant information for the area of investigation. Annex 3 contains the relevant information from the National Archives.

Post-war UXO clearance: Coast Guard and OSPAR

The area of investigation is situated in the North Sea, 12 Nautical Miles off the Dutch coast. Therefore, the UXO-related interventions of the Coast Guard⁵ and the database of the OSPAR Commission⁶ were consulted. The results are shown in annex 5.

The National Archives (TNA) in London

The National Archives have been consulted for information on naval minefields, air strikes, naval combat, bomb jettisons and other relevant war related events. The Admiralty, War Cabinet and Air Ministry archives have been consulted for this information. Annex 5 contains relevant results from TNA.

Bundesarchiv-Abteilung Militärarchiv (BAMA) in Freiburg

The German military archives were severely damaged during World War II. What remains of the archives is kept and maintained in the Bundesarchiv in Freiburg. The archives of the German navy (*Kriegsmarine*) survived the war relatively well compared to the other service branches. These have been consulted for this desk top study, as well as the German Air Force (*Luftwaffe*) archives, from which only 2% of the documents survived the onslaught of the war. Annex 5 contains the relevant information from the BAMA. On behalf of REASeuro some exemplary documents have been delivered by Wardocs B.V. The report of Wardocs is added in Annex 8.

National Archives and Records Administration (NARA) in College Park (MD)

Research has been conducted in the US National Archives and Records Administration. The NARA has been consulted for documents from the US Army Air Forces (USAAF) and for the collection of captured German records.

Noordzeeloket

The Noordzeeloket contains information on military usage of the North Sea, and has thus been consulted for information on the area of investigation.

Royal Netherlands Navy Hydrographic service

This has been consulted for recent naval charts of the area of investigation. These naval charts show wrecks and other obstructions on the seabed. Information on wrecks has also been derived from the wreck register (HP39). Annex 7 contains information from the Hydrographic Service.

⁵ The Royal Netherlands Navy keeps a detailed registration on UXO encounters in the Dutch and Belgian part of the North Sea. The registration provides information on UXO encounters since 2005.

⁶ The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR-convention) provides a framework for reporting encounters with conventional and chemical munitions in the OSPAR maritime area.

UK Hydrographic Office

The UK hydrographical office maintains a collection of historical naval charts, including charts that contain minefields and convoy routes. Naval charts showing the area of investigation have been consulted and are shown in Annex 6.

Marinemuseum, Den Helder

The Navy Museum ('Marinemuseum') holds a collection of Royal Netherlands Navy maps and charts. The collection includes maps of post-war minesweeping operations. The relevant information is added in Annex 6.

Navy Museum, Den Helder

The Navy Museum ('Marinemuseum') holds a collection of Royal Netherlands Navy maps and charts. The collection includes maps of post-war minesweeping operations. The relevant information is added in Annex 6.

3 WAR RELATED EVENTS

The consulted historical sources (see Annexes) indicate several war related events within the area of analysis. The war related events derived from the historical sources are listed chronological in the table underneath. A primary analysis divides the events between events considered relevant and not relevant for the area of investigation. Relevant events are subsequently referred to a paragraph for further analysis. All relevant events that could be located on the map, are visible on the Fact Map (see Annex 9) and have a unique number (HKW_<number>).

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
1881-1888	Erection of Fort IJmuiden with 5 x 24 cm and 2 x 15 cm guns.	TOL, VER			Yes, the guns reached the area of analysis.	4.4	HKW_001
1914-1918	Moored German and British mines were laid in front of the Dutch coast. Moored mines also break loose and start drifting.	CRO, BEZ1		BAMA: RM 5/4721K. Library of Congress.	Yes, mines were encountered in the area of analysis.	4.3	-
26 July 1915	3 miles N of IJmuiden a mine was sunk.		NA: 2.12.18.		Yes, within area of analysis.	4.3	-
18 September 1915	A Dutch ship ran onto a moored mine.		NA: 2.05.32.09.		Yes, within area of analysis.	4.3	HKW_006
26 April 1916	A Dutch ship ran onto a moored mine.		NA: 2.05.32.09.		Yes, within area of analysis.	4.3	HKW_007
1938-1939	Exercise with coastal Battery I and II at IJmuiden on a moving target at sea. Also exercises with the 15 cm guns were held.	HAV			Yes, within area of analysis.	4.4	HKW_001
1939	To protect the IJmuiden harbour, a series of ground mines were laid in the outer harbour.	BUR			Yes, within area of analysis.	4.3	-
1939-1945	British minelaying offensive. An amount of 73,650 mines was laid or dropped in enemy waters.			TNA: ADM 1/18996, 239/304.	Yes, relevant context information.	4.3	-
	Air minelaying offensive ("Gardening operations") in gardening zone "Whelks" and "Trefoil".			TNA: ADM 234/560, 234/561. BAMA: ZA 5/27.	Yes, within area of analysis.	4.3	HKW_008, HKW_009
	German defensive minelaying. A total of 5 minefields has overlap with the area of analysis.			BAMA: ZA 5/44, 5/48 UK Hydrographic Office.	Yes, within area of analysis.	4.3	HKW_010 to _014
1940-1945	Allied bombardments on different targets in IJmuiden.	HKV, BUR, ZWA1&2, ROL		BAMA: RM 67/26.	These air raids were against onshore targets, and are therefore not relevant for the scope of this desktop study.	-	-
1940	At the beginning of the Second World War, five coastal batteries were stationed in IJmuiden.	VER, POL	NA: 2.12.18. NIMH: Collection 492.		Yes, within area of analysis.	4.3	HKW_002 to _005

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
10 May 1940	German planes dropped magnetic mines in front of IJmuiden.	ROL, BOS, BEZ1, DIS, BUR			Yes, within area of analysis.	4.2	-
	German planes attacked shipping in IJmuiden and at the sea of IJmuiden with bombs, cannon and machine guns.	BEZ1			Yes, within area of analysis.	4.3	-
	Coastal forces. Minelaying. Operation CBX: 236 mines were laid.	BUR		TNA: ADM 234/560, 234/561.	Yes, within area of analysis.	4.3	HKW_015
12 May 1940	15 miles off IJmuiden, the steam ship Sembilan was attacked by German planes.	BUR			Yes, within area of analysis.	4.2	-
12/13 May 1940	A Dutch steam ship – Van Renselaer – was hit by a magnetic mine between the moles.	BUR, BOS, ROL			Yes, within area of analysis.	4.3	-
13 May 1940	The British HMS. Whitshed was attacked by six German planes with bombs while entering IJmuiden harbour.	BUR			Yes, within area of analysis.	4.2	-
14 May 1940	Luftwaffe. German planes dropped LMA and LMB mines, also in front of IJmuiden.	ZWA1, BUR			Yes, within area of analysis.	4.3	-
27 May 1940	CC. Air attack on MTB near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
28 May 1940	CC. Air attack on a ship that was blocking the harbour entrance of IJmuiden.	BUR, ZWA1			Yes, within area of analysis.	4.2	-
	CC. Air attack on 3 MTB's 60 km WNW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
29 May 1940	CC. Air attacks on ships in and near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
29/30 June 1940	CC. Mines dropped by British planes near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.3	HKW_008
12/13 July 1940	CC. Mines dropped by British planes near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.3	HKW_008
4 October 1940	Plane crash in the sea off IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
23/24 October 1940	CC. Mines dropped by British planes near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.3	HKW_008
27 October 1940	BC and CC. Air attacks on ships in and near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
16 November 1940	BC. Air attack on ships near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
11 January 1941	BC. Air attack on 4 E-boats 8 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
17 January 1941	CC. Air attack on convoy 12 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
19 January 1941	CC. Air attack on convoy 25 km NW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
Since 22 January 1941	Dutch fishing vessels were allowed to fish at sea during the night. The trawlers were often attack by English planes or had to deal with mines.	BUR			Yes, relevant context information.	4.2, 4.3	-
1 March 1941	Sicherungsdivision (SD). Mine barrier cleared in AN 8528/29.			BAMA: RM 67/6.	Yes, probably within area of analysis.	4.3	HKW_015
13 March 1941	SD. Suspected mine droppings off IJmuiden.			BAMA: RM 67/6.	Yes, probably within area of analysis.	4.3	HKW_008
15 March 1941	SD. Mk XIV mine barrier found in AN 8524. Four mines cleared and five mines disposed in AN 8524.			BAMA: RM 67/6.	Yes, probably within area of analysis.	4.3	-
20/21 March 1941	BC. Air attack on a convoy near IJmuiden.	ZWA1		TNA: AIR 24/229.	Yes, probably within area of analysis.	4.2	HKW_032
26 March 1941	CC. Air attack with torpedo on a convoy entering IJmuiden. Other air attacks on ships west off IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
31 March 1941	SD. Two mines cleared in AN 8529.			BAMA: RM 67/6.	Yes, probably within area of analysis.	4.3	-
1 April 1941	A Dutch fishing trawler ran on a mine near IJmuiden and sunk.	BUR			Yes, probably within area of analysis.	4.3	-
7 April 1941	A Blenheim crashed in the sea, 25 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.2	-
7/8 May 1941	BC. Air attack on a ship 7 km off IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
13 May 1941	CC. Air attack on 5 ships with bombs, 40 km W off IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
14 May 1941	CC. Air attack with torpedo on a ship 25 km WNM of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
23 May 1941	BC. Air attack on ships near IJmuiden.	ZWA1		TNA: AIR 24/231.	Yes, probably within area of analysis.	4.2	HKW_033
7 June 1941	BC. Air attack on a convoy near IJmuiden. 3 hits at least.	ZWA1			Yes, probably within area of analysis.	4.2	-
16-17 June 1941	Many mines and buoys have drifted ashore.			BAMA: RM 45-II/302.	Yes, probably within area of analysis.	4.3	-
29 June 1941	CC. Air attack on convoy 28 km NW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
12 July 1941	BC. Air attack on convoy near IJmuiden.	ZWA1		TNA: AIR 24/233.	Yes, probably within area of analysis.	4.2	HKW_034

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
	Plane crashed in the sea during attack on convoy.	ZWA1, SGLO			Yes, probably within area of analysis.	4.5.1	-
14 July 1941	BC. Air attacks on convoys at 13 km N and 40 km SW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
2 August 1941	BC. Air attack on a trawler 5 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
14 August 1941	BC. Air attack on a ship 50 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
16 August 1941	BC. Air attack on a ship 10 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
18 August 1941.	BC. Air attack on ships.			TNA: AIR 24/234.	Yes, probably within area of analysis.	4.2	HKW_035
21 August 1941	A Spitfire crashed in the sea near IJmuiden. Another Spitfire crashed 20 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
26 August 1941	BC, SD. Air attack on a convoy 7 km SW of IJmuiden.	ZWA1		BAMA: RM 45-II/235, 45-II/302, RM 67/12.	Yes, probably within area of analysis.	4.2	-
	2 Blenheim's crashed in the sea off IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
18 September 1941	BC. Air attack on 2 ships near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
10 October 1941	CC. Air attack with bombs and cannon on 2 ships near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
20 October 1941	BC. Air attack on ship 7 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
21 October 1941	BC. Air attack on convoy 8 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
	Two Blenheim's were shot down during attack on convoy.	ZWA1		TNA: AIR 24/236.	Yes, probably within area of analysis.	4.5.1	-
15 November 1941	SD. Air strike on harbour boats in front of IJmuiden.			BAMA: RM 67/15.	Yes, probably within area of analysis.	4.2	-
29 November 1941	CC. Air attack on ship 18 km off IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
7 December 1941	CC. Air attack on a cargo ship 9 km west of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
9 December 1941	CC. Air attack on a ship near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
11 December 1941	CC. Air attack on two small ships 25 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-

Event Date	Details	Historical sources			Primary analysis		
		Literature	Dutch archives	International archives	Relevant?	Paragraph	HKW_nr
12 December 1941	CC. Air attack on a destroyer 25 km SW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
1942 and onward	The building of Fortress IJmuiden (<i>Festung IJmuiden</i>).	POL, ROL, SAK	NA: 2.13.167. NIMH: collection 575. Kadaster: defence overprint, aerial photographs.	BAMA: RH 24-88, RM 35-I/277, RM 45-II/238K. LAC: defence overprint.	Yes, within area of analysis.	4.4	
	The entrance to the harbour was blocked with 24 RMA (magnetic ground mines).			BAMA: RM 35-I/277.	Yes, within area of analysis.	4.3	HKW_014
Early 1942	British operations against German shipping started to increase. British BC laid mines (magnetic – acoustic) along German shipping lanes. MTB's also attacked German ships.	BUR			Yes, relevant context information.	4.1, 4.3	-
3 January 1942	CC. Air attack on 2 vessels 15 km SW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
5 January 1942	CC. Air attack on a convoy that shortly before had left IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
6 January 1942	CC. Air attack on a ship 20 km NNW of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
19 January 1942	SD. Air strike on group B of the 34 th <i>Minensuchflotille</i> in front of IJmuiden.			BAMA: RM 67/17.	Yes, probably within area of analysis.	4.2	-
29 January 1942	CC. Air attack with on a ship 15 km N of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
13 February 1942.	BC. Attacks on warships in a convoy.			TNA: AIR 24/240.	Yes, probably within area of analysis.	4.2	HKW_036
27 March 1942.	SD. A Dutch fishing ship was sunk by fast boats, 21 miles NW off IJmuiden.			BAMA: RM 67/19.	Yes, probably within area of analysis.	4.1	-
17/18 April 1942	CC. Air attack on a ship 16 km W of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
18 April 1942	A Hudson crashed in the sea.	SGLO			Yes, probably within area of analysis.	4.5.1	-
4 May 1942	CC. Air attack on a convoy in AN 8531 – W of IJmuiden.	ZWA1, BUR		TNA: AIR 28/595.	Yes, probably within area of analysis.	4.2	HKW_037
8/9 May 1942	Air fight between two planes near IJmuiden, one plane – a German Dornier Do 217 – was shot down.	ZWA1, SGLO			Yes, probably within area of analysis.	4.5.1	-
23/24 June 1942	A Junkers Ju88 crashed in the sea off IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
30 June/1 July 1942	SD. Air attack and surface craft battle with a convoy N of IJmuiden.			BAMA: RM 67/19.	Yes, probably within area of analysis.	4.2	-
9/10 August 1942	Mines were dropped by planes between IJmuiden and Texel.	ZWA1			Yes, probably within area of analysis.	4.3	-
11 September 1942	Surface craft battle just N of IJmuiden between German and British MTB's.	BUR			Yes, probably within area of analysis.	4.1	-
1/2 October 1942	CC. Air attack on convoy near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
3 October 1942	SD. Air attack on group B of the 34 th Minensuchflotille in AN 8553.			BAMA: RM 67/23.	Yes, within area of analysis.	4.2	-
5 November 1942	Coastal forces. Minelaying. Operation QU1.			TNA: ADM 199/1168.	Yes, within area of analysis.	4.3	HKW_016
9 November 1942	A Hudson crashed in the sea off IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
25 November 1942	CC. Air attack on a convoy N of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
27 November 1942	CC. Air attack on convoy near IJmuiden.	ZWA1		TNA: AIR 25/343.	Yes, probably within area of analysis.	4.2	HKW_038
23 December 1942	SD. Air attack in AN 8529.			BAMA: RM 67/25.	Yes, probably within area of analysis.	4.2	-
9 January 1943	SD. Air attack in AN 8553.			BAMA: RM 67/26.	Yes, within area of analysis.	4.2	-
29 January 1943	A Spitfire crashed in the sea 15 km NW of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
10 February 1943	Air attack with bombs on armed trawler near IJmuiden.	ZWA1		BAMA: RM 67/26.	Yes, probably within area of analysis.	4.2	-
18/19 February 1943	CC. Air attack on convoy near IJmuiden with bombs and torpedoes.	ZWA1		TNA: AIR 25/346.	Yes, probably within area of analysis.	4.2	HKW_039
20/21 February 1943	Coastal forces. Gunfire contact NW of IJmuiden.			TNA: ADM 199/2414. BAMA: RM 67/26.	Yes, probably within area of analysis.	4.1	-
28 February 1943	Coastal forces. Gunfire contact. MGB 49 was sunk.			TNA: ADM 199/2414. BAMA: RM 67/26.	Yes, probably within area of analysis.	4.1	-
5 March 1943	FC. Air attack on two German fast boats near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
11 March 1943	A German Focke Wulf Fw 190 crashed in the sea near IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
12 March 1943	FC. Air attack on trawler entering IJmuiden harbour.	ZWA1			Yes, probably within area of analysis.	4.2	-
20 March 1943	FC. Air attack on two armed trawlers near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
27 March 1943	FC. Air attack on barges and destroyers in the vicinity of IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
8/9 April 1943	A Wellington crashed in the sea 20 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
10 April 1943	A Typhoon crashed in the sea 1 km W of IJmuiden.	ZWA1, SGLO			Yes, probably within area of analysis.	4.5.1	-
15 April 1943	FC. Air attack on three trawlers near IJmuiden.	ZWA1			Yes, probably within area of analysis.	4.2	-
17 April 1943	Coastal forces. Minelaying. Operation QU2B.			TNA: ADM 199/544, 199/2414.	Yes, within area of analysis.	4.3	HKW_017
17/18 April 1943	Coastal forces. Gunfire contact.			TNA: ADM 199/537. BAMA: RM 67/27.	Yes, probably within area of analysis.	4.1	-
22 April 1943	FC. Air attack on armed trawler and fast boat.	ZWA1			Yes, probably within area of analysis.	4.2	-
28/29 April 1943	Coastal forces. Gunfire contact. A German Vorpostenboot – V.1330 – was sunk during a surface craft battle with British MTB's.	MUN1		TNA: ADM 199/537, 199/2414. BAMA: RM 67/	Yes, probably within area of analysis.	4.1	-
3 May 1943	A Boston crashed in the sea 8 km west of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
	SD. Air attack in front of IJmuiden. A Ventura was shot down and crashed in the sea 19 km west of IJmuiden.	SGLO		BAMA: RM 67/28.	Yes, probably within area of analysis.	4.2	-
5 May 1943	Coastal forces. Two times short gunfire contact.			TNA: ADM 199/2415. BAMA: RM 67/28.	Yes, probably within area of analysis.	4.1	-
17 May 1943	A B-26 crashed in the sea, 3 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
	A B-26 crashed in the sea, 8 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
29 May 1943	Coastal forces. Minelaying. Operation QU11.			TNA: ADM 199/544.	Yes, within area of analysis.	4.3	HKW_018
11/12 June 1943	A Lancaster crashed in the sea just W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
21/22 June 1943	A Wellington crashed in the sea 65 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
25/26 June 1943	A Lancaster crashed in the sea 1 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
5 July 1943	SD. Due to strong west winds, own moored contact mines break loose. A Dutch fishing ship ran onto a mine.			BAMA: RM 67/28.	Yes, probably within area of analysis.	4.3	-

Event Date	Details	Historical sources			Primary analysis		
		Literature	Dutch archives	International archives	Relevant?	Paragraph	HKW_nr
12 July 1943.	SD. Air attack on two minesweepers in front of IJmuiden.			BAMA: RM 67/28.	Yes, probably within area of analysis.	4.2	-
22/23 July 1943	Coastal forces. Gunfire contact.			TNA: ADM 199/537.	Yes, probably within area of analysis.	4.1	-
23 July 1943	Coastal forces, SD. Gunfire contact and attack with torpedoes in AN 8553.			TNA: ADM 199/2415. BAMA: RM 67/	Yes, within area of analysis.	4.1	-
23/24 July 1943	Coastal forces. Gunfire contact.			TNA: ADM 199/537.	Yes, probably within area of analysis.	4.1	-
25 July 1943	A Spitfire crashed in the sea 15 km W off Wijk aan Zee.	SGLO			Yes, probably within area of analysis.	4.5.1	-
	Coastal forces, SD. Gunfire contact in AN 8553.			TNA: ADM 199/2415. BAMA: RM 67/28.	Yes, within area of analysis.	4.1	-
28 July 1943	A B-17 crashed in the sea near IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
1 August 1943	SD. Surface craft battle.			BAMA: RM 67/29.	Yes, probably within area of analysis.	4.1	-
18/19 August 1943	Coastal forces, SD. Gunfire contact with trawlers. Attack on convoy with torpedoes in AN 8553.			TNA: ADM 199/537, 199/2415. BAMA: RM 67/29.	Yes, within area of analysis.	4.1	-
25 August 1943	Coastal forces, SD. Gunfire contact in AN 8553 and 8584.			TNA: ADM 199/537. BAMA: RM 67/29.	Yes, within area of analysis.	4.1	-
1 September 1943	The Hospital ship "Baloeran" – renamed "Strassbourg" – ran onto a mine between IJmuiden and Wijk aan Zee.	MUN 2, BEZ1			Yes, probably within area of analysis.	4.3	-
	CC. Air attack with torpedo on a stationary passenger ship.	ZWA2			Yes, within area of analysis.	4.2	HKW_031
15 September 1943	CC. Air attacks with torpedoes on a stationary liner.			TNA: AIR 25/353.	Yes, within area of analysis.	4.2	HKW_031
19/20 September 1943	Coastal forces, SD. Gunfire contact and torpedo attack on the "Strassbourg".	BEZ1		TNA: ADM 199/536, 199/2415. BAMA: RM 67/29.	Yes, within area of analysis.	4.1	HKW_031
20 September 1943	SD. Surface craft battle. Short gunfire contact.			BAMA: RM 67/29.	Yes, probably within area of analysis.	4.1	
19/20 October 1943	CC, SD. Air attack with 60 lbs rockets, cannon and machine guns on the wreck of the "Strassbourg". British MTB's also attacked the wreck.	BEZ1, ZWA2		TNA: AIR 25/354, 24/407. BAMA: RM 67/29.	Yes, within area of analysis.	4.1, 4.2	HKW_031
November 1943	A minefield (Sperrung) was laid in the sea about 75 to 100 meters in front of the entrance to the harbour.	BUR			Yes, within area of analysis.	4.3	HKW_014

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
7 January 1944	A P-47 Thunderbolt crashed in the sea 7 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
12/13 February 1944	CC. Air attack with torpedo on a convoy 7 miles N of IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.2	-
14/15 February	Coastal forces, SD. Encounter with enemy E-boats.			TNA: ADM 199/265, 199/2416 BAMA: RM 67/30.	Yes, probably within area of analysis.	4.1	-
24 February 1944	A P-47 Thunderbolt crashed in the sea off IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
	SD. 1 ground mine disposed in AN 8553.			BAMA: RM 67/30.	Yes, within area of analysis.	4.3	-
24/25 February 1944	Coastal forces, SD. Gunfire contact.			TNA: ADM 199/266, 199/2416 NARA: T1022/R3893. BAMA: RM 67/30.	Yes, probably within area of analysis.	4.1	-
5/6 March 1944	Coastal forces, SD. Gunfire contact with trawler.			TNA: ADM 199/265, 199/2416 BAMA: RM 67/30.	Yes, probably within area of analysis.	4.1	-
6/7 March 1944	Coastal forces, SD, 14 th Vorpostenflotille. Battle with guns and torpedoes.			TNA: ADM 199/2416. NARA: RG242 T1022/R3785 (via Wardocs) BAMA: RM 67/30.	Yes, within area of analysis.	4.1	-
24/25 March 1944	Coastal forces, SD. Gunfire contact with trawlers.			TNA: ADM 199/265, 199/2416 BAMA: RM 67/30.	Yes, probably within area of analysis.	4.1	-
28/29 March 1944.	Coastal forces, SD. Attack on convoy with torpedoes.			TNA: ADM 199/2416. BAMA: RM 67/30.	Yes, probably within area of analysis.	4.1	-
29/30 March 1944	Coastal forces, SD. Attack on convoy.			TNA: ADM 199/265, 199/2416 BAMA: RM 67/30.	Yes, probably within area of analysis.	4.1	-
30/31 March 1944	Führer der Schnellboote. Observation of a gunfire contact between surface crafts in AN 8553. A Vorpostenboot was hit by enemy gunfire when entering IJmuiden.			NARA: RG242 T1022/R3146, T1022/R3260 via Wardocs).	Yes, within area of analysis.	4.1	-
10/11 April 1944	CC. Air attack on German fast boats with three 500 lbs bombs.	ZWA2			Yes, probably within area of analysis.	4.2	-
13 April 1944	CC. Bombs were jettisoned live.			TNA: AIR 25/360.	Yes, within area of analysis.	4.2	HKW_040
17 April 1944	Coastal forces. Minelaying. Operation QU29.			TNA: ADM 199/1350, 234/560.	Yes, within area of analysis.	4.3	HKW_019

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
18 April 1944	A P-38 Lighting crashed in the sea 35 km W off IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
19 April 1944	Coastal forces. Minelaying. Operation QU28.			TNA: ADM 234/560.	Yes, within area of analysis.	4.3	HKW_020
22/23 April 1944	CC. Air attack with eight 100 lbs anti-U-boat bombs on German fast boats 30 miles W of IJmuiden.	ZWA2		TNA: AIR 25/360.	Yes, probably within area of analysis.	4.2	HKW_041
23 April 1944	Coastal forces. Minelaying. Operation QU27.			TNA: ADM 199/1350, 234/560.	Yes, within area of analysis.	4.3	HKW_021
	SD. English ground mines disposed in AN 8553.			BAMA: RM 67/31.	Yes, within area of analysis.	4.3	-
24 April 1944	SD. English ground mines disposed in AN 8553.			BAMA: RM 67/31.	Yes, within area of analysis.	4.3	-
27 April 1944	SD. Air attack on mine search party.			BAMA: RM 67/31.	Yes, probably within area of analysis.	4.2	-
30 April 1944	SD. English ground mine disposed with acoustic hammer in AN 8553.			BAMA: RM 67/31.	Yes, within area of analysis.	4.3	-
15/16 May 1944	CC. Air attack on small cargo ship with four 250 lbs bombs.	ZWA2			Yes, probably within area of analysis.	4.2	-
21 May 1944	SD. Air attack on flotilla in AN 8525.			BAMA: RM 67/31.	Yes, probably within area of analysis.	4.2	-
23 May 1944	SD. Air attack on flotilla in AN 8551.			BAMA: RM 67/31.	Yes, probably within area of analysis.	4.2	-
24/25 May 1944	CC. Air attack on four minesweepers near IJmuiden with 500 lbs and 250 lbs General Purpose bombs.	ZWA2		TNA: AIR 25/361.	Yes, probably within area of analysis.	4.2	HKW_042
26/27 May 1944	BC. 15 mines dropped by planes near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
27/28 May 1944	BC. 15 mines dropped by planes near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
28/29 May 1944	BC. 5 mines dropped by a plane near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
29/30 May 1944	BC. 4 mines dropped by a plane near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
31 May/1 June 1944	BC. 4 mines dropped by planes near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
1/2 June 1944	CC. Air attack on two ships with 500 and 250 lbs bombs, 10 miles NW of IJmuiden.	ZWA2		TNA: AIR 25/362	Yes, probably within area of analysis.	4.2	HKW_043
2/3 June 1944	BC. 16 mines dropped by planes near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006

Event Date	Details	Historical sources			Primary analysis		
		Literature	Dutch archives	International archives	Relevant?	Paragraph	HKW_nr
	CC. Air attack on 2 or 3 ships 10 miles NW off IJmuiden. Three 500 lbs and three 250 lbs bombs were dropped.	ZWA2			Yes, probably within area of analysis.	4.2	-
3/4 June 1944	BC. 24 mines dropped by planes near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
4/5 June 1944	BC. 4 mines dropped by a plane near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
Period of June-July 1944	SD. Various English ground mines were disposed in AN 8553, 8561, 8529.			BAMA: RM 67/32.	Yes, within area of analysis.	4.3	-
9/10 June 1944	Surface craft battle. British MTB's attacked a convoy with torpedoes between IJmuiden and Egmond aan Zee. Two German Vp.-boats and one British MTB were sunk.	BUR			Yes, probably within area of analysis.	4.1	-
15/16 June 1944	BC. 6 mines dropped by a plane near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
30 June/1 July 1944	BC. 12 mines dropped by planes near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
4/5 July 1944	Surface craft battle in front of the IJmuiden harbour entrance.	BUR, ZWA2			Yes, probably within area of analysis.	4.1	-
6/7 July 1944	BC. 6 mines dropped by a plane near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.3	HKW_006
8 July 1944	CC. Air attack on two radar contacts with six 500 lbs bombs.			TNA: AIR 25/363.	Yes, probably within area of analysis.	4.2	HKW_044
13/14 July 1944	Coastal forces, SD, 14 th Vorpostenflotille. Gunfire contact. One Vp.-boat was sunk after being hit by two torpedoes.			TNA: ADM 199/266, 199/2417. NARA: RG242 T1022/R3786 (via Wardocs) BAMA: RM 67/32.	Yes, probably within area of analysis.	4.1	/
17 July 1944	Allied Expeditionary Air Force (AEAF). Air attack on ship leaving IJmuiden harbour.	ZWA2			Yes, probably within area of analysis.	4.2	-
23 July 1944	SD. Surface craft battle. Gunfire contact in AN 8529.			BAMA: RM 67/32.	Yes, probably within area of analysis.	4.1	-
24 July 1944	SD. Surface craft battle. Gunfire contact in AN 8529.			BAMA: RM 67/32.	Yes, probably within area of analysis.	4.1	-
September 1944 – 5 May 1945	Air offensive against enemy shipping: operations against German E-boats and midget submarines.			TNA: CAB 101/324.	Yes, relevant context information.	4.2	-

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
7 September 1944	CC, SD. Air attack on convoy with two 250 lbs and two 500 lbs bombs.			TNA: AIR 25/366. BAMA: RM 67/33.	Yes, probably within area of analysis.	4.2	HKW_045
9 September 1944	CC, 14 th Vorpostenflotille. Observation of an air attack on ships.			TNA: AIR 25/366. NARA: RG242 T1022/R3786 (via Wardocs).	Yes, probably within area of analysis.	4.2	HKW_046
13/14 September 1944	CC. Air attack on ships 14 miles ZW of IJmuiden. Three 500 lbs MC bombs were used.	ZWA2		TNA: AIR 25/366.	Yes, probably within area of analysis.	4.2	HKW_047
15 September 1944	A Spitfire crashed in the sea, 48 km W of IJmuiden.	SGLO			Yes, probably within area of analysis.	4.5.1	-
18/19 September 1944	SD. Air attacks with dive bombers on Position Rom.			BAMA: RM 67/33.	Yes, probably within area of analysis.	4.2	-
19 September 1944	SD. Air attack on Position Rom.			BAMA: RM 67/33.	Yes, probably within area of analysis.	4.2	-
23/24 September 1944	CC. Air attack on ships.			TNA: AIR 25/366.	Yes, probably within area of analysis.	4.2	HKW_048
30 September/1 October 1944	Coastal forces, SD. Attack on convoy.			TNA: ADM 199/2417. BAMA: RM 67/34.	Yes, probably within area of analysis.	4.1	-
1/2 October 1944	SD. Air attack on convoy in AN 8529, 8553 and 8556, with guns, bombs and torpedoes.			BAMA: RM 67/34.	Yes, within area of analysis.	4.2	-
3/4 October 1944	CC, 14 th Vorpostenflotille. Air attack on radar contacts.			TNA: AIR 25/367. NARA: RG242 T1022/R3786 (via Wardocs).	Yes, probably within area of analysis.	4.2	HKW_049
5 October 1944	SD. Air attacks in AN 8553.			BAMA: RM 67/34.	Yes, within area of analysis.	4.2	-
7 October 1944	CC. Air attack on radar contacts.			TNA: AIR 25/367.	Yes, probably within area of analysis.	4.2	HKW_050
8/9 October 1944	Coastal forces, SD. Gunfire contact and torpedo attack.			TNA: ADM 199/2417. BAMA: RM 67/34.	Yes, probably within area of analysis.	4.1	-
12/13 October 1944	CC. Bombs jettisoned live.			TNA: AIR 25/367.	Yes, within area of analysis.	4.2	HKW_051
15/16 October 1944	Coastal forces, SD. Gunfire contact with four enemy trawlers.			TNA: ADM 199/2418. BAMA: RM 67/34.	Yes, probably within area of analysis.	4.1	-

Event Date	Details	Historical sources			Primary analysis		
		Literature	Dutch archives	International archives	Relevant?	Paragraph	HKW_nr
16 October 1944	SD. Surface craft battle. Short gunfire contact.			BAMA: RM 67/34.	Yes, probably within area of analysis.	4.1	-
26/27 October 1944	SD. Surface craft battle. Gunfire contact.			BAMA: RM 67/34.	Yes, probably within area of analysis.	4.1	-
2 November 1944	CC, SD. Air attack on E-boats.			TNA: AIR 25/368. BAMA: RM 67/34.	Yes, probably within area of analysis.	4.2	HKW_052
	SD. Surface craft battle. Gunfire contact.			BAMA: RM 67/34.	Yes, probably within area of analysis.	4.1	-
16 November 1944	SD. Coastal Battery fired at unknown objects in AN 8553.			BAMA: RM 67/34.	Yes, within area of analysis.	4.4	-
30 November 1944	CC. Air attack on vessels.			TNA: AIR 25/368.	Yes, probably within area of analysis.	4.2	HKW_053
9 December 1944	CC. Air attack on radar contacts with six 250 lbs bombs.			TNA: AIR 25/369.	Yes, probably within area of analysis.	4.2	HKW_054
11 December 1944	SD. Air attack on Position Rom in AN 8553.			BAMA: RM 67/34.	Yes, within area of analysis.	4.2	-
15 December 1944	CC. Air attack on radar contact.			TNA: AIR 25/369.	Yes, probably within area of analysis.	4.2	HKW_055
18/19 December 1944	CC. Air attack on six German fast boats 19 miles WSW of IJmuiden. Six 250 lbs bombs were dropped.	ZWA2			Yes, probably within area of analysis.	4.2	-
23/24 December 1944	CC. Air attack on ships near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.2	-
24/25 December 1944	CC. Air attack with six 250 lbs bombs on two ships 5 miles W of IJmuiden.	ZWA2		TNA: AIR 25/369.	Yes, probably within area of analysis.	4.2	HKW_056
28 December 1944	SD. Air attack on Position Rom in AN 8553.			BAMA: RM 67/34.	Yes, within area of analysis.	4.2	-
5/6 January 1945	CC. Air attack on radar contacts.			TNA: AIR 25/370.	Yes, probably within area of analysis.	4.2	HKW_057
6/7 January 1945	CC, SD. Air attacks by individual planes on ships and radar contacts between IJmuiden and lightship "Maas".	ZWA2		BAMA: RM 67/34.	Yes, probably within area of analysis.	4.2	-
13 January 1945	CC. Two bombs jettisoned live.			TNA: AIR 25/370.	Yes, probably within area of analysis.	4.4	HKW_058
14/15 January 1945	CC. Air attack on radar contacts SW of IJmuiden. Six 250 lbs bombs were used.	ZWA2		TNA: AIR 25/370.	Yes, probably within area of analysis.	4.2	HKW_059

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
15/16 January 1945	CC. Air attack on radar contacts 15 miles WNW off IJmuiden. Twelve 250 lbs bombs were used.	ZWA2			Yes, probably within area of analysis.	4.2	-
3 February 1945	CC. Bombs jettisoned safe.			TNA: AIR 25/371.	Yes, within area of analysis.	4.2	HKW_060
5 February 1945	CC. Bombs jettisoned live.			TNA: AIR 25/371.	Yes, within area of analysis.	4.2	
	CC. Air attack on E-boats.			TNA: AIR 25/371.	Yes, probably within area of analysis.	4.2	HKW_061
8/9 February 1945	CC. Air attack on radar contact 8 miles SW of IJmuiden. Six 250 lbs bombs were used.	ZWA2			Yes, probably within area of analysis.	4.2	-
19/20 February 1945	CC. Air attack on radar contact near IJmuiden. Six 250 lbs bombs were used.	ZWA2		TNA: AIR 25/371.	Yes, probably within area of analysis.	4.2	HKW_062
22/23 February 1945	CC. Air attack on E-boats.			TNA: AIR 25/371.	Yes, probably within area of analysis.	4.2	HKW_063
25 February 1945	CC. Air attack on ship.			TNA: AIR 25/371.	Yes, probably within area of analysis.	4.2	HKW_064
10 March 1945	SD. Air attack on Position Rom.			BAMA: RM 67/34.	Yes, probably within area of analysis.	4.2	-
12/13 March 1945	CC. Air attack on a ship at the height of IJmuiden with six 250 lbs bombs. 1 direct hit.	ZWA2		TNA: AIR 25/372.	Yes, probably within area of analysis.	4.2	HKW_065
14 March 1945	CC. Observation of wreck.			TNA: AIR 25/372.	Yes, probably within area of analysis.	4.5.1	HKW_066
15 March 1945	CC. Air attack on ships.			TNA: AIR 25/372.	Yes, probably within area of analysis.	4.2	HKW_067
24 March 1945	FC. Air attack on two midget submarines near IJmuiden.	ZWA2			Yes, probably within area of analysis.	4.2	-
27/28 March 1945	CC. Air attack on ships with anti-E-boat bombs.			TNA: AIR 25/372.	Yes, probably within area of analysis.	4.2	HKW_068
April 1945	The IJmuiden Seagate was blocked with mines, the midget submarines stayed in the harbour to the end of the war.	ROL			Yes, within area of analysis.	4.3	-
5 April 1945	CC. Air attack on vessels.			TNA: AIR 25/373.	Yes, probably within area of analysis.	4.2	HKW_069
7/8 April 1945	CC. Air attack on ships with bombs.			TNA: AIR 25/373.	Yes, probably within area of analysis.	4.2	HKW_070
8/9 April 1945	CC. Air attack on a radar contact near IJmuiden.	ZWA2		TNA: AIR 25/373.	Yes, probably within area of analysis.	4.2	HKW_071
9/10 April 1945	CC. Air attack on ships near IJmuiden.	ZWA2		TNA: AIR 25/373.	Yes, probably within area of analysis.	4.2	HKW_072
12 April 1945	CC. Air attack on ships.			TNA: AIR 25/373.	Yes, probably within area of analysis.	4.2	HKW_073
24 April 1945	CC. Air attack on ships.			TNA: AIR 25/373.	Yes, probably within area of analysis.	4.2	HKW_074
2/3 May 1945	CC. Air attack on midget submarine 30 miles WNW of IJmuiden. Six 250 lbs depth charges were used.	ZWA2			Yes, probably within area of analysis.	4.2	-

Event Date	Details	Historical sources			Primary analysis Relevant?	Paragraph	HKW_nr
		Literature	Dutch archives	International archives			
	CC. Air attack on a midget submarine 26 miles WSW of IJmuiden with four 250 lbs depth charges.	ZWA2			Yes, probably within area of analysis.	4.2	-
After 5 May 1945	The start of mine clearing operations.	ROE	Navy Museum Den Helder: Nemedri chart.	TNA: ADM 1/18743, 1/19754.	Yes, within area of analysis.	4.3	-
12 March 1946	A ship – Norwegian Betty – hit a mine off IJmuiden, outside swept water.			TNA: ADM 1/19754.	Yes, within area of analysis.	4.3	-
1946-1947	Dumping of ammunitions in a zone about 20 miles off IJmuiden.		NA: 2.12.19, 2.12.56.		Yes, within area of analysis.	4.5.2	HKW_022
August-September 1949	The clearing of KMA mines along the coast.		NIMH: Collection 035.		Yes, within area of analysis.	4.3	-
1960's	A cancelled and a former mine sweeping area appear (partly) within the area of analysis.		NA: 2.12.56.		Yes, within area of analysis.	4.5.3	HKW_023, HKW_024
13, 17, 22 April 1967	Dutch ships found mines in fishing nets.		NA: 2.12.56.		Yes, within area of analysis.	4	HKW_027, _028, _029
3 April 1968	Ammunition is encountered outside the dumping ground, therefore a larger zone around the zone is marked.		NA: 2.12.56.		Yes, within area of analysis.	4.5.2	HKW_022
Since 2005	UXO were encountered on the North Sea.		Dutch coast guard.	OSPAR.	Yes, within area of analysis.	4.1, 4.2, 4.3, 4.4	HKW_025, HKW_026
Post-war - nowadays	A large artillery shooting range and ammunition dump zone are indicated.		Noordzeeloket.		Yes, within area of analysis.	4.5.2, 4.5.3	HKW_022, HKW_030
-	Various wrecks appear in the area of analysis.		Royal Netherlands Navy Hydrographic service. Wreck register HP39.		Yes, within area of analysis.	4.5.1	HKW_031

Table 2: Chronological overview of war related events.

4 ANALYSIS OF WAR RELATED EVENTS

As listed in chapter 3, many war related events did occur in the area of analysis. The relevant events are analysed in this chapter in order to determine if UXO could remain. The events are grouped into five categories: war at sea, the air war, naval mines, coastal guns, post-war military exercises and ammunition dump.

4.1 WAR AT SEA

Considering the surface craft battles, the area of investigation is situated on a 'hotspot'. IJmuiden and its harbour lie immediately to the south of this area. During the Second World War IJmuiden became an important base for the German fast attack boats (*Schnellboote*, S-Boats), for which a bunker was constructed. Later on, midget submarines also operated from IJmuiden. Furthermore, a convoy route passed across the area of investigation. The convoys were accompanied with armed escort ships. Also the convoy route itself was guarded by armed vessels and trawlers, the so-called "*Vorpostenboote*" that patrolled between checkpoints. The convoy route and German quadrants are shown in Figure 4.

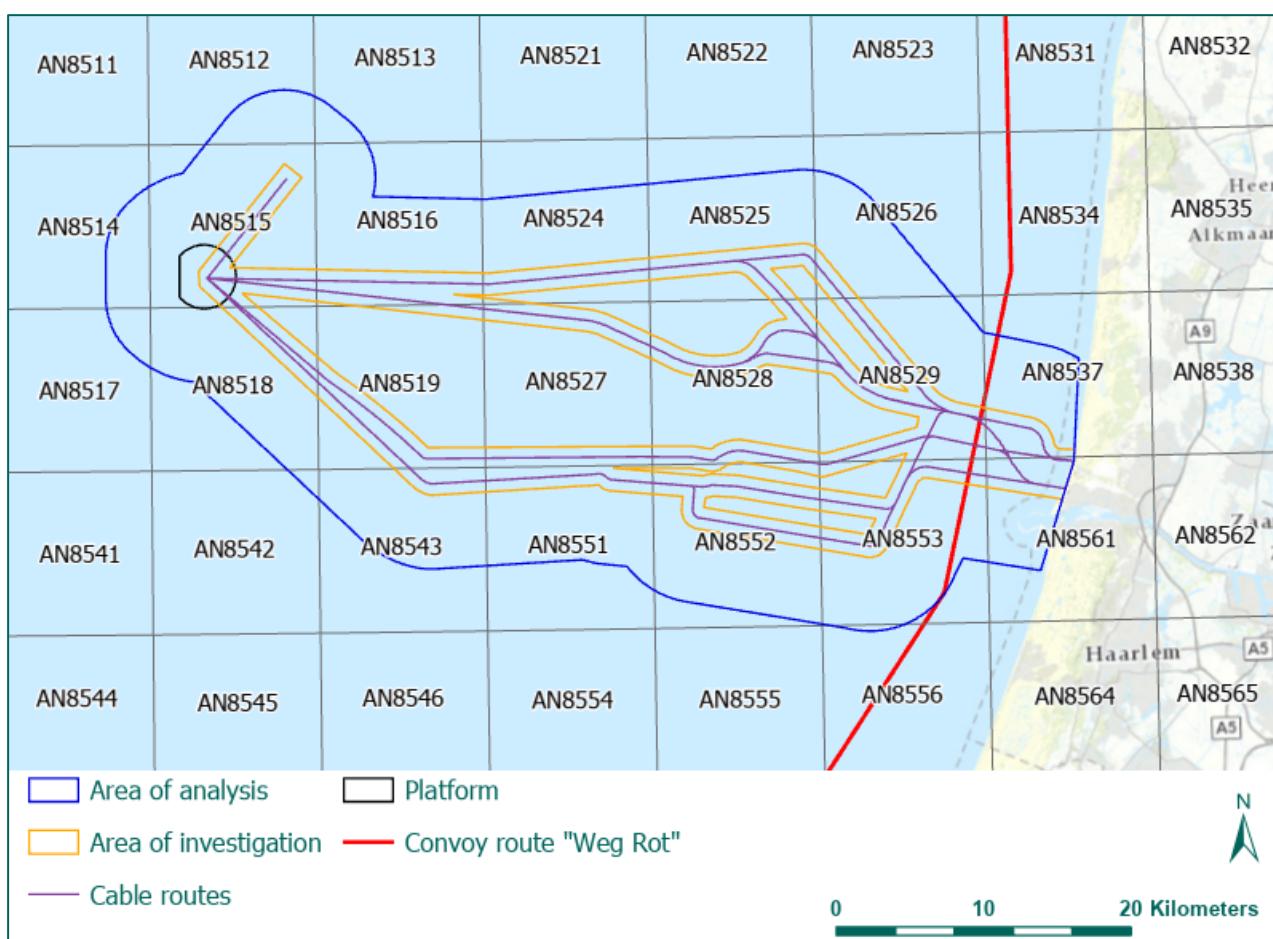


Figure 4: Convoy route "Weg Rot" and the quadrants used by the German navy. (Source basemap: ESRI).

The armed escorts and Vorpostenboote did not prevent the British Coastal Forces from attacking these ships and convoys. The Vorpostenboote along the coast off IJmuiden operated under 1st Security Division (1. *Sicherungsdivision*). The records of the Bundesarchiv-Militärarchiv (Freiburg, Germany) and The National Archives (London, United Kingdom) are consulted to get an overview of surface craft battles within the area of analysis. The information of each belligerent party is given in Annex 4. As shown in Chapter 3, it appears that 36 battles took place between ships during the Second World War. For the purpose of a clear and to

the point desktop study, the various attacks are not discussed separately. In the next paragraphs, two examples are given of how such battles were conducted and what kind and amount of ammunition was used.

4.1.1 Example 1: surface craft battle, 6/7 March 1944

According to the records of the 1.Sicherungsdivision, Vorpostenboote of the 14.Vorpostenflotille and ships of the 34.*Minensuchflotille* (34th Minesweeper Flotilla) were attacked by six to eight enemy fast boats while entering IJmuiden harbour during the night of 6/7 March 1944. Three enemy fast boats were probably sunk. Due to the attack, a lot of damage was done to the Minesweepers.



Figure 5: Illustration of a German Vorpostenboot, which was in fact a heavily armed trawler. (Source: <http://prussia.online/Data/Book/kr/kriegsmarine-coastal-forces/NV151%20-20Kriegsmarine%20Coastal%20Forces.pdf>).

The records of the 14.Vorpostenflotille give information on the used guns and ammunition, see Figure 6. From the German side 8.8 cm, 3.7 cm and 2 cm guns were used together with machine guns and rockets.

<u>7.) Eingesetzte Waffen und Munitionsverbrauch:</u>
Boot:
AF 42 2x 8,8 cm = 39 Lg. 40 Sprgr. 2x2cm Vierl. = 3300 Schuß
1411 1x 3,7 cm = 230, 2x Einzellauf. 2 cm = 550, 1x 15 mm = 50, 1x 1 RAG.
<u>Eigener Waffeneinsatz und Munitionsverbrauch:</u>
Vp. 1412 1 x 3,7 cm = 20 Schuss, 3 x 2 cm = 330 Schuss, 4xRAG = 5 Lg. = 5 Spr.
2 x M.G. = 100 "
Vp. 1413 1 x 8,8 cm Lg. = 52 Schuss, 23 Spgr., 3 x 2 cm = 500 Schuss.
AF 41 2 x 8,8 cm Lg. = 72 Schuss, 42 Spgr., 2 x Vierl. 2cm = 2200"

Figure 6: Used ammunition. (Source: NARA, RG242, T1022/R3785).

German sketches indicates that the battle took place in front of the harbour entrance and more to the north. Due to too few reference points, it is not possible to georeference the sketches onto a map.

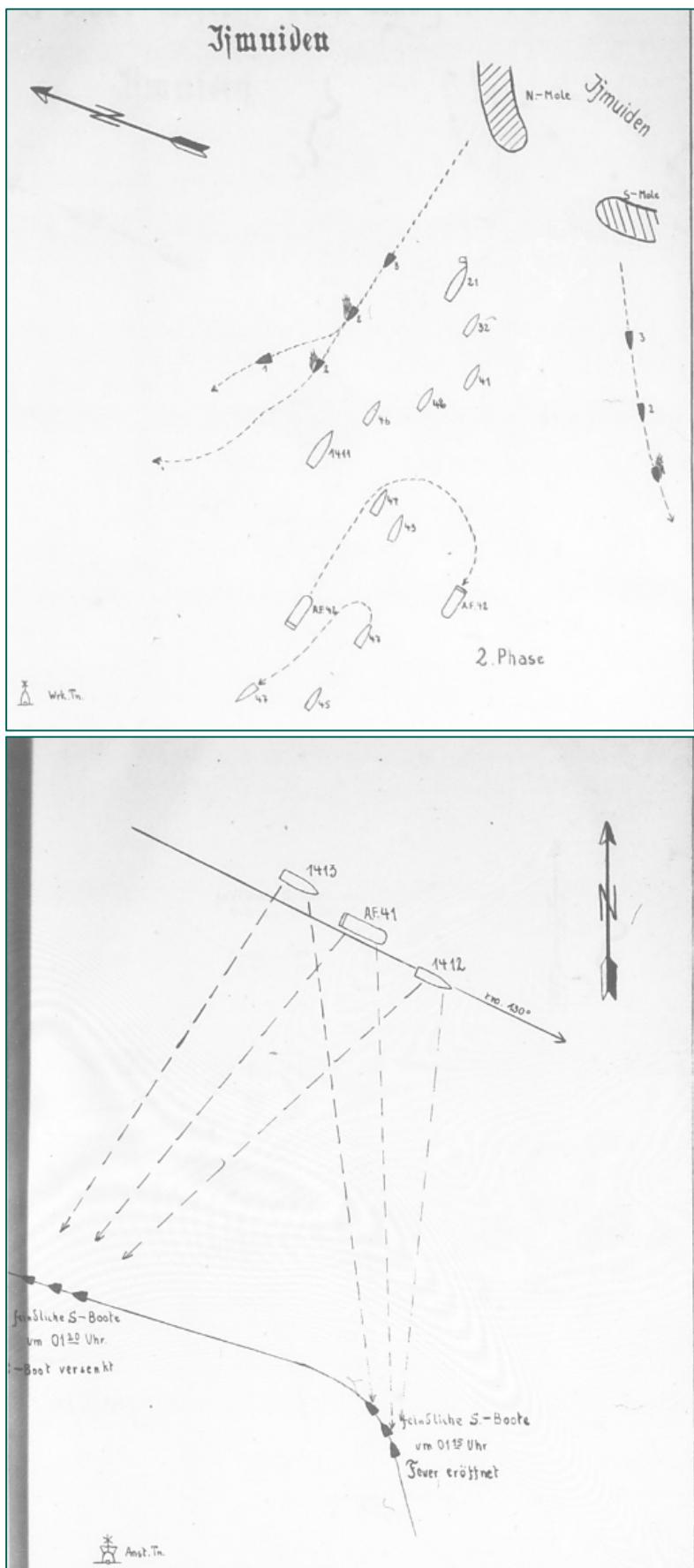


Figure 7: Gefechtskizze (Battle sketch). (Source: (Source: NARA, RG242, T1022/R3785).

The attack in the night from 6 to 7 March 1944 is also documented in the records of the British Coastal Forces. A handwritten report of two Motor gunboats (MGBs) showed that the English boats took a position on both sides of the IJmuiden harbour entrance, what is confirmed in one of the German sketches. The MGBs fired torpedoes, four 18 inch Mk XV in total. Also 6 pounder and 2 pounder guns, and .5 and .303 machine guns were used.

<u>Ammunition Expended</u>		6pds	6pdr	2Pdr Phos Ph	.5"	.303
HTB 693	36	140	184	600	20	
- 694	45	360	35	500	300	
- 690	13	45	13	200	200	
- 689	8	210	24	600	150	
- 695	22	280	63	200	200	
<u>Torpedoes</u>						
HTB 690		2-18" Nach xx				
694		2-18" Nach xx				

Figure 8: Expended ammunition. (Source: TNA, ADM 199/2416).

4.1.2 Example 2: surface craft battle, 14 July 1944

On 14 July 1944 the 1.Sicherungsdivision reported a surface craft battle in Quadrant AN 8553. Six or eight enemy fast boats attacked the Vorpostenposition Rom (near IJmuiden, west of the convoy route) where three Vorpostenboote were on patrol. According to the German records the attackers used artillery and torpedoes. One Vp.-boat, Vp.1412, was sunk after two torpedo hits, see Figure 9. Two enemy fast boats were set on fire.

<u>Waffeneinwirkung des Gegners mit Angaben über Störungen am Schiff, Geschützen und Gerät:</u>
Vp. 1412 durch 2 Torpedotreffer gesunken. Kommandant und 17 Mann vermisst, 1 schwer und 7 leichtverletzte.

Figure 9: Damage caused by the enemy. (Source: NARA, RG242 T1022/R3786).

The report of the 14.Vorpostenflottille gives a detailed information of the weapons used to repel the attackers, see Figure 10. Note that the ammunition used by the sunk Vp.-boat is estimated.

<u>Eingesetzte Waffen und Munitionsverbrauch:</u>
Vp. 1418 1 x 8,8 cm=125 LG's, 40 EKZ, 3 x 2 cm= 1900 Schuss, 1 MG 42=600.
Vp. 1415 1 x 3,7 cm=300 Schuss, 2 x 2 cm=560 Schuß, 1x13,2 mm=200 Schuß,
1 x M.G. -150 Schuss.
Vp. 1412 eig. 3,7 cm=60 Schuss, 3 x 2 cm=180 Schuss (nach Schätzung).

Figure 10: Expended ammunition. (Source: NARA, RG242 T1022/R3786).

The report of the 14.Vorpostenflottille contains also a battle sketch. Unfortunately, the sketch does not have any geographic reference.

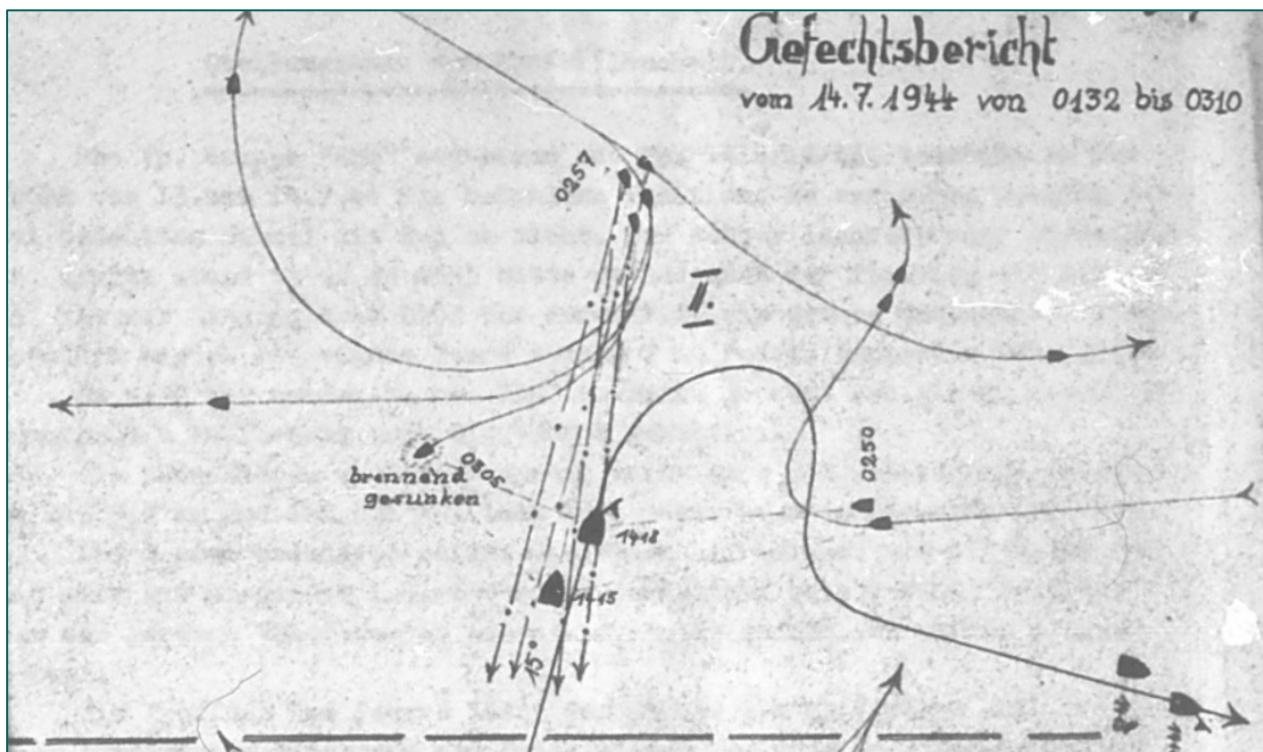


Figure 11: Battle sketch. (Source: NARA, RG242 T1022/R3786).

The battle is very well documented in the Admiralty records. Seven MTBs carried out a torpedo attack against armed trawlers five miles off IJmuideren. After a first gunfire contact, the MTBs were easily forced off with well-placed salvos. Then the MTBs organised and attacked in groups of two or three. This time, the MTBs were able to get closer and managed to gunfire torpedoes, despite heavy gun gunfire. As a cause of an attack with torpedoes, the MTBs barely used their guns and machine guns. Instead, a lot of flares were fired in order to get a good view on the enemy ships. The usage of the torpedoes was justified in a separate report that seems to be lost.

III -	<u>Gunnery:</u>				
	<u>6 pdr.</u>	<u>2 pdr.</u>	<u>20 m.m.</u>	<u>.303 in.</u>	<u>2" Rocket flares.</u>
M.T.B. 455	--	25	40	nil	--
457	--	12	nil	nil	--
458	--	nil	nil	nil	{ 11 5000 yards
467	--	nil	nil	nil	{ 11 2500 yards
468	--	nil	nil	nil	{ 12 5000 yards
469	--	nil	nil	nil	{ 2 2500 yards.
470	--	nil	nil	nil	{ 11 5000 yards
					{ 2 2500 yards
					{ 1 5000 yards
					{ 6 5000 yards

Figure 12: Expended ammunition. (Source: TNA, ADM 199/266).

At last, the Coastal Force records also contain a sketch that gives more insight in the attacking movement of the MTBs. There are too few reference points to place the sketch on a map.

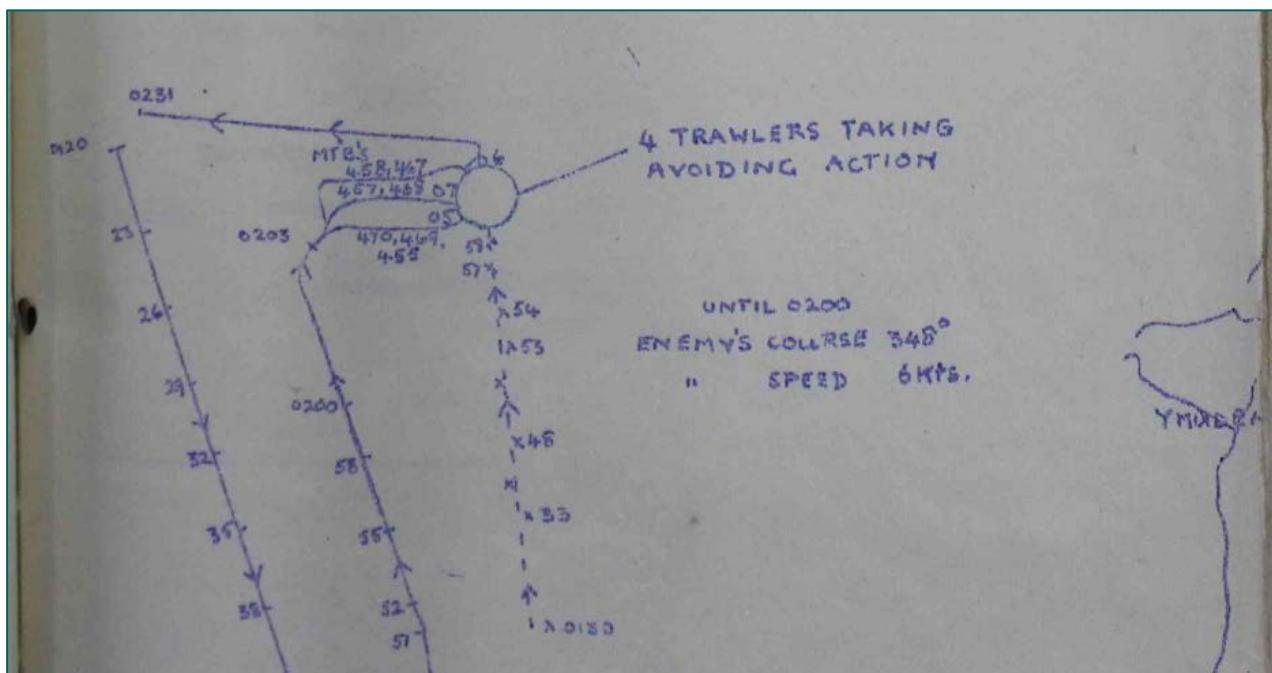


Figure 13: Battle sketch. ((Source: TNA, ADM 199/266).

4.1.3 Conclusion

According to the consulted sources 36 surface craft battles took place within the area of analysis. The localisation is mainly based on the quadrants used by the German navy. The accuracy of these quadrants is not better than six to six nautical miles. The battle sketches, as shown in the two examples, can give a better insight of the place where a battle took place. However, these sketches often lack suitable reference points and could therefore not pinpoint the location of the battle activity. For many of the surface craft battles only one source is available. Nevertheless, the German records show that most battles took place in a zone from the coast to the west of the convoy route.

Because of the large amount of battles, a UXO risk area is defined. Based upon the given quadrants in German sources and the locations of post-war encounters with shells and torpedoes, the UXO risk area is defined as the first 20 km from the coast into the sea. In this risk area, most probably the following UXO can be encountered:

UXO main group	Type	Amount (estimated)	Condition
Small calibre ammunition	.303	0 - 100	
	.50	0 - 100	
	13,2 mm	0 - 100	
	15 mm	0 - 100	
Artillery shells	2 cm/20 mm	0 - 100	Armed
	2 pr. pompom	0 - 100	
	3,7 cm	0 - 50	
	6 pr.	0 - 50	
	8,8 cm	0 - 50	
Rockets	RAG	0 - 20	
	flares	0 - 20	
Under water ammunition	18 in torpedo Mk XV	0 - 3	Armed

Table 3: Expected UXO.

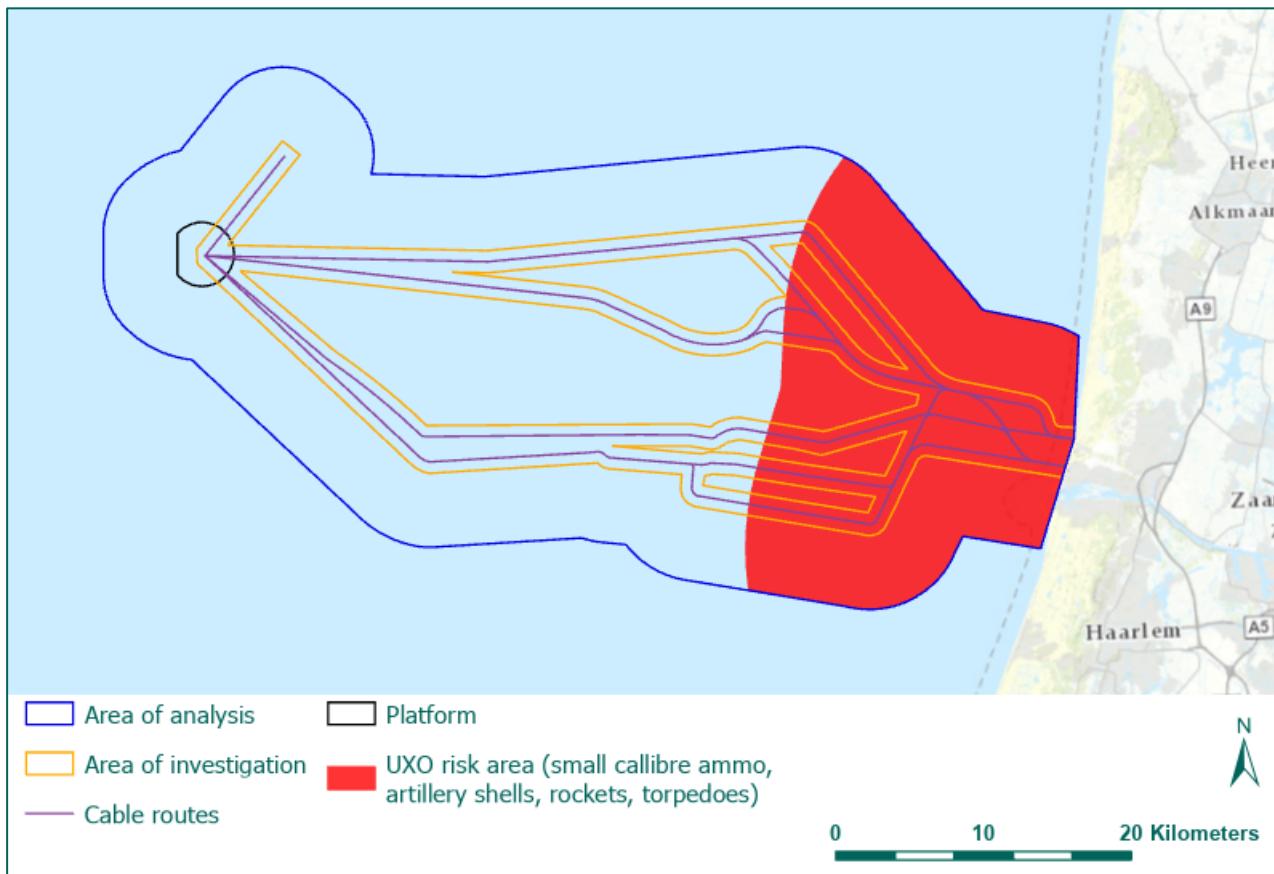


Figure 14: UXO risk area caused by surface craft battles. (Source basemap: ESRI).

4.2 AIR WAR

In and in the vicinity of the area of investigation many events relating to the air war did occur. This concerns air strikes on shipping, jettisons of bombs, and anti-aircraft gunfire. Airplane crashes will be discussed in paragraph 4.5.

4.2.1 Air strikes on surface vessels

A German convoy route crossed the area of analysis. During the Second World War the British Air Force almost continuously attacked the German convoys and other ships like minesweepers or the *Vorpostenboote*. From November 1944 onwards, also attacks were carried out on midget submarines which threatened the Allied convoys towards the harbour of Antwerp.

The locations of the air strikes are seldom very accurate. Navigating above the sea was not an easy task. The consulted literature (see Annex 2) points out that a lot of ships were attacked along the Dutch coast. It started with the German invasion on 10 May 1940. Three attacks on ships by German planes, near or west off IJmuiden, are mentioned in literature (see Annex 2).

The air attacks by the British Bomber Command and Coastal Command are added in a geodatabase, if possible. Coastal Command used a code instead of decimal degrees. Next to the database, the information from German records mentioning attacks in quadrants is consulted. This resulted in 112 air strikes on ships that probably took place in the area of analysis. Because of the large amount of attacks and the fact that many attacks could only be based upon one source, two rather incomplete examples of air strikes are given below.

- **Example 1: air strike on convoy, 8/9 September 1944**

During the night of 8/9 September 1944 a German convoy leaving IJmuiden harbour, was attacked four times by enemy planes. The attack is described in the logs of the 1.Sicherungsdivision. The

Hafenkommandant (Harbour Commander) IJmuiden informs that the steamship "Weichsel" needs to be towed to Amsterdam. A dive bombing attack damaged the ship and the ship was making water. The steamship was attacked during the night in quadrant AN 8543⁷, as was mentioned by the 14.Vorpostenflotille who escorted the "Weichsel".

The records of the 14.Vorpostenflotille give a more detailed report. It appears that the convoy was leaving IJmuiden when they were attacked. A bomb detonated 5 meters away from the steamship. While pumping out the incoming water, the "Weichsel" had to go back to the IJmuiden harbour. When returning towards IJmuiden, the convoy suffered three more attacks with bombs. During the last attack, German anti-aircraft guns managed to shoot down the plane. The attacks were marked on sketches with sufficient geographic reference points. The sketch of the last attack is shown in Figure 15.

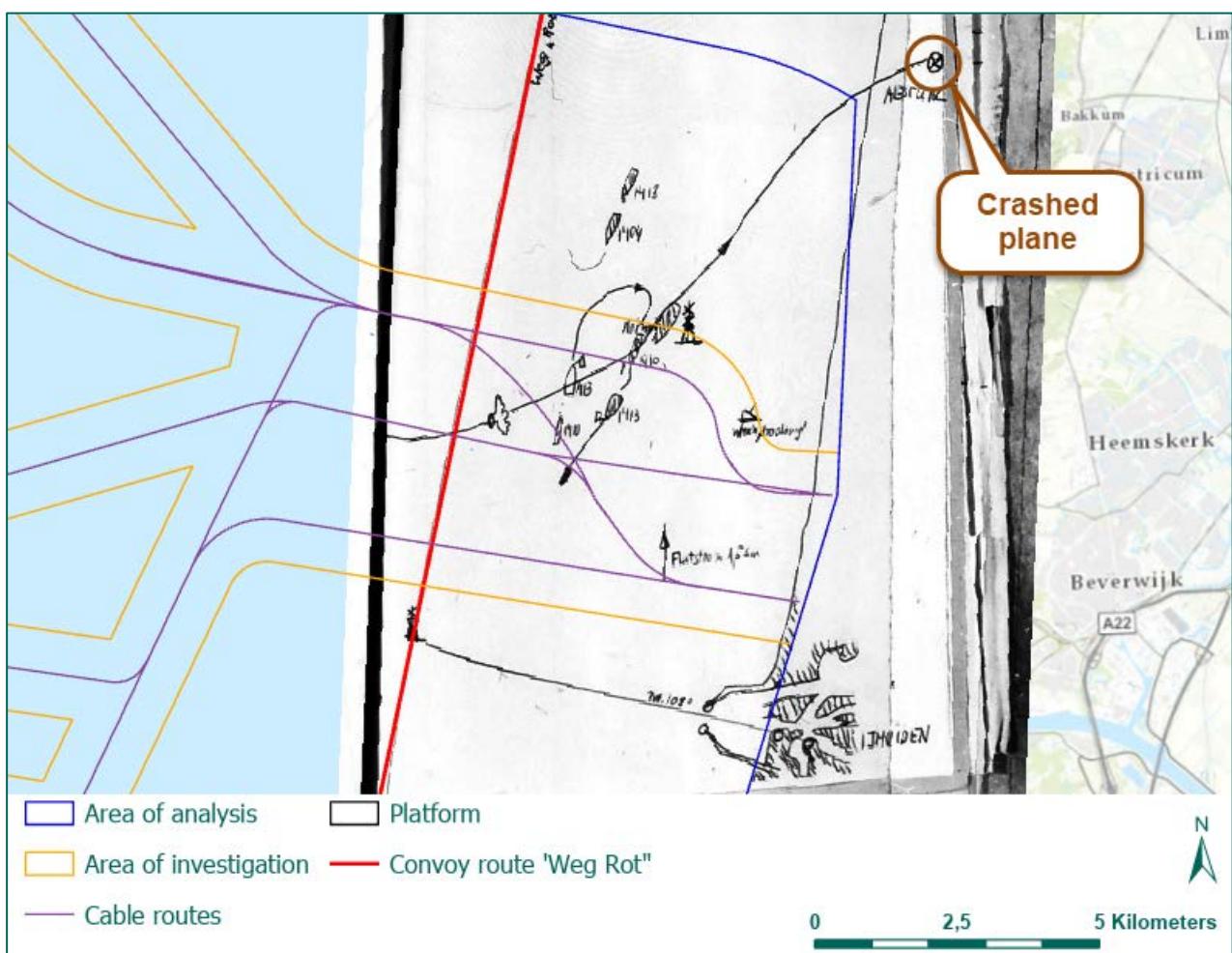


Figure 15: Sketch of air attack on steamship "Weichsel" and its escort ships. (Source: NARA, RG 242 T1022/R3786).

In addition to the German records, the logbooks of Coastal Command are checked for operations during the night of 8/9 September 1944. It stood out that many operations were cancelled that night due to bad weather conditions. Although, eight Grumman Avengers (855 Squadron) were airborne between 20.15 and 22.35 hours to patrol the Dutch coast from Hoek van Holland to 06 00E and back. All aircraft were armed with two 500 lbs and two 250 lbs bombs. The object was to destroy enemy shipping.

⁷ AN 8543 might be wrong since the convoy was leaving IJmuiden. More plausible is that the attack happened in AN 8553, closer to IJmuiden.

According to the reports, the Avengers carried out different attacks along the Dutch coast (at 22.07, 22.25, and 23.07 hours). One aircraft observed ten or more radar contacts at 22.04 in position 52 28N, 04 31E. This position lies directly in front of IJmuiden. At 22.07 an attack was made, but the bombs failed to explode. The position of the convoy was transferred to other aircraft, but no response was heard.

The Coastal Command reports are vague, because the given positions do not match with the location mentioned in the German report. When comparing the times on which both parties mention the attacks took place, slight differences appear. Despite the differences, not many other airplanes were active in this timeframe along the Dutch coast. The German information is judged to be better and more correct than the Coastal Command reports. Especially when the aircraft were operating at night in bad weather conditions. The conclusion is that the German convoy was attacked four times near IJmuiden and thus in the area of analysis. This example shows that, despite different sources, air attacks at sea are not easy to pinpoint.

- [Example 2: air strike on Vorpostenboote, 2/3 October 1944](#)

According to a report of the 14.Vorpostenflotille a German convoy was attacked twice during the evening of 2/3 October 1944. The convoy had left Den Helder and headed south for IJmuiden. Both air strikes were carried out with bombs. The first attack took place at 22.35 hours and three bombs were dropped. The second attack was at 01.18 hours, when the convoy passed buoy in front of IJmuiden. A part of the convoy was already entering into the harbour. Four bombs were dropped. A sketch of the second attack is shown in Figure 16.

In addition, the logbooks of the British Coastal Command are consulted. During the night of 2/3 October 1944 a Grumman Avenger observed an unidentified stationary vessel outside IJmuiden at 1.09 hours. The vessel was the last one of other vessels entering IJmuiden harbour. The Avenger attacked this vessel in a dive from 3,500 to 1,200 feet (=1,066 to 366 meters) with two 500 lbs and two 250 lbs bombs. The nearest bomb overshot by 10 yards (=9 meters). The pilots experienced intense accurate light anti-aircraft gunfire. The time, location and amount of expended bombs match in the records of both belligerent parties.

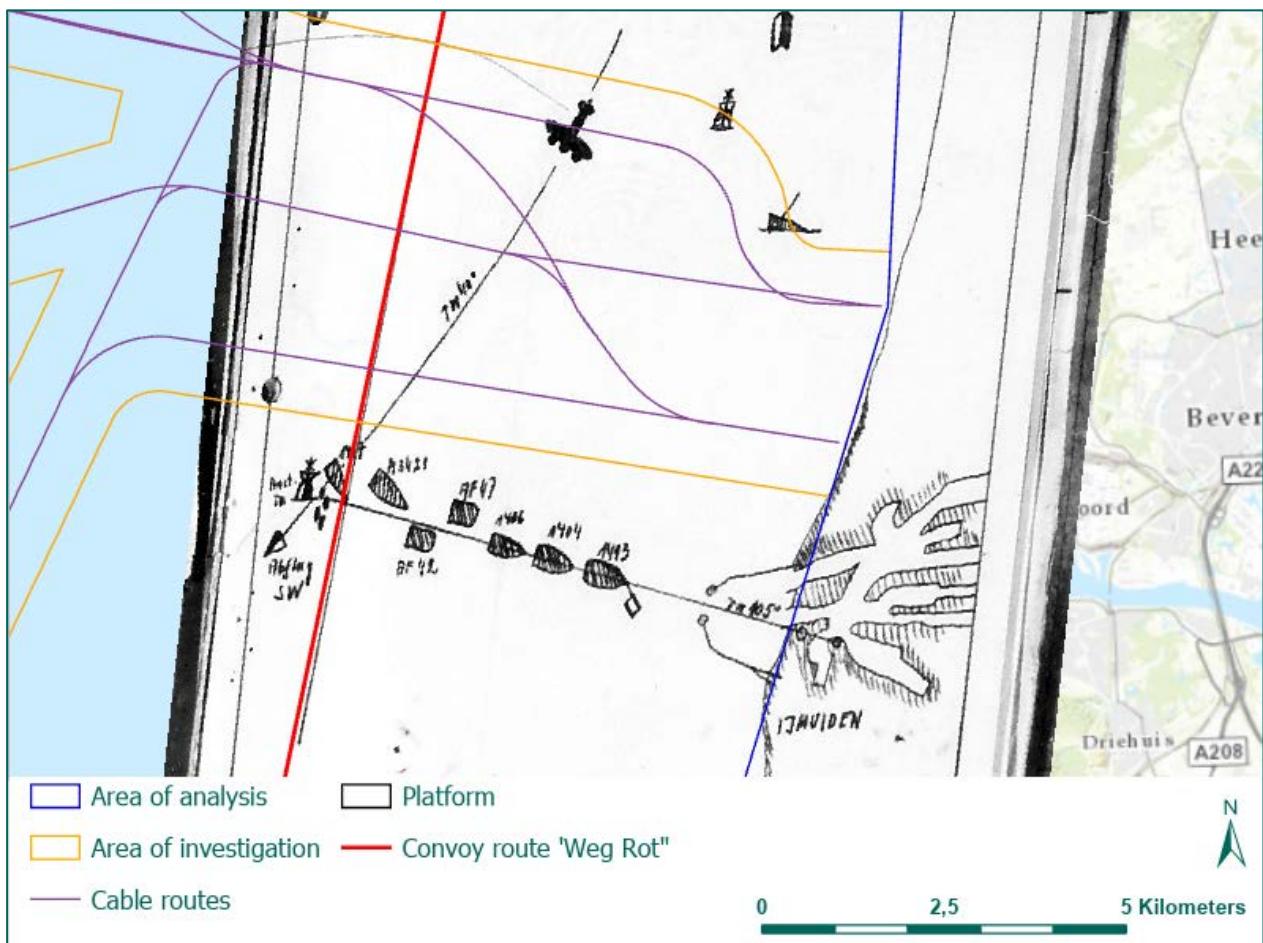


Figure 16: Sketch of the air attack, night 2/3 October 1944. (Source: NARA, RG242 T1022/R3786).

Since more than hundred air strikes took place in the area of analysis, it is expected that UXO remain. Air strikes on ships were carried out with aerial bombs, depth charges, torpedoes, and 3 inch rockets with a 60 lbs warhead semi armour piercing (SAP). The definition of the UXO risk area and the calibres is explained in paragraph 4.2.5.

4.2.2 Jettisoned bombs

During the Second World War groups varying from few to many British and American bombers flew almost on a daily basis (day and night) towards targets in Germany or German occupied territory. The flight paths towards targets and back to base (in the United Kingdom) ran across the North Sea.

The Allied bombers were often attacked by German fighters in order to prevent the bombers bombing their targets. Hundreds of planes were hit and/or shot down. When a bomber was involved in an air battle the procedure was to jettison the bombs. This would reduce the weight of the bomber enabling it to increase the speed and manoeuvrability, and thus the crews chance to survive. Normally, bombs had to be jettisoned in a safe, thus unarmed, condition. This procedure is documented in a record from The National Archives (see Annex 4).

Jettisons in the sea also happened when aircraft could not find a suitable target or in other cases when a crew could not drop their bombs. The reason to jettison the bombs was to avoid a landing with the bomb load, which was a risk full event. Jettisons were seldom accurately documented. Furthermore, bombs were also jettisoned live. As added in the table in Chapter 3 and Annex 4, four live jettisons by Coastal Command planes occurred in the area of analysis.

seen . Thereupon course was set parallel to coast . At 230hrs, MFB 5 "Return to Base no later than 2359hrs." Off Patrol at position 5236N 0427E . 3 BOMBS were jettisoned live . At 2330hrs MFB 3 "Nil report ETA 0010hrs." Airborne 1823hrs.....Landed 0020hrs.

Figure 17: Example of a live jettison, night 12/13 October 1944. (Source: TNA, AIR 25/367).

It is not clear how many times such jettisons occurred. Annex 4 gives an example of a flight path that crosses the area of analysis. Next to the documented jettisons, it is estimated that – due to intensive bombing campaigns and air strikes near IJmuiden – many more jettisons happened in the area of analysis.

Based upon the consulted sources, it is concluded that aerial bombs remain in the area of investigation as a result of jettisons. Because it is not possible to define the calibres specifically, the most common allied bombs are taken into account. The UXO risk area is specified in paragraph 4.2.5. Detailed information on the UXO is given in Annex 10.

4.2.3 Anti-aircraft gunfire

The guns which were placed onto the German Vorpostenboote and escort ships were also used against enemy airplanes. The calibres of the guns vary from 2 cm to 8.8 cm. Machine guns (7.92 cm, 13,2 mm, 15 mm) completed the anti-aircraft weaponry on ships. Every time when ships and convoys were attacked, they opened fire. Also rockets were used. The figure below gives an indication of the expended ammunition during the night of 2/3 October 1944, when a convoy was attacked twice (see also example 2 in paragraph 4.2.1).

		60 Schuß
<u>Vd 1406:</u>	1 mal 3,7 cm Fla-Waffe	
	3 " 2 " " Waffen	400 "
	1 " 1,5 " " Waffen	200 "
<u>Vd 1412:</u>	2 " 3,7 " " Waffen	110 "
	2 " 2 " " "	160 "
	1 " 1,5 " " Waffen	40 "
<u>AF 42:</u>	2 " 8,8 " Waffen	----
	2 " 2 " Fla-Waffen(Vierlinge)	750 "
<u>AF 47:</u>	2 " 8,8 " Waffen	----
	2 " 2 " Vierlinge	770 "
<u>M 3421:</u>	1 " 8,8 " Waffen	— "
	1 " 4 " Fla-Waffe	35 "
	3 " 2 " " Waffen	340 "
	1 " 1,5 " " Waffen	30 "

Figure 18: Expended anti-aircraft ammunition. (Source: NARA, RG242 T1022/R3786).

Taken into account the large amount of air strikes on ships, UXO of anti-aircraft weapons are present in the area of investigation. Unexploded shells could come down on the surface and sink to sea bottom. The UXO risk area is defined in paragraph 4.2.5.

4.2.4 Post-war UXO encounters

As showed in Annex 5, aerial bombs are encountered throughout the entire area of analysis. A total of seventeen bombs have been encountered and disposed of since 2005. These bombs could originate from air strikes and/or jettisons. Next to aerial bombs, also artillery shells are encountered, which possibly were caused by the use of anti-aircraft gunfire.

4.2.5 Conclusion

In response of the various air strikes, and jettisons UXO probably remain in the area of analysis. Since 2005 UXO have been encountered and disposed of. Therefore a UXO risk area is defined. Since it is not possible to determine the exact locations of all air strikes and jettisons, UXO of these events could remain in the entire area of analysis. It concerns the following UXO:

UXO main group	Type/calibre	Amount (estimated)	Condition
Aerial bombs	4 lbs, 25 lbs, 30 lbs, 100 lbs, 250 lbs, 260 lbs, 300 lbs, 500 lbs, 1.000 lbs, 4.000 lbs	0 - 10	Armed/not armed (safe)
Under water ammunition	18 in torpedo Mk XV	0 - 5	Armed
	Depth charge	0 - 5	Armed
Rockets	3 inch rocket with 60 lbs warhead SAP	0 - 10	Armed

Table 4: Expected UXO.

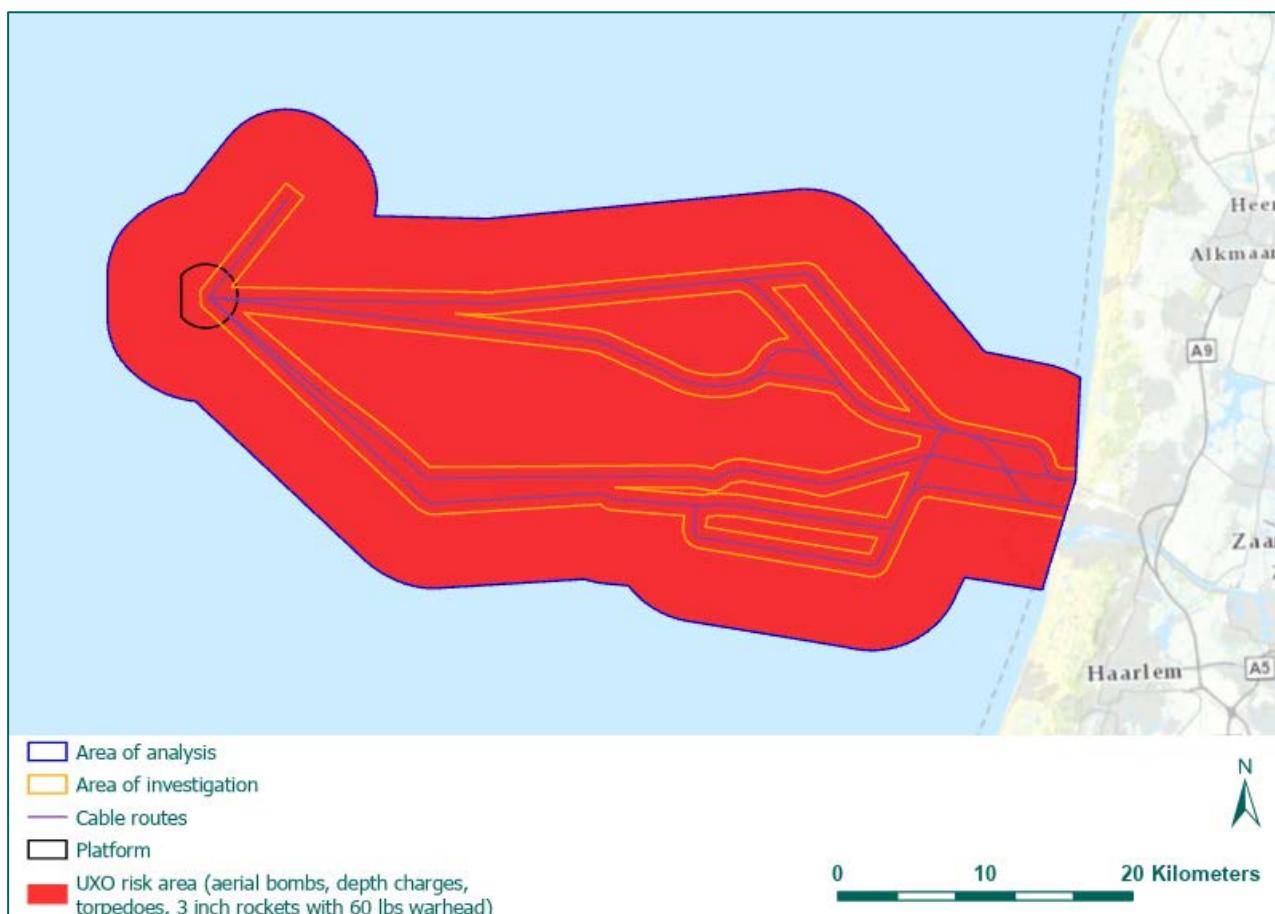


Figure 19: UXO risk area caused by air strikes and jettisons. (Source basemap: ESRI).

As on land, it is not possible to define a UXO risk area in response to the usage of anti-aircraft gunfire. The gunfire was aimed towards a moving target in the air. Unexploded shells could come down almost anywhere. It should be noticed that probably most AA-projectiles came down between the shore and to the west of the convoy route. This area lies within the UXO risk zone that is defined in prospect of the surface craft battles (see paragraph 4.1.3).

4.3 NAVAL MINES

Naval mines were laid in the North Sea during the First and Second World War. The purpose was twofold. Mines were used in a defensive way to protect own waters and ports and to hold off enemy ships. At the same time, mines could be used to harass enemy shipping and obstruct military movements. Mines could

be laid by surface ships, submarines and aircraft. During the First World War moored contact mines were used almost uniquely. Moored mines float beneath the water surface and are kept in position with an anchor and anchor cable. This technique was also used during the Second World War. Next to contact mines, the belligerent parties developed influence mines. These mines were laid on the sea bottom and would detonate if sensors in the mine detect a difference in pressure, sound, or magnetism caused by a passing ship.

The area of analysis has overlap with a German minefield from the First World War and several German and British minefields from the Second World War. These minefields, the post-war clearance and UXO encounters are discussed in the next paragraphs. A conclusion is added in paragraph 4.3.5.

4.3.1 First World War

A map from the Library of Congress (see Annex 6) shows a minefield overlapping the area of analysis. It was a large German minefield lying along the Dutch coast. The map title (see subscript of Figure 20) explains that only the approximate position of the minefield is showed. The presence of the minefield is confirmed in the book *The Hidden Threat* (see Annex 2). According to this book 664 mines were laid in the field. No information about the exact type of mines was found, but the belligerent parties during the First World War used almost uniquely moored contact mines.

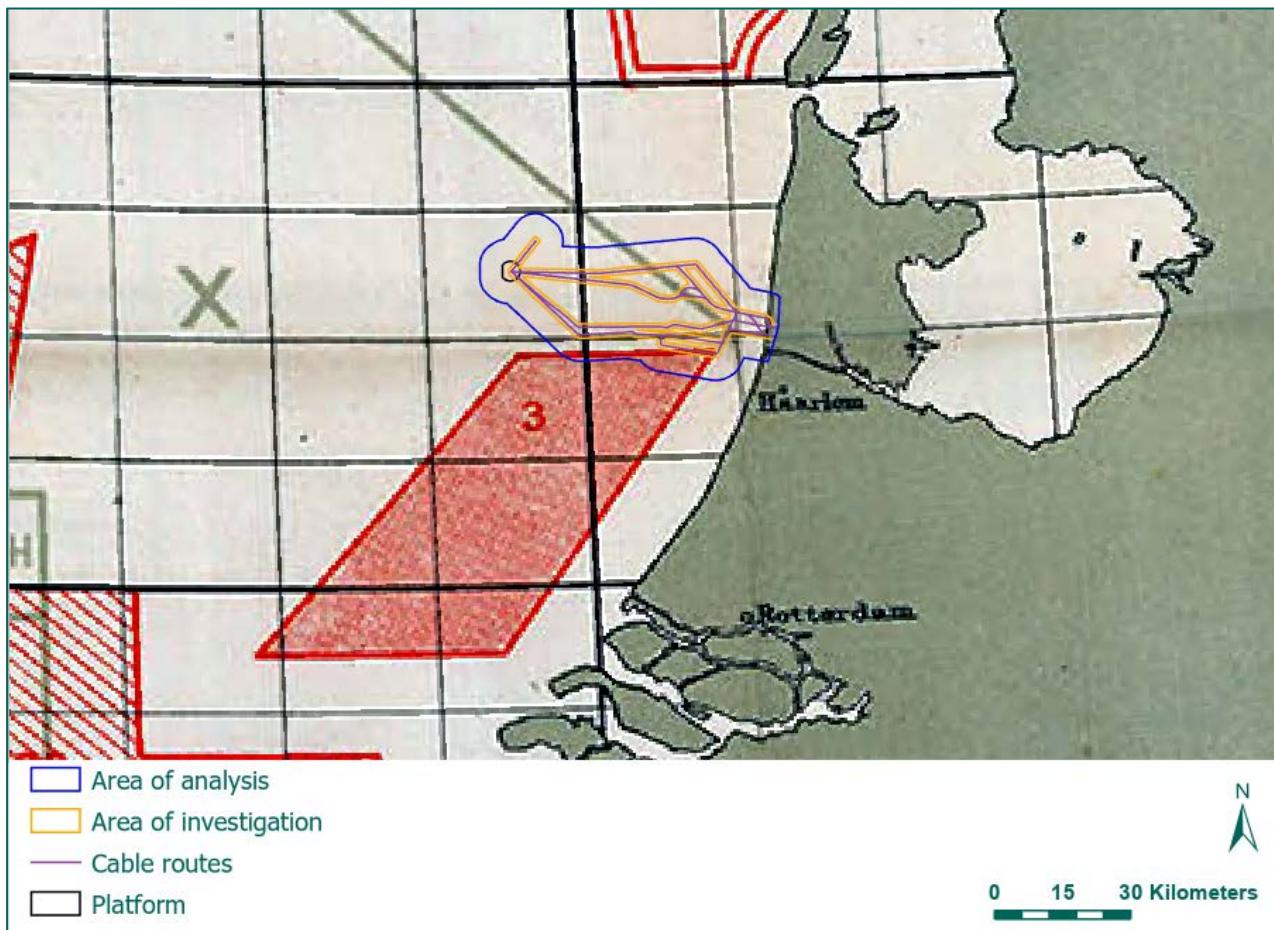


Figure 20: British Islands. Approximate position of minefields, 19 August 1918. (Source: Library of Congress).

During the war, a lot of mines broke loose from their anchor and drifted away. A total of 6,000 mines washed ashore on the Dutch beaches (see Annex 2). Amongst those mines 4,981 were from British origin, 431 were German, 81 were French, and 500 mines were from foreign origin. It is estimated that no less than 240,000 mines had been spread out in the North Sea.

Records from The Dutch National Archives (see Annex 3) contain evidence that mines were present in the area of analysis during the First World War. On 26 July 1915 a moored mine was sunk by the Dutch navy about 3 km north of IJmuiden. Furthermore, on 18 September 1915 and on 26 April 1916 two Dutch ships ran onto mines. The locations where the accidents happened were pinpointed on a map, see Figure 21.

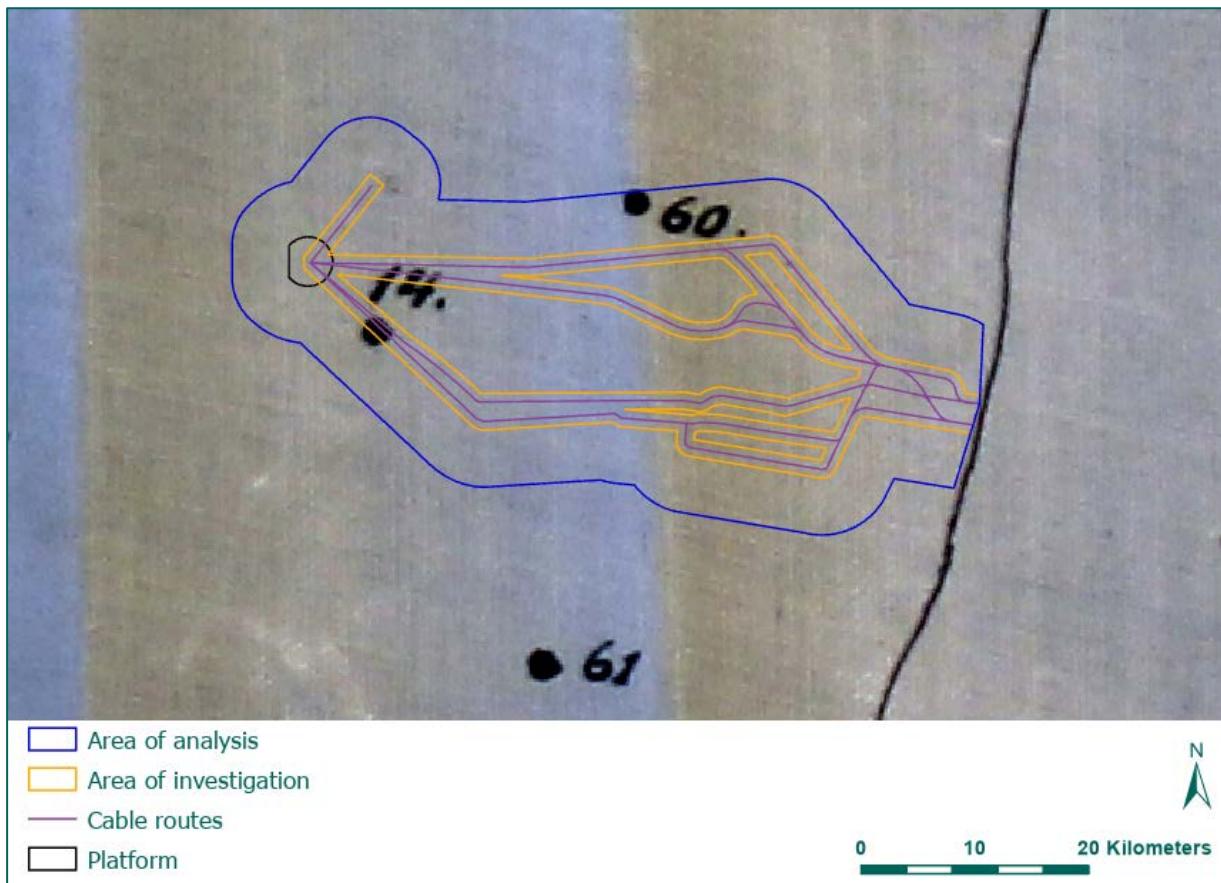


Figure 21: Map showing the locations where a ship ran onto a moored mine, 1914-1916. (Source: NA, Toegang 2.05.32.09).

A German minefield overlapped the area of analysis during the First World War. Two ships had an encounter with a moored contact mine. Furthermore, many mines broke loose and ended up elsewhere. Based upon this facts, First World War German contact mines could be present in the area of analysis. Next to the German mines, broke away British mines could have ended up in the area of analysis. Since no information is found about the precise types of the mines, it is estimated that the most common mines are left in the area of analysis, as the German E-mine and the Vickers / British Elia and the H Mark II moored contact mines. The definition of the UXO risk area is discussed in paragraph 4.3.5.

4.3.2 Second World War

The mine war during the Second World War saw different means of how mines were used. Before the war, a Dutch defensive minefield was laid in the IJmuiden outer harbour. With the German invasion in May 1940 German planes dropped mines in the IJmuiden harbour. Also in May 1940, British ships laid a defensive minefield. Later on, the German navy laid defensive minefields along the Dutch coast. To harass German shipping, British planes and ships laid mines on different spots in the sea across the convoy route and near IJmuiden. All the different stages in the mine warfare are elaborated in this paragraph.

Dutch ground mines (defensive)

According to the book *Oorlogsstorm over zee en havens* (see Annex 2) two rows of ground mines were laid in the outer harbour in 1939. This was to defend IJmuiden better against an attack from over the sea. No details are given about the exact location, amount and type of the mines. The outer harbour is indicated in Figure 22.

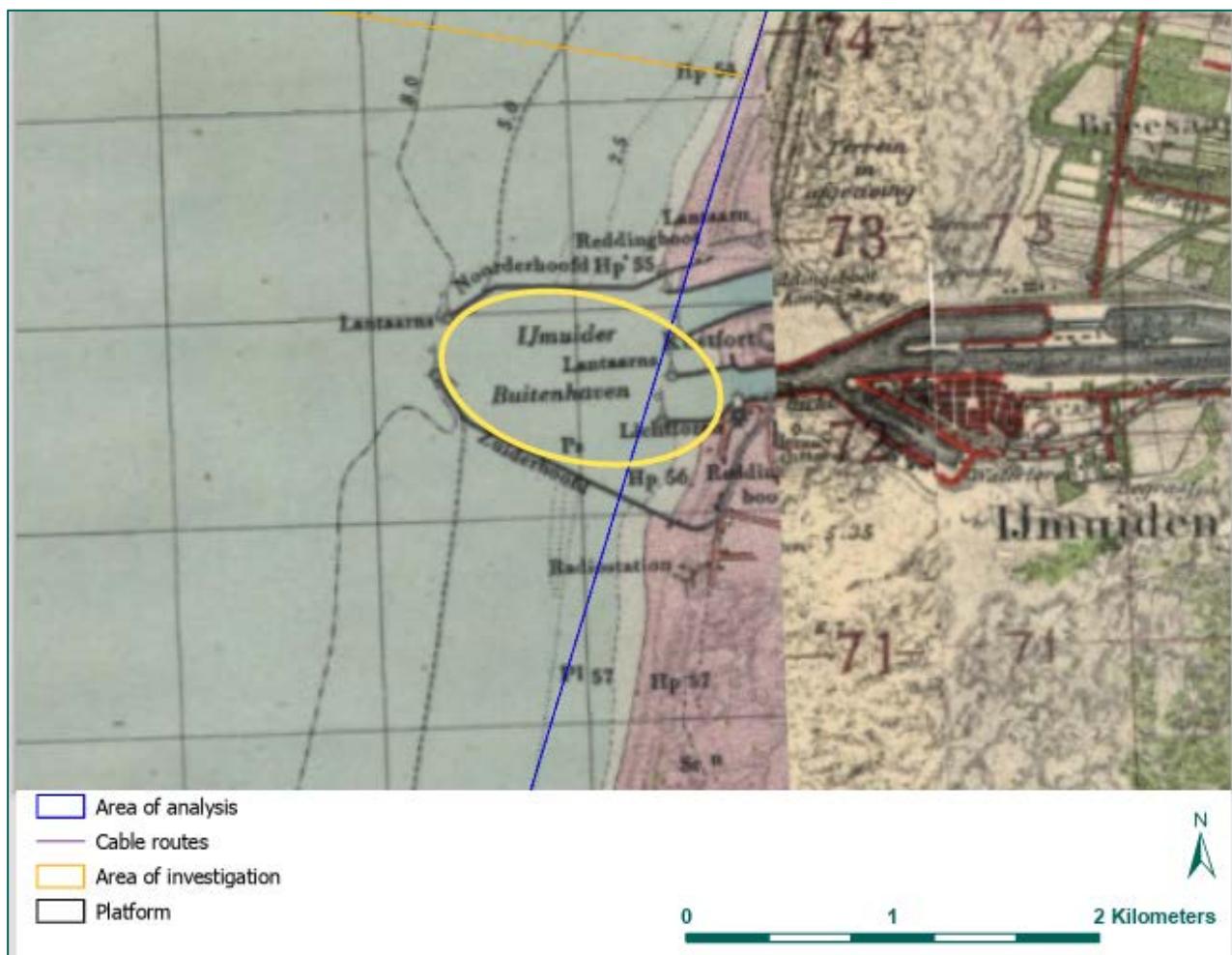


Figure 22: The IJmuiden outer harbour (indicated with yellow). (Source basemap: Topotijdrexis).

German minefields (offensive and defensive)

In the early morning of 10 May 1940 three German planes (Heinkel He-115's) dropped magnetic mines into the IJmuiden outer harbour. During another air raid, magnetic mines were also drop just outside the outer harbour. One mine hit the north mole and exploded, a second one fell into the sea about 50 meters north of the north mole. Immediate action was taken to mark the spots where the mines came down. Dutch forces were busy all day trying to clear the German mines, which was not very successful without adequate equipment. Three French airplanes, equipped with a device to create a magnetic field, came to aid. Despite the French aid, the German mines could not be destroyed. In the night of 12/13 May 1940 the Dutch ship "Van Rensselaer" was hit by a magnetic mine between the two moles.

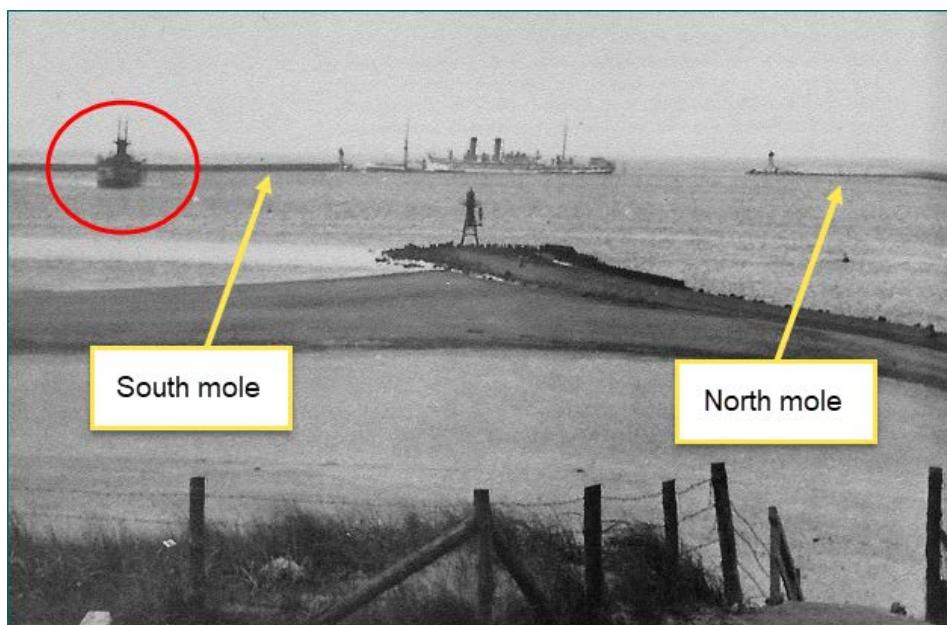


Figure 23: View from the dunes towards the sea at IJmuiden. The "Van Rensselaer" is indicated with red. (Source: ROL, page 6).

Later on, the German occupier started to lay defensive minefields along the Dutch coast. As is shown in Figure 24, four German minefields have overlap with the area of analysis. The original map is added in Annex 4.

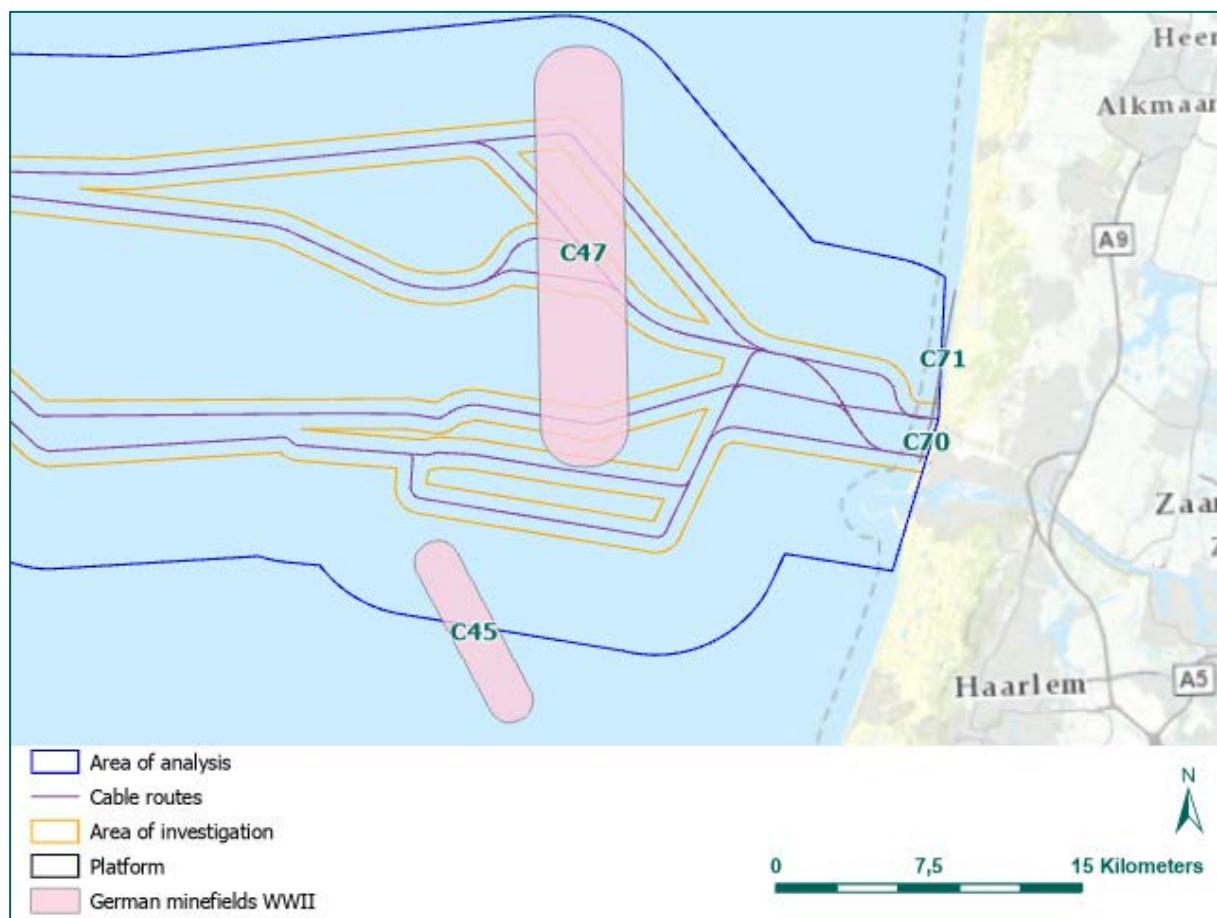


Figure 24: German minefields within the area of analysis. (Source basemap: ESRI).

Name	Date	Number and type of mines	Other specifications	Depth
C45	September 1944	72 LMB ground mines.	Armed after 24 hours, laid into two lines.	-
C47	November 1944	160 EMC moored contact mines, 40 sweep obstructor.	Chains of four mines + one obstructor.	10 feet (=3.05 meters)
C70	May 1944	75 KMA ground mines.	Laid into two lines.	Below high water springs
C71	July 1944	285 KMA ground mines.	Laid into two lines.	Below mean high water springs

Table 5: Explanation of the German minefields.

At last, also a mine barrier was laid in front of the entrance to the IJmuiden harbour. This is documented in the records of the *Marinegruppenkommando Ost – Nord* (see Annex 4). The minefield consisted of 24 RMA magnetic ground mines. The detonator of each mine was connected with a cable to a device on the mole, enabling the defenders to switch the mines on and off. The approximately position of the RMA minefield is given in Figure 25.



Figure 25: German RMA minefield. (Source basemap: ESRI).

British minefields (defensive and offensive)

In May 1940, the British forces tried to support their allies on the Continent and obstruct the advance of the German army. In doing so, on 10 May 1940 the British navy carried out operation 'CBX'. This operation foresaw a minefield in front of the Dutch coast. A total of 236 Mk XIV moored contact mines (with Mk XVII

anchor) were put in the field at a depth of 8 feet (=2.4 meters). The minefield crossed the area of investigation, see figure below.

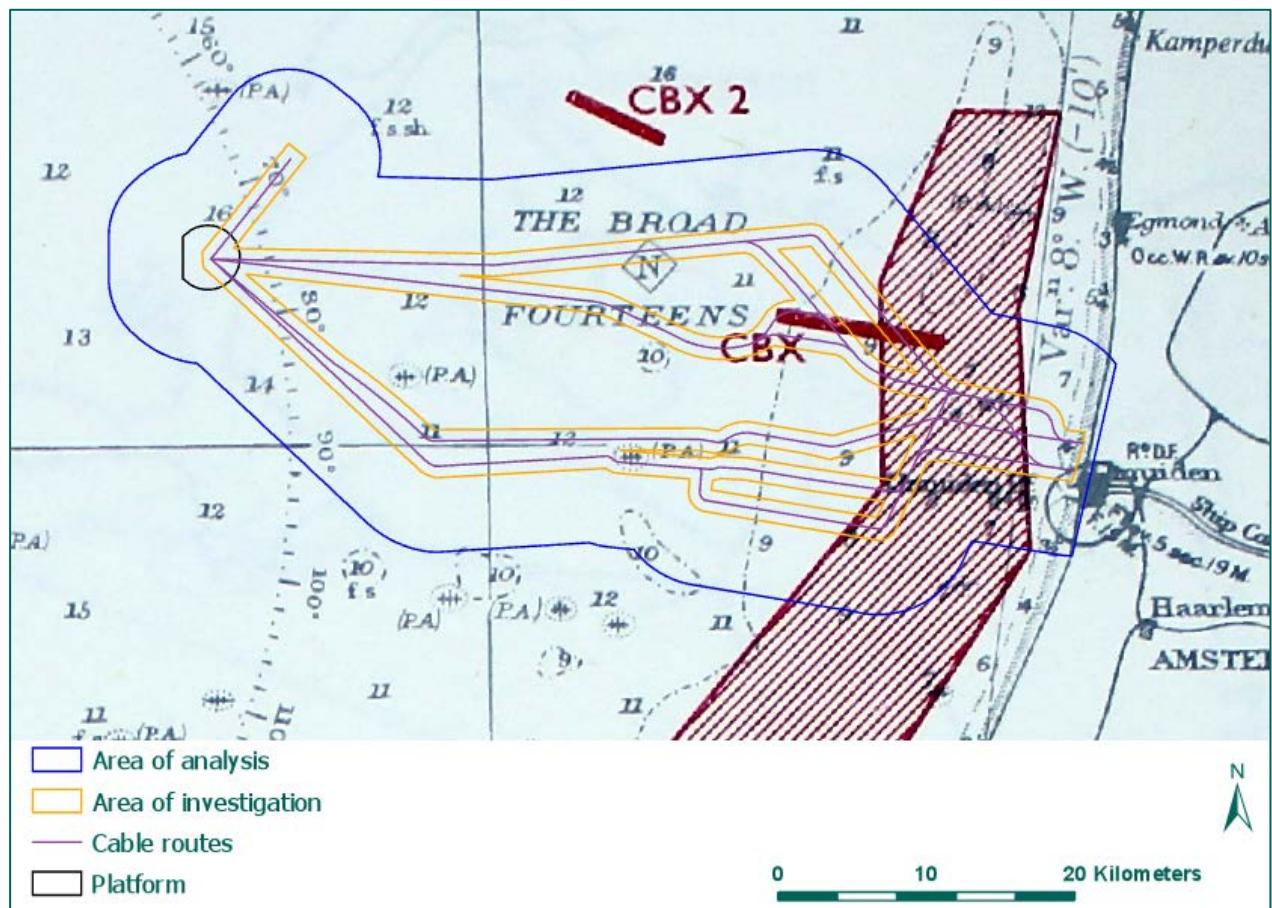


Figure 26: British defensive and offensive minelaying. (Source: TNA, ADM 234/561).

A large zone along the Dutch coast, indicated with hatched red plane in Figure 26, was reserved for the coastal forces. Within the large zone, minelayers and/or smaller motorboats would lay mines into predefined minefields. Each operation had its own codename. The table underneath gives an overview of those minefields.

Operation	Date	Number and type of mines	Other specifications	Depth
QU1	5 November 1942	18A Mk I-IV ground mines.	Disarming clocks set 40 days.	-
QU2B	17 April 1943	12 ground mines.	No disarms, arming after 3 days.	-
QU11	29 May 1943	16 ground mines.	No disarms, no delays.	-
QU27	23 April 1944	36 ground mines, 7 Mk XVII / Mk XVIII and 9 Mk XVII / Mk XVII moored contact mines.	See Annex 4.	- 22-23 feet (=6.7-7 meters)
QU28	19 April 1944	36 Mk I-IV ground mines. 18 Mk XVII / XVIII moored contact mines	See Annex 4.	- 23 feet (=7 meters)

Operation	Date	Number and type of mines	Other specifications	Depth
QU29	17 April 1944	32 ground mines + 12 ground mines.	All 16 day disarmers + arming after 8 days, 8 day disamers.	-

Table 6: Explanation of the British minefields, laid by coastal forces.

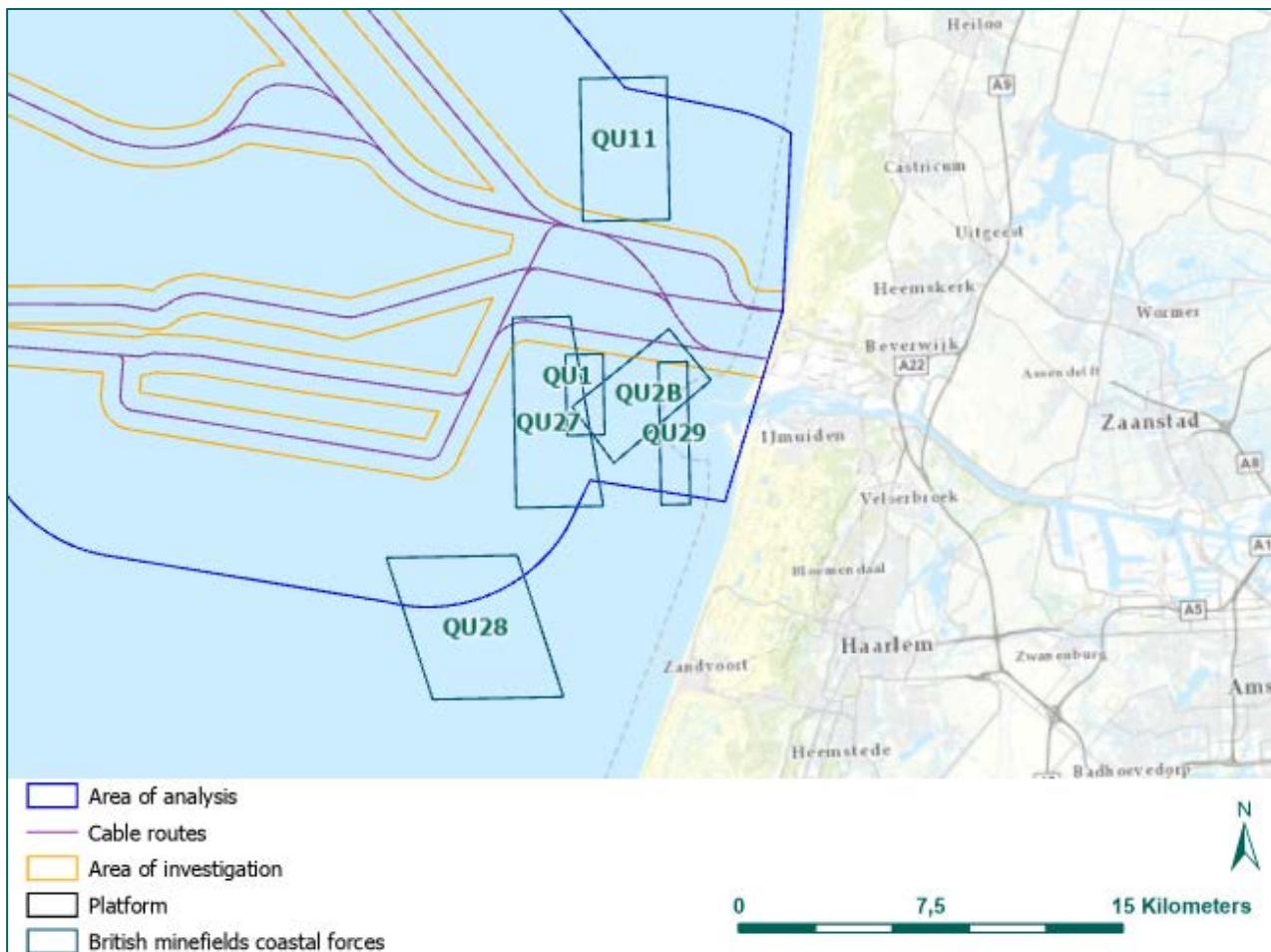


Figure 27: Minefields laid by coastal forces. (Source: TNA, ADM 199).

Another means of minelaying were the "Gardening" operations. These operations were carried out by the Royal Air Force. Planes dropped mines into designated zones. Three zoned lied in front of the Dutch coast. Two of these zones, "Whelks" and "Trefoil", have overlap with the area of analysis. The mines laid by planes were ground mines. A total of 136 mines were laid into "Whelks" and 671 into "Trefoil".

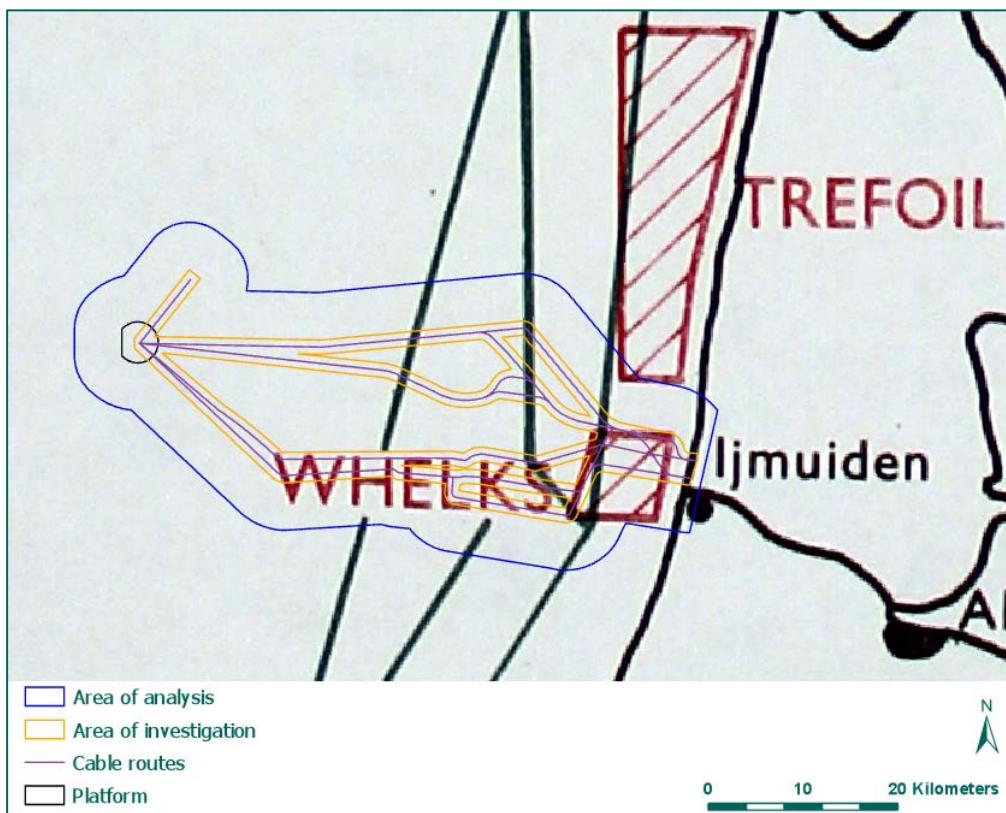


Figure 28: Gardening zones (hatched fields). (Source: TNA, ADM 234/561).

The British minelaying operations forced the German navy to sweep the convoy routes and sea lanes over and over again. According to the records of the 1.Sicherungsdivision (see Annex 4) many mines were cleared during the war. In March 1941 the Germans cleared a minefield that was probably laid during the British "CBX" operation. From February to July 1944 about 42 British ground mines were disposed.

4.3.3 Post-war mine clearance

After World War I, a large effort was made to clear shipping lanes of naval mines. It took several months and a fleet of minesweepers to clear the mine fields. Sweeping was carried out by sweeping a cable with anchors below the water surface. The cable was dragged by two ships.

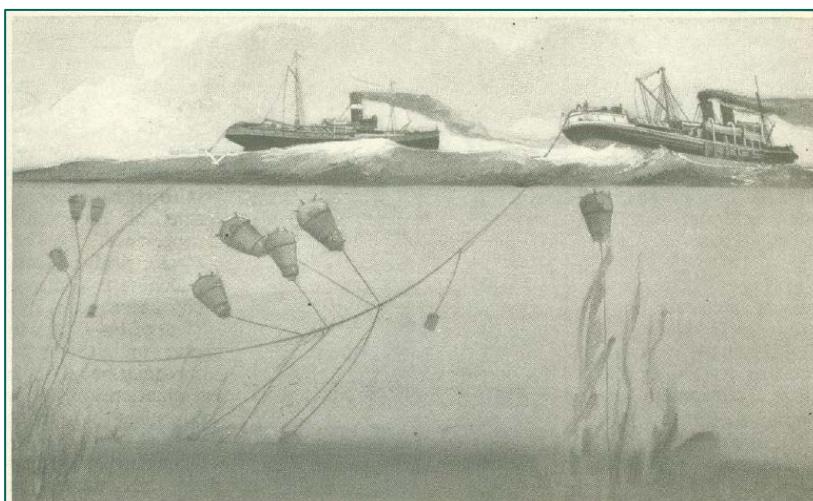


Figure 29: Post WWI-mine sweeping. (Source: <http://www.digitalhistoryproject.com/2012/06/submarine-mines-in-world-war-i-byleland.html>).

Mines also continued to pose a danger to shipping after World War II. In order to combat this threat, a large scale minesweeping campaign was set up. The area of investigation was situated in the Dutch sweeping zone. Charts of the Marinemuseum (see Annex 6) show that the entire area was a designated danger area. Minesweeping was conducted with a variety of methods. Moored mines were usually swept with Oropesa sweeping gear⁸.

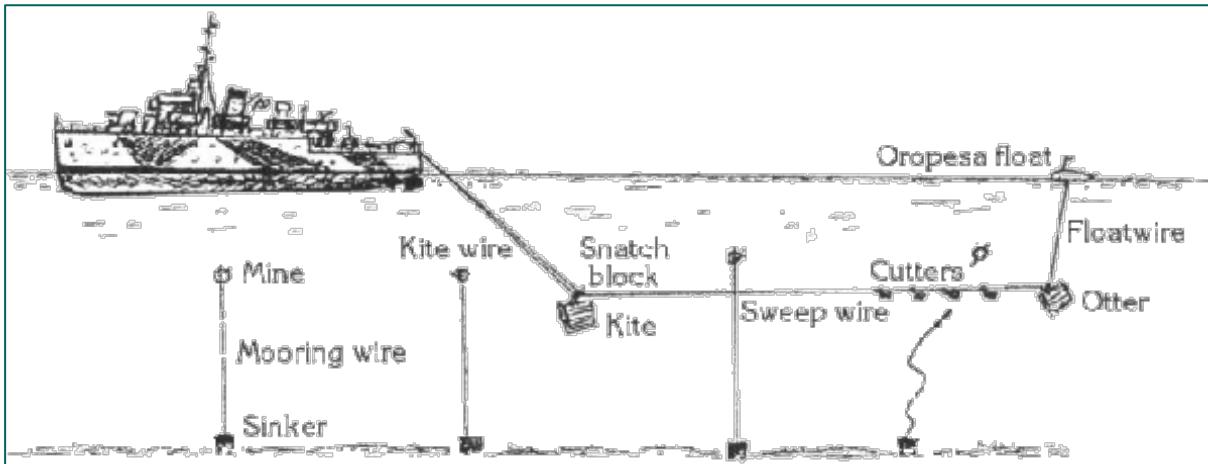


Figure 30: Oropesa sweeping (source: 'The 'Art' of Minesweeping', 27 May 2013, <http://www.minesweepers.org.uk/sweeping.htm>, consulted 2 August 2019).

The moorings of the mines were cut with cutters dragged on a wire behind a ship. Cutting the mooring wires/cables caused the mines to float to the surface, where the mines could easily be shot with cannon or rifle fire. Shooting the mines caused them to sink or to detonate. Ground mines were swept with acoustic hammer boxes, triggering the acoustic mines, or by magnetic sweeping gear to trigger magnetic mines.

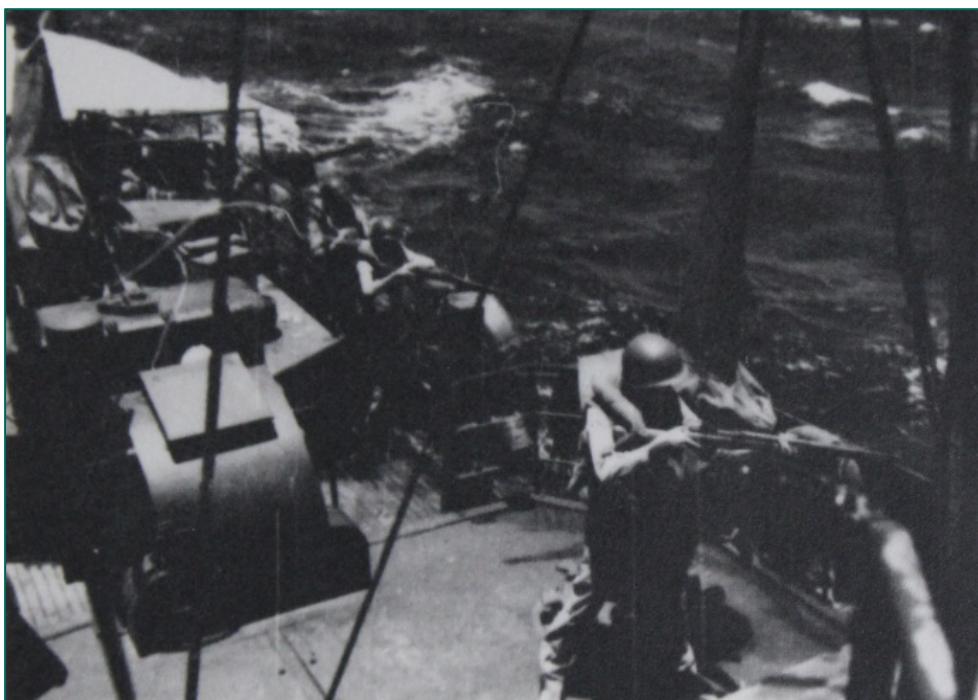


Figure 31: Mine disposal team preparing to fire on swept mines. (Source: TNA, ADM 199/154).

⁸ So named after the World War I trawler in which the technique was first developed. Till then all sweeping was done using two ships joined by a single wire.

The clearance of the German KMA mines (*Küstenmine A*) asked for another approach. Since these mines were put around the high water level, it was too shallow for regular minesweepers. Therefore the so-called Kathymine parties used two rubber boats with a cable between the boats to scrape the seabed. When the cable hooked, a diver went into the water to confirm if a mine was found. If so, some explosives were attached and the mine was blown.

Minesweeping was not synonymous to mine clearance. Objective of the operations was to clear the shipping lanes for navigation. The sea bottom is still littered with unexploded mines, including swept and sunken moored mines, self-disarmed mines⁹ and ground mines with empty batteries. Nowadays, fishermen and dredging ships still encounter these naval mines on a regular basis.

As a cause of clearance operations, tidal and other weather conditions, moored mines could break loose from their anchor and migrate. Furthermore, due to extensive pair and beam trawling there is often no clear relation between the positions of encountered mines and the locations of historical minefields. This observation is confirmed in documents from the Dutch National Archives (see Annex 4) and the Dutch Coast Guard (see Annex 5). In April 1967, three mines were encountered in and just outside the area of analysis. It concerned two German LMB ground mines and one contact mine dating back from the First World War. Also the records of the Dutch Coast Guard mention contact mines that were encountered well outside historical minefields.

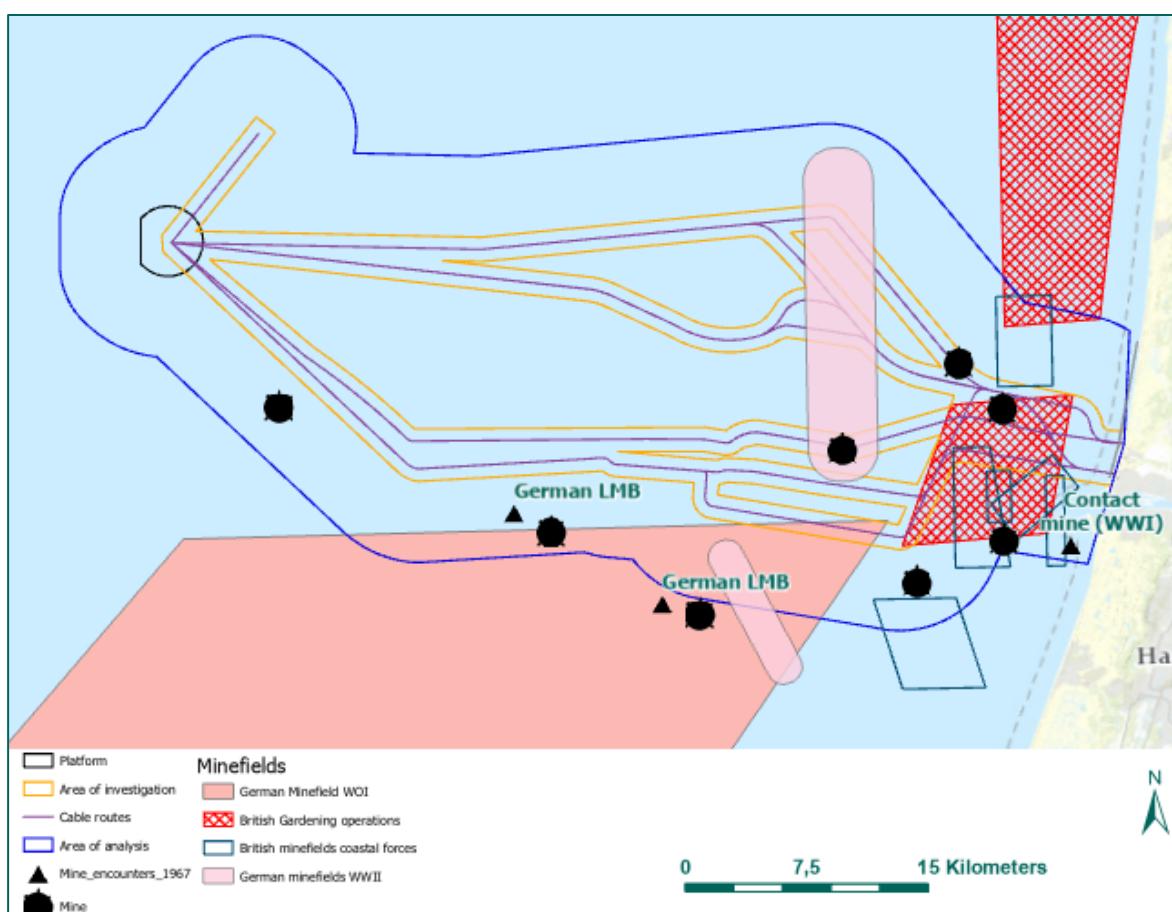


Figure 32: Overview of historical minefields and locations where mines were encountered. (Source basemap: ESRI).

⁹ According to international laws, mines are obligated to include mechanisms to automatically disarm or 'self-sterilize' them after a set time. Moored mines were to sink to the seabed after a given time through, for example, a soluble plug, while ground mines disarmed automatically through a timing mechanism or simply at the end of their battery life. These mechanisms move the mine out of harm's way, but do not disable mechanical fusing mechanisms like *herz horns* and anti-handling devices.

4.3.4 Conclusion

The area of analysis intersects several historical minefields. During World War I, a large German minefield lies in the south of it and during this war two ships ran on a mine within the area. In 1967, a contact mine from the First World War was encountered. It is also possible that British contact mines from this war could end up in the area of analysis. During World War II, the Whelks and Trefoil gardens were put into place. A total of 136 mines were laid into "Whelks" and 671 into "Trefoil". The British Coastal Forces did their effort in placing various minefields in front of IJmuiden and the Dutch coast. The German army laid four minefields that intersect with the area of analysis. During the German invasion, magnetic ground mines were dropped in the sea near IJmuiden.

Post war minesweeping succeeded in securing the shipping lanes, but did not manage to dispose of all mines. Many mines still litter the seabed, with mechanical fusing mechanisms still in place. Sweeping, trawling and extreme tidal and weather conditions caused these mines to migrate over the years, resulting in a situation in which there is no longer a clear link between the original minefields and the current positions of naval mines. Therefore mines, contact mines as well as ground mines, are to be expected in the whole area of analysis.

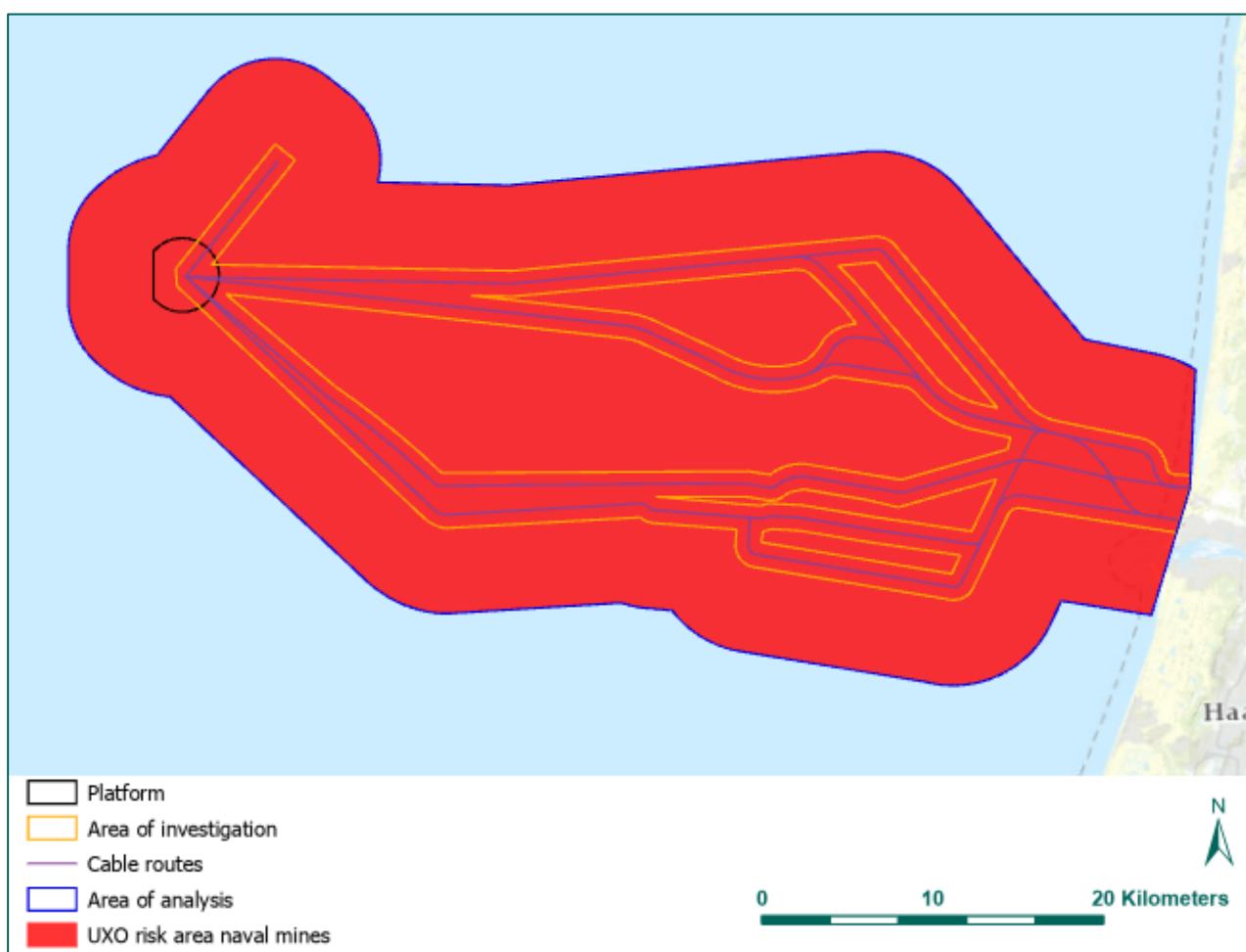


Figure 33: UXO risk area caused by naval mines. (Source basemap: ESRI).

According to the historical sources, the following mines could be present in the area of analysis:

UXO main group	Type/calibre	Amount (estimated)	Condition
Under water ammunition (contact mines)	British Elia / Vickers Elia	0 - 3	Sunk
	Type H Mk. II	0 - 3	
	German E-mine	0 - 3	

UXO main group	Type/calibre	Amount (estimated)	Condition
	EMC	0 - 10	Armed
	British Mk. XVII (with Mk XVIII anchor)	0 - 10	
	British Mk. XIV (with Mk XVII anchor)	0 - 10	
Under water ammunition (ground mines)	British A Mk. I - IV	0 - 20	Armed
	German RMA	0 - 3	
	German LMB	0 - 5	

Table 7: Expected UXO.

4.4 COASTAL GUNS

Coastal guns were traditionally used in strongpoints that had to defend harbours from enemy ships. At the end of the 19th century the Dutch government built a fortress at IJmuiden. For almost five decades, the old guns stayed in place. Shortly before the beginning of World War II, four more modern batteries were installed at IJmuiden. The Dutch batteries were nothing compared to the extent of the German coastal batteries during the Second World War.

The area of analysis starts at the shore, meaning that most of the guns could reach the area. Various sources such as literature, records from the Dutch National Archives, the Bundesarchiv, maps and aerial photographs were used to determine the calibres and locations of the guns. Only the guns with a range far enough to reach the area of analysis, are investigated thoroughly. The analysis is based upon drawings of the different batteries and defence works.

4.4.1 Dutch coastal guns

In 1888 a fortress to defend IJmuiden was erected on an island. This fortress was equipped with five 24 cm L40 and two 15 cm L30 guns. During World War I the 19th century guns were not modernised and stayed in place. At the beginning of World War II, fortress IJmuiden still existed with the five 24 cm guns, but some reinforcements had took place. In the dunes to the North and South of the fortress new batteries were installed. Battery I and II were placed in the North and consisted of three 12 cm L40 guns each. In the South, Battery III and IV were installed with three 7 (7.5 cm) L40 guns. An overview is given in the table below. The shooting ranges are projected in Figure 34.

Guns	Calibre	Range (in meters)	Analyse
Battery I and Battery II	12 cm L40	12.500	Although the guns did not see action during World War II, shooting exercises on moving targets at sea took place.
Battery III and Battery IV	7 (7.5 cm) L40	5.500	This battery did not came into action during World War II. No evidence was found on exercises.
Fortress IJmuiden	24 cm L40	10.000	This battery did not came into action during World War II. Evidence is found that shooting exercises took place on targets at sea.
Fortress IJmuiden	15 cm L30	8.000	Although the guns did not saw action during World War II, shooting exercises took place.

Table 8: Overview Dutch coastal guns.

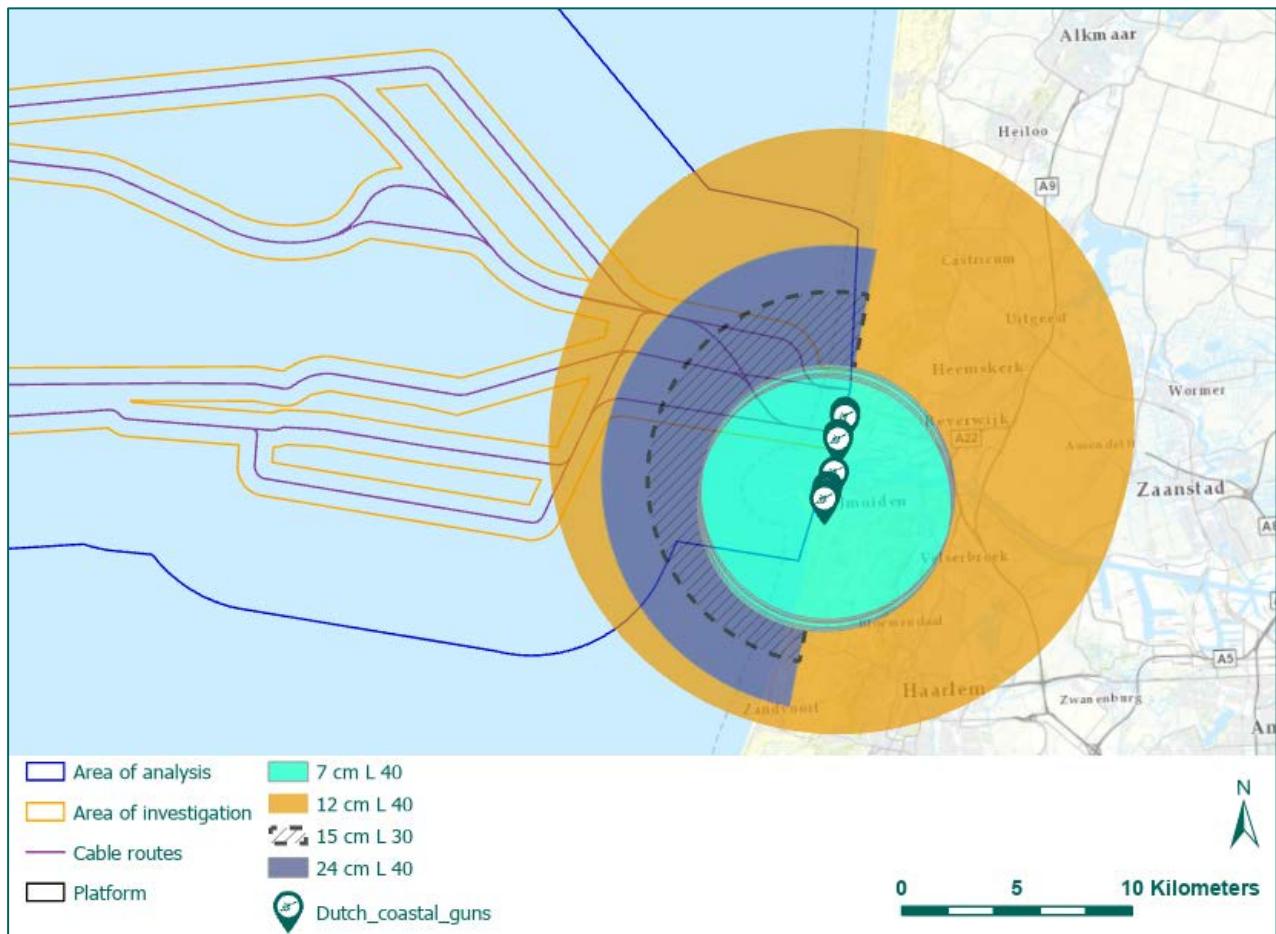


Figure 34: Locations and maximum range of the Dutch coastal guns, 1939. (Source basemap: ESRI).

4.4.2 German coastal guns

From 1942 onwards, the German army started to build a massive defence line at the coast, stretching from the French-Spanish border to Norway. Along the coast various defence works were constructed. The German High Command allocated different levels to the defences, to indicate the importance and thus the strength. IJmuiden was granted the highest level, namely that of the fortress (*Festung*). Fortress IJmuiden – not to confuse with the Dutch fortress (see paragraph 4.4.1) – had a seafront and a land front. The guns in the seafront were aimed towards the beaches and the sea and are relevant for this desktop study. An overview of the strongpoints (*Widerstandsnest*, WN), amount of guns, ranges and calibres are given in Table 9. XX shows the maximum ranges in theory.

Strongpoint	Calibre	Range (in meters)
WN 62	1 x 5 cm Pak	2,700
	1 x 7.5 cm Pak	7,700
WN 63	1 x 7.5 cm Pak	7,700
WN 66	4 x 15 cm SKC36d	19,500
	1 x 7.5 cm FK234b	10,500
	2 x 7.5 cm Pak 97/38	11,000
WN 70	1 x 4.7 cm FP36	4,000
WN 71	1 x 4.7 cm FP36(t)	4,000
WN 72	1 x 4.7 cm FP36(t)	4,000
WN 73	1 x 3.7 cm SKC30	8,500
	2 x 15 cm SKL40	14,200
	1 x 9.4 cm	14,000
	6 x 4.7 cm	4,000

Strongpoint	Calibre	Range (in meters)
WN 81	4 x 17 cm SKL40	19,500
	1 x 7.5 cm FK234b	10,500
St.P. XVI	5 x 12 cm SKL45	18,500
St.P. XIX M	4 x 10.5 cm SKC32	16,000
St.P. XXII H	4 x 10.5 cm K35t	18,100
Battery Zuidzand	4 x 9.4 cm	14,300
Battery Langerak	4 x 15 cm SKC32	22,000

Table 9: Overview German coastal guns.

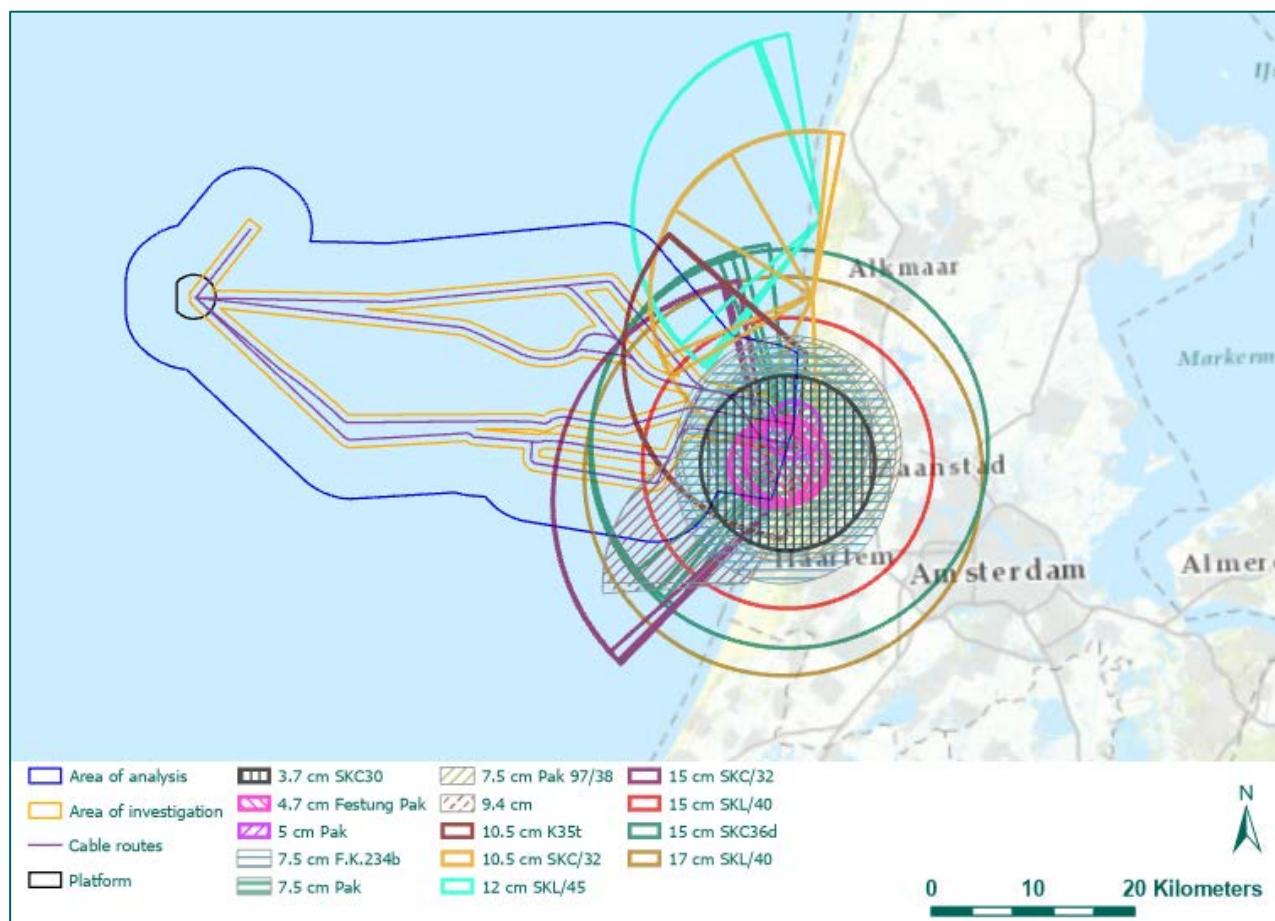


Figure 35: Indicated ranges of German coastal guns. (Basemap: ESRI).

The consulted sources seldom mention firing actions of coastal guns. Two examples show that the German guns did fire on targets at sea. According to the records of the 1.Sicherungsdivision (see Annex 4), on 16 November 1944 a coastal battery fired at unknown objects in AN 8553, which lies in the area of analysis (see also Figure 4). 4 May 1942, during an attack of Coastal Command on a convoy near IJmuiden – in the area of analysis – the airplanes were hindered by shells of the German coastal batteries, see also Figure 36. Since the sea in front of IJmuiden experienced a lot of surface craft battles and air strikes (see also paragraphs 4.1 and 4.2), and since from time to time gun crews had to practice it is estimated that unexploded shells from coastal guns ended up in the area of analysis.



Figure 36: Strike photo showing the impact of a shell, fired by a German coastal battery. 4 May 1942. (Source: TNA, AIR 28/595).

It should be noticed that also a lot of anti-aircraft guns were installed. Three batteries with 8.8 cm and 10.5 cm were present in the Fortress IJmuiden. Furthermore, a lot of strongpoints within the Fortress had light (2cm, 3.7 cm) anti-aircraft guns. Since those gun were firing at moving targets in the air, shells that did not explode could come down practically anywhere within the range of the gun.

4.4.3 Conclusion

Different guns could reach the area of analysis. Although the sources give only a few hints about the action of the coastal guns, it is estimated that all guns and crews had to practice from time to time. Furthermore, the sea in front of IJmuiden saw a lot of action during World War II. Therefore shells of coastal guns could remain in the area of analysis. Two UXO risk areas are defined:

- From 3.7 cm to 5 cm;
- From 7.5 cm to 17 cm.

UXO main group	Type/calibre	Amount (estimated)	Condition
Artillery shells	3.7 cm HE	0 - 10	Fired
	4.7 cm AP	0 - 10	
	5 cm HE	0 - 10	
	7.5 cm 234b	0 - 10	
	7.5 cm AP	0 - 10	
	7.5 cm AP 97/38	0 - 10	
	9. 4 cm	0 - 10	
	10.5 cm K38t	0 - 10	
	10.5 cm SKC/32	0 - 10	
	12 cm L40	0 - 10	
	12 cm SKL/45	0 - 10	
	15 cm SKC/32	0 - 10	
	15 cm SKL/40	0 - 10	
	15 cm SKC36d	0 - 10	

UXO main group	Type/calibre	Amount (estimated)	Condition
	15 cm L30	0 - 10	
	17 cm SKL/40	0 - 10	
	24 cm L40	0 - 10	

Table 10: Expected UXO.

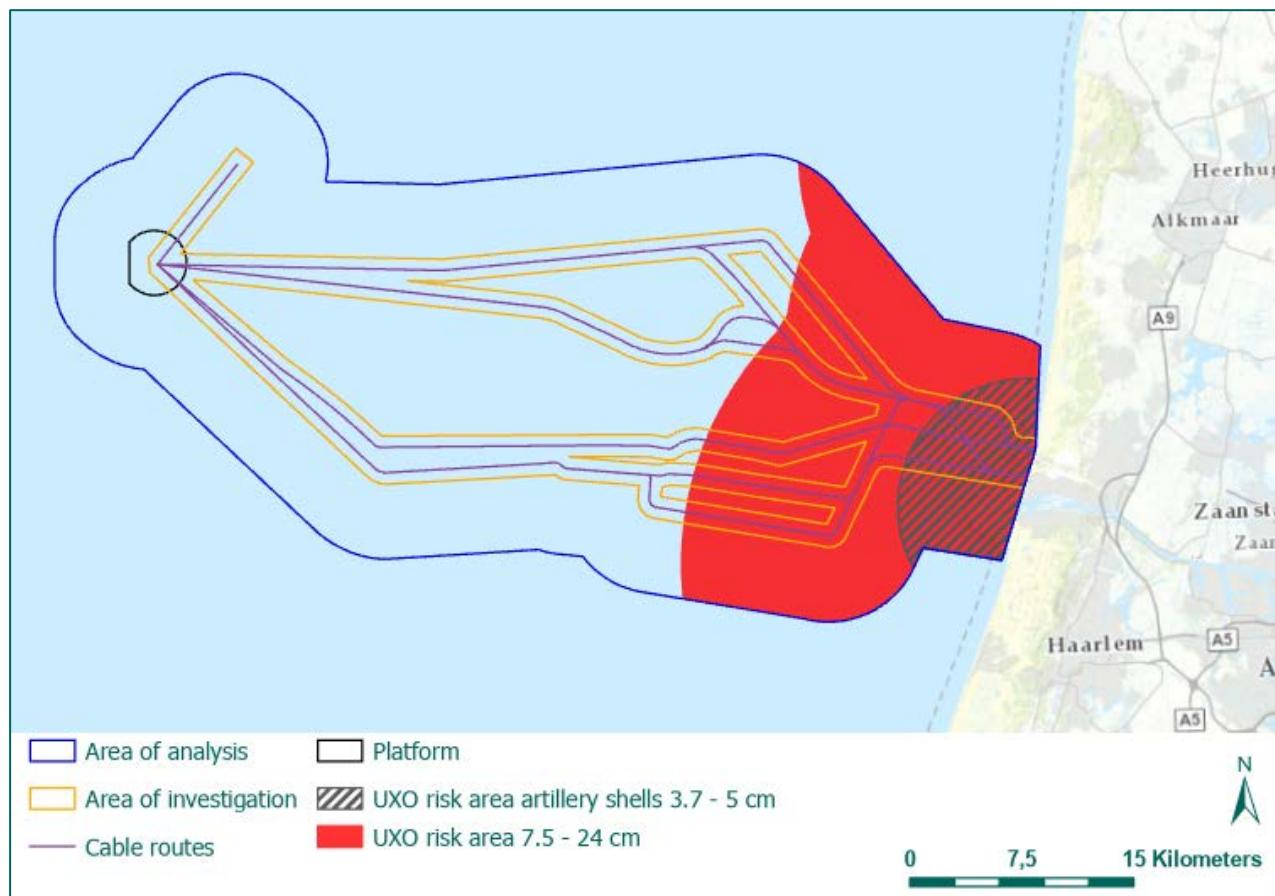


Figure 37: UXO risk areas artillery shells. (Source basemap: ESRI).

4.5 OTHER UXO-RELATED EVENTS

This paragraph discusses three UXO-related events that did not come up in the previous paragraphs. It concerns wrecks, an ammunition dump zone, and a military exercise area.

4.5.1 Wrecks

According to consulted sources (literature, SGLO, archival documents, PH39 Wrakkenregister), various airplanes crashed into the sea and boats sunk off IJmuiden. For many crashes and shipwrecks the exact location is not known. The Register of Losses (SGLO) only gives a vague indication like "crashed 40 km off IJmuiden"

The wreck register (PH39 Wrakkenregister) show 130 shipwrecks in the area of analysis (see Annex6). Most wrecks are unknown, but some have a name. The wrecks with a name within the area of investigation are checked for UXO-related information. This yielded the following relevant results:

Name	Information	Source
Skoghaug	Norwegian Coal ship, built in 1930. During a storm on 24 December 1947, the ship ran on a mine.	http://www.soortenbank.nl/soorten.php?soortengroep=d_uikgids&menuentry=inleiding&id=64&tab=foto

Name	Information	Source
Baloeran (Strassbourg)	Dutch passenger steam ship, built in 1930. Ran on a mine off Wijk aan Zee and was put on a sandbank. Later on in the war, the wreck was attacked by British MTBs and planes.	https://www.shipdata.nl/index.php?mode=info&Page=11 3

Table 11: UXO-related shipwrecks.

Because of the many wrecks within the area of analysis, (parts of) ship and airplane wrecks are to be expected. No information was found on wrecks containing UXO. The two ships in Table 11 were sunk by a mine, and in the case of the Baloeran (Strassbourg) attacked afterwards. These war-related events are already taken into account in the paragraphs 4.1, 4.2 and 4.3.

4.5.2 Ammunition dump

As shown on the naval chart, an ammunition dump ground is situated within the area of analysis. According to archival documents, tons of German left behind ammunition were dumped into this zone shortly after World War II. In the 1960's, it appeared that fishermen encountered also ammunition outside the dump ground, therefore a larger zone was marked as "*dangerous for fishing, intrusive, and seismographic activities*". The centre of the dump ground is marked with a buoy in position 52-33,5N, 04-03,6E. The dangerous area is defined by a radius of three nautical miles around this buoy.

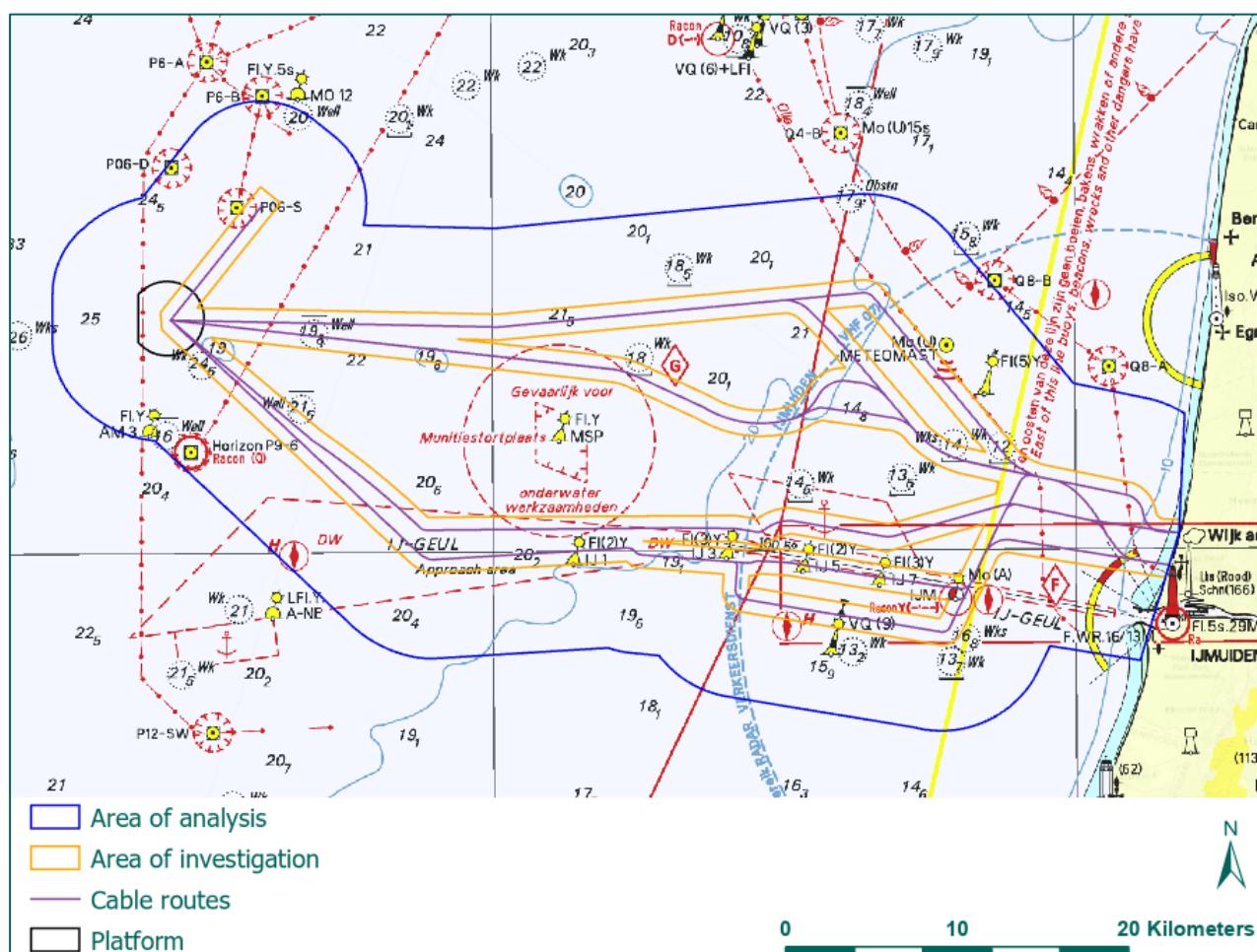


Figure 38: Naval chart showing an ammunition dump ground (Munitiestortplaats). (Source: Royal Netherlands Hydrographic Service).

Since ammunition was dumped on purpose, a UXO risk area is defined. No information is available on the exact amount and type of the ditched ammunition. Therefore, the sort, type, amount and condition cannot be determined.

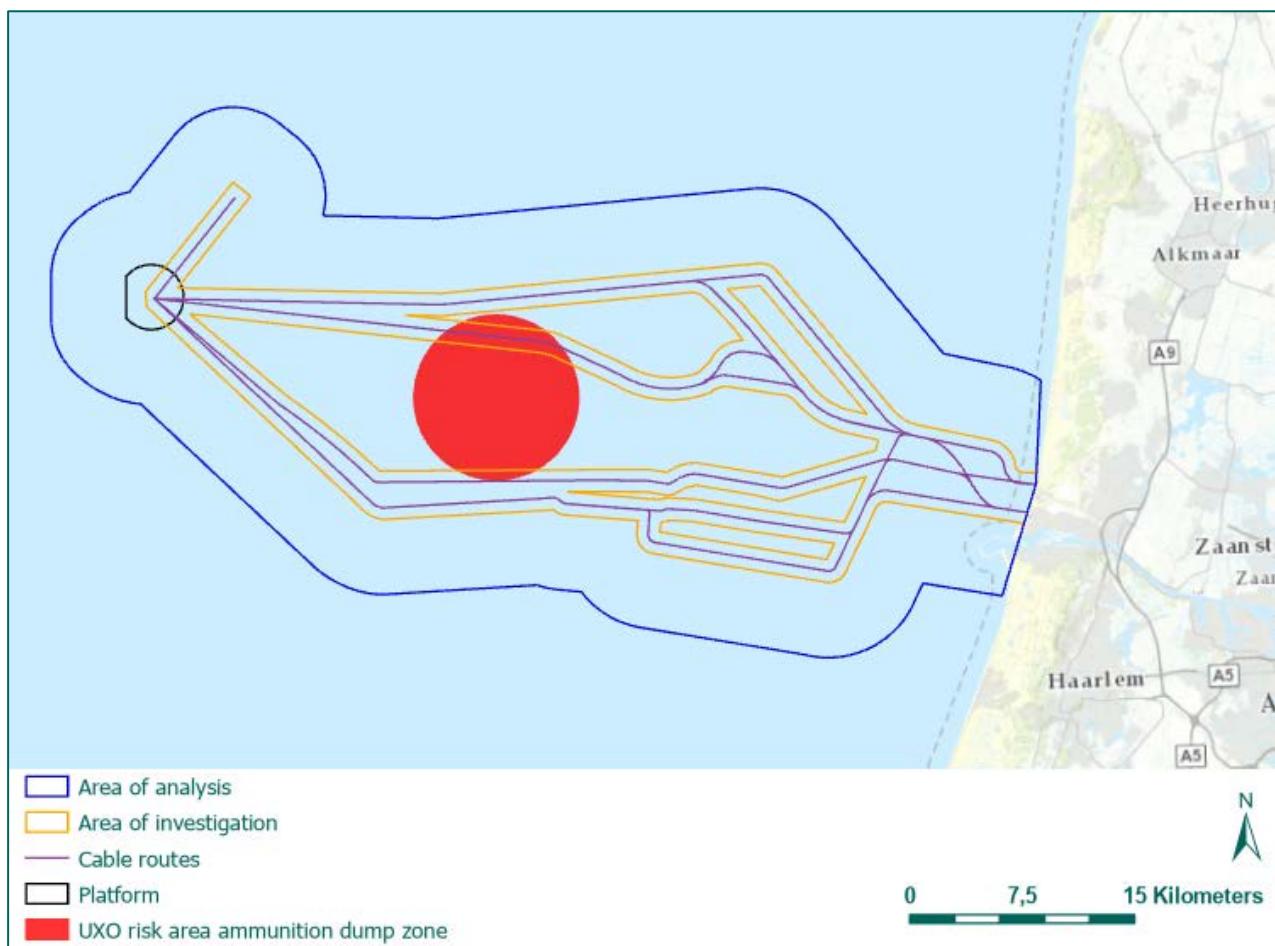


Figure 39: UXO risk area ammunition dump ground. (Source basemap: ESRI).

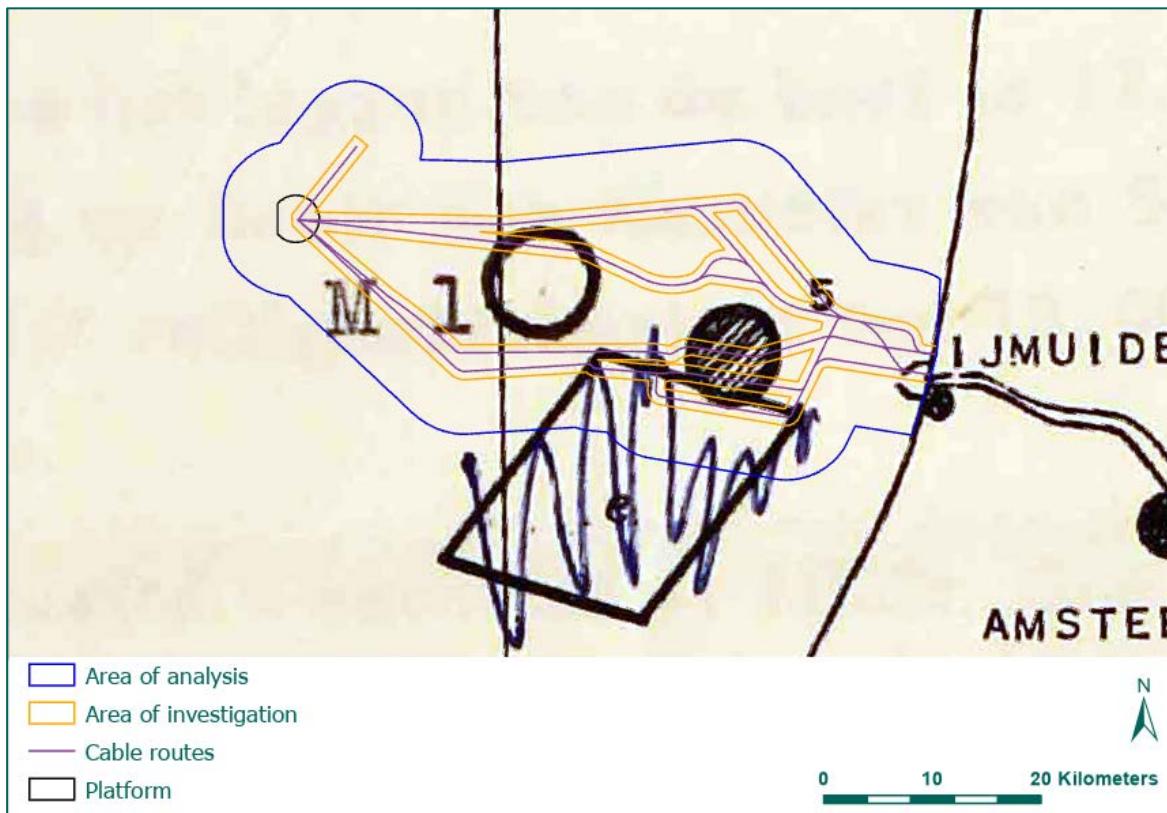
4.5.3 Military exercise areas (post-war)

Based upon information from Dutch archives (see Annex 3 and 6) three military exercise zones have overlap with the area of analysis. It concerns two minesweeping areas and a modern shooting range. The shooting range has only overlap with the area of analysis, therefore it is not expected that UXO from the range are left into the area of investigation.

A map shows the two minesweeping areas (area "5" and "e")¹⁰. According to the added explanation (see Annex 3), field 5 is a cancelled exercise area and field e is stated in 1968 a former exercise area. This means no actual minesweeping exercises are held there today. It is not known how long the areas were used for exercises and which type and amount of mines were used. There are no post-war mine encounters that could be linked to these exercise areas.

Normally, explosives are no part of exercise ammunition. Devices to simulate the impact, like smoke markers, can be present. For this reason, no UXO risk area is defined as a cause of minesweeping exercise areas.

¹⁰ M1 indicates an ammunition dump ground, see paragraph 4.5.2.



4.6 GAPS IN KNOWLEDGE

When conducting the desktop study, some gaps in knowledge did appear:

- Many German documents – especially from the air force – did not survive World War II. German primary sources are often lacking.
- It is not possible to pinpoint exactly war-related events at sea. This problem is partly solved by defining a large area of analysis. Events that took place within this area could have led to a UXO risk area.
- Information on UXO encounters and disposal between 1945 and 2005 is incomplete.
- Most of the encountered UXO at sea is not identified thoroughly.
- Crash locations of planes during World War II are not exactly known. This is also the case for many shipwrecks, which are also unknown in the Register of Wrecks (Wrakkenregister).
- It is unknown how many times each individual coastal gun fired and to which target it was aimed.
- The type and amount of mines used in the minesweeping exercise areas is not known.

4.7 UXO RISK AREA: HORIZONTAL DEMARCTION

Based upon the above paragraphs it is concluded that UXO could remain in the area of analysis. Detailed specifications of the expected UXO are added into Annex 12. The horizontal demarcation of the different UXO risk areas is explained at the end of each paragraph (4.1, 4.2, 4.3, 4.4, and 4.5). It is not always possible to define specific UXO risk areas in an offshore environment. The UXO risk areas are cut off on the border of the area of analysis, which is the scope of the desktop study.

The different UXO risk areas are showed in drawing 02.

5 VERTICAL DEMARCATON AND MIGRATION ASSESSMENT

In dynamic sediment conditions, UXO items are likely to become buried; the depth of burial is depending on a number of variables that will be explored below. In the offshore marine environment, UXO burial is predominantly due to one or a combination of the following three mechanisms:

- Initial impact
- Scour
- Bedform migration

5.1 BURIAL ON IMPACT

The first mechanism for UXO burial to consider is that due to initial impact. In the marine environment, a bomb or air-delivered ground mine's kinetic energy is rapidly attenuated by the water it passes through and its geometry is changed substantially. The depth of water, therefore, is also an important factor in estimating the likely burial depth on impact.

Experiments on Mk 84 bombs show that the trajectory of a bomb falling into water at an angle of entry of ~90° is rapidly altered by the new medium. The bomb rotates and orientates to near parallel to the seabed by a water depth of around 5 meter¹¹ (see Figure 41). Its burial in sandy soils due to impact will be minimal in water depths over 5 meter. Burial on impact of a large air dropped ground mine will also be minimal at larger water depths. The water depth within the investigation area varies from 15.0 to 34.5 meter (LAT), with an average of 22.6 meter (LAT). Burial on impact is therefore assessed to be null.

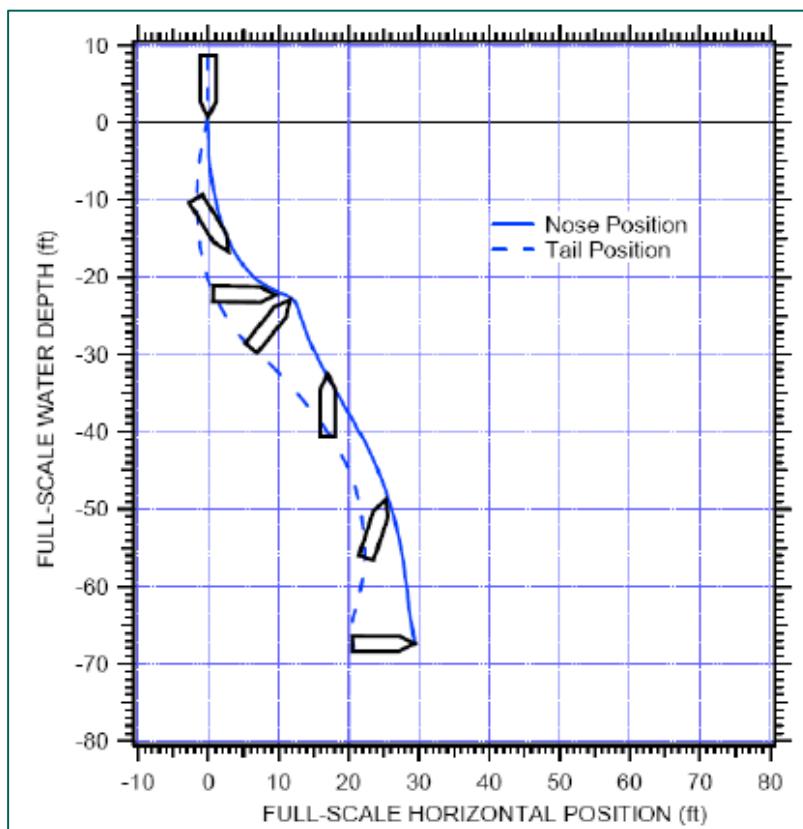


Figure 41: Trajectory of Mk 84 with no tail section and water-entry velocity of 296 m/s.

¹¹ Chu P.C. et al, Semi Empirical Formulas of Drag/Lift Coefficients for High Speed Rigid Body Maneuvering in Water Column, May 2008.

5.2 SCOUR

Scour¹² is the change in bed configuration due to the change in flow pattern around an object such as a UXO placed on or near the surface of a movable bed. The presence of the object modifies the flow pattern around the object, generating vortices that locally increase and decrease the bottom flow stresses. The vortices cause depressions and mounds to form on the bed surface. Objects placed on beds where the flow was causing no apparent motion can locally increase the bed stress behind the object and induce bed motion and scour.

Studies of mines placed on sandy bottoms show that subsequent burial occurs through a series of scour events followed by rolling or sliding of the mine into the scour depression. It has been shown that the amount and rates of scour and burial of objects on the sea floor under the influence of waves and currents is a function of their size, weight, and shape. Shape is an essential variable because scour is related to the intensity of the vortex system that forms around the object as the current flows past it. Thus, streamlined bodies scour less rapidly than bluff (blunt) bodies. Once scour depressions develop around a UXO, the object is buried incrementally by moving into the depressions formed by the scour process, either by rolling or sliding (see Figure 42).

In general, small UXO items scour and bury deeper relative to their diameters than large UXO, while absolute burial as measured from sediment surface to UXO keel is greater for large UXO. Furthermore, three-dimensional UXO (ovoids and hemispheres) bury more slowly than two-dimensional (cylindrical) UXO.

The scour process stops when the UXO is at a depth where it's protected against the scour. Experiments and modelling have shown this depth to be approximately $0.6 \times \text{diameter}$ for large objects in sandy sediments. UXO burial due to scour to the maximum scour depth is to be expected in the investigation area. The largest UXO possibly to be present is a German EMC moored mine. This mine has a diameter of 1.2 meter and can be buried due to scour up to approximately 0.7 meter below seabed.

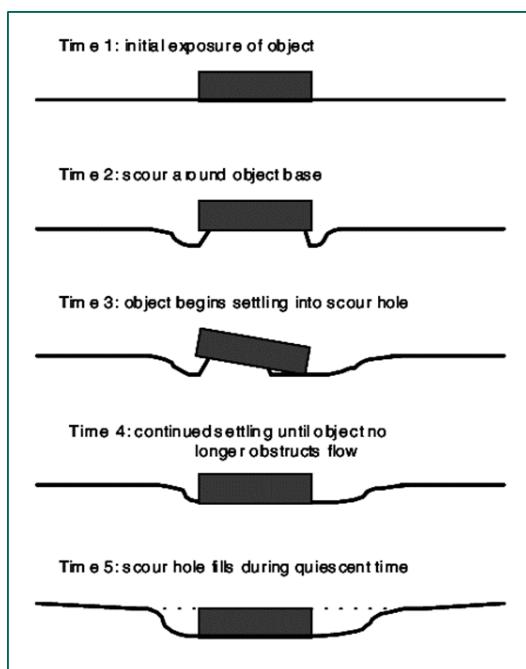


Figure 42: Scour mechanism¹³.

¹² Source: Douglas L. Inman et al., Scour and burial of bottom mines, A Mine Burial Primer, September 2002.

¹³ Source: www.researchgate.net

5.3 BEDFORM MIGRATION

Assessment of possible UXO burial requires insights in the behaviour of the mobile morphological features within the investigation area. UXO burial (and exposure) may be caused by the formation and migration of bedforms. The spatial scale of the bed forms ranges from several meters to several kilometres and migration speeds range from < 1 m/year to > 100 m/year. Table 12 summarizes the six different types of bed forms can be distinguished at the Dutch continental shelf.

Bed form	Length (m)	Height (m)	Migration speed (m/year)	Evolution time scale
Ripples	0.1 - 1	0.01 – 0.1	100 – 1,000	Hours
Mega ripples	1 – 10	0.1 – 1	100 – 1,000	Hours – days
Sand waves	100 – 1,000	1 – 5 ¹⁴	1 – 10	Decades
Long bed waves	1,500	5	Unknown	Centuries
Shore face connected ridges	5,000 – 8,000	1 – 5	1 – 10	Centuries
Tidal sand banks	5,000 – 10,000	1 – 5	< 1	Centuries

Table 12: Overview of bed forms located at the Dutch continental shelf.¹⁵

The ripples and mega ripples are too low to be of major importance for the burial assessment. Long bed waves, shore face connected ridges and tidal sand banks migrate too slowly to be of importance for the burial assessment. Due to their height and migration rates sand waves are the predominant bed forms in regards to the burial depth of UXO.

At the time of the composing of this report a detailed study on seabed morphology was not yet available. This study will be undertaken at a later stage. Based on the information currently available¹⁶ the burial depth of UXO due to the migration of bedforms is assessed to be negligible.

5.4 CONCLUSIONS BURIAL DEPTH

Based on the mechanisms outlined in the previous paragraphs, the likely maximum burial depth (MBD) for an item of UXO can be calculated using the basic formula:

$$MBD = (0 \text{ (burial on impact)}) + (0.6 \times 1.2 \text{ (UXO diameter)}) + (0 \text{ (height of bedform)}) = \mathbf{0.7 \text{ meter}}$$

This calculation is based on data available at the moment of conducting this risk assessment. The calculation should be verified when more information on bedform height becomes available.

In preparation for the geophysical UXO survey, the potential migration of UXO needs to be assessed. UXO migration is highly relevant in determining the maximum permissible safe time interval between the conclusion of a geophysical UXO survey, UXO clearance operations and the commencement of construction works.

Migration can occur due to environmental and natural causes and also human activity. In the next paragraphs the possible migration of UXO is assessed.

5.5 MIGRATION BY NATURAL CAUSES

Migration by natural causes may occur due to hydrodynamics and/or morphodynamical behaviour. In this paragraph these aspects will be assessed.

¹⁴ Average values. The maximum height/depth ratio observed to be about 1/3.

¹⁵ Menninga J., 2012. Analysis of variations in characteristics of sand waves observed in the Dutch coastal zone: a field and model study. MSc dissertation thesis. Utrecht University, 2012.

¹⁶ Rijkswaterstaat, Bathymetry 2017. Online Viewer www.informatiehuismarien.nl/open-data.

5.5.1 Hydrodynamics along the cable routes

The hydrodynamics along the cable routes is characterized by tide and wind generated currents and waves. The tide is predominantly semi-diurnal tide. Table 13 presents the mean tidal water levels at Ijmuiden Buitenhaven to illustrate the tidal characteristics. The mean tidal range is 1.69 meter, with a mean high water of NAP+1.01 meter and a mean low water of NAP-0.68 meter.

Tide	HW [m NAP]	LW (m NAP)	Tidal range (m)
Mean tide	1.01	-0.68	1.69
Spring tide	1.16	-0.72	1.88
Neap tide	0.76	-0.61	1.37

Table 13: Tidal water levels Ijmuiden Buitenhaven.¹⁷

The average tidal streams during average weather conditions (wind south-west force 3 to 4) reaches speeds up to 0.8 kts (1.0 kts at spring tides)¹⁸. The given speeds of tidal streams are average calculated speeds. The actual speeds depend on a large number of variables. Therefore, the actual speeds may be higher than the calculated speed.

The shapes, dimensions and weights of the UXO that can be expected in the investigation area are such that they are not likely to be transported over long distances by normal wave and tidal conditions. Due to water depth, influence of storm loading must be taken in consideration in nearshore areas.

5.5.2 Morphodynamical behaviour

The migration of objects is also not likely to be influenced by morphological changes in the area. Because of the minimal geomorphic activity of the seabed the risk of UXO getting unburied in the slopes of sand waves is assessed to be negligible. Therefore, UXO migration due to morphodynamical behaviour is not a factor to consider in the determination of the maximum permissible safe time interval between the conclusion of a geophysical UXO survey, UXO clearance operations and the commencement of construction works.

5.6 MIGRATION DUE TO HUMAN ACTIVITY

Human activity may have a more significant impact on UXO migration than natural causes. Especially dredging and fishing activities have the capacity to move items of UXO.

Particularly in areas where beam and pair trawling are prevalent. Currently the investigation area is fished several times a year¹⁹. It's expected that some trawlers may have unintentionally moved UXO. These UXO items may have been transported with the movements of the vessel's nets for considerable distances before they are returned to the seabed. In such circumstances, fishing nets have been known to move UXO up to 30 miles (48 km) from their original location²⁰.

After completion of the cable route it will be crossed by vessels. Therefore, the risk of UXO being moved unintentionally by fisherman after conduction of the UXO survey and completion of the cable remains. Dredging activities in the shipping lane to Ijmuiden harbour can also influence UXO migration.

¹⁷ Rijkswaterstaat, Kenmerkende waarden getijgebied 2011.0, July 22, 2013.

¹⁸ HP33, Waterstanden en stromen 2014, 2014. Mentioned speeds are current speeds at the surface.

¹⁹ <http://www.clo.nl/indicatoren/nl2093-ecologische-duurzaamheid-bodemvisserij>, Visserij Intensiteit op het Nederlands Continentaal Plat, 2007-2011 (no longer available, historic data used)

²⁰ Unexploded Ordnance Munitions Migration Assessment, Report Number: P3872-E3MMA, August 2014

It is not possible to quantify the UXO migration due to human interaction. Therefore, human interaction is not a factor in the ALARP sign off certification process. This migration factor is part of the baseline residual risk. If a large calibre UXO is unintentionally dragged into the area of investigation by fisherman, it will lie on the seafloor. Therefore, it will most likely be visible in for example SSS data.

5.7 MAXIMUM PERMISSABLE SAFE TIME INTERVAL

In general, due to the possibility of UXO migration, the time periods lapsed from completion of the geophysical survey, UXO/anomaly investigation, UXO disposal phase and installation operations, must be kept to an absolute minimum. This is to ensure that UXO migration cannot nullify the validation period of the final ALARP clearance certification. It is therefore imperative to manage and plan the phases of the project, in an educated and calculated manner. This can be achieved by ensuring that vessel planning, vessel availability, weather windows, vessel/contractor capability, project phase execution and management are carefully planned and implemented to guarantee that the operations are carried out within the specified time scale reflective of the UXO migration assessment information.

For the investigation area horizontal migration of UXO is most likely to occur due to human interference. However, it proved not to be possible to quantify the horizontal migration rate.

The maximum permissible safe time interval between the conclusion of a geophysical UXO survey, UXO clearance operations and the commencement of construction works is assessed to be approximately two years. This is a widely accepted industry standard.

6 CABLE ROUTES AND ALTERNATIVES

In the HKW cable routes project four routes plus alternatives are predefined. This chapter gives an overview of the UXO risk areas for the platform, the inter link, the cable routes and their alternatives.

6.1 PLATFORM AND INTERLINK

The platform and interlink are situated approximately 56 km off the coast. As showed in Figure 43 the platform and interlink have overlap with two UXO risk areas: naval mines and aerial bombs. The expected UXO in both parts is listed in Table 14.

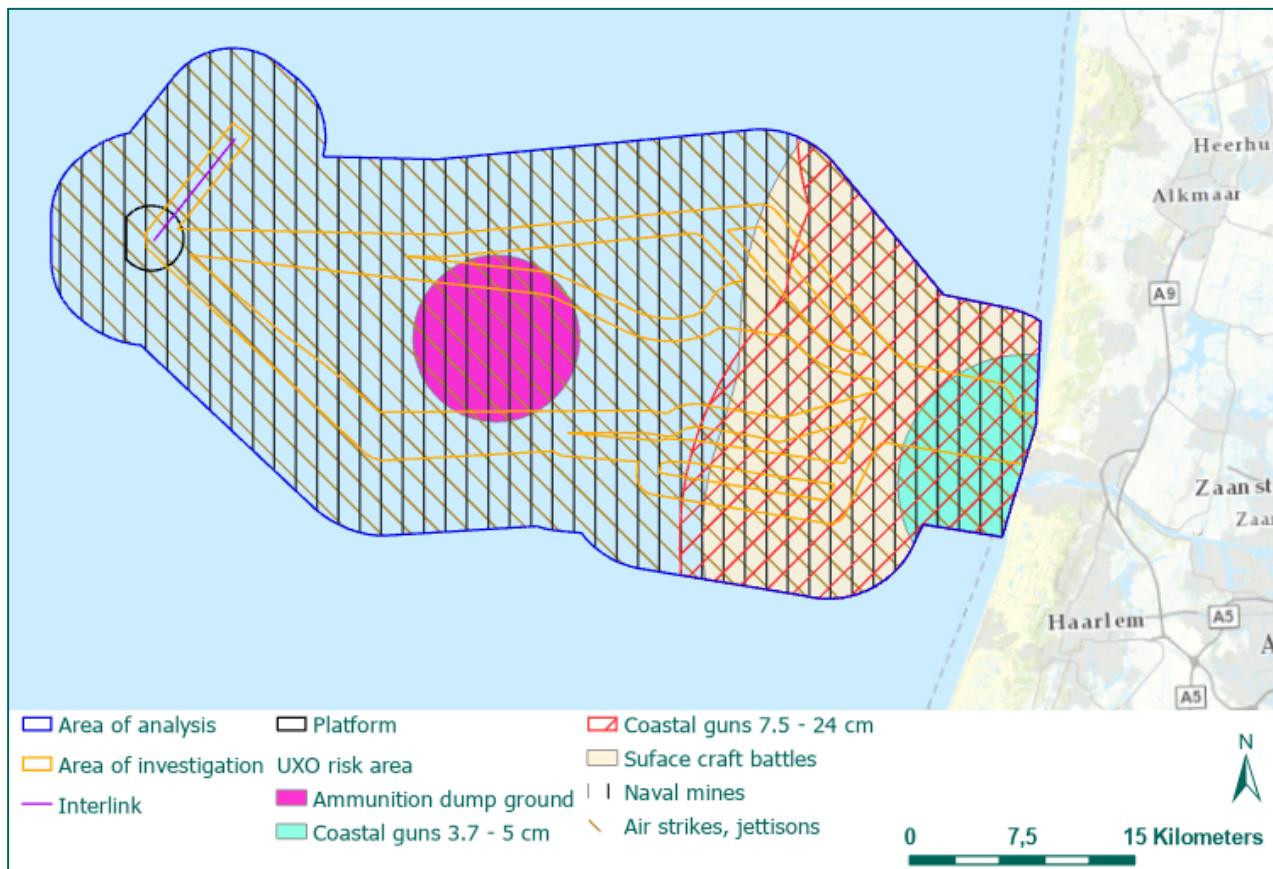


Figure 43: UXO risk areas within the platform and interlink. (Source basemap: ESRI).

Part	Expected UXO Main group	Type	Estimated amount	Condition
Platform Interlink	Under water ammunition (contact mines)	British Elia / Vickers Elia Type H Mk. II German E-mine EMC British Mk. XVII (with Mk XVIII anchor) British Mk. XIV (with Mk XVII anchor)	0 - 10	Sunk
	Under water ammunition (ground mines)	British A Mk. I – IV German RMA German LMB	0 - 10	Armed
	Aerial bombs	4 lbs, 25 lbs, 30 lbs, 100 lbs, 250 lbs, 260 lbs, 300 lbs, 500 lbs, 1,000 lbs, 2,000 lbs, 4,000 lbs	0 - 10	Armed / safe

Table 14: Expected UXO within the platform and interlink.

6.2 ROUTES 1N, 1Z, 1ZA, 1ZB

The routes 1N, 1Z, 1ZA, and 1ZB are showed in Figure 44. These routes have an overlap with almost all the defined UXO risk areas, except the ammunition dump zone.

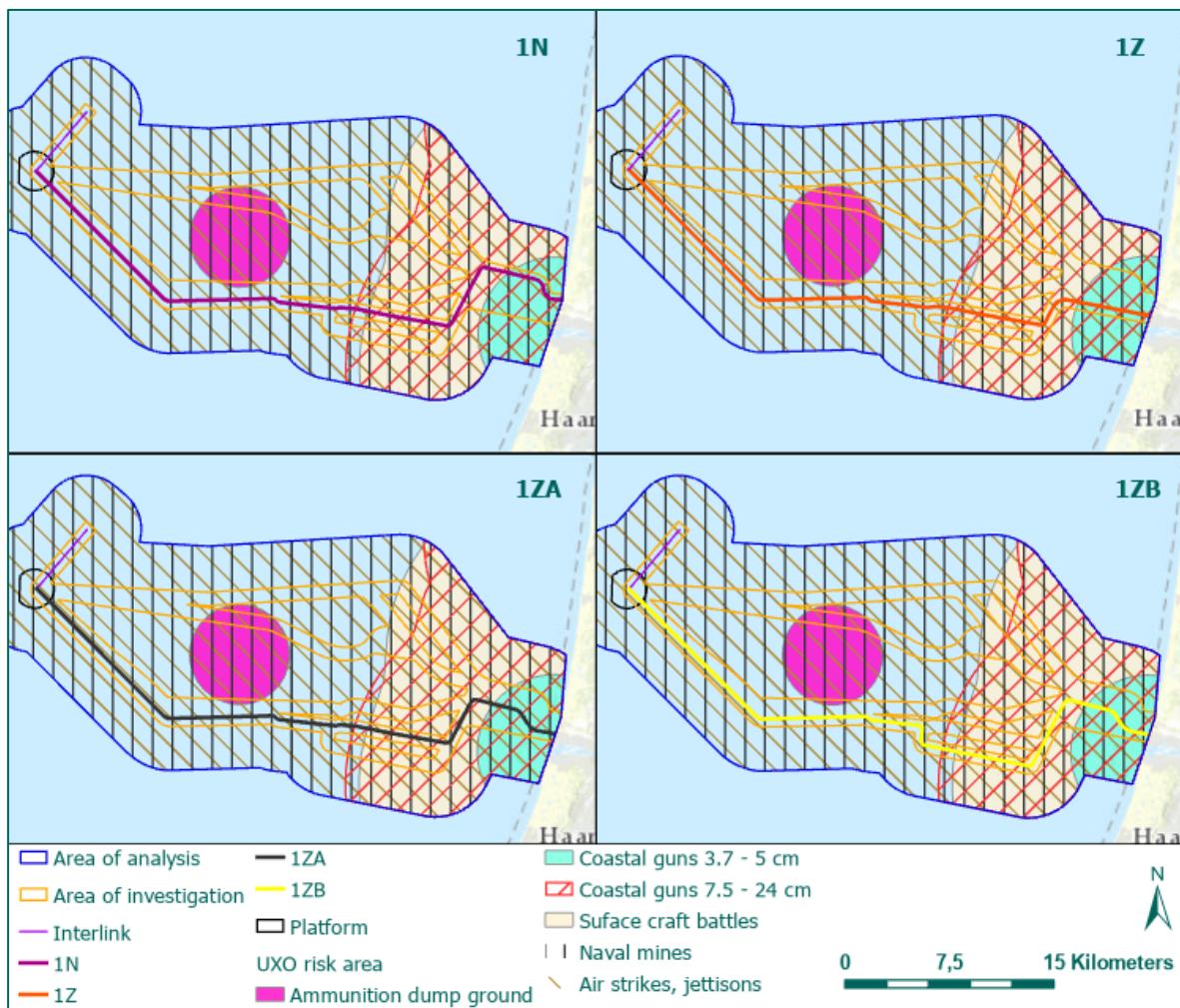


Figure 44: UXO risk areas within the routes 1N, 1Z, 1ZA, and 1ZB. (Source basemap: ESRI).

Part	Expected UXO Main group	Type	Estimated amount	Condition
Routes 1N, 1Z, 1ZA, and 1ZB	Under water ammunition (contact mines)	British Elia / Vickers Elia Type H Mk. II German E-mine EMC British Mk. XVII (with Mk XVIII anchor) British Mk. XIV (with Mk XVII anchor)	0 - 10	Sunk
	Under water ammunition (ground mines)	British A Mk. I – IV German RMA German LMB	0 - 10	Armed
	Under water ammunition	18 in torpedo Mk XV Depth charge	0 - 10	Armed
	Aerial bombs	4 lbs, 25 lbs, 30 lbs, 100 lbs, 250 lbs, 260 lbs, 300 lbs, 500 lbs, 1,000 lbs, 2,000 lbs, 4,000 lbs	0 - 10	Armed / safe
	Rockets	3 inch rocket with 60 lbs warhead SAP RAG Flares	0 - 10	Fired
	Artillery shells	2 cm/20 mm 2 pr. pompom	0 - 200	Fired

Part	Expected UXO Main group	Type	Estimated amount	Condition
		3.7 cm 4.7 cm 5 cm 6 pr. 7.5 cm (234b, AP, 97/38) 8.8 cm 9.4 cm 10.5 cm (K38t, SKC/32) 12 cm (L40, SKL/45) 15 cm (SKC/32, SKL/40, SKC36d, L30) 17 cm SKL/40 24 cm L40		
	Small calibre ammunition	.303 .50 13,2 mm 15 mm	0 - 200	Fired

Table 15: Expected UXO within the routes 1N, 1Z, 1ZA, and 1ZB.

6.3 2N, 2Z

The routes 2N and 2Z are showed in Figure 45. These routes have an overlap with almost all the defined UXO risk areas, except the ammunition dump zone. The same conclusion is applicable on the route and the alternative.

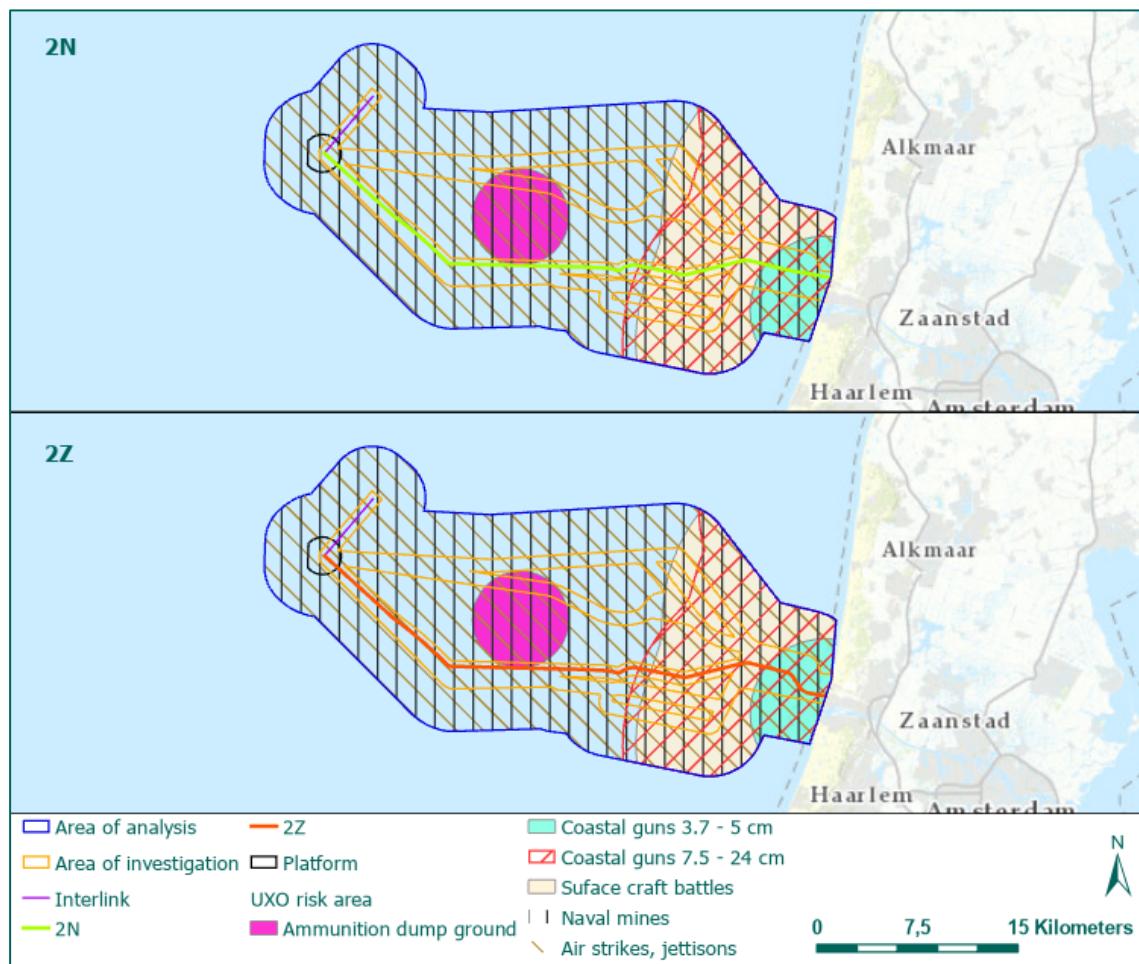


Figure 45: UXO risk areas within the routes 2N and 2Z. (Source basemap: ESRI).

Part	Expected UXO Main group	Type	Estimated amount	Condition
Routes 1N, 1Z, 1ZA, and 1ZB	Under water ammunition (contact mines)	British Elia / Vickers Elia Type H Mk. II German E-mine EMC British Mk. XVII (with Mk XVIII anchor) British Mk. XIV (with Mk XVII anchor)	0 - 10	Sunk
	Under water ammunition (ground mines)	British A Mk. I – IV German RMA German LMB	0 - 10	Armed
	Under water ammunition	18 in torpedo Mk XV Depth charge	0 - 10	Armed
	Aerial bombs	4 lbs, 25 lbs, 30 lbs, 100 lbs, 250 lbs, 260 lbs, 300 lbs, 500 lbs, 1,000 lbs, 2,000 lbs, 4,000 lbs	0 - 10	Armed / safe
	Rockets	3 inch rocket with 60 lbs warhead SAP RAG Flares	0 - 10	Fired
	Artillery shells	2 cm/20 mm 2 pr. pompom 3.7 cm 4.7 cm 5 cm 6 pr. 7.5 cm (234b, AP, 97/38) 8.8 cm 9.4 cm 10.5 cm (K38t, SKC/32) 12 cm (L40, SKL/45) 15 cm (SKC/32, SKL/40, SKC36d, L30) 17 cm SKL/40 24 cm L40	0 - 200	Fired
	Small calibre ammunition	.303 .50 13,2 mm 15 mm	0 - 200	Fired

Table 16: Expected UXO within the routes 2N and 2Z.

6.4 3N, 3NA, 3Z, 3ZA

The routes 3N, 3NA, 3Z, and 3ZA are showed in Figure 46. These routes have an overlap with almost all the defined UXO risk areas. It should be noticed that the route crosses the demarcated zone around the ammunition dump zone. The same conclusion is applicable on all routes and alternatives.

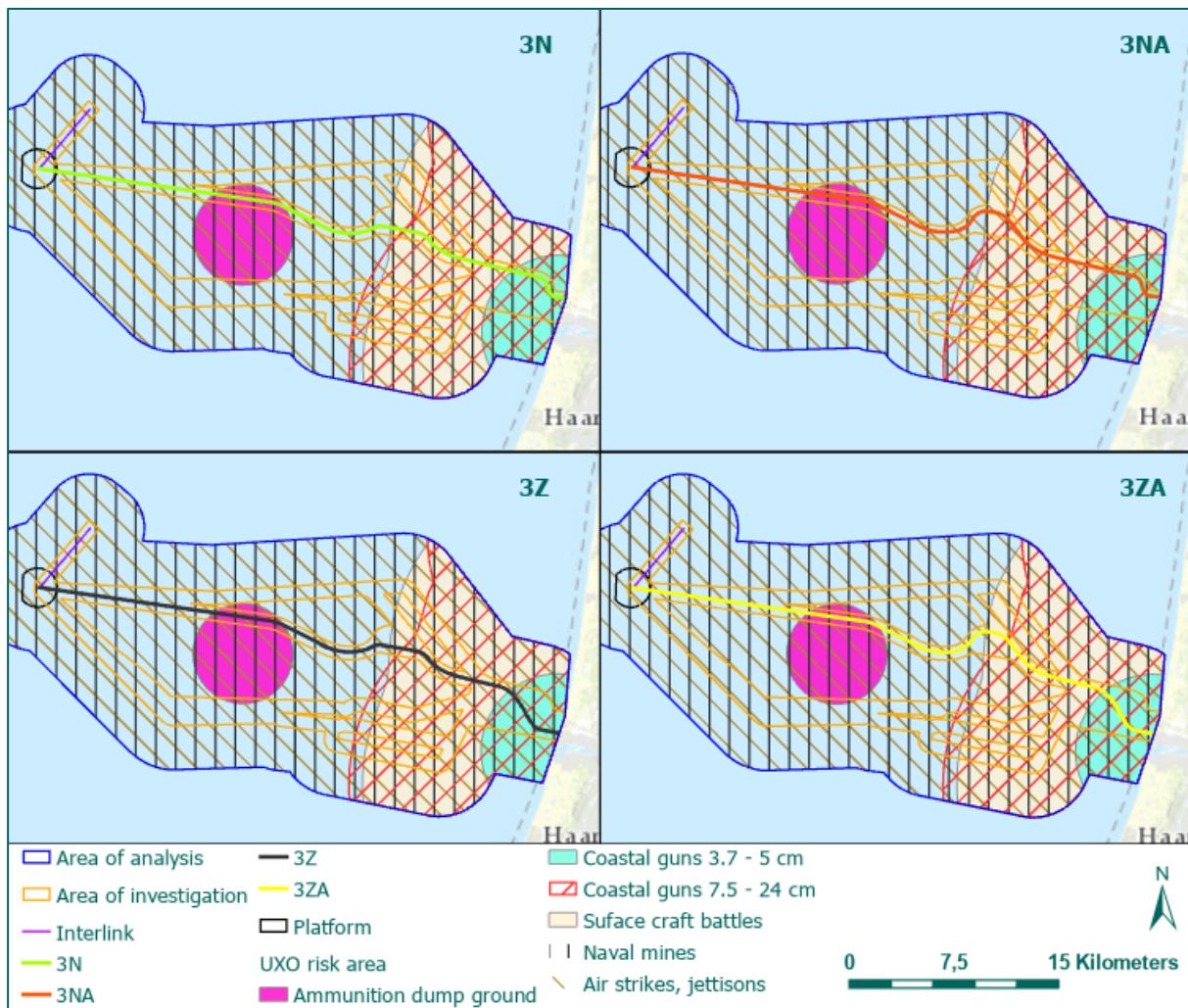


Figure 46: Expected UXO within the routes 3N, 3NA, 3Z, and 3ZA.

Part	Expected UXO Main group	Type	Estimated amount	Condition
Routes 3N, 3NA, 3Z, and 3ZA	Under water ammunition (contact mines)	British Elia / Vickers Elia Type H Mk. II German E-mine EMC British Mk. XVII (with Mk XVIII anchor) British Mk. XIV (with Mk XVII anchor)	0 - 10	Sunk
	Under water ammunition (ground mines)	British A Mk. I – IV German RMA German LMB	0 - 10	Armed
	Under water ammunition	18 in torpedo Mk XV Depth charge	0 - 10	Armed
	Aerial bombs	4 lbs, 25 lbs, 30 lbs, 100 lbs, 250 lbs, 260 lbs, 300 lbs, 500 lbs, 1,000 lbs, 2,000 lbs, 4,000 lbs	0 - 10	Armed / safe
	Rockets	3 inch rocket with 60 lbs warhead SAP RAG Flares	0 - 10	Fired
	Artillery shells	2 cm/20 mm 2 pr. pompom 3.7 cm 4.7 cm 5 cm 6 pr. 7.5 cm (234b, AP, 97/38)	0 - 200	Fired

Part	Expected UXO Main group	Type	Estimated amount	Condition
		8.8 cm 9.4 cm 10.5 cm (K38t, SKC/32) 12 cm (L40, SKL/45) 15 cm (SKC/32, SKL/40, SKC36d, L30) 17 cm SKL/40 24 cm L40		
	Small calibre ammunition	.303 .50 13,2 mm 15 mm	0 - 200	Fired
	Unknown	German ammunition in offshore dump ground.	Unknown	Dumped

Table 17: Expected UXO within the routes 3N, 3NA, 3Z, and 3ZA.

6.5 4NA, 4NB, 4ZA, 4ZB

The routes 4NA, 4NB, 4ZA, and 4ZB are showed in Figure 47. These routes have overlap with almost all the defined UXO risk areas, except the ammunition dump zone. The same conclusion is applicable on all routes and alternatives.

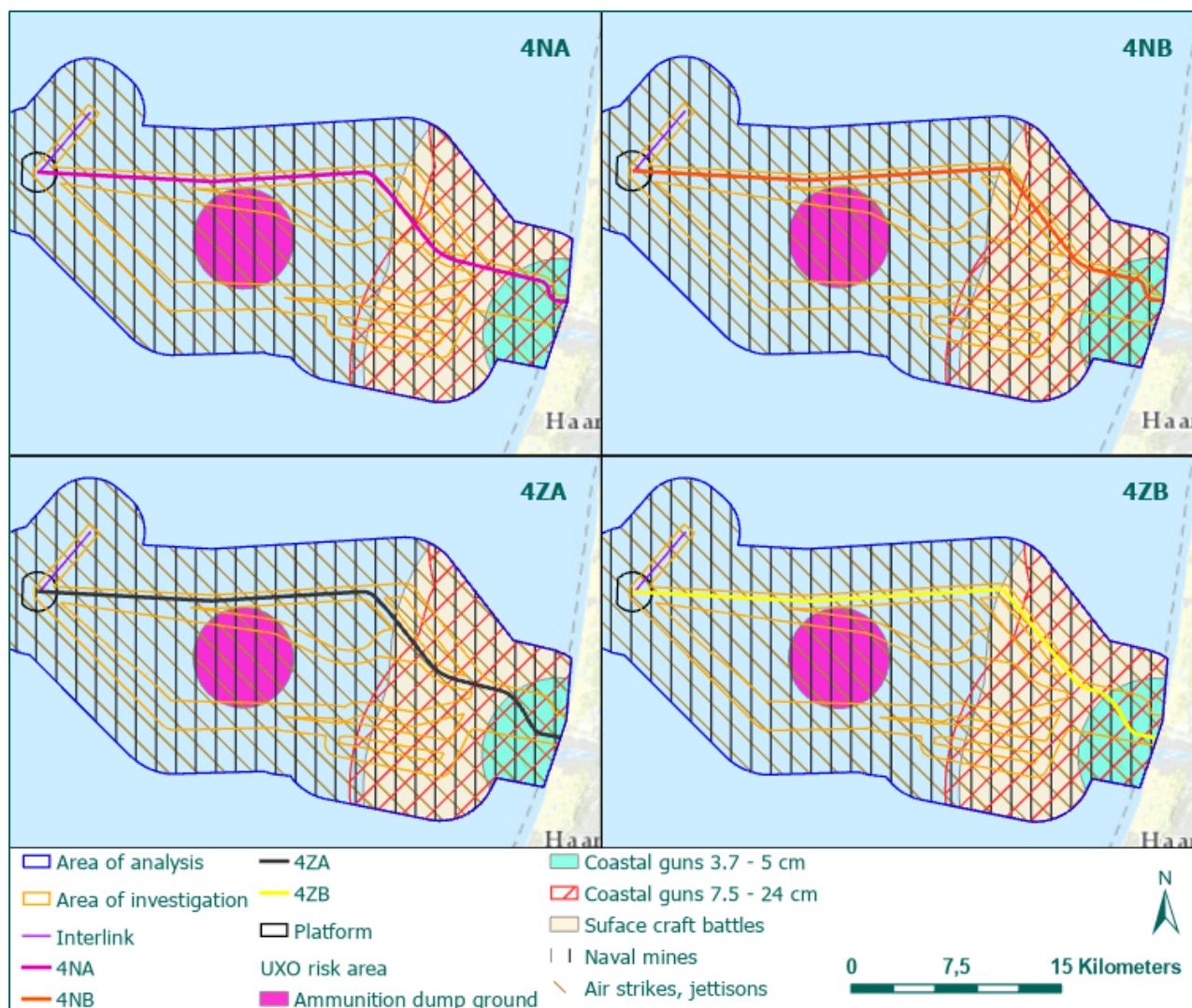


Figure 47: Expected UXO within the routes 4NA, 4NB, 4ZA, and 4ZB.

Part	Expected UXO Main group	Type	Estimated amount	Condition
Routes 1N, 1Z, 1ZA, and 1ZB	Under water ammunition (contact mines)	British Elia / Vickers Elia Type H Mk. II German E-mine EMC British Mk. XVII (with Mk XVIII anchor) British Mk. XIV (with Mk XVII anchor)	0 - 10	Sunk
	Under water ammunition (ground mines)	British A Mk. I – IV German RMA German LMB	0 - 10	Armed
	Under water ammunition	18 in torpedo Mk XV Depth charge	0 - 10	Armed
	Aerial bombs	4 lbs, 25 lbs, 30 lbs, 100 lbs, 250 lbs, 260 lbs, 300 lbs, 500 lbs, 1,000 lbs, 2,000 lbs, 4,000 lbs	0 - 10	Armed / safe
	Rockets	3 inch rocket with 60 lbs warhead SAP RAG Flares	0 - 10	Fired
	Artillery shells	2 cm/20 mm 2 pr. pompom 3.7 cm 4.7 cm 5 cm 6 pr. 7.5 cm (234b, AP, 97/38) 8.8 cm 9.4 cm 10.5 cm (K38t, SKC/32) 12 cm (L40, SKL/45) 15 cm (SKC/32, SKL/40, SKC36d, L30) 17 cm SKL/40 24 cm L40	0 - 200	Fired
	Small calibre ammunition	.303 .50 13,2 mm 15 mm	0 - 200	Fired

Table 18: Expected UXO within the routes 4NA, 4NA, 4ZA, and 4ZB.

7 GENERAL CONCLUSION AND ADVICE

Based on the results of the historical research and UXO risk assessment the research questions are answered as follows:

- *Could UXO remain in the area of investigation?*

Yes, various war related events such as air strikes and naval battles did occur. Also minefields, coastal guns and an ammunition dump ground were present. As a result of these events UXO could remain.

- *What are the characteristics (the type, amount, and condition) of the expected UXO?*

The type, amount (estimated) and condition of the expected UXO are given for each cable route and alternative in Chapter 6.

8 ANNEXES

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ANNEX 1 GLOSSARY OF TERMS

Begrip	Definitie
Bijdragebesluit / Gemeentefonds	Regeling voor Rijksfinanciering van (een deel van) de kosten voor het NGE-bodemonderzoek.
Conventionele Explosieven (CE)	Elk explosief dat niet als geïmproviseerd, nucleair, biologisch of chemisch kan worden aangemerkt. Bij het opsporingsproces wordt aan CE gelijkgesteld en als zodanig behandeld: <ul style="list-style-type: none"> - CE die geen explosieve stoffen (meer) bevatten; - Restanten van CE die door leken als zodanig herkenbaar zijn; - Voorwerpen die door leken kunnen worden aangemerkt als CE; - Wapens of onderdelen daarvan.
Historisch Vooronderzoek - Niet Gesprongen Explosieven (HVO-NGE)	Bureaustudie waarin de oorlogshandelingen van de periode 1940-1945 (incl. naoorlogse munitieruimingen en opsporingsactiviteiten) worden geanalyseerd. Doel is om vast te stellen of in het onderzoeksgebied sprake is van een NGE-Risicogebied in relatie tot het werkgebied. Het HVO-NGE bestaat uit: <ul style="list-style-type: none"> - Rapportage. - Positief of negatief advies. - In het geval van een positief advies: Horizontale afbakening NGE-Risicogebied(en). - NGE-Risicokaart.
Negatief advies	Op basis van de analyse van het bronnenmateriaal wordt niet verwacht NGE aan te treffen in het onderzoeksgebied. Een vervolgstap van het NGE-bodemonderzoek wordt niet geadviseerd. De geplande werkzaamheden kunnen regulier worden uitgevoerd.
Niet Gesprongen Explosieven (NGE)	Door REASeuro gehanteerd begrip waaronder wordt verstaan: alle explosieven of onderdelen/restanten van explosieven die niet of gedeeltelijk hebben gefunctioneerd. Onder NGE vallen: <ul style="list-style-type: none"> - Conventionele Explosieven (CE); - Geïmproviseerde explosieven; - Explosieven voor civiel gebruik; - Chemische explosieven; - Biologische explosieven; - Nucleaire explosieven.
Niet Gesprongen Explosieven – Bodemonderzoek (NGE-Bodemonderzoek)	Werkwijze van REASeuro waaronder wordt verstaan: de integrale totaalpak voor de NGE-problematiek bestaande uit vijf afzonderlijke fasen. Hierdoor kan de opdrachtgever per fase een weloverwogen besluit nemen en zijn vervolgacties plannen met als doel dat de opdrachtgever de regie over het project in handen houdt. De vijf fasen zijn: <ol style="list-style-type: none"> 1. HVO-NGE (Historisch Vooronderzoek NGE). 2. PRA-NGE (Projectgeboden Risicoanalyse NGE). 3. Projectplan-NGE. 4. Uitvoering-NGE. 5. PvO-NGE (Proces-verbaal van Oplevering).
Niet Gesprongen Explosieven – Risicogebied (NGE-Risicogebied)	Gebied waar op basis van historisch bronnenmateriaal een risico op het aantreffen van NGE bestaat naar de situatie van 1940-1945 (inclusief naoorlogse munitieruimingen en opsporingsactiviteiten). Het NGE-Risicogebied is horizontaal afgebakend, waarin zijn opgenomen: <ul style="list-style-type: none"> - Eventuele onzekerheden en onnauwkeurigheden uit het bronnenmateriaal (o.a. cartografische onnauwkeurigheden). - De maximale horizontale verplaatsing van NGE in de bodem.

Begrip	Definitie
Niet Gesprongen Explosieven – Risicokaart (NGE-Risicokaart)	Cartografische weergave van het (de) NGE-Risicogebied(en).
Onderzoeksgebied	Gebied waarop het HVO-NGE zich richt. Het onderzoeksgebied is ruimer dan het werkgebied om een zo compleet mogelijk beeld te krijgen van de situatie in oorlogstijd.
Oorlogshandeling	Gebeurtenissen die kunnen hebben geleid tot de aanwezigheid van NGE. Voorbeelden van oorlogshandelingen zijn: <ul style="list-style-type: none"> - Bombardementen - Artilleriebeschietingen - Munitiedump - Munitieongevallen - Vliegtuigcrashes - Aanwezigheid van verdedigingswerken
Opsporingsgebied	Het verdachte gebied binnen het werkgebied waar voorafgaand aan de reguliere werkzaamheden de opsporing naar NGE wordt geadviseerd.
Positief advies	Analyse van het bronnenmateriaal heeft aangetoond dat NGE kunnen worden aangetroffen in het onderzoeksgebied. <p>Een vervolgstap van het NGE-bodemonderzoek wordt geadviseerd. Tevens vormt een positief advies de legitimatie voor het indienen van een Raadsbesluit t.b.v. van een Rijksbijdrage.</p>
Projectgebonden Risicoanalyse -Niet Gesprongen Explosieven (PRA-NGE)	Bureaustudie waarin het verdachte gebied binnen het NGE-Risicogebied wordt afgebakend. Daarnaast worden de risico's van de voorgenomen reguliere werkzaamheden in relatie tot de aan te treffen NGE vastgesteld. <p>De PRA-NGE bestaat o.a. uit:</p> <ul style="list-style-type: none"> - Indien nodig het opvullen van leemten in kennis van het HVO-NGE. - De horizontale en verticale afbakening van het verdachte gebied. - Een NGE-Risicoanalyse. - Het bepalen van aanvaardbare risico's. - Het opsporingsadvies. - De mogelijkheid tot een proefdetectie.
Reguliere werkzaamheden	Alle door de opdrachtgever voorgenomen niet NGE-gerelateerde werkzaamheden. <p>Enkele voorbeelden zijn civieltechnische, milieutechnische en archeologische werkzaamheden.</p>
Verdacht gebied	De horizontale en verticale afbakening van het NGE-Risicogebied. Bij de afbakening is o.a. rekening gehouden met: <ul style="list-style-type: none"> - Het vaststellen van de horizontale verplaatsing van de NGE in de bodem (inkaderen NGE-Risicogebied). - De mogelijke inperking van de onzekerheden en onnauwkeurigheden uit het bronnenmateriaal. - De naoorlogse werkzaamheden (zoals ontgravingen, ophogingen etc.). - De bodemkundige parameters (zoals grondsoort en draagkracht van de grond).
Werkgebied	Het door de opdrachtgever aangegeven gebied waarbinnen reguliere werkzaamheden (niet NGE-gerelateerd) uitgevoerd gaan worden of waar een functieverandering wordt doorgevoerd.
Werkveldspecifiek certificatieschema voor het systeemcertificaat Osporen Conventionele Explosieven (WSCS-OCE)	Het WSCS-OCE is het Werkveldspecifiek certificatieschema voor het opsporen van Conventionele Explosieven. Hierin zijn onder andere richtlijnen, proceseisen en deskundigheidseisen opgenomen. Het WSCS-OCE is sinds 1 juli 2012 de opvolger van de Beoordelingsrichtlijn Osporen Conventionele Explosieven (BRL-OCE) en is wettelijk verankerd in de Arbowet. <p>Om het maatschappelijk belang – veiligheid en gezondheid van en rondom de arbeid – te waarborgen, is door de overheid gekozen voor een wettelijk verplichte certificatieregeling voor de borging van de kwaliteit/veiligheid van het opsporen van conventionele explosieven.</p>

ANNEX 2 LITERATURE

For this research the following literary sources are consulted:

Abbreviation	Author	Title	Relevant
BEZ 1&2	Bezemer, K.W.L.	<i>Geschiedenis van de Nederlandse Koopvaardij in de Tweede Wereldoorlog</i> (2 dln.; Amsterdam).	Yes
BUR	Burg, G. van	<i>Oorlogsstorm over zee en havens. IJmuiden 1939-1946</i> (Schoorl 1995).	Yes
CRO	Crossley, J.	<i>The Hidden Threat. The story of mines and minesweeping by the Royal Navy in World War I</i> (South Yorkshire 2011).	Yes
DIS	Dissel, A. van e.a.	<i>De Nederlandse koopvaardij in oorlogstijd</i> (Amsterdam 2014).	Yes
HAR	Hartendorf, G.	<i>Velsen bezet en bevrijd</i> (Velserbroek 2000).	No
HAV	Haver, H. en T., Kalkman	<i>Luister, het fort vertelt. Fort IJmuiden</i> (IJmuiden 2004).	Yes
HKV	Historische Kring Velsen	<i>Velsen 1940-1945. Een gemeente in oorlogstijd</i> (Santpoort 1995).	Yes
HOE	Hoevens, H. en R., Pols	<i>Landfront IJmuiden. Duitse bunkers in het landfront van de Festung IJmuiden</i> (Velserbroek 2000).	No
KUR	Kurowski, F.	<i>Seekrieg aus der Luft. Die Deutsche Seeluftwaffe im Zweiten Weltkrieg</i> (Herford 1979).	No
MVL	Ministerie voor Luchtvaart	<i>Coastal Command speurt, beschermt, valt aan</i> (London, z.j.)	No
MUN 1&2	Münching, L.L. von	<i>De Nederlandse koopvaardijvlot in de Tweede Wereldoorlog</i> (Amsterdam 1986).	Yes
NES	Nesbit, R.C.	<i>The Strike Wings. Special Anti-Shipping Squadrons 1924-45</i> (London 1995).	No
POL	Pols, R. en L., Vries de	<i>Seefront IJmuiden. Duitse bunkers in de kustverdediging van de Festung IJmuiden</i> (Velserbroek 2007).	Yes
ROE	Roetering, B.,	<i>90 jaar Mijnendienst: Feiten Verhalen En Anekdoten Uit Het Negentigjarig Bestaan Van De Mijnendienst Van De Koninklijke Marine</i> (Z.P. 1997).	Yes
ROL	Rolle, S. e.a.	<i>De bevrijding van Velsen. Van uur tot uur</i> (IJmuiden 1995).	Yes
ROW	Rohwer, J., en G. Hümmelchen	<i>Chronik des Seekrieges 1939-1945</i> (Stuttgart 2007) via https://www.wlb-stuttgart.de/seekrieg/chronik.htm .	Yes
SAK	Sakkers, H. e.a.	<i>Een vestingbouwkundige wandeling langs de bunkers van de Atlantikwall in het zuidwestelijke deel van de Festung IJmuiden</i> (Nieuw Weerdinge 1999).	Yes
SCH	Schroeder, W., Kutzleben, K. von	<i>Minnenschiffe. Marinekleinkampfmittel</i> (1974).	No
SGLO	Studiegroep Luchtoorlog	<i>Crash database. Dutch Air War Studygroup.</i> http://www.verliesregister.studiegroepluchtoorlog.nl	Yes
TOL	Tol, H.	<i>1888 tot 2013. 125 jaar Fort IJmuiden en Hermann Guson's pantserwerken</i> (IJmuiden 2013).	Yes
VER	Verbeek, J.R.	<i>Kustversterkingen 1900-1940</i> (Wassenaar 1988).	Yes
ZWA 1&2	Zwanenburg, G.J.,	<i>En Nooit was het Stil. Kroniek van een Luchtoorlog</i> (2 dln. & supplement; Oldemarkt).	Yes

Table 19: References to literature.

The annexes in this table contain the events that are considered relevant for the area of interest. To guarantee authenticity, the sources in Dutch, English, French and German have been quoted in their original language.

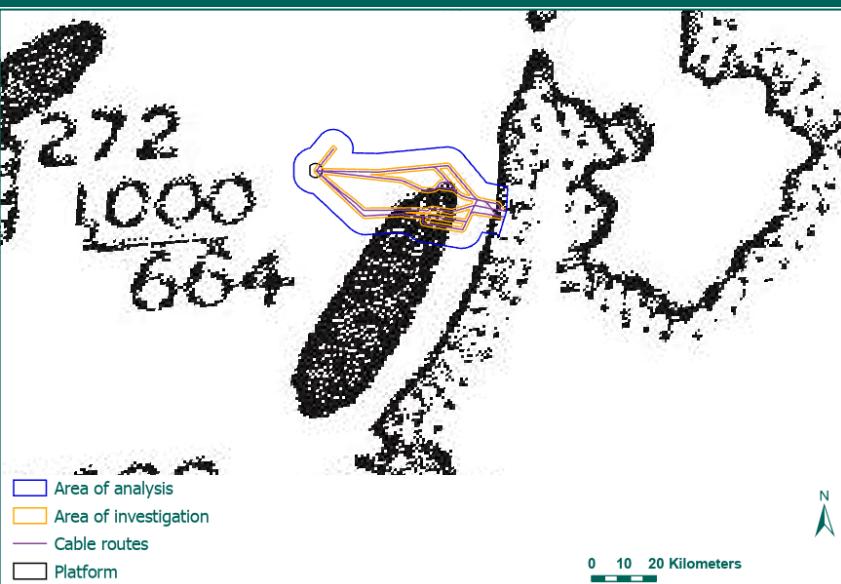
First World War mobilization and interbellum, 1914-1939

The First World War forced the Dutch armed forces to mobilize. Coastal guns were installed to protect strategic positions on the coast. The Netherlands maintained a policy of neutrality. However, Dutch shipping took considerable

damage from mine and U-boat warfare. Dozens of Dutch merchant vessels were sunk by the thousands of mines laid by the German and British navies. Large scale efforts to clear the minefields after the First World War did not succeed in clearing all these mines. The following literature is relevant for this period:

Date / year	Event	Source	Page
4 October 1981	<p>Het definitieve ontwerp van Fort IJmuiden wordt vastgelegd.</p> <p>Schootvelden Fort bij IJmuiden</p> <p>De bewapening van het fort bij IJmuiden bestaat uit:</p>	TOL	36-40

Date / year	Event	Source	Page			
	<ul style="list-style-type: none"> ○ Vijf Stalen vuurmonden van 24 cm lang 30 kaliber; in de gepantserde kustbatterij voor het bestrijken van de ingang van de haven, een groot gedeelte van de buitenhaven en van de Noordzee buiten de havenmond. 					
1882-1883	<p>Ondertussen ontstond de behoefte, bij het fort bij IJmuiden en het fort aan den Hoek van Holland, aan een gepantserde geschutsopstelling voor verdediging met infanterie en licht geschut naar de landzijde.</p> <table border="1" data-bbox="382 489 1203 572"> <tr> <td>Fort bij IJmuiden</td> <td>Batterij koepel</td> <td>5 stuks 24 cm L30 2 stuks 15 cm L30</td> </tr> </table> <p>Nadat in 1883 de opdracht aan Gruson was gegeven voor het fabriceren van de bepantsering voor de Forten aan den Hoek van Holland, Fort bij IJmuiden en het Fort op de Harssens begon Gruson met de fabricatie van de pantserdelen. Alleen al voor het Fort bij IJmuiden waren er 84 gietstukken nodig voor de pantserbatterij en vijf gietstukken voor de geschutskoepel voor de 15 cm kanonnen.</p>	Fort bij IJmuiden	Batterij koepel	5 stuks 24 cm L30 2 stuks 15 cm L30	TOL	30
Fort bij IJmuiden	Batterij koepel	5 stuks 24 cm L30 2 stuks 15 cm L30				
1888	<p>Fort bij IJmuiden ter verdediging van de toegang tot het Noordzeekanaal, het sluizencomplex en de haven van IJmuiden, bewapend met 5 kanonnen van 24 cm lang 30 op raamaffuit in een gepantserde batterij, 2 kanonnen van 15 cm lang 30 in een pantserkoepel.</p> <p>Het fort van IJmuiden was ongeschikt om een vijandelijke scheepsmacht te dwingen op verre afstand te blijven, aangezien de zware 24 cm vuurmonden, die in een gekazematteerde pantseropstelling opgesteld waren, slechts een beperkt schootsveld hadden en schepen zich buiten dat schootsveld konden posteren om het fort ongehinderd te beschieten. De 15 cm vuurmonden van het fort waren wél in een draaibare pantser koepel opgesteld, doch dienden voor de verdediging van het Buitenkanaal en konden tegen zware pantsers niets uitrichten. De commissie achtte de aanleg van een tweede fort noodzakelijk en gaf de voorkeur aan een locatie ten zuiden van het kanaal. De bewapening van dit nieuwe fort zou moeten bestaan uit vier kanonnen van 28 cm lang 40 in koepelopstelling, aangevuld met vier kanonnen van 7,5 cm lang 30 voor de eigen verdediging van het fort en de bestrijking van de versperringen.</p>	VER	16,24			
1914-1918	<p>British, German and American mines laid during the war. The German minefields are in black, whereas the Allied fields are shaded. The underlined figures are numbers of Allied mines, and other figures are numbers of German mines. With their vastly greater resources, the Allies laid far more mines in the latter part of the war placing them strategically where they would effectively trap the maximum numbers of U-boats. German mines were placed mainly close to headlands where ships would make landfalls and around the approach to major ports. From 1916 onwards, most of the German mines were laid by submarines, whereas the Allies were able to use surface ships, especially fast destroyer-minelayers, to operate close to enemy coasts. The chart gives an idea of how dangerous mine laying and minesweeping operations were as both enemy and friendly mines might be laid in the same areas.</p> <p><i>Hatched areas in the figure below indicate allied minefields, solid areas indicate German minefields. A German minefield with a total of 664 naval mines has overlap with the area of analysis.</i></p>	CRO	62			

Date / year	Event	Source	Page
			
Augustus 1914	<p>Tot de onbeperkte Duitse onderzeebootoorlog in februari 1917 begon, vormden mijnen de voornaamste oorzaak van onze koopvaardijverliezen. De Duitse regering deelde al in augustus 1914 mede, dat zij zich waarschijnlijk genoodzaakt zou zien mijnen te leggen voor de operatiebases der vijandelijke vloten en voor havens waar troepen van de tegenstander zouden worden ingescheept of ontscheept. In oktober volgde een Britse bekendmaking dat een mijnenveld in een nader omschreven deel der Noordzee was gelegd, maar er bleef een geul over voor de scheepvaart. In de loop van de oorlog werden steeds meer geallieerde en Duitse mijnen gelegd in uitgestrekte delen van de zee, die beide partijen tot oorlogs- of gevaarlijke zones hadden gedeclareerd en verliezen onder de neutrale scheepvaart konden hierdoor moeilijk uitblijven.</p> <p>Er werden hoofdzakelijk verankerde mijnen gelegd die als ze van hun verankering lossloegen, onschadelijk werden. Zo hoorde het althans, maar de praktijk wees herhaaldelijk anders uit. Gedurende de oorlog spoelden ruim 6.000 mijnen alleen al op de Nederlandse kust aan, meest Engelse, namelijk 4.981 stuks (tegen 431 Duitse, 81 Franse en ruim 500 van onbekende oorsprong). Vele ervan kwamen echter toch tot ontploffing.</p> <p>Eind 1916 waren in totaal 29 Nederlandse schepen door mijnen gezonken. Ongeveer een derde deel daarvan was op mijnen gelopen door U-boot-mijnenleggers gelegd, zoals eerst vele jaren na de oorlog bleek. Hoewel navigatorisch geen eenvoudige operatie, met het kleine type onderzeeboot hiervoor meestal gebruikt, wisten de Duitse onderzeebootcommandanten bijzonder nauwkeurig, in aansluitende vakken, mijnenvelden te leggen.</p>	BEZ 1	24-25
2 November 1914	Op 2 november 1914 had Engeland de gehele Noordzee tot oorlogsgebied verklaard. Het overschrijden van een lijn, lopend van de noorpunt der Hebriden tot IJssland, werd ontraden in termen die met een verbod gelijk stonden, met de bedoeling de neutrale scheepvaart te dwingen de weg door Het Kanaal te nemen.	BEZ	18
Na 1918	Later when hostilities were over, it was possible to use drifters by themselves to sweep shallow fields near the Dutch and Belgian coasts where the water was very shallow and even mines sitting on the bottom were a danger. These all had to be painstakingly trawled up and exploded. There was also the dangerous job of exploding the many mines that became washed up on shore. This work was undertaken by a small flotilla of drifters based on Ostend.	CRO	154
1918	Mines, of course, remain deadly irrespective of peace treaties or armistices. No fewer than 240,000 mines were scattered about the seas, some in their original	CRO	149-160

Date / year	Event	Source	Page
	<p>position, some having dragged their moorings and settled in a new location, and some drifting freely. These constituted a major danger to shipping after the end of the war. To clear them up an international committee was formed, which included most belligerent and neutral countries, and was eventually joined by the defeated powers. This was called the International Mine Clearance Committee (IMCC) and was organized principally by the Royal Navy. All members carried out mine clearance activities and reported regularly to the IMCC, who issued regular charts and updates showing safe areas and known danger zones.</p> <p>The main part of the clearance work was divided between the maritime nations, Germany being responsible for sweeping Heligoland Bight, France the waters off the French and Belgian coasts, America the Northern Barrage and the UK, most of the rest, working through a new organization called the Mine Clearance Service. The service was manned mainly by Royal Navy personnel and fishermen and consisted of 14,500 men and 700 officers at its peak.</p> <p>A particular danger when clearing dense fields was what was known as 'counter mining'. This occurred when exploding one mine would set off others in the vicinity – possibly dangerously close to the sweeper involved.</p> <p>Normally, deep minefields were left until last, as they did not constitute a serious danger to shipping, but sometimes some of the mines were laid incorrectly and finished up close to the surface. It was determined to skim off any of these shallow mines first, and the sweep began in the normal way.</p> <p>The intensive mining of the eastern North Sea also affected the German Navy to such an extent that it could not even undertake exercises safely, the British offensive mining campaign contributed to the collapse of fleet discipline and hence to the popular revolt against the Kaiser's government, which resulted in the Armistice.</p>		
1927-1938	Het sluitstuk van het 15 cm koepelgeschut had veel minder last van gaslekkage. Met dit geschut is er nog van 1927 tot 1938 geoefend. Voor schietoefeningen met deze kanonnen kwam een groep artilleristen vanuit Fort Erfprins in Den Helder twee keer per jaar gedurende twee weken naar Fort IJmuiden.	TOL	76
1938-1939	Voor de rest van de week stonden er schietoefeningen op het programma. De hele week moest hij schietinstructie geven bij de batterijen één en twee in de duinen bij Wijk aan Zee. Er werd door batterij één indirect, en door batterij twee direct geschoten (1). Indirect schieten hield in, dat de kanonniers het doel zelf niet konden zien. Ze kregen de positie op van het vuurleidingscommando. Per batterij stonden drie stuks geschut 12 cm, lang 40, opgesteld. Dit waren kanonnen met een loop van 12 cm in doorsnede en een lengte van 4.80 meter.	HAV	19
	Vanuit Fort Erfprins gingen ze met een groep van 40 man naar Fort IJmuiden. Daar werden schietoefeningen gehouden met de twee 15 cm kanonnen in de geschutskoepel aan de oostzijde van het Fort. Na de lunch was het menens. Dan werd het kanon geladen en een doelwit uitgekozen waarop geschoten werd. Meestal was dat een houten frame, bespannen met zeildoek, dat op een vlot werd voorgetrokken door een sleepboot. De kanonnen in de geschutskoepel hadden eigen richtmiddelen en via een kijkspleet in de koepel kon het doel geobserveerd worden. Als het doel voor het Fort langs voer was dit vanuit de achterste geschutskoepel niet te zien en werd er indirect geschoten. De instructies voor het richten kwamen dan vanuit de commandotoren, het vuurleidingscentrum van het Fort. Met behulp van spreekbuizen werden de gegevens voor de instellingen van	HAV	73
1939	Hoewel het grote Fon in IJmuiden nog steeds een dominante plaats inneemt in het vaarwater russen de pieren en de sluizen van IJmuiden, was de in 1887 voltooide versterking in 1939 reeds jarenlang verouderd.	BUR	8
	Bovendien werden in IJmuiden, ter beveiliging voor aanvallen uit zee, grond mijnen in het Noorderbuitenkanaal en het Zuiderbuitenkanaal gelegd. De	BUR	18

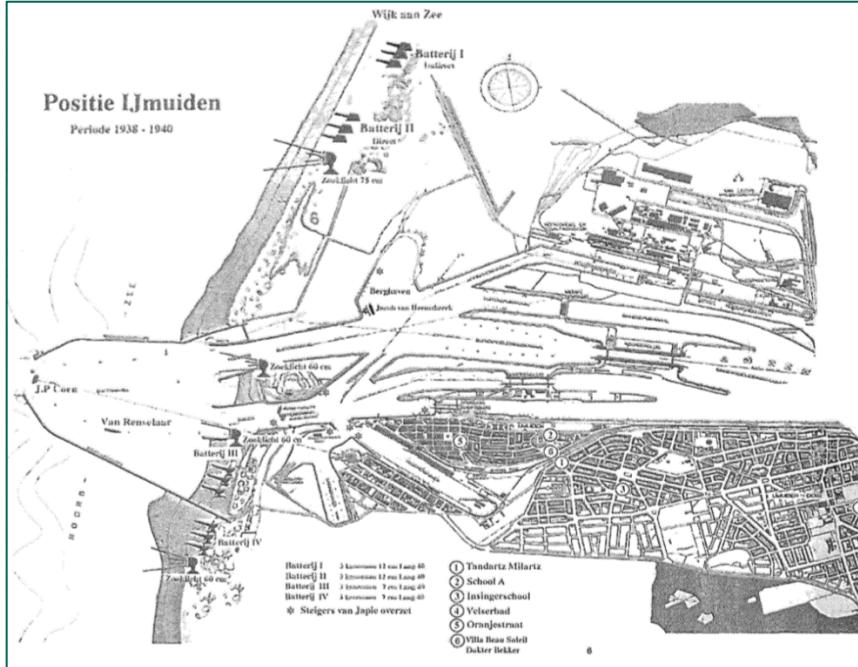
Date / year	Event	Source	Page
	ontstekingspost voor die mijnen bevond zich op het Forteiland. Kon voor het uitbreken van de oorlog werden nog twee rijen grondmijnen in de Buitenhaven gelegd.		
	Al eerder waren er vanaf de wal controleerbare grondmijnen gelegd in de haven van IJmuiden in het Noorder- en Zuiderkanaal en te Hoek van Holland in de Nieuwe Waterweg.	ROE	22
April 1939	Toen dan ook op 7 april 1939 de roestand van 'strategische veiligheid' werd afgekondigd bestond de kustverdediging van de positie IJmuiden uit vier batterijen. De batterijen I en II, ieder uitgerust met drie kanonnen van 12 cm, waren in de duinenrij bij Wijk aan Zee gebouwd. De batterijen III en IV, uitgerust met drie kanonnen van 7 cm, waren in de duinenrij ten zuiden van de piermonding aangelegd.	BUR	9
1938-1940	Fort IJmuiden: 	HAV	40

Table 20: Overview of events World War 1 – Interbellum.

Mobilisation and German invasion, 1939-1940

When the inevitability of the Second World War became clear in August 1939, the Dutch army once again mobilized to prepare for an imminent attack. While serious naval threats were not foreseen, preparations also took place on the coast and the sea. Coastal guns were once again installed, and vital waterways were mined.

In the morning of May the 10th, 1940, the German army invaded the Netherlands. One of the first steps of the German military was to mine the Dutch ports. Major clashes between naval forces did not take place however.

Date / year	Event	Source	Page
1940-1945	Overzicht van bombardementen op IJmuiden en omgeving: zie pag. 39-40. Extract:	HKV	39-40

Date / year	Event	Source	Page																																																															
	<table border="1"> <thead> <tr> <th>datum</th><th>plaats</th><th>omgeving</th></tr> </thead> <tbody> <tr><td>12-05-1940</td><td>IJmuiden</td><td>Pr. Hendrikstraat</td></tr> <tr><td>19-06</td><td>IJmuiden</td><td>Hoogovens Sluseiland</td></tr> <tr><td>20-06</td><td>IJmuiden</td><td>Forteiland</td></tr> <tr><td>20-06</td><td>IJmuiden</td><td>Hoogovens IJzerpark</td></tr> <tr><td>21-06</td><td>IJmuiden</td><td>Hoogovens Slakkenberg</td></tr> <tr><td>22-06</td><td>IJmuiden</td><td>Hoogovens Buitenhaven</td></tr> <tr><td>23-06</td><td>?</td><td>?</td></tr> <tr><td>31-07</td><td>IJmuiden</td><td>boven zee</td></tr> <tr><td>04-08</td><td>IJmuiden</td><td>Forteiland</td></tr> <tr><td>?-08</td><td>IJmuiden</td><td>?</td></tr> <tr><td>04-08</td><td>Velsen-N</td><td>t.o. van de Plaatwellerij</td></tr> <tr><td>18-08</td><td>IJmuiden</td><td>Heerenduinen</td></tr> <tr><td>28-09</td><td>IJmuiden</td><td>Strand</td></tr> <tr><td>04-10</td><td>IJmuiden</td><td>Forteiland</td></tr> <tr><td>08-10</td><td>IJmuiden</td><td>?</td></tr> <tr><td>25-10</td><td>IJmuiden</td><td>boven zee</td></tr> <tr><td>29-10</td><td>IJmuiden</td><td>Haringhaven</td></tr> <tr><td>08-11</td><td>IJmuiden</td><td>Forteiland</td></tr> <tr><td>13-11</td><td>IJmuiden</td><td>Sluseiland</td></tr> <tr><td>21-11</td><td>IJmuiden</td><td>Burg, Rambonnetlaan</td></tr> </tbody> </table>	datum	plaats	omgeving	12-05-1940	IJmuiden	Pr. Hendrikstraat	19-06	IJmuiden	Hoogovens Sluseiland	20-06	IJmuiden	Forteiland	20-06	IJmuiden	Hoogovens IJzerpark	21-06	IJmuiden	Hoogovens Slakkenberg	22-06	IJmuiden	Hoogovens Buitenhaven	23-06	?	?	31-07	IJmuiden	boven zee	04-08	IJmuiden	Forteiland	?-08	IJmuiden	?	04-08	Velsen-N	t.o. van de Plaatwellerij	18-08	IJmuiden	Heerenduinen	28-09	IJmuiden	Strand	04-10	IJmuiden	Forteiland	08-10	IJmuiden	?	25-10	IJmuiden	boven zee	29-10	IJmuiden	Haringhaven	08-11	IJmuiden	Forteiland	13-11	IJmuiden	Sluseiland	21-11	IJmuiden	Burg, Rambonnetlaan		
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1940	<p>Overzicht van de Positie IJmuiden in 1940.</p> <p>1 = Batterij I van 12 cm lang 40 (bereik van 12.500 m)</p> <p>2 = Batterij II van 12 cm lang 40</p> <p>3 = Batterij III van 7 cm lang 40 (bereik van 5.500 m)</p> <p>4 = Batterij IV van 7 cm lang 40</p> <p>5 = geprojecteerde zware batterij van 24 cm lang 40 (bereik van 8.000 m)</p>	VER	174, 310- 311																																																															

Date / year	Event	Source	Page
			
May 1940	<p>De Marine Artillerie Abteilung 203 zou de eerste afdeling zijn die direct in mei 1940 de verdediging van de haven van IJmuiden ter hand nam. De stationering van de compagnieën van deze afdeling zou slechts van korte duur zijn. In juni 1940 vertrok men namelijk naar Frankrijk.</p> <p>Als opvolger van de M.A.A. 203 werd de M.A.A. 201 geformeerd. Deze afdeling bestond bij de formatie uit vijf compagnieën. Gedurende de oorlog werd de afdeling uitgebreid en bestond aan het einde van de oorlog uit 9 batterijen.</p> <p>In de eerste dagen van de bezetting meldde de <i>Erkundungsstab</i>, die de Nederlandse verdedigingswerken aan de kust inventariseerde, voor de positie IJmuiden het volgende aan bruikbaar geschut: 3 x 7,5 cm SKL/40 geschut uit 1895 (wat er uiteindelijk vier bleken te zijn). In het pantserfort op het zogenaamde Forteiland troffen zij 5 stukken oud 24 cm geschut aan, die nog geladen waren. Tevens waren er op het eiland twee stukken geschut met een kaliber van 10 cm en twee stukken met een kaliber van 15 cm aanwezig. Ten noorden van het kanaal troffen de Duitse verkenners de vuurleidingposten van de batterijen I en II geheel intact aan. Buitgemaakt werden twee afstandsmeters van drie meter, een vuurleidingstoestel en een telefooncentrale. Het vuurleidingstoestel diende om de informatie, verkregen met de afstandsmeter en andere meetapparatuur, om te rekenen naar voor het geschut bruikbare parameters. Het 12 cm geschut van de beide batterijen was onklaar gemaakt.</p>	POL	28

Date / year	Event	Source	Page
	In de meidagen van 1940 vond er Engelse mijnenleg plaats voor de kust bij Castricum en bij Hoek van Holland en Duitse mijnenleg in de wateren nabij Den Helder, Hoek van Holland, IJmuiden en Vlissingen.	ROE	34
10 May 1940	<p>In de uren die volgden vlogen Duitse vliegtuigen voortdurend over het Havengebied, heftig bestookt door de schaarse batterijen luchtafweer; tussen de pieren en in het Noordzeekanaal werden mijnen afgeworpen en in Oud-IJmuiden vielen enkele bommen.</p> <p>Ongeveer om 04.00 uur begonnen de vijandelijkheden door het afwerpen van magnetische mijnen aan parachutes in de buitenhaven door drie Heinkel He 115 (tweemotorige drievleugelvliegtuigen). De toestellen waren moeilijk te bestoken daar ze zeer laag vlogen en de buitenste duinenrij in de weg lag. Er werd vrijwel direct actie ondernomen de mijnen te markeren en te ruimen</p> <p>Wanneer de uit Amsterdam vertrokken schepen eenmaal IJmuiden hadden bereikt, liepen zij niet alleen kans door magnetische mijnen te worden getroffen, maar ook door bommen en boordgeschut van Duitse vliegtuigen die voortdurend voor IJmuiden en ook op de Noordzee aanvielen. Wij zullen zien dat desondanks de verliezen geleden bij de uittocht van Nederlandse schepen uit het Amsterdamse havengebied, laag zijn geweest.</p> <p>Ook voor de haven van IJmuiden werden door de Duitse luchtmacht magnetische mijnen afgeworpen. Met behulp van Engelse mijnenvegers werd getracht deze te ruimen en zo de vaarroute vrij te houden, maar spoedig werden nieuwe mijnen afgeworpen. Bovendien bemoeilijkten Duitse bommenwerpers het vertrek uit de haven.</p> <p>Het was op 10 mei 1940 omstreeks 03.30 uur toen drie onbekende vliegtuigen, laag vliegend vanuit de Noordzee, het Nederlandse luchtruim bij IJmuiden binnenvlogen. Door die vliegtuigen werden twee magnetische mijnen in het vaarwater tussen de pieren afgeworpen. De aanvallers werden door de 40 mm kanons van het Batterijsschip en het luchtafweergeschut dat bij de noordelijke duinrand stond opgesteld hevig beschoten.</p> <p>De eerste aanval werd kort daarop gevolgd door een tweede. De drie vliegtuigen die deze aanval uitvoerden kwamen laag langs de kustlijn uit noordelijke richting. Hier werd niet op geschoten; de luchtverdediging van IJmuiden was zo opgesteld dat er op de aanvliegroute van de vliegtuigen niet kon worden gevurd. De aanval werd echter slecht uitgevoerd. Van de twee afgeworpen mijnen viel er één 50 meter ten noorden van de Noordpier in het water, terwijl de andere op de Noordpier terechtkwam en daar explodeerde zonder schade aan te richten. Om nieuwe aanvallen uit die richting te bemoeilijken, werd daarna op de kop van iedere pier een zware mitraillleur opgesteld. Enige uren later werd door een derde groep vliegtuigen magnetische mijnen boven het sluizencomplex afgeworpen. De hele dag werd geprobeerd de afgeworpen Duitse magnetische mijnen te vegen, wat echter door het ontbreken van de juiste opruimmiddelen mislukte. Ook drie Franse vliegtuigen die 's middags te hulp kwamen en voorzien waren van een grote ring – die over het einde van de vleugels en de staart liep, bedoeld voor het opruimen van magnetische mijnen – slaagden er niet in de mijnen tot ontploffing te brengen. (Ondanks alle maatregelen liep op zondag 13 mei de mijnenveger M 4 bij de Velserbrug op een mijn en zonk. Zeven van de vijftien opvarenden verloren hierbij het leven. Het stoomschip VAN RENSELÄER, een passagierschip van de K.N.S.M. liep in de nacht van 13 op 14 mei russen de pieren van IJmuiden op een mijn en ging verloren.)</p> <p>Om 18.00 uur voer de Engelse torpedobootjager HMS. WHITSHED IJmuiden binnen. Niet onvermeld mag blijven dat de WHITSHED voor de pieren van IJmuiden door zes Duitse vliegtuigen was aangevallen. Eén van de afgeworpen bommen ontplofte in de nabijheid van de kanons op het achterschip. Daar ontstond brand in de gereedheidsunitie, waarbij zestien mannen gewond raakten en sloegen door de explosie zes bemanningsleden overboord.</p>	ROL BOS BEZ1 DIS BUR	7 19 177 23 19

Date / year	Event	Source	Page
12 May 1940	Nauwelijks was de dag aangebroken of het ss SEMBILAN van de Maatschappij Nederland verliet IJmuiden en zette koers naar Engeland. Nauwelijks 15 mijl ten westen van IJmuiden zond het schip per radio een SOS uit omdat het door Duitse vliegtuigen werd aangevallen. Op die nooddignalen voor de oude torpedoboot HR.MS. Z 6 ter assistentie uit, gevolgd door de sleepboten NESTOR en STENTOR. Toen bleek dat het schip door de luchtaanvallen geen schade had opgelopen werden de eerder genoemde schepen teruggeroepen.	BUR	22
	Wel werd door de Britse mijnenlegger HMS PRINCESS VICTORIA een groot mijnenveld voor de Nederlandse kust gelegd. (Het mijnenveld bestond uit 236 mijnen en lag vijf mijl ter hoogte van Castricum uit de kust.) Hierdoor waren operaties voor de Nederlandse en Belgische kust tegen aanvallen van Duitse zeestrijdkrachten gedekt, evenals de evacuatie van Nederlandse koopvaardijsschepen.	BUR	22
	In de avond van zondag 12 mei liep het ss VAN RENSSELAER, een passagierschip van de K.N.S.M., bij het verlaten van de pieren van IJmuiden op een magnetische mijn. Het schip kon binnen de pieren aan de zuidzijde van het vaarwater aan de grond worden gezet.	BUR	23
13 May 1940	In de nacht, rond 02.30 uur, liep de Van Rensselaer binnen de pieren op een mijn.	BOS	23
14 May 1940	14 mei 1940, de havenmond van IJmuiden geblokkeerd door het s.s. Jan Pieterszoon Coen. Links het s.s. Van Rensselaer, dat een dag daarvoor met vluchtelingen uit Amsterdam op een Duitse magnetische mijn was gelopen.	ROL	6
			
	Luftwaffe: Onder de 9.FL.Division hebben 23 He-115's van KGGr 106 en 12 Ju-88's van III/KG4 in totaal 24 LM/A en 24 LM/B mijnen afgeworpen in het zeegebied bij Texel, Den Helder en IJmuiden. Deze zijn om 21.50 uur uitgevlogen.	ZWA 1	28
	Om de indruk te wekken dat IJmuiden had gecapituleerd was het licht van de vuurtoren ontstoken. Toch werd het konvooi tussen de piermonding door Duitse vliegtuigen met machinegeweren beschoten, terwijl er boven dien (wee magnetische mijnen) werden afgeworpen.	BUR	27
15 May 1940	Vijf dagen na de inval van de Duitsers op 10 mei 1940 capituleerde het Nederlandse leger en werd aan de Nederlandse Militairen van Positie IJmuiden de opdracht gegeven de kanonnen van Batterij I en II onbruikbaar te maken.	HAV	75-76
	Vlak vóór de capitulatie van de Nederlandse strijdkrachten op 14 mei 1940 werd nog een deel van het artilleriematerieel van de kustartillerie en de marinebatterijen door eigen personeel vernield, te weten: IJmuiden: Bt I van 12 cm lang 40: 3 stukken Bt IJ van 12 cm lang 40: 3 stukken.	VER	136

Table 21: Overview of events mobilization – Dutch capitulation.

The occupation, May 1940 – June 1944 (D-Day)

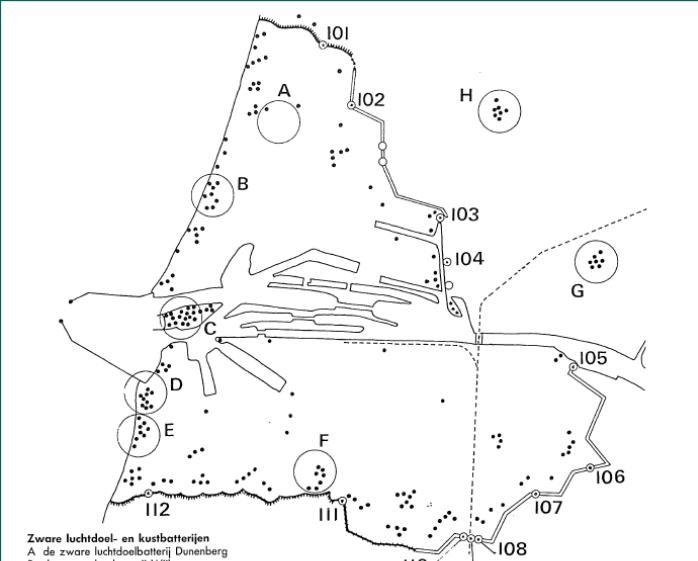
Occupation followed the capitulation of the Dutch army. The North Sea became the frontline between Great-Britain and occupied mainland Europe. Fast attack craft from the Royal Navy coastal forces attacked German shipping close to the coast and laid mines to further hamper German navigation of the North Sea. Patrolling allied aircraft attacked convoys, submarines and surface vessels with all possible means, while heavy bombers dropped even more mines in the waters around The Netherlands. To make matters worse, thousands of aircraft flew over the North Sea on route to targets in Germany, jettisoning their bombs in the sea when they encountered German fighters.

Date / year	Event	Source	Page
27 May 1940	Coastal Command: Een Hudson deed een aanval op een motortorpedoboot bij IJmuiden, maar geen treffers werden geconstateerd.	ZWA 1	41
28 May 1940	In IJmuiden was men terecht bevreesd dat de havens en de Koninklijke Hoogovens en Staalfabrieken in de toekomst door vliegtuigen van de Royal Air Force zouden worden aangevallen. Reeds op 28 mei 1940, twee weken na de capitulatie van de Nederlandse strijdkrachten, deed een Engelse bommenwerper een aanval op een schip van ongeveer 6000 ton dat – volgens het Engelse rapport – de haven van IJmuiden blokkeerde. De afgeworpen bommen vielen voor het schip en veroorzaakten geen schade, aldus het rapport. De volgende dag waren het opnieuw Engelse toestellen die hun bommen boven de havens van IJmuiden lieten vallen.	BUR	82
	Coastal Command: Offensieve patrouilles door negen Swordfishes van de basis van Bircham Newton en acht Swordfishes van de basis Detling voor aanvallen op onder andere drie motortorpedoboten 60 km WNW van IJmuiden. Er werden geen resultaten gerapporteerd. Een Hudson heeft enkele bommen afgeworpen op een passagierschip van ca. 6000 ton dat de haven van IJmuiden bijna blokkeerde. Deze bommen kwamen ongeveer 30 meter voor het schip neer en veroorzaakten geen schade.	ZWA 1	41
29 May 1940	Coastal Command: 3 Beauforts hebben hun bommen afgeworpen op een schip van ca. 3000 ton dat op zijn kant tegen de noordkant van de buitenhaven lag. Hierbij werden twee treffers genoteerd. Twee van deze Beauforts wierpen eveneens bommen af op enkele kleine schepen in de buitenhaven. Een vierde Beaufort wierp bommen af op een passagiersschip in het oostelijke deel van de haven en een vijfde in het midden van de haven. Er konden geen resultaten worden waargenomen. Er zijn bij de aanvallen 250 ponders gebruikt.	ZWA 1	41
June 1940	Nadat de in juni 1940 geformeerde Marine Artillerie Abteilung 201 het eerste oorlogsjaar veelal op het aan de kust aangetroffen geschut was aangewezen, werden de eenheden gedurende de oorlog bewapend met nieuw, in de regel zwaarder, scheepsgeschut. De uiteindelijke kustverdediging van de Festung IJmuiden zou gaan bestaan uit drie kustbatterijen. Deze batterijen konden ondersteund worden door de luchtafweerinstallingen die in staat waren doelen op zee onder vuur te nemen en een tweetal artillerie batterijen in het binnenland (Divisie Batterijen). Centraal in de vesting lag op het Forteland Batterie Kernwerk. Ten noorden van het Noordzeekanaal lag de Batterie Wijk en ten zuiden van het kanaal de Batterie Heerenduin. De batterij Heerenduin was met het 17 cm geschut tevens de zwaarste batterij van de M.A.A. 201.	POL	30
3 June 1940	Coastal Command: Een Hudson deed een aanval op een torpedobootjager in de haven van IJmuiden die ten noordoosten van de pier langs zij een werf lag. De bommen vielen ongeveer 150 meter achter het schip in de haven zonder schade aan te richten.	ZWA 1	43
19 June 1940	De eerste bom die het terrein van de Hoogovens trof werd op 19 juni 1940 afgeworpen. Het projectiel kwam in het zgn. 'ijzerpark', terecht. Na die eerste bombardementen zouden er nog vele tientallen volgen.	BUR	82
29/30 June 1940	Coastal Command: 6 Swordfishes legden mijnen bij IJmuiden.	ZWA 1	52

Date / year	Event	Source	Page
12/13 July 1940	Coastal Command: 6 Swordfishes legden mijnen bij IJmuiden.	ZWA 1	60
21/22 July 1940	Volgens een Engels rapport deed een bommenwerper (een Hudson) van Coastal Command die nacht een aanval op de buitenhaven van IJmuiden. Coastal Command: 1 Hudson deed een aanval op de buitenhaven van IJmuiden.	BUR	42
23/24 July 1940	Twee dagen later, in de nacht van 23 op 24 juli, deden de Engelsen opnieuw een aanval op IJmuiden. Engelse rapporten meldden dat één bommenwerper (een Blenheim) bommen boven de haven van IJmuiden afwierp. Coastal Command: 1 Blenheim van No. 53 Squadron wierp zijn bommen af bij IJmuiden.	ZWA 1	63
4/5 August 1940	In de nacht van 4 op 5 augustus 1940 deden de Engelsen opnieuw een hevige luchtaanval op IJmuiden. Bommenwerpers wierpen vier bommen op Forteiland en de havens. Na die aanval bleek er brand op het Fort te zijn uitgebroken. Brand in een Fort waar de rondslingerende munitie nog lang niet was opgeruimd, dat zou een catastrofe kunnen worden.	BUR	43
24/25 August 1940	Bomber Command: 1 Wellington heeft twee schepen van ca. 2000 ton in IJmuiden aangevallen. Geen resultaat waargenomen.	ZWA 1	80
14/15 September 1940	Bomber Command: 1 Wellington gooide enkele bommen op ongeveer 50 meter naast twee vrachtschepen van ca. 2000 ton en andere tussen enkele binnenschepen in de haven van IJmuiden. Ook werden explosies waargenomen op de haven en sluizen.	ZWA 1	97
Fall 1940	All in de nazomer van 1940 kozen 'Schnellboote' en andere kleine marinevaartuigen ligplaats in de Vissershaven. Eind januari 1941 arriveerde het 1 ^e Schnellbootflottille, in oktober afgelost door het 2 ^e . Later zouden nog andere eenheden komen, in steeds snellere opeenvolging, totdat tenslotte, in het voorjaar van 1945, het 8 ^e Flottille – een der laatste flottieljes, die IJmuiden als operatiebasis gebruikten – nog slechts de beschikking had over een vijftal boten.	ROL	11
4 October 1940	Crash. Beaufort of 42 Squadron crashed in the North Sea off IJmuiden.	SGLO	T0858A
23/24 October 1940	Coastal Command: 4 Swordfishes legden mijnen bij IJmuiden.	ZWA 1	123
27 October 1940	Bomber Command: 1 Blenheim deed een aanval op een klein vrachtschip bij IJmuiden, maar de dichtstbijzijnde bom viel tenminste 60 meter vanaf het schip. Coastal Command: 1 Beaufort welke tussen 5.27 en 8.20 uur uitgevlogen was, heeft twee vrachtschepen, één van 1000 en één van 2000 ton, bij IJmuiden aangevallen. De aanval met een torpedo op het grootste schip miste.	ZWA 1	125
16 November 1940	Bomber Command: 1 Blenheim heeft vier grotere en drie kleinere schepen bij IJmuiden zonder resultaat aangevallen.	ZWA 1	130
11 January 1941	Bomber Command: 9 Blenheims hebben verschillende aanvallen uitgevoerd, waaronder één aanval op vier E-botens 8 kilometer ten westen van IJmuiden.	ZWA 1	147
17 January 1941	Coastal Command: 4 Beauforts geëscorteerd door 3 Blenheims deden tussen 13.25 en 13.47 op 12 kilometer ten westen van IJmuiden een aanval op een konvooi van vier vrachtschepen en drie flakschepen. Daarbij werden voltreffers geregistreerd op twee van de vrachtschepen. Ook waren er twee near misses. 1 van de Beauforts voerde om 13.26 op 25 kilometer ten zuidwesten van IJmuiden een aanval uit op een ander konvooi bestaande uit één torpedobootjager, vier middelgrote vrachtschepen en ca. 26 kleine schepen. Eén van de kleine schepen werd hierbij waarschijnlijk geraakt.	ZWA 1	148
19 January 1941	Coastal Command: 1 Blenheim heeft om 12.58 op 25 km ten NW van IJmuiden het laatste schip van een konvooi van vijf schepen aangevallen met een duikaanval, maar de bommen misten hun doel.	ZWA 1	149

Date / year	Event	Source	Page
22 January 1941	<p>Op 22 januari 1941, gaven de Duitsers ook vergunning om vanuit IJmuiden met een beperkt aantal schepen de visvangst te beoefenen. De zgn. nachtvisserij mocht door drieëndertig schepen worden uitgevoerd.</p> <p>De schepen stonden aan ernstige gevaren bloot. Moest er aanvankelijk scherp worden uitgekeken naar mijnen, later waren het Engelse vliegtuigen die met bommen en mitraillleurvuur aanvallen deden op de schepen.</p> <p>De vissersschepen, die gedurende de oorlogsjaren vanuit IJmuiden betrekkelijk dicht bij de wal visten en kostbare vangsten binnenbrachten, hebben het herhaaldelijk zwaar re verduren gehad. Niet alleen door mijnen en torpedo's, die in de netten werden opgehaald; maar ook van de vliegtuigen van de RAF (Royal Air Force). Engelse piloten verkeerden in de veronderstelling, dat tussen de onschuldig uitziende vissers er enkele waren die handen spandiensten verleenden aan de Duitsers.</p>	BUR	53
10 March 1941	Op 10 maart 1941 werd de stikstofffabriek van de Hoogovens getroffen. Toen werd duidelijk dat de IJmond zich in de volle belangstelling van de strategen in Engeland kon 'verheugen'.	BUR	82
22 March 1941	Bomber Command: 1 Blenheim heeft een konvooi van 15 schepen bij IJmuiden aangevallen, waarbij de bommen dwars over één van de schepen vielen.	ZWA 1	173
26 March 1941	<p>Coastal Command: 1 Beaufort zag om 13.48 uur een konvooi van zes vrachtschepen, geëscorteerd door drie flakschepen de haven van IJmuiden binnenlopen. De Beaufort deed een torpedo-aanval op het grootste schip (6000 ton) en plaatste een voltreffer die resulteerde in een explosie en het zinken van het schip. Een ander schip in het konvooi (2000 ton) werd met boordwapens beschoten.</p> <p>Er was een melding dat om twee uur na de middag een schip 12 mijl WNW van IJmuiden door een vliegtuig gebombardeerd.</p> <p>Zes mijl ten westen van IJmuiden troffen verschillende Beauforts na tweeën een groot Duits schip met torpedo's.</p>	ZWA 1	174
1 April 1941	CORNELIA MARIA 5CH. 135 – Motorlogger – 124 ton – 1918 – Woubrugge – N.V Vischhandel, Reederij en Ijsfabriek v/h Frank Vrolijk in Scheveningen. 1 april 1941 is het schip, dat in de nabijheid van IJmuiden viste, op een mijn gelopen en vergaan. Bij deze ramp kwam de gehele bemanning van 7 koppen om het leven.	BUR	126
6 April 1941	Een paar weken later op 6 april werden een paar schepen in de Oostelijke binnenhaven en de PEN-centrale door 6 Engelse bommenwerpers aangevallen. Bij die aanval werden 4brisantbommen afgeworpen en vielen er 2 zwaar- en 7 lichtgewonden. Daarna zouden de Hoogovens, havens en andere objecten min of meer regelmatig worden aangevallen. Vooral de onderkomens (bunkers) voor de Schnellboten, die de Duitsers aan de Haringhaven hadden gebouwd, en de Hoogovens hadden alle aandacht.	BUR	82
7 April 1941	Crash. A Blenheim of 139 Squadron crashed into the North Sea 25 km west of IJmuiden.	SGLO	T0982
25/26 April 1941	Coastal Command: 1 Blenheim van No. 59 Squadron heeft de E-bootbasis in IJmuiden aangevallen.	ZWA 1	185
26/27 April 1941	Coastal Command: 4 Blenheims voerden een aanval uit op de E-bootbasis in IJmuiden. Ten zuiden van de middensluis werd een grote explosie gerapporteerd.	ZWA 1	185
7/8 May 1941	Bomber Command: 1 Blenheim deed een aanval op een 300 ton schip 7 km van IJmuiden. Een voltreffer.	ZWA 1	194
9/10 May 1941	Coastal Command: 2 Beauforts voerden een aanval uit op de E-bootbasis te IJmuiden. Alle bommen zijn in het doelgebied terechtgekomen.	ZWA 1	198
11/12 May 1941	Coastal Command: 3 Blenheims voerden een aanval op de E-bootbasis te IJmuiden uit. Enkele inslagen in doelgebied.	ZWA 1	198
13 May 1941	Coastal Command: 1 Blenheim voerde om 17.25 een aanval met bommen en boordwapens uit op vijf schepen 40 km ten westen van IJmuiden.	ZWA 1	200

Date / year	Event	Source	Page
14 May 1941	Coastal Command: 1 Beaufort voerde om 11.45 uur een torpedoaanval uit op een schip 25 km WNW van IJmuiden. Er werd een grote kolom zwarte rook gezien.	ZWA 1	200
15/16 May 1941	Coastal Command: 4 Beauforts hebben de E-bootbasis te IJmuiden tussen 3.50 en 4.30 uur gebombardeerd. Resultaten niet goed waargenomen, maar wel enkele inslagen gezien.	ZWA 1	201
23 May 1941	Bomber Command: 2 Blenheims voerden een aanval uit op twee vrachtschepen bij IJmuiden. Er kwam een grote rookkolom uit een van de schepen.	ZWA 1	202
7 June 1941	Bomber Comamnd: 2 Blenheims van No. 107 Squadron deden een aanval op een konvooi bij IJmuiden. Minimaal drie voltreffers.	ZWA 1	206
29 June 1941	Coastal Command: 1 Blenheim viel om 16.47 een konvooi van zeven schepen op 28 km NNW van IJmuiden aan. Ook met boordwapens onder vuur genomen, maar geen resultaat.	ZWA 1	216
12 July 1941	Crash. A Blenheim of 107 Squadron crashed into the North Sea off IJmuiden.	SGLO	T1106
	Bomber Command: 1 Blenheim werd bij een aanval op een konvooi bij IJmuiden in zee neergeschoten.	ZWA 1	227
14 July 1941	Bomber Command: 8 Blenheims hebben een konvooi 13 km N van IJmuiden aangevallen waarna er drie schepen vernietigd zijn. 3 Blenheims voerden 40 km ZW van IJmuiden een aanval uit op twee trawlers. Hier waren alleen 'near misses'.	ZWA 1	228
2 Augustus 1941	Bomber Command: 1 Blenheim heeft een trawler op 5 km ten westen van IJmuiden aangevallen, maar bommen vielen er ver naast.	ZWA 1	237
14 Augustus 1941	Bomber Command: 2 Blenheims vielen een schip op 50 km ten westen van IJmuiden aan.	ZWA 1	239
16 Augustus 1941	Bomber Command: 1 Blenheim voerde een aanval uit op een schip 10 km NW van IJmuiden. Zowelbrisant als brandbommen afgeworpen. Verder met boordwapens beschoten.	ZWA 1	244
21 August 1941	Crash. A Spitfire of 130 Squadron crashed into the North Sea near IJmuiden.	SGLO	T1213A
	Crash. A Spitfire of 130 Squadron crashed into the North Sea 20 km west off IJmuiden.	SGLO	T1213B
26 August 1941	Crash. A Blenheim of 21 Squadron crashed into the North Sea west of IJmuiden.	SGLO	T1217
	Crash. A Blenheim of 88 Squadron crashed into the North Sea off IJmuiden.	SGLO	T1216
	Bomber Command: 11 Blenheims vielen een konvooi 7 km ZW van IJmuiden aan. Vier schepen werden geraakt.	ZWA 1	248
9 September 1941	Zo deden op 9 september 1942 om 10.57 uur drie Engelse Mosquito's, die slechts 30 meter hoog vlogen, een aanval op de Hoogovens. T\vee andere toestellen van hetzelfde type kwamen enige minuten later boven het doel. Bij die aanvallen werden in totaal 15 bommen afgeworpen die aanzienlijke schade veroorzaakten.	BUR	83
18 September 1941	Bomber Command: 6 Blenheims met jagerescorte twee schepen bij IJmuiden aangevallen. Eén voltreffer.	ZWA 1	264
10 October 1941	Coastal Command: 1 Blenheim voerde een aanval met bommen en boordgeschut uit op 2 schepen bij IJmuiden.	ZWA 1	273-274
20 October 1941	Bomber Command: 1 Blenheim heeft een schip 7 km ten westen van IJmuiden aangevallen.	ZWA 1	277
21 October 1941	Bomber Command: 2 Blenheims vielen een konvooi van zeven of acht schepen op 8 km ten westen van IJmuiden aan. Enkele treffers. 2 Blenheims neergeschoten.	ZWA 1	278
29 November 1941	Coastal Command: 1 Beaufort viel een schip op 18 km van IJmuiden aan. Resultaten niet waargenomen.	ZWA 1	298
30 November/1 December 1941	Coastal Command: 1 Hudson viel een schip in de buitenhaven van IJmuiden aan. Eén treffer geplaatst.	ZWA 1	301

Date / year	Event	Source	Page
7 December 1941	Coastal Command: 1 Hudson voerde om 12.47 uur 9 km ten westen van IJmuiden een vrachtschip aan. Enkele 'near misses'.	ZWA 1	303
9 December 1941	Coastal Command: 1 Hudson voerde om 17.25 uur een aanval op een schip bij IJmuiden uit. Geen resultaten waargenomen.	ZWA 1	305
11 December 1941	Coastal Command: 1 Hudson voerde om 15.45 uur 25 km van IJmuiden een aanval met bordwapens op twee kleine schepen uit. Vele treffers gezien.	ZWA 1	309
12 December 1941	Coastal Command: 1 Hudson voerde om 10.50 uur 25 km ZW van IJmuiden een aanval op een torpedobotjager uit.	ZWA 1	309
1942	<p>Festung IJmuiden:</p>  <p>Zware luchtdoel- en kustbatterijen</p> <ul style="list-style-type: none"> A de zware luchtdoelbatterij Dunenberg B de zware kustbatterij Wijk C het zwaarst verdedigde deel van de Festung, genaamd Kernwerk (Forteiland) D de zware kustbatterij Heerenduin E de zware luchtdoelbatterij Olmen F de zware luchtdoelbatterij Süd-Ost G de zware luchtdoelbatterij Bahnhof H de zware luchtdoelbatterij Kruisberg <p>Walzkörpersperre</p> <ul style="list-style-type: none"> 101 Von Oldenborghweg 102 Zeedijk 103 Noorderverlaat 104 Hoofdingang Hoogovens 105 Amsterdamseweg 106 Rijksweg 107 Doodweg (Kapelweg) 108 Hagelingerveld 109 Spoorbaan Driehuis-Westerveld 110 Duin en Kruidbergerweg 111 Siegfried (Duitse stelling) 112 Werner (Duitse stelling) <p>De Festung IJmuiden had een defensief karakter, terwijl de beide Schnellbootbunkers aan de Haringhaven als offensieve basis dienden voor de Kriegsmarine en derhalve niet op de kaart zijn aangegeven.</p>	ROL	16
	In het vroege voorjaar van 1942 hadden de Engelsen hun achterstand op de Duitsers echter ingehaald, waarna er hevige aanvallen op de langs de kust varende konvooiën werden uitgevoerd. Omstreeks diezelfde tijd startte Bomber Command van de Royal Air Force (RAF) met het leggen van een groot aantal mijnen. Alleen al in het eerste half jaar van 1942 werden door vliegtuigen meer dan 4000 mijnen van allerlei typen (magnetische- en akoestische) in de scheepvaartroute langs de Nederlandse kust gedeponeerd. De Duitsers waren daardoor gedwongen de mijnenvrije route tussen de bekende mijnenvelden voor elk konvooi opnieuw te vegen. Ook de Duitse E-boren, die dikwijls ter bescherming van konvooiën meevoeren, werden met mijnenvegtuigen uitgerust. Bovendien werd verwacht dat de begeleidende schepen de steeds op de loer liggende Britse motortorpedoboten – die dikwijls gelijktijdig met MGB's (motorgunboats) opereerden – zouden bestrijden.	BUR	120
Early 1942	<p><u>Marineflakbatterie Olmen</u></p> <p>In zuidelijke richting ligt naast de kustbatterij een in bomvrije bunkers uitgebouwde opstelling van de luchtdoelartillerie. In eerste instantie had men batterijen met 7,5 cm geschut tegen luchtaanvallen opgesteld. Begin 1942 was</p>	SAK	29

Date / year	Event	Source	Page
	men begonnen hier zwaardere kanonnen met een kaliber van 10,5 cm te plaatsen. Hiervan moest er één ten zuiden van de kustbatterij Heerenduin komen. Uiteindelijk werden er vijf zware luchtdoelbatterijen rond IJmuiden geplaatst waardoor deze stad berucht was onder de geallieerde vliegers. Het kanon dat in 1942 in de batterij Olmen kwam was typisch een stuk marinegeschut. Het ging om de 10,5 cm Schnellade Kanone, 10,5 cm SKC/32. De kanonnen in batterij Olmen waren moderne en efficiënte wapens. Tot op een hoogte van 10,5 km kon het geschut vliegtuigen bestrijden. Ook kon het geschut tegen landdoelen ingezet worden met een maximaal bereik van 15,3 km.		
3 January 1942	Coastal Command: 1 Hudson viel om 9.45 uur 15 km ZW van IJmuiden twee kustvaartuigen aan. Op het eerste schip drie bommen afgeworpen, op een tweede één bom.	ZWA 1	317
5 January 1942	Coastal Command: 1 Hudson viel om 10.30 uur een aanval aan op een schip dat onderdeel uitmaakte van een konvooi dat net de haven van IJmuiden had verlaten. Twee voltreffers en twee near misses werden gescoord.	ZWA 1	317-218
6 January 1942	Coastal Command: 1 Hudson viel om 18.18 een schip op 20 km NNW van IJmuiden aan, maar geen resultaten werden waargenomen.	ZWA 1	319
29 January 1942	Coastal Command: 1 Beaufighter viel 15 km ten noorden van IJmuiden om 8.58 uur een schip met boordwapens aan. Enkele treffers.	ZWA 1	323
7 February 1942	<u>Marineküstenbatterie Heerenduin</u> Zo werden er op 7 februari 1942 kanonnen beschikbaar gesteld voor de bouw van een batterij bij IJmuiden. Het ging om stukken 17 cm S.K. L/40 geschut die gedurende de Eerste Wereldoorlog op slagschepen waren geplaatst. Het kanon kon een 62,8 kg wegende granaat tot op een afstand van 27,2 km schieten. De batterij is bekend geworden onder de naam Heerenduin maar droeg in 1942 een periode de naam Batterie Prien.	SAK	17-29
17/18 April 1942	Coastal Command: 1 Hudson voerde 16 km ten westen van IJmuiden een aanval uit op een schip, maar resultaten werden niet waargenomen.	ZWA 1	346
18 April 1942	Crash. A Hudson of 407 Squadron crashed in the North Sea 16 km west of IJmuiden.	SGLO	T1485A
4 May 1942	Als haviken stortten op 4 mei 1942 zes Engelse bommenwerpers zich op een Duits konvooi dat voor de Nederlandse kust voer. Het waren Hudsons (tweemotorige bommenwerpers) van Coastal Command die de aanval uitvoerden. De aanval, die ten westen van IJmuiden plaats vond, (Duitse aanduiding bij QA AN 8531) was gericht op een klein konvooi (Geleit) nr. 260 dat uit de Duitse Bocht in zuidelijke richting stoomde.	BUR	75
	Coastal Command: 4 Hudsons hebben enkele schepen van een konvooi nabij IJmuiden aangevallen met bommen en boordwapens. Er werden met de bommen geen treffers geplaatst. Vrij veel flak. 2 Hudsons zijn in het water iets ten westen van het konvooi in zee gestort.	ZWA 1	351
8/9 May 1942	Crash. A German Dornier Do 217 of 9/KG2 crashed in the North Sea near IJmuiden.	SGLO	T1508A
	Fighter Command: Luchtgevecht tussen 1 Hurricane en een Dornier bij IJmuiden waarbij de laatste vermoedelijk werd neergeschoten.	ZWA 1	356
23/24 June 1942	Crash. A German Junkers Ju 88 crashed in the North Sea off IJmuiden.	SGLO	T1627AA
9/10 August 1942	Coastal Command: 7 Swordfishes hebben mijnen afgeworpen tussen IJmuiden en Texel.	ZWA 1	393
11 September 1942	Op 11 september 1942 om 11.20 uur raakten Engelse en Duitse motortorpedoboten, even ten noorden van IJmuiden, met elkaar in gevecht. Volgens een Duits bericht waren bij dit gevecht 14 Duitse boten van de groep S-booten A betrokken. De Engelsen opeerdeerden met MGB- en MAS- boten. Eén van de Engelse MTB's werd zwaar beschadigd en kon door de Duitsers worden geënterd.	BUR	90

Date / year	Event	Source	Page
1/2 October 1942	Coastal Command: 1 Hudson van No. 320 Squadron voerde een aanval uit op een konvooi bij IJmuiden. De aanval resulteerde in een explosie.	ZWA 1	410
9 November 1942	Crash. A Hudson of 320 Squadron crashed in the North Sea off IJmuiden.	SGLO	T1905A
25 November 1942	Coastal Command: 8 Hudsons voerden ten noorden van IJmuiden een aanval uit op een konvooi, waarbij een voltreffer werd gezien. Verder mogelijke treffer en near misses bij andere schepen.	ZWA 1	426
27 November 1942	Coastal Command: 5 Hudsons vielen een konvooi bij IJmuiden aan waarbij er near misses gerapporteerd werden.	ZWA 1	428
29 January 1943	Crash. A Spitfire of 118 Squadron crashed in the North Sea 15 km northwest of IJmuiden.	SGLO	T2017
10 February 1943	Fighter Command: 4 Typhoons hebben met bommen bij IJmuiden een bewapende trawler aangevallen, waarbij near misses werden gerapporteerd. Het schip is beschadigd.	ZWA 1	456
13 February 1943	De bomaanval van 13 februari 1943 met als doel de Hoogovens. Een Ventura bommenwerper van het 21th squadron R.A.F. dropt zijn last boven het sluizencomplex en de omgeving van de buitenhaven	ROL	11
18/19 February 1943	Coastal Command: 4 Hudsons vielen een konvooi bij IJmuiden aan, waarna twee voltreffers en één near miss geregistreerd was. 1 Beaufighter deed een torpedo-aanval waarbij geen resultaten werden waargenomen. 1 Hampden voerde ook een torpedo-aanval uit.	ZWA 1	470
5 March 1943	Fighter Command: 2 Spifires voerden bij IJmuiden een aanval uit op twee E-bot. Verschillende treffers geregistreerd.	ZWA 1	475
11 March 1943	Crash. A German Fw 190 of 4/JG1 crashed in the North Sea west of IJmuiden.	SGLO	T2106
12 March 1943	Fighter Command: 2 Typhoons voerden tussen 7.15 en 8.40 uur een aanval uit op een trawler die bij IJmuiden binnenliep.	ZWA 1	478
20 March 1943	Fighter Command: 2 Typhoons voerden om 17.00 uur een aanval uit op twee bewapende trawlers bij IJmuiden.	ZWA 1	479
27 March 1943	Fighter Command: 4 Typhoons voerden een aanval uit op vier aken in de buurt van IJmuiden en op de brug van enkele vijandelijke torpedobootjagers.	ZWA 1	481
8/9 April 1943	Crash. A Wellington of 300 Squadron crashed in the North Sea 20 km west of IJmuiden.	SGLO	T2193
10 April 1943	Fighter Command: 2 Typhoons van No. 56 Squadron kwamen beide in zee neer, waarvan één op 1 km ten westen van IJmuiden.	ZWA 1	489
	Crash. A Typhoon of 56 Squadron crashed in the North Sea 1 km west of IJmuiden.	SGLO	T2193
15 April 1943	Fighter Command: 2 Typhoons vielen tussen 7.05 en 8.25 uur drie trawlers bij IJmuiden aan.	ZWA 1	490
22 April 1943	Fighter Command: 2 Typhoons hebben een aanval gedaan op een bewapende trawler, zonder resultaat, en een E/R-boot welke in brand werd geschoten.	ZWA 1	493
29 April 1943	Cycloop: door de Duitse marine gevorderd en ingericht tot Vorpostenboot v 1330, daarna 1408; 29.4. 1943 op de Noordzee ten westen van IJmuiden op 52.27 1'1.13. en 04.22 O.L. in gevecht met Britse TM-bot. tot zinken gebracht (.). N.r.S.H.M. (J 9 J 6-43- J 50) 2 maart J 942 te Tandjong Priok door de bemanning tot zinken gebracht; later door de Japanners gelicht, hersteld en in gebruik genomen en tijdens de oorlog in Japanse	MUN 1	277
3 May 1943	Crash. A Boston of 107 Squadron crashed in the North Sea 8 km west of IJmuiden.	SGLO	T2238
	Crash. A Ventura of 487 Squadron crashed in the North Sea 19 km west of IJmuiden.	SGLO	T2248
17 May 1943	Crash. A B-26 of 322BG/450BS crashed in the North Sea 3 km west of IJmuiden.	SGLO	T2333
	Crash. A B-26 of 322BG/450BS crashed in the North Sea 8 km west of IJmuiden.	SGLO	T2340