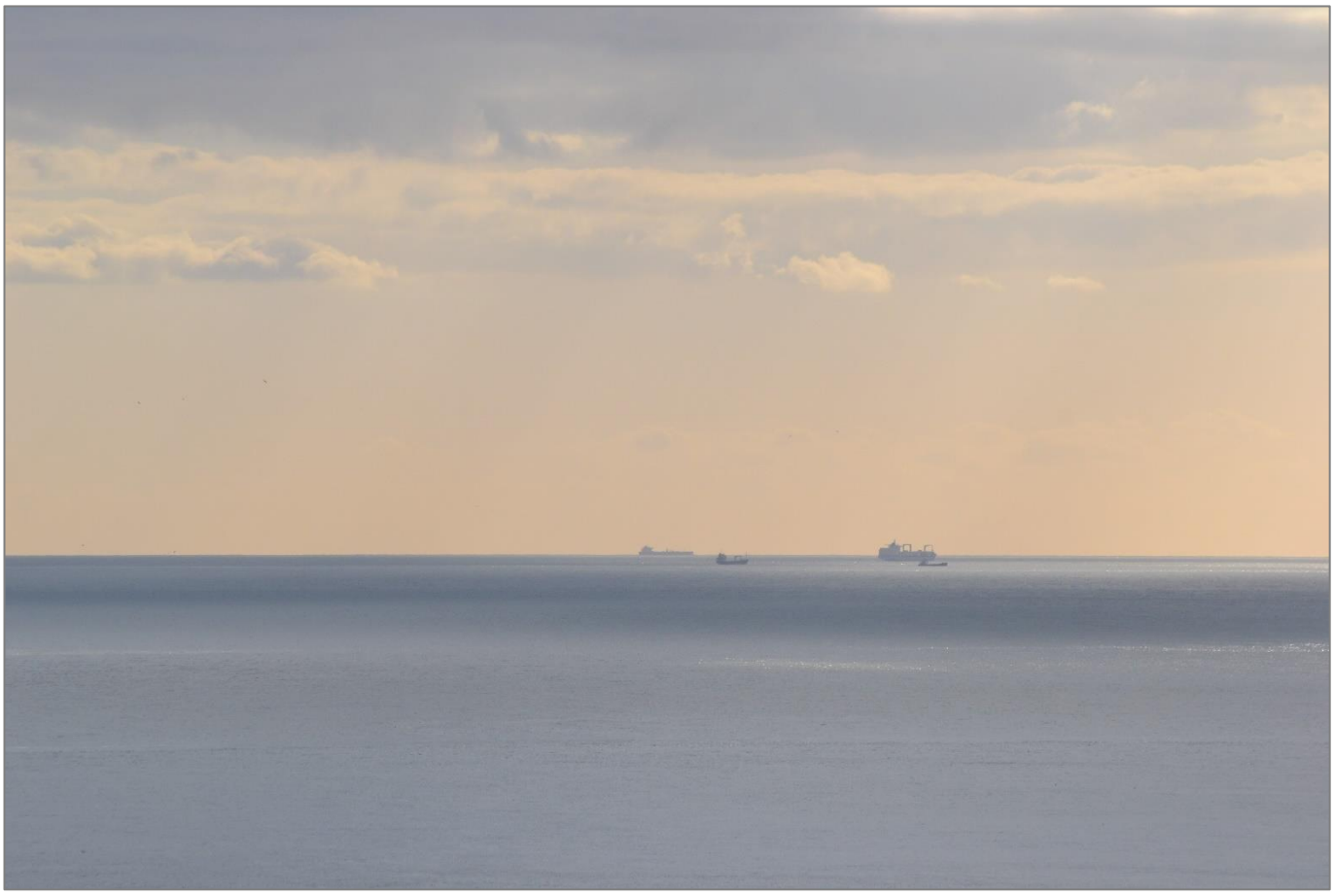
Fjordr

Marine and Historic Environment Consulting

Dover Sector
1914-18 and 1939-45

Antony Firth

September 2021



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Executive Summary

This project provides a 'landscape' approach to understanding the marine area of the Dover Sector in the First and Second World War. The Dover Sector is considered to extend between the coast of Kent from Dungeness to Foreness Point in England, across to the coast of the Continent from Le Touquet near Etaples in France to Westkapelle in the Netherlands (Figure 1). A study area that encompasses continental marine areas is adopted to understand and present the significance of heritage assets that lie within English waters within their wider landscape. It also recognising that there are many UK-related wrecks in continental waters that played an integral role in the operation of the Dover Sector in both conflicts.

A major element of the project is to establish a narrative for the Dover Sector in the First and Second World War that reflects the heritage assets that are present, but also significant themes that are less-well represented. The approach has focussed on four principal themes:

- Naval attacks beyond the Dover Sector that took place from or through the Dover Sector, focussing largely on efforts to prevent the passage of U-boats.
- Cross-channel transport throughout the First World War, and before and after the German occupation of the continental coast in the Second World War.
- Coastwise shipping in both conflicts and along both coasts in changing circumstances; and
- Shore-oriented actions, both planned and actual, including bombardments, disembarkations and evacuations, and amphibious assaults.

The interplay of sea, land and air is woven through these themes, which represent relatively discrete events but also the day-to-day effort involved by all sides in conducting warfare in this constrained and highly contested space.

Attention is drawn to the heritage assets and wider historic landscape of the Dover Sector, but reference is made also to material culture that is absent from the Dover Sector. The archaeological record is very rich, but an appreciation of its richness is hampered by a lack of detailed data about what still lies on the seabed. It is also hampered by historical records – documents, photographs, films, paintings – being severed from heritage assets and dispersed around many collections. A lack of diversity among the voices apparent also dampens the potential that the Dover Sector presents. However, these factors are all changing due to the availability of high-resolution surveys, online digital resources, and the growth of avocational history through digital media. This is, therefore, a good time to address the Dover Sector in the First and Second World War, and to challenge other barriers that might limit its fullest appreciation: between environments (principally land and sea), between disciplines, and between countries. Reflecting the conflicts themselves, the heritage of the Dover Sector warrants an approach that is amphibious, interdisciplinary and transnational.

The study sets out an extensive series of recommendations on the significance, survival and trajectory of heritage assets associated with the Dover Sector; on the potential of additional sources of data for record enhancement; and on engaging stakeholders and increasing public awareness.

Dover Sector
1914-18 and 1939-45

Fjordr 16281 / HE 7171

1. Introduction

1.1. This project developed from initial work on the East Coast War Channels (ECWCs) project (6586 – which encompassed both the First and Second World War[1]) and was informed by the subsequent ECWCs Community Archaeology project (6971 – focussing on the First World War alone). The ECWCs projects firmly established the need to consider military heritage in the seas around England using a landscape approach. Rather than the sea being a uniform blue dotted with ostensibly random wreck sites, in both major conflicts of the twentieth century these waters were very heavily structured spatially. Some of this structuring accrued through the layering of activity by enemy, neutral and friendly forces; but in some cases, the seas represented almost a designed landscape, with fixed features and structures. Importantly, the structuring of the marine landscape around England did not involve only those units – ships and boats – that were deployed at sea: the land, air and airwaves were also integral to the marine battlefield.

1.2. The importance of the marine area around the English coast to the conduct of both the First and Second World War cannot be overstated, especially in the Dover Sector. Indeed, the significance and complexity of the Dover Sector was the reason that the ECWCs projects have their southern boundary at North Foreland. The necessity of considering the Dover Sector in its own right was a conclusion of the initial ECWCs report (p. 68). A further conclusion was that heritage assets in the Dover Sector could not be understood by reference only to those waters that fall within the UK's current maritime boundaries. Consequently, this project takes the novel step of encompassing parts of other countries' sea areas to inform the assessment of assets within UK jurisdiction upon which it concentrates.

1.3. The sea off Dover was a critical barrier to the land war that engulfed continental Europe in both 1914-1918 and 1939-45. This has to a large extent been recognised in projects focussing on defensive installations from both wars at the coast and further inland (Defence of Britain[2]; South East RCZAS). However, this stretch of sea was not just a space between two defended coasts. The marine area of the Dover Sector provided the medium for a huge complexity of different operations. This project seeks to unravel this complexity in order to present a focussed account of the military heritage of the marine area.

1.4. The research aim of the project has been to contribute to greater protection and appreciation of heritage assets from the First and Second World War associated with the Dover Sector. The objectives of the project are as follows:

- O1 To develop a narrative overview of the Dover Sector in the First and Second World War that outlines the key asset types, their original phasing, their overall distribution, and spatial character;
- O2 To outline the significance of the Dover Sector in the First and Second World War in terms of both the history of the UK and of local, community and family histories;
- O3 To provide an overview of the current survival of heritage assets associated with the Dover Sector, of current and future activities that may affect their survival, and opportunities for these assets to contribute to economic growth;

[1] https://www.historicengland.org.uk/images-books/publications/east-coast-war-channels-first-and-second-world-wars/.
[2] http://archaeologydataservice.ac.uk/archives/view/dob/.

O4 To encourage the incorporation of additional sources of data relating to the Dover Sector – including quantitative, documentary, cartographic and photographic sources – within heritage records, including through measures to enhance national and local historic environment records.

O5 To facilitate communication amongst stakeholders – institutions, agencies, and individuals – with interests in heritage assets associated with the Dover Sector.

O6 To promote wider awareness of heritage assets associated with the Dover Sector and their significance, including through specific material targeted at sea-users in the region.

1.5. The project study area (see Figure 1) lies between a boundary in the north from Foreness Point to Westkapelle on Walcheren, encompassing the northern shore of the Westerscheldt[3], to a boundary in the south from Dungeness to Le Touquet, encompassing the WWI British Expeditionary Force depot at Etaples on the Canche estuary. The project includes the whole marine area, including the marine area beyond UK territorial jurisdiction insofar as it has a bearing on the heritage of the Dover Sector.

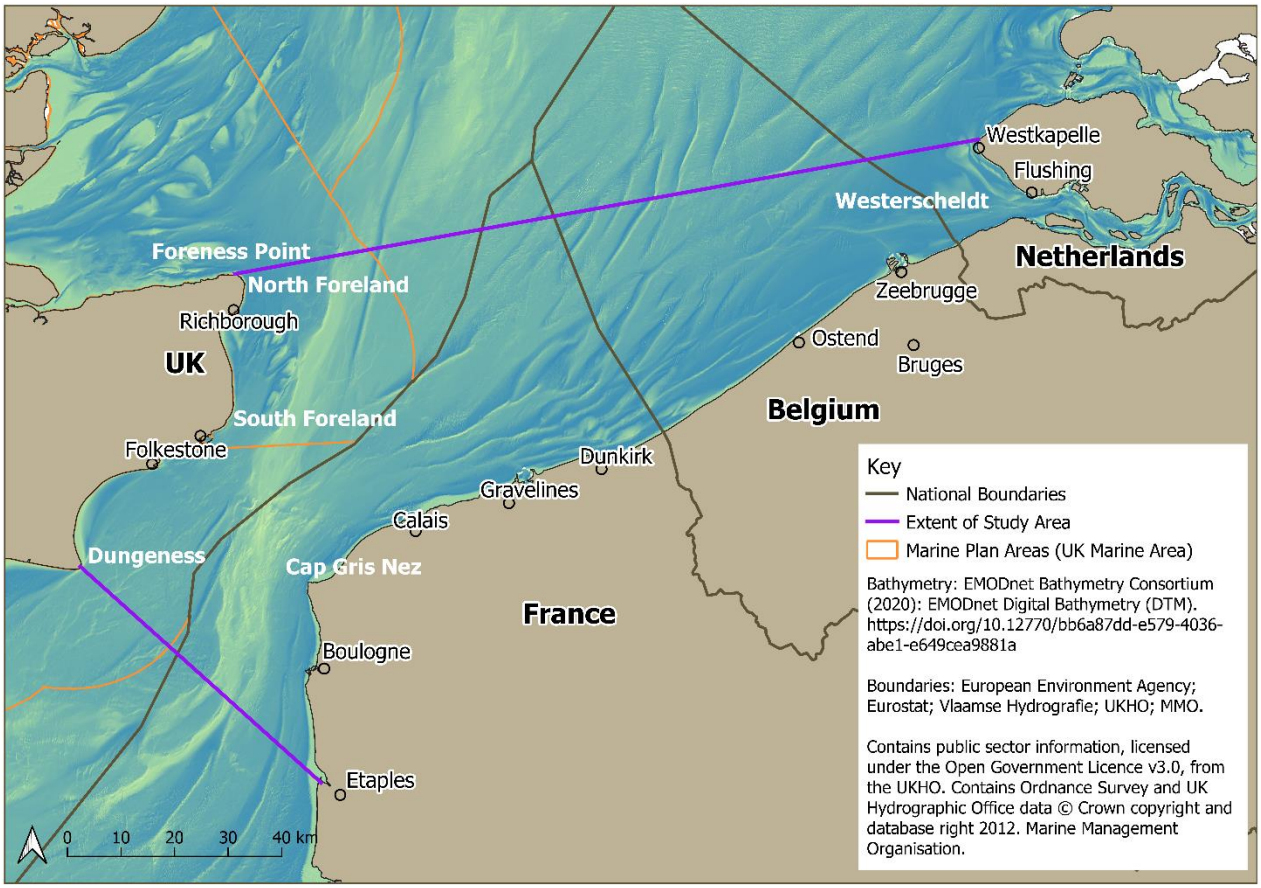

Figure 1: Dover Sector Study Area.

1.6. The intention has been to limit the scope of the project so that it does not lose its focus amongst the very extensive record of land-based sites of various types between North Foreland and Dungeness. Hence, the project does not include installations relating to the defence of land – including ports – against attack and invasion such as pillboxes, strongpoints and obstructions (Pattison and Thomas 2018, 68–73). These have, in any case, been addressed at least in part through the Defence of Britain project and recorded through the Rapid Coastal Zone Assessment Survey (RCZAS) programme. The project does, however, encompass shore-based assets that had a direct functional relationship to the sea, such as gun batteries designed for use against shipping

[3] The estuary of the Scheldt estuary / Western Scheldt. The spelling in Dutch is Westerschelde / Schelde: Westerscheldt / Scheldt is the convention in English.

targets and land-based facilities for activities at sea. The articulation between assets on land whose principal focus was the marine area, and assets situated in the sea (intentionally or otherwise), is made clear in the following text.

1.7. The geographical scope of the project is smaller than the ECWCs, but the ECWCS projects were limited thematically to civilian shipping and their defence. In contrast, this project includes not only civilian shipping and its defence but also overtly military activities, including actions by fleet units and coastal forces, and military transport. Identifying and presenting the particularly intense and complex layers of the two World Wars in the Dover Sector is a considerable challenge.

1.8. The temporal scope – as indicated – is limited to two periods, 1914-1918 and 1939-45. Of course, there are heritage assets within this geographical area that relate to other highly important periods; the fact that they are ignored here does not imply the significance of those assets – or of the maritime history of Dover – is any less outside these two wartime periods. Some flexibility is required in any case, as the two wartime periods had antecedents and consequences relating to heritage assets in the marine sphere that extend before and after these date ranges.

1.9. Heritage asset data for assets within UK territorial waters has been drawn principally from Historic England's marine record (formerly NRHE). These data were incorporated into a single dataset with asset records relating to the East Coast War Channels (Firth 2014) and processed into a common form that removes duplication between records for known wreck sites ('SIT') and records for documented losses or casualties ('CAS'). The records were then incorporated into a GIS that shows the locations given for both SIT and CAS in 1914-18 (Figure 2; Figure 3) and 1939-45.

1.10. The military heritage of the Dover Sector lies in an area that continues to be heavily used today, which has implications for the future survival and management of significant heritage assets. The Dover Sector is one of the busiest stretches of water in the world, with intensive shipping movements between the Channel and North Sea and between England and the Continent. There is also extensive fishing activity, aggregate dredging, renewable energy installations and multiple power and telecommunications cables. Recreational use of the area for angling, sailing and diving is widespread; and both the English and continental coasts host significant tourism industries. Whilst all this activity places pressure on marine heritage, it also presents opportunities in terms of data and investigation, but also in terms of broadening audiences.

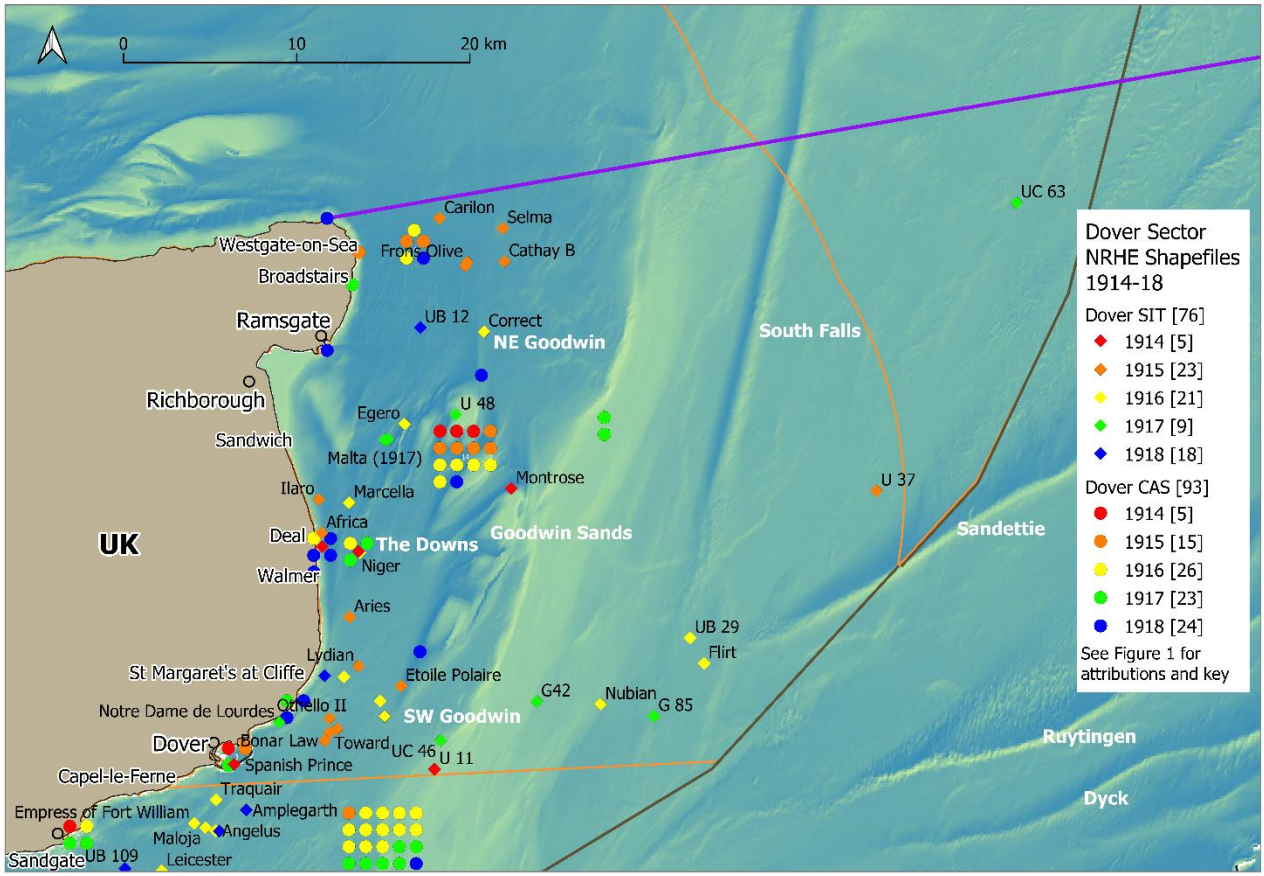

Figure 2: Marine Heritage Assets 1914-18 – North.

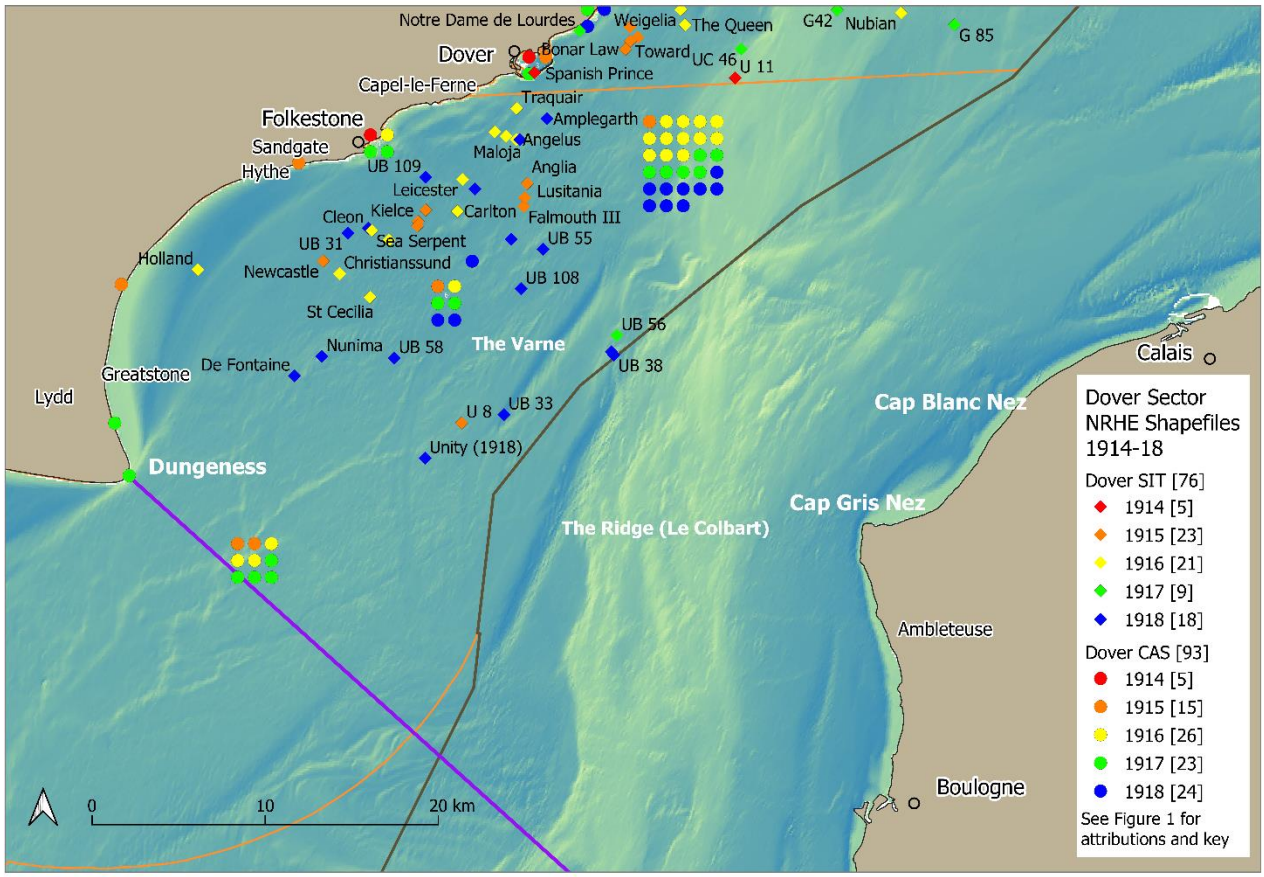

Figure 3: Marine Heritage Assets 1914-18 – South.

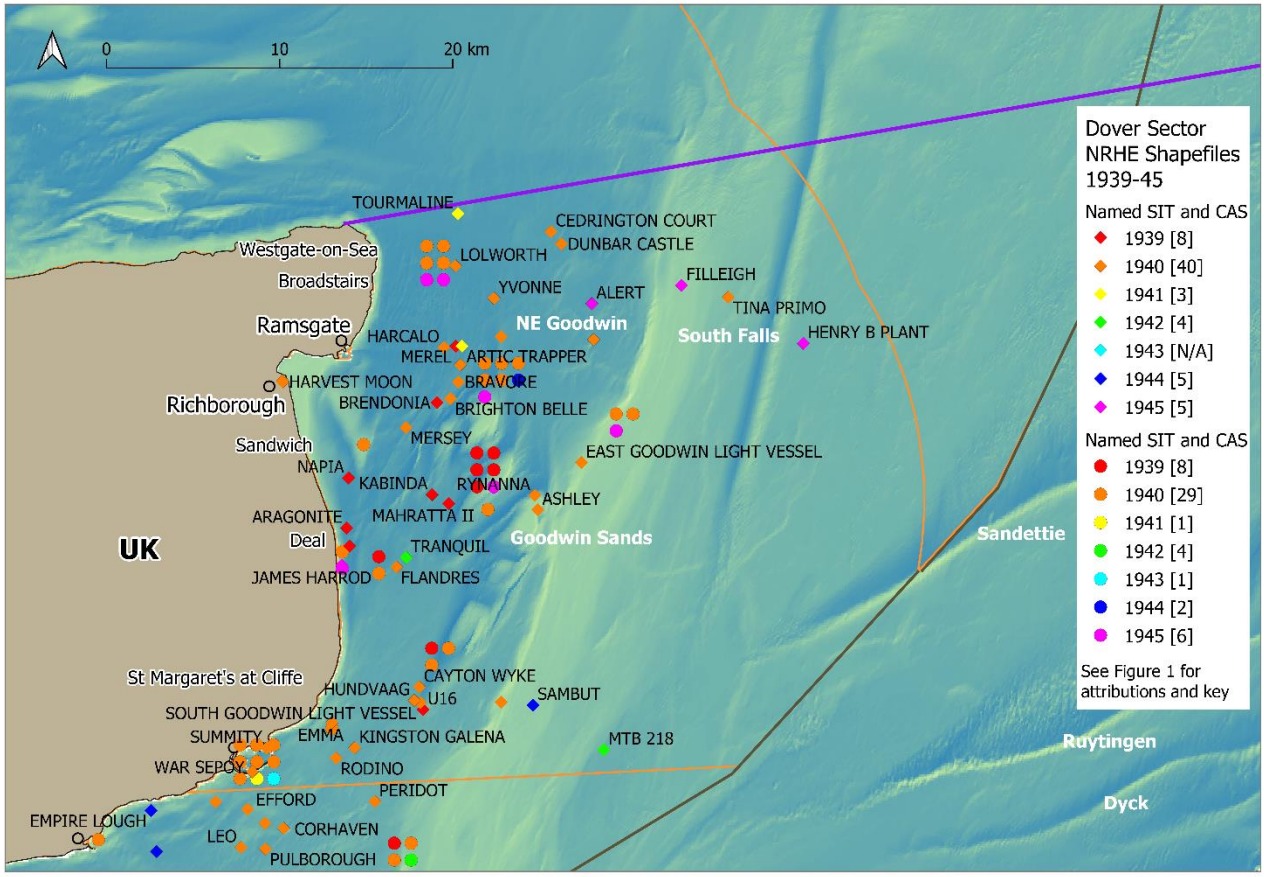

Figure 4: Marine Heritage Assets 1939-45 – North.

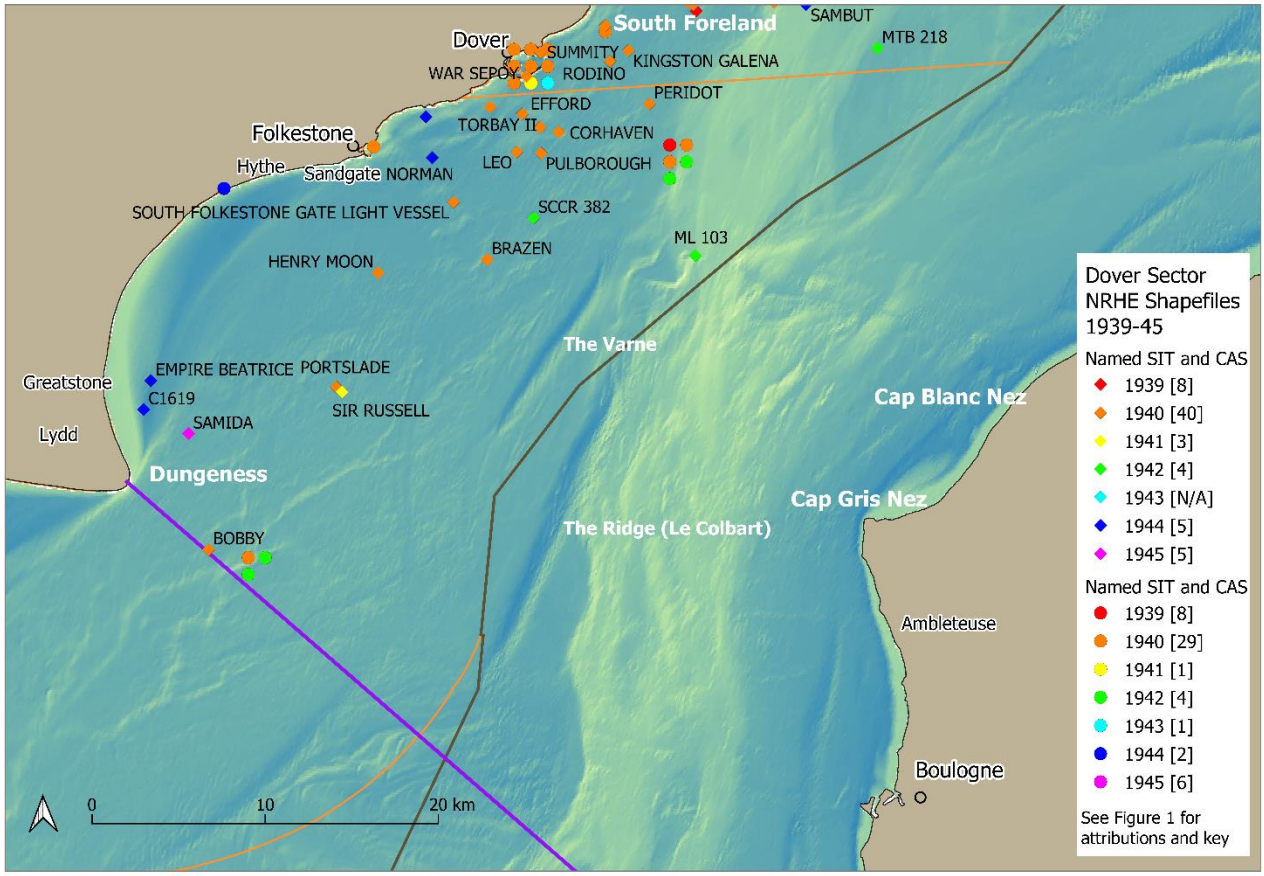

Figure 5: Marine Heritage Assets 1939-45 – South.

2. The Dover Sector in the First and Second World War: overview

2.1. The opportunity to consider the same sea area in two major conflicts is very valuable, because of the comparisons and contrasts it enables. The details of the First and Second World War are very different and it would be easy to fall back on a wholly chronological account of each conflict, considering each in its very specific context. Notwithstanding their distinctiveness, the two World Wars have a lot in common as far as the Dover Sector is concerned, warranting a thematic approach that provides some overall structure to frame the complex flow of actions and events.

2.2. To a large degree, the geography of the Dover Sector is the same in both the First and Second World War. As a whole, the environment does not change markedly between 1914 and 1945; the distances between places remain fixed. One of the key characteristics of this sea area is that it is relatively small: on a clear day you can easily see right across (Figure 6; Figure 7; Figure 8). At its boundaries, Dungeness to Le Touquet is about 32 nautical miles (nm) (59 km) whilst North Foreland to Westkapelle is about 75 nm (c. 139 km); South Foreland to Gris Nez is just 18 nm (c. 33 km). Other approximate straight-line distances are set out in Table 1.

Places	Nautical Miles	Kilometers
Folkestone – Boulogne	25 nm	47 km
Dover – Calais	21 nm	39 km
Dover – Dunkirk	32 nm	59 km
Dover – Nieuwport	53 nm	98 km
Dover – Oostende	60 nm	112 km
Dover – Zeebrugge	72 nm	133 km

Table 1: Straight line distances, Dover Sector.

2.3. In a straight line, a fast vessel at 25 knots (kn) (c. 46 kmh) could readily navigate much of the sector within a few hours; First World War aircraft at 75 kn (139 kmh) could traverse in less than an hour; Second World War aircraft at 250 kn (463 kmh) would be across in minutes. As a conflict zone, the Dover Sector is quite confined.

Figure 6: Dunkirk from Dover Patrol Monument. © AJ Firth / Fjordr Ltd.

Figure 7: Shipping in the Dover Strait with French coast behind, from Dover Patrol Monument. © AJ Firth / Fjordr Ltd.

Figure 8: Thanet Wind Farm to the north of the Dover Sector on the far side of the Goodwin Sands, from Dover Patrol Monument. The Goodwin Sands are indicated by white lines of surf. © AJ Firth / Fjordr Ltd.

2.4. Although only a small space, the Dover Sector is far from benign – even when other people are not trying to kill you. It experiences strong tidal currents and strong winds, independently dangerous and very hazardous in combination. Poor weather can also have a severe effect on visibility. Rocky shores backed by tall cliffs present a further set of hazards, as do shoal areas such as the Goodwin Sands and the many banks off the Belgian coast: the tidal range is typically 5-6 m (16-20 ft), which can make a huge difference to the seascape over the course of just a few hours.

2.5. The overall strategic situation in each war was reflected by – and affected – the occupation of the coasts adjoining the Dover Sector. Notably, occupation of the continental coast embodied a major difference between the geography of First and Second World Wars. In the First World War, only a short length of the Belgian coast was occupied by Germany, from Niewport to the Western Scheldt. This short section of coast was hugely important because it included the ports of Ostend, Zeebrugge and (by canal) Bruges. To the north, the coast in the First World War remained in the hands of neutral Netherlands, whilst to the south the coast was in Allied hands. Germany held this length of Belgian coast from mid-October 1914 to mid-October 1918 – almost the entire war. Important chronological distinctions can be drawn in the intervening four years, but the basic strategic situation in the Dover Sector did not change: German forces in Flanders remained potent until evacuation was ordered at the very end of September 1918.

2.6. For the first eight months of the Second World War, the continental coastline fronting the Dover Sector was in the hands of Allied forces: Germany had no direct coastal access to the Dover Sector. However, German offensives in the west – starting in April in Denmark and Norway; and in May in France, Belgium and the Netherlands – changed this entirely. The evacuation of Dunkirk was largely simultaneous with the evacuation of Narvik, whilst the Armistice with France on 25 June meant that the whole seaboard of north west Europe was under German control from the Barents Sea to the border of Spain (itself nominally neutral but sympathetic to Germany).

2.7. A fundamental geographical consequence of Germany's extensive control of the continental seaboard in the Second World War is that U-boats were largely stationed further west in France's Atlantic ports (Brest, Lorient, St. Nazaire, La Pallice (La Rochelle), Bordeaux), closer to their targets in the Battle of Atlantic. This is a marked contrast to Germany's narrow access to the sea in the First World War, when U-boats stationed within the Dover Sector were of such importance to the wider conflict.

2.8. The continental coast of the Dover Sector did not come back under Allied control until well after D-Day, through the coastal campaign of September to November 1944[4]. Although the continental coast was in German hands for over four years, the periods before (Sep 1939 to May 1940) and after (Nov 1944 to May 1945) must not be overlooked in considering the character of the Dover Sector in the Second World War overall. Equally, the duration of German control of the continental coast of the Dover Sector was leavened by the degree to which the Second World War turned in the Allies' favour. This was not a sudden change and it certainly did not remove the dangers of the Dover Sector, which continued right to the end of the war; but the tide started to turn in mid-late 1941 as Germany directed its attention to the East and the capability of Allied forces grew. The pendulum swing of the Second World War in the Dover Sector is quite different to the constancy of the First World War.

2.9. Despite German control of the continental coast of the Dover Sector – the Belgian coast for much of WWI and the whole coast for a good part of WWII – the sea itself can be broadly described as remaining in Allied hands across the whole Dover Sector for much of both wars, except for areas very close to the German-held shore. Even in the Second World War, it can be argued that Britannia persistently ruled the waves: perhaps excepting a few months in the summer of 1940. However, it is an important characteristic of both sea and air that – unlike land – neither can be occupied militarily. Their control requires constant effort; actual control is fleeting. The space is also stratified: control may be different below the sea, on the sea's surface, at low level and at height. Even during periods of dominance, the Dover Sector was prone to incursions. As a space in which combatants co-existed, the whole sea area from high water to high water can be regarded as no man's land.

2.10. Despite these strategic and chronological differences in the Dover Sector between the First and Second World War, there is much in common between the two wars. Accordingly, this report takes a thematic approach to understanding the Dover Sector as a landscape across both wars rather than offering a chronological account of the Sector in each war. There is a practical reason for this, in that a chronological account of such a densely fought area across two World Wars would be more than a life's work bearing in mind the significance of, and contestation around, even singular events. But the principal reason for taking a more conceptual approach is to try to focus attention on the physical remains of the Dover Sector as a battlefield in these two particular periods.

2.11. The Dover Sector is approached in terms of the following four themes:

- Naval attacks beyond the Dover Sector that took place from or through the Dover Sector, and the efforts to prevent these from occurring.
- Cross-channel transport, including attacks upon cross-channel transport and its defence.
- Coastwise shipping, including attacks and defence, including attacks upon coastwise transport and its defence.
- Shore-oriented actions, including counter attacks and defence.

2.12. A key characteristic of naval warfare in the Dover Sector in both World Wars is that engagements were asymmetrical, not always in the sense of being unequal but at least in the sense that much of the action involved dissimilar units. Engagements of matched units – especially larger warships – did not occur. The actions of the Allied and German fleets that were such a preoccupation in the first half of WWI did not encroach upon the Dover Sector, although the possibility of incursions by the German fleet were a concern at the outset. Whilst fleet units passed through the Dover Sector and were sometimes stationed within it, across both conflicts the most notable foray of major warships was the unique 'Channel Dash' in February 1942. Even in this case, Allied attacks were

[4] Even then, the liberation was not complete as Dunkirk remained in German hands until May 1945.

delivered by coastal batteries, coastal forces, destroyers, and aircraft; units of similar scale to the major German warships were absent on the Allied side. Perhaps the closest to matched engagements were actions between destroyers in WWI and between coastal forces in WWII. Even these were relatively rare: an adjunct to asymmetrical operations that occasionally resulted in similar vessels engaging with each other.

2.13. The Dover Sector was a dangerous place because of the intense focus upon it, the concentration of bases and units in close proximity, and its environmental constraints and hazards. It was a place that had to be traversed – along the Channel or across it – to get somewhere else; units operated in the Dover Sector only because they had to. The Dover Sector was not a field of battle that any side would choose, so there are few instances of naval units coming from outside the Dover Sector with the intention of meeting their opposite numbers. This amplifies the point above about fleet actions; fleets stayed out of the Dover Sector. There are instances where units assembled in the Dover Sector to carry out major attacks within the Sector – Allied assaults on the Flanders coast from Dover in WWI are a case in point; the assembly of invasion vessels for Seelowe in 1940 is perhaps another – but instances of naval units coming into the Dover Sector from outside the sector in order to engage are rare in both conflicts. As noted above, the incursions by German destroyers in WWI are the chief examples.

2.14. There were major technological differences between the First and Second World War, but the emphasis should probably be on the similarities. Many of the technologies – and their applications – that tend to be associated with the Second World War were being used in the conflict at sea during the First World War. In particular, the use of wireless for direction-finding and intercepts (Cocroft and Stamper 2018, 52–55), and air power, were strongly exercised in the Dover Sector in the First World War. However, the use of radar at sea in the Second World War does not have an antecedent in the First; wartime acoustic mirrors (such as the eastern mirror at Fan Bay[5]) appear to have been designed only to warn against aircraft.

2.15. Although the tendency is to think in terms of discrete events – not least as some hugely important events took place in the Dover Sector – it is important to bear in mind the constant activity of vessels and aircraft in the Sector throughout both World Wars. Much activity in both conflicts comprised routine, day-to-day operations, both directly in support of respective war efforts, but also in the myriad actions that are needed to keep sea areas and their infrastructure functioning. 'Pushing water' on patrol was as much a part of both conflicts as actual fighting; such were the characteristics of the conflict in the Dover Sector that routine activities could also be suddenly lethal.

2.16. Deaths and injuries amongst military and civilian personnel occurred in the Dover Sector in both conflicts, often in very violent circumstances. These personal tragedies may be reflected by heritage assets that were destroyed or sunk and still lie in the Sector. However, most people who at some stage found themselves in the Dover Sector during the First and Second World War were not killed or injured there, even if they experienced extremely harrowing events. Remembering those who died in the conflicts of the Dover Sector is important in its own right; but it is also important to remember all those who also took part in such momentous events, but survived.

2.17. Equally, the heritage assets that are present in the Dover Sector are a tiny fraction of the material effects that were mobilised in the two wars. On land, the physical environment of the First and Second World Wars in the Dover Sector have been rewrought by subsequent activity and development; heritage assets survive as both standing and below-ground remains, but they are a partial record. It is the same in marine areas, but for different reasons. Of course, there are heritage assets whose form has been changed since they became situated on the seabed due to a variety of destructive processes, including intentional removal; but most of the physical assets

[5] Scheduled Monument LEN 1442235.

through which the battles of the Dover Sector were fought were mobile at sea and in the air; their presence in the Sector – whether brief or lengthy – was intrinsically temporary. Vessels and aircraft that saw service in the Dover Sector may have been wrecked subsequently in a different locale, but the vast majority will have been scrapped at the end of their working lives. It is of course important to address the specific characteristics and significance of individual heritage assets still present in the Dover Sector, but it is also essential to recognise how these few assets represent so very much more.

2.18. The sections below focus on the physical heritage assets of the Dover Sector, predominantly at sea but also on land where they relate directly to conflict at sea. On land this generally means fixed infrastructure of various forms, including harbour installations and some military features. At sea, heritage assets principally comprise wrecks of vessels (ships and boats) and aircraft. However, there was also fixed infrastructure at sea in the Dover Sector, though in many cases this is likely to have been removed. Fixed infrastructure in the marine area includes the minefields and other physical obstructions that were such a feature of the Dover Sector; whilst the mines can be expected to have been removed (notwithstanding occasional discoveries), the moorings that fixed mines to the seabed can be expected to have remained present. Other fixed infrastructure could include remains of submerged anti-invasion defences, and the remains of PLUTO (Pipe Line Under The Ocean) between Dungeness and Ambleteuse, near Boulogne[6]. Although not exactly fixed, another key category of heritage asset additional to vessel and aircraft wrecks is the large amount of ordnance in addition to mines that was expended in the Dover Sector, and which continues to be uncovered.

2.19. It should be noted at this point that this study does not address in detail the built environment of the ports and harbours of the Dover Sector in the First and Second World War, except insofar as arises in relation to the principal themes. It is important to note, however, that Dover had taken on its now familiar character – with a large expanse of sheltered water enabling it to serve as a key naval base – only a few years before the outbreak of the First World War. Before the mid nineteenth century, Dover Harbour was behind the line of the coast with a relatively narrow entrance. Protection of this entrance was provided by the Admiralty Pier[7] to the west, which was begun in 1847 and extended in a number of phases while starting to serve cross channel steamers berthing alongside. Works to entirely enclose the sea area forward of the coast – by extending the Admiralty Pier and building the Eastern Arm[8] and Southern Breakwater[9] – started in 1897 and were formerly opened only in 1909[10]. Given the role that Dover was to develop – especially in hosting the many vessels of the Dover Patrol – this timing was fortuitous; but additional defences had to be added in the form of anti-submarine defences and blockships[11]. The new Outer Harbour contained a smaller harbour referred to as the Submarine Harbour or Camber against the inside of the Eastern Arm, in the area now occupied by Dover Eastern Docks. This was used for submarines, smaller vessels[12] and a floating dock[13] in the First World War; it was subsequently used as a shipbreaking yard and in the Second World War it was the site of concrete pens for coastal forces craft, demolished in 1990[14]. The land-based defences of Dover in the First World War are detailed by Pattison and Thomas (2018, 69–73)

[6] https://www.combinedops.com/pluto.htm.
[7] Listed Building LEN 1393608.
[8] Listed Building LEN 1393604.
[9] Listed Building LEN 1393607.
[10] For photographic record of construction, see TNA ADM 195/10 to ADM 195/14.
[11] https://www.iwm.org.uk/collections/item/object/205283592; https://www.iwm.org.uk/collections/item/object/16241; https://www.iwm.org.uk/collections/item/object/25505 with CMB departing.
[12] https://www.iwm.org.uk/collections/item/object/205252778; https://www.iwm.org.uk/collections/item/object/205252777.
[13] http://www.tynebuiltships.co.uk/D-Ships/Dover_Dock-1912.jpg; http://www.tynebuiltships.co.uk/D-Ships/doverdock1912.html.
[14] http://www.dover-kent.com/Dover-Society1/008/008%2036-38.pdf.

2.20. Intrinsically, the heritage of the Dover Sector is shared. It falls within the jurisdiction of four different countries and multiple sub-national administrations. Its significance relates to these four countries, but to many more too: not least Germany, but also the many other countries whose vessels, aircraft, service personnel and civilians found themselves in the Dover Sector at various points in the two World Wars. This report concentrates on heritage assets irrespective of country of origin that are now situated within the territorial jurisdiction of the UK as a coastal state, for which Historic England is the UK Government's heritage advisor. This report also focuses upon heritage assets outside the UK's territorial jurisdiction but in which the UK has a continuing interest, including the residual sovereignty of wrecked vessels and aircraft, and UK Government ownership of wrecked vessels, aircraft and their contents; and the very wide range of other verifiable cultural and historical links between heritage assets and the UK, not least the commemorative connection to war dead. There are of course heritage assets in the Dover Sector outside UK jurisdiction that have as strong or stronger ties to other countries; if these are not a focus here, it does not imply that their significance is any less.

2.21. It is worth recalling that, although a dominant party, at no time were operations in the Dover Sector maintained solely by the UK in a simple bilateral conflict with Germany. The role of continental allies was hugely important in the history of the Dover Sector during the First World War and during the periods of the Second World War when the continental coast was at liberty. But the conflicts fought in the confined space of the Dover Sector were manifestly global too. A striking manifestation of this globally shared heritage is presented by the Dover Patrol Monument near St. Margaret's-at-Cliffe, which is a Grade II* Listed Building[15]. It is one of three identical monuments: one overlooks the Dover Strait from the other side at Cap Blanc Nez; and another overlooks the entrance to New York harbour.

[15] LEN 1070067.

3. Naval attacks from or through Dover Sector

3.1. Overview

3.1.1. This section addresses naval attacks beyond the Dover Sector that took place from bases within the Dover Sector, or that involved passage through the Dover Sector. Efforts to prevent the passage of attacking craft are also included in this section.

3.1.2. The use of the Dover Sector in making attacks elsewhere – and the efforts to prevent such use – was a vital concern of the First World War. In particular, the Dover Sector was important for U-boats travelling to and from the Channel, the Western Approaches and the Atlantic. Preventing U-boats from transiting the Strait of Dover was a major concern of the Allies.

3.1.3. Conversely, the Strait of Dover were not important in the First World War for major warships of either side transiting to make attacks elsewhere. This is not to say that no major warships transited the Dover Sector in WWI; but the emphasis of fleet operations lay in the central and northern North Sea, and on the northern routes into the Atlantic.

3.1.4. The Dover Sector was also expected to be important for transiting U-boats in the Second World War and the period to May 1940 is addressed in this section. However, fundamental changes in the overall situation were wrought by the fall of Norway, the Netherlands, Belgium and France in May-June 1940. As a result, WWII U-boats operated predominantly from western France well-beyond the Dover Sector, and from Norway and Germany, and largely fall outside the scope of this study.

3.1.5. Equally, German S-boats (E-boats in UK parlance) were based predominantly north and south of the Dover Sector, in Rotterdam and Ijmuiden for operations in the North Sea; and Cherbourg for operations in the Channel. The partial exceptions are Ostend and Boulogne, which were used as bases for attacks within the Dover Sector itself but also beyond. S-boat operations within the Dover Sector are addressed under coastwise shipping, below.

3.1.6. One famous but essentially unique instance of warships transiting the Dover Sector in the Second World War is presented by Operation Cerberus (German codename), known as the Channel Dash or Operation Fuller (Allied codename for response). Even in this case, the transiting vessels – the battleships *Scharnhorst* and *Gneisenau* and the heavy cruiser *Prince Eugen*, plus escorts – were not en route for an attack, but were redeploying from Brest to German ports in anticipation of an Allied attack on Norway. Consequently, Operation Cerberus is best regarded as a form of coastwise shipping and is addressed in that section accordingly.

3.1.7. Operation Neptune – often referred to as 'D-Day' – was an attack with its focus to the south that involved many vessels transiting the Dover Sector. However, this is better considered as a shore-oriented action and addressed as such below. Vessels and related units such as Mulberry Harbour components passed through the Dover Sector, though in effect this was largely coastwise shipping en route, often via marshalling areas on the south coast. The large number of major warships involved in the assault came via the west rather than through the Dover Sector.

3.2. U-boats and Dover Sector blockades in the First World War

3.2.1. During the First World War, the 'Flanders Flotillas' in the Dover Sector ports of Ostend, Zeebrugge and – via the canal network – Bruges were of potentially decisive importance. The relatively short-range U-boats that first operated from these ports could attack the East Coast War Channels across the North Sea, but they could also infiltrate the Dover Sector. As their range increased, they transited the Dover Sector to make attacks elsewhere, especially in the Western Approaches and further into the Atlantic. Moreover, U-boats stationed at Heligoland and on the German coast, much further north, could also transit through the Dover Sector to make attacks in the Atlantic, instead of taking the northern route around Scotland. The strategic significance of the Dover

Sector as a route for U-boats transiting to make attacks elsewhere became a major focus of Allied effort as they sought, in effect, to block all passage of U-boats. This effort is reflected in the physical infrastructure of nets and minefields established within the Dover Sector, in the physical remains of vessels lost in trying to maintain the blockades, and especially in the remains of U-boats and other vessels that tried to overcome the blockades but were lost in the process.

3.2.2. Clearly, the attempts to curtail the movement of U-boats affected U-boat attacks within the Dover Sector. However, as the focus here is on the importance of the Dover Sector for U-boats transiting to and from patrol areas further west, attacks by U-boats within the Dover Sector are addressed in the subsequent sections on cross-channel and coastwise shipping, below.

3.2.3. Blockades in the Dover Sector included efforts directed towards the bases of Ostend and Zeebrugge as well as the Dover Strait itself, using different methods and approaches and at different locations. In addition, there were local barriers against U-boats in the Goodwin Sands; and mines and nets were deployed more widely in the southern North Sea including the Dover Sector.

3.2.4. U-boats operating from the German Bight were active in the southern North Sea from early in the war, as demonstrated – devastatingly – by the torpedoing by *U-9* of the cruisers Aboukir, Cressy and Hogue while patrolling the 'Broad Fourteens' off Noordwijk aan Zee in the Netherlands, to the north of the Dover Sector, in September 1914 (Corbett 1920, 1:174–77). Within the Dover Sector, the light cruiser turned seaplane carrier HMS *Hermes*[16] was sunk by *U-27* near the Ruytingen Bank off Calais on 31 October 1914 (Corbett 1920, 1:234); the gunboat HMS *Niger*[17] was sunk in the Downs by *U-12* on 11 November 1914 (Corbett 1920, 1:254). These losses were further confirmation in the early months of the war of the efficacy of U-boats and the vulnerability of ships even on the UK's doorstep.

3.2.5. As noted above, German forces reached the Belgian coast in mid-October 1914 and U-boats first used the Flanders ports as early as November 1914 (Karau 2015, 33): but their initial purpose was to help defend against Allied vessels bombarding the newly captured coast. Although U-boats based in Germany made use of Ostend and Zeebrugge (Termote 2017, 28–29), German command remained reluctant to transfer them permanently, so it was not until the introduction of coastal U-boats of UB I and UC I classes that specific Flanders-based forces started to develop. The UB and UC classes were small and designed specifically for narrow, shallow seas (Karau 2015, 42): they were prefabricated in Germany but transferred by rail to Antwerp for assembly before travelling by canal to Bruges, and from there to the sea via Ostend and Zeebrugge. The A-class coastal torpedo boats were designed similarly, and again were transported first by train and then by canal once assembled. The first UBs – armed with two torpedo tubes and a deck-mounted machine gun – arrived at the end of March 1915 and began operations on 9 April; the UCs – carrying 12 mines and a deck machine-gun – arrived on 26 May began operations on 31 May(Karau 2015, 44; 46). Although larger and more capable classes of UB and UC U-boat were subsequently introduced, their overall numbers remained relatively small – generally between 20 and 30 vessels, peaking at 34 in early 1917 (Karau 2015, 43).

3.2.6. As indicated above, the larger U-boats based in Germany were active in the southern North Sea from the start of the war and would transit the Strait of Dover to operate in the Channel and Western Approaches. The battleship HMS *Formidable* – lost on 1 January 1915 east of Start Point – was sunk by one such, *U-24*. Traverses of the Dover Strait were halted in April 1915 because of anti-submarine measures taken by Allied forces (Karau 2015, 45). However, the new Flanders-based units sought to test this, sending *UB-6* on a successful journey to Boulogne and back on June 21st-22nd 1915. This gave rise to an initial operational area for the UBs and UCs extending

[16] UID 883745.
[17] UID 904855.

west to a line between Portland and Cap da la Hogue (Karau 2015, 45), as well as up into the Thames Estuary. Their range was to extend significantly with the later classes of UB and UC U-boats; the scope for the Flanders U-boats to transit the Strait to reach out towards the Atlantic was critical for the German war effort.

3.2.7. It was equally critical for the Allies to prevent these transits. However, the first barriers – starting with mines laid in early October 1914 – were intended to safeguard the flank of cross-channel transport against attacks by U-boats and surface craft, rather than to block the Strait. Accordingly, these mines were laid to the north-east of the Dover Strait – off Flanders – even though they are referred to as the 'Dover Strait Minefield' (Director of Naval Warfare 1977, fig. 20). *U-5* and *U-11* were lost to mines off the Belgian coast in December 1914 (Director of Naval Warfare 1973, 7). Mines and 'sweep obstructors' were laid further south – between Dunkirk and North Foreland – in February 1915 (Director of Naval Warfare 1973, 8). Further mines were laid to the north in July 1915, supplemented by fields to protect the Thames Estuary. At this stage, however, UK mines were not reliable.

3.2.8. A further method of entrapping U-boats was introduced from February 1915 at Dover and elsewhere around the UK, comprising relatively light 'indicator nets' deployed from drifters (Corbett 1921, 2:271). Indicator nets could be either moored or towed at low speed[18]; a U-boat caught in such a net could be seen from the surface as the net floats were displaced, and then attacked by accompanying patrol vessels. *U-8* was sunk near The Varne bank (about 20km off Dymchurch) after being indicated by nets in March 1915 (McCartney 2015, 42–43) and other U-boats became entangled such that – as noted above – transits of the Dover Strait were halted in April 1915. Nonetheless, the apparent ineffectiveness of indicator nets contributed to the dismissal of Admiral Hood from command at Dover on April 9th. Subsequently, indicator nets were also equipped with small electro-contact (EC) mines[19] and were used extensively in the North Sea, for example.

3.2.9. To supplement the indicator nets, work started in April 1915 to install a boom – a heavy net of the sort used to protect harbours and anchorages – across the Strait of Dover from Folkestone to Gris Nez (Corbett 1921, 2:283). This was a massive undertaking in view of the environment and seems to have been 'easier to project than to complete' (Newbolt 1928, 4:291).

3.2.10. In the meantime, the effectiveness of the UB and UC classes in Flanders prompted a specific effort to blockade Ostend and Zeebrugge directly using a combination of mine nets and mines known as the 'Zareba' (from an African word for a protective enclosure made of thorns). The Zareba was installed in late April 1916 and reinforced in July; it was further reinforced in July 1917 (Director of Naval Warfare 1973, 11; 12; 16).

3.2.11. Beyond the Zareba, attention switched to closing the Strait directly using a 'Cross-Channel Barrage' between South Goodwin and Dunkirk. This barrage consisted of mine nets supported by deep mines and was installed from September 1916 (Director of Naval Warfare 1973, 12) and largely completed by early February 1917. More effective mines were by then available, but the danger of mines and nets dragging into each other in the harsh conditions of the Dover Strait led – after the loss of THV *Alert* – to the Cross-Channel Barrage being removed and replaced with a simple net (Director of Naval Warfare 1973, 16). The net was suspended using a series of buoys at quarter-mile intervals; each mile-long section had a number and each buoy had a letter code also; hence the net was marked by buoys from 0A to 26D (Figure 9).

[18] TNA ADM 275/195 TH 40: 48-50.
[19] ADM 275/195 TH 40: 53-54.

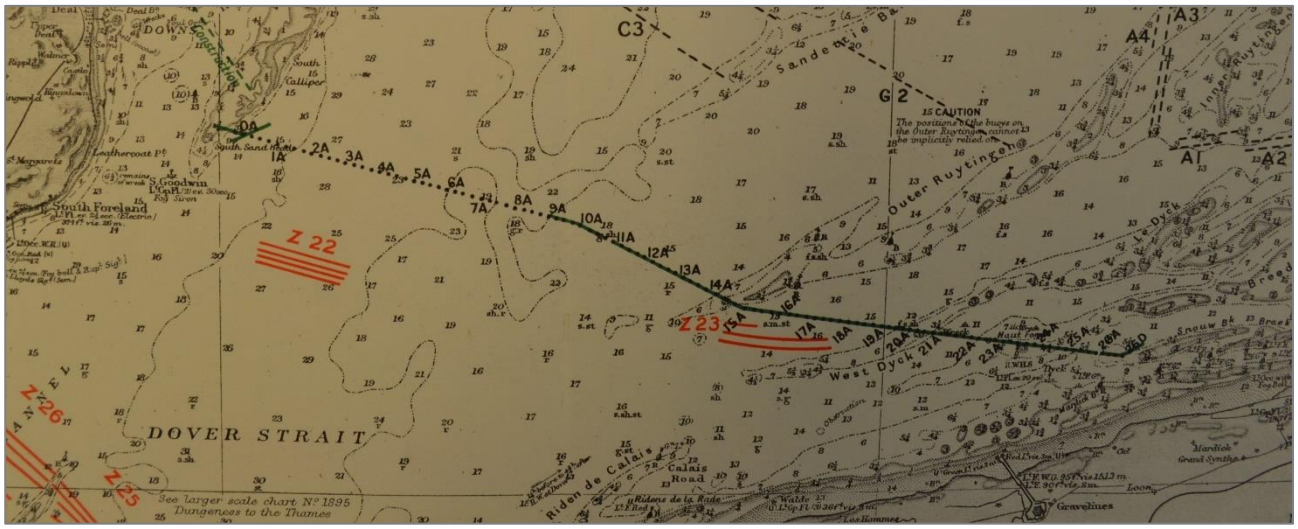

Figure 9: Chart Z 14 (April 1918) showing lines of mines connected by nets, and explosive nets, between South Goodwin and Dunkirk. Courtesy of UKHO Archive.

3.2.12. Nonetheless, it appeared that despite all the efforts, U-boats were able to pass through the Strait of Dover with care but essentially unhindered from June 1915 onwards. From July 1917 a new mine barrage across the Strait – between Folkestone and Gris Nez – was contemplated and led to the establishment of a 'Channel Barrage Committee' (Director of Naval Warfare 1973, 17–18). Deep mines were laid at depths varying between 30 feet and 100 feet, initially – from November 1917 – in ten lines. The barrage continued to be reinforced by minelaying in 1918; by the time of its completion in October 1918 it was about five miles wide. The deep mines were to be supplemented by other measures, notably 'barrage light vessels' equipped with searchlights and hydrophones (Director of Naval Warfare 1973, 21) and patrol vessels with powerful flares to prevent U-boats crossing on the surface at night. The previous ineffectiveness of the efforts to blockade the Dover Strait was contentious, as was the plan to illuminate the barrage, contributing to the replacement of Admiral Bacon at Dover by Admiral Keyes at the end of 1917 (Bacon 1919a Preface).

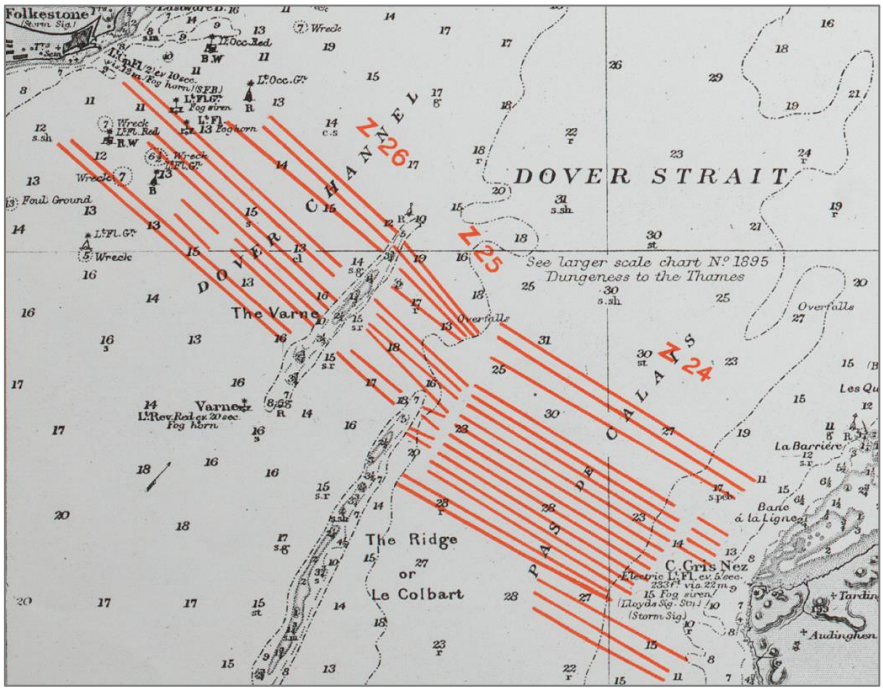

Figure 10: Folkestone - Gris Nez Barrage. Chart Z.14, April 1918. Courtesy of UKHO Archive.

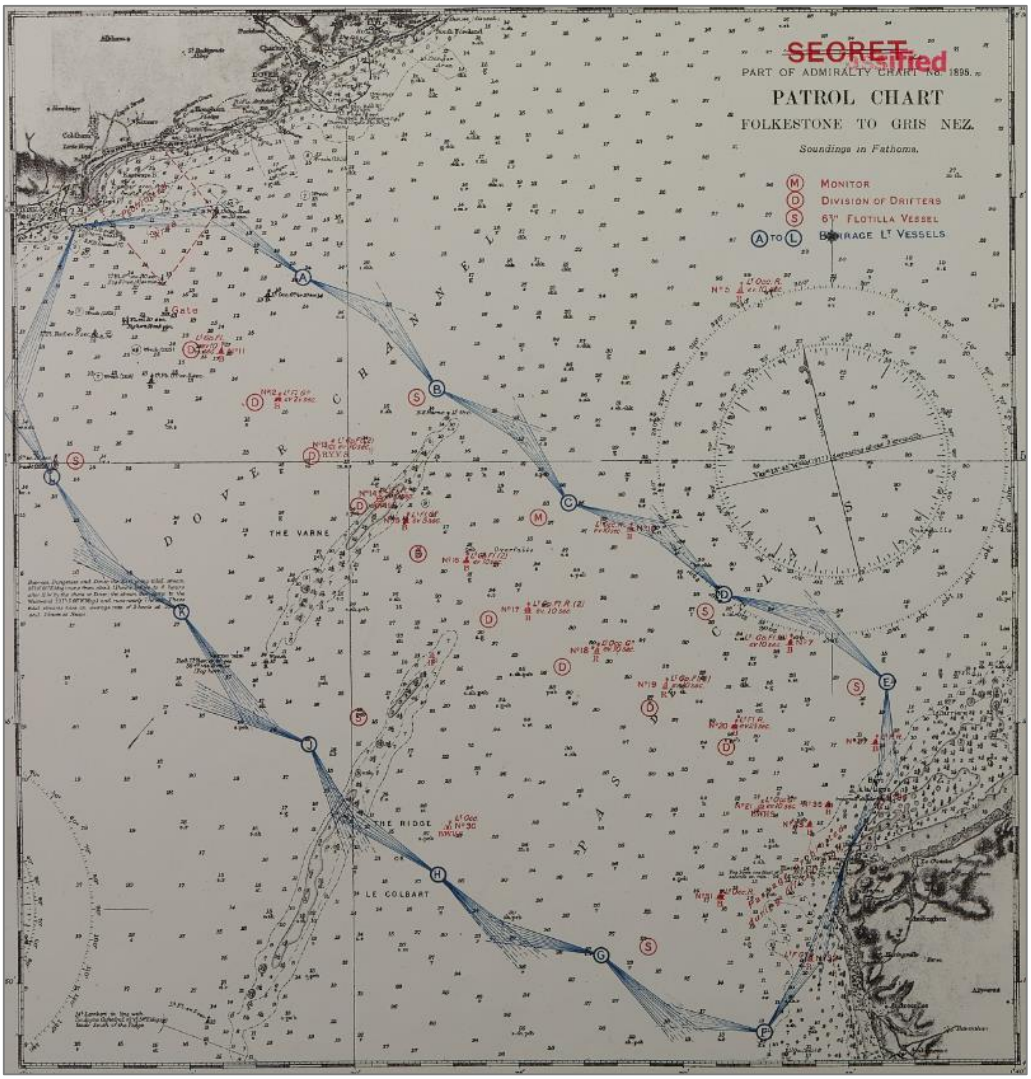

Figure 11: Light Barrage and patrol stations, Folkestone - Gris Nez. Chart Z.27F June 1918. Courtesy of UKHO.

3.2.13. Indicator loops were a further element of the infrastructure installed in 1918 to accompany the Folkestone-Gris Nez mine barrage. Indicator loops were wires laid on the seabed which, when crossed by a magnetic object such as a U-boat, caused deflections on instruments housed onshore[20]. Indicator loops and controlled mines that could be fired by an onshore observer were installed in the shipping gates either side of the main Folkestone-Gris Nez barrage (Director of Naval Warfare 1973, 17) and appear to have been responsible for the sinking of one U-boat, *UB-109* (McCartney 2015, 62; Wessex Archaeology 2014b, 7). A western set of indicator loops were installed jointly from Dungeness and from Hardelot Plage (mid-way between Boulogne and Le Touquet); and an eastern set between Dumpton[21] (north of Ramsgate) and Oye (near Gravelines). The eastern and western loops would have enabled patrol vessels to be despatched on the basis of contacts made, reducing the number of patrol vessels required overall. Although considered likely to be effective, by this stage the mine barrage had cut the flow of U-boats so there were no opportunities to test the eastern and western loops in service. The observation station at Dungeness was in the Dunge Coastguard Station whilst the station at Dumpton was in a General Post Office (GPO) cable hut. The location of the observation station at Folkestone is not known.

3.2.14. A further evolution of the blockade was already in hand when the First World War ended. The MN Scheme would have seen a series of concrete towers emplaced on the seabed between Dungeness

[20] TNA ADM 275/195 TH 7: 28-31.

[21] http://indicatorloops.com/loopworks.htm.

and Boulogne, equipped with controlled mines, searchlights and guns (Director of Naval Warfare 1973, 21). Construction of the first two towers commenced in Shoreham in June 1918 but they became redundant as the war ended; one was demolished whilst still at Shoreham but the other was installed –and still survives in use – as a navigational aid, known as the Nab Tower (Pattison and Thomas 2018, 79)[22].

3.2.15. Throughout the period of the war, the mines and other barriers were accompanied by large numbers of patrol vessels, including vessels designed as warships such as destroyers, but also requisitioned craft, especially drifters. Germany challenged the blockade of the Dover Strait principally through the U-boats that sought to transit without being detected, but on a number of occasions it also made overt challenges through attacks by surface vessels. Significant raids were made in October 1916, February 1917, March 1917, April 1917 and February 1918 by German torpedo boats based in Flanders, reinforced by units from the High Seas Fleet normally based in Germany[23]. Drifters bore the brunt of the raids in October 1916 and February 1918, but the engagements also involved destroyers and other vessels, including destroyers despatched to chase down the raiders. Six drifters and a destroyer (HMS *Flirt*) were lost in the October 1916 raid; a second destroyer – HMS *Nubian* – lost its bow and ended up below the cliffs near Dover. Seven drifters and a trawler were lost in the February 1918 raid. Although German torpedo boats engaged the destroyer HMS *Laverock* in the February 1917 raid, no vessels were lost. In the March 1917 raid, destroyers HMS *Paragon* and HMS *Llewellyn* were torpedoed; HMS *Paragon* sank. In the April 1917 raid there was an intense action between German torpedo boats and the destroyers HMS *Broke* and HMS *Swift*; two torpedo boats – *G-42* and *G-85* – were sunk. Although these German raids focussed on the barrage, they had other objectives too, including sweeps into the Downs and along the Channel looking for cross-channel transports or merchant ships (resulting in the loss of SS *The Queen*[24] in October 1916 and SS *Greypoint*[25] in March 1917), and bombardment of Ramsgate and Broadstairs in March 1917 and Dover and Calais in April 1917. Of course, the Alllies took opportunities to attack German surface forces based in Flanders when opportunities occurred or could be created: one notable loss was the German destroyer *G-88* off Zeebrugge in April 1917, the first ship to be lost in a torpedo attack by coastal motor boats (CMBs). The British had noted that the Germans moved their destroyers out of the harbour at Zeebrugge during air raids, so set an aerial trap to be sprung by the newly developed CMBs (Bacon 1919b, 2:468; Karau 2015, 128).

3.2.16. As well as the nets, booms, loops and patrolling vessels, reference also has to be made more generally to the role of aircraft in seeking to block the passage of U-boats through the Dover Strait. Despite the recent advent of powered heavier-than-air flight, aircraft were deployed in the Dover Sector from the earliest stage: a coastal patrol of the whole east coast was ordered on 8th August 1914, with the Royal Flying Corps (RFC) responsible for the section from Clacton round to Dungeness (Raleigh 1922, 1:360). To cover the British Expeditionary Force crossing to France, seaplane patrols were flown from Westgate (St. Mildred's Bay, just east of Margate) and airships based at Kingsnorth (HMA No. 3 – Astra Torres; and HMA No. 4 – Parseval) patrolled the southern North Sea and Dover Strait (Raleigh 1922, 1:361–64). The intention of these early patrols was to report on enemy ships, aircraft and submarines; and it is important to note that throughout the

[22] And see https://www.islandeye.co.uk/history/lighthouses/nab-tower.html.

[23] For historical accounts of the raids see:

	(Newbolt 1931; 1928)	(Karau 2015)	(Faulkner 2015)	(Hepper 2006)
26-27 Oct 1916	IV 53-66	75-79	112-113	71-72
25 Feb 1917	IV 353-355	119-120	122-123	
17 March 1917	IV 361-368	120-121		83
20-21 Apr 1917	IV 372-378	124-126	126-127	
14-15 Feb 1918	V 210-220	175-178	144-145	121-122

[24] UID 813816; https://wrecksite.eu/wreck.aspx?40.

[25] UID 883711; https://wrecksite.eu/wreck.aspx?118465.

First World War, Allied aircraft in the Dover Strait continued to be used for multiple purposes. Preventing the passage of U-boats included not only spotting and attacking them directly, but also bombing their bases at Bruges, Ostend and Zeebrugge; spotting for naval bombardments of the ports and the artillery protecting them; and defending against enemy fighters and bombing raids. The latter included offensive as well as defensive actions against German Zeppelins and heavy-than-air aircraft attacking Allied ports and targets further inland.

3.2.17. As already indicated, both Allied and German forces used both lighter-than-air and heavier-than-air craft in the Dover Sector. Lighter-than-air included rigid airships and, especially among the Allies, non-rigid airships – comprising a 'blimp' with a powered gondola beneath. Unpowered 'kite' balloons were also deployed onshore (for artillery spotting) and towed by ships. Heavier-than-air craft in the Dover Sector included land planes, seaplanes (on floats) and flying boats (with hulls directly on the water). All could serve in reconnaissance, fighter and bomber roles, though with growing specialisation as the war progressed.

3.2.18. Aside from the early role of the RFC in coastal patrols, the Royal Naval Air Service (RNAS) had principal responsibility for Allied aviation in the Dover Sector, including supporting the RFC at times with respect to 'military' objectives in addition to its 'naval' objectives. RNAS activities were integrated across the Channel as a combined Dover-Dunkirk command, which – from August 1915 – fell under the overall command of the Dover Patrol. Even after the integration of the RNAS and RFC to form the Royal Air Force (RAF) in April 1918, one wing was attached permanently to the Dover-Dunkirk Command under the operational command of the Senior Naval Officer (Jones 1937, 6:380–81).

3.2.19. A seaplane base was established at Dunkirk on 31st October 1914 (Raleigh 1922, 1:393); RNAS landplanes were to become well established at airfields the vicinity of Dunkirk also. On the UK side, the seaplane station at Westgate continued to be used and a new seaplane station was set up within Dover Harbour on 21st November 1914 as a response to the torpedoing of HMS *Niger* in the Downs earlier in the month (Jones 1928, 2:340). The increasing impact of U-boats from February 1915 led to the creation of the Submarine Scout (SS) non-rigid airships[26], initially consisting of the fuselage of a BE2c aircraft slung under a Willows airship (Jones 1928, 2:345–46). In the Dover Sector, airship stations were established at Capel-le-Ferne (between Dover and Folkestone – Figure 12) and Polegate (east of the Dover Sector, inland of Beachy Head) in May and July 1915 respectively[27]. An airship station was also established at Marquise between Calais and Boulogne in June, though this passed to French forces in January 1916 (Jones 1928, 2:346). RNAS landplanes were based at Dover (Guston Road – Burgoyne Heights, above Dover Eastern Docks).

[26] https://www.iwm.org.uk/collections/item/object/205357111.

[27] A later Coastal class (C.23A) and two SSZs (SSZ 3; SSZ 4) appear to have been filmed at Capel IWM 551. See Reel 7 from 09:27; and over Folkestone from 14:25.

Figure 12: Submarine Scout and Coastal class airships over the Warren, immediately south of Capel-le-Ferne. Folkestone Harbour in the background. © IWM Q 18268.

3.2.20. As well as airfields on land, there were German seaplane stations at Zeebrugge (Flanders I) and Ostend (Flanders II), equipped in particular with floatplane fighters that were 'often superior, and never inferior' to Allied patrol aircraft in performance and in numbers (Jones 1937, 6:380). Heavier German floatplanes were used as bombers and – as discussed below – torpedo bombers. Both sides had guns of various calibres both on land and on vessels that could be used against aircraft, including anti-aircraft mountings.

3.2.21. Allied aircraft certainly observed and attacked U-boats in the Dover Sector, including alerting other units to make attacks also. Establishing how much damage was actually done to U-boats by air attack – including definite losses – is a harder task, reflecting overall ambiguities in U-boat losses and their causes magnified by the circumstances of most air attacks. Confident accounts of bombs hitting U-boats are not matched by recorded losses; but equally, air attack may have contributed to losses attributed to other causes. Moreover, the measure of effectiveness of the air war against U-boats is not only about successful attacks; aircraft had a major role in reducing the effectiveness of U-boats by disturbing and deterring their activities.

3.2.22. Ships and aircraft worked in close collaboration in the Dover Sector, helped in particular by wireless communications between the air and the ground. This was especially important for airships that had relatively little scope to make successful attacks on U-boats themselves but could call upon vessels to do so. In order to improve the position-fixing of airships – so that their reports would be more accurate – a series of direction finding stations were set up after August 1915 at Sandwich, Lydd and Pevensey for the Dover Strait (Jones 1928, 2:391–92; Phimester 2015 OA.67 (Sandwich); OA.42 (Lydd); OA.58 (Pevensey)). Direction Finding had been used to locate German vessels (including U-boats) from their transmissions since early in the war, but it wasn't until May 1917 that intelligence was communicated directly from the Admiralty to air stations so that they could take immediate action; a chart of coded squares was introduced to facilitate this in July 1917 (Jones 1933, 50). However, McCartney (2019) has underlined the discipline with which U-boats based in Flanders maintained radio silence, removing the opportunities for direction finding and other signals intelligence afforded by U-boats based with the High Seas Fleet in Germany.

3.2.23. Although there were instances of U-boats shooting down attacking aircraft or capturing them on the surface, their most effective defence was probably German seaplane fighters. Their advantage over airships eventually precluded non-rigids patrolling south of Norfolk from December 1917 (Jones 1933, 62–63). German seaplanes also had the advantage over Allied seaplanes; given that the benefit of being able to land on the sea declined as aircraft engines improved, especially in the

narrow seas of the Dover Sector, then Allied seaplanes were withdrawn in favour of landplanes after June 1917 and remaining seaplanes and a flying boat had to be escorted. By February 1918 the seaplane station had been handed over to the Americans and only one flight of Short 184s was retained at Dover (Bacon 1919b, 2:554–56; Jones 1933, 72–74). The Short 184s were eclipsed by Handley Page 0/100 landplanes used in the Dover Sector from March 1917, initially for daylight patrols but thereafter provided a heavy bombing capability for night raids against the German naval bases and other targets in Flanders (Bacon 1919b, 2:562; Jones 1933, 81). Concrete shelters constructed in Bruges, Zeebrugge and Ostend to protect U-boasts and other vessels from such bombing (Jones 1933, 103–6) anticipated the monumental pens of the Second World War.

Archaeological remains of the blockade

3.2.24. The effort to prevent U-boats from traversing the Dover Strait was of tremendous significance to the Allies and required massive expenditure in time and effort, as well as technical innovation. Despite its importance in the strategic landscape of the First World War, the blockade appears only to have limited archaeological expression. Much of the blockade's infrastructure was deployed on the seabed – especially in the form of mines with their sinkers but also nets, booms and indicator loops, plus buoys and moorings, it is likely that most of this was recovered or swept up during the war or in the immediate post-war period. Some WWI blockade-related material may still be present[28]; but if so, it is largely invisible. The direct physical manifestation of the blockade in its various forms is not reflected in archaeological records. The partial exception to this is the Nab Tower, effectively a relic of the blockade even though it was not deployed in its intended context; nonetheless, it is significant because of its origin.

3.2.25. The blockade was installed by Allied vessels taking part in minelaying, net laying, cable laying and so on, and by further vessels that provided defence during those installation operations. An even larger number of vessels – especially minor warships such as drifters, trawlers, and Motor Launches (MLs) – was involved in patrolling the blockade. Although of critical importance in difficult and often dangerous circumstances, relatively few vessels were lost in installing and maintaining the blockade of the Dover Strait. One example, already mentioned, was the Trinity House Vessel *Alert*[29]; THV *Alert* was a very capable vessel engaged in lifting and re-laying buoys when, in April 1917 it fouled a mine and was sunk off the coast between Calais and Gravelines (Woodman 1983, 103–4). Although outside the Dover Sector study area, reference might also be made to HMS *Princess Irene*[30] which exploded at Sheerness in May 1915 with huge loss of life while mines were being prepared for laying (Director of Naval Warfare 1973, 9).

3.2.26. The scores of vessels engaged in the day-in-day-out travails of patrolling the blockade are best represented archaeologically by the vessels lost in the German raids in October 1916, March 1917, and February 1918. The following vessels engaged in maintaining the blockade were lost in these actions, often with heavy loss of life (60 aboard HMS *Flirt*; 75 aboard HMS *Paragon*; typically 9-10 on each drifter: none are designated under Protection of Military Remains Act (PMRA) 1986:

Name	Vessel	SIT/CAS	UID	Wrecksite
Oct 1916				
HMS *Datum*	Drifter	CAS	1201659	https://wrecksite.eu/wreck.aspx?257248
HMS *Gleaner of the Sea*	Drifter	CAS	1201655	https://wrecksite.eu/wreck.aspx?257255
HMS *Spotless Prince*	Drifter	CAS	1201633	https://wrecksite.eu/wreck.aspx?257269
HMS *Waveney II*	Drifter	CAS	1201791	https://wrecksite.eu/wreck.aspx?257268
HMS *Ajax II*	Drifter	CAS	1201667	
HMS *Launch Out*	Drifter	CAS	1201654	https://wrecksite.eu/wreck.aspx?257258

[28] Wrecksite refers to the presence on the seabed of an Anti-Submarine Net Buoy but contains no further detail: https://wrecksite.eu/wreck.aspx?73343.

[29] https://wrecksite.eu/wreck.aspx?134623.

[30] UID 904923; UID 971014.

HMS *Roburn*	Drifter	CAS	1201652	
HMS *Flirt*	Destroyer	SIT	901838; 883706	https://wrecksite.eu/wreck.aspx?2932
HMS *Nubian* (bow section)	Destroyer	SIT	1540610	https://wrecksite.eu/wreck.aspx?433
Mar 1917				
HMS *Paragon*	Destroyer	SIT	1197513	https://wrecksite.eu/wreck.aspx?10748; https://wrecksite.eu/wreck.aspx?4712
Feb 1918				
HMS *Christina Craig*	Drifter	CAS	1256261	https://wrecksite.eu/wreck.aspx?257240
HMS *Clover Bank*	Drifter	CAS	1256444	https://wrecksite.eu/wreck.aspx?257237
HMS *Cosmos*	Drifter	CAS	1256323	https://wrecksite.eu/wreck.aspx?257241
HMS *Jeannie Murray*	Drifter	CAS	1256281	https://wrecksite.eu/wreck.aspx?257257
HMS *Silver Queen*	Drifter	CAS	1256242	https://wrecksite.eu/wreck.aspx?257266
HMS *Veracity*	Drifter	CAS	1256321	
HMS *W Elliott*	Drifter	CAS	1256282	https://wrecksite.eu/wreck.aspx?257267
HMS *James Pond*	Trawler	CAS		https://wrecksite.eu/wreck.aspx?202215

Table 2: RN vessels sunk in German raids on the Dover Strait in WWI

3.2.27. As well as its bow section left on the seabed, HMS *Nubian* is understood to be represented by another archaeological trace. Whilst being towed back to Dover, the tow parted and HMS *Nubian* came ashore under South Foreland[31]. A cutting had to be blasted through the rocks in order that it be refloated; this cutting may still be visible (Bacon 1919b, 2:619; Plate LXIII).

3.2.28. Dunge Coastguard Station, where the western indicator loop came ashore, still stands as a series of private dwellings at NGR 608760118520. The GPO cable hut where the eastern indicator loop came ashore at Dumpton Gap also seems to survive at NGR 6399530 166680. Otherwise, the shore-based infrastructure for the blockade largely comprised the port and harbour facilities that served the minelayers, net layers and patrol vessels, not least at Dover. Reference might also be made to the industrial hinterland required by the construction and maintenance of the blockade: the scale of deployment of mines, nets and other infrastructure, together with ancillaries such as sinkers and cables, amounted to a huge quantity of materiel that had to be produced and transported to the Dover Sector. The fact that the installed blockade no longer survives should not detract from an appreciation of the wartime effort required, as much as if it had been made of concrete.

3.2.29. The role of air power in the blockade might, in principle, be reflected in the remains of aircraft lost at sea. Only one First World War aircraft is recorded in the Dover Sector in Historic England's records, a Gotha that crashed off Folkestone in 1917[32], and even this is a casualty (recorded loss) rather than a known site. There are, however, numerous references to aircraft of different types being brought down in the Dover Sector, some of which appear to have been salvaged at the time, but others surely reached the seabed. Discoveries in the Humber point to the potential survival of the remains of First World War aircraft in the sea, despite their generally light construction (Firth 2014, 33–34). Such remains would be highly significant, including the remains of RNAS/RAF aircraft in the waters of France, Belgium, or the Netherlands. Instances of aircraft that crashed include the Coastal class airship C.17, which was shot down in flames off North Foreland (possibly to the north of the Dover Sector) by a German seaplane fighter from Zeebrugge in April 1917 (Jones 1933, 62). Also in April 1917, a Handley Page 0/100 was lost off Ostend (Jones 1933, 81); and another in April 1918 in connection with the first cancelled raids on Zeebrugge and Ostend (Jones 1937, 6:386). It seems likely that a Short 184 was lost when, due to engine failure, it alighted on the sea close to a U-boat it was about to attack; the U-boat took the aircrew prisoner and submerged (Jones 1933, 70). A comprehensive trawl through the literature would probably result in many recorded losses of aircraft in the Dover Sector in WWI, but firm locations are likely to be rare.

[31] UID 1540613.
[32] UID 1536476.

3.2.30. There is greater certainty in respect of the physical remains of seaplane and airship stations, and of airfields used by landplanes involved in the blockade. The seaplane station at Dover can be precisely located – there is detailed film of it in operation[33] – but the site was redeveloped as a landing place for Landing Craft Tank (LCTs) in WWII (see below); it is now crossed by the approach road for Dover Eastern Docks, though foundations might survive in the adjacent land. The airship stations at Capel[34] and Polegate[35] have surviving remains (Cant and Dunkley 2018, 58–59). Satellite images suggest remains are still present at Dover (Guston Road), not far to the north of the scheduled area of Fort Burgoyne[36]. Drone photographs recently demonstrated the presence of below ground remains at the seaplane station at Westgate[37]. The potential for the survival of remains associated with the DF wireless stations established for tracking airships at Sandwich, Lydd and Pevensey has also been suggested (Phimester 2015 Table 1).

3.2.31. The most evident archaeological remains of the blockade are, however, the wrecks of the U-boats that were sunk by it. These wrecks are now relatively well documented, especially through the work of McCartney (2015), Termote (2017) and investigations funded by Historic England. Although some ambiguities remain in the identities of known U-boat wrecks, their overall spatial and chronological patterning corresponds closely to the efforts to blockade the Dover Strait (Table 3).

ECWCs ID	Vessel name	Class	Location	UID	Date of Loss	Cause of Loss
1069	*U-11*	U	Belgium	901814	09/12/1914	Mined
1074	*U-8*	U	Folkestone	901747	04/03/1915	Netted
1071	*U-37*	U	Channel	904860	30/04/1915	Mined
1084	*UB-29*	UB II	Channel	831686	13/12/1916	Mined
	UB/UC II		Dover		13/12/1916	
1105	*UC-46*	UC II	Dover	901819	08/02/1917	Ramming
	UB-39	UB II	Channel		07/05/1917	Mined
1102	*UC-26*	UC II	Dover	883715	09/05/1917	Ramming
	UC-61	UC II	Gris Nez		26/07/1917	Stranded
	UB-20	UB II	Belgium		28/07/1917	Mined
	UC-72	UC II	Dover		12/08/1917	Mined
1110	*UC-63*	UC II	Channel	1490000	01/11/1917	Torpedoed
1073	*U-48*	U	Ramsgate	904880	24/11/1917	Stranded
1093	*UB-56*	UB III	Folkestone	901760	19/12/1917	Mined
	Submarine		Gris Nez		01/01/1918	
	U-93	U	Le Touquet		17/01/1918	Mined
	UB-35	UB II	Dover		26/01/1918	Depth Charged
	U-109	U	Gris Nez		28/01/1918	Mined
1088	*UB-38*	UB II	Folkestone	1536010	08/02/1918	Mined
1094	*UB-58*	UB III	Folkestone	901756	10/03/1918	Mined
	UC-79	UC II	Gris Nez		01/04/1918	Mined
1087	*UB-33*	UB II	Folkestone	1477356	11/04/1918	Mined
1092	*UB-55*	UB III	Folkestone	901772	22/04/1918	Mined
1086	*UB-31*	UB II	Folkestone	901777	02/05/1918	Depth Charged
1096	*UB-78*	UB III	Folkestone	1388897	09/05/1918	Ramming
1117	*UC-78*	UC II	Gris Nez	1536009	09/05/1918	Ramming
1112	*UC-64*	UC II	Folkestone	1489948	20/06/1918	Mined
1076	*UB-108*	UB III	Folkestone	901764	14/07/1918	Mined

[33] IWM 570 https://www.iwm.org.uk/collections/item/object/1060023112.

[34] UID 1413688. Kent HER TR 23 NE 29. And see https://www.pinterest.co.uk/pin/392516923766181407/.

[35] UID 972519.

[36] LEN 1004224.

[37] https://theisleofthanetnews.com/2018/08/20/aerial-photos-show-ghost-outline-of-first-world-war-seaplane-hangar-in-westgate/. And see Kent HER TR 37 SW 79.

ECWCs ID	Vessel name	Class	Location	UID	Date of Loss	Cause of Loss
1116	*UC-77*	UC II	Folkestone	1490147	14/07/1918	Mined
	UB-103	UB III	Gris Nez		14/08/1918	Mined
1081	*UB-12*	UB I	Ramsgate	904896	24/08/1918	Mined
1077	*UB-109*	UB III	Folkestone	901790	29/08/1918	Mined
	UB-40	UB II	Channel		05/10/1918	Scuttled
1121	Unidentified U-Boat		Folkestone	813472		

Table 3: U-boats lost in Dover Sector, 1914-18

3.2.32. The preponderance of losses in the Folkestone – Gris Nez area from November 1917 onwards is a physical manifestation of the effectiveness of the blockade in its eventual form, though the fact that losses continued through to the end of August 1918 shows that U-boats were still willing to risk transiting. Earlier blockading efforts also resulted in losses, through the measures directed at the Belgian coast, through the original Dover Strait Minefield to the east, and through the net and mine defences of the Cross Channel Barrage from South Goodwin to Dunkirk from September 1916. Although extensive, blockade efforts in the first three years of the war appear to have been relatively ineffective, especially in 1916. Nonetheless, losses to ramming and even stranding reinforce the point that mining should not be seen in isolation; various measures were applied which, collectively, rendered the Dover Sector hazardous to transiting U-boats: even if it did not prove sufficiently hazardous until 1918.

3.2.33. The chronology of types of U-boats wrecked in the Dover Sector is also notable. The presence of U-types (based in Germany) within the Dover Sector is apparent in the losses of 1914 and early 1915. The absence of UB I and UC I types whose ability to transit the Dover Strait was demonstrated in June 1915 might indicate that their limited capabilities confined their actions predominantly to the North Sea and the East Coast War Channels. The commissioning of UB II and UC II types in December 1915 and June 1916 respectively extended both range and capability; these types were plainly active in the Dover Sector and are the main source of losses in 1917; but such losses did not start to occur until December 1916. Longer range UB III types – commissioned in Flanders from August 1917 – form a substantial proportion of the Dover-Gris Nez losses in 1918.

3.2.34. Each U-boat wreck in the Dover Sector has significance in itself, because of the specific characteristics of its construction and commissioning, its history in use, and the circumstances of its loss. U-boats caused death and destruction, but sight should not be lost either of the horrific conditions in which many U-boat crew members died, remembering too that the time and place of their deaths often remained unknown to their kin. For these reasons, U-boat wrecks are important as individual places. U-boats are also important in terms of their individual landscapes. Like other vessels, there is a geography to the journeys U-boats made: given the importance of U-boats to the overall conduct of the First World War, this geography is essential to understanding the conduct of the war by Germany, Allied forces, and Neutrals. Unlike most other vessels, the geography of many U-boats still has a physical presence in the wrecks of the ships they sank, whether by shelling and scuttling, by torpedo, or by laying mines. With exceptions – discussed in following sections – the landscape of wrecks lost to individual U-boats largely lies outside the Dover Sector; but the routes which U-boats took between their targets and their bases often lay through the Dover Strait. As a result, it is still a central feature of their landscape: the Dover Strait would be a hugely important feature of the U-boat war in WWI – and of the landscape of the First World War as a whole – even if not a single U-boat were to lie wrecked within it.

3.2.35. Nonetheless, the Dover Sector was also important as a key battleground in which Allied forces sought to stop the flow of U-boats, making it different to other stretches of water that U-boats frequently traversed. As discussed, this battleground had different elements and chronological phases: the blockade of Ostend and Zeebrugge; the minefields east of the Dover Strait; and the mine nets between Dover and Dunkirk. These may be represented archaeologically by the remnants of nets, mines, sinkers and other infrastructure on the seabed, and they are all

represented by specific U-boat wrecks. However, these other blockade elements were significantly outperformed by the Folkestone-Gris Nez barrage comprising deep mines, the accompanying patrols, light barrage, indicator loops, controlled mines and other infrastructure. The barrage was a focus of intense activity in both its construction and maintenance and had distinct spatial extents and a confined chronology – between November 1917 and November 1918. The barrage played a critical role in defending shipping from U-boats and is most obviously manifest in the discrete grouping of U-boat wrecks that demonstrate the barrage's effectiveness. The Folkestone – Gris Nez barrage can be seen as a fortification as important to the Allies as the system of trenches in Belgium in France. Even though the thousands of mines would have been invisible, the lines of patrol vessels and aircraft would have been visible to people at sea and onshore alike; whilst at night the light barrage must have been a striking presence closing the Dover Strait between England and France. This fortification – about 20 miles long by 5 miles wide – is kept visible today by the score of U-boat wrecks that are associated with it; and whose collective importance extends beyond their individual significance as a result.

3.2.36. Four U-boats associated with the Folkestone-Gris Nez barrage have been subject to detailed investigations by Historic England: *UB-31* (Wessex Archaeology 2014b); *UC-78* (Wessex Archaeology 2015b); *UB-12* (Wessex Archaeology 2016); and *UB-109* (Wessex Archaeology 2015a). U-boat *U-8* has also been investigated by Historic England (Wessex Archaeology 2015c; Cant and Dunkley 2018, 50), but the loss of *U-8* was attributable to indicator nets in March 1915 rather than the Folkestone -Gris Nez barrage. In 2019, *UB-31* and *UB-78* associated with the Folkestone-Gris Nez barrage were designated under the PMRA 1986[38].

3.3. Blockading the Dover Sector in the Second World War

U-boats

3.3.1. As the prospect of war with Germany increased again in the late 1930s, the UK returned to the effectiveness of the Folkestone-Gris Nez barrage in stemming the flow of German U-boats. Plans were laid from Spring 1938, to include deep mines between Folkestone and Gris Nez supported by shallow and deep mines further east between the Goodwins and Ruytingen bank (roughly Dover – Dunkirk), plus indicator loops (Director of Naval Warfare 1973, 47). War was declared on 3rd September 1939 and mining swiftly followed (Director of Naval Warfare 1973, 49–55):

5th September	Mining commenced by the French Navy off Dunkirk.
11th-16th September	Mining by the RN on the Goodwins-Ruytingen (GR) lines: 3,119 mines in five lines, A-E.
25th September to 23rd October 1939	Folkestone-Gris Nez barrage: 3,636 mines laid as 12 lines, F-Q.
2nd November	Further 502 mines laid in three lines between the Tail of the Falls and Sandettie Bank
November 1939; February 1940	Folkestone – Gris Nez barrage extended and reinforced.

3.3.2. Further plans were interrupted by the German invasion of Holland, Belgium and France, which necessitated the dispatch of minelayers to assist in the evacuation of French ports. Now obsolescent as a blockade against U-boats, attention switched to reframing the minefields in the Dover Sector to become anti-invasion defences (Director of Naval Warfare 1973, 57 et seq.). Subsequently the emphasis changed to offensive mining against the German-held coast of the Continent (see below).

[38] https://www.legislation.gov.uk/uksi/2019/1191/contents/made Schedule 1 (ch), (cl).

3.3.3. Although the effort to blockade the Dover Strait against U-boats was relatively brief, it was effective. German reports subsequently indicated that three U-boats successfully transited the Strait (*U-31*; *U-15*; *U-16*) from east to west. But three were lost: *U12*; *U-40*; and *U-16* returning west to east. A further U-boat, *U-35*, turned back due to the hazards and entered the Channel from the west using the north-about route (Director of Naval Warfare 1973, 66–68) ((BR 1736(56)(1) 66-68). Transiting the Dover Strait was abandoned from October 1939.

3.3.4. Of the three U-boats that fell victim in the Dover Sector in WWII, *U-12*[39] was lost after 8th October 1939, presumably due to mines, and has yet to be located (McCartney 2015, 177–78). The wreck is designated as a protected place under the PMRA 1986 even though the location of the wreck is not known[40].

3.3.5. *U-40*[41] was mined on 13th October 1939 in the Goodwins-Ruytingen area, in French waters off Calais (McCartney 2015, 173–74).

3.3.6. *U-16* was sunk on 25th October 1939 at south of the Goodwins after being depth charged by HMS *Puffin* and HMS *Cayton Wyke*. McCartney (2015, 178) notes that the wreck of *U-16* has not been located, but it is regarded as a known site in other records[42]. Although neither identity is absolutely confirmed, the wreck of *Cayton Wyke* – sunk by an S-boat in July 1940 – is reported to lie only about 1.3km from *U-16*, which makes an interesting grouping.

3.3.7. U-boats stayed out of UK coastal waters until 1944 and even at that point their approach was from the west, from bases on France's Atlantic coast. Other than measures associated with Operation Maple – mining in support of Operation Neptune (Director of Naval Warfare 1973, 346 et seq.) – anti-U-boat mining in the English Channel was contemplated again only after July 1944 as a consequence of attacks made on supply routes to Normandy. U-boats were withdrawn from their French bases to regroup in Norway in August 1944; when the inshore campaign commenced in September 1944 – encompassing the English Channel from December 1944 – U-boats transited via the north about route, not via the Dover Strait (Director of Naval Warfare 1973, 241; 263–67; McCartney 2015, 6). Consequently, mining focussed on the Channel west of Brighton (Director of Naval Warfare 1977, fig. 43) and there was no return to blockading U-boats in the Dover Sector.

Operation Cerberus

3.3.8. An infamous event that sits alongside the attempts to close the Channel to German naval vessels in the Second World War is Operation Cerberus, known as the Channel Dash, in February 1942 (Roskill 1956, 149–61). In this case, however, German vessels were not embarking directly on offensive operations but transiting between bases. In essence, Cerberus was a bold and risky plan to redeploy the battleships *Scharnhorst* and *Gneisenau* and the heavy cruiser *Prinz Eugen* – heavily defended by smaller vessels and air cover – from Brest on the Atlantic coast of France via the English Channel to Germany in readiness for operations off Norway.

3.3.9. In a costly and ignominious fashion, Britain failed to block the passage of the German force through the Dover Sector, though *Scharnhorst* and *Gneisenau* suffered damage from mines further to the north. Poor weather contributed, but effective planning and implementation of the operation by Germany and a series of failings by British forces meant that the three capital ships and their escorts successfully traversed an area in which they were intensely vulnerable. Broadly, the German force hugged the French coast until they passed Gris Nez; then passed on a more central

[39] UID 1448364.

[40] https://www.legislation.gov.uk/uksi/2019/1191/contents/made Schedule 1 (cg).

[41] SHOM FR 0000007475 00001;

UKHO 14916 – though identified as *UB-40* which is pictured blown up in dry dock in Ostend in October 1918 by Termote (2017, 258).

[42] UID 813847; UKHO 13666.

route off the East Coast of Kent to avoid the sandbanks of the Belgian coast; and then onwards into the southern North Sea.

3.3.10. Redeployment of the German force from Brest had been anticipated by the British but was not picked up until it was observed off Le Touquet, entering the Dover Sector, shortly before 1100 on 12th February (Roskill 1956, 155). British coastal batteries fired on the ships ineffectively in the Dover Strait from about 1220. Six Swordfish torpedo bombers attacked off East Kent around 1230-1240, but were all shot down. Five MTBs tried to attack at about the same time, but also unsuccessfully. Subsequent direct attacks by Beaufort torpedo bombers, by heavy bombers and by destroyers all took place to the north of the Dover Sector, and were also ineffective. Aerial mining by British aircraft before and during the operation was more effective: *Scharnhorst* triggered mines on two occasions; and *Gneisenau* also triggered one (Director of Naval Warfare 1973, 317–19; Roskill 1956) . Although not catastrophic, both ships were affected and required dry dock repairs once they reached Germany.

3.3.11. Despite the damage eventually achieved, the outcome was in stark contrast to Japan's sinking of the battleship HMS *Prince of Wales* and battlecruiser HMS *Repulse* just two months earlier, in more open water and further from attacking bases (Roskill 1954, 566–67). Unlike the South China Sea, the archaeological record of Cerberus does not consist of the wrecks of two or even three WWII capital ships in the Dover Sector. Instead, it might comprise the unlocated or unidentified remains of six Swordfish aircraft and possibly some other crash sites of Allied and German aircraft lost in Cerberus-related engagements. The wreck of *Scharnhorst* lies in the Barents Sea[43] and the *Prinz Eugen* in the Marshall Islands[44]; the *Gneisenau* was scrapped but one of its turrets survives in Norway[45].

[43] https://wrecksite.eu/wreck.aspx?115556.
[44] https://wrecksite.eu/wreck.aspx?138267.
[45] https://en.wikipedia.org/wiki/Austr%C3%A5tt_Fort.

4. Cross-channel Transport

4.1. Overview

4.1.1. The UK conducting war on the Continent was central to Allied efforts in both the First and Second World War; sea transport was fundamental to this effort. The first phases of both conflicts required deployments of the British Expeditionary Force (BEF). In the First World War, these initial deployments developed into regular cross-channel transport for the duration. The initial deployments and regular traffic are both discussed here.

4.1.2. In the Second World War, arrangements following the initial deployments were curtailed by the emergency evacuation of the BEF and French forces from the Channel ports of Boulogne, Calais and Dunkirk. These evacuations are addressed in the section on shore-oriented operations below. Similarly, the initial re-establishment of Allied forces on the Continent in 1944 through Operation Neptune is also regarded as a shore-oriented operation, below.

4.1.3. Following D-Day on 6th June 1944, Allied forces on the Continent were supplied at first through the Normandy bridgehead and by ports to the west of the Dover Sector, as they became available. Boulogne and Calais were not liberated until late September 1944 and – because of damage – their ports did not become operational until October and November; Dunkirk was left as a German enclave until VE day in May 1945. In any case, the port of Antwerp was regarded as more important logistically and had been secured largely intact in early September, though it could not start to receive ships until late November once German forces controlling the Westerscheldt had been defeated. Antwerp lies beyond the Dover Sector, but the approaches to the Westerscheldt are within the study area: the amphibious operations to secure the Westerscheldt are addressed in the section on shore-oriented operations below; whilst the effort to maintain cross-channel transport via the Westerscheldt in the face of German attacks is addressed in this section.

4.1.4. One of the paradoxes of maritime archaeology is that much human activity leaves little trace: there is little in the way of physical trace once the wash of a vessel has dissipated unless a catastrophe takes the vessel to the seabed. This appears to be especially true of cross-channel transport in WWI and WWII. As will be noted, some ships did sink but they were very few relative to the huge number of crossings and the volume of people and material that were transported. Considering the points on the coast where these crossings started and ended, it should also be recognised that wartime damage, reconstruction and redevelopment are likely to have removed many of the physical traces of their busy history during each world war. Consequently, the element of the Dover Sector's wartime history that is quantitively greatest is probably the least represented by the archaeological record. Surviving heritage assets relating to cross-channel transport are correspondingly important and there is special need to reflect its magnitude in public interpretation.

4.2. Initial cross-channel deployments in WWI

4.2.1. Although the Channel ports of Dover and Folkestone present the shortest sea crossings, other ports played a very significant role in both conflicts, especially Southampton and Newhaven, both outside the Study Area. Troops, horses and hospital ships mobilised at Southampton when the BEF embarked in 1914; Newhaven was the principal port for stores with heavier equipment embarked at Avonmouth and Liverpool. Glasgow, Dublin, Queenstown and Belfast were used in embarking units from Scotland and Ireland. The main port of arrival was Le Havre at the mouth of the Seine, with some vessels proceeding up river to Rouen – both outside the Study Area – and a few to Boulogne (Corbett 1920, vol. 1, chap. V). The mobilisation started on 9th August with the bulk of the force crossing between August 12th and August 23rd (Corbett 1920, 1:78–81).

4.2.2. Between the mobilisation in August and the conclusion of the 'Race to the Sea' in mid-late October 1914 – which determined the general disposition of combatants for the following four years – the

situation was highly fluid. The Channel ports on the continental coast were at catastrophic risk of capture, but also provided vital bridgeheads for short-term reinforcement and flanking moves. Allied forces were deployed, withdrawn and redeployed by sea in a complex series of operations, all with equally complex cover against seaborne attack. Operations included the deployment of three battalions of Marines to Ostend in late August followed by their evacuation soon after; the wholesale movement of supply bases in September[46]; and deployment of the Royal Naval Division and other reinforcements to Dunkirk, Zeebrugge and Ostend in early October. No transports were lost in any of these extensive cross-channel operations. However, the minesweeping trawlers HMS *Princess Beatrice*[47] and HMS *Drumoak*[48] were lost between Sandettie Bank and Fairy Bank[49] on 5th October en route to sweep an Allied minefield that had been laid to protect cross-channel transports but had to be removed to allow reinforcements to be deployed (Corbett 1920, vol. 1, sec. Oct. 4-5, 1914).

4.3. Regular cross-channel traffic in WWI

4.3.1. As noted previously, the Race to the Sea ended with Ostend and Zeebrugge under German control, whilst Dunkirk, Calais, Boulogne and ports further west remained in French hands. Ports such as Southampton and Newhaven remained very important for cross-channel transport, but the English ports of the Dover Sector also became focal points for cross-channel transport. Ramsgate and Dover were used predominantly for naval operations but there were cross-channel services at both Folkestone and Dover, operated by the South Eastern and Chatham Railway (SE&CR). Richborough became very important for cross-channel transport later in the war.

Dover Strait

4.3.2. Folkestone was an established port for civilian cross-channel passengers and their volume increased substantially at the start of the war (Yelverton and Carlile n.d., 186). Initial movements of people through Folkestone were increased by those fleeing Belgium, including civilians and wounded soldiers: while Dover received over 15,000 refugees from Belgium, refugees at Folkestone totalled 108,500, first arriving on fishing boats and colliers around 20th August 1914 (Pratt 1921, 1096, 1097).

4.3.3. A key event on 26 October 1914 was the torpedo attack by a U-boat on the French packet boat SS *Amiral Ganteaume* off Cap Gris Nez, en route from Ostend to Le Havre via Calais carrying 2,500 Belgian refugees. The attack, ascribed to *U-24*, was without warning: initially thought to have been caused by a mine, the damage and fragments of torpedo proved that in fact this had been among the first attacks by a U-boat on a civilian ship. The cross-channel ferry SS *The Queen* was returning from Boulogne when *Amiral Ganteaume* was hit, taking off almost 2,000 passengers ship-to-ship in chaotic circumstances. As well as engine room crew lost in the initial explosion,

[46] 'At Havre and Rouen, besides the various disembarkation staffs, there were, with reinforcements held up there, 15,000 officers and men and 1,500 horses, and amongst the vast quantities of stores that had accumulated in the two places there were no less than 60,000 tons of oil … For the bulk of this our Admiralty had to provide tankers as well as transport for the troops and our own stores. … Of the [French] troops at Dunkirk, so many as were not required for a garrison, the French were able to embark in their own transports, and to transfer them to Honfleur; but for the rest that lay out in the departments to the number of 25,000, mainly Territorials, the assistance of the Admiralty had to be sought. It was readily granted, and in due course all were embarked in British ships and landed at La Rochelle. Besides these, 2,000 Belgians at Havre, who had been found fit for service, were also carried with 2,000 horses to Ostend, and 10,000 French from Calais to Cherbourg … In the final six days of the evacuation there had left Havre 20,000 officers and men, 4,000 horses, and 60,000 tons of stores' (Corbett 1920, vol. 1, chap. VIII).

[47] UID 1403390.

[48] UID 1366089.

[49] See TNA ADM 137/3109. Historic England's records for Princess Beatrice and Drumoak incorrectly attribute them to being lost off Tynemouth.

about 20-30 people were lost or severely injured in harrowing circumstances during the transfer [50]. *The Queen* landed the people saved at Folkestone (Yelverton and Carlile n.d., 187–89). The *Amiral Ganteaume* did not sink and was recovered to Boulogne for repairs, so there is no archaeological trace. However, *The Queen* – which saved so many from the *Amiral Ganteaume* and transported many more wartime passengers without incident – was sunk in the German destroyer raid of October 1916 and lies on the seabed[51] (see Section 4 above).

4.3.4. Sick and wounded troops from France were received at Dover at the start of the conflict but due to lack of facilities this traffic was directed to Folkestone. Yelverton and Carlile note that 'there was not sufficient space alongside the quays for the boats to land all the wounded who were brought to [Folkestone] harbour in the early days of the War' (n.d., 189), so this traffic was then transferred to Southampton. However, completion of Dover Marine [Railway] Station with its own quay with three berths plus a coaling berth meant that ambulance train traffic switched back to Dover. Between January 1915 and February 1919, about 4,000 ambulance boats were received at Dover Marine Station and 7,781 ambulance trains with about 1,260,000 patients were dispatched (Pratt 1921, 1096; McGreal 2008, 25).

4.3.5. Ambulance boats and hospital ships were, in principle, protected from enemy action by the Geneva Conventions. In practice, however, 20-30 hospital ships were sunk around the globe during the First World War by mines or by U-boats making direct attacks with torpedoes. The loss of HM Hospital Ship *Anglia*[52] in the Dover Sector is one of these instances. *Anglia* had been operated by the London and North Western Railway Company on the route between Holyhead and Dublin. After being commissioned as an armed boarding steamer at the start of the war, HMHS *Anglia* was converted to a hospital ship in April 1915. On 17th November 1915, HMHS *Anglia* struck a mine laid by *UC-5* about 3.5 nm (6.5km) off Shakespeare Cliff (between Dover and Folkestone) whilst en route from Boulogne to Dover with, it was reported, 500 wounded including 160 cot cases. The ship sank in about 20 minutes with many wounded – including amputees – unable to escape. Figures for the numbers of those killed are not certain (McGreal 2008, 76–85; Wessex Archaeology 2014a): CWGC records 132 men and women commemorated at Hollybrook Cemetery including 10 Medical Corps and one Nurse, plus a further 25 Mercantile Marine commemorated at Tower Hill or laid to rest. ADM 137/2959 gives the total as 164 (25 crew, 139 passengers) with 271 survivors picked up and landed at Dover[53]. The wreck was subject to geophysical survey in 2014 funded by Historic England and is reported to be mostly intact with a good deal of structure present (Wessex Archaeology 2014a; Cant and Dunkley 2018, 43–44). In 2017 the wreck of HMHS *Anglia* was designated[54] under the PMRA 1986, administered by the Ministry of Defence. One of the vessels that went to the assistance of HMHS *Anglia* was the SS *Lusitania*[55] on passage from London to Spain with general goods and government stores (ADM 137/2959). Hearing the explosion, *Lusitania*'s Master turned back to HMHS *Anglia*, lowered two boats and was about to lower a third when it also struck a mine laid by *UC-5*. No lives were lost but the wreck lies about 750m from HMHS *Anglia*. Two days later, the minesweeping trawler HMS *Falmouth III*[56] was mined close by with the loss of seven lives.

4.3.6. Folkestone was used to transport troops from about the end of March 1915 (Yelverton and Carlile n.d., 195) and this continued through the war. Pratt and Yelvertone and Carlile provide slightly

[50] https://m.facebook.com/notes/small-town-great-war-hucknall-1914-1918/ss-admiral-ganteaume-the-first-merchant-ship-torpedoed-without-warning-26th-octo/154995951185817/; https://forum.pages14-18.com/viewtopic.php?f=29&t=43152&start=30; https://forum.pages14-18.com/viewtopic.php?f=4&t=10823&start=0; https://doverhistorian.com/2016/10/02/captain-carey-and-the-queen/.
[51] UID 813816.
[52] UID 901788.
[53] Including 72 picked up by MLs (Bacon 1919b, 2:477).
[54] https://www.legislation.gov.uk/uksi/2017/147/made.
[55] UID 901786.
[56] UID 901784.

different figures for total numbers embarking and landing at Folkestone (Pratt 1921, 1098; Yelverton and Carlile n.d., 198)(Table 4:

Category	Yelverton and Carlile	Pratt
	from the commencement of hostilities to the signing of the Peace	Between August 5th 1914 and June 28th 1919
British officers and men	9,253,652	
Allied officers and men	537,523	
British and Allied officers and men		9,271,726
Civilians engaged in Red Cross and other war work	846,919	1,233,177
German prisoners of war	3,592	2,010

Table 4: Crossings via Folkstone, WWI

4.3.7. Figures for men carried across the Channel are approximately 3,000,500 in 1917 and 2,986,000 in 1918(Yelverton and Carlile n.d., 196). Operational requirements could result in very large movements: 'no less than 11,000 men per day were transported to France as reinforcements' and 'for weeks the average number totalled 120,000' during the German Spring Offensive in April 1918 (Yelverton and Carlile n.d., 196). Folkestone dealt principally with officers and men going to or returning from leave, together with drafts from training camps to the front; but the large numbers in spring 1918 were divisional deployments (Pratt 1921, 1076). Leave became such a substantial element of troop movements from November 1914 onwards that special trains were run to and from Folkestone – initially 3-4 in each direction but up to a dozen at times. Folkestone Harbour Station remained in use until 2008 and was disused for some time; it has recently been restored as part of a wider redevelopment of the harbour and seafront[57].

4.3.8. From July 1917 special leave trains also ran to and from Dover Marine Station. By October 1918, 7,500 men per day were travelling in each direction between London and Calais / Boulogne (Pratt 1921, 1087): a total of 1,774,932 passengers travelled on 1,993 boats between July 1917 and February 1919 (Pratt 1921, 1097). From November 1918, repatriated prisoners also started to arrive: 55,398 on 180 boats by February 1919. Dover Marine Station also received 720,664 demobilising service personnel between January 1919 and March 1920 (Pratt 1921, 1096–97).

4.3.9. Passenger movements also included civilian ferries operating between Folkestone and Dieppe, freeing up Newhaven for military transport. One incident on this route was especially significant, when the passenger ferry SS *Sussex* en route from Folkestone to Dieppe was torpedoed without warning by *UB-29* on 24 March 1916. According to Wrecksite, the bow of SS *Sussex* lies on the seabed just outside the Study Area, about 9 nm off Dungeness[58]; the main part of the vessel stayed afloat and was towed to Boulogne. There were over 50 crew and 300 passengers aboard SS *Sussex* and at least 50 were killed. The attack resulted in an ultimatum from the US on 20 April 1916 to break off diplomatic relations with Germany unless it ceased unrestricted attacks on passenger and cargo vessels. Germany accepted on 4 May in what became known as the 'Sussex Pledge' which endured until the resumption of unrestricted submarine warfare in February 1917 (Corbett 1923; George and George 2008, 53–54).

4.3.10. The quantification of material conveyed from Folkestone by the SE&CR from the commencement of the war to February 1919 is set out in Table 5 (Yelverton and Carlile n.d., 197)):

Category	Quantity
Motor cars	3,416
Company traffic	192,468 tons

[57] https://www.folkestoneseafront.com/folkestone-harbour-seafront-development/the-station/.
[58] https://wrecksite.eu/wreck.aspx?282654.

Government stores	91,000 tons
Red Cross material	11,641 tons
Expeditionary Force Canteens	63,985 tons

Table 5: Material crossing via Folkestone, WWI

4.3.11. Yelverton and Carlile also note that Folkestone traffic included 383,098 [tons] of mails and parcel post (Yelverton and Carlile n.d., 197). According to Pratt, the number of mail sacks dispatched by the SC&ER from Victoria via Folkestone, totalling 324,596 tons ,is set out in Table 6 (Pratt 1921, 1090).

Year	Sacks
1914	25,785
1915	177,220
1916	3,023,851
1917	4,210,805
1918	3,026,173

Table 6: Mail sacks via Folkestone, WWI

4.3.12. Yelverton and Carlile suggest that 'on an average six ships, not including cargo ships and lighters, sailed daily all through the war with reinforcements and leave men' but just a few lines later 'More than thirty ships made up the average, exclusive of lighters and small craft, in the daily routes to Calais, Boulogne, Dunkirk, and other French ports' (Yelverton and Carlile n.d., 195). Another indication of scale is that over 400,000 tons of coal was supplied to ships transporting troops and wounded at Dover and Folkestone during the war (Pratt 1921, 1085; Yelverton and Carlile n.d., 197). The complexities of maintaining and protecting this level of traffic – such that no transports were attacked or lives lost throughout the entire conflict – is set out in detail by Bacon (Bacon 1919a, 1:291–324).

4.3.13. It is worth noting that Folkestone was not only involved in cross-channel transport. Yelverton and Carlile note that the SE&CR purchased, inspected and despatched stores on behalf of the War Office to Egypt, Mesopotamia, Salonika and Russia as well as France (n.d., 197–98).

4.3.14. Bacon lists the cross-channel transports as follows (Bacon 1919b Appendix IV):

Invicta
Onward
Queen
Victoria
Princess Victoria
Golden Eagle
Arundel
Princess Henriette
Princes Clementine
St David
St. Andrew
St. Patrick
Newhaven
Brighton
Dieppe
Stad Antwerp
Jan Breydel
Princesse Elisabeth
Pieter de Coninck
Ville de Liege
St Denis
Anglia

4.3.15. One of the most extraordinary logistical developments of the First World War centred on cross-channel traffic, namely the construction of an entirely new port at Richborough, equipped with roll-on roll-off train ferries and towed barges that – having crossed the Channel – could carry on to inland distribution points via the canal and river network in France. Like much cross-channel transport in the First World War there were no losses to enemy action, despite the volume of traffic. Consequently, this transport is not represented on the seabed in the Study Area, but there are extensive remains of the port itself in intertidal and onshore environments at Richborough.

Richborough

4.3.16. Richborough was a major site with a number of functions. It was operated by Inland Water Transport (IWT) and was their principal base, supporting IWT activity not only in France but in other theatres such as Mesopotamia, Salonika, Egypt and East Africa. Base activities included a

Stores Depot, Regimental Depot and Camps not only for people serving at Richborough but also for instruction and for deployment overseas[59]. Initially, IWT had a base at Dover and a temporary stores depot at Ashford, but neither were satisfactory so a site was sought from which barges could proceed to France 'without touching Dover' (War Office 1920, 2). Moves started in early 1916, with the Depot using a yard and old wharf that had been used by contractors during the construction of the Admiralty Harbour at Dover, opened in 1909. By 1918 this had become a major well-equipped port of 2000 acres capable of handling 30,000 tons of traffic per week (War Office 1920, 3).

4.3.17. Construction of facilities for the Cross-Channel Barge Service started in May 1916 and was practically complete by the end of December 1916 (War Office 1920, 5). The intention was to use barges towed by tugs to reduce the pressure on ordinary shipping, with the capability of proceeding directly to inland depots using French waterways also reducing transhipment pressure on French ports. Initially having 18 berths served by electric transporter and gantry cranes, the New Quay was extended to 24 berths by the end of hostilities (War Office 1920, 5). The first barge departed Richborough on 1st December 1916: over 10,000 barges carrying 1.3M Dead Weight Tons (DWT) of cargo were dispatched by the end of 1918, primarily ammunition, RFC stores (including aircraft), and 18,000 guns, carriages and limbers. No barges were lost to enemy action, though there were a few losses from collision or weather (War Office 1920, 5–6).

4.3.18. Barges were specially designed and had a capacity of 180 tons, though ten 1,000 ton barges were also introduced. By 1918 there were 255 barges and 67 tugs operating from Richborough, as well as a further 64 other vessels (War Office 1920, 6). It had proved difficult to obtain sufficient barges for use on French waterways, so barge-building facilities formed part of the overall provision at Richborough (War Office 1920, 8). Ten slipways were in operation before the end of 1916, assembling barges from materials fabricated elsewhere; but as the pressure on shipbuilding increased, Richborough took materials direct from rolling mills to carry out the entire construction process, also taking on the construction of tugs and other small vessels. The first barge was launched in January 1917: over the year 92 vessels were launched and 619 vessels overhauled: there were 22 building ways by the end of 1917. Facilities expanded further to take on many other forms of IWT-related construction, including building and reconditioning cranes, building railway wagons and repairing vehicles (War Office 1920, 8).

4.3.19. A further key aspect of cross-channel traffic at Richborough was salvage, making use of the returning barges, starting in May 1917 and becoming substantial by September: 46,642 tons of salvaged material was brought to Richborough in 1917; in 1918, the figure was 155,810 tons. Salvage was stored, sorted and then sent out for 're-forming'. All of the salvage work was carried out by female labour (War Office 1920, 8–9).

4.3.20. The whole of the Richborough port complex was dependent on the railway and had an extensive system of branches, sidings and yards with 35 locomotives (War Office 1920, 6–8).

4.3.21. Richborough hosted one of two cross-channel train ferry services, to the ports of Dunkirk and Calais. The second train ferry service ran between Southampton and Dieppe. The inaugural services from Richborough and Southampton were on 10 and 22 February 1918 respectively (War Office 1920, 9–11). A further service was added between Southampton and Cherbourg later in 1918 using a fourth ferry previously used on the St Lawrence at Quebec[60]. A total of 201,115 deadweight tons was exported from Richborough using the train ferries in 1918, and 61,148 tons was imported. The train ferries continued in use during demobilisation in 1919 when the pattern switched: 58,372 tons were exported and 323,870 tons were imported (War Office 1920, 14). As

[59] As well as people with no previous skills in this area, IWT specifically sought volunteers from men accustomed to working on rivers, such as keelmen and lightermen from Hull: http://www.humberpacketboats.co.uk/iwt.html.

[60] https://www.lner.info/ships/GER/index_train.php.

well as removing the need for the equivalent to six 8,000 ton ocean-going steamships, the train ferries had a massive impact in reducing transhipment at the ports. The ferries had a capacity of 54 fully loaded 10-ton wagons (or their equivalent) but loading and unloading took an average of less than 30 minutes. Anything that could be carried on rails could be transported, including tanks[61], guns and ambulance trains. By way of example, two 14-inch guns on railway mountings, each weighing 296 tons, were carries to Calais in May 1918 (War Office 1920, 11).

4.3.22. One paradox is that although the train ferries travelled without loss in the First World War, two of the three original train ferries were sunk off the coast of France by enemy action in the Second World War. After serving as civilian train ferries in the interwar period, all three ferries were requisitioned in 1939-1940. Although initially operating at Dover they had varied careers (see below). In terms of their eventual fates, Train Ferry No. 1 (TF1) became HMS *Iris* and returned to civilian service on the Harwich – Zeebrugge route after the Second World War until scrapped in 1957[62]; TF2 was damaged by shore batteries in June 1940 while evacuating St-Valery-en-Caux and went ashore near Le Havre[63]; and TF3 became HMS *Daffodil* and sank after striking a mine off Dieppe in March 1945[64].

4.3.23. The train ferry berth from Southampton – comprising the towers with their lifting mechanism and the linkspan that bridged from shore to vessel – was dispatched to Harwich in 1923 in and between two barges. However, the cargo shifted in transit and it all sank about 2.5 miles from the Cork Light Vessel (formerly off Landguard Point, Felixstowe)[65]. The linkspan was subsequently salvaged, but the barges and towers were dispersed; it is not known what might remain on the seabed. In their place, the towers and lifting mechanism were brought from Richborough and erected with the linkspan from Southampton: the combination was used for the Harwich train ferry service until 1987, when it was listed[66].

4.3.24. There are drawings of Richborough port in 'An Account of the Construction and Working of Richborough Port' (War Office 1920; and see Cocroft and Stamper 2018, 32–33) but also a range of photographs and paintings[67] that give an indication of the scale and industry of the port. The site was sold-off shortly after the First World War: there is a detailed inventory of the site and its components in the sale particulars within MUN 4/6825. Although parts of the huge site have been heavily redeveloped, there is still plainly a great deal surviving on the margins of the River Stour including structures associated with the train ferry berth and the wharf used for the cross-channel barge service.

4.4. Initial cross-channel deployments and regular traffic in WWII, to May 1940

4.4.1. The general pattern of cross-channel traffic in the first part of the Second World War – up to the German assault in the west – had much in common with the First World War. As in 1914, in September 1939 the British Expeditionary Force was mobilised to the Continent and supported subsequently through ports to the west of the Dover Sector: from Portsmouth, Southampton and the Bristol Channel (Avonmouth, Swansea, Barry and Newport) to Cherbourg, Nantes and St.

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[61] See IWM Q 60862: https://www.iwm.org.uk/collections/item/object/205308379.
[62] https://www.lner.info/ships/GER/ferry1.php.
[63] https://www.lner.info/ships/GER/ferry2.php.
[64] https://www.lner.info/ships/GER/ferry3.php; https://wrecksite.eu/wreck.aspx?2629; http://archive.divernet.com/wreck-tours/p301784-wrecktour:153-hms-daffodil.html; https://www.grieme.org/epaves/manche2/14-base/manche-est/d/67-daffodil.html#le-navire.
[65] http://www.harwichanddovercourt.co.uk/train-ferry-service/.
[66] Listed Building LEN 1187897.
[67] See e.g. Art.IWM ART 1387: https://www.iwm.org.uk/collections/item/object/16265;
Art.IWM ART 1272: https://www.iwm.org.uk/collections/item/object/16252;
Art.IWM ART 1253: https://www.iwm.org.uk/collections/item/object/16233.

Nazaire (Ellis 1953, 15; Roskill 1954, 63). There were no losses in the course of mobilisation, partly because Germany limited its use of U-boats (Ellis 1953, 15).

4.4.2. Whilst the majority of cross-channel traffic took place further west, train ferry services were used to transport ambulance trains, rolling stock and heavy guns from Dover to Calais and Dunkirk (Ellis 1953, 16; Spiers 1988, 97). The civilian train ferries based in Dover were requisitioned for minelaying, so it was the former WWI train ferries TF1, TF2 and TF3 that worked out of Dover, having spent the interwar years on the civilian Harwich – Zeebrugge route. Newhaven-Dieppe became the main route for hospital ships. Other ports, still generally further west (Dieppe, Caen, St. Malo, Rouen, Fecamp) but also Boulogne, started to be used in October in response to pressure on the western routes and to shorten supply lines at sea and on land (Ellis 1953, 16). It should be noted that Belgium was a neutral country at this point, so the BEF remained in France and no use was made of Zeebrugge or Ostend.

4.4.3. As with the train ferries, cross-channel traffic within the Dover Sector was carried out predominantly by civilian ferries requisitioned as 'leave ships' such as the Southern Railway's *Canterbury* and *Biarritz* between Dover and Boulogne, and the *Royal Daffodil* (Spiers 1988). As an indication of the volume of cross-channel traffic in the early stages of WWII, 200,000 men travelled in each direction across the Channel on leave in the six months from December 1939 (Roskill 1954, 64). Many of the former civilian ferries had extraordinary careers: in action at Dunkirk in 1940; in Normandy in 1944; returning to troop-carrying duties on cross-channel routes once the Channel ports were liberated; and then carrying on as civilian ferries into the 1960s and 1970s (Spiers 1988; Winser 1997).

4.4.4. Regular cross-channel traffic came swiftly to an end in May 1940. The German assault on the Netherlands, Belgium, Luxembourg and France started on 10th May (Ellis 1953, 35). The BEF and French forces advanced to the pre-planned 'Dyle Line' in Belgium but German forces made an unexpected push through the Ardennes and towards the Channel coast, which they reached at Abbeville on 20th May, splitting Allied forces in the north away from those in the south. Provision was made to send vital supplies of stores, ammunition and fuel directly to Boulogne, Calais and Dunkirk using coasters – including small Dutch coasters that had escaped the fall of the Netherlands (Winser 2009, 9). Reinforcements were sent by sea directly from the UK to arrive in Boulogne on 22nd May, but German units were already in the outskirts and it fell on 25th May (Ellis 1953, 153–59). Its evacuation is addressed in Section 6 below. Similarly, Calais was reinforced by sea from 22nd May. British forces were ordered not to evacuate: the town fell on 26th May (Ellis 1953, 159–69), by which point the decision had been taken to attempt wholesale evacuation. Although some evacuation of non-essential troops had already taken place through Ostend (as through Boulogne and Calais before they fell), Ostend was no longer available because of the likely collapse of Belgian forces. Hence the only continental port still available in the Dover sector was Dunkirk.

4.5. Cross-channel post D-Day

4.5.1. Regular cross-channel traffic was not to start again until the continental ports were liberated following the Normandy invasion. As with the defence of Calais and Boulogne, military aspects of the liberation of the Channel ports is addressed in Section 6 below. It is sufficient at this stage to note that in breaking out from Normandy, Allied forces pushed directly towards Belgium, the Netherlands and Northern Germany, rather than proceeding along the coast. Antwerp was an important target as a port and was secured on 4 September; assaults on Boulogne and Calais took place later in September – when the German coastal batteries at Gris Nez were also neutralised; and Dunkirk was sealed off with its German garrison still inside. In consequence, continental ports in the Dover Sector did not start to become available for regular cross-channel traffic until late in 1944.

4.5.2. In his introducing his account of Calais, Spiers (1988, 19–21) provides a useful summary of the Channel ports.

- Dieppe was fully operational by mid-September 1944 and had a train ferry berth (operating with the former-WWI train ferries) by 29th September, though personnel berths were limited.
- Boulogne was the most heavily damaged. Some limited capacity for LCTs and cargo ships from 12th October 1944 (and see Fisher 2021).
- Ostend was captured without a struggle in early September, received its first ship on 29th September and first personnel ship on 7th December. It received vessels from Dover and Tilbury but was exposed to German E-boats and midget submarines operating from bases in the Netherlands. Ostend was used to embark the amphibious force that assaulted Westkapelle in Operation Infatuate II, on 1st November 1944 (see below).
- Antwerp captured 4th September and designated as main supply base for British and Canadian forces, but not operational until 29th November after the Scheldt had been secured.
- Dunkirk was not liberated until VE day.
- Le Havre was captured on 12th September and handed to US forces. Extensive damage meant that the first ship was not received until 9th October. Rouen also opened as a subsidiary cargo port.
- Cherbourg was liberated at the end of June but badly damaged; shipping first entered in late July and with limited capacity from mid-August 1944. It was used principally by US forces, especially after Antwerp became operational in November.

4.5.3. Spiers (1988, 13–17) records that Calais harbour had been mined and obstructed though a narrow channel was still available. This was extended by sweeping for mines and lifting blockships in the course of October; reconstruction of the facilities started on 22nd October. A train ferry berth was completed by 15th November; a first Landing Ship, Tank (LST) hard by 27th November and a Second LST hard by 20th December. Quays also had to be rendered operational and the first berthing trials by a personnel ship took place on 23rd December. Two further berths were available by April 1945. Lock gates for the main tidal basin had been destroyed but the basin was rendered operational again by May 1945.

4.5.4. The decision to make Calais the main personnel port for British and Canadian personnel was made on 18th December 1944 (Spiers 1988, 19). Once facilities were operational, numbers grew significantly: initially of soldiers going to and from leave but subsequently for demobilization. In early January 1945, 2000 personnel were travelling through Calais in each direction each day; this grew month-by-month to 12,000 personnel in each direction each day from June 1945. Routes operated between Calais and Dover, Folkestone and Harwich – which was longer and more exposed to enemy action – subsequently consolidating on Dover and Folkestone until March 1946 when Folkestone returned to civilian use. Calais closed as a military port on 1st August 1947, by which time 5 million troops had passed through (Spiers 1988, 21–22).

4.5.5. As noted above, many of the vessels on the cross-channel route had already had eventful careers, and went on to be civilian cross-channel ferries subsequently. No ships were lost: the only major damage was to HMS *Princess Astrid* which fouled an obstruction at the entrance to Calais and was holed; troops were disembarked and the ship was later repaired (Spiers 1988, 91). However, back in civilian service as *Prinses Astrid* – which had served as a Landing Ship Infantry (LSI(S)) for the Dieppe Raid and on D-Day – the ship struck a mine in Dunkirk Roads on passage to Dover in June 1949, killing five crew in the engine room. The rest of the crew and passengers were taken off but salvage attempts failed (Spiers 1988, 92), so the wreck still lies off Dunkirk[68].

[68] https://www.wrecksite.eu/wreck.aspx?39.

4.5.6. A further instance of traffic across the Dover Strait post D-Day that warrants attention is the Pipe Line Under The Ocean (PLUTO). The purpose of PLUTO was to provide fuel supplies to Allied forces following the Normandy invasion and during the subsequent advance using a method that was less vulnerable than sea transport to enemy attacks and weather, and which would reduce pressure on shipping and port capacity. Two forms of pipeline were used – HAIS (Hartley, Anglo/Iranian, Siemen) based on a lead pipe with a 3-inch internal diameter; and HAMEL (Hammick, Ellis) based on a steel pipe with a 2-inch and, in later production, 3-inch diameter. The aim was to pump 4-5,000 tons of oil per day, equivalent to 40-50% of expected total requirements (Payton-Smith 1971). Pipelines were planned between the Isle of Wight and Cherbourg, known as BAMBI, with a capacity up to 3,500 tons per day; and between Dungeness and Ambleteuse, north of Boulogne, known as DUMBO with a capacity of up to 3,000 tons per day. However, PLUTO was intended to be a 'bonus' supplementary system: in planning Operation Overlord, the Allies made provision for 'all their cross-Channel oil needs through the orthodox method of tanker shipments' including a crash programme of pre-fabricated 'Channel Tankers' (CHANTs) (Payton-Smith 1971) and sending 'cased petrol' (fuel in containers) using coasters (Winser 2009).

4.5.7. After D-Day, HAIS and HAMEL pipelines were laid between the Isle of Wight and Cherbourg (BAMBI) in August 1944 but pumping didn't start until 18th September; it was wound up on 4th October and attention concentrated on DUMBO. Pipelaying started in October and the first pumping started on 27th. Six HAIS (4x 3-inch and 2x 2-inch) were in place by mid-December but only four were operational. PLUTO had proved much more difficult to deploy and maintain than anticipated; its value relative to the number of ships and men involved was questioned by the Navy but a decision was taken to press on with deployment in January 1945, which continued even after VE-day. Eventually, DUMBO comprised sixteen pipelines – ten HAIS (8x 3-inch and 2x 2-inch) and six Hamel (3-inch) – of which 11 were usable. It continued in use until July 1945, by which time five HAMEL pipes were out of action.

4.5.8. The pipelines were salvaged for scrap in 1946-49, reportedly collecting all but 34 miles of over 800 miles of pipeline laid. Some of the pipelines between Dungeness and Ambleteuse were too deeply embedded in the sandbanks they crossed to be recovered. Additionally, there are buildings at Greatstone and Dungeness[69] in the form of domestic residences that – in their disguise – housed PLUTO infrastructure; these buildings subsequently became residential properties, such as 49, 51 and 53 Leonard Road, Greatstone[70].

4.5.9. PLUTO involved a massive and extraordinary effort in its design, manufacture[71] and installation[72]. It was publicised as a success after the war[73] and subsequently. However, the volume of fuel supplied did not match the investment of ingenuity and resources. A total of 370,000 tons of petrol was pumped via PLUTO at a peak of about 3,300 tons a day but averaging only 1,800 tons a day. This total was only about 8% of cross-channel oil supplies between D-Day and the cessation of German hostilities, the vast majority being transported by tankers, including Ostend and Antwerp within the Dover Sector.

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[69] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX51504; https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX51502.

[70] https://goo.gl/maps/d2H4oPaLV2GE2oD19;
IWM HU 75670 https://www.iwm.org.uk/collections/item/object/205078850;
https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX51503.

[71] See Listed Building LEN 1468474.

[72] See e.g. IWM T 26: https://www.iwm.org.uk/collections/item/object/205195440;
IWM A 28817: https://www.iwm.org.uk/collections/item/object/205195444;
IWM T 29: https://www.iwm.org.uk/collections/item/object/205193081;
IWM T 30: https://www.iwm.org.uk/collections/item/object/205195437.

[73] https://www.britishpathe.com/video/operation-pluto.

4.6. Westerscheldt after November 1944

4.6.1. As already noted, the port of Antwerp was regarded as essential to the defeat of Germany and was captured relatively quickly, on 4th September 1944. However, to reach the port, ships would have to navigate the Scheldt estuary – the Westerscheldt – the banks of which (the Breskens Pocket on the south; South Beveland and Walcheren on the north) still lay in German hands. The maritime dimension of the Battle of the Scheldt is addressed under the section on shore-oriented actions below. Whilst the battle ended on 8 November, the Scheldt then had to be cleared of mines and obstructions and the port made operational, so the first cargo vessels did not enter Antwerp until 28 November.

4.6.2. Once the Scheldt was open, convoy routes were put in place between the Thames (Southend) and the Scheldt (Antwerp), coded TAM from Southend to Antwerp and ATM from Antwerp to Southend. The traffic attracted the renewed attention of German forces: principally S-boats based in Rotterdam, Ijmuiden and Den Helder. There is a distinct phase of wrecks in the Westerscheldt and its approaches sunk predominantly by mines laid by S-boats. However, their scope of action was limited not only by almost overwhelming Allied superiority in coastal forces and destroyers, air power, radar and signals intelligence, but also by Germany's limited resources and by restrictions introduced by the higher levels of German command. Notably, minelaying within the Scheldt was restricted until February 1945 in order that operations by midget submarines (below) would not be hindered. S-boat operations from Holland ceased on 16 April 1945. During 1945 they sank 25 ships by mine and six by torpedo, as well as seriously damaging seven others – these attacks encompassing the East Coast War Channels as well as the Dover Sector. Fifteen S-boats were lost (Frank 2007).

4.6.3. The following sets out examples of ships sunk in the approaches to the Scheldt once the Thames-Antwerp route was opened, demonstrating the impact of mining (Table 7).

Date of Loss	Vessel	Flag	Cause of Loss
03/12/1944	*Francis Asbury*	US	mined
07/12/1944	*Samsip*[74]	UK	mined
12/12/1944	*Lookout*	Panamanian	wrecked
15/12/1944	*Fort Maissoneuve*	Canadian	mined
16/12/1944	*War Diwan*	UK	mined
18/12/1944	*Steel Traveler*	US	mined
24/12/1944	*Empire Path*	UK	mined
18/01/1945	*Samvern*	US	mined
22/01/1945	*Halo*	UK	torpedo (S-boat)
26/02/1945	*Nashaba*	US	mined
26/02/1945	*Auretta*	UK	mined
27/02/1945	*Sampa*	UK	mined
01/03/1945	*Robert L. Vann*	US	mined
19/03/1945	*Empire Blessing*	UK	mined
19/03/1945	*Samselbu*	UK	mined
23/03/1945	*Charles D. McIver*	US	mined
23/03/1945	*Eleftheria*	Greek	mined
16/04/1945	*Gold Shell*	UK	torpedoed
27/05/1945	*John Woolman*	US	mined

Table 7: Losses in the approaches to the Scheldt, 1944-45

4.6.4. To these might be added the operational losses that occurred to vessels seeking to defend against German attacks, notably the significant loss of vessels and crew that occurred among Royal Canadian Navy and RN coastal forces based at Ostend in February 1945. A fire ignited petrol and

[74] For survey of *Samsip* by Vlaamse Hydrografie (Flemish Hydrography) see https://twitter.com/KVS_VLHydro/status/1191988589225115648.

ammunition, including torpedoes, resulting in the destruction of twelve vessels and the deaths of over 60 officers and ratings, plus nine civilians, with over 60 wounded (Reynolds 2000, 159–60)[75].

4.6.5. On the English coast, U-boats became a hazard for the first time since 1939. *U-245* is credited with torpedoing the US *Henry B. Plant*[76] (Convoy TAM 71) on 6th February 1945 and the UK *Filleigh*[77] and Norwegian *Karmt*[78] (Convoy TAM 142) on 18th April.

4.6.6. As noted above, Germany's *Kleinkampfverband* – K-Verbande – deployed midget submarines in the Dover Sector from December 1944 (Kemp 1999; Paterson 2018). Biber submarines – with one crew and two underslung torpedoes (or one torpedo and one mine) – were deployed from Poortershavn and Hellevoetsluis near Rotterdam. Losses among the Biber were desperately high and only one ship is reported to have been sunk by them, the *Alan A. Dale*[79] in the Westerscheldt but beyond the Study Area. Biber no. 90 captured by the minesweeper HMS *Ready* off North Foreland on 29 December 1944 was towed to Dover, where it sank in the harbour but was subsequently raised and subject to trials (Kemp 1999, 47; Paterson 2018, 147–51): Biber 90 is in the collections of the IWM[80].

4.6.7. Seehunds also carried two underslung torpedoes but were larger and had two crew. Seehunds were more successful: in addition to three ships damaged, they are thought to have sunk nine ships in the southern North Sea / Channel, including five in the Dover Sector:

- Trawler HMS *Hayburn Wyke*[81] sunk 01/01/45 off Ostend.
- *LST-364*[82] sunk 22/02/45 in mid-Channel, between South Falls and Sandettie.
- Cable Ship *Alert*[83] sunk 24/02/45 in mid-Channel, off North Foreland.
- US tanker *Y-17*[84] sunk 17/04/45 near West Hinder.
- SS *Samida*[85] sunk 19/04/45 near Dungeness.

4.6.8. The usual uncertainties of ascribing shipwreck losses to specific causes in wartime are exacerbated in respect of midget submarines because of the uncertainty of their position, the observations they were able to make, the fact that many did not return, and the collapsing administration of German forces. Consequently, some of the ships in this list might not be ascribed to Seehunds: SS *Samida*, for example, is considered to have been sunk by U-boat. Equally, there are a number of other ships in the Dover Sector whose loss might be ascribed to Seehunds, including losses ascribed to mines -- SS *Auretta*; SS *Nashaba*; SS *Charles D. McIver* and *ML 466*[86] (Paterson 2018, 193; 205) – and torpedoes – SS *Gold Shell*, which Wrecksite attributes to a Seehund[87].

4.6.9. Although more successful than Bibers, Seehunds were still prone to operational failures and highly vulnerable to weather, accident and attack – especially as considerable air and sea resources were directed by Allied forces against them. Thirty-five Seehunds were lost, many without trace (Kemp 1999). However, the wreck of *U-5377* was discovered in 2012 by a diving team near the Goodwin

[75] And see http://cfv.org.uk/research/history/article/the-ostend-disaster-1945.
[76] UID 904889.
[77] UID 904902.
[78] UID 1256891.
[79] https://wrecksite.eu/wreck.aspx?613.
[80] IWM MAR 558: https://www.iwm.org.uk/collections/item/object/30004028.
[81] https://wrecksite.eu/wreck.aspx?216.
[82] https://wrecksite.eu/wreck.aspx?4734.
[83] https://wrecksite.eu/wreck.aspx?1; UID 904407; UID 904899.
[84] https://wrecksite.eu/wreck.aspx?1790.
[85] https://wrecksite.eu/wreck.aspx?126; UID 901748.
[86] https://wrecksite.eu/wreck.aspx?270363.
[87] https://wrecksite.eu/wreck.aspx?215.

Sands, investigating a fisherman's gear snag. The results of the diving investigation – including an account of the *U-5377*s loss following an attack by destroyer HMS *Torrington* – are available online[88].

4.6.10. The K-Verbande also deployed Molch midget submarines and Linsen explosive boats against Allied shipping crossing to the Scheldt, but these were even more vulnerable and achieved no confirmed successes, other than adding to the defensive demands upon Allied air and sea forces (Paterson 2018). K-Verbande craft were also used to supply the besieged garrison at Dunkirk, notably Seehunds carrying storage canisters – 'butter torpedoes' – where they would normally carry their weapons. K-Verbande forces remaining at Ijmuiden surrendered on 6 May 1945 (Paterson 2018).

[88] http://www.seehund.co.uk/index.html.

5. Coastwise Shipping

5.1. Coastwise shipping along the Channel rather than across it was a central feature of the Dover Sector in both wars. Allied and neutral shipping followed coastal routes to and from the Thames and North Sea through the Dover Sector in both wars. They also used routes along the coast of Belgium and France in WWI; and in WWII prior to May 1940 and from autumn 1944 as the coast was liberated. German forces sought to interdict this coastwise shipping using various means and their degrees of success is elaborated below.

5.2. German forces also undertook coastwise shipping along the continental coast from 1940 to 1944, which was in turn a target for Allied attacks. Again, this is considered below.

5.1. Coastwise shipping along the English coast in WWI

5.1.1. The English Channel is the world's busiest seaway, connecting ports and their hinterlands around the North Sea and Baltic to the Atlantic and, thereby, the rest of the World. Even for UK domestic shipping, the Channel is an essential seaway connecting east coast ports – including the Thames – to the south and south west. The importance of this route in the First World War encompassed the essential coal trade between north east England and the south coast and France; routes between London and the Empire; and also neutral traffic – including traffic potentially trading with Germany. In the north of the Dover Sector, the East Coast War Channel terminated at the Elbow buoy, east of North Foreland. South of that point, traffic passed through the Downs, inshore of the Goodwin Sands (Figure 13); the Downs also served as a key anchorage and inspection point. To the south, traffic remained inshore from South Goodwins light vessel past South Foreland and Dover to the Folkestone 'gate', marked by two lightships. There was a swept route to the west along the English coast (ADM 186/604, chart facing p. 70), whilst traffic along the coast of France crossed to/from the English coast either between Cherbourg and Portland / Isle of Wight; or between Le Touquet and Dungeness (Figure 14).

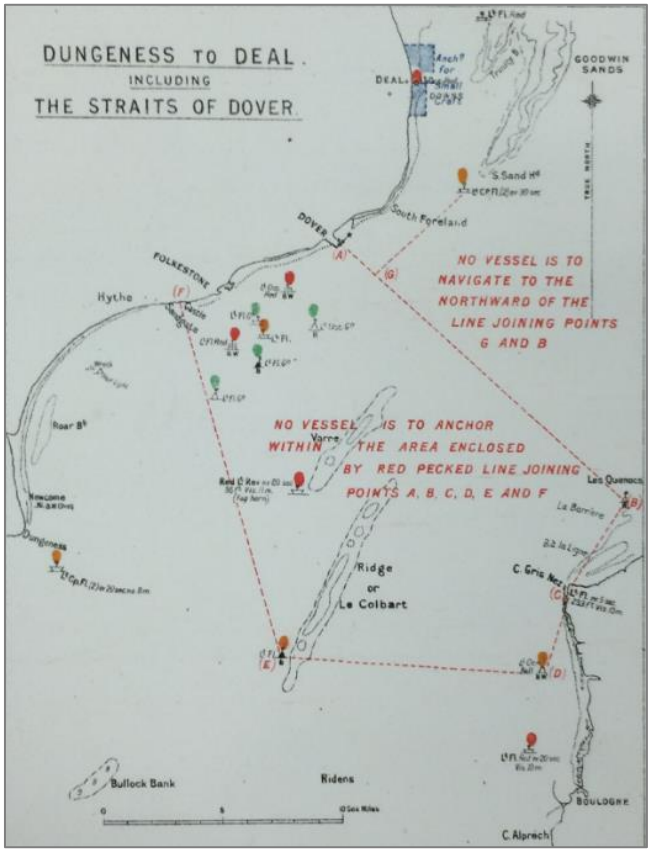

Figure 13: Chart and instructions for barges and small craft navigating through the Dover Strait, showing the gate off Folkestone and inshore route off Dover to The Downs. Chart X.315, June 1918. Courtesy of UKHO Archive.

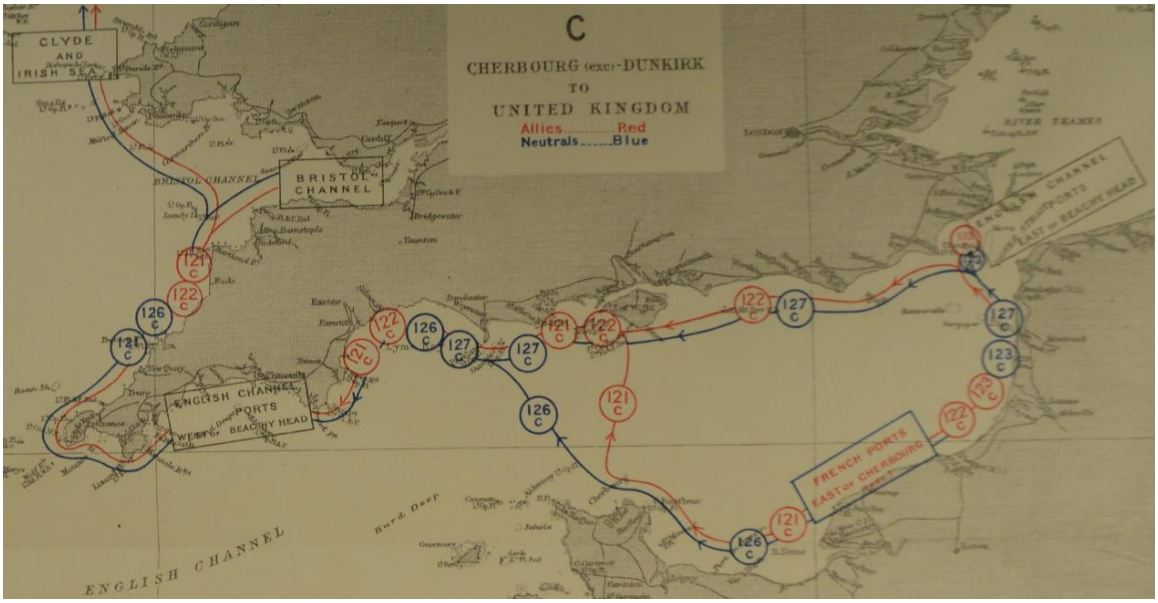

Figure 14: Diagram of Routes for French Ports. Chart Z.15, March 1917. Courtesy of UKHO Archive.

5.1.2. As well as controlling the routes that vessels took, the protection of coastwise shipping required patrols and extensive minesweeping. Almost the whole of the Dover Sector study area was in Patrol Area XI, from a line between North Foreland and Walcheren in the north, to Beachy Head on the south coast; though the British patrol areas did not extend to the French coast south of Boulogne. Defending civilian ships placed a heavy burden on the small warships that carried out patrolling and minesweeping: these small warships were critical to coastwise shipping and they are considered collectively with civil vessels below.

	Maritime Peril						Enemy Action					
Type/ Year	**Collis-ion**	**Foun-dered**	**Grou-nded**	**Leak-ed**	**Lost**	**Stran-ded**	**Mined**	**Torp-edoed**	**Expl-osion**	**Gun Action**	**Scutt-led**	**Total**
Cargo												
1914	3											3
1915	1	1			1	5	10	3				21
1916	8	1				5	9	1				24
1917	6			1		3	1	2	2	1		16
1918	2	5		1		3	3	1				15
Total	**20**	**7**		**2**	**1**	**16**	**23**	**7**	**2**	**1**		**79**
Civil												
1914			1			2					1	4
1915	1						2					3
1916							2				1	3
1918		1				1						2
Total	**1**	**1**	**1**			**3**	**4**				**2**	**12**
Fishing												
1916							1					1
1917											1	1
Total							**1**				**1**	**2**
Warship												
1914								2				2
1915	2					1	9					12
1916	2					1	5	2		8		18
1917	1					1	4	1				7
1918		1					4			7		12
Total	**5**	**1**				**3**	**22**	**5**		**15**		**51**
Total	**26**	**9**	**1**	**2**	**1**	**22**	**50**	**12**	**2**	**16**	**3**	**144**
By cause						**57**					**87**	

Table 8: Losses in principal categories, WWI

5.1.3. Table 8 sets out the number of cargo, civil and fishing vessels – plus the number of British warships – lost in the Dover Sector during WWI. Cause of loss is split between 'maritime peril' – the general hazards of shipping – in green; and different forms of enemy action in red. These figures include all shipping – i.e cross -channel as well as coastwise. It has already been remarked that there were very few instances of cross-channel shipping being sunk, but HMHS *Anglia* and SS *The Queen* are included in these figures too.

5.1.4. It should be noted that fishing was prohibited from Cromer round to Weymouth (X 43; X 44) – though fishing vessels could still transit the area – hence losses of fishing vessels in the Dover Sector in WWI are much lower than in the ECWCs.

5.1.5. As can be seen from Table 8, 40% of losses were attributable to maritime peril – especially collision and strandings – though these may have been exacerbated by wartime conditions that constrained shipping, placed ships in close proximity and reduced navigation aids such as lighting.

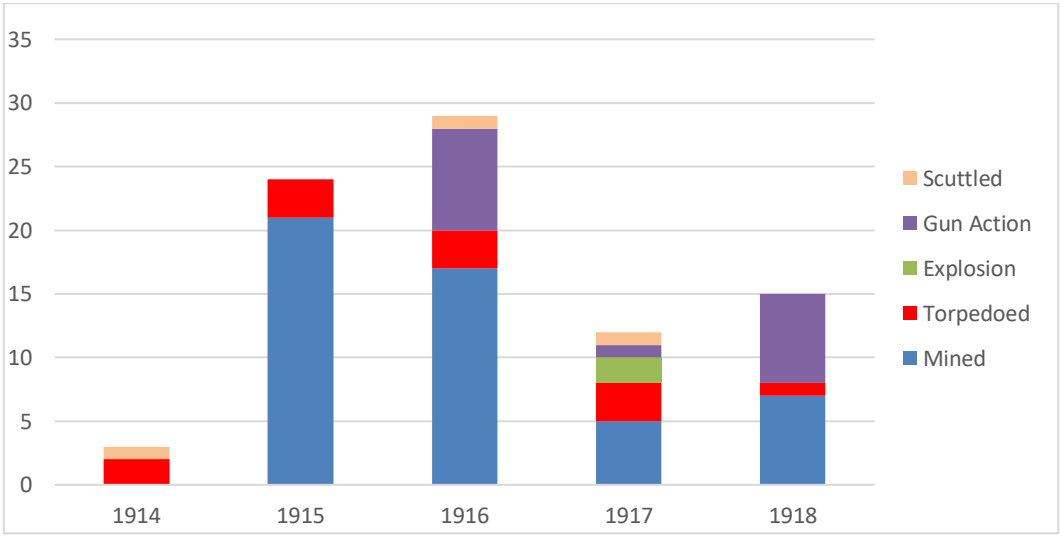

Table 9: Losses due to Enemy Action, WWI

5.1.6. Looking in more detail at losses due to enemy action (Table 9), there are noticeable spikes for losses to gun actions in 1916 and 1918: these represent the drifters and destroyers caught by the German raids on the blockade in October 1916 and February 1918. Attempts by German surface craft against coastwise shipping – in the Downs for example (see below) – were largely unsuccessful.

5.1.7. The main interest of U-boats in the Dover Sector was to penetrate the blockade to reach further west (and return) as U-boat capabilities increased. This may be reflected in the relatively low number of losses to torpedoes in each year, bearing in mind that the intensity of patrolling meant that the Dover Sector was a very dangerous place for U-boats to attempt to stalk their targets. Equally, scuttling – which was typical of U-boat operations against small vessels such as fishing vessels – accounts for only three losses. This may also reflect the vulnerability of U-boats in the Dover Sector as surfacing to carry out such an attack in such a tightly controlled area would very likely lead to the loss of the U-boat. In fact, even the examples of scuttling that are included are atypical of this method elsewhere, comprising: the loss of *The Queen* in the German raid of October 1916 (sources disagree on the exact cause of loss but it seems most likely that it was sunk by gunfire (Fisher pers. comm.[89])); the French fishing vessel *Notre Dame de Lourdes*[90] which was stopped elsewhere in the English Channel by a U-boat that set scuttling charges – but the fishing vessel did not sink and subsequently stranded on South Foreland; and the SS Spanish Prince,

[89] See MT 23/616/7.

[90] UID 1443220.

which was scuttled as a defensive blockship at the western entrance of Dover Harbour in March 1915[91].

5.1.8. The table shows that mines were plainly the most damaging weapon. In the Dover Sector this meant mines laid by U-boats: the start of high numbers of losses reflecting the introduction of the first coastal minelaying U-boats (UC I class) to Flanders from the end of May 1915. The spatial distribution of losses to mines laid by UC Is in 1915 is mostly in the Downs and around the Goodwins, perhaps reflecting the degree to which the capabilities of this new weapon were being explored, together with caution towards the Dover Strait which were such a focus of attempts to block U-boats transiting. However, the distribution in 1916 is more focussed on the area off Dover and Folkestone, demonstrating the success of coastal U-boats in penetrating the defences across the Dover Strait. The record of losses – noting how their dates are often closely grouped – underlines the amount of damage that could be done by just a few U-boats on relatively few patrols (Table 10).

Year	Name	UID	ECWCs cod	Date of Loss	Cause of	U-boat responsibl known)
1915	*Hull Trader*	881546	Cargo	13/02/1915	Mined	?foundered
	Cathay (B)	904903	Cargo	05/05/1915	Mined	
	Ben Ardna	1486292	Warship	08/08/1915	Mined	*UC-1*
	Monarch	901780	Civil	08/09/1915	Mined	*UC-5*
	Africa	904857	Cargo	16/09/1915	Mined	*UC-6*
	Lydian	904847	Warship	18/09/1915	Mined	*UC-6*
	Great Hart	1255770	Warship	24/09/1915	Mined	*UC-6*
	Newcastle	901771	Cargo	10/10/1915	Mined	*UC-5*
	Frons Olive	904905	Warship	12/10/1915	Mined	*UC-5*
	Ilaro	904866	Cargo	23/10/1915	Mined	*UC-5*
	Selma	904908	Cargo	25/10/1915	Mined	*UC-3*
	Aries	904849	Warship	31/10/1915	Mined	*UC-6*
	Eidsiva (1915)	901823	Cargo	31/10/1915	Mined	*UC-6*
	Othello II	813821	Warship	31/10/1915	Mined	*UC-6*
	Toward	901821	Cargo	31/10/1915	Mined	*UC-6*
	Anglia	901788	Civil	17/11/1915	Mined	*UC-5*
	Lusitania	901786	Cargo	17/11/1915	Mined	*UC-5*
	Falmouth III	901784	Warship	19/11/1915	Mined	*UC-5*
	Klar	1457828	Cargo	26/11/1915	Mined	*UC-1*
	Etoile Polaire	901836	Warship	03/12/1915	Mined	*UC-1*
	Carilon	904910	Warship	24/12/1915	Mined	*UC-1*
1916	*Traquair*	901810	Cargo	12/01/1916	Mined	*UC-6*
	Leoville	1441074	Cargo	19/01/1916	Mined	*UC-6*
	Persistive	1255786	Warship	09/02/1916	Mined	
	Leicester	901789	Cargo	12/02/1916	Mined	*UC-6*
	Carlton	901783	Civil	21/02/1916	Mined	*UC-6*
	Empress of Fort William	901803	Cargo	27/02/1916	Mined	*UC-6*
	Maloja	901799	Civil	27/02/1916	Mined	*UC-6*
	Angelus	901797	Warship	28/02/1916	Mined	*UC-6*
	Weigelia	901831	Warship	28/02/1916	Mined	*UC-6*
	Flicker	883688	Warship	04/03/1916	Mined	*UC-6*
	Sea Serpent	901778	Cargo	23/03/1916	Mined	*UC-6*
	Christianssund	901766	Cargo	24/03/1916	Mined	*UC-6*
	St Cecilia	901763	Cargo	26/03/1916	Mined	*UC-6*
	Saxon Prince	1399225	Warship	28/03/1916	Mined	?foundered
	Halcyon	904457	Cargo	07/04/1916	Mined	*UC-6*
	Shenandoah	901776	Cargo	14/04/1916	Mined	*UC-6*

[91] UID 901816. Another blockship, the SS *Livonian*, had also been scuttled in the western entrance in December 1914 but was salvaged in 1931-33. SS *Spanish Prince* was salvaged in 2010. https://doverhistorian.com/2014/01/28/blockships/.

Year	Name	UID	ECWCs cod	Date of Loss	Cause of	U-boat responsibl known)
	Margaret	1202296	Fishing	17/12/1916	Mined	*UC-21*
1917	*Sea Gull* (1917)	883753	Cargo	26/02/1917	Mined	*UC-16*
	Foyle	1452534	Warship	15/03/1917	Mined	*UC-68*
	Protect	1197509	Warship	16/03/1917	Mined	
	Kempton	1198272	Warship	24/06/1917	Mined	*UC-1*
	Redcar	1198275	Warship	24/06/1917	Mined	*UC-1*
1918	*Cleon*	901779	Warship	02/01/1918	Mined	
	Drumtochty	901775	Warship	29/01/1918	Mined	
	Gaupen	1256484	Cargo	12/03/1918	Mined	
	Amplegarth	901806	Cargo	10/05/1918	Mined	*UC-71*
	City of Liverpool	1256662	Warship	31/07/1918	Mined	*UC-71*
	Coleus	1256680	Warship	04/10/1918	Mined	
	De Fontaine	901753	Cargo	16/11/1918	Mined	

Table 10: Losses to Minelaying U-boats, WWI

5.1.9. Of the 50 vessels lost to mining, 21 are attributed to *UC-6* under the command of Matthias Graf von Schmettow; including all but one of the attributed losses in 1916 off Dover and Folkestone. *UC-6* is thought to have been lost in a mine net in September 1917 off North Foreland, to the north of the Dover Sector (Termote 2017, 294–95); von Schmettow was killed along with most of the crew of *UC-26*[92] in May 1917 about 13 km off Calais (McCartney 2015, 48–49; Termote 2017, 305–6).

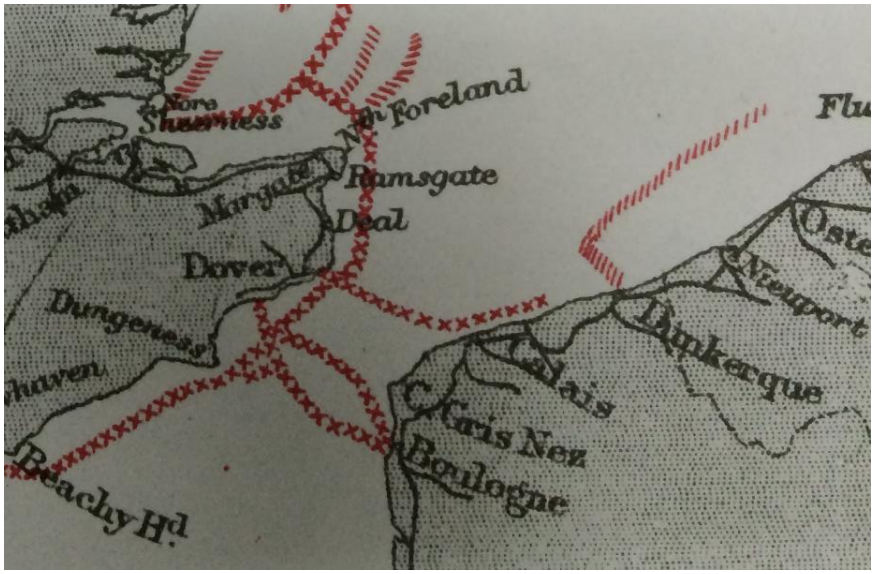

Figure 15: Chart indicating daily sweeping (red xxxx), 1918. TNA ADM 186/604, facing p. 70.

5.1.10. The effort directed to sweeping (Figure 15) is indicated by the heavy losses of small warships to mines: 22 warships (predominantly minesweeping trawlers) compared to 28 cargo/civil/fishing vessels. The association between civilian losses and sweepers is acute in some cases: mines from *UC-6* sank the SS *Maloja* and SS *Empress of Fort William* on 27 February 1916; the sweepers HMS *Angelus* and HMS *Wiegela* on 28th February (Figure 16); and the sweeper HMS *Flicker* on 4th March. Similarly, *UC-5* sank the HMHS *Anglia* and SS *Lusitania* on 17th November 1915; and the sweeper HMS *Falmouth III* on 19th November. It is also worth noting that the *Lusitania* had been going to the assistance of the *Anglia*, and the *Empress of Fort William* to the *Maloja*, when each of these would-be Samaritans were themselves lost.

[92] UID 883715.

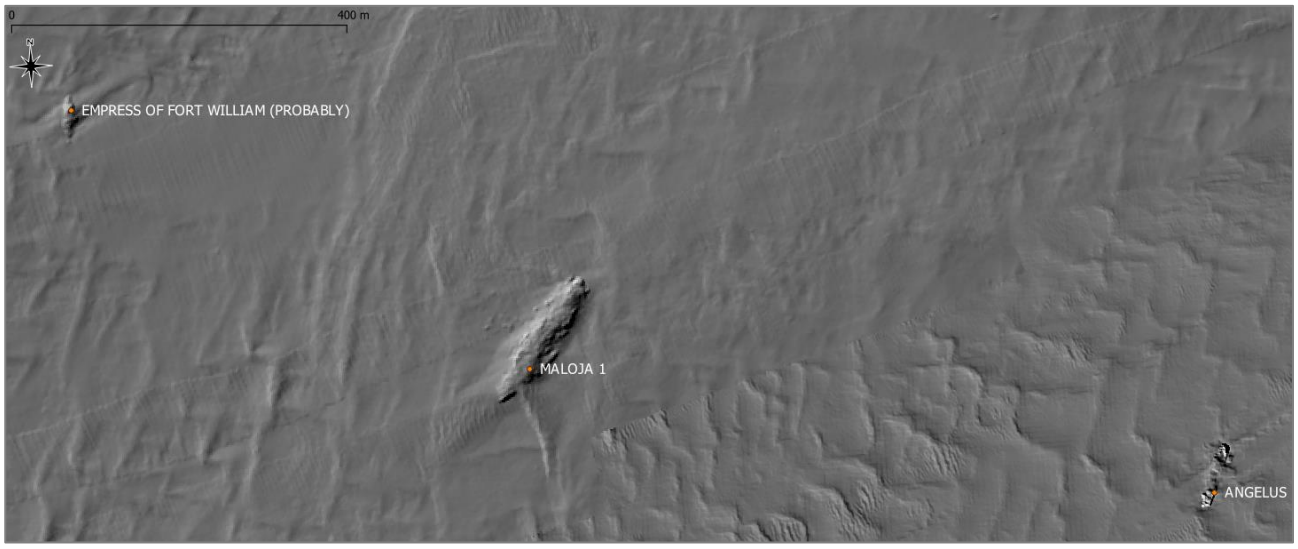

Figure 16: CHP multibeam data showing wrecks of *Maloja*, *Empress of Fort William* and *Angelus* off Dover. Contains public sector information, licensed under the Open Government Licence v3.0, from the UKHO.

5.1.11. The table also underlines the concentration of losses to minelaying U-boats in the English part of the Dover Sector in just seven months from September 1915 to April 1916. The end of this period broadly coincides with the introduction of the Sussex pledge, introduced on 4th May 1916 after SS *Sussex* was torpedoed en route from Folkestone in March. However, UC Is continued to be active elsewhere on the east coast, confirming that the pledge did not extend to minelaying in places where passenger ships and merchant vessels predominated. The cessation of mining in the Dover Sector does not seem to reflect an increase in anti-submarine activity or effectiveness in the Dover Strait; and UC II class with longer ranges enabling activity much further west were not deployed until September-October 1916. It is unclear why U-boat minelaying activity within the Dover Sector dwindled from April 1916 onwards, having been so destructive for seven months.

5.1.12. The general increase in the use of U-boats against merchant shipping following their use in supporting the High Seas Fleet in the actions of summer 1916, appears not to have focussed on attacks on coastwise shipping within the Dover Sector. As noted, U-boat attention was directed further west, so the hazardous-filled sector was to be transited rather than lingered within; the effectiveness of anti-U-boat measures including sweeping and the eventual success of the barrage in 1918 may also have contributed to lower losses of coastwise shipping to mines in later years. As remarked earlier, the huge volume of cross-channel shipping was more-or-less unscathed; without downplaying the losses that did occur, the huge volume of coastwise shipping that transited the Dover Sector was also relatively untouched.

5.1.13. To repeat a point already made, the heritage of coastwise shipping is not only found on the seabed. It was served also by infrastructure on land, such as the chain of War Watching Stations and War Signal Stations, as at Dover[93], often re-purposed from Coastguard Stations during hostilities (Figure 17). These served as a means of keeping a check of what was happening at sea, including keeping a look out for U-boats and enemy craft.

[93] https://www.english-heritage.org.uk/visit/places/dover-castle/history-and-stories/fortress-dover/.

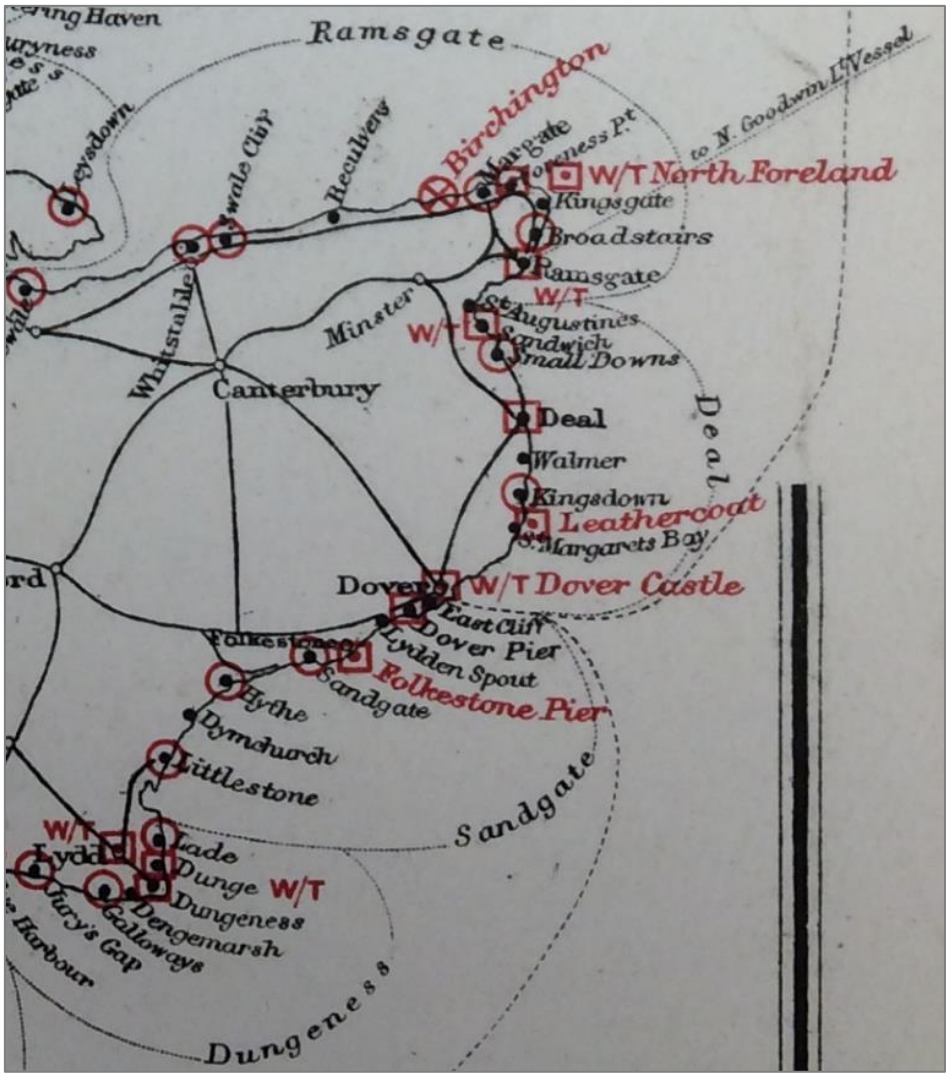

Figure 17: War Watching Stations (red circles), War Signal Stations (red squares) and Wireless Telegraph Stations (W/T) along the coast of the Dover Sector. Courtesy of UKHO Archive.

5.1.14. A sense of the volume of shipping passing coastwise through the Dover Sector is provided by Bacon's account of the Examination Service, which examined ships for contraband (goods traded with Germany) and the presence of German nationals. All coastwise traffic passed through the Downs, between the Goodwin Sands and the coast of Kent. As well as being an essential through route, the Downs also served as an anchorage, as it has for centuries. The Examination Service operated in the Downs, based at Ramsgate, until it was moved to Southend. Bacon states that in the period 1915-17, the Examination Service dealt with 121,707 British, Allied and neutral vessels (Bacon 1919b, 2:366). Examinations were carried out by the Downs Boarding Flotilla (DBF), which initially comprised six tugs supported by the gunboat HMS *Harrier* and destroyer HMS *Niger* (Bacon 1919b, 2:370). Details of boarding activity are held in TNA in the form of Boarding Office Logs No. 2 to No. 66[94]; Record of Vessels Boarded No. 1 to 35 (5 Aug 1914 to 8 Aug 1916)[95]; and the Ship Boarding Books, 7 Aug 1916 to 28 Dec 1918[96]. Bacon does not detail how much contraband was seized or vessels arrested, but he notes that 426 'enemy prisoners and suspects' were removed from vessels in the Downs, including the German naval intelligence officer von Rintelen – travelling under an alias – who had been fomenting sabotage and labour disputes in the US (Bacon 1919b, 2:374–75).

[94] ADM 137/2301 - ADM 137/2365.
[95] ADM 137/2366 – ADM 137/2400.
[96] ADM 137/2401 - ADM 137/2423.

5.1.15. Bacon refers to the Downs as 'the place of greatest importance in the Dover Patrol' (Bacon 1919b, 2:366) with sometimes a hundred ships at anchor, forming a major target. The Downs Boarding Flotilla was supported by up to 30 armed drifters also based in Ramsgate, providing assistance and a degree of defensive capability. The drifters were supplemented at times by destroyers and gunboats; subsequently monitors were stationed in the Downs as guardships, and by the HMS *Marshall Ney* from April 1917. Shore batteries were constructed at Foreness[97] and North Foreland (Figure 19) around the same time. Within the Downs, a net obstruction was placed across the Downs in March 1915 with a gateway between two buoys – guarded by drifters – through which all traffic had to pass (Bacon 1919b, 2:372). This appears to correspond with the obstruction labelled 'Coastal Motor Boat Defence' and 'complete' in August 1917, and as 'obstruction to surface craft (under construction)' in April 1918[98]. The lights and buoys around the Downs and Goodwins were also altered, to continue serving as navigation aids for merchant shipping whilst being obscured to attacking forces (Bacon 1919b, 2:386–87).

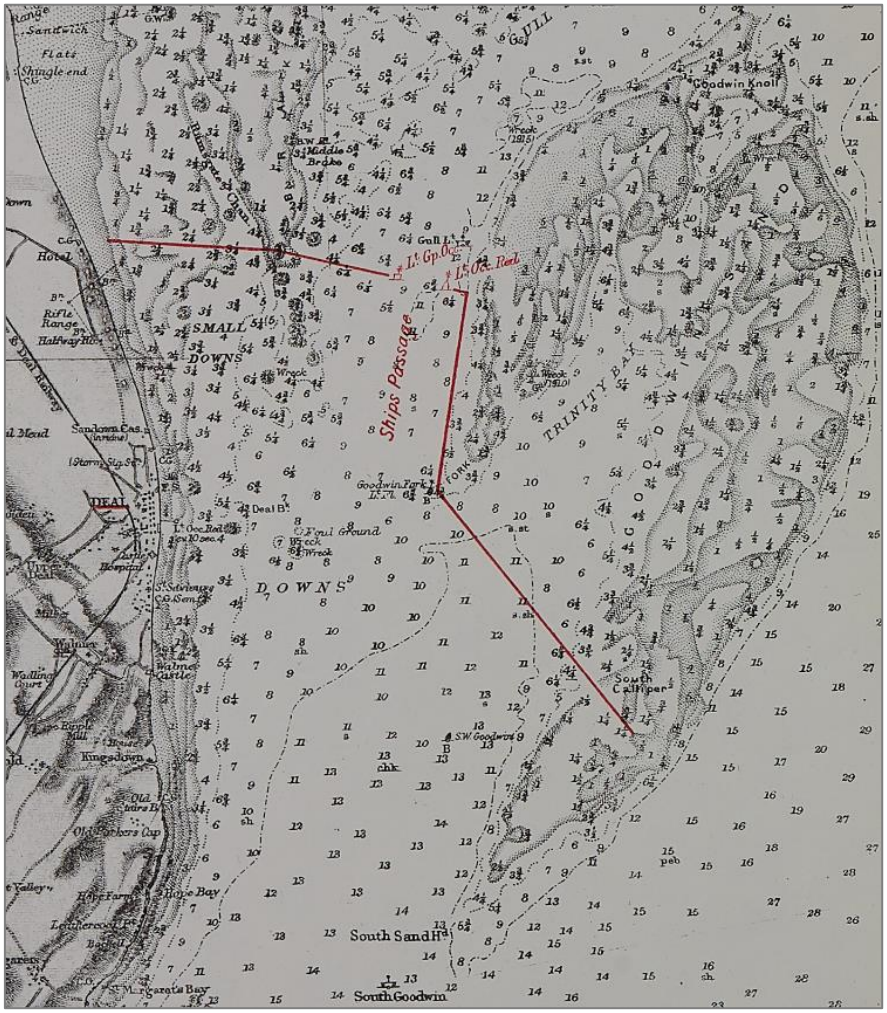

Figure 18: Coastal Motor Boat Defence protecting the Downs, described as 'complete as shown'. Chart Z.141EEE, 1917. Courtesy of UKHO Archive.

[97] There appears to be no reference to these batteries in archaeological records. Photo of Foreness Point from Britain from Above, 1923: https://britainfromabove.org.uk/en/image/EPW009237. Although there are extensive works on the cliff top, the battery is not clear.

[98] UKHO Z 141 EEE.

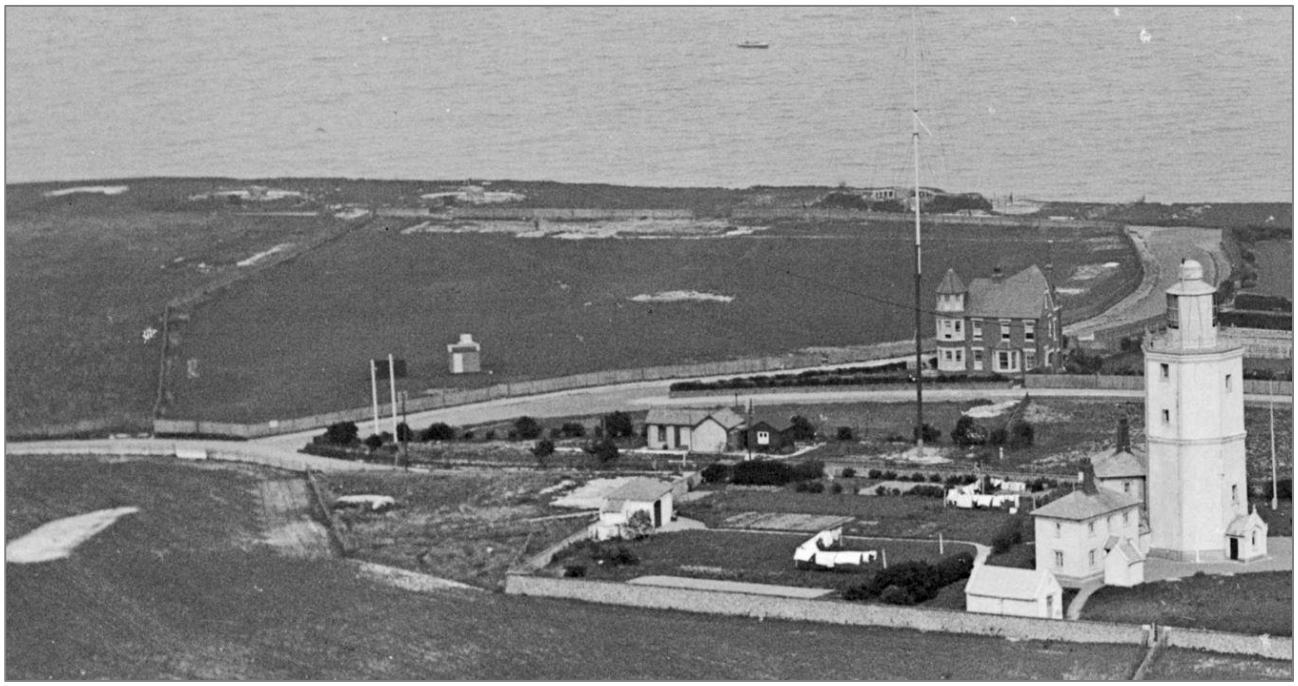

Figure 19: North Foreland photographed in 1920. It appears to show a gun battery close to the cliff line. The mast and hut to the left of the lighthouse are likely to be the wireless station. Image courtesy Britain from Above: https://britainfromabove.org.uk/en/image/EPW000668.

5.1.16. Although attacks on the Downs were attempted by German forces, they were largely unsuccessful. An early loss was the DBF's HMS *Niger*[99], torpedoed by *U-12* off Deal in November 1914. As noted previously, UC I minelaying U-boats were active in the area especially in 1915 but they confined their attacks to the northern and southern entrances: HM Yacht *Aries*[100] is an example, mined in October 1915 while serving with the DBF. Bacon comments that U-boats rarely came into the Downs as they 'did not like coming into water less than ten fathoms in depth in case patrol vessels forced them to dive' (Bacon 1919b, 2:379). The hazards are illustrated by *U-48*[101] which – while transiting outside the Goodwins in November 1917 – appears to have snagged an anti-submarine net, drifted on to the sands, was shelled by drifters and then scuttled by its crew. *UB-12*[102] has been given a location in the Goodwins but is unconfirmed: it left Zeebrugge on 19 August 1918 to lay mines in the area of the Goodwins but nothing further was heard of the submarine (Termote 2017, 231).

5.1.17. Raids on the Downs by German surface craft were attempted on several occasions: on 23rd November 1916, a destroyer flotilla exchanged fire with a drifter patrol at the southern entrance but turned away; on 25th February 1917 several destroyers appeared in the North Downs, shelling drifters and the coast; and on 18th March 1917, four destroyers attacked the drifter patrol and shelled Ramsgate. The final raid was on 27th April 1917, shortly after HMS *Marshall Ney* came on station; Ramsgate was shelled by German destroyers and *Marshall Ney* opened fire on them (Bacon 1919b, 2:384–87). None of these raids appear to have been a sustained attack on coastwise shipping.

5.1.18. A final form of attack on coastwise shipping in the Downs was presented by aircraft. Ramsgate was especially exposed to German aircraft – both fixed-wing and Zeppelins – flying to/from the Thames and London, suffering a number of raids onshore. Bacon notes an air attack on shipping in March 1915 and also notes that the drifters were involved in 'scraps with aircraft too frequent to detail' (Bacon 1919b, 2:376; 382). A number of air attacks on shipping in the Downs and Dover Sector

[99] UID 904855.
[100] UID 904849.
[101] UID 904880.
[102] UID 904896.

are outlined out by Jones, including: six bombs dropped on a coaster on 20th March 1915 (perhaps the instance that Bacon refers to); attacks on shipping near the Goodwins and off Dover on 23rd May 1915; and bombing of shipping near the Kentish Knock (Jones 1931, 3:150–52). There appear to have been no losses to shipping from aerial bombing, but – as with the shelling by destroyers – there were casualties onshore.

5.1.19. One particular air attack in the Downs is worth noting. On 19th April 1917, six seaplanes – three of which were carrying torpedoes – appeared off the Goodwin Light Vessel. One torpedo was launched at the drifter HMS *Carolbank* but just missed. A torpedo was then launched at the SS *Nyanza* but also missed. A third torpedo was launched at HMS *Marshall Ney* but missed, passed under a dredger and embedded itself in mud near Ramsgate Harbour (Jones 1933, 55–56). These were the first attacks by torpedo bombers in UK waters[103] and caused alarm, especially when further merchant ships were attacked and two sunk – the SS *Gena* and SS *Kankakee* – north of the Dover Sector in May 1917 (Jones 1933, 56–57). The attacks were carried out by Gotha WD 14 seaplanes from Torpedostaffel II established in March 1917 at Zeebrugge[104]. A flight of aircraft was established at Walmer to protect merchant shipping in the Downs and patrols arranged from existing air stations along the War Channel between Yarmouth and Dover (Jones 1933, 57). Machine guns or 3-pounders, with a crew, were placed temporarily on merchant ships while transiting the danger area (Jones 1933, 57). Further unsuccessful attacks were carried out on ships in May and July, and SS *Storm* was sunk by air launched torpedo in September 1917 (Jones 1933, 58). This was the last attack as the 'results were not commensurate with the efforts', though the potential of such attacks was clear and alertness to this danger was maintained (Jones 1933, 58; Layman 2002, 63).

5.1.20. Notwithstanding the varying forms of attack and the defensive measures that were taken, actual losses to enemy action were slight. Instead, maritime peril – especially collision in these crowded waters – accounted for the majority of losses in the Downs and their vicinity (Table 11):

Name	UID	Type	Date of Lo	Cause of Los
Maine	883361	Cargo	02/04/1914	Collision
Eileen	881544	Civil	22/07/1914	Stranded
Adjutant	882345	Cargo	22/10/1914	Collision
Stranton	881545	Cargo	30/12/1914	Collision
Char	1349569	Civil	16/01/1915	Collision
Wallsend (1915)	881549	Cargo	09/09/1915	Collision
Bonar Law	881550	Warship	28/10/1915	Collision
Benabourd	881552	Cargo	24/12/1915	Stranded
Envermeu	881552	Cargo	24/12/1915	Stranded
De La Pole	881553	Warship	04/02/1916	Stranded
Correct	904895	Cargo	29/02/1916	Collision
Egero	904878	Cargo	04/03/1916	Collision
Marcella	904863	Warship	24/03/1916	Collision
Jacob Luckenbach	904854	Cargo	05/07/1916	Collision
Rooke	882350	Warship	03/08/1916	Collision
Pola	882351	Cargo	18/11/1916	Foundered
Consorzio Carboni	881555	Cargo	19/11/1916	Stranded
Val Salice	881555	Cargo	19/11/1916	Stranded
Sibiria	881556	Cargo	20/11/1916	Stranded
Navigator	1388129	Cargo	28/12/1916	Collision
Kongshavn	882353	Cargo	01/02/1917	Collision
Koenigshaven	904875	Cargo	02/02/1917	Leaked
Malta (1917)	904876	Cargo	16/02/1917	Collision

[103] The UK had also been developing torpedo bombers and is considered to have sunk two or perhaps three vessels in Turkish waters with them in 1915, though details are disputed or unverified (Layman 2002, 62–63; 211).

[104] See https://www.greatwarforum.org/topic/159761-hansa-brandenburg-gw/; https://forum.axishistory.com/viewtopic.php?t=243887.

Name	UID	Type	Date of Lo	Cause of Los
Ocean Queen	882352	Cargo	28/08/1917	Collision
Ethnee	1388215	Warship	15/01/1918	Foundered
Countess	882357	Cargo	02/03/1918	Foundered
Diamond	882356	Cargo	02/03/1918	Foundered
Eliza and Alice	882354	Cargo	02/03/1918	Foundered
Novator	882358	Cargo	02/03/1918	Collision
Olympia	901839	Cargo	13/03/1918	Foundered
Lina	1197606	Cargo	23/09/1918	Stranded
Dawn	882355	Cargo	02/11/1918	Stranded
Sea Gull (1918)	881559	Civil	30/11/1918	Stranded
Kate and Emily	883758	Cargo	18/12/1918	Leaked

Table 11: Losses in and near the Downs, WWI

5.2. Coastwise shipping along the Continental coast in WWI

5.2.1. Table 12, derived from Wrecksite, is not exhaustive but gives an indication of vessels lost in coastwise shipping on the continental coast of the Dover Sector, by date, in WWI. In this case, 'coastwise' necessarily includes shipping that was crossing the Channel, though predominantly to or from destinations further afield rather than between Channel ports (such as the SS *Nigel*, mined off Boulogne en route from Newhaven). It also includes warships defending this shipping by minesweeping and patrolling, and therefore vulnerable to the same hazards.

Name	Date of Loss	Category	Type	Nationality	Cause of Los	Notes	Area
Tysla	07/08/1914	Cargo	SS	Norwegian	mined	Dutch mine	Westerschel dt
Ardmount	05/10/1914	Cargo	SS	UK	mined	-	Zeebrugge
Etoile Polaire	28/12/1914	Cargo	SV	French	wrecked	-	Boulogne
Torpilleur 319	19/01/1915	Warship	TB	French	mined	-	Niewport
Marie	20/02/1915	Warship	minesweeper	French	mined	-	Niewport
William Dawson	21/08/1915	Cargo	SS	UK	mined	by *UC-5*	Boulogne
Saint Pierre I	23/09/1915	Warship	Patrol boat	French	torpedoed	by *UB-17*	Gravelines / Dunkirk
Moorside	12/11/1915	Cargo	SS	UK	mined	by *UC-6*	Boulogne
*Nigel**	12/11/1915	Cargo	SS	UK	mined	by *UC-6*	Boulogne
Dotterel	29/11/1915	Cargo	SS	UK	mined	-	Gris-Nez
Pinegrove	11/12/1915	Cargo	SS	UK	mined	by *UC-3*	Gris-Nez
Belford	20/12/1915	Cargo	SS	UK	torpedoed	by *UB-10*	Boulogne
Huntly	20/12/1915	Cargo	SS	UK	torpedoed	by *UB-10*	Boulogne
Argo	08/02/1916	Cargo	SS	UK	mined	by *UC-3*	Boulogne
Hamatris	08/03/1916	Cargo	SS	UK	torpedoed	by *UB-18*	Boulogne
Tustnastabb	15/04/1916	Cargo	SS	Norwegian	mined	by *UC-7*	Boulogne
Estafette	21/04/1916	Warship	Patrol boat	French	mined	by *UC-6*	Gravelines / Dunkirk
Saint Corentin	29/04/1916	Warship	Patrol boat	French	mined	by *UC-6*	Gravelines / Dunkirk
Mercator	13/10/1916	Cargo	SS	Finnish	mined	by *UC-26*	Boulogne
Blanc Nez	27/10/1916	Warship	Patrol boat	French	mined	by *UC-26*	Gris-Nez
Zulu	08/11/1916	Warship	Destroyer	UK	mined	by *UC-1*	Gravelines / Dunkirk
Torpilleur 317	28/12/1916	Warship	TB	French	mined	by *UC-1*	Calais
Port Nicholson	15/01/1917	Cargo	SS	UK	mined	by *UC-1*	Gravelines / Dunkirk
Dartmore	15/02/1917	Cargo	SS	UK	wrecked	-	Blanc-Nez
Munificent	01/03/1917	Cargo	SS	UK	mined	-	Blanc-Nez
Elisabeth	13/03/1917	Warship	Patrol boat	French	mined	by *UB-12*	Calais
Duchess of Montrose	18/03/1917	Warship	PS minesweeper	UK	mined	by *UB-12*	Gravelines / Dunkirk
Laforey	23/03/1917	Warship	Destroyer	UK	mined	by *UB-12*	Gris-Nez

Name	Date of Loss	Category	Type	Nationality	Cause of Los	Notes	Area
Alert	15/04/1917	Utility	TH Yacht	UK	mined	-	Gravelines / Dunkirk
Marden	16/04/1917	Cargo	SS	UK	gunfire (U-boat)	by *UB-36*	Gris-Nez
Rochester Castle	16/04/1917	Cargo	SV	UK	gunfire (U-boat)	by *UB-36*	Gris-Nez
Alhama	26/04/1917	Cargo	SS	UK	mined	by *UB-12*	Calais
Lorraine	18/05/1917	Fishing	FV	French	collision	-	Le Tourquet / Etaples
Fraser	17/06/1917	Warship	HMT minesweeper	UK	mined	by *UC-65*	Boulogne
Kempton	24/06/1917	Warship	PS minesweeper	UK	mined	by *UC-1*	Gravelines / Dunkirk
Redcar	24/06/1917	Warship	PS minesweeper	UK	mined	by *UC-1*	Gravelines / Dunkirk
Jupiter I	10/07/1917	Warship	Patrol boat	French	mined	by *UB-12*	Calais
Venedocian	29/08/1917	Cargo	SV	UK	wrecked	-	Boulogne
Advent	27/09/1917	Cargo	SS	UK	mined	-	Blanc-Nez
Gladys	27/11/1917	Cargo	SS	UK	mined	*UC-69*	Gris-Nez
Lord Grey	02/12/1917	Warship	HMT minesweeper	UK	wrecked		Gris-Nez
Eustratious	04/04/1918	Cargo	SS	Greek	torpedoed	By *UC-78*	Gris-Nez
Nepaulin	20/04/1918	Warship	PS minesweeper	UK	mined	by *UB-12*	Gravelines / Dunkirk
Rhea	22/06/1918	Cargo	SS	UK	mined	by *UC-49*	Le Tourquet / Etaples
Biruta	07/08/1918	Cargo	SS	UK	torpedoed	or mined	Blanc-Nez
Branlebas	29/09/2015	Warship	Destroyer	French	mined	-	Niewport

Table 12: Losses to coastwise shipping on continental coast, WWI

5.2.2. Many of these losses are UK vessels, underlining the degree to which even coastwise shipping on the continental side is a shared heritage. Commonalities in the overall pattern are also shared with the UK side: the losses include many cargo vessels but also minor warships such as minesweepers and patrol boats, plus several destroyers.

5.2.3. As on the English side, U-boats were a major cause of loss: sometimes by gunfire but more often by torpedoes and especially mines. Accordingly, there are chronological similarities too – relatively few losses in 1914, increasing markedly in the period from September 1915 to April 1916 when the UC and UB coastal U-boats of the Flanders flotillas were very active. Boulogne was the first target when Flanders vessels found a way through the cross-channel barrage and continued to be a 'favourite'.

5.2.4. The number of losses increases markedly in 1917 with the onset of unrestricted submarine warfare in February. This is a contrast with the English side, where there were relatively few coastwise losses in 1917 despite the new German campaign. This may reflect the high level of control over the English side and the preference of the German U-boats for traversing the Channel on the continental side, taking opportunities to attack while doing so. A reduction in losses in 1918 probably reflects the eventual effectiveness of the Folkestone – Gris Nez barrage.

5.2.5. Losses to French warships are a reminder that the defence of shipping was a shared enterprise. Minesweeper *Marie* and patrol boat *Saint Pierre I* lost in 1915 were both former trawlers; as were *Estafette*, *Saint Corentin* and *Blanc Nez* in 1916; and *Elisabeth* and *Jupiter I* in 1917. Of these seven former trawlers, five were UK-built.

5.3. Coastwise shipping along the English coast in WWII

5.3.1. Coastwise shipping through the Channel on the English side was to be as critical to the Allied war effort in WWII as in WWI. Lessons from 1918 were absorbed into plans that came into effect in 1939, just over 20 years later: notably the use of War Channels; convoys and mine barriers. Action on all of these had been planned in advance and they were introduced rapidly. If anything, the system of War Channels was more developed: whereas in WWI the War Channel extended north from North Foreland (though channels were swept on the south coast also), in WWII the War Channels continued south through the Downs and along the south coast. Similarly, more extensive routing of convoys was introduced from the earliest phase of WWII. Whereas the Humber had been the southerly terminus of east coast convoys in WWI with vessels sailing unconvoyed south of that point, Southend became the terminus for east coast convoys (FN – FS) in WWII starting 6th September 1939 (Roskill 1954, 93). Southend was also the terminus for outward ocean convoys down the Channel (OA) from 7th September. As noted above, the Dover Mine Barrage as a blockade against transiting U-boats was installed from 11th September; a huge East Coast Mine Barrage was started later in the year. A further innovation was radar: more famous for its role in intercepting bombers and fighters making attacks inland, but designed also to protect the War Channels from surface attacks (Figure 20).

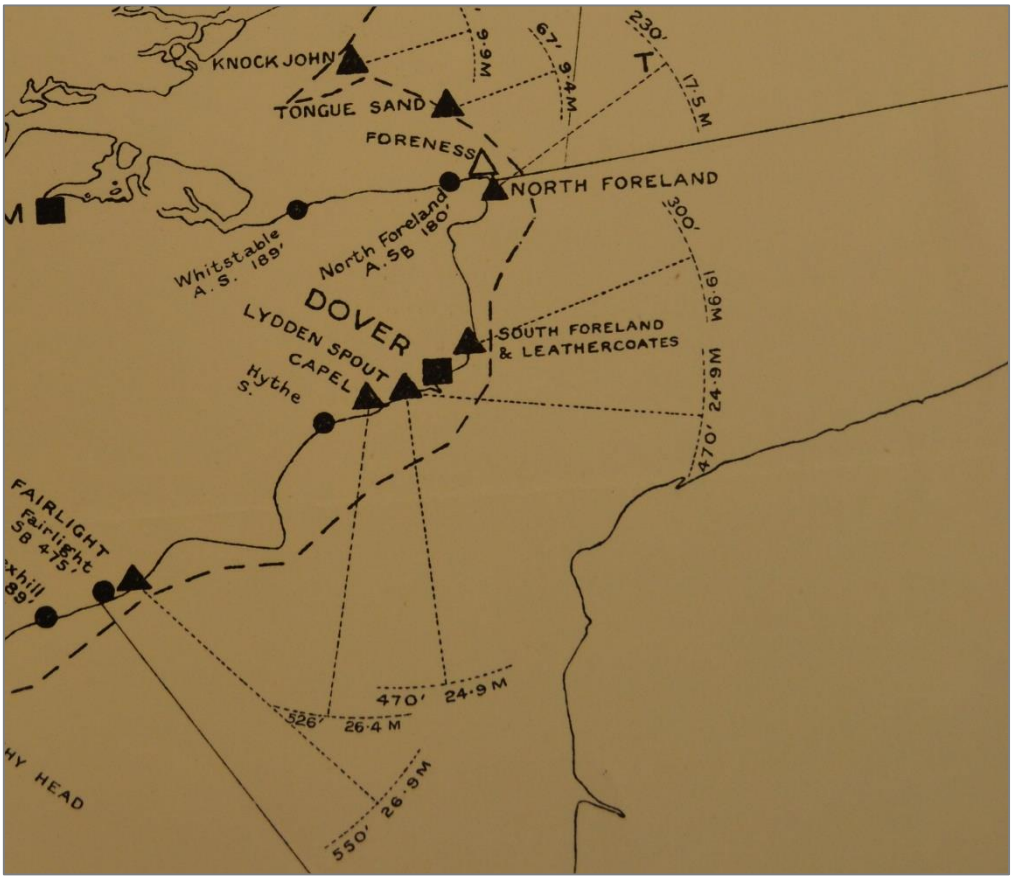

Figure 20: R.D/F (radar) Home Chain - Surface Watching (Chart Z 61, 1942). Shows 'convoy route' as dashed line covered by arcs of radar cover. Square indicates Naval Plotting Room at Dover. Courtesy of UKHO Archive.

5.3.2. There is a distinct periodicity to losses on the English side of the Dover Sector in the Second World War, with high losses to cargo ships and warships in 1940 (Table 13: Counts of losses among coastwise shipping, WWII; Table 13; Figure 21).

Year	Utility	Warship	Cargo	Total
1939		2	7	9
1940	3	17	30	50
1941		3	1	4
1942		7	1	8
1943		1		1
1944		2	4	6
1945	1	1	5	7
Grand Total	**4**	**33**	**48**	**85**

Table 13: Counts of losses among coastwise shipping, WWII

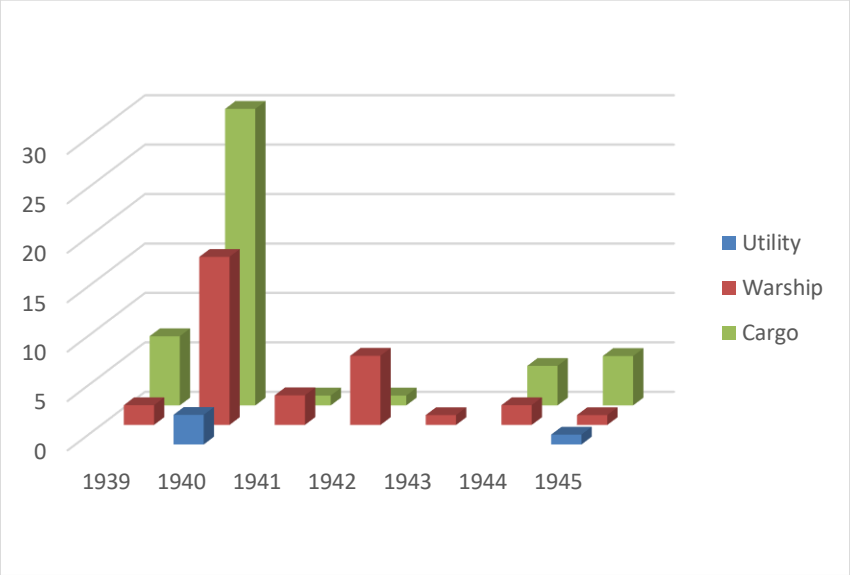

Figure 21: Bar chart showing losses among coastwise shipping, WWII

5.3.3. Losses in the four wartime months of 1939 are notable too, whilst the increase in losses in 1944 and 1945 largely relates to vessels attacked on the route to and from the Scheldt once Antwerp became operational, addressed in the cross-channel section above. The increase in warship losses in 1942 relates to coastal forces craft and is discussed below; a small number of losses on the English side of the Dover Sector that are associated with the evacuation from Dunkirk are addressed in a subsequent section also.

5.3.4. Setting aside these other themes, the story of coastwise shipping in the Dover Sector in WWII is largely concerned with the vulnerability of shipping in 1939-40. Coastwise shipping continued through 1941-45 – indeed it intensified in preparing for and supporting the liberation of the Continent – but it is barely represented by wrecks on the seabed.

5.3.5. Losses are summarised in Table 14 for 1939; 1940 to 10th May; and 1940 after 10th May.

Date of Loss	Cause of Loss	Convoy	Type	Name	UID
11/09/1939	collision		Cargo	*Brendonia*	904881
06/10/1939	stranded		Cargo	*Mahratta II*	904864
04/11/1939	mined		Cargo	*Nicolaos M Embiricos*	881568
22/11/1939	mined		Warship	*Aragonite*	904858
30/11/1939	foundered		Cargo	*Gretha*	881569
08/12/1939	collision		Cargo	*Dinard*	904856
08/12/1939	mined		Cargo	*Merel*	904891

Date of Loss	Cause of Loss	Convoy	Type	Name	UID
10/12/1939	stranded		Cargo	*Kabinda*	904868
20/12/1939	mined		Warship	*Napia*	904872
07/01/1940	mined		Cargo	*Cedrington Court*	904909
09/01/1940	mined		Cargo	*Dunbar Castle*	904907
09/01/1940	mined		Cargo	*Truida*	1260330
21/01/1940	stranded		Cargo	*Rynanna*	904865
29/01/1940	mined		Cargo	*Nora*	882364
10/02/1940	foundered		Cargo	*Gallia*	882365
12/02/1940	collision		Cargo	*Flandres*	904850
15/03/1940	mined		Warship	*Peridot*	901807
18/03/1940	mined		Cargo	*Tina Primo*	904898
08/04/1940	mined		Cargo	*Okeania*	904426
20/04/1940	mined		Cargo	*Mersey*	904879
23/04/1940	mined		Cargo	*Lolworth*	904906
24/04/1940	mined	(FS (1)51)	Cargo	*Bravore*	904884
24/04/1940	mined	(FS (1)51)	Cargo	*Rydal Force*	904887
25/04/1940	collision		Cargo	*Bobby*	901732
09/05/1940	stranded		Cargo	*Ashley*	904861
22/05/1940	collision		Cargo	*Efford*	1398622
30/05/1940	not known		Cargo	*Dutch Schooner*	904893
30/05/1940	foundered		Warship	*Alfred Colebrook*	904886
03/06/1940	collision	-	Cargo	*Emma*	813830
06/06/1940	mined	-	Cargo	*Harcalo*	904890
12/06/1940	mined	-	Cargo	*Yvonne*	904901
18/06/1940	air attack	-	Utility	*East Goodwin Light Vessel*	904873
08/07/1940	torpedoed	-	Warship	*Cayton Wyke*	901837
14/07/1940	air attack	CW 5	Cargo	*Island Queen*	883787
19/07/1940	air attack	-	Cargo	*War Sepoy*	901815
20/07/1940	air attack	FS (2)24; CW 7	Cargo	*Pulborough*	901793
21/07/1940	air attack	CW 7	Warship	*Brazen*	901769
24/07/1940	air attack	-	Warship	*Kingston Galena*	901820
24/07/1940	air attack	-	Warship	*Rodino*	901818
25/07/1940	air attack	FS (2)27; CW 8	Cargo	*Corhaven*	901800
25/07/1940	air attack	CW 8	Cargo	*Henry Moon*	901768
25/07/1940	air attack	CW 8	Cargo	*Leo*	901795
25/07/1940	air attack	FS (2)27; CW 8	Cargo	*Polgrange*	901805
25/07/1940	air attack	FS (2)27; CW 8	Cargo	*Portslade*	901752
25/07/1940	air attack	CW 8	Cargo	*Summity*	1399385
27/07/1940	air attack	-	Warship	*Codrington*	883788
29/07/1940	air attack	FS (2)27; CW8	Cargo	*Gronland*	1256763
29/07/1940	air attack	-	Warship	*Gulzar*	883789
14/08/1940	air attack	-	Utility	*South Folkestone Gate Light Vessel*	901787
14/08/1940	air attack	-	Warship	*Elizabeth Angela*	904894
25/10/1940	air attack	-	Utility	*South Goodwin Light Vessel*	901832
01/11/1940	mined	-	Cargo	*Hundvaag*	901833
01/11/1940	air attack	-	Warship	*Torbay II*	901812
14/11/1940	air attack	-	Warship	*Shipmates*	883792
14/11/1940	foundered		Warship	*The Boys*	901830
15/11/1940	mined	-	Warship	*Guardsman*	904429

Date of Loss	Cause of Loss	Convoy	Type	Name	UID
24/12/1940	collision	-	Warship	*Lord Howard*	883793

Table 14: Losses to coastwise shipping along the English coast, 1939-40

5.3.6. Several points are apparent from this listing. As noted by Hewitt (2008), there was no 'Phoney War' prior to 10th May 1940 at sea. There were significant losses attributable directly to enemy action off the English coast long before German assault on 10 May 1940. These losses were principally attributable to mines – including by surface minelayers but notably by aircraft. Cargo vessels bore the brunt of losses to mines but, as previously, minor warships involved in sweeping, patrolling and otherwise supporting the maintenance of coastwise shipping also suffered. HMS *Napia*, mined on 20 December 1939 off Sandwich for example, was a tug employed as an examination vessel in the Downs. Mining was especially concerning because as well as conventional mines, Germany was laying magnetic mines for which new modes of sweeping had to be developed. It is also worth noting that the usual perils of the sea resulted in several losses in this period and subsequently, through stranding, foundering and collision. As noted previously, these hazards were probably intensified by constraining shipping to narrow channels and convoys whilst aids to navigation were also being withdrawn.

5.3.7. Following the German offensive in May, the most striking aspect of losses to coastwise shipping in the Dover Sector is the impact of air attacks in just ten days from 20 July to 29 July. This corresponds to the Kanalkampf ('Channel fight'), which is regarded as the first phase of the Battle of Britain (Cull 2017; Holland 2011). As noted above, Germany had been making air attacks on shipping – directly and by mining – from early in the war. The Kanalkampf was distinctive because of the scale of attacks and the role of the massed aircraft in drawing Allied fighters into combat, seeking a level of attrition that would dismantle the RAF and enable defeat of the UK. Achieving an effective blockade of UK merchant shipping from the air – by halting convoys and cutting overall tonnage – was also a factor in German action. That merchant ships, not just RAF fighters, were the target is underlined by the role of German naval units – S-boats – operating in conjunction with the Luftwaffe against the same convoys.

5.3.8. It is worth noting that the Kanalkampf did not focus only on the Dover Strait: much of the action was further down the Channel, between the Cherbourg peninsula and the Isle of Wight and Portland. Kanalkampf is also a misnomer in that there were air attacks on shipping beyond the English Channel: in the Thames; on the east coast; in the Bristol Channel and in Scottish waters. Air attacks were made on ships in harbour as well as on convoys and other ships in open water, notably at Dover[105] and Portland. In addition to those that were sunk, which are included in the list above, many other ships were damaged and suffered casualties.

5.3.9. A key aspect of the archaeology of the Kanalkampf in the Dover Sector is the number of aircraft lost on both sides, amongst fighters and bombers but also reconnaissance aircraft and rescue aeroplanes. Given the extraordinary aerial melees, it is not surprising that losses claimed and acknowledged do not always correlate; and that the locations of aircraft crashing into the sea (never mind the trajectories that the remains of crashed aircraft took between sea surface and seabed) are highly uncertain (Cull 2017 passim.). Although Historic England's records indicate 99 aircraft as crashing in the Dover Sector in 1940, most are attributed only a general location.

5.3.10. As noted, the Kanalkampf is regarded as the opening phase of the Battle of Britain, which is conventionally regarded as starting on 10th July; the Kanalkampf is considered as lasting until around 10th-12th August, with the Luftwaffe's emphasis shifting to attacks on RAF airfields in the major offensive of 'Adler Tag' (12th August). Air attacks on shipping occurred before and after the

[105] For example, *War Sepoy* was burnt out following air attack on 19th July and subsequently sunk as a block ship. The patrol yacht *Gulzar* was sunk by air attack in Dover Harbour on 29th July.

10th July – 10th August period; however, the greatest intensity of losses within the Dover Sector was in the period 10th-29th July and is closely linked to convoy movements.

5.3.11. The ocean-outbound convoys routed from Southend via the Strait of Dover that commenced in September 1939 – labelled OA – ceased at the start of July. The last of these – OA 178 – departed Southend on 3rd July and was attacked by German aircraft between Cherbourg and the Isle of Wight on 4th July. Ships were sunk and others damaged, which were detached for Weymouth Bay and Portland – which was also targeted. S-boats attacked OA 178 at dusk on 4th. Of 35 merchant ships listed in convoy OA 178[106], five were sunk and 11 were damaged, in some cases very seriously. All this occurred to the west of the Dover Sector, but OA178 marked the last ocean-bound OA convoy to be routed through the Strait. OA 179 sailed just a few days later, on 8 July, but from Methil (Firth of Forth) – ships from the Thames having transited north in east coast convoys such as FN (2)14 and FN (2)15.

5.3.12. Traffic from the Thames (and the east coast) to the south coast remained essential, however, so new series of convoys were instituted to and from Southend via the Strait of Dover starting on 6th July: CW (Channel heading west) and CE (Channel heading east). These convoys – and warships associated with them – bore the brunt of the Kanalkampf within the Channel.

5.3.13. A couple of the CW convoys lost a significant number of vessels sunk and others damaged: notably CW 8 in the Dover Sector (after which convoys were suspended for a week) and CW 9 (Convoy Peewit) further west. Damage and losses to other convoys were fewer but the aerial combat above them was nonetheless intense. As noted in the table above, SS *Island Queen* was lost in the Dover Sector from CW 5 on 14th July off Folkestone; SS *Mons* and SS *Balder* were also damaged. SS *Pulborough* from CW 7 was sunk on 20th July off Dover, having travelled down the east coast as part of FS (2)24; one of the escorting destroyers, HMS *Brazen*, was badly damaged and although taken in tow sank the following day. On 24th July, trawlers HMS *Kingston Galena* and HMS *Rodino* – engaged in anti-submarine / minesweeping work – were also sunk off Dover.

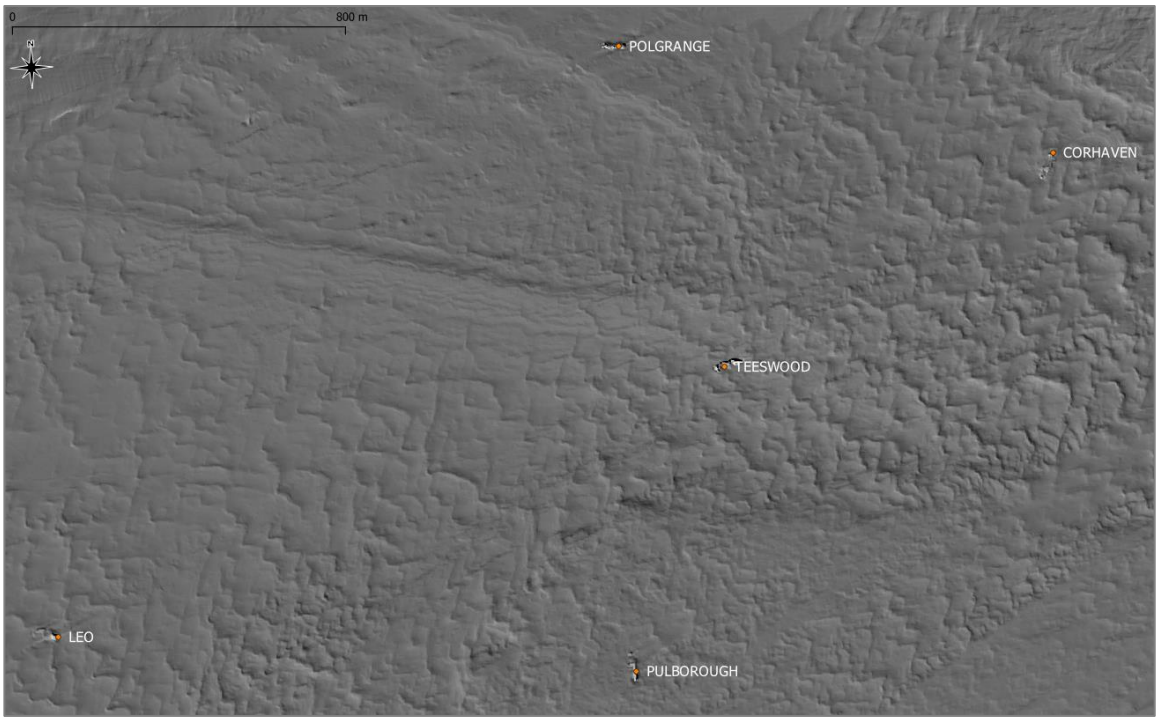

Figure 22: CHP multibeam data showing wrecks of *Pulborough* (sunk 20th July 1940), *Corhaven*, *Leo* and *Polgrange* (sunk 25th July 1940). *Teeswood* sank in 1956. Contains public sector information, licensed under the Open Government Licence v3.0, from the UKHO.

[106] http://www.convoyweb.org.uk/oa/index.html.

5.3.14. The greatest loss of ships within the Dover Sector attributable to the Kanalkampf took place on 25th July when CW 8 was attacked by Ju 87 dive-bombers. Several of the ships had travelled down the east coast with FS (2)27 before joining CW 8, which comprised 25 merchant ships[107]. SS *Corhaven*, SS *Leo* and SS *Polgrange* were sunk off Dover, close to where SS *Pulborough* had been sunk a few days before (Figure 22). SS *Henry Moon* was sunk south of Folkestone and Portslade about 7km further towards Dungeness. SS *Summity*, SS *Hodder*, SS *Newminster*, SS *Tamworth* and SS *Gronland* were damaged. SS *Summity* was beached in Langdon Bay; SS *Newminster*, SS *Tamworth* and SS *Gronland* were detached under tow to Dover Harbour[108]. As CW 8 carried on, west of the Dover Sector, it was attacked by S-boats south of Shoreham on the night of the 25th/26th, sinking a further three ships. SS *Gronland*, after being towed to Dover Harbour, was bombed and sunk there on 29th July. Two of the destroyers in pursuit of the S-boats – HMS *Boreas* and HMS *Brilliant* – were also badly damaged by Ju 87s. Roskill notes that the losses to CW 8 caused the Admiralty to stop Channel convoys temporarily while developing defensive measures; but he also notes that during the last week in July, 103 ships were convoyed through the Dover Strait, and that the tonnage lost between 10th July and 7th August was 'considerably less' than losses from mines in the same period (Roskill 1954, 324).

5.3.15. The next CW convoy – CW 9, known as Peewit – did not leave Southend until 7th August. It passed through the Dover Sector without being attacked, but was hit by S-boats in the early hours of 8th August off Beachy Head and subsequently by air attacks during the day. Losses on the water were high and again the aerial battle was intense. However, the Luftwaffe's priorities then shifted to attacks on airfields and other targets on land, and although air attacks on shipping and ports continued, the Kanalkampf as such had passed.

5.3.16. It is also worth noting that air attacks were made on light vessels in this period. Within the Dover Sector, *East Goodwin Light Vessel* was sunk on 18th June, *South Folkestone Gate Light Vessel* on 14th August and *South Goodwin Light Vessel* on 25th October. Navigation aids such as lighthouses and lightships were generally regarded as beyond the scope of military activity: they could not be used for military purposes, nor targeted. However, light vessels and their tenders suffered numerous losses in WWII including these three examples in the Dover Sector. Two Trinity House crew were killed on the South Folkestone Gate Light Vessel.

5.3.17. German forces established long range batteries at Cape Gris Nez that came into operation on 12th August 1940 against coastal convoys. Roskill describes this as nerve-racking for the crews but ineffective (Roskill 1954, 325; Hewitt 2008). Losses to vessels in the Dover Sector caused by German shore batteries did not occur until 1943 and 1944.

Date of Loss	Cause of Loss	Type	Name	UID
03/01/1941	stranded	Warship	*Dusky Queen*	883794
03/02/1941	air attack	Warship	*Artic Trapper*	904892
05/02/1941	air attack	Warship	*Tourmaline*	904911
16/06/1942	collision	Warship	*Tranquil*	904853
21/07/1942	gun action	Warship	*MGB 328*	883795
24/07/1942	gun action	Warship	*MGB 601*	883796
11/08/1941	torpedoed	Cargo	*Sir Russell*	901751
18/08/1942	mined	Warship	*MTB 218*	901817
19/08/1942	collision	Warship	*Golden Sunbeam*	883797
24/08/1942	mined	Warship	*ML 103*	901767
28/08/1942	foundered	Cargo	*SCCR 382*	813366
17/09/1942	air attack	Warship	*Waterfly*	883798
02/03/1943	gun action (shore)	Warship	*Ut Prosim*	1256867
06/06/1944	gun action (shore)	Cargo	*Sambut*	1544031
24/06/1944	gun action (shore)	Cargo	*Empire Lough*	901808

[107] http://www.convoyweb.org.uk/cw/index.html.
[108] https://www.naval-history.net/xDKWW2-4007-20JUL02.htm.

Date of Loss	Cause of Loss	Type	Name	UID
26/07/1944	torpedoed	Cargo	*Empire Beatrice*	901755
07/10/1944	foundered	Cargo	*Norman*	901794
07/11/1944	mined	Warship	*Grethe Mortensen*	881579
10/11/1944	fire	Warship	*LCPS 129*	1256871
22/01/1945	collision	Cargo	*James Harrod*	904851
09/04/1945	torpedoed	Cargo	*Samida*	901748
08/07/1945	collision	Warship	*La Nantaise*	1259007

Table 15: Losses to coastwise shipping along the English coast, 1941-45

5.3.18. The losses to coastwise shipping on the English side of the Dover Sector 1941-45 are low in number, especially if losses due to maritime peril are set aside (Table 15). Two themes stand out: the loss of coastal forces craft in 1942; and Operation Neptune in 1944.

5.3.19. The four coastal forces craft lost on the English side of the Dover Sector date to the same period – a little over a month in July-August 1942. These small, speedy fighting vessels were a feature of the Dover Sector from 1940 in the form of a motor torpedo boat (MTB) Flotilla based at Dover; the intention of these short (c. 70ft) but fast MTBs was to conduct offensive operations against enemy shipping, but initially they were used mainly as rescue boats for crew of crashed aircraft and merchant ships (Reynolds 2000, 12). The pressing need, however, was for vessels that were sufficiently fast and well-armed to take on the German S-boats. Consequently, motor gun boats (MGBs) evolved from the motor anti-submarine boats (MA/SB) whose original role proved unnecessary. Also initially about 70ft long, MGBs defended shipping from the S-boats by taking the offensive – seeking to intercept the S-boats out in the Channel and on the coast of the occupied Continent. Larger (though slower) vessels were also in development, notably motor launches (MLs) – Fairmile As and Bs – that were originally conceived as anti-submarine craft but, as in WWI, were to develop a wider range of roles. These vessels were to become the basis of 'long' MGBs and MTBs – notably the Fairmile Ds – that came into operation in 1942. 'Defence' was pursued aggressively across the Channel, including attacking German coastwise shipping on the continental coast as well as seeking action with S-boats and other German coastal forces. Within such an offensive frame, both MTBs and MGBs worked together. The armament of the longer boats was to some degree interchangeable and as the gun-carrying capability of MTBs increased, the roles increasingly overlapped. Within the Dover Sector, coastal forces were based at Dover and Ramsgate, with further important bases in the North Sea and to the west, down the English Channel.

5.3.20. The losses recorded in the Dover Sector in July-August 1942 reflect this broader context: three were 'long' boats: *ML 103* was a Fairmile A; *MGB 328* was a Fairmile C; and *MGB 601* was a Fairmile D. *MTB 218* was a 'short' Vosper-built boat. The variety of coastal craft based at Dover – including also RAF High Speed Launches – is illustrated by a series of photographs in the IWM Collections titled 'With the Royal Naval Coastal Force, Dover'. The series shows the boats in a dock under improvised camouflage in February 1942[109] together with photographs of *MGB 328* at sea[110]; *MGB 328* was sunk by enemy gunfire in an action on 21st July; it has been suggested that a small wreck to the south east of SW Goodwin – confirmed by CHP survey – may be that of *MGB 328*[111]. *MGB 601* seems to have sunk a few days later on 24th July but as a result of damage sustained in the same action on 21st July. There appear to be photographs in the National Archives showing

[109] IWM A 7442: https://www.iwm.org.uk/collections/item/object/205141524;
IWM A 7443: https://www.iwm.org.uk/collections/item/object/205141525;
IWM A 7444: https://www.iwm.org.uk/collections/item/object/205141526;
IWM A 7453: https://www.iwm.org.uk/collections/item/object/205141534;
IWM A 7454: https://www.iwm.org.uk/collections/item/object/205141535;
[110] IWM A 7451: https://www.iwm.org.uk/collections/item/object/205141532;
IWM A 7452: https://www.iwm.org.uk/collections/item/object/205141533.
[111] https://wrecksite.eu/wreck.aspx?74843.

'shell damage, petrol explosion and fire damage'[112]. Scott notes that *MGB 601* was the first Fairmile D to see action; with two Fairmile C's they attacked a convoy to the north of Cap Gris Nez, comprising a merchant ship with a heavy escort. According to Scott, *MGB 601* was hit repeatedly and caught fire, and may have been rammed before blowing up; this does not match with the accounts indicating that *MGB 601* was lost at Dover following the action; nor is reference made by Scott to *MGB 328* (Scott 2009, 82).

5.3.21. Although attributed to the English side of the Dover Sector, *MTB 218* was sunk in an action with other Dover-based coastal forces against a convoy in the Dunkirk channel on 18th August 1942: *MTB 218* was hit in the engine room during its first attack and attempted a second, but was making water fast and had to abandon the attempt. While drifting, it hit a mine and blew up. The six surviving crew were picked up from amongst the mines by another MTB (Scott 2009, 90–91). *MTB 43* was sunk by enemy gunfire in the same action. Also based at Dover according to the caption of an IWM photograph[113], *ML 103* appears to have been mined – possibly while minesweeping – less than a week later.

5.3.22. Coastal forces continued to be highly active in the Dover Sector; further reference will be made to them in the section on German coastwise shipping along the continental coast, below.

5.3.23. The three D-Day related examples of coastwise shipping lost in the Dover Sector are the SS *Sambut*, lost on D-Day itself; the SS *Empire Lough* lost nearly three weeks later on 24 June, and the SS *Empire Beatrice* lost on 26 July. As these were traversing along the coast in support of the landings rather than directly as part of the assault and disembarkation, it seems appropriate to consider them here as coastwise shipping, rather than in the section on shore-oriented actions, below. They are a reminder of the role of sea transport in the huge logistical effort that made Operation Overlord successful, and of the volume of shipping that passed through the Dover Strait in summer 1944.

5.3.24. Both the SS *Sambut* and the SS *Empire Lough* were sunk by German coastal artillery. The circumstances of *Sambut*'s loss – within convoy ETM 1 from Southend to Seine Bay (off Normandy)[114] – is set out in detail in HE's Wreck of the Week blog[115]. Loaded with troops, vehicles and supplies, the ship caught fire after being shelled off Dover and had to be abandoned. It was scuttled by torpedo east of SW Goodwin; though a small number of crew and around 130 troops had been lost. SS *Empire Lough* was in convoy ETC 17 also from Southend to Seine Bay for Normandy, carrying fuel, when shelled on 24th June. It was badly damaged and beached between Folkestone and Dover.

5.3.25. SS *Empire Beatrice* was in convoy ETM 46 from Southend to Seine Bay when torpedoed in a S-boat attack off Dungeness. The SS *Fort Perrot* was also damaged but continued under tow. This attack represented a change of approach by S-boats trying to target Operation Neptune. Up to this point, forays had been made against the mass of shipping off the Normandy coast, but this had a perimeter heavily defended by coastal forces, frigates, destroyers and aircraft, severely restricting the effectiveness of S-boats and resulting in losses among them. S-boats were also being targeted in their bases by heavy bombing: an attack on Le Havre on 14th-15th June having been especially devastating. Consequently, the S-boats switched to an indirect approach, attacking coastal convoys in transit. Whilst the attack on ETM 46 by one flotilla of S-boats took place off Dungeness, according to Frank (2007, 117) another flotilla tied down the 'security ring' of coastal forces off Cap D'Antifer (Reynolds 2000, 145–46) when two MTBs were lost for one S-boat. SS *Empire*

[112] https://discovery.nationalarchives.gov.uk/details/r/C2754704.
[113] IWM A 9910: https://www.iwm.org.uk/collections/item/object/205119530.
[114] http://www.convoyweb.org.uk/etm/index.html.
[115] https://thewreckoftheweek.wordpress.com/2014/06/06/no-55-sambut/.

Beatrice was beached near Greatstone-on-Sea, where all but 50 ft of its stern was subsequently salvaged and repaired; the repaired vessel carried on its career until scrapped in 1966[116].

5.4. Allied Coastwise shipping along the Continental coast: Sep 1939 to May 1940

5.4.1. Returning to the earlier part of the war, when the coast of the Continent was in Allied hands, it will be recalled that the routing of merchant ships was introduced at an early stage, predominantly using channels close to the English coast which – even in the 'phoney war' – were targeted especially by minelaying. Losses on the continental coast were far fewer. For example, SS *Bramden*[117] is reported as being sunk by a British mine near Westhinder in September 1939; SS *Stanbrook*[118] was torpedoed by a U-boat off the Westerscheldt in November 1939; SS *Floride*[119] was sunk by a magnetic mine at Dunkirk in December 1939; while SS *Hafry*[120] was sunk in collision at Dunkirk a little later in the month; SS *Atlantic Scout*[121] went aground near Cap Gris Nez in January; the French patrol boat *La Cancalaise*[122] – a Cook, Wilson and Gemmel trawler formerly used by the RN, was mined off Calais at the end of April 1940; SS *Brighton*[123] was mined off Gravelines/Dunkirk on 6th May.

5.4.2. When the German offence on the west commenced on 10 May 1940 there was a big increase in losses among ships on the continental coast, especially to air attack – including on the Dyck lightship (Table 16).

[116] https://en.wikipedia.org/wiki/SS_Empire_Beatrice.
[117] https://wrecksite.eu/wreck.aspx?206618.
[118] https://wrecksite.eu/wreck.aspx?13025.
[119] https://wrecksite.eu/wreck.aspx?75039.
[120] https://wrecksite.eu/wreck.aspx?2684.
[121] https://wrecksite.eu/wreck.aspx?80702.
[122] https://wrecksite.eu/wreck.aspx?13282.
[123] https://wrecksite.eu/wreck.aspx?2599.

Date	Location	Type	Name	Category	Nationality	Cause
15/05/1940	Westerscheldt	Pilot Boat	Loodsboot No. 1	Utility	Netherlands	mined
20/05/1940	Calais	Tug	Hercule	Utility	French	not specified
21/05/1940	Gravelines / Dunkirk	MV	Niger	Cargo	French	air raid
21/05/1940	Gravelines / Dunkirk	SS	Pavon	Cargo	French	air raid
21/05/1940	Boulogne	SS	Ophelie	Cargo	French	air raid
21/05/1940	Boulogne	SS	Firth Fisher	Cargo	UK	mined
22/05/1940	Gravelines / Dunkirk	SS	Portrieux	Cargo	French	air raid
22/05/1940	Gravelines / Dunkirk	Trawler	Notre Dame des Dunes	Fishing	French	air raid
25/05/1940	Zeebrugge	SS	Florentino	Cargo	UK	scuttled
25/05/1940	Calais	Lightship	Dyck	Utility	French	air raid

Table 16: Losses on the Continental coast prior to Operation Dynamo

5.4.3. This period saw the progressive loss of the continental coast to German forces, culminating in the evacuation at Dunkirk – famous not least for the role of civilian vessels – which is considered in the section on shore-oriented actions, below.

5.5. German Coastwise shipping along the Continental coast: May 1940 to Autumn 1944

5.5.1. Having secured the Continent, coastwise shipping was strategically valuable to Germany and the occupied countries, but it was very vulnerable to Allied attack. As on the English coast, mines were a major threat, laid especially by Allied aircraft and coastal forces, requiring huge and dangerous effort in sweeping. Mirroring the impact of S-boats on coastwise shipping, Allied coastal forces were also very damaging, necessitating heavy escort. As noted above, Britain's meagre coastal forces in 1940 included MTBs at Dover and also Felixstowe, which embarked on offensive raids against German shipping on the continental coast even when the UK's defences were vulnerable. For example, torpedo attacks were made against 20 merchant vessels in Ostend roads on 8th September 1940, following attacks by destroyers and aircraft, sinking one and possibly another (Reynolds 2000, 14).

5.5.2. The uncertainties associated with marine records are greater for the occupied continental coast than for the English coast, especially in respect of the location of vessels lost in fast and wide-ranging actions. The following list from Wrecksite gives an impression of the impact of Allied aerial mining and surface attacks on coastwise shipping along the continental coast, but is certainly not definitive. Losses to coastal forces were significant given their light construction, highly offensive mode of operations, and the heavily armed escorts they often faced; their losses are certainly underrepresented in Table 17:

Date	Location	Name	Type	Nationalit	Cause
07/09/1940	Calais	*Niendorf*	Patrol boat	German	mined
18/12/1940	Westerscheldt	*Birkenfels*	SS	German	depth charge (MTB)
18/12/1940	Westerscheldt	*V-403*	Patrol boat	German	mined
08/01/1941	Gravelines / Dunkirk	*Wolf*	TB	German	mined
08/09/1941	Gravelines / Dunkirk	*Trifels*	SS	German	torpedoed (MTB)
25/11/1941	Blanc-Nez	*Ernst Kuhling*	Patrol boat	German	torpedoed (MTB)
01/01/1942	Gravelines /	*Cargo (le)*	minesweeper	German	not specified

	Dunkirk				
01/01/1942	Gravelines / Dunkirk	*Fred (la)*	minesweeper	German	not specified
20/02/1942	Calais	*Sperrbrecher-171*	minesweeper	German	mined
03/03/1942	Blanc-Nez	*Abbeville*	SS	German	torpedoed (MTB)
16/03/1942	Gravelines / Dunkirk	*HS-97*	Patrol boat	German	mined
13/05/1942	Gris-Nez	*Iltis*	Destroyer	German	torpedoed
13/05/1942	Gris-Nez	*Seeadler*	TB	German	torpedoed (MTB)
23/05/1942	Niewport	*V-1808*	Patrol boat	German	mined
13/05/1942	Boulogne	*MTB 220*	MTB	UK	gunfire
28/05/1942	Gravelines / Dunkirk	*Sperrbrecher-174*	minesweeper	German	mined
23/06/1942	Gravelines / Dunkirk	*Sperrbrecher-183*	minesweeper	German	mined
01/08/1942	Niewport	*Raumboot A-7*	minesweeper	German	not specified
07/08/1942	Ostend	*Sperrbrecher-170*	minesweeper	German	mined
14/09/1942	Ostend	*Sperrbrecher-142*	minesweeper	German	mined
09/10/1942	Niewport	*Sperrbrecher-143*	minesweeper	German	mined
24/11/1942	Ostend	*M-3610*	minesweeper	German	mined
05/04/1943	Niewport	*D. Meerburg Sr.*	Patrol boat	German	gunfire (coastal batteries)
25/07/1943	Gravelines / Dunkirk	*S-77*	S-boat	German	gunfire (MGB)
17/09/1943	Zeebrugge	*M-3604*	minesweeper	German	mined
17/09/1943	Zeebrugge	*M-3606*	minesweeper	German	mined
23/09/1943	Gravelines / Dunkirk	*R-93*	minesweeper	German	not specified
27/09/1943	Le Tourquet / Etaples	*Madali*	SS	German	torpedoed (MTB)
14/03/1944	Gravelines / Dunkirk	*M-3630*	minesweeper	German	torpedoed (MTB)
13/05/1944	Westerscheldt	*AFP AF-73*	Gunboat	German	not specified
18/05/1944	Gravelines / Dunkirk	*M-345*	minesweeper	German	air raid
13/06/1944	Boulogne	*S-189*	S-boat	German	air raid
15/06/1944	Boulogne	*V-1513*	Patrol boat	German	air raid
25/08/1944	Westerscheldt	*V-2009*	Patrol boat	German	torpedoed (MTB)
05/09/1944	Calais	*S-184*	S-boat	German	gunfire (coastal batteries)
09/10/1944	Westerscheldt	*M-3230*	minesweeper	German	mined
09/10/1944	Westerscheldt	*M-3231*	minesweeper	German	mined

Table 17: Losses to coastwise shipping along the continental coast, 1940-1944

5.5.3. A further characteristic of this list is that German warships – minesweepers and various forms of patrol and escort vessels – predominate over the cargo vessels they were escorting. German convoys often comprised very few merchant vessels – even just one or two – with a very heavy escort. *Birkenfels*[124] was part of a larger convoy, discovered at anchor, and illustrates an extraordinary form of attack developed by coastal forces: crossing very close to the target and releasing one or more depth charges in their immediate vicinity (Reynolds 2000, 14–15). In this case it was because torpedoes had failed; but this form of attack was also used by MGBs which otherwise lacked weaponry sufficient to sink larger vessels. The *Abbeville*[125], *Trifels*[126] and *Madali*[127] were sunk more conventionally using torpedoes by coastal forces based at Dover in March 1942, September 1942 and September 1943 respectively. Reynolds' (2000, 39) account of what appears to be attack on the *Abbeville* – one of two 'tankers' with heavy escort – on the night of 1-2 March 1942 gives the impression that the vessel, although torpedoed, did not sink; though

[124] https://wrecksite.eu/wreck.aspx?72.
[125] https://wrecksite.eu/wreck.aspx?2561.
[126] https://wrecksite.eu/wreck.aspx?46; http://ddghansa-shipsphotos.de/trifels300.htm.
[127] https://wrecksite.eu/wreck.aspx?4931.

as the date of loss for *Abbeville* is 3rd March it may have taken some time to eventually succumb. The attack that seems to have accounted for *Trifels* – though the location may not match – was against two vessels escorted by armed trawlers and S-boats, resulting in the award of DSCs and DSMs to several of the crews involved (Reynolds 2000, 28–30). MTBs supported by MGBs ambushed the *Madali* from inshore in the early hours of 27th September 1943; the *Madali* had an escort of about 15 vessels (Reynolds 2000, 108–11).

5.5.4. The majority of the losses among continental coastwise shipping are of German minor warships, including former civilian vessels requisitioned into military service as well as a variety of military built vessels. As with UK and French minor warships, German used requisitioned trawlers as minesweepers and escorts. Merchant ships were also requisitioned and converted as Sperrbrecher with reinforced hulls to trigger any remaining mines in advance of the vessels they were escorting[128]; they could also be heavily armed. Military-built vessels lost in support of coastwise shipping included M-class minesweepers; Raumboote or R-boats, used as minesweepers and escorts; S-boats; and 'Flak-lighters'. The latter were developed as large landing craft but were modified for various roles: equipped with multiple forms of anti-aircraft artillery, they were used as convoy escorts.

5.5.5. Reference has already been made to the threat to coastwise shipping on the English side from German coastal batteries, which included batteries more suited to firing at land targets, causing significant damage and loss of life in Dover. In response, batteries were installed near St. Margaret's in 1940: the 14-inch guns Winnie[129] and Pooh[130], though these were not suitable for use against vessels underway. Subsequently, batteries were built at:

- Fan Bay (3x 6-inch)[131]
- South Foreland (4x 9.2-inch)[132]
- Wanstone (2x 15-inch)[133]
- Lydden Spout (3x 6-inch)[134]
- Capel (3x 8-inch)[135]
- Hougham (3x 8-inch)[136]

5.5.6. These batteries were engaged in anti-shipping actions and – in the case of the larger guns – some counter-battery activity, though details of their role in anti-shipping seem sparse. One acknowledged loss was the S-boat *S-184*, hit on the night of 5th September as the S-boats abandoned Boulogne. Frank quotes their senior officer, Petersen 'Remarkable … is the fact that after four years' warfare in the Channel, only in the last passage by German S-boats through the Channel Narrows did enemy shore batteries score a hit for the first time – albeit a lucky one' (Frank 2007, 118). Otherwise, there are indications that the following four ships were also sunk by the coastal batteries near Dover[137]: *Pentiver* / *Penthierve* (2nd March 1943); *Livadia* (4th October 1943); *Walkenried* (20th January 1944); and *Rekum* (21st March 1944).

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[128] For survey of Sperrbrecher-142 by Vlaamse Hydrografie (Flemish Hydrography) see https://twitter.com/KVS_VLHydro/status/1197062019779878912. https://wrecksite.eu/wreck.aspx?242.

[129] UID 1429250.

[130] see UID 1520749.

[131] UID 1423672.

[132] UID 1421774; UID 1423885.

[133] UID 1423874; UID 1423871.

[134] UID 1423481.

[135] UID 1416952.

[136] UID 1423505.

[137] https://en.wikipedia.org/wiki/Dover_Strait_coastal_guns;
Penthierve: https://www.wlb-stuttgart.de/seekrieg/verluste/ausl+dtsch-4012.htm;
Livadia: https://www.wlb-stuttgart.de/seekrieg/verluste/ausl+dtsch-4312.htm, https://wrecksite.eu/wreck.aspx?132461;

5.5.7. Whilst losses among German coastwise shipping were quite moderate in 1940 and 1941, increased losses in 1942-1944 underline the degree to which Allied forces achieved control over the Dover Sector as the war progressed.

5.6. Allied Coastwise shipping along the Continental coast: Autumn 1944 to May 1945

5.6.1. The continental coast was progressively liberated from June to November 1944, leaving just the enclave of besieged Dunkirk. Traffic through the Dover Strait continued to be routed along the English coast (Figure 23), but coastwise shipping took place between continental ports as they were liberated and became operational (Winser 2009, 131–41)(Figure 24). As noted of the S-boats on 5th September, German forces quit the Channel to focus operations on the approaches to the Westerscheldt and the east coast of England. Reflecting the ceding of control, Roskill notes that from 9th September, vessels were allowed to sail independently when returning from Arromanches, rather than in convoy (Roskill 1961, 136), though he acknowledges that most Channel traffic still sailed in convoy due to the danger from mines and U-boats (Roskill 1961, 137). Through the remainder of 1944 and into 1945, there appears to have been no loss of coastwise shipping to German action on the continental coast. As already noted, the battle over merchant shipping moved up the Channel into the southern North Sea and the crossing between the Thames and Antwerp, addressed above as cross-channel shipping[138].

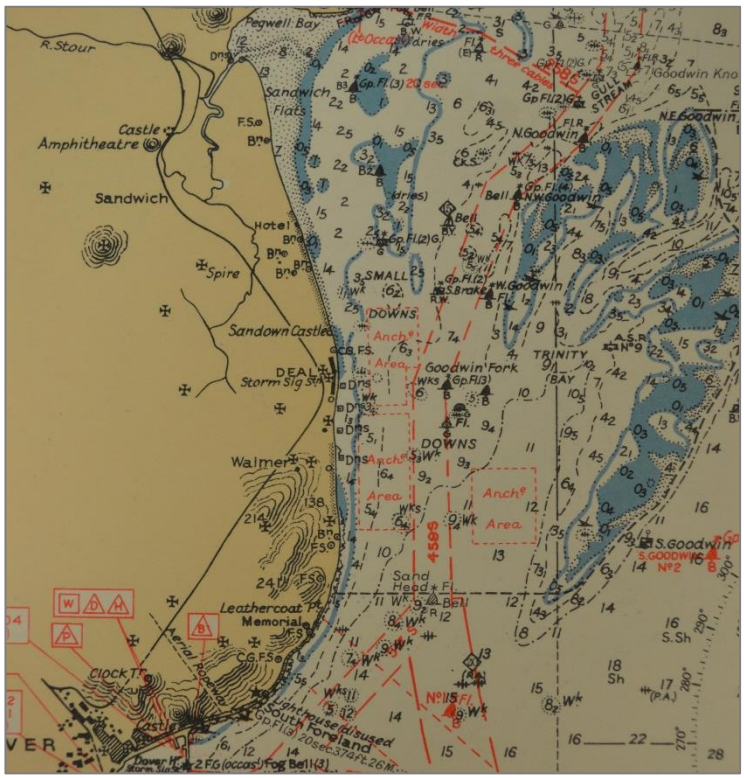

Figure 23: Channels and anchorages in The Downs, December 1944. Chart F. 1086. Courtesy of UKHO Archive

Munsterland/ *Walkenried* https://www.wlb-stuttgart.de/seekrieg/verluste/ausl+dtsch-4403.htm, https://www.wrecksite.eu/wreck.aspx?160302;
Rekum: https://www.wlb-stuttgart.de/seekrieg/verluste/ausl+dtsch-4403.htm, https://wrecksite.eu/wreck.aspx?31327.

[138] SS *Halo* (https://wrecksite.eu/wreck.aspx?1881; https://wrecksite.eu/wreck.aspx?75269) sunk under tow after being torpedoed by S-boats while en route from Caen to Antwerp (Winser 2009, 139), but appears to have been routed via the Downs and was lost just south of Westhinder shoal.

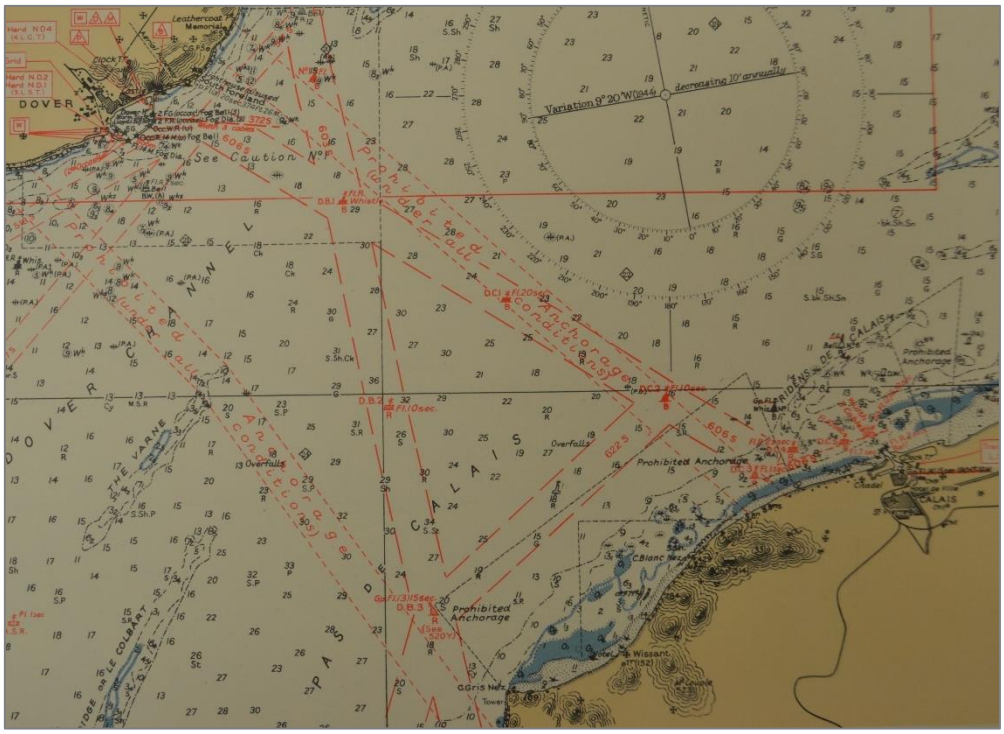

Figure 24: Routes for crossing the Dover Strait, December 1944. Chart F.1086. Courtesy of UKHO Archive.

6. Shore-oriented Actions

6.1. The Dover Sector has hosted – or played a significant role in – some of the most important events of the UK's Twentieth Century history: some have been pivotal; others perhaps less so but have certainly received a great deal of attention. This is especially true of shore-oriented actions. Detailed examination of their context and progression – and their archaeological implications – are beyond the scope of the study presented here, so they will be addressed only in summary. They include the raids in April and May 1918 on Ostend and Zeebrugge; the Dunkirk evacuation in 1940; and the part that the Dover Sector played in supporting Operation Neptune in June 1944.

6.2. Three different types of shore-oriented action are considered here:

- Naval bombardments from the sea to land, and the defensive measures taken against such bombardment.
- Disembarkations and evacuations.
- Amphibious assaults – including both raids that were intentionally temporary, and landings with longer-term intent.

6.3. Whilst the maritime component of amphibious assaults is considered, onshore defence against invasion is largely beyond the scope of this study.

6.1. Naval Bombardment: WWI

6.1.1. As previously noted, German forces reached the sea in October 1914 and sought to turn the Allied line, threatening Dunkirk and potentially Calais. Ostend and Zeebrugge had been abandoned and while the RN wished to destroy the harbour works at Zeebrugge, the War Office wanted it to remain intact so that it could be used subsequently by Allied forces in retaking the coast: it was to prove an unfortunate decision (Corbett 1920, 1:214–15). Belgian forces withdrew to the Yser, reaching the coast at Nieuwport and, being seriously depleted, sought support from the UK in the form of naval support. From 18th October to 8th November 1918, a fleet that included older battleships, cruisers, monitors, gunboats and their screening destroyers provided a huge amount of fire support to Belgian and French forces as the situation hung in the balance. In the intense fighting, naval bombardment appears to have played a critical role in disrupting repeated German offensives; but Belgian and French forces were not able to break through either, leading to the decision to flood the area as a defence. In effect, this was to fix the front line where it met the coast for the ensuing years (Corbett 1920, 1:216–34). The bombarding ships were vulnerable to U-boats and, increasingly, to fire from the shore as German forces moved artillery into the dunes. Although there was damage to ships and casualties from German fire, no vessels were lost directly; however, the seaplane carrier HMS *Hermes* – formerly a light cruiser – was sunk by *U-27* with the loss of 44 crew while returning from Dunkirk to Dover on 31st October[139], confirming the danger presented to warships by U-boats in the area.

6.1.2. Over the next few months, German forces went on to heavily fortify the coast with multiple batteries to protect the captured shoreline and the bases at Ostend and Zeebrugge from bombardment. Minefields and aircraft added to the defences, as did torpedo boats, destroyers and U-boats in the two bases (Karau 2015, 23–28). This made the coast very difficult to approach. Nonetheless, bombardment of the Flanders coast by Allied forces was to be a recurrent theme: later in November 1914, the pre-dreadnought battleships HMS *Russell* and HMS *Exmouth* – with support – shelled Zeebrugge (Corbett 1921, 2:12–13).

[139] https://wrecksite.eu/wreck.aspx?19. Hermes was subject to illegal recovery of artefacts, prompting convictions in 2018 https://www.bbc.co.uk/news/uk-england-kent-44536788.

6.1.3. Subsequently, the pre-dreadnought battleships HMS *Venerable* and HMS *Revenge* – later re-named HMS *Redoubtable* – were used for coastal bombardment. HMS *Venerable* was dispatched to the Dardanelles in May 1915, whilst HMS *Revenge* was fitted with an anti-torpedo bulge to afford a degree of protection. A series of specialised monitors was also employed. M15 class monitors (*M.21*, *M.23*, *M.24*, *M.25*, *M.26* and *M.27*) became available from around May 1915; initially equipped with 9.2-inch guns, they were subsequently fitted with 7.5-inch and 6-inch guns. The 12-inch monitors HMS *Lord Clive*, HMS *Sir John Moore*, HMS *Prince Rupert*, HMS *General Crauford*, HMS *Prince Eugene* and HMS *General Wolfe* started to become available from summer 1915. The 15-inch monitors HMS *Marshall Ney* and HMS *Marshall Soult* joined the Dover patrol in March 1916; and a further two 15-inch monitors, HMS *Erebus* and HMS *Terror*, joined in 1917 (Bacon 1919a, 1:25–33).

6.1.4. In operations, these vessels – some of which had limited speed and manoeuvrability – had to be accompanied by a large number of supporting vessels to protect against attack by U-boats, surface craft or aircraft, and also to support aiming or 'spotting'. For example, Bacon notes that the bombardment of 23rd August 1915 by three of the 12-inch monitors involved a fleet of about 100 vessels, and included the temporary deployment of tripod platforms on the seabed as forward observation posts (Bacon 1919a, Plate VI).

6.1.5. Progressively, the German defences were augmented with batteries up to 38cm (c. 15-inch), providing the capability to out-range the British vessels and fire on them. Nonetheless, bombardments took place periodically during 1915, 1916, 1917 and 1918 as weather and circumstances allowed: Bacon refers to 28 bombardments during his command of the Dover Patrol from 13th April 1915 to 1st January 1918. Smoke screens from Motor Launches afford protection from return fire from May 1917 onwards. Bacon concluded that by October 1917, German forces gave up the use of Ostend as a result of bombardments; Karau indicates that this conclusion was actually reached following a bombardment in June 1917, which sank U-boat *UC-70*[140] and two barges, seriously damaged torpedo boat *G-41*, and lightly damaged torpedo boat *S-55* and U-boat *UC-16* (Karau 2015, 139).

6.1.6. Archaeological remains associated with the UK bombardment of the Flanders coast are sparse, though some of the German fortifications survive on land (de Meyer 2013)[141]. Offshore, there were a few losses: The destroyer HMS *Maori* hit a mine whilst reconnoitring on 7th May 1915 and then came under fire from the shore (Hepper 2006, 36). The yacht HMS *Sanda* was hit by shore batteries during a bombardment of Zeebrugge on 25th September 1915 (Hepper 2006, 42). After the Flanders coast had been abandoned in October 1918, Monitor *M. 21* hit two mines off Ostend; an attempt was made to beach the vessel and it grounded and was abandoned about 2,500 yards from the West Pier at Ostend (Hepper 2006, 142).

6.1.7. One of the unusual innovations of German forces in defending against bombardment was the introduction of wire-controlled motorboats known as Fernlenkboot (FL-boat). The control wire spooled from the back of the boat for up to 20km and the boats were armed with 700kg of explosive. They were targeted using aircraft reporting by radio to the controllers on shore (Bacon 1919a, 1:106; Karau 2015, 163)[142]. One of these – *FL-12* – struck HMS *Erebus* on 28th October 1917, badly damaging its anti-torpedo bulge. *FL-8* was sunk in an earlier attack on 6th September

[140] UC-70 was subsequently lifted, repaired, and returned to service; to be finally sunk off the Yorkshire coast in August 1918 (Termote 2017, 335–36).

[141] And see https://www.raversyde.be/en/atlantikwall/aachen-battery.

[142] And see TNA ADM 137/1907.

1917[143], and *FL-7* was sunk in an attack on Nieuwport[144]. *FL-3*, *FL-4* and *FL-5* are also recorded on Wrecksite off the Flanders coast[145].

6.1.8. German naval forces carried out several bombardments of the English coast, most famously at Scarborough, Whitby and Hartlepool in December 1914, but also Yarmouth (Gorleston) in November 1914 and Lowestoft in April 1916. On the English coast of the Dover Sector, however, German naval bombardments were small-scale and opportunistic adjuncts to destroyer raids: Broadstairs was shelled on 1st March 1917 (Bacon 1919b, 2:345); Margate and Ramsgate on 23rd March (Bacon 1919b, 2:348–49); Dover on 20th April; and Ramsgate again on 27th April (Bacon 1919b, 2:359) (Karau (2015, 126) gives Margate)[146]. Calais was also shelled, with Dover, on 20th April 1917; German naval forces had previously shelled the port and harbour of Dunkirk on 24th March, sinking two colliers, and again on 24th April 1917.

6.2. Naval Bombardment: WWII

6.2.1. There are no examples of German naval forces bombarding the English coast from the sea within the Dover Sector in WWII, and instances of Allied naval bombardment in the Dover Sector in WWII were much more limited than Royal Navy's extensive efforts to bombard the Flanders coast in WWI. While naval bombardment played a very significant role in Operation Neptune, that occurred well to the west of this study area.

6.2.2. Allied bombardments took the form of naval gunfire directed onshore while evacuating Allied troops in 1940, principally at Boulogne and Calais, which is addressed in the context of those evacuations in the section below. There was also some naval bombardment of continental Channel ports by the Royal Navy when invasion barges were amassing in August 1940, also addressed below.

6.2.3. Naval gunfire appears not to have been used in support of the liberation of continental ports – Boulogne and Calais – by land-based forces in 1944. The heavy coastal batteries at Gris Nez would have presented a considerable danger to attacking warships and they were not captured until 29th September, by land forces after the main assaults on Boulogne (Operation Wellhit, 17-22nd September) and Calais (Operation Undergo 25-29th September (ceasefire)) (Monahan 1986). However, the coastal batteries at St. Margaret's fired on the Grosser Kurfürst battery at Floringzelle, Gris Nez immediately prior to the assault. This counter battery action damaged the gun positions and knocked out six anti-aircraft guns, which was considered to have reduced casualties among the attacking force (Monahan 1986, 51). Neutralising the batteries at Gris Nez had an important consequence for the Dover Sector, enabling cross-channel supplies directly from Dover to Boulogne using LCTs from early October 1944 (Fisher 2021).

6.2.4. As noted below, the amphibious assault on Westkapelle (Operation Infatuate II, 1st November 1944) was accompanied by bombardment from the battleship HMS *Warspite* and the monitors HMS *Erebus* and HMS *Roberts*. It was the last action of HMS *Warspite* in a career that spanned both World Wars; the much-reduced remains of the ship lie in Mount's Bay[147]. For HMS *Erebus*, bombarding Westkapelle in 1944 recalls its role in bombarding the Flanders coast in 1917-18.

[143] https://wrecksite.eu/wreck.aspx?129123.
[144] https://wrecksite.eu/wreck.aspx?75569.
[145] https://wrecksite.eu/wreck.aspx?75222; https://wrecksite.eu/wreck.aspx?75189; https://wrecksite.eu/wreck.aspx?129232
[146] And see http://kentww1.com/27th-april-1917-ramsgate-attack/.
[147] UID 1520024; UID 1520032.

6.3. Disembarkations and Evacuations

6.3.1. In the section on cross-channel traffic, reference was made to the use of shipping to move troops around the continental coast in the highly dynamic phase of WWI, which involved both disembarkations and re-embarkations (Corbett 1920, 1:122–26). However, these were not evacuations under enemy fire as were to occur so significantly in May-June 1940. Nonetheless, it is important to note that even in 1940 the traffic was not all one way: military personnel and stores were disembarked from vessels even when evacuation was to prove inevitable.

Before Dynamo

6.3.2. It is difficult to overstate the intensity and complexity of activity following the German assault on the west – Case Yellow (Fall Gelb) – starting on 10th May 1940. Reference has already been made to Allied coastwise shipping lost in this short period, but there were also significant losses amongs vessels engaged in operations directed at the coast (Table 18).

Date	Name	Category	Type	Nationality	Location	Cause
19/05/1940	*Whitley*	Warship	Destroyer	UK	Niewport	air raid
21/05/1940	*L'Adroit*	Warship	Destroyer	French	Gravelines / Dunkirk	air raid
23/05/1940	*Jaguar*	Warship	Destroyer	French	Gravelines / Dunkirk	torpedoed
23/05/1940	*Orage*	Warship	Destroyer	French	Boulogne	air raid
24/05/1940	*Chacal*	Warship	Destroyer	French	Gris-Nez	air raid
25/05/1940	*Wessex*	Warship	Destroyer	UK	Calais	air raid
27/05/1940	*Atlantic Guide*	Cargo / Blockship	SS	UK	Zeebrugge	scuttled
27/05/1940	*Borodino*	Cargo / Blockship	SS	UK	Zeebrugge	scuttled

Table 18: Losses in the course of operations directed at the continental coast, May 1940

6.3.3. The German offensive in the west instigated actions by the RN on the coast of the Continent to safeguard certain assets whilst damaging others. The precipitous collapse of the Netherlands, for example, was accompanied by the despatch of vessels to evacuate the Dutch royal family, members of the government, gold reserves and shipping; whilst demolition parties were landed to destroy oil reserves and harbour facilities. This included actions to the north of the Dover Sector at Ijmuiden and Hook of Holland, but also within the Dover Sector at Flushing and Antwerp in the period 11th to 19th May. Offers were made to embark some of the Dutch army, but this was refused. Demolition activities were not fully successful because of an understandable reluctance from people locally; but from Antwerp, for example, 26 ships, 50 tugs and 600 barges, dredgers and cranes were evacuated (Roskill 1954, 206–10). Two RN destroyers were lost to air attack: HMS *Valentine* sunk near Terneuzen on the Scheldt, beyond the Dover Sector, on 15th May[148]; and HMS *Whitley*, beached near Nieuwport on 19th May[149].

6.3.4. At Ostend, civilian refugees were evacuated from 15-18th May by Belgian, French and UK transports and destroyers (Roskill 1954, 211). The first suggestion that the British Expeditionary Force might have to be evacuated came on 19th May and planning started, anticipating that several ports – Boulogne, Calais, Dunkirk, Ostend – would be available. Demolition parties were deployed to Boulogne, Calais and Dunkirk in anticipation and the evacuation of non-essential personnel commenced (Roskill 1954, 212–13).

6.3.5. To bolster defences, two battalions of soldiers, equipment and stores were deployed to Boulogne, disembarking on 22nd May, together with additional seamen and marines to assist in the docks on 23rd, whilst wounded and refugees were evacuated. The destroyers carrying out these movements were under enemy fire whilst alongside: the Commanding Officer of HMS *Keith* was killed on the bridge, whilst the CO of HMS *Vimy* was mortally wounded. The French destroyer *Orage*, engaging

[148] https://wrecksite.eu/wreck.aspx?1103.
[149] https://wrecksite.eu/wreck.aspx?87.

shore targets, was sunk by air attack[150]. By the evening of 23rd May, general evacuation had been ordered. Supported by air cover, the destroyers had to fight their way into the port, engaging enemy batteries – including French batteries that had been taken by German forces – and engaging tanks, artillery and machine gun positions. By the time the last destroyer left, at 0245 on 24th May, a total of 4,360 people were evacuated; 300 Welsh Guards were left behind, some of which – with remnants of other regiments and French infantry – held out for a further 36 hours before capitulating (Ellis 1953, 153–59; Roskill 1954, 213–14).

6.3.6. At Calais, additional troops and tanks were deployed and disembarked using personnel ships and destroyers on May 22nd and early on May 23rd, by which time the harbour was under artillery fire. Disembarkation was slow and incomplete. Evacuation of non-fighting troops began on 24th May. Destroyers provided supporting bombardments, also disembarking ammunition, Royal Marines and evacuating wounded on 24th. In order to delay, as much as possible, the German advance towards Dunkirk and to demonstrate Allied solidarity with French forces, the officer commanding at Boulogne was instructed to fight to the last: there was to be no general evacuation. Warships remained on the scene on 25th May, supporting the troops with naval bombardments: as well as ships being damaged, the destroyer HMS *Wessex* was sunk[151]. Although there was to be no general evacuation, a fleet of yachts, trawlers and drifters was sent to Calais on the night of the 25th-26th May, entering the harbour and evacuating some men, including wounded, to larger ships offshore. Supporting naval bombardments continued on 26th May, including from the light cruisers HMS *Arethusa* and HMS *Galatea*. Forces on land capitulated during the afternoon of the 26th; the yacht HMS *Gulzar* managed to embark 50 soldiers from the end of Calais breakwater at 0100 on 27th, after the port had fallen. The number of people evacuated from Calais is not known, but is considered to be less than 1,000 (Ellis 1953, 159–70; Roskill 1954, 214–16).

6.3.7. Meanwhile, to the north of Dunkirk, German forces pressed on to the coast. The Allies' intention was to block both Ostend and Zeebrugge with blockships: two at Zeebrugge and three at Ostend. A first attempt at Zeebrugge on 25th May was unsuccessful as one ship went off course and grounded while the second scuttled ineffectively nearby[152]. A second attempt with the blockships SS *Atlantic Guide* and SS *Borodino* at Zeebrugge on 26th May was successful, but attempts at Ostend were cancelled on two occasions, latterly due to lack of air cover.

Operation Dynamo

6.3.8. Operation Dynamo – the evacuation from Dunkirk and adjacent beaches – formally started at 18:57 on 26th May. As noted above planning had started on 20th May, including ordering the evacuation of non-essential personnel. Nearly 28,000 had been evacuated before Dynamo started. It was hoped initially that Dynamo itself would lift 45,000 in two days. The eventual number was 338,226 (in addition to the 28,000 pre-Dynamo) by the formal conclusion of Dynamo at 1423 on 4th June 1940.

6.3.9. It is worth underlining that – for all the focus on the evacuation – a desperate land battle was ongoing throughout Dynamo, which was itself a continuation of actions that had been ongoing since 10th May. Equally important was the air battle, often fought well above Dunkirk and over a much broader territory even while bombs were falling on the port, beaches and ships. On both sides, tactical decisions were being made in a strategic context to anticipate the phases that would inevitably follow, whatever happened at Dunkirk: the continuing German assault on France; and likely assault against the territory of the UK.

[150] https://wrecksite.eu/wreck.aspx?30377.
[151] https://wrecksite.eu/wreck.aspx?50.
[152] The Liverpool-built steamship Florentino appears to be one of these: https://wrecksite.eu/wreck.aspx?766.

6.3.10. At sea, the evacuation battlefield was organised in terms of three routes. The coast of northern France and Belgium has numerous sandbanks broadly parallel with the coast, which means that the chief navigable routes – between the sandbanks – are also parallel with the coast. The shortest route from Dunkirk to Dover – Route Z (39 nm / 72 km) – ran roughly parallel with the coast to Calais and then across the Dover Strait. However, with this coastline largely in German hands it was susceptible to shore artillery as well as to air attack. The principal alternative – Route Y (87 nm / c. 161 km) – veered away from the Belgian coast up into the southern North Sea before turning back at the Kwinte Buoy off Ostend towards the North Goodwins and through the Downs to Dover. As well as being over twice as long as Route Z it was exposed to U-boats and S-boats. A third route – Route X (55 nm / c. 102 km) – was used from 29th May, running only a short way parallel to the coast towards Gravelines and then perpendicular out to Outer Ruytingen and then across to North Goodwin and the Downs. Whilst larger vessels docked at Dover, smaller vessels – notably Dutch schuyts, 50 of which had been brought across before the Dutch capitulated – were able to use Margate and Ramsgate.

6.3.11. The inner harbour of Dunkirk had been destroyed by bombing, so evacuation took place from two places: the outer harbour (Figure 25) focussing on two Moles, east and west[153]; and the beaches stretching for ten miles north of Dunkirk in three sectors: Malo-les-Bains, Bray Dunes and La Panne from south to north, with about a mile gap between each sector (Plummer 1990, 19). Whilst Dunkirk itself, Malo and Bray were in France, La Panne was over the border in Belgium. Belgian forces – which had been holding the north of the Allied pocket – capitulated on 27th May, obliging the remaining Allied forces – France and UK – to frame their defence of the perimeter accordingly. Dynamo was not only an evacuation: food, water and ammunition had to be disembarked to supply the retreating armies; small craft were supplied; and additional naval staff provided to facilitate organisation (Weir 2020).

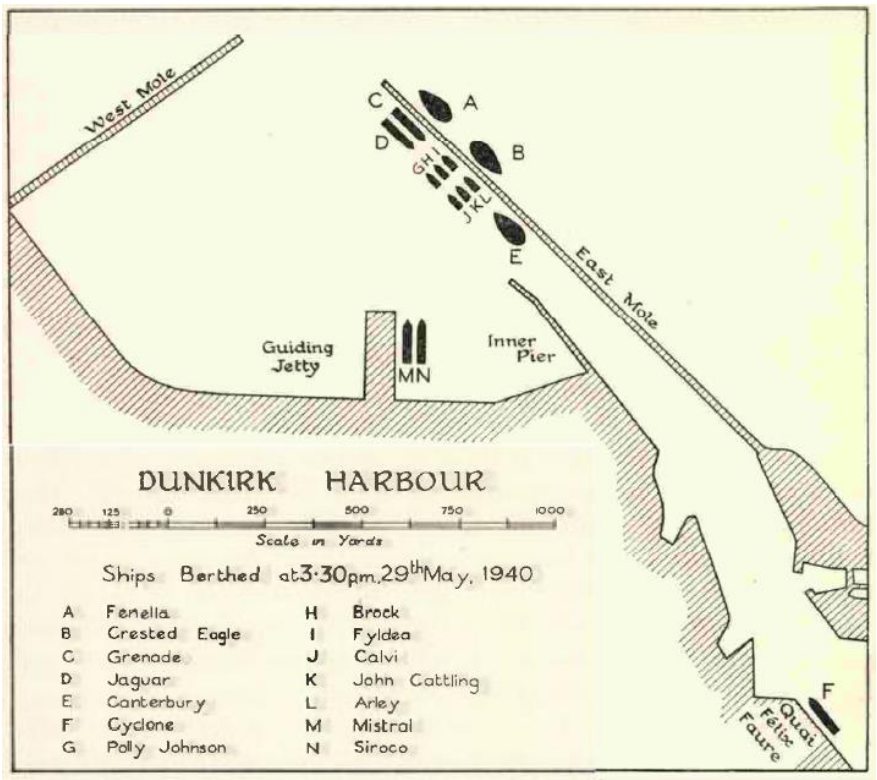

Figure 25: Dunkirk Harbour (Ellis 1953, 222).

[153] Outer harbour – IWM C 1720: https://www.iwm.org.uk/collections/item/object/205227520.
West Mole (image mirrored!) – IWM HU 76075: https://www.iwm.org.uk/collections/item/object/205082255;
East Mole – IWM HU 1153: https://www.iwm.org.uk/collections/item/object/205086987;
IWM HU 73187: https://www.iwm.org.uk/collections/item/object/205075734.

6.3.12. In outline, Dynamo proceeded as set out in Table 19.

Day	Key Events	Evacuated from Harbour	Evacuated from Beach	Total Evacuated
Sunday 26th May	Dynamo signal reached Dover 1857. Mona's Isle first ship to depart Dover.			
Monday 27th May	Tennant sent to Dunkirk as Senior Naval Officer (SNO) with officers, staff and ratings aboard Wolfhound in afternoon. Reported that only the beaches were to be used due to destruction of harbour facilities. Berthing experiments on East Mole. Y-route brought into use. Belgian surrender.	7,669		7,669
Tuesday 28th May	Destroyers berthing in outer harbour. Personnel ships not to be used during daylight. Dutch schuyts commenced service to Ramsgate. French vessels arrived to contribute to evacuation.	11,874	5,930	17,804
Wednesday 29th May	Evacuation from East Mole and beaches; later reported at Dover that Dunkirk harbour blocked so vessels directed to beaches. Naval officers dispatched to beaches. Route Y under gunfire; change to Route X during daylight (enemy not aware of Route X for 3 days).	33,558	13,752	47,310
Thursday 30th May	Wake-Walker arrived. Small craft en route, towed by tugs. Vehicle piers built at Bray and then La Panne. La Panne under shellfire.	24,311	29,512	53,823
Friday 31st May	Communications improved. Weather rendered beach impossible in morning. Shelling of harbour. Small boats arriving in high numbers. Weather moderated on beach in evening. La Panne abandoned before midnight. Gort handed over to Alexander and evacuated.	45,072	22,942	68,014
Saturday 1st June	Personnel ships and destroyers using outer harbour. Only Malo still in use	47,081	17,348	64,429
Sunday 2nd June	Estimated 6k UK and 65k French soldiers remaining. Daylight evacuation prohibited. Malo unusable. Demolition and blockships put in hand.	19,561	6,695	26,256
Monday 3rd June	Night operation 2nd to 3rd. Some ships returned empty as troops not arriving fast enough. No further UK forces to evacuate.	26,746		26,746
Tuesday 4th June	Final operation from 2215 on 3rd to 0340 on 4th involving 50 vessels. Destroyer Shikari last vessel to depart. About 40,000 French troops remaining; surrendered 0900. Evacuation vessels dispersed 1030. Official end 1443.	26,175		26,175
Total Evacuated		**242,047**	**96,179**	**338,226**

Table 19: Operation Dynamo – Overview

6.3.13. Roskill summarises the vessels involved in Dynamo – together with those lost or damaged – in Appendix L of the first volume of The War at Sea 1939-45. Excluding small craft, he gives a total of 606 UK and Allied vessels of which 65 were lost by enemy action and a further 28 lost by other causes. Key categories are set out in Table 20.

Number and Category	Troops lifted
56 destroyers and torpedo boats	102,843
45 personnel vessels – principally ferries etc.	87,810
38 large minesweepers	48,472
230 trawlers and drifters	28,709
40 schuyts	22,698

Table 20: Numbers of troops lifted by different categories of vessel

6.3.14. According to Roskill, nine destroyers, nine personnel vessels and 23 trawlers and drifters were among those lost.

6.3.15. Roskill estimates a total of 242 small craft took part, lifting 6,023 troops: though it is not clear from the table if this number relates to troops landed in England from small craft, rather than troops lifted by small craft and transported to larger vessels for passage back to England. It should also be borne in mind generally that a large number of troops who were lifted from Dunkirk successfully did not survive to be landed in England as the vessels on which they were travelling were lost. Attacks where the vessel survived also resulted in casualties among the troops; and of course there were also deaths and injuries amongst naval and civilian seafarers.

6.3.16. The small craft in Roskill's table comprise 12 naval motor boats; 8 War Department launches; 19 RNLI lifeboats; and 203 private motor boats. However, he notes that the number of small craft taking part were probably greater than this, and that the names of many were never reported or discovered. Of the small craft, Roskell indicates that seven were lost by enemy action and 135 by other causes; presumably by abandonment in many cases.

6.3.17. Uncertainties regarding the identities and overall numbers of vessels need to be kept in mind. Winser names 56 coasters – including Dutch vessels – known to have reached the French coast in the course of Dynamo, rescuing 28,000 people (Winser 2009, 10–11, 14–15). Ellis gives 765 British vessels (Ellis 1953, 248). Plummer notes that the number is estimated between 800 and 1200 (Plummer 1990, 9). Weir says 'more than 800' (Weir 2020, 44) . The Association of Dunkirk Little Ships maintains a list of all known vessels relating to Dynamo (also Operations Aerial and Cycle)[154]: there are over 1800 vessels on the list attributed to Dynamo.

6.3.18. For the wrecks associated with Dynamo, the website Épaves au Large de Dunkirk[155] draws together historic documentary and photographic sources, together with information from divers including photographs and sketches. Some geophysical data is also presented, such as multibeam data of the substantially intact destroyer HMS *Keith* and of the blockship SS *Gourko*, courtesy of Grand Port Maritime de Dunkerque (GPMD)[156]. Several wrecks appear in the intertidal area at low tide, including the *Crested Eagle*, *Devonia*, *Claude*, *Empress* and *Lorina*. Along Route Y are the wrecks of ships such as the French destroyer *Bourrasque* sunk on 30th May by coastal artillery[157], the paddle steamer *Gracie Fields* also sunk on 30th May by air attack[158], and the minesweeping trawler HMS *Achilles* mined on 1st June[159]. HMS *Wakeful* – lost with few survivors from 650 troops on board (Ellis 1953, 220) – and HMS *Grafton*, both torpedoed on 29th May, are even further offshore; the Dan Layer *Comfort* was sunk by 'friendly' gunfire and ramming in the confusion following the attacks [160]. Closer to the coast of England, the wreck of HMS *Brighton Belle*[161] – which struck a wreck while returning with evacuated troops – is in the Downs. The harbour defence vessel HMS *Amulree*[162] was sunk in collision with destroyer HMS *Vimy* in the Dover Strait on 1st June.

[154] https://www.adls.org.uk/the-list.
[155] http://dkepaves.free.fr/.
[156] http://dkepaves.free.fr/img/3Dgourko.jpg.
[157] https://wrecksite.eu/wreck.aspx?6; IWM HU 2280 https://www.iwm.org.uk/collections/item/object/205086989.
[158] https://wrecksite.eu/wreck.aspx?16.
[159] https://wrecksite.eu/wreck.aspx?132178.
[160] https://wrecksite.eu/wreck.aspx?1192; https://wrecksite.eu/wreck.aspx?75; UID 1199253.
[161] UID 904882.
[162] UID 1199271.

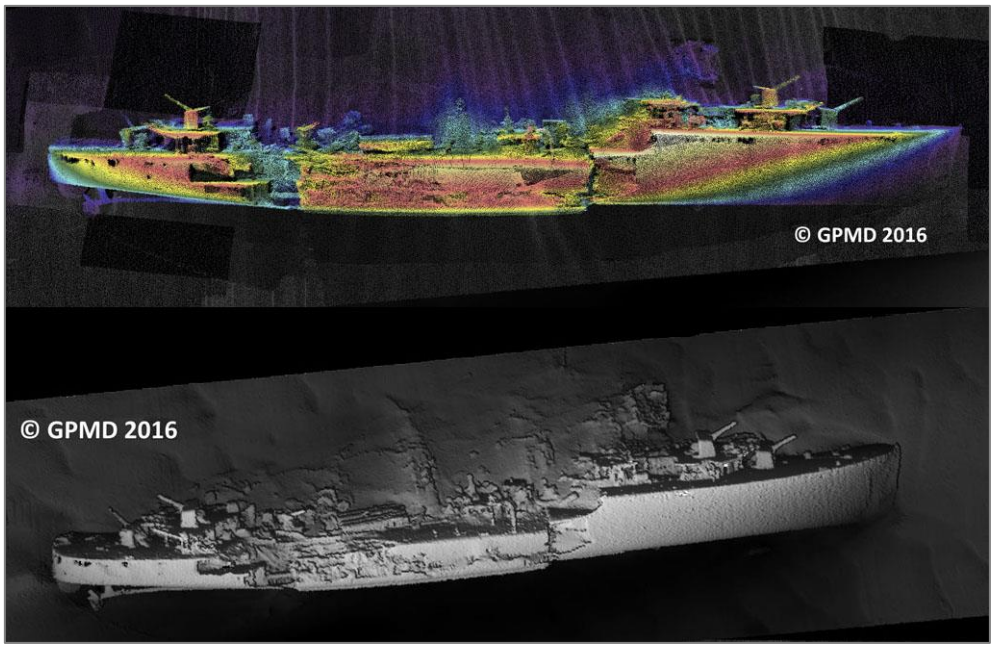

Figure 26: Multibeam images of HMS Keith, surveyed by Grand Port Maritime de Dunkerque (GPMD). http://dkepaves.free.fr/img/3Dkeith.jpg

6.3.19. This report cannot detail all larger vessels lost to enemy action or other causes during Dynamo, never mind the huge number of small craft. It is sufficient to say that the surviving wrecks associated with Dynamo should be regarded as a highly significant group; as much so as the land-based heritage assets such as the Dover tunnels associated with Dynamo[163]. Their diffuse locations – around Routes X, Y and Z; in UK waters off Dover; and in the more immediate vicinity of Dunkirk port and beaches[164] – adds to this significance by manifesting the distinct landscape of the operation. As indicated, some of the losses are associated with high loss of life because ships were sunk on their return journeys with evacuated troops on board. HMS *Skipjack*, for example, had 275 troops aboard when it was bombed off Bray Dunes on 1st June, of which few survived (Ellis 1953, 244). Moreover, some of the losses are of French or other Allied vessels; and there were many French troops on some UK vessels when lost. For example, there were 600-700 French and North African troops aboard the *Brighton Queen* when it was bombed on Route X on 1st June (Plummer 1990, 84; Ellis 1953, 244). Such instances gain significance through underlining the degree to which Dynamo was an Allied operation, not just British[165].

6.3.20. The ships that survive as wrecks are significant because of the circumstances of their loss, but also for their histories prior to their loss, as many vessels made multiple voyages between Dunkirk and England: *Mona's Queen*, for example, had successfully evacuated 1200 troops on 27th May and was carrying supplies of drinking water to Dunkirk – in expectation of evacuating further troops on the return – when an aerial mine caused it to sink in under two minutes early on 29th May off Malo[166]. To repeat a point made previously, the wrecks associated with Dynamo – like the Dunkirk little ships surviving in preservation (Weir 2020) – are doubly significant because they also evoke the much larger number of ships that continued their careers and left no physical trace. Indeed, there were many ships that had remarkable wartime careers before and after their involvement in Dynamo, only to be broken-up in the 1950s, 60s, 70s and even 80s (Plummer 1990; Spiers 1988; Winser 1997). Despite the high loss of life and clearly military character of their service when sunk,

[163] https://www.english-heritage.org.uk/visit/places/dover-castle/things-to-do/operation-dynamo-rescue-from-dunkirk/.
[164] e.g. HMS *Basilisk*, immediately off La Panne. For survey by Vlaamse Hydrografie (Flemish Hydrography) see https://twitter.com/KVS_VLHydro/status/1186900058790400000. https://wrecksite.eu/wreck.aspx?71.
[165] IWM H 1621: https://www.iwm.org.uk/collections/item/object/205197150.
[166] IWM HU 1146: https://www.iwm.org.uk/collections/item/object/205222769.

none of the wrecks associated with Dynamo appear to be designated under the PMRA 1986. HMS *Wakeful*, however, is protected under Belgian law[167].

6.3.21. As in the other continental ports, attempts were made to deploy Blockships at Dunkirk also: SS *Holland* was in collision with SS *Ben-My-Chree* and sank off Gravelines whilst en route to Dunkirk on 3rd June[168]; SS *Gourko* hit a mine outside Dunkirk and was lost on 4th June[169]; SS *Pacifico*, SS *Westcove*, SS *Moyle* and SS *Edvard Nissen* appear to have been deployed successfully[170], though German forces were able to reopen the port for their own purposes relatively rapidly.

After Dynamo

6.3.22. Even while they were extinguishing the Dunkirk bridgehead, German forces were preparing for the next phase of their offensive – Case Red (Fall Rot) – towards Allied forces defending France south of the Somme and the Aisne. These forces were predominantly French, but there were important elements of the BEF, reinforced with further British and Canadian troops. The offensive began on 5th June and was to result in Allied evacuations at Le Havre and St. Valery-en-Caux (Operation Cycle) on 10th-13th June – from which most troops were disembarked as reinforcements at Cherbourg – and then from Atlantic ports from Cherbourg down to the border with Spain (Operation Ariel) on 15th-25th June. A total of 191,870 troops of various nationalities was brought to England, with some equipment and stores; together with several tens of thousands of civilians (Roskill 1954, 229–40). Operations Cycle and Aerial took place to the west of the Dover Sector, but involved some of the same vessels, aircraft and personnel that had been directly involved in operations at Dunkirk. However huge and significant, it is important to remember that Dynamo did not mark the end of the evacuations from France.

6.4. Amphibious Assaults

6.4.1. Amphibious assaults in the Dover Sector in the First and Second World War are of two main forms: raids that were intended to be of relatively short duration involving no persistent occupation of the area that was attacked; and assaults where ground was to be taken and held as part of a longer-term deployment. Another distinction can be drawn between amphibious assaults that were planned, and those that took place.

6.4.2. In the First World War an assault was planned against the coast of Flanders as part of a larger overall offensive – Passchendaele – in 1917, but which was delayed and subsequently cancelled because of the tragic attrition that overcame the overall offensive. The amphibious element was referred to by Bacon as 'The Great Landing' but known more conventionally as Operation Hush and has several interesting aspects.

6.4.3. Actual carnage ensued from the amphibious raids conducted on the Flanders coast in spring 1918 at Ostend and Zeebrugge; their heroic portrayal was nonetheless important at a time when German forces were making significant – if temporary – gains elsewhere on the Western Front.

6.4.4. Raids were a key element of Allied strategy in the Second World War. The closest substantial raid – the 1942 Dieppe Raid – was just to the south of the Dover Sector, with troops embarking principally from Newhaven. Arguably, there are some interesting parallels between the Ostend /Zeebrugge Raids in 1918 and the St Nazaire Raid in March 1942, though again, this was somewhat further west of the Dover Sector. Within the Dover Sector, a series of small raids was

[167] 13 Mai 2014 – Arrêté ministérial relative à la protection de l'épave HMS Wakeful en tant que patrimoine culturel subaquatique. C – 2014/14608. Moniteur Belge 09.10.2014, 79243.

[168] https://wrecksite.eu/wreck.aspx?148.

[169] https://wrecksite.eu/wreck.aspx?145.

[170] https://wrecksite.eu/wreck.aspx?157; https://wrecksite.eu/wreck.aspx?31081; https://wrecksite.eu/wreck.aspx?154; https://wrecksite.eu/wreck.aspx?141.

carried out starting a matter of weeks after Dunkirk and continuing until shortly before D-Day. The archaeological implications are probably slight, but they are discussed briefly below.

6.4.5. Three amphibious assaults directed at longer term occupation in the Second Word War are discussed below. The first – the assault by German forces on the English coast planned for summer-autumn 1940, Operation Sealion – did not go ahead. The most famous of all such assaults – Operation Neptune in June 1944 – had its principal focus to the west of the Dover Sector but involved a range of activities within the Dover Sector in preparation. A further smaller scale but significant amphibious assault took place later in 1944 at Walcheren as part of the effort to remove German forces from either side of the Scheldt.

WWI: Operation Hush

6.4.6. In 1916, Bacon developed a plan for an amphibious assault on the Flanders coast – 'not a mere raid, but an important movement' – that would dislodge German forces. Bacon was extremely concerned about the threat that German control of Ostend and Zeebrugge presented for naval attacks by surface forces on the UK's vital routes along on the east coast and south coast, and the cross-channel route to and from France. Although the British Army knew the importance of making an advance on the Flanders coast, it was not to receive priority until 1917. Early in 1917, Jellico (as First Sea Lord) agreed the proposal provided that the Army would be advancing, and Douglas Haig (Commander in Chief of the BEF) agreed on condition that the main advance had made substantial progress towards Bruges and Ostend. Detailed planning and preparations for Hush were set in motion.

6.4.7. The main advance was to come from Ypres to avoid the difficult terrain of the coast, to be supplemented by an advance along the coast at Nieuwpoort when the main advance had progressed sufficiently. The advance at Niewport would itself be supplemented by the surprise amphibious assault just a few miles up the coast at Westende-Bains and Middelkerke, between Nieuwpoort and Ostend. The main attack at Ypres started on 31st July 1917, becoming known as the Third Battle of Ypres – the Battle of Passchendaele – and continuing through to November without achieving the substantial progress that had been a precondition for Hush. The attack along the coast at Nieuwpoort was in any case disrupted by a spoiling attack by German forces in July. Operation Hush was repeatedly postponed until finally cancelled in October.

6.4.8. The planned assault is of interest because of the preparations made and the degree to which it prefigured some aspects of later amphibious operations. The focus of the assault was to be on gently sloping beaches backed by a seawall and dunes, bearing in mind also the extensive fortification of the coast with its major gun batteries, emplacements, and troops of the MarineKorps Flanderen. Indeed, the prospect of amphibious attack on the coast featured prominently among German concerns, so measures were taken in terms of reconnaissance – to provide early warning – as well as additional defences and planning to allow reinforcement and counter-attack. Karau is of the view that the level of German preparation for an attempted landing would have resulted in disaster for the attackers (Karau 2015, 141–56).

6.4.9. The gentle slope of the beach presented a major problem for landing with ships, so Bacon determined to use 'piers' that would provide a bridge from vessels to dry land. Conceptually, these piers evolved into pontoons that would each be propelled to the beach by two Monitors strapped side by side. In order to reach the dry beach whilst the Monitors stayed afloat, the pontoons were to be 550 feet long, and to have a further 100-foot timber platform on the front. As well as forming a bridge, the pontoons would carry men and equipment, including three tanks on each pontoon. The tanks were to be modified and equipped with ramps that they could deploy at the sea wall to enable them to mount it and enter the dunes, and were tested on a 'dummy' sea wall at the headquarters of the Tank Corps in France. There were to be three Monitor-propelled pontoons each carrying around 4,500 officers and men, hitting the beach simultaneously and

roughly a kilometre apart. The assault would be screened by smoke provided by Motor Launches and supported by gunfire form the Monitors propelling the pontoons together with other accompanying Monitors and destroyers.

6.4.10. Given the role of the pontoons, the feasibility of this assault was highly dependent on knowing the beach profile at each planned location. This was obtained by systematically photographing the beach from the air at different states of tide; and by obtaining the height of the tide throughout its cycle from a submarine resting on the seabed off Ostend and using its depth gauge to measure the changing height of water above it for repeated 24 hour periods (Bacon 1919a, 1:234). Very detailed plans were made for the manoeuvres that would be required to move the pontoons to Dunkirk where they could be loaded, attached to the Monitors and deployed precisely to the beaches.

6.4.11. Perhaps the most remarkable aspect of this plan is that the pontoons were all built and underwent extensive trials and practices with the Monitors in the Thames Estuary[171]. The first pontoon was built at Chatham Dockyard and tested in March 1917 in the Swin, which is the channel off the Essex coast from Foulness to Walton-on-the-Naze. Initial problems were overcome and the two other pontoons – each displacing 2,500 tons – were quickly built. The Monitors, pontoons, rafts and some supporting vessels were all quarantined in the Swin out of sight of land with no communication with the shore in order to maintain secrecy. Manoeuvres were practiced each night when the weather was suitable. Although, as noted, detailed plans were made for their eventual deployment via Dunkirk, Bacon indicates that this was not carried out. It seems that the quarantine was maintained from at least July until October 15th when the operation was eventually cancelled; the only relief being a trip aboard the Monitors to spend three days ashore with the similarly quarantined troops at Le Clipon in Dunkirk. Bacon does not indicate what happened to the pontoons after the operation was cancelled. It might be presumed that they were recycled via a breaker's yard, but it is conceivable that they were simply sunk.

6.4.12. Although on a completely different scale, there are at least a few parallels between Operation Hush and Operation Neptune. The target was a gently sloping beach backed by a fortified coast. Surprise was essential, as was the detail required in planning, preparation, and training. Overcoming the difficulties of landing on an open beach without harbour facilities required novel engineering solutions: Bacon's pontoons addressed a similar problem to the 'Whale' floating bridges of the Mulberry Harbours but operated more like the LCTs of WWII. Tanks required special modifications to enable them to be landed in immediate support of the troops and to fight their way off the beaches. The close collaboration between the navy and the army in preparing and training for the operation is a further aspect of Hush that would need to feature in amphibious operations subsequently. Briefly put, Operation Hush seems to have had more in common with the landings in Normandy in 1944 than with the landings at Gallipoli just two years before.

WWI: Raids on Ostend and Zeebrugge in 1918

6.4.13. Some sense of what might have unfolded had Operation Hush gone ahead – despite the planning and preparation – is provided by the raids on Zeebrugge and Ostend in spring 1918. Celebrated for bravery and audacity, these raids were ill-suited to the defences they faced and pitched the Allied forces into dreadful firefights whilst largely failing in their military objectives and strategic objectives. Bacon had been suddenly replaced by Keyes in command of the Dover Patrol at the end of December 1917; as much as Keyes had thought Operation Hush would fail, so Bacon was scathing about the Ostend and Zeebrugge raids, having himself planned a raid on Ostend in 1915 (Bacon 1919a, 1:209–22).

[171] IWM Q 23388: https://www.iwm.org.uk/collections/item/object/205263840;
IWM Q 23387: https://www.iwm.org.uk/collections/item/object/205263839.

6.4.14. The first raids at Zeebrugge and Ostend (Operation ZO) took place on the night of the 22nd-23rd April 1918; a second raid took place at Ostend (Operation VS) on the night of 9th-10th of May. The purpose of the raids was to scuttle blockships in the entrances to the canals used by U-boats to enter the North Sea at both ports, thereby removing or reducing the impact of those U-boats on Allied shipping. Both ports were very heavily defended by coastal artillery including, at Zeebrugge, artillery on the Mole that curved around in front of the harbour and canal entrance. At Zeebrugge, therefore, the attempt to insert the blockships would be accompanied by an assault on the Mole to capture the guns, including using submarines packed with explosives to sever the Mole from the land to prevent reinforcement. The raids depended on surprise, which would be achieved using huge smoke screens deployed from coastal motor boats (CMBs) and motor launches (MLs). Prior bombardment – akin to previous bombardments so as not to alert the defences to the raids themselves – would be provided by Monitors and the whole force would be screened by destroyers. Over 160 UK and French vessels were deployed in the first raids.

6.4.15. At Zeebrugge, the obsolete cruisers HMS *Thetis*, HMS *Intrepid* and HMS *Iphigenia* would be the blockships, while the cruiser HMS *Vindictive* would lead the assault on the Mole, supported by the requisitioned Mersey ferries HMS *Daffodil* and HMS *Iris* II. At Ostend, the blockships would be HMS *Sirius* and HMS *Brilliant*. Once the blockships were in position and explosives fired to scuttle them, their crews would be taken off by MLs and the attacking force would depart.

6.4.16. Despite the planning and preparation, matters did not unfold as hoped at either Zeebrugge or Ostend. The attack on the Mole at Zeebrugge went very badly: high casualties were incurred without coming close to securing the guns there. Although in the harbour, HMS *Thetis* grounded without reaching the canal entrance and the sinking charges were fired. HMS *Iphigenia* and HMS *Intrepid* successfully reached the canal entrance and were scuttled; but their eventual positions were such that the entrance was not fully blocked[172]. At Ostend, German forces had re-positioned the buoy by which the blockships were to navigate, so neither found the entrance: the vessels grounded and were scuttled to no effect.

6.4.17. As the attempt at Ostend had wholly failed, the second raid (Operation VS) was carried out in May with HMS *Vindictive* – damaged but still navigable after its attack on Zeebrugge Mole – and HMS *Sappho* as blockships together with a large force of CMBs, MLs, destroyers, monitors and other craft. The blockship HMS *Sapho* suffered an engine problem shortly after departing, but the raid proceeded with HMS *Vindictive* now being the sole blockship. Again, things did not go to plan and HMS *Vindictive* was grounded and scuttled in a position that did not block the entrance.

6.4.18. The casualties across the raids were one-sided. Coleman gives them as 204 killed, 412 wounded and 13 taken prisoner on the Allied side; and 11 killed and 24 wounded on the German side (Coleman 2014, 238).

6.4.19. As well as the blockships Thetis, Intrepid and Iphigenia, and submarine *C.3* that was exploded against the Mole, the losses in the Zeebrugge raid were the destroyer HMS *North Star* – incapacitated by gunfire and scuttled by a torpedo from HMS *Phoebe* – and MLs *110* and *424*. In the first Ostend raid, just the blockships HMS *Brilliant* and HMS *Sirius* were sunk. In the second Ostend raid, *ML 254* was sunk in addition to the blockship HMS *Vindictive*. All the blockships and the destroyer HMS *North Star* appear to have been lifted after the war; a section of the bow of HMS *Vindictive* survives as a memorial at Ostend[173].

6.4.20. It is worth noting that CMBs *18A* and *33A* were lost in an earlier attempt to carry out the Zeebrugge and Ostend raids on the night of 11th-12th April, which was aborted due to a change in wind direction. *CMB 18A* sank following a collision, whereas *CMB 33A* became detached, ran

[172] IWM Q 49164: https://www.iwm.org.uk/collections/item/object/205216456.
[173] https://www.belgiancoast.co.uk/en/do/memorial-monument-hms-vindictive.

aground and was engaged by shore batteries. It subsequently drifted ashore at Ostend where it was found by German forces to have papers onboard relating to the planned raids; however, the full implications were not realised (Hepper 2006, 127–28; Karau 2015, 192).

6.4.21. In terms of their effectiveness in impeding the use of the Flanders bases, Ostend was not affected by the raids and this also meant that Bruges continued to have access to the sea. HMS *Iphigenia* and HMS *Intrepid* in the entrance to the canal at Zeebrugge did cause a degree of restriction, however. When inspected after the raid on 23rd April, the channel was considered to be blocked at low tide and it was initially thought that it might be blocked at high tide also. However, four smaller torpedo boats were able to pass through on 24th April and *UB-16* (a smaller UB I class boat) passed through on 25th April. Larger destroyers had to use the canal at Ostend (Karau 2015, 200; 202). It was decided to dredge a route around the blockships, though one of the dredgers at Zeebrugge had been destroyed by a torpedo from HMS *North Star* and another badly damaged by being rammed by HMS *Intrepid*. Nonetheless, on 4th May *UC-17* – a larger UC II class – passed through the entrance and on 14th May four destroyers were able to get through at high tide without difficulty (Karau 2015, 203). The entrance was closed again following a direct hit on a lock gate during an air attack on 28th May, and the newly repaired gate was hit in a coastal bombardment on 9th June which rendered it impassable for the rest of the month (Karau 2015, 207). In any case, the value of the Flanders bases was already being seriously reduced by the effectiveness of the Dover barrage, such that U-boats from Flanders were already taking the long route via Scotland to reach the Atlantic (Karau 2015, 207–8; Newbolt 1931).

6.4.22. Although it failed to significantly impact German use of the Flanders bases, the raids did prompt additional effort to counter further attacks in terms of coastal defences, defensive mining and troop allocations. More broadly, huge emphasis has been placed on the display of courage and audacity as a boost to morale amongst the Allies, domestically and militarily, at a time when Allied forces had their 'backs to the wall' under the pressure of the German Spring Offensives: Haig's special order stating 'each one of us must fight on to the end' had been issued on 11th April. Determining how much the lionisation of the Zeebrugge and Ostend raids affected the conduct of the war – positively for Allied forces or negatively for German forces – is well beyond the scope of this report. But even if they had little tangible effect in stopping U-boat attacks, the raids remain a highly significant facet of the Dover Sector.

WWII: Operation Sealion

6.4.23. Sealion (Seelöwe) was the German codename for the planned invasion of Britain in 1940, which was largely focussed on the Dover Sector (Collier 1957, 175–82). Had it been attempted, it would undoubtedly been one of the most significant episodes occurring within the Dover Sector in either the First or Second World War, whether it failed or succeeded in any degree. Even today, the prospect of a German amphibious assault across the Channel in 1940 is a focus of historical debate: over whether it was seriously in contention as an operation, rather than a threat to secure a diplomatic end; and over what would have happened had it commenced, including its chances of short- or longer-term success. These larger questions can be left aside here, because preparations for Sealion certainly did take place in the Dover Sector at Boulogne, Calais, Dunkirk and Ostend. Moreover, these preparations prompted countermeasures in the Dover Sector including defensive actions and pre-emptive attacks.

6.4.24. Defence measures also took place very close inshore, in intertidal areas, at the coast and inland, the extensive physical remains of which are a significant component of England's Second World War heritage. Although a great deal of archaeological recording and investigations needs still to be directed towards the nearshore and onshore defences of 1940, they are not the focus here. The preparations for Sealion in terms of aerial warfare have already been addressed with reference to the Kanalkampf and wider Battle of Britain, above.

6.4.25. The plan for Sealion envisaged forces departing from the Scheldt, Ostend, Dunkirk, Calais Boulogne and Etaples landing between Folkestone and New Romney (east of Dungeness); and between Camber and Eastbourne (west of Dungeness to Beachy Head). Outside the Dover Sector, forces launching from Le Havre would land between Beachy Head and Brighton; there was also a plan for forces from Cherbourg to land in Lyme Bay, west of Weymouth (Collier 1957, 178).

6.4.26. German preparations for Sealion within the Dover Sector were not initiated until the middle of July 1941 and the operation was postponed in mid-September. In these two months, large numbers of vessels – especially tugs and barges – were assembled in the continental ports of the Dover Sector and modified for their tasks. One element of the Admiralty's strategy towards seaborne invasion was to 'attack before departure' (Roskill 1954, 248), so the assembled vessels were a focus for aerial bombing by the RAF[174] and several hundred were damaged or lost (Collier 1957, 177–78; Holland 2011, 774–75). Whilst some of these lost vessels might have contributed to the archaeological record, none are recorded; and it is likely that most – being in harbour and therefore an impediment – would have been recovered at the time. The remains of RAF bombers lost during these raids might also lie within the Dover Sector.

6.4.27. Operation Lucid was an intended British seaborne attack on the assembled invasion vessels using 'fireships' reminiscent of measures taken in much earlier conflicts. Redundant tankers loaded with a combustible mix of fuel and oil – together with explosives – were to be directed into the French harbours and abandoned by their crews[175]. Preparations took place and the operation set in train on several occasions in September and October 1940 but cancelled due variously to weather, breakdown and mine damage to an escorting vessel. The invasion ports were also bombarded from the sea by UK naval forces (Roskill 1954, 255) and coastal forces were deployed: on 11th October 1940 the monitor HMS *Erebus* bombarded Calais; supporting MTBs from Dover sank two trawlers with torpedoes and depth charges (Reynolds 2000, 14).

6.4.28. Sealion prompted the deployment of mines by both sides. The RN laid a series of fields across the Dover Strait in July (MN) and August (MP); and mid-channel between Dover and Calais in September (MS and MU) (Director of Naval Warfare 1973, 59–63; 1977, fig. 23). German forces planned to use mines to protect the flank of the invasion from the expected attack from RN forces (Roskill 1954, 255), laying minefields Hannelore, Walter and Bernard in the Straits in September.

6.4.29. The threat of invasion prompted the deployment of large numbers of minor Allied warships – trawlers, drifters and small craft – to patrol inshore in order to raise the alarm should German forces be intercepted. Destroyers, escort vessels and corvettes were deployed further out or were held ready to strike German forces whilst still en route; and cruisers were dispersed around the coast. Heavier forces remained further north, as they could reach the invasion area within 24 hours (Roskill 1954, 248–54). These deployments left no archaeological trace within the Dover Sector; but the reduction in vessels available to protect merchant shipping from U-boats is embodied in an increase in wrecks from this period in the Western Approaches (Roskill 1954, 253). This paradox underlines the degree to which Sealion – one of the most momentous operations to focus on the Dover Sector – actually left very little archaeological trace within it.

WWII: Commando raids on the continental coast

6.4.30. Brief mention should be made of a series of commando raids directed at the continental coast of the Dover Sector in WWII, as part of a more general strategy of raiding along the whole German-held coast from Norway to south-west France. In the Dover Sector, there were almost a dozen raids in 1940-44 (Table 21), which were generally small with very limited objectives. Raids were

[174] See IWM C 1819: https://www.iwm.org.uk/collections/item/object/205023048; https://www.iwm.org.uk/history/how-bomber-command-helped-win-the-battle-of-britain.
[175] http://www.historicalrfa.org/archived-stories/77-rfa-fire-ships-in-world-war-2.

often based on co-operation with coastal forces and/or used small vessels such as Landing Craft Assault (LCAs). The first – Operation Collar, directed at beaches between Boulogne and Le Tourquet – took place on the night of 24th-25th of June 1940, just a few weeks after Operation Dynamo. These raids are unlikely to be visible in the archaeological record of the Dover Sector, the possible exception being Operation Abercrombie which involved the loss of an LCA off Dover in an initial attempt on 19th April 1942; and may have also resulted in the loss of an S-boat when the coastal forces supporting the raid engaged German forces during the return. In the IWM Collections there is a striking series of photographs[176] and film footage[177] of commandos returning to Hastings beach after Operation Bristle, directed at a German radar station between Boulogne and Le Touquet on 3rd-4th June 1942. The imagery incudes both LCAs and the escorting coastal forces.

Date	Operation	No. of raiders	Target
24th-25th June 1940	Collar	200	Boulogne – Le Touquet
27th-28th July 1941	Chess	16	Ambleteuse
30th-31st August 1941	Acid Drop	25	Neufchâtel-Hardelot
11th-12th April 1942	JV	2	Boulogne
21st-22nd April 1942	Abercrombie	150	Neufchâtel-Hardelot
3rd-4th June 1942	Bristle		St. Cecile
3rd-4th August 1943	Forfar Love	4	Dunkirk
24th-25th December 1943	Hardtack 11	7	Gravelines
27th-28th December 1943	Hardtack 23	10	Ostend
15th-16th May 1944	Tarbrush 5	2	Dunkirk
16th-17th May 1944	Tarbrush 3	2	Bray-Dunes

Table 21:Commando raids in the Dover Sector, 1940-44[178]

WWII: Operations Neptune, Fortitude and Quicksilver

6.4.31. Operation Neptune was the Allied amphibious assault on German-occupied France in June 1944, itself part of the overall operation – Operation Overlord – to regain a secure Allied position on the Continent. As noted, the assault largely took place well to the west of the Dover Sector. However, the Sector hosted some of the shipping routes that supplied Neptune and was, accordingly, a focus for German attacks, resulting in the loss of the SS *Sambut*, SS *Empire Lough* and SS *Empire Beatrice* addressed as coastwise shipping above.

6.4.32. Within the Dover Sector, embarkation hards were planned, built and staffed at Hythe, Folkestone, Dover and Deal. However, it was decided not to use them for the assault in the first instance but to keep them ready for immediate use (Fisher pers. comm.[179]). The embarkation hards at Dover were used in connection with the Fortitude South deception and for subsequent cross-channel supply (see below).

6.4.33. A different aspect of the logistical supply chain for Operation Neptune is represented in the Dover Sector by the Mulberry Harbour caisson located off Littlestone-on-Sea, on the east side of Dungeness. The Phoenix caisson is a scheduled monument[180]. It lies in this location because following their construction at various sites around the UK, elements of the Mulberry harbours were 'parked' in the lee of Selsey Bill and Dungeness in anticipation of being dispatched to

[176] See IWM H 20342 onwards: https://www.iwm.org.uk/collections/item/object/205492962;
to IWM H 20372: https://www.iwm.org.uk/collections/item/object/205492991.
[177] IWM ARY 13 https://www.iwm.org.uk/collections/item/object/1060021061.
[178] See https://en.wikipedia.org/wiki/List_of_Commando_raids_on_the_Atlantic_Wall.
[179] See ADM 199/1575.
[180] Scheduled Monument LEN 1415588.

Normandy. The reason for situating the park at Dungeness may have been to add to the deception that Calais was the intended focus of Neptune[181].

6.4.34. The Phoenix caissons were parked by flooding them to rest on the seabed, and then re-floating them in preparation for deployment across the Channel. Temporarily sinking the caissons had not been part of the original plan: they were intended to be kept afloat, but there were insufficient moorings available. Parking did, however, provide useful experience of handling and sinking the caissons prior to their intended use in Normandy (Wood 1948). A total of 213 Phoenix caissons were constructed, of which 147 were required for Normandy. Wood comments that the conditions at Selsey were good, as 'all eighty caissons parked there were safely raised without damage, although one A1 unit was irretrievably damaged after being sunk a second time across the hollow in the seabed formed by its first bedding'. However, 'the Dungeness site was bad on account of scour, and six small caissons were lost to use there' (Wood 1948, 356). Quite how many caissons were parked at Dungeness is not known, but it seems likely to have been several scores.

6.4.35. Other Mulberry infrastructure was also stored temporarily in the parks[182]. As well as the A1 caisson lost at the Selsey park[183], an Intermediate Pierhead Pontoon is also visible above water[184] and there are various other Mulberry elements below water (Mayor 2015; Firth 2018a, 38–40). At Dungeness, a Whale unit[185] is recorded off Lydd, about 3.6km from the scheduled Phoenix caisson at Littlestone; but Wood's reference to six caissons being lost suggests that others must have been re-floated subsequently or demolished on site, perhaps indicating that more Mulberry related infrastructure may yet be found in the Dover Sector.

6.4.36. The deception that the Allied assault was planned for the Pas de Calais rather than Normandy was a critical element of Operation Neptune. The deception was maintained in the build-up to the assault and for several weeks subsequently: the notion that even after it occurred, Normandy was a 'feint' for a main assault still to come across the Dover Strait resulted in German forces being held in reserve rather than deployed against Allied forces when they were vulnerable at the beachhead. The deception was called Operation Fortitude, 'Fortitude South' concentrating on the south of England. Multiple channels were engaged in the deception – not least the system of double agents known as Double Cross (MacIntyre 2016) – but Fortitude also had physical elements, notably Operation Quicksilver which gave the appearance of the fictitious First US Army Group (FUSAG) being ready to deploy from south east England (Reymond 1994). Two elements of Quicksilver involved the Dover Sector itself. First, as part of Quicksilver III, dummy landing craft built of scaffolding and canvas (bigbobs[186]) were launched and moored at Folkestone and Dover (Reymond 1994, 37–48) as well as at locations further east as far as Great Yarmouth[187]. At Dover, dummy landing craft were launched from an embarkation hard at the junction of East Cliff and Marine Parade[188] built on the former First World War seaplane station; the hard was subsequently used by genuine LCTs for cross-channel transport (Fisher 2021). Second, intensive air attacks were mounted on the Pas de Calais as Quicksilver IV to counterbalance bombing in Normandy (Reymond 1994, 13), which may have resulted in Allied and German aircraft crashing into the sea.

[181] IWM Oral history 13040: https://www.iwm.org.uk/collections/item/object/80012764, Reel 3.
[182] IWM H 38675: https://www.iwm.org.uk/collections/item/object/205195429;
Art.IWM ART LD 5189: https://www.iwm.org.uk/collections/item/object/8760.
[183] Scheduled Monument LEN 1452912.
[184] Scheduled Monument LEN 1453065.
[185] UID 901750.
[186] WO 199/2629; WO 199/2630.
[187] http://pillboxes-suffolk.webeden.co.uk/dummy-landing-craft/4569800041.
[188] https://britainfromabove.org.uk/en/image/EAW007608; https://britainfromabove.org.uk/en/image/EAW006160.

WWII: Operation Infatuate

6.4.37. In contrast to Operation Neptune, the amphibious assault at Westkapelle in November 1944 involved fierce fighting within the Dover Sector resulting in substantial losses that amount to a relatively discrete and distinctive assemblage of shipwrecks off the coast of the Netherlands.

6.4.38. The importance of Antwerp to cross-channel traffic following the Allied invasion has already been highlighted, as has the progressive but hard-fought liberation of the continental coast. Antwerp had been captured in early September 1944, but German forces retained the south bank of the Scheldt – the 'Breskens Pocket' including Zeebrugge – and the north bank comprising the peninsula-cum-islands of South Beverland and Walcheren, with the port of Flushing (Vlissingen) and the town of Westkapelle at its tip. German forces were able to consolidate their defences in these areas in the second half of September whilst Allied forces focussed on Operation Market Garden much further inland, which unsuccessfully sought to secure a bridgehead over the river Rhine.

6.4.39. The assault on German forces to the south and north of the Scheldt took place in October and was very hard fought. South Beverland was secured by the end of October through Operation Vitality, by which point much of the Breskens Pocket (Operation Switchback) had been taken also. Zeebrugge was liberated on 3rd November.

6.4.40. The remaining island of Walcheren was subject to amphibious assault through Operation Infatuate starting on 1st November. In preparation, coastal dikes had been breached by bombing[189] such that the interior of Walcheren was largely flooded. Short range amphibious forces were used at the causeway from South Beverland to Walcheren and in a major assault across the Scheldt landing at Vlissingen (Infatuate I), in which a number of small Landing Craft Assault (LCA) were sunk. A major seaborn assault was directed at Westkapelle (Infatuate II) from Ostend, though at least some of the landing craft had only recently arrived at Ostend from Poole. The assault was carried out by the RN, with Royal Marine Commandos of the 4th Special Service Brigade and Belgian and Norwegian Commando units going ashore.

6.3.54. Westkapelle was strongly defended by coastal gun emplacements and other artillery. Heavy bombardment in support of the assault on Westkapelle was provided by the battleship HMS *Warspite* in its last action[190] and the monitors HMS *Roberts* and HMS *Erebus*[191]. The landings also had air support from RAF Typhoons.

6.3.54. Close support was provided by a variety of specialised landing craft that mounted artillery (Table 22).

Abbreviation	Type	Images/References
LCS (L)	Landing Craft Support (Large)	http://www.navypedia.org/ships/uk/brit_aws_lcsl2.htm
LCG (L)	Landing Craft Gun (Large)	IWM FL 5991: https://www.iwm.org.uk/collections/item/object/205120519
LCG (M)	Landing Craft Gun (Medium)	IWM Model MOD 943: https://www.iwm.org.uk/collections/item/object/30019013
LCF	Landing Craft Flak	IWM A 23758: https://www.iwm.org.uk/collections/item/object/205155812

Table 22: Types of support landing craft

[189] IWM C 4668: https://www.iwm.org.uk/collections/item/object/205023407.
[190] Art. IWM ART LD 4691: https://www.iwm.org.uk/collections/item/object/3204.
[191] Art. IWM ART LD 4706: https://www.iwm.org.uk/collections/item/object/3205.

6.3.54. A further specialised form of landing craft, LCT(R) – Landing Craft Tank (Rocket) – were deployed to fire rocket barrages onto the landing sites to clear mines and other defences. The operation of LCT(R) at Westkapelle features in a number of pieces of war art in IWM Collections[192].

6.3.54 Local command and control was provided by Landing Craft Headquarters (LCH) equipped with radar (see accounts of Infatuate from aboard *LCH 269*[193] and *LCH 187*[194]).

6.3.54 Troops were landed from Landing Craft Infantry (Small) (LCI(S))[195]; Landing Craft Tank (LCTs) landed troops and supporting equipment including amphibious tracked vessels such as Buffaloes and Weasels, and Churchill AVRE and Sherman tanks.

6.3.54 The specialised support landing craft were deployed close inshore to draw the fire of the defending forces onshore to give the craft that would be landing troops and equipment a clearer path. Consequently, the supporting craft were very badly hit, leading to significant loss and damage among vessels and crew members. Reports suggest that of 27 vessels in the support squadron, seven or eight were lost or abandoned (see below) and a further 11 badly damaged: only seven remained fit for action[196]. Some of the rockets from the LCT(R) are also reported to have fallen much closer to the support craft than intended.

6.3.54 Wrecksite includes details of 12 landing craft off Westkapelle. Seven were lost to gunfire, some with considerable numbers killed or wounded. A further four were lost to mines when on the return journey, after the assault. A further landing craft is described as lost on 2nd November (Table 23).

Vessel	Cause of loss	Killed	Images / details
Landing Craft Support (Large)			
LCS(L) 252	gunfire	27	
LCS(L) 256	gunfire	26	IWM FL 5827: https://www.iwm.org.uk/collections/item/object/205120499; https://www.british-genealogy.com/forum/threads/89332-Combined-Operations-Landing-Craft-LCS-(L)-256
LCS(L) 258	gunfire	24	
Landing Craft Gun (Large)			
LCG(L) 1	gunfire	1	
LCG(L) 2	mine	1	
Landing Craft Gun (Medium)			
LCG(M) 101	gunfire	1	IWM FL 5988 https://www.iwm.org.uk/collections/item/object/205120517; IWM Model MOD 280 https://www.iwm.org.uk/collections/item/object/30019559; And see sequence by Coote, below.
LCG(M) 102	gunfire	31	IWM A 27906 https://www.iwm.org.uk/collections/item/object/205119963
Landing Craft Flak			
LCF 37	gunfire	41	http://www.wigard.nl/WO2/Infatuate/LCF37/index.html
Landing Craft Tank			
LCT 789	mine		IWM B 5105 (prior to D-Day) https://www.iwm.org.uk/collections/item/object/205087327; Film (not digitised) https://www.iwm.org.uk/collections/item/object/1060020374
LCT 839	lost		
LCT 1133	mine		

[192] Art. IWM ART LD 5464: https://www.iwm.org.uk/collections/item/object/9629;
Art. IWM ART LD 4707: https://www.iwm.org.uk/collections/item/object/3206;
Art. IWM ART LD 5465: https://www.iwm.org.uk/collections/item/object/9630).
[193] http://www.naval-history.net/WW2Memoir-Walcheren.htm.
[194] http://www.wigard.nl/WO2/Infatuate/Bruton/index.html.
[195] http://www.navypedia.org/ships/uk/brit_aws_lcis.html.
[196] http://www.naval-history.net/WW2Memoir-Walcheren.htm.

Landing Craft Infantry (Small)			
LCI (S) 532	mine		

Table 23: Losses to landing craft, Westkapelle 1944 (Infatuate II)

6.3.54 In addition to the vessels listed in Wrecksite, *LCF 38* was abandoned at anchor, ablaze from gunfire[197]. *LCT 7011* is also referred to as being lost in Operation Infatuate[198]. *LCT 324* is photographed fully ashore across line of posts / groyne, but seems likely to have been re-floated[199].

6.3.54 As well as the images and artworks already referred to, the assault on Westkapelle features in a range of media in the IWM Collections (Table 24).

IWM Ref	**Description**	**Link**
BU 1279	LCT unloading on beach	https://www.iwm.org.uk/collections/item/object/205206904;
BU 1283	LCI(S) 514	https://www.iwm.org.uk/collections/item/object/205219889
WPN 188	Newsreel	https://www.iwm.org.uk/collections/item/object/1060007161
ART LD 4653	LCGs	https://www.iwm.org.uk/collections/item/object/3201
COI 495	Unedited footage of various aspects of assault	https://www.iwm.org.uk/collections/item/object/1060021679 notably reel 2 from 0450

Table 24: Imagery of Infatuate II in IWM Collections

6.3.54 Perhaps the most instructive images are the series of photographs taken by RN official photographers Coote and McNeill. Although these images do not appear to be fully in sequence, they provide a compelling overview of the assault on Westkapelle and its hazards (Table 25).

IWM Ref	**Description**	**Link**
RN official photographer Coote, R G G (Lt)		
A 26233	?*LCG(M) 101* sinking	https://www.iwm.org.uk/collections/item/object/205187389
A 26234	Landing craft almost sunk	https://www.iwm.org.uk/collections/item/object/205157869
A 26235	*LCG(M) 101* sinking	https://www.iwm.org.uk/collections/item/object/205157870
A 26236	?*LCG(M) 101* sinking	https://www.iwm.org.uk/collections/item/object/205187390
A 26237	? LCG(L)	https://www.iwm.org.uk/collections/item/object/205187391
A 26238	Crew rescue from ?LCG	https://www.iwm.org.uk/collections/item/object/205187392
A 26239	*LCI(S) 532*	https://www.iwm.org.uk/collections/item/object/205187393
A 26240	LCH with radar dome	https://www.iwm.org.uk/collections/item/object/205157871
A 26241	Transfer of wounded	https://www.iwm.org.uk/collections/item/object/205157872
A 26242	Transfer of wounded between landing craft, from G11	https://www.iwm.org.uk/collections/item/object/205157873
A 26243	Transfer of wounded between landing craft	https://www.iwm.org.uk/collections/item/object/205187394
A 26244	Transfer of wounded	https://www.iwm.org.uk/collections/item/object/205157874
A 26245	Aboard LCI (S) being used as hospital ship	https://www.iwm.org.uk/collections/item/object/205157875
RN official photographer McNeill, M H A (Lt)		
A 26254	*LCT 532*, officers on bridge	https://www.iwm.org.uk/collections/item/object/205157884
A 26255	*LCT 532* Oerlikon gunners	https://www.iwm.org.uk/collections/item/object/205157885
A 26256	*LCT 532* signalling	https://www.iwm.org.uk/collections/item/object/205157886
A 26257	*LCT 532* Seamen swabbing deck	https://www.iwm.org.uk/collections/item/object/205157887
A 26258	*LCT 532* Seamen	https://www.iwm.org.uk/collections/item/object/205157888
A 26259	*LCT 532* wheelhouse	https://www.iwm.org.uk/collections/item/object/205187395
A 26260	Aboard LCT with Buffaloes (?1E, ?3E) en route	https://www.iwm.org.uk/collections/item/object/205187396
A 26261	Aboard LCT with Buffaloes (1E, 3E) en route	https://www.iwm.org.uk/collections/item/object/205157889

[197] http://www.wigard.nl/WO2/Infatuate/Wilks/index.html.
[198] http://www.wigard.nl/WO2/Infatuate/Lost/index.html.
[199] IWM BU 1281: https://www.iwm.org.uk/collections/item/object/205219891.

IWM Ref	Description	Link
A 26262	Aboard LCT on approach (Typhoon attack)	https://www.iwm.org.uk/collections/item/object/205187397;
A 26263	Of LCI(S) unloading	https://www.iwm.org.uk/collections/item/object/205187398
A 26264	Of Landing Craft Rocket	https://www.iwm.org.uk/collections/item/object/205187399
A 26265	Aboard LCT looking towards ?Typhoon attack; LCH in middle distance	https://www.iwm.org.uk/collections/item/object/205157890
A 26266	Aboard LCT with Buffaloes (3E) and Weasels on approach	https://www.iwm.org.uk/collections/item/object/205187400
A 26267	Fall of rockets	https://www.iwm.org.uk/collections/item/object/205157891
A 26268	Aboard LCT unloading Buffalo (1E) and Weasels on beach	https://www.iwm.org.uk/collections/item/object/205187401
A 26269	Of *LCT 952* with Buffalos	https://www.iwm.org.uk/collections/item/object/205187402
A 26270	Aboard ?LCT looking onshore	https://www.iwm.org.uk/collections/item/object/205187403
A 26271	Aboard LCT overlooking adjacent LCT with Buffalos (2A, 2D, ?2B) and Weasels	https://www.iwm.org.uk/collections/item/object/205187404
A 26272	Of *LCT 952* with Buffalos	https://www.iwm.org.uk/collections/item/object/205187405
A 26273	Distant explosion	https://www.iwm.org.uk/collections/item/object/205157892
A 26274	Of *LCT 979* en route	https://www.iwm.org.uk/collections/item/object/205187406
A 26275	Aboard LCT, en route	https://www.iwm.org.uk/collections/item/object/205187407;
A 26276	Aboard *LCT 532*, en route	https://www.iwm.org.uk/collections/item/object/205157893

Table 25: Photographs of Operation Infatuate II by Coote and McNeill

6.3.54 The landing craft sunk off Westkapelle – including vessels of the support squadron that suffered so badly and landing craft sunk subsequently by mines – form a notable group. Their continued presence reflects the variety of specialised craft used in such an integrated assault; the specific naval action that achieved a successful assault; and the broader strategic importance of taking Walcheren as the last step in securing the Scheldt and access to Antwerp. For such small vessels, the loss of life was considerable, and there is a distinct commemorative importance to this group of wrecks also.

7. Discussion and Recommendations

7.1. Heritage Assets associated with the Dover Sector: significance, survival and trajectory

Significance

7.1.1. Over two short periods in the twentieth century, activity in the Dover Sector was of an intensity and momentousness that has no parallel elsewhere in English waters. It was, of course, the arena for specific events of existential importance to England and the UK and profound importance for other parts of the world: not least Germany. However, everyday activities pursued over long periods could be just as significant – even existentially so – as renowned events. This interweaving of the extraordinary with the everyday is both a source of significance for the Dover Sector but also a challenge for communicating that significance. The thematic approach adopted here – applied across the two conflicts whilst also noting their distinctiveness – is an attempt to deal with this challenge. Recommendations for this and subsequent sections are numbered R1 - R27 below.

7.1.2. Also challenging is the fact that historical significance is not always matched by the physical record presented by heritage assets. This is partly because – to reiterate an earlier point – much of the material culture of both conflicts in the Dover Sector was highly mobile and most of it lasted beyond its often brief period in the study area to be lost or, more likely, to be scrapped and recycled elsewhere. Any heritage assets still present within the Dover Sector represent far more that is absent, in addition to their own distinct histories. This is especially true of the huge volumes of activity at sea and in the air that unfolded without a persistent physical trace reaching the seabed. Such transient activities ashore may shape the land in the long term, but the sea's surface and water column, and the air above it, are different in this fundamental respect. The problem is that without physical traces, such activities might seem obscure or insignificant, especially when great emphasis is placed on the tangible and the visible by society and its agencies. Insofar as heritage management favours the conservation of physical remains, then additional effort is required to discover how activities that were historically significant can be represented materially where this is not self-evident.

7.1.3. The challenge of aligning the significance of what occurred at sea and in the air with representative heritage assets is eased to a degree by the fact that the land, sea and air of the Dover Sector were integrated in the conduct of both conflicts. In consequence, there are heritage assets on land that have a direct bearing on the sea-focussed themes outlined here. However, they share the space with a great number of heritage assets from those conflicts that are less directly connected to the Dover Sector, hence specific attention might be required to give due weight to their maritime significance. This includes heritage assets that are already designated but whose significance to the Dover Sector in WWI and WWII might be elucidated more fully: for example, the harbours at Folkestone, Dover and Ramsgate, which all have elements that are listed. There are other onshore heritage assets whose significance reflects that of the wider Dover Sector where attention might also be focussed, such as the airfields and seaplane stations of the First World War (Dover Guston Road; Dover Harbour; Westgate; Capel) where remains are known or may potentially survive. Richborough Port is perhaps the most striking example, where there are clearly surviving remains of major significance. The infrastructure of interceptor loops, wireless and direction-finding stations (Phimester 2015) are further examples where apparently unprepossessing heritage assets embody a high level of significance relating to the Dover Sector as a whole.

R1 Review heritage assets on land in light of their 'maritime' significance to the Dover Sector in WWI and WWII.

7.1.4. As well as crossing between land and sea, it should be plain also that conceptions of significance relating to the Dover Sector must also traverse national boundaries. The above account has shown that are many heritage assets within the territory of France, Belgium and the Netherlands that are

very closely linked to the UK, including through continued ownership, sovereign immunity, and the nationality of war dead. However, to focus only on these links would be to miss an essential point: that heritage of the Dover Sector in WWI and WWII gains much of its significance from a geographical context that encompassed both coastlines and the intervening sea and air. The Dover Sector spanned the Channel in both wars: it cannot be comprehended from one side alone. It is important, therefore, that in elaborating the significance of heritage assets in the Dover Sector attention is paid to 'UK heritage assets' and 'non-UK heritage assets' irrespective of the territory in which they are located; but also to engage with their significance from perspectives other than that of England or the UK. Perspectives from France, Belgium and the Netherlands need to be taken onboard, bearing in mind that those perspectives – by virtue of their own distinct experiences in WWI and WWII – may not align in their entirety with perspectives from England or the UK. This also includes Germany and other countries with links to the Dover Sector and its wartime heritage: former dominions and colonies of the UK; allies such as the US who were present in the Dover Sector in both conflicts; and neutrals whose ships and crews also navigated this war zone. It is to be hoped that engaging with different perspectives on the significance of heritage assets relating to the Dover Sector in WWI and WWII will counteract any tendency to use those assets merely as props for established or invented narratives – to which the Dover Sector might be especially prone. The history of the Dover Sector in WWI and WWII – like other maritime places[200] – is diverse and multivocal. Some narratives are familiar, but this study provides a foundation for developing others that have been little explored.

R2 Draw upon perspectives on significance from other countries that share the heritage of the Dover Sector. Explore significance in relation to diversity of people engaged in Dover Sector but not currently represented in narratives.

7.1.5. So far, this discussion has focussed on the Dover Sector as a whole, but within this there is scope also to focus on more narrowly defined areas, sometimes over defined periods too. However, such areas overlap in time and/or space: assigning historic character areas with exclusive spatial or temporal boundaries would be inappropriate, but the identification of such areas could complement landscape and seascape assessment (see LUC 2015; 2017). Examples of these significant areas could include:

- The Downs throughout WWI and WWII.
- The Cross-Channel Route 1914-18.
- Flanders coast (Niewport-Zeebrugge) October 1914 to October 1918.
- The Folkestone-Gris Nez barrage from November 1917 to November 1918.
- Boulogne and Calais, May 1940
- Dunkirk and Routes X, Y and Z in May-June 1940.
- Convoy route off Dover, July 1940.
- Continental coastwise route, June 1940 – June 1944.
- Dungeness Mulberry park, Spring 1944.
- Approaches to Westkapelle, November 1944.
- The Thames-Westerscheldt route from late November 1944.

7.1.6. It can be argued that sea areas such as these have a coherence or sense of place that goes beyond the assets that are located within them to include the topographic, operational and administrative factors that gave rise to a distinct landscape that would have been known and

[200] http://www.fjordr.com/fjordr-blog/the-worlds-war-on-the-east-coast; http://www.fjordr.com/fjordr-blog/steel-on-the-seabed-how-catastrophe-has-saved-the-uks-maritime-industrial-heritage.

meaningful to the people who sailed there at the time. In these cases, the area has a significance beyond the heritage assets that lie there – capturing at least a little of the activity absent in the physical remains.

R3 Develop place-based approach to the significance of distinctive areas within the Dover Sector.

7.1.7. Turning more directly to known heritage assets – and alongside the identification of areas – there is an immediate case for strengthening consideration of their significance in terms of group value. As already indicated, while there is an overarching coherence to the Dover Sector, the heritage assets within it also have much more discrete associations in term of theme, event and/or place. These may be nested as groups within groups; and they may even be distant in time or space but have a strong thematic association, even extending beyond the Dover Sector. As their significance derives in part from these associations, then expressly recognising their group value is an important step. Examples might include:

- HMHS *Anglia* – SS *Lusitania* – HMS *Falmouth III*, sunk November 1915.
- SS *Maloja* – SS *Empress of Fort William* –HMS *Angelus* – HMS *Wiegelia*, sunk February 1916.
- Vessels sunk by *UC-6*, September 1915 to April 1916.
- Drifters and destroyers sunk in the German raid of October 1916.
- Drifters and trawler sunk in the German raid of February 1918.
- UK-built trawlers sunk in French service in WWI.
- Vessels lost in the Downs, 1914-1918.
- Wrecks sunk between 10th May and 4th June 1940.
- Vessels sunk in convoys CW 7 and CW 8, July 1940.
- Light vessels – East Goodwin, South Folkestone Gate, South Goodwin – sunk in 1940.
- Landing craft lost off Westkapelle on 1st November 1944.
- Vessels sunk in the approaches to the Scheldt, December 1944 – May 1945.

R4 Bring additional focus to the significance of groups of heritage assets in the Dover Sector.

7.1.8. There is overlap here with some of the significant areas flagged above, simply because these closely associated heritage assets have significance as a group (over and above their significance individually) as well as the area or place having significance for shaping the events that took place there beyond the assets that are present.

7.1.9. There are, of course, vessels among those already mentioned in this discussion and elsewhere in the report that are individually significant. In some cases, this significance is already reflected to a degree by designation, though this is more often through military remains legislation than heritage legislation, potentially dampening the recognition of their heritage value and the steps that might be taken to share it. For the Dover Sector in WWI and WWII, only *U-8* is designated under the Protection of Wrecks Act 1973 while, at sea, the Phoenix Caisson off Littlestone is the only Scheduled Monument. Whilst not necessarily suggesting they be designated, greater attention could be drawn to the significance of vessels such as SS *The Queen*, the bow of SS *Sussex*, SS *Maloja*, TF3 / HMS *Daffodil* (outside the Dover Sector but critical to the story of Richborough Port), Seehund *U-5377*, and *Prinses Astrid* (formerly HMS *Princess Astrid*) lost post-WWII. On a different tack and outside the Dover Sector but closely related to it, the significance of the Nab Tower as a vestige of the planned MN barrage ought to be highlighted.

R5 Review the significance of specific heritage assets relating to the Dover Sector, including in the context of designation under heritage legislation. Where highly significant heritage assets are not designated under heritage legislation, ensure that statements of significance are published and made available to consenting authorities.

7.1.10. A final consideration for the significance of heritage assets relating to the Dover Sector in WWI and WWII is the importance of features not yet identified or known. Historic England's records include only a handful of known aircraft crash sites most of which, where identified in any way, are more likely to relate to strategic bombing than to aviation concerned directly with the Dover Sector (Table 26). Further aircraft that are recorded – especially if they relate to the Dover Sector itself – are likely to be regarded as significant, as demonstrated by interest surrounding the Dornier 17 recovered from the Goodwin Sands in 2013[201]. Similarly, any discovery of coastal forces craft, further Mulberry components or unrecovered sections of PLUTO pipeline are likely to be significant. Equally, direct traces of the nets, booms and mines deployed across the Dover Sector – evoking immense effort and strategic importance but perhaps only likely to show up in the form of sinkers – would have a significance far beyond their appearance.

UID	Name	Category	Description
813145			UNIDENTIFIED FEATURE, POSSIBLY AN AIRCRAFT.
813338			POSSIBLE REMAINS OF AIRCRAFT
831719		US BOMBER	A wreck thought to be the remains of a Second World War American bomber, located in the Gull Stream among the Goodwin Sands; the precise type is as yet unknown. Please note that military aircraft wreck sites are protected by the 1986 Military Remains Act
1398702	B17 FLYING FORTRESS	US BOMBER	Possibly a B17 Flying Fortress.
1398705	B26 MARAUDER	US BOMBER	Probably a B26 Marauder which lies on top of an old shipwreck in Kellett Gut.
1398733	B-24 LIBERATOR	US BOMBER	American B-24 Liberator which crashed off Broadstairs.
1398852		BRITISH BOMBER	A Second World War Lancaster bomber which ditched in Pegwell Bay.
1598555		BRITISH FIGHTER	An aluminium rudder pedal marked "Supermarine" serial No. 30033/447/0 found by a diver on the seabed near the wreck of THE QUEEN (see 813816) approximately 3.2 nautical miles east of South Foreland.

Table 26: Aircraft Crash Sites in Dover Sector in WWII recorded by Historic England

R6 Anticipate the significance of as yet undiscovered heritage assets, especially more ephemeral features that have a bearing on aspects of the Dover Sector that are under-represented among known heritage assets.

Survival and trajectory

7.1.11. Gauging current survival and trajectory can be divided, to a degree, between land and marine zones; but there are commonalities too. The archaeological record is much richer on land in the sense that more information is recorded about the presence of heritage assets, and both their

[201] https://www.shropshirestar.com/entertainment/attractions/2019/05/01/rare-german-dornier-bomber-staying-put-at-raf-cosford/. And see http://www.3hconsulting.com/sites/SitesGoodwinsAircraft1.html.

condition and pressures likely to affect them can be gauged from readily available sources indicating ground cover, land use, accessibility and so on. The record offshore is generally much poorer and background information is less readily available (though not absent); the relationship between recorded activities and their potential effects on heritage assets is also less direct. Determining whether a former airfield is subject to arable cultivation is much easier than establishing whether a wreck is being affected by trawling, for example. Nonetheless, the relatively high awareness of military heritage on land for several decades has not been uniform in its attention, so even heritage assets on land pertaining to the Dover Sector are not as well recorded as might be expected: either they are not included in records; or the content of records is limited in its precision or in relating the asset to its Dover Sector context. Conversely – and in general terms – records of heritage assets at sea are far more attuned to the maritime conflicts that provide their context, especially where they relate to specific events or encounters. Systemic issues with asset location / position, and a general lack of detail on the extent, character, and condition of what lies on the seabed, bring their own difficulties.

R7 Enhance archaeological records for marine heritage assets in the Dover Sector with information about their condition on the seabed and about the pressures/processes that may be affecting them.

7.1.12. Heritage assets on land associated with the Dover Sector survive on land as built heritage – often still in use – or as surficial or below ground remains where there has been a degree of dismantling or demolition. For those structures that continue to survive, the principal concern might be that their context and character in relation to the Dover Sector is not fully recognised: Dover Harbour, for example. This might apply also where there are surficial or below ground remains, and be more concerning for their being less evident and less recognised: the RNAS airfields and seaplane stations, for example. The risk is that such sites may be affected by activities that unintentionally degrade them simply because their presence and import was not taken on board – whether due to alterations or wholescale redevelopment. In some cases, it is too late: the WWII concrete pens in Dover Harbour were entirely demolished in 1990 without recording (as far as is known) and indeed the entire character of that part of Dover Harbour is quite different from its naval origins. The records of heritage assets on land relating to the Dover Sector – including records relating to designation – could be reviewed to ensure that their presence, extent, character and significance are fully reflected.

R8 Enhance records for heritage assets on land relating to the Dover Sector in respect of their condition/trajectory if this has been overlooked previously.

7.1.13. Heritage assets at sea are likely to have been brusquely handled throughout the period since WWI and WWII. At best, they will have suffered 'benign neglect' – though the environment itself and general activities such as fishing are difficult to regard as benign. In many cases, marine heritage assets will have been subject to active removal, demolition or both – perhaps starting very soon after they first reached the seabed. This applies to things that were installed on the seabed – minefields, nets, booms, buoyage, PLUTO pipelines – and also ships and boats that reached the seabed as a result of misfortune. Some material – ranging from whole vessels to valuable parts – would have been salvaged at the time of loss or subsequently and may have been recorded and even been curated as 'finds'. In many cases, sites will have been demolished without seeking to recover anything, simply to disperse them as potential hazards to navigation. By way of example, a note by the Hydrographer in July 1917 recorded that contractors had taken 8 to 9 weeks to disperse the wreck of HMS *Niger*, whilst 477 working days had been taken by Trinity House to disperse the wreck of SS *Maloja*[202]. Notwithstanding, advances in underwater survey are making it clear that the wrecks of many vessels survive as 'built heritage' on the seabed, and even where there has been major degradation there is still sufficient coherence for the asset to be interpretable

[202] TNA ADM 1/9212.

and significant (Firth 2020b). This is as true of the Dover Sector as it is of other sea areas, despite the intensity of marine activities in the area over the last century: although a great deal of effort was devoted to its dispersal, SS *Maloja* still stands 6.5m above the seabed and is described as 'hull mainly intact'[203].

R9 Presume that marine heritage assets in the Dover Sector retain a considerably degree of significance despite a history of dispersal and/or salvage, and despite the effects of environmental processes and diffuse activities such as fishing.

7.1.14. Where heritage assets in the Dover Sector are known and their significance is recognised, then there is scope to anticipate the possible consequences of activities such as dredging or construction that require consent – as development, national infrastructure or marine licensable activities – and avoid or mitigate them. There are policies that can be used to conserve heritage assets across different environments and consenting systems, and even across national jurisdictions. To be effective overall, some gaps in frameworks may need to be plugged and consistent implementation may be a challenge when resources are stretched. Public awareness and engagement in respect of the treatment of the marine environment appears to be rising and most consenting systems have a public element, so scrutiny such as that exercised by the Goodwin Sands SOS campaign[204] – which has focussed on the wartime heritage of part of the Dover Sector – can be expected to increase. With effective implementation and scrutiny – and based on a reliable record – development activities need not present a major risk to the heritage assets of the Dover Sector.

R10 Ensure that consenting mechanisms are implemented effectively to protect marine heritage assets in the Dover Sector from the effects of planned activities. Ensure that the implementation of consenting is properly resourced, and identify and address any gaps in consenting systems across environments, different consenting systems and jurisdictional boundaries.

7.1.15. Diffuse activities that do not require consent – and do not, therefore, trigger a process of assessment, evaluation and mitigation – might be more of a concern. On land, they include activities such as agriculture, change in land use, and access; and at sea they include fishing and recreational diving. Even in these cases, damaging activities may be restricted by heritage, conservation or other legislation, and there may be other processes relating to funding or consultation through which heritage conservation measures can be brought to bear. Except for a minority, damage to heritage assets is likely to be an unintentional consequence of their activities, which can be addressed by informing, engaging, and educating participants about the assets their activities might affect. However, the scope and scale of such activities may be such that their overall extent and consequences – and hence the need for active attention – may be greater than 'development' that is more impactful in principle but much more limited in spatial terms.

R11 Identify non-consented activities that give rise to risks to heritage assets in the Dover Sector; seek to address the risks presented by such activities by informing, engaging and educating their participants and practitioners.

7.1.16. Even with investment in engagement, it is likely that diffuse activities will result in occasional impacts: provision needs to be in place to encourage those responsible for such impacts to draw them to archaeological attention and to facilitate mitigation. Such impacts are often characterised as 'discoveries', concentrating on the material that has been disturbed rather than the asset still lying on the seabed; and using legal approaches that focus on the 'thing' rather than the impact that brought it to light. Nonetheless, the reporting of discoveries on land and sea provides a useful safety net that, with suitable systems in place, is generating valuable knowledge about the

[203] https://wrecksite.eu/wreck.aspx?11685.
[204] https://goodwinsandssos.org/.

presence and distribution of material of heritage interest, especially for as-yet unrecognised heritage assets. Currently, the uptake of reporting systems is inconsistent between different sectors of activity. Their capacity to deal with material still in the ground or seabed – as opposed to already having been removed – is ad hoc. A more consistent and better resourced approach to encouraging reporting, and to enabling appropriate responses when a report has been made, could do much to address the impacts of diffuse activities. Better reporting may also help in identifying the remains of sinkers and moorings, aircraft debris and spent ordnance that will help build a more comprehensive representation of the Dover Sector in WWI and WWII.

R 12 Bolster existing reporting systems and fill in any gaps to ensure an effective means and mechanism for dealing with impacts to heritage assets in the Dover Sector from diffuse or non-consented activities.

7.1.17. A final category concerned with the future survival of heritage assets relating to the Dover Sector is that of natural processes, especially in the context of climate change and parallel crises in respect of ecosystems and pollution. Although they concern the 'natural' environment, the drivers are often not natural: that is to say, the effects on heritage assets may be mediated through physical, chemical, or biological pathways, but human interventions often lie at their root. This can be true of impacts to heritage assets from changing patterns of erosion and deposition caused by channel dredging, shoreline erosion prompted by rising sea level, colonisation by invasive species, or the aggregation of discarded plastics. It is worth underlining that the interplay between complex environmental processes and heritage assets is not well understood – including how these are influenced by climate change – through the body of evidence is growing (Dunkley 2015; Harkin et al. 2020). In the Dover Sector, the strength of tides and weather, their effects on highly dynamic sediment transport regimes, and the consequences for energy and sediment flows of the construction of significant port facilities on both sides of the Channel all add to the complexity of gauging the implications of 'natural' processes on marine heritage assets. Citizen science – exemplified by the role of CITiZAN and other volunteer groups in addressing heritage assets at risk from coastal erosion – is likely to be an important component of long-term adaptation.

R 13 Review pathways of 'natural' processes affecting heritage assets in the Dover Sector to clarify the relationship between effects on heritage assets and their sources. Clearer understanding of the implications of climate change for (marine) heritage assets in the Dover Sector – as elsewhere – is urgently required. Develop mechanisms for assessing and mitigating 'natural' impacts in the Dover Sector.

7.1.18. The implications of climate change and these other crises for heritage assets must also take into account adaptation: that is to say, measures being taken to lessen, deal with or ameliorate climate change, loss of habitat or burgeoning pollution. In some cases, adaptations intended to address these crises could themselves have negative impacts on heritage assets. Where these adaptations are subject to consent themselves, their consequences for heritage assets might be anticipated and addressed as if they were 'development' or some other licensable activity. In effect, this is the case with Offshore Wind Farms (OWF) – which reduce reliance on carbon for energy – such as Thanet OWF just to the north of the Dover Sector. The South East Bidding Area for OWF Leasing Round 4 extends around Dungeness and almost as far as Dover, though it is understood that no bids are currently progressing in this area [205]. Diffuse forms of adaptation – like planting trees, to which there is a commitment to increase planting by 30,000 ha per year[206] – could be a particular risk to heritage assets that have survived by virtue of hitherto marginal interest in the land they occupy. As indicated above, existing processes focussing on development and licensing may not intercept such risks. Even where consent is required, there may be structural issues that impede consideration of the historic environment, as indicated in respect of large scale shoreline

[205] https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/offshore-wind-leasing-round-4/.
[206] https://www.gov.uk/government/news/39-million-to-drive-innovative-tree-planting.

interventions (such as managed retreat and habitat creation) where climate change adaptation is a major driver (Cooper and Firth 2020).

R 14 Alongside climate change, address the implications for heritage assets in the Dover Sector of climate change adaptation, including adaptation activities that do not normally prompt archaeological assessment.

7.1.19. More positively, there is growing awareness of the value that heritage assets can provide in both economic and social terms, by drawing attention to their presence and significance. This value is underlined by Heritage Counts for heritage assets on land (Historic England 2020a; 2020b), and the extension in principle to heritage assets at sea has also been laid out (Firth 2016; 2015). The potential for the historic environment to act as a catalyst for economic and cultural expansion is being pursued through Heritage Action Zones (HAZs) and High Street (HAZs), including at Ramsgate in the Dover Sector. The wartime heritage of east Kent already has a high profile, but attention continues to be directed towards defence against invasion, defence against air attack and the evacuation of Dunkirk (LUC and Archangel Heritage 2018; Small and Barber 2019). Bringing attention to the wider narratives of the Dover Sector throughout WWI and WWII could bring considerable economic and social benefits to the coast, harbours and settlements between Dungeness and North Foreland. Making a step in the right direction for the region as a whole, Franklin et al. note the presence of the Dover Boarding Patrol at Ramsgate in WWI and state the case for greater connection between the history of the town, the harbour and its wider maritime landscape (2020, 124, 144). The Deep Shelter for the Fan Bay battery constructed in 1940, operated by the National Trust[207], has considerable potential for elucidating the story of WWII shipping through the Strait, as does the Port War Signal Station at Dover, operated by English Heritage[208]. Bacon notes (1919b, 2:590):

> The work of the shore establishments at Dover deserves special mention. Foremost of these was the Port of War Signal-station, with Commander A. E. B. Greville in charge, and Lieutenant-Commander C. O. Campbell to assist him; incessant day and night duty was the order for these two officers, and it was carried out with efficiency. This station was an important adjunct to the port, as it was the centre of distribution of information to distant stations in the area, and also to adjoining areas.

7.1.20. Bearing in mind the emphasis placed in this study on the Dover Sector encompassing both sides of the Channel, the scope for seeking economic and social benefits through a joined-up approach is worth emphasising. Tourism trails that include both, and focus on the war at sea as well as on land, could develop from existing examples[209].

R15 Encourage greater attention to the economic and social benefits of heritage assets in the Dover Sector, including by broadening beyond traditional narratives. Seek to increase benefits by pursuing opportunities to collaborate across the Dover Sector in this shared heritage.

7.2. Additional sources of Data relating to the Dover sector: the potential for enhancement

7.2.1. There is a huge and rapidly expanding amount of data available for enhancing historic environment records relating to the Dover Sector. This includes data in a relatively raw form – processed and accessible, but not interpreted; interpreted data ranging from existing records and inventories to narratives (books and reports) that include (re-)useable data; and other forms of media in which data are implicit, such as contemporary photographs, film, and artworks. Examples of all of these

[207] https://www.nationaltrust.org.uk/the-white-cliffs-of-dover/features/visiting-fan-bay-deep-shelter.
[208] https://www.english-heritage.org.uk/visit/places/dover-castle/history-and-stories/fortress-dover/.
[209] e.g. http://www.remembrancetrails-northernfrance.com/trails/the-allies-logisitics-base-on-the-channel-coast.html; https://www.raversyde.be/en/atlantikwall/aachen-battery.

have been drawn upon in the account above. The reasons for the growth in data available for enhancement are broadly threefold. First, existing sources such as IWM and the National Archives are becoming more accessible through digitisation and their collections being made available online. Second, major improvements are occurring in survey methods and the availability of their results – such as satellite imagery, multibeam survey, lidar, drone imagery and photogrammetry. Third, a major contribution is being made by individuals and groups researching families, localities and themes and sharing their enquiries and results online, including privately held archive material (e.g. family records and photographs). These factors are not specific to the Dover Sector, though it might be suggested that the intensity and momentousness of activity here in WWI and WWII causes a degree of amplification.

7.2.2. Data and interpretation are not, however, evenly spread. People's interest over the last century has focussed on some aspects of the Dover Sector but not others, and this has an effect not only on the narratives that result but also on the data that are brought to light. Despite increasing data and interest, some aspects of the Dover Sector are not widely understood or explored. Furthermore, there are facets of the Dover Sector for which official sources may be lacking because they were not recorded in the first place, or the records may have been discarded. Typically, information about certain aspects of the 'front line' – the perspectives of commanders for example – is more apparent that the perspectives of other ranks, or of people engaged in the vast array of activity needed to support the front line (Figure 27). Many voices are still absent or underrepresented. Arguably, this is changing as sources increase in availability, and family and community sources and research become more evident[210]. There is certainly a role for the material culture of the Dover Sector – at the scale of artefact, asset or landscape – to challenge the mass of documentary sources and pose questions that are not otherwise raised.

R16 Develop a strategy for record enhancement for the Dover Sector that challenges familiar narratives and includes absent and underrepresented elements of the Dover Sector's history.

Figure 27: WRNS ship mechanic welding on the deck of a Landing Craft. The location is not specified. © IWM D 18163.

[210] e.g. https://www.bbc.co.uk/history/ww2peopleswar/stories/29/a8966929.shtml.

7.2.3. With a few exceptions, the material culture of the Dover Sector – especially in the marine sphere – is not well represented in archaeological records. Even where documentary sources have been brought together, the connection to the physical remains may not be secure and the record of those physical remains is itself sparse. Much of this may be attributable to well-known weaknesses in the capacity of HE's recording systems in the marine sphere, which is in the course of being addressed. Persistent issues with recorded positions and with the identification of heritage assets preclude greater advantage being taken of the growing availability of data, in terms of both data from the seabed and documentary and private sources. Reconciling multiple sources is especially time-consuming if core information is not secure or relatable, and has meant that this project has not gone far down this path. But the potential is very great once confidence in the core can be established, and the availability of seabed data in the form of multibeam bathymetry for large areas of the Dover Sector as a result of the Civil Hydrography Programme offers a key (Figure 28). An initial enhancement of HE's record based on available seabed data could resolve ambiguities relating to position and identity and will directly enable recording of condition, trajectory and probably some impacts also; and more secure identification will unlock connections to both public collections and privately shared sources.

R17 Prioritise the reconciliation of HE data sets for marine heritage assets in the Dover Sector with other sources, notably high-resolution bathymetry data available as a result of the Civil Hydrography Programme.

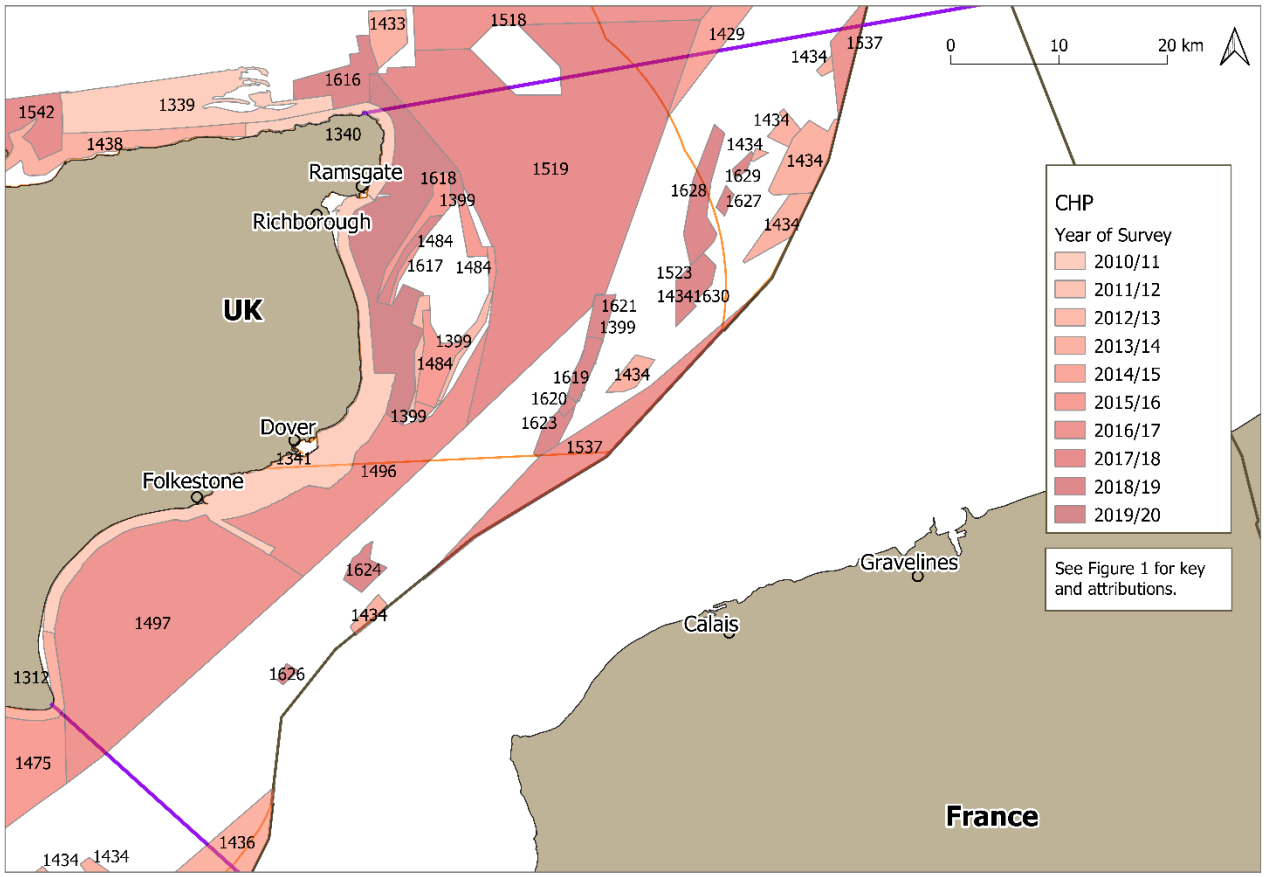

Figure 28: Availability of high-resolution bathymetry data in Dover Sector resulting from Civil Hydrography Programme since 2010. Numbers are Hydrographic Instruction (HI) numbers used to identify each survey.

7.2.4. Whilst HE's focus in terms of enhancement might lie predominantly in UK waters, this study has underlined the degree to which there are heritage assets in which the UK has a strong interest in the waters of France, Belgium and the Netherlands. In some cases – such as HMS *Wakeful* – continental authorities are already providing protection for UK heritage assets. Furthermore, understanding the significance of heritage assets relating to the Dover Sector even within UK waters requires knowledge of heritage assets in continental waters also. Consideration needs to be

given, therefore, to how the UK might address data relating to other jurisdictions that is critical also to understanding UK heritage. It should be borne in mind that similar factors relating to the availability of data apply in France, Belgium and the Netherlands also: more collections are coming online; there is new survey data; and data and information are being generated by private individuals and groups. Also, ambiguities regarding the position and identification of wrecks in particular are inhibiting connections from being made, which impedes enhancement. The sharing of public data in Europe – such as availability of common datasets through EMODnet[211] or national agencies making data available directly through their adherence to INSPIRE[212] – offers the prospect of addressing these common problems and especially of addressing the transnational character and significance of (maritime) cultural heritage (Figure 29). But although extremely welcome, shared public wreck data is largely made available by the agencies responsible for charting wrecks, rather than by heritage agencies, so the data has relatively few attributes and transnational queries would require substantial prior enhancement.

R 18 On the basis of publicly available data and in collaboration with their respective authorities, develop a preliminary record of UK-related heritage assets in the waters of France, Belgium and the Netherlands that are associated with the Dover Sector in WWI and WWII.

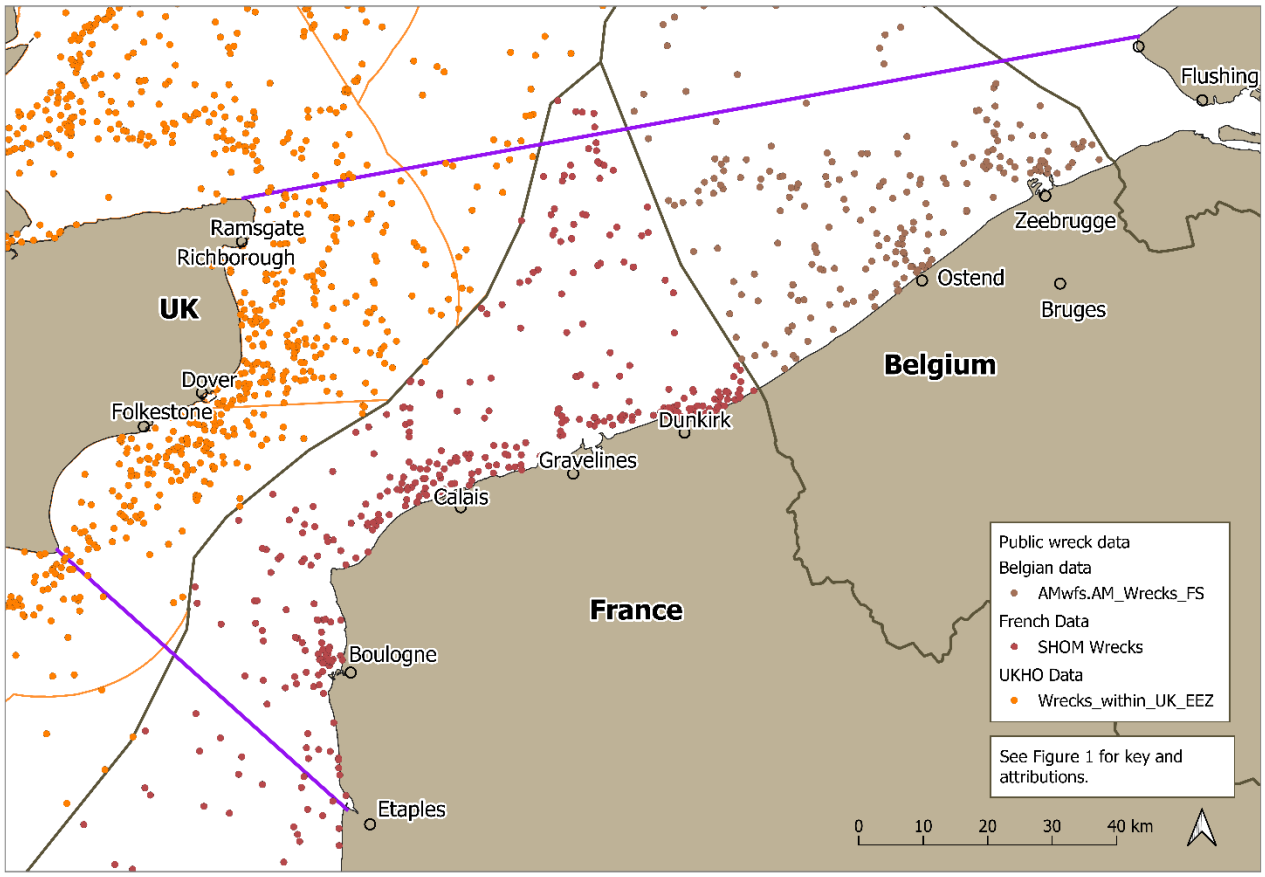

Figure 29: Publicly available wreck data for the Dover Sector, including France and Belgium. Data for the Netherlands not available at time of writing. Includes wrecks of all periods, though a substantial proportion are likely to date to 1914-18 and 1939-45. The data for France and Belgium includes many UK wrecks.

7.2.5. The most capable transnational dataset relating to maritime heritage is Wrecksite, which has been drawn upon extensively during this study. Although, Wrecksite is a private rather than public dataset, in many respects it presents a model that deserves attention by public authorities. Especially for the Dover Sector, the seamless availability of a common standard of record across different jurisdictions, and the capacity to apply spatial queries across boundaries, are major

[211] https://www.emodnet.eu/en.
[212] https://inspire.ec.europa.eu/.

benefits. Records are often detailed and there is direct integration (for subscribers) of other datasets, notably the UKHO wreck database. Wrecksite also integrates information added by private individuals, again transnationally. Of course, Wrecksite also has to contend with uncertainties around positioning and vessel identity; and options for using its data directly in a project GIS or database are highly constrained.

7.2.6. The increasing availability of non-text data such as imagery and visualisations – including static images, moving images and 3D models through which the viewer can themselves move – is as an exciting a prospect for the Dover Sector as for other study areas. They combine to present a very rich record and experience, but introduce complexities ranging from exponential rise in storage requirements to the necessity of tracking intellectual property and rights. Even studies such as this are affected by these matters, limiting what can be brought together and shared, but the implications for systematic enhancement of public records are considerable. Connectivity is key, enabling source material to remain in its digital location without duplication, but preserving the connection and accessibility. Nonetheless, there needs also to be scope to capture sources that will be lost otherwise bearing in mind that digital material is still perhaps the most fragile of media, especially if it is outside a publicly maintained accessible collection. Again, even within the scope and timescale of a project such as this, digital sources are not always persistent.

R19 Facilitate and encourage persistent links between HE data relating to the Dover Sector and other publicly accessible collections. Make provision for capturing digital data relating to the Dover Sector that may not be secure for the long term, acknowledging original sources and contributors.

7.2.7. As already indicated, enabling records to be enhanced by members of the public through their own investigations and/or sources to which only they have access (such as family stories, photographs, and memorabilia) is critical to depth, breadth and diversity; and to maintaining engagement. This project had the advantage of working alongside the CBA's Home Front Legacy project[213] and CITiZAN[214], including joint presentations and workshops. The intention of supporting these wider initiatives – which already had mechanisms for members of the public to contribute records, rather than overlapping them with a further mechanism –proved effective. However, tying enhancement mechanisms to fixed-term initiatives inevitably raises questions about succession: how will members of the public be able to continue contributing once the term is ended? Projects like this can establish the potential for enhancement and indicate the directions it can take; they can also build connections and awareness among groups and individuals who want to get involved in the enhancement process. But there needs to be a mechanism – like Enrich the List for designated sites[215] – through which public enhancement of HE's marine records can take place that is available indefinitely to would-be contributors.

R20 Ensure long term provision for members of the public to make their own contributions to HE's records relating to the Dover Sector.

7.3. Stakeholder Interests and Raising Awareness of Heritage Assets

7.3.1. As noted above, engagement with stakeholders during this project focussed on collaboration with the Home Front Legacy project and CITiZAN, which included joint workshops at the National Trust's South Foreland Lighthouse and in Folkestone, hosted by Shepway HEART Forum[216]. Additional lectures were hosted by Shepway HEART Forum and Sandgate Society, and a poster presentation at Council for Kentish Archaeology conference on the First World War. The audience and enthusiasm generated by these events vouched for the interest in the heritage of the Dover

[213] https://archaeologydataservice.ac.uk/archives/view/hfl_he_2020/.
[214] https://citizan.org.uk/.
[215] https://historicengland.org.uk/listing/enrich-the-list/.
[216] http://shepwayheartforum.co.uk/.

Sector in WWI and WWII, not least because the maritime dimension is relatively unknown even among people with an appetite for local history.

7.3.2. Although projects such as this can reach out successfully to groups and individuals with local, family, or thematic interests, establishing a sustained awareness and interest in other stakeholder groups can be more difficult and is dependent on the channels that are available. For some stakeholder groups, the availability of enhanced data – linked to a clear account of significance – is an important channel: notably for regulators, their advisors and environmental managers in local and national government. Developing measures to flag the significance of places/areas and groups of heritage assets is likely to raise greater awareness than undifferentiated dot maps; and also creates scope for more tailored policies and implementation plans[217]. Where cultural heritage is not a primary driver for policies and management responsibilities – such as in the designation and management of marine protected areas – then data about the presence of heritage assets needs to be accompanied by information relevant to the primary drivers, such as the role of heritage assets as habitat, a focus for commercial fishing or sea angling, or a potential source of pollution, for example (Firth 2018b). Enabling heritage data to interface with schema relating to Ecosystem Services and/or Natural Capital could be important in raising awareness in this respect (HM Government 2018; Fluck and Holyoak 2017; Firth 2020a; Evans and Davidson 2019).

R21 Ensure that heritage data for the Dover Sector is fit for purpose as a principal channel for engaging with regulators, advisors and environmental managers. Relate heritage data to Ecosystem Services / Natural Capital in order to increase the interface between heritage and managing the environment in context of 25 Year Environment Plan.

7.3.3. The availability of accessible data is likely to be an important means of engaging groups and individuals who use the coastal and marine environment presented by the Dover Sector. These user groups include: developers of ports and harbours or offshore renewables who need to respond to planning policies that invoke heritage data and the significance of the assets recorded; groups that have a commercial or related interest such as fishing or navigation; groups who might have a degree of direct interest in the heritage of these assets, such as divers and coastal walkers. As these groups are diverse, their interests in data are diverse also. In some cases – such as preparing a development proposal – the authority of the source may be paramount; whereas in others – especially where there are alternatives – tailored accessibility and engaging content will be influential. In this respect, the virtual dive tours developed by Historic England – including of the *U-8* within the Dover Sector[218] – have considerable potential for further development and should be integrated with heritage asset data. To place individual assets within their context by relate them to significant areas or groups, then other forms of digital access such as Story Maps offer great potential, especially where these can in turn be linked to physical access through trails (on land and at sea) and signage.

R22 Use heritage data for the Dover Sector as a key channel for engaging with user groups. The form and accessibility of heritage data should be tailored to the interests of different user groups, to include digital interpretations / visualisations that are directly integrated with data in more elementary forms.

[217] See policies S-HER-1 and S-SCP-1, South Inshore and South Offshore Marine Plan https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726867/South_Marine_Plan_2018.pdf and Technical Annex https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/725885/02c_Technical_Annex.pdf; and policies S-HER-1 and S-SCP-1 in Draft South East Inshore Marine Plan https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/857296/DRAFT_SE_Marine_Plan.pdf.

[218] https://www.cloudtour.tv/u8/.

7.3.4. It should be clear from the above that in using heritage data as a core means of engaging stakeholders and raising awareness of the Dover Sector, it is important that heritage data are not regarded principally as a constraint. In this respect, it is useful that the policy S-HER-1 for the Draft South East Inshore Marine Plan referred to above starts with the positive statement that 'Proposals that demonstrate they will conserve and enhance elements contributing to the significance of heritage assets will be supported' before moving on to the constraints that heritage assets give rise to, which are foregrounded in the equivalent policy of the South Inshore and South Offshore Marine Plan. It is to be hoped that by stressing the positive benefits that can arise from the marine historic environment, such plan policies will help set the tone more widely. In this respect, initiatives such as HAZs and High Street HAZs as at Ramsgate provide scope for information about the heritage of the Dover Sector and its significance to become embedded in local communities and their public realm. There is scope here to go beyond specific user groups to reach people who live, work or visit the region and, indeed, travel right through its core on ferry services that pass very close to some of the Dover Sector's key heritage assets.

R23 Promote – through practical demonstration backed by robust evaluation – the contribution that the heritage of the Dover Sector in WWI and WWII can make to the region socially, economically, and environmentally.

7.3.5. Another important group of stakeholders are Galleries, Libraries, Archives and Museums (GLAM) – including heritage-based visitor attractions – with material relating to the Dover Sector at their sites, in their collections, and in their on-site and online content. The value of the GLAM sector to understanding and representing the Dover Sector has been illustrated throughout the narrative above, and the potential of connecting this material to heritage data has already been underlined. Using digital connections to build on the relationship between content within the GLAM sector and heritage assets externally is mutually beneficial across multiple audiences ranging across the groups already discussed – from people who might have a passing interest in their locality to others who might be prompted to investigate GLAM collections through their personal research. Nationally and locally, GLAM institutions have a physical presence through their premises and in their collections on display that lends a tangible presence to heritage assets that cannot be readily seen because they are underwater or in another country.

R24 Build relationships with Galleries, Libraries, Archives and Museums (GLAM) – including heritage-based visitor attractions – that are based locally in the Dover Sector or have sites, collections and content relating to the Dover Sector. Articulate links between GLAM sites and collections and heritage assets.

7.3.6. As an Independent Research Organisation (IRO) and having its own Heritage Schools programme, HE has scope to increase attention to the heritage assets of the Dover Sector in both research and education. Research could address many of the themes flagged in the narrative above and might be especially helpful in encouraging interdisciplinary studies that combine archaeological and historical sources and perspectives. Research could also be usefully directed to points raised in this discussion, to address relationships between heritage assets and their environments, and between heritage assets and their communities. There is also clearly a lot of scope for data gathering with respect to heritage assets themselves, their condition and trajectory; and methodological developments that will facilitate data gathering and analysis. Developing research partnerships to pursue such topics can have the added benefit of raising awareness and embedding links between HE and stakeholders in the Dover Sector. There is similarly broad scope for building partnerships with stakeholders and raising awareness of the Dover Sector's historic environment through schools, higher and further education, and other education settings especially in the south and east of Kent. Some of these paths may seem well-trodden, but the account set out above indicates the richness of the content and especially the opportunities for new and challenging perspectives beyond those that are already familiar.

R25 Establish partnerships in research and education relating to the Dover Sector alongside other actions relating to significance, asset condition/trajectory, enhancement and engagement, to increase mutually beneficial outcomes.

7.3.7. A final group of stakeholders where engagement is essential in understanding and conserving the significance of heritage assets addressed in this study are the populations beyond the UK who have interests in the Dover Sector, and the authorities – especially heritage agencies – that represent them. This includes, of course, populations and agencies whose territory encompasses parts of the Dover Sector in France, Belgium, and the Netherlands; and of Germany, which shares the history of this area including its casualties. As noted already, several other countries, including the US, share in the heritage of the Dover Sector. Notwithstanding potential differences in perspective, the heritage of the Dover Sector in the First and Second World War presents important opportunities for HE to engage transnationally in extending appreciation of the significance of this heritage but also in facing common concerns about potential pressures and impacts, and raising public awareness. The MACHU Project, which had a wider temporal and geographical scope (Manders, Oosting, and Brouwers 2010) could be a source of many valuable lessons in the more closely circumscribed Dover Sector. Although relations between the UK and its continental neighbours are now on a different footing, there are still platforms on which to build a transnational approach to the significance of heritage assets in the Dover Sector relating to WWI and WWII, and their capacity to engage[219].

R26 Using experience from previous projects, develop a substantive transnational initiative to progress mutual objectives relating to the heritage of the Dover Sector, and to develop practice in respect of shared heritage.

7.3.8. This discussion of stakeholder interests and raising awareness has focused on heritage data and the places to which it relates, because these channels offer connections that can be persistent and sustained. There are other channels that may be more transitory but are undoubtedly impactful at least in the short term, based around events such as anniversaries; specific activities; publication of web pages, reports and articles; and related conventional and social media. Broadening to the wider cultural and creative sphere has been shown to be effective (Shimko 2019) and is a major strand of the High Street HAZ initiative. Achieving a sustained effect from events is likely to require a programmatic approach or at least a clear model for how the events will achieve a longer-term outcome. Insofar as this study has focussed on two events – the First and Second World War – which were themselves eventful, then the Dover Sector is replete with anniversaries on which to draw. Some of these anniversaries are major, nationally and internationally, and inevitably generate a great deal of interest: HE might anticipate those which provide an opportunity to extend and broaden public appreciation of the heritage assets through which momentous events in the Dover Strait took place.

R27 Anticipate key anniversaries relating to the Dover Sector to develop a strategic events-based approach that will achieve long-term outcomes as well as more immediate impacts. The breadth and depth of the historic environment relating to the Dover Sector should be used to extend and challenge established narratives, not just provide a familiar backdrop.

7.3.9. One way to embed and sustain greater public awareness and long-term relationships between stakeholders – even though projects and events are transitory – would be to develop a network around the heritage of the Dover Sector in the First and Second World War, encompassing curatorial interests but also the different groups of stakeholders outlined above. Fora and partnerships with a range of environmental drivers are widely employed in the coastal and marine sphere and are playing a key role in co-design and co-implementation of initiatives. Coastal and

[219] e.g. Action Plan of Dover / Pas de Calais Strait, March 2018: https://www.kent.gov.uk/__data/assets/pdf_file/0003/96906/Dover-Strait-action-plan.pdf.

marine fora are still relatively underused in and/or under-representative of cultural heritage, with the principal exception of the North East Maritime Archaeology Forum (NEMAF). A forum defined quite tightly around the distinctive space, time and themes set out in this study could do much to overcome boundaries between groups of stakeholders, between countries and between land and sea that have previously hampered a fuller understanding and appreciation of the Dover Sector's wartime heritage.

R28 Encourage the establishment of a 'Dover Sector Forum' to provide a focus for collaboration across stakeholder groups and to facilitate co-design and co-implementation of future programmes.

8. Conclusion

8.1. A major element of this project has been concerned with establishing a narrative for the Dover Sector in the First and Second World War that reflects the heritage assets that are present, but which takes into account also those significant themes that are less-well represented. The intensity and complexity of the conflicts in the Dover Sector are such that a standard chronological account would not be optimal: important continuities and discontinuities between the two conflicts, and how they are reflected in the historic environment, could be obscured by the detail of unfolding events. A more thematic approach also provides better anchorage in the face of the Dover Sector's better-known episodes and the weight of literature that swirls around them. Of course, a thematic rather than chronological approach introduces its own temporal disjunctures; it is hoped that these are not too exasperating.

8.2. The approach has focussed on four principal themes:

- Naval attacks beyond the Dover Sector that took place from or through the Dover Sector, focussing largely on efforts to prevent the passage of U-boats.
- Cross-channel transport throughout the First World War, and before and after the German occupation of the continental coast in the Second World War.
- Coastwise shipping in both conflicts and along both coasts in changing circumstances; and
- Shore-oriented actions, both planned and actual, including bombardments, disembarkations and evacuations, and amphibious assaults.

The interplay of sea, land and air is woven through these themes, which represent relatively discrete events but also the day-to-day effort involved by all sides in conducting warfare in this constrained and highly contested space.

8.3. Attention has been drawn to the heritage assets and wider historic landscape of the Dover Sector, and to the material culture that is absent from the Dover Sector as well as present. It is a rich record, but an appreciation of its richness has been hampered by lack of detailed data about what still lies on the seabed. It has also been hampered by historical records – documents, photographs, films, paintings – being severed from heritage assets and dispersed around many collections. A lack of diversity among the voices apparent also dampens the potential that the Dover Sector presents. These factors are all changing due to the availability of high-resolution surveys, online digital resources, and the growth of avocational history through digital media. This is, therefore, a good time to address the Dover Sector in the First and Second World War, and to challenge other barriers that might limit its fullest appreciation: between environments (principally land and sea), between disciplines, and between countries. Reflecting the conflicts themselves, the heritage of the Dover Sector warrants an approach that is amphibious, interdisciplinary and transnational.

8.4. The significance of heritage assets in the Dover Sector reflects points made in the preceding paragraphs. Attention has been drawn to the importance of some heritage assets on land of particular importance because they represent huge levels of activity at sea that passed without incident – at least in terms of material reaching the seabed. Attention has been drawn also to areas whose significance arises from their landscape as well as from the heritage assets they contain; and to distinctive groups of heritage assets associated with specific engagements or shared themes. Some individual heritage assets have also been flagged for their significance, again often relating to a wider aspect of the Dover Sector's history of which they are a rare representation.

8.5. The survival of heritage assets relating to the Dover Sector is often better than might be expected, which is another of the messages being delivered by high-resolution survey – on land as well as at sea. The likely trajectory of heritage assets is subjected to planned activities requiring consent, which should include mechanisms to anticipate and deal with significant impacts; more diffuse

activities where engagement and education are warranted, supported by a safety net for 'discoveries' where inadvertent disturbance occurs; and natural processes that are often affected in turn by human influences, including climate change whose implications for marine heritage assets are still poorly understood. Encouragingly, there is increasing recognition of the benefits arising from heritage – including coastal and marine heritage – which could give rise to positive trajectories also.

8.6. As a consequence of the factors in play, there is considerable potential for data enhancement. The anticipated redevelopment of HE's record of marine sites – and its articulation with local authority HERs – is an essential precursor to enhancement. The availability of seabed survey data should enable known issues with respect to heritage asset positioning and ambiguity over identifications to be largely resolved, at least for the reasonably well-documented periods and substantial vessels discussed here (though resolving aircraft and small vessels such as coastal forces and 'little ships' is bound to remain problematic). Improvements in identification will enable greater connectivity with material in other collections, reconnecting assets to rich content about their context. Enabling people to engage directly with records – and to submit their own sources and findings – should be used as an opportunity to increase representativity.

8.7. There are several different groups of stakeholders with which engagement and awareness-raising is desirable. Achieving sustained outcomes is likely to depend on the content, accessibility, and connectivity of heritage data, reinforcing the importance of data enhancement and the architecture that will enable it to fulfil its potential. Again, it is important that the heritage of the Dover Sector is seen as an enabler, not just a constraint, and HE is well placed to develop partnerships with GLAM, research and education institutions to extend and embed understanding and awareness. There is a specific need to engage stakeholders across the territorial boundaries of the Dover Sector, especially with heritage agencies in France, Belgium, and the Netherlands. The interests of Germany in its historical associations with the Dover Sector – including its casualties – require engagement too. Although the history of the Dover Sector in WWI and WWII is replete with anniversaries and event-led engagement can have a high impact, achieving persistent outcomes using transitory methods is problematic. Developing a forum on the historic environment of the Dover Sector in the First and Second World War might offer a sustainable path for engagement and awareness raising in the long term.

8.8. Activity in the Dover Sector in the First and Second World War was of an intensity and momentousness that has no parallel elsewhere in English waters. Its heritage is, however, largely untapped. Consequently, the Dover Sector presents numerous opportunities to build on current trends in survey, connectivity, engagement, and mobilising heritage for its wider benefits. It is important not to lose sight of the many human tragedies that the historic environment of the Dover Sector represents, as is often the case for maritime and military heritage. But most people's encounters with the Dover Sector in wartime were not fatal: commemoration is clearly warranted, but it can be accompanied by exploring the narratives of all those whose extraordinary endeavours and experiences are represented by the archaeological and historical record here. There is tremendous scope for innovating in the investigation, management, and elucidation of maritime cultural heritage and the Dover Sector in the First and Second World War would be as rewarding as it is challenging.

8.9. The recommendations arising from this study are summarised below:

R1 Review heritage assets on land in light of their 'maritime' significance to the Dover Sector in WWI and WWII.

R2 Draw upon perspectives on significance from other countries that share the heritage of the Dover Sector. Explore significance in relation to diversity of people engaged in Dover Sector but not currently represented in narratives.

R3 Develop place-based approach to the significance of distinctive areas within the Dover Sector.

R4 Bring additional focus to the significance of groups of heritage assets in the Dover Sector.

R5 Review the significance of specific heritage assets relating to the Dover Sector, including in the context of designation under heritage legislation. Where highly significant heritage assets are not designated under heritage legislation, ensure that statements of significance are published and made available to consenting authorities.

R6 Anticipate the significance of as yet undiscovered heritage assets, especially more ephemeral features that have a bearing on aspects of the Dover Sector that are under-represented among known heritage assets.

R7 Enhance archaeological records for marine heritage assets in the Dover Sector with information about their condition on the seabed and about the pressures/processes that may be affecting them.

R8 Enhance records for heritage assets on land relating to the Dover Sector in respect of their condition/trajectory if this has been overlooked previously.

R9 Presume that marine heritage assets in the Dover Sector retain a considerably degree of significance despite a history of dispersal and/or salvage, and despite the effects of environmental processes and diffuse activities such as fishing.

R10 Ensure that consenting mechanisms are implemented effectively to protect marine heritage assets in the Dover Sector from the effects of planned activities. Ensure that the implementation of consenting is properly resourced, and identify and address any gaps in consenting systems across environments, different consenting systems and jurisdictional boundaries.

R11 Identify non-consented activities that give rise to risks to heritage assets in the Dover Sector; seek to address the risks presented by such activities by informing, engaging and educating their participants and practitioners.

R 12 Bolster existing reporting systems and fill in any gaps to ensure an effective means and mechanism for dealing with impacts to heritage assets in the Dover Sector from diffuse or non-consented activities.

R 13 Review pathways of 'natural' processes affecting heritage assets in the Dover Sector to clarify the relationship between effects on heritage assets and their sources. Clearer understanding of the implications of climate change for (marine) heritage assets in the Dover Sector – as elsewhere – is urgently required. Develop mechanisms for assessing and mitigating 'natural' impacts in the Dover Sector.

R 14 Alongside climate change, address the implications for heritage assets in the Dover Sector of climate change adaptation, including adaptation activities that do not normally prompt archaeological assessment.

R15 Encourage greater attention to the economic and social benefits of heritage assets in the Dover Sector, including by broadening beyond traditional narratives. Seek to increase benefits by pursuing opportunities to collaborate across the Dover Sector in this shared heritage.

R16 Develop a strategy for record enhancement for the Dover Sector that challenges familiar narratives and includes absent and underrepresented elements of the Dover Sector's history.

R17 Prioritise the reconciliation of HE data sets for marine heritage assets in the Dover Sector with other sources, notably high-resolution bathymetry data available as a result of the Civil Hydrography Programme.

R 18 On the basis of publicly available data and in collaboration with their respective authorities, develop a preliminary record of UK-related heritage assets in the waters of France, Belgium and the Netherlands that are associated with the Dover Sector in WWI and WWII.

R19 Facilitate and encourage persistent links between HE data relating to the Dover Sector and other publicly accessible collections. Make provision for capturing digital data relating to the Dover Sector that may not be secure for the long term, acknowledging original sources and contributors.

R20 Ensure long term provision for members of the public to make their own contributions to HE's records relating to the Dover Sector.

R21 Ensure that heritage data for the Dover Sector is fit for purpose as a principal channel for engaging with regulators, advisors and environmental managers. Relate heritage data to Ecosystem Services / Natural Capital in order to increase the interface between heritage and managing the environment in context of 25 Year Environment Plan.

R22 Use heritage data for the Dover Sector as a key channel for engaging with user groups. The form and accessibility of heritage data should be tailored to the interests of different user groups, to include digital interpretations / visualisations that are directly integrated with data in more elementary forms.

R23 Promote – through practical demonstration backed by robust evaluation – the contribution that the heritage of the Dover Sector in WWI and WWII can make to the region socially, economically, and environmentally.

R24 Build relationships with Galleries, Libraries, Archives and Museums (GLAM) – including heritage-based visitor attractions – that are based locally in the Dover Sector or have sites, collections and content relating to the Dover Sector. Articulate links between GLAM sites and collections and heritage assets.

R25 Establish partnerships in research and education relating to the Dover Sector alongside other actions relating to significance, asset condition/trajectory, enhancement and engagement, to increase mutually beneficial outcomes.

R26 Using experience from previous projects, develop a substantive transnational initiative to progress mutual objectives relating to the heritage of the Dover Sector, and to develop practice in respect of shared heritage.

R27 Anticipate key anniversaries relating to the Dover Sector to develop a strategic events-based approach that will achieve long-term outcomes as well as more immediate impacts. The breadth and depth of the historic environment relating to the Dover Sector should be used to extend and challenge established narratives, not just provide a familiar backdrop.

R28 Encourage the establishment of a 'Dover Sector Forum' to provide a focus for collaboration across stakeholder groups and to facilitate co-design and co-implementation of future programmes.

9. References

Bacon, R. 1919a. *The Dover Patrol 1915-1917. Vol. I.* Vol. 1. 2 vols. New York: Doran.

———. 1919b. *The Dover Patrol 1915-1917. Vol. II.* Vol. 2. 2 vols. London: Hutchinson.

Cant, Serena, and Mark Dunkley. 2018. 'The Naval War'. In *Legacies of the First World War: Building for Total War 1914-18*, edited by Wayne Cocroft and Paul Stamper. Swindon: Historic England.

Cocroft, Wayne, and Paul Stamper, eds. 2018. *Legacies of the First World War: Building for Total War 1914-18*. Swindon: Historic England.

Coleman, E. C. 2014. *No Pyrrhic Victories: The 1918 Raids on Zeebrugge and Ostend - a Radical Reappraisal*.

Collier, Basil. 1957. *The Defence of the United Kingdom*. London: HMSO.

Cooper, Bill, and Antony Firth. 2020. 'Large-Scale Shoreline Interventions: Considerations for the Historic Environment'. 7865. Cooper Marine Advisors / Fjordr.

Corbett, Julian S. 1920. *Naval Operations: Official History of the War. Volume I.* Vol. 1. 5 vols. London: Longmans Green.

———. 1921. *Naval Operations: Official History of the War. Volume II.* Vol. 2. 5 vols. London: Longmans Green.

———. 1923. *Naval Operations: Official History of the War. Volume III.* Vol. 3. 5 vols. London: Longmans Green.

Cull, Brian. 2017. *Battle for the Channel: The First Month of the Battle of Britain 10 July - 10 August 1940.*

Director of Naval Warfare. 1973. *British Mining Operations 1939-1945. Volume 1*. Naval Staff History, BR 1736(56)(1). London: Ministry of Defence.

———. 1977. *British Mining Operations 1939-1945. Volume 2*. Naval Staff History, BR 1736(56)(2). London: Ministry of Defence.

Dunkley, Mark. 2015. '"Climate Is What We Expect, Weather Is What We Get". Managing the Potential Effects of Oceanic Climate Change on Underwater Cultural Heritage'. In *Water & Heritage: Material, Conceptual and Spiritual Connections*, 217–29. Leiden: Sidestone Press.

Ellis, L.F. 1953. *The War in France and Flanders 1939-1940*. London: HMSO.

Evans, Sally, and Matt Davidson. 2019. 'Wrecks in Coastal and Marine Ecosystems: The Goodwin Sands and Kent Coast'. HE 7745. MSDS Marine / Carcinus.

Faulkner, Marcus. 2015. *The Great War at Sea: A Naval Atlas 1914-1919*. Barnsley: Seaforth Publishing.

Firth, Antony. 2014. 'East Coast War Channels in the First and Second World War'. EH Project Number 6586, Fjordr Ref: 16131. English Heritage.

———. 2015. *The Social and Economic Benefits of Marine and Maritime Cultural Heritage: Towards Greater Accessibility and Effective Management*. London: Honor Frost Foundation.

———. 2016. 'The Social and Economic Value of the Marine Historic Environment: Issues and Opportunities'. Project Number HE 7079, Fjordr Ref: 16241. Tisbury: Fjordr. https://historicengland.org.uk/images-books/publications/social-and-economic-value-of-marine-historic-environment/.

———. 2018a. 'Understanding Fishermen's Fasteners: A Report for Historic England on Behalf of Sussex IFCA'. Fjordr Ref: 16281/ Historic England Ref: 7171. Tisbury: Fjordr Limited.

———. 2018b. *Managing Shipwrecks*. London: Honor Frost Foundation. http://honorfrostfoundation.org/wp/wp-content/uploads/2018/07/Managing-Shipwrecks-April-2018-web.pdf.

———. 2020a. 'Heritage, Natural Capital & Ecosystem Services: Case Studies on the Dorset Stour and Tyne to Tees Marine Area'. HE 7751/7752; Fjordr Ref: 16440/16450. Tisbury: Fjordr Limited.

———. 2020b. 'HMS Falmouth: Addressing the Significance of a Light Cruiser Lost in the First World War off the Coast of Yorkshire'. *International Journal of Nautical Archaeology* 49 (1): 142–54. https://doi.org/10.1111/1095-9270.12392.

Fisher, Stephen. 2021. 'LCT 7074: The History of the Last D-Day LCT. Unpublished Report.' National Museum of the Royal Navy.

Fluck, Hannah, and Vince Holyoak. 2017. 'Natural Capital, Ecosystem Services and the Historic Environment'. 19/2017. Research Department Reports.

Frank, Hans. 2007. *German S-boats in action: in the Second World War*. Barnsley: Seaforth.

Franklin, Geraint, Nick Dermott, and Allan Brodie. 2020. *Ramsgate: The Town and Its Seaside Heritage*. Informed Conservation Series. Swindon: Liverpool University Press.

George, Michael, and Christine George. 2008. *Dover and Folkestone during the Great War*. Barnsley, South Yorkshire: Pen & Sword Military.

Harkin, D., M. Davies, E. Hyslop, H. Fluck, M. Wiggins, O. Merritt, L. Barker, M. Deery, R. McNeary, and K. Westley. 2020. 'Impacts of Climate Change on Cultural Heritage'. Pdf. *MCCIP Science Review 2020*, 26 pages. https://doi.org/10.14465/2020.ARC26.CHE.

Hepper, David J. 2006. *British Warship Losses in the Ironclad Era, 1860-1919*. London: Chatham ; St. Paul, MN : Distributed in the U.S.A. by MBI Publishing.

Hewitt, Nick. 2008. *Coastal Convoys 1939-1945: The Indestructible Highway*. Barnsley: Pen & Sword Maritime.

Historic England. 2020a. 'Heritage and Society 2020'. Historic England on behalf of the Historic Environment Forum. https://historicengland.org.uk/content/heritage-counts/pub/2020/heritage-and-society-2020/.

———. 2020b. 'Heritage and the Economy 2020'. Historic England on behalf of the Historic Environment Forum. https://historicengland.org.uk/content/heritage-counts/pub/2020/heritage-and-the-economy-2020/.

HM Government. 2018. 'A Green Future: Our 25 Year Plan to Improve the Environment'. London: Defra.

Holland, James. 2011. *The Battle of Britain: Five Months That Changed History, May-October 1940*. London: Corgi.

Jones, H.A. 1928. *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force. Vol. II*. Vol. 2. 6 vols. Oxford: Clarendon Press.

———. 1931. *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force. Vol. III*. Vol. 3. 6 vols. Oxford: Clarendon Press.

———. 1933. *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force. Vol. IV*. 6th ed. 4 vols. Oxford: Clarendon Press.

———. 1937. *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force. Vol. VI*. Vol. 6. 6 vols. Oxford: Clarendon Press.

Karau, Mark D. 2015. *The Naval Flank of the Western Front: The Development and Operation of the German MarineKorps Flandern 1914-1918*. Barnsley: Seaforth/Pen & Sword.

Kemp, Paul. 1999. *Midget Submarines of the Second World War*. London: Chatham Publishing.

Layman, R. D. 2002. *Naval Aviation in the First World War: Its Impact and Influence*. England: Caxton Editions.

LUC. 2015. 'Seascape Character Assessment for the Dover Strait'. Bristol: LUC.

———. 2017. 'Historic Seascape Characterisation (HSC): Consolidating the National HSC Database. Final Report'. Bristol: LUC.

LUC, and Archangel Heritage. 2018. 'Ramsgate, Thanet: Historic Characterisation of Ramsgate'. 48/2018. Research Report Series. Portsmouth: Historic England.

Manders, Martijn, Rob Oosting, and Will Brouwers, eds. 2010. *MACHU: Managing Cultural Heritage Underwater. Final Report*. MACHU.

Mayor, Alison. 2015. 'Mulberry 70 Project Report'. Southsea: Southsea Sub-Aqua Club.

McCartney, Innes. 2015. *The Maritime Archaeology of a Modern Conflict: Comparing the Archaeology of German Submarine Wrecks to the Historical Text*. Routledge Studies in Archaeology 16. New York: Routledge.

———. 2019. 'The Archaeology of First World War U-Boat Losses in the English Channel and Its Impact on the Historical Record'. *The Mariner's Mirror* 105 (2): 183–201. https://doi.org/10.1080/00253359.2019.1589114.

McGreal, Stephen. 2008. *The War on Hospital Ships 1914 - 1918*. Barnsley: Pen & Sword Maritime.

Monahan, John W. 1986. 'Canadian Participation in the Operations in North-West Europe 1944. Part V: Clearing the Channel Ports, 3 Sep 44 - 6 Feb 45'. Ottawa, Canada: Directorate of History, National Defence Headquarters.

Newbolt, Henry. 1928. *Naval Operations: Official History of the War. Volume IV.* Vol. 4. 5 vols. London: Longmans Green.

———. 1931. *Naval Operations: Official History of the War. Volume V.* Vol. 5. 5 vols. London: Longmans Green.

Paterson, Lawrence. 2018. *Weapons of Desperation: German Frogmen and Midget Submarines of the Second World War*. Frontline Books.

Pattison, Paul, and Roger J. C. Thomas. 2018. 'Defending the Coast'. In *Legacies of the First World War: Building for Total War 1914-18*, edited by Wayne Cocroft and Paul Stamper, 66–92. Swindon: Historic England.

Payton-Smith, D.J. 1971. *Oil: A Study of Wartime Policy and Administration*. London: HMSO.

Phimester, Jane. 2015. 'First World War Wireless Stations in England'. 3748. Oxford: Oxford Archaeology.

Plummer, Russell. 1990. *The Ships That Saved an Army: A Comprehensive Record of the 1,300 'Little Ships' of Dunkirk*. Wellingborough, Northamptonshire, England: P. Stephens.

Pratt, Edwin A. 1921. *British Railways and the Great War: Organisation, Efforts, Difficulties and Achievements. Vol. II.* London: Selwyn and Blount.

Raleigh, Walter. 1922. *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force. Vol. I*. Vol. 1. 6 vols. Oxford: Clarendon Press.

Reymond, John. 1994. *Fortitude South: Kent's Wartime Deception*. Maidstone: Kent County Council: Arts & Libraries Publications.

Reynolds, L. C. 2000. *Home Waters MTBs & MGBs at War, 1939-1945*. Thrupp, Stroud, Gloucestershire: Sutton in association with The Imperial War Museum.

Roskill, S.W. 1954. *The War at Sea 1939-1945. Volume I. The Defensive*. Reprint. Uckfield: Naval and Military Press, 2004.

———. 1956. *The War at Sea 1939-1945. Volume II. The Period of Balance*. Reprint. Uckfield: Naval and Military Press, 2004.

———. 1961. *The War at Sea 1939-1945. Volume III. The Offensive. Part II. 1st June 1944 - 14th August 1945*. Reprint. Uckfield: Naval and Military Press, 2004.

Scott, Peter. 2009. *The Battle of the Narrow Seas: A History of the Light Coastal Forces in the Channel and North Sea, 1939-1945*. Barnsley: Seaforth.

Shimko, Hannah. 2019. 'Inspiring Creativity: Heritage and the Creative Industries.' London: Heritage Alliance.

Small, Fiona, and Martyn Barber. 2019. 'Ramsgate Heritage Action Zone: An Assessment of Aerial Photographs and Lidar'. 25/2019. Research Report Series. Portsmouth: Historic England.

Spiers, Derek. 1988. *Troopships to Calais: The Story of Calais as a Military Port from 1944 to 1947 and the Ships Which Served It*. Rainham, Kent: Meresborough Books.

Termote, Tomas. 2017. *War Beneath the Waves: U-Boat Flotilla Flandern 1915-1918*. London: Uniform, an imprint of Unicorn Publishing Group.

War Office. 1920. 'An Account of the Construction and Working of the Port of Richborough'. London: HMSO.

Weir, Philip. 2020. *Dunkirk and the Little Ships*. London: Shire Publications.

Wessex Archaeology. 2014a. 'HMHS Anglia: Marine Geophysical Survey Report'. 83803.39. Salisbury: Wessex Archaeology.

———. 2014b. 'UB-31, Folkestone, Kent: Archaeological Report'. 83803.32. Salisbury: Wessex Archaeology.

———. 2015a. 'UB-109, off Folkestone, Kent: Archaeological Report'. 83803.34. Salisbury: Wessex Archaeology.

———. 2015b. 'UC-78, off Folkestone, Kent: Archaeological Report'. 83803.40. Salisbury: Wessex Archaeology.

———. 2015c. 'U-8, off South Varne Buoy: Undesignated Site Assessment'. 108280.14. Salisbury: Wessex Archaeology.

———. 2016. 'UB-12, off Ramsgate: Marine Geophysical Survey and Archaeological Report'. 108280.04. Salisbury: Wessex Archaeology.

Winser, John de S. 1997. *Short Sea: Long War: Cross-Channel Ships' Naval & Military Service in World War II*. Gravesend: World Ship Soc.

———. 2009. *Coasters Go to War: Military Sailings to the Continent, 1939-1945*. Ships in Focus.

Wood, C.R.J. 1948. 'Phoenix'. In *The Civil Engineer in War: A Symposium of Papers on War-Time Engineering Problems. Vol. 2: Docks and Harbours*. London: Institution of Civil Engineers.

Woodman, Richard. 1983. *Keepers of the Sea: A History of the Yachts and Tenders of Trinity House*. Lavenham, Suffolk: T. Dalton.

Yelverton, B.J.D., and D.D. Carlile. n.d. 'Cross-Channel Service'. In *Folkestone during the War: A Record of the Town's Life and Work*. Folkestone: F.J. Parsons.

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