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The Fortification of the Firth of Forth 1880–1977

'The most powerful naval fortress in the British Empire'

Gordon J Barclay and Ron Morris

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The title of our book is taken from an article titled 'The Islands of the Forth in War', published in *Chambers's Journal* in 1922, by General George K Scott-Moncrieff (1855–1924). He had been Director, Fortifications & Works, War Office, from 1911 to 1918, after a distinguished career as a Royal Engineer, serving in Afghanistan, at the relief of Peking in the Boxer Rebellion, and on the North West Frontier. The director was responsible for the construction and maintenance of the fortifications we describe in our book. The full quotation is:

> Yet in 1916 the Forth became the most powerful naval fortress – most powerful whether measured by armament, by garrison, or by any other standard – in the British Empire, and probably, therefore, in the World.[1]

Shortly before this, at the time of his retirement in 1918, he had written for an official readership a history of coast defence in the previous 60 years,[2] in which he wrote:

> The Forth is now a first class naval fortress equal to, if not of greater importance than Portsmouth, Plymouth, the Medway or any of those abroad.

1 Scott-Moncrieff 1922: 498.
2 WO 32/5528 1918.

Dedicated to
Lord Herbert of Lea
Secretary at War, 1845–6 and 1852–4
Secretary of State for War, 1859–61

Between 1922 and 1995, when it was stolen, an impressive bronze plaque was affixed to the rock of Inchkeith at NT 2927 8280. It read:

IN REMEMBRANCE OF SIDNEY,
FIRST LORD HERBERT OF LEA
BORN 1810, DIED 1861.
TWICE SECRETARY OF STATE FOR WAR

Who was the first member of Government to perceive the necessity of protecting the shores of the Firth of Forth from the inroads of hostile cruisers & for this purpose took steps for the fortification of the island of Inchkeith. He was the steadfast supporter of Florence Nightingale and the friend of the soldiers of the British Army.
This memorial is erected by the Trustees of Robert Mackay Smith, Merchant, Leith, in accordance with the provisions of his will.

Frontispiece
The Herbert of Lea commemorative plaque before its theft in 1995 (© Ron Morris)

In the continued absence of the plaque, let this volume now be his memorial.
And to Dr Douglas Grant and Bruce Stenhouse, who were the first to wish to write the history of these defences.

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We are very grateful to Col Bill Clements, John Graham, Andrew Kerr, Allan Kilpatrick and Dr Mike Osborne for reading and commenting on the draft text, and Dr Richard Walding for reading the text relating to detector loops. The remaining omissions and errors are our own responsibility. Andrew Kerr also shared with us his encyclopaedic knowledge of the naval history of the Forth. Two anonymous readers reported to the Society of Antiquaries of Scotland on the prospective volume, and we are grateful for their helpful and positive comments.

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We record special gratitude to the late Bruce Stenhouse and the late Douglas Grant for the amount of source material supplied to RM, as well as sharing their first-hand knowledge and experience in relation to coast artillery and other defences, especially with regards to the Firth of Forth. Also to the late Jean Stenhouse for allowing continued access to her husband's extensive archives following his death.[3] Ms Alison Laidlaw, of Anderson Strathern, was very helpful in arranging permissions from the Stenhouse estate.

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A number of people and institutions kindly gave us permission to publish photographs in their collections, or for which they hold the copyright: Bob Adams; Nigel Clarke (www.hitlersukpicture.co.uk); Andreas Liebold (www.festungsbauten.de); John Hanscomb; Mrs Fiona Buchanan, for the sketches by her father, 2nd Lt Archibald Hugh Houston Ross (RA(T)), of Inchkeith in the First World War; John Stanton (Battery Belmont); Neil Grant, for the estate of Douglas Grant; the Royal Navy Museum; the Ministry of Defence Naval Historical Branch, via Ms Jenny Wraight.

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Our thanks to Alan K Smith and David Shiels, owners respectively of Dalmeny and part of Carlingnose batteries,

3 *The Stenhouse Collection, Firth of Forth Defences in the 20th century*, is now held in the Special Collections department of the University of Edinburgh Library. University of Edinburgh Archives, Gen. 978–982: PC57. Bruce Stenhouse had also copied to one of us (RM) a great deal of his archive, before his death.

for their hospitality, and also David Wilson and Anne Calvert (owners of part of the 5-inch practice battery site at Kinghorn), who provided coffee, cake and information after an exhausting scramble over the cliffs fronting the battery, and Barbara Page, who lives in the former engine house at Pettycur, for a tour of the building.

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LIST OF ABBREVIATIONS AND KEY TERMS

Below are some key terms and abbreviations used in the text. Where not defined, the reader is directed to a specific page for an explanation.

AA Anti-aircraft.

A/B Anti-boat, usually describing a type of *boom*.

AP Armour-piercing shell.

A/S Anti-submarine.

ASDIC The British name ('ASD' stands for 'Anti-submarine Division') for an active sound detection system for submarines, developed during the First World War, but reaching its full effectiveness in the Second. An ASDIC device transmits a pulse of sound and then listens for its reflection. The devices use a range of beam formations and listening devices to determine the range and bearing of an underwater object.

A/T Anti-torpedo, usually used to describe a type of net to stop torpedoes.

BC Battery Commander.

BCP Battery Control or, later, Command Post.

BL Breech-loading.

block-ship Ship to be sunk in the approach channel or entrance of an enemy port or dock.

boom A physical barrier at the water surface to prevent the passage of a vessel, usually a motor torpedo boat. Comprising either heavy baulks of timber or a heavy cable supported at the surface, in the Second World War with heavy sharp spikes to penetrate the hull.

boom-smasher An enemy ship intended to smash an anti-boat boom, to allow other ships, especially smaller torpedo craft, to swarm through to attack the vessels in the *inner waters*.

BOP Battery Observation Post.

CASL Coast Artillery Searchlight. The Second World War term for a *DEL*.

CB Counter Bombardment: the role of a 9.2-inch or 6-inch battery intended to fight large enemy ships standing off the coast and bombarding targets from long ranges.

CD Close Defence: the role of usually a 6-inch gun to fire at short range at destroyers, block-ships or boom-smashers. Also used to mean the defences of the locality of a battery.

CE Chief Engineer.

CMB Coastal motor boat.

Coastguard/Coast Guard We use the term 'Coastguard' throughout, although the service was for many years known as the Coast Guard. Until 1923, the Coastguard was under Admiralty control, and its men were part of the Royal Naval Reserve. In the First World War, many coastguards served at sea.

CP Central Pedestal. Type of gun mount introduced in 1894 and in use until 1956. The gun rotates on a pedestal fixed firmly to a holdfast (usually comprising a series of vertically set threaded rods) fixed into the concrete base of its emplacement.

CRA Commander, Royal Artillery. The senior RA officer in a particular formation, such as Scottish Command.

CRE Commanding, Royal Engineers. The senior RE officer in a particular formation, such as Scottish Command.

CRH Calibre Radius Head. The radius of a circle with the curve of the shell's nose on its circumference, expressed in terms of the shell's calibre. The longer and more pointed (and hence streamlined) the shell's nose, the higher the CRH. The 9.2-inch shells in use until 1930 were 2crh; those issued after, 6crh.

DEL Defence Electric Light. A light for illuminating a target for guns, either illuminating a fixed area, or moveable. Power was supplied by an engine room.

DEMS Defensively Equipped Merchant Ship. A merchant ship in the Second World War armed with surplus naval guns, notably 4-inch QF. DEMS ratings manned the coast defence guns at Methil in the Second World War.

dolphin A group of linked posts set firmly into the seabed and protruding above the water, in the Forth acting as an obstruction, or to support a suspended net or boom.

DPF Depression Position Finder *see* page 32.

DRF Depression Range Finder *see* page 32.

EC mine Electro-contact mine. A mine set off by contact from a vessel. The mines could, however, be switched to 'safe' from a control station.

EDO (or XDO) Extended Defence Officer: the naval officer in charge of the purely maritime defences of a port, such as patrol vessels, anti-submarine booms.

ELD Electric Light Director; a post on a battery from which the DELs/CASLs were directed, often in the same building as the Battery Command Post.

Examination Battery One or more batteries of guns in a port, designed to cover the Examination Area (see *Examination Service*), so that any ship found to be a threat to the port could be threatened with or subjected to gunfire.

Examination Officer Naval officer in charge of the *Examination Service* of a port.

Examination Service The Examination Service was to identify and establish the character of all ships which did not have a private signal (that is, smaller naval vessels and merchantmen) once they had been allowed through the anti-submarine defences into an area that lay beneath the guns of the *Examination Battery*.

FC Fire Commander. The officer in charge of directing the fire of a group of batteries covering a particular area of water.

FCP Fire Command Post, where the *Fire Commander* was based.

fighting light A term in use in the earlier years of coast artillery searchlights to apply to searchlights that could be turned to follow a target.

fortress In coast defence, the defended area of a port: the Forth was a fortress.

FRB Fort Record Book.

GGC Gun Group Commander. The relatively junior officer who would command a group of guns in a battery, usually two. The GGC could command a pair of light guns under a Fire Commander, without an intervening Battery Commander.

GOC General Officer Commanding. The most senior Army officer in a locale, in this case in *Scottish Command*.

GL Gun Layer. Second senior NCO responsible for a gun's crew.

HE High-explosive shell.

holdfast A ring of vertically set threaded bolts set usually in a circle in a base of concrete, onto which the pedestal or other mounting of a coast defence or anti-aircraft gun, or a Second World War anti-aircraft projector would be bolted. The diameter of the circle and the number and size of bolts varied considerably.

HP mounting 'Hydro-pneumatic'. Abbreviation most often found in lists of armaments, describing Elswick HP 'disappearing' mountings.

hurdle An alternative obstruction to *dolphins* to stop the penetration of an anchorage by boats, submarines or torpedoes, usually made of steel rails ('heavy hurdle') or scaffolding tubes ('light hurdle'); the latter often used to support anti-torpedo net. They were made in two sizes, to block channels 4 fathoms (7.3m) or 8 fathoms (14.6m) deep.

hydrophone A passive listening device developed in the First World War to detect the sound of (mainly submerged) vessels. Lines of hydrophones could be used to determine the approximate direction of the target vessel.

inner waters Areas of water within the defences of a port.

LMG Light Machine Gun.

MTB Motor torpedo boat. A light, fast boat carrying a small number of torpedoes and light guns, designed to attack shipping.

naval anchorage Harbours used by the fleet in peace or war. Their selection is mainly dependent on current strategic requirements. For example, Scapa Flow.

PF Position Finder *see* page 32.

PFC Position Finding Cell. Specially designed structure to house a *Position Finder*.

pile dolphin See *dolphin*.

precautionary period A period before any formal declaration of war, when tensions between states might be high, and small-scale, pre-emptive armed action by a potential enemy might have to be guarded against.

private signal Secret means of identification for the larger vessels of the Royal Navy and allies at British defended ports. (See *Special Signal*.)

PWSS Port War Signal Station.

QF Quick-firing. Generally lighter guns with rapidly operating breeches, and its ammunition – shell and cartridge – as one piece. The 4.7-inch gun did not have single-piece ammunition.

quick-return lift A lift designed to carry shells and possibly cartridges from the magazine to the emplacement floor above. The flat lift platform would be released in such a way that it could be allowed to drop back to the magazine level,

rather than have to be taken down more slowly, under power. This would make it available more quickly to lift the next shell.

RA Royal Artillery.

RE Royal Engineers.

RGA Royal Garrison Artillery. Part of the Royal Artillery. Mainly volunteer force formed in 1899 to man the coast defences and also the Army's heaviest siege and field artillery.

RML Rifled Muzzle-loader. The final type of muzzle-loading guns, superseded by breech-loading guns.

Scottish Command Britain was broken up into a number of military districts in 1793. Scottish Command was established in 1905. The term was used to refer both to the area and to the command structure.

silent cabinet A soundproof or at least quiet room, hut or ship's cabin, designed for use by personnel using wireless, hydrophone or other equipment requiring quiet and/or concentration.

SMO Selected Military Officer: Army officer to whom information concerning the movements of all vessels approaching or manoeuvring near a fortress is communicated by the Port War Signal Station. Usually the Commander of the Fire Command nearest the enemy.

special signal Distinguishing signal given by *Examining Officer* to incoming vessels not in possession of the *private signal* – usually minor Naval or merchant vessels.

TF Territorial Forces, formerly the Volunteers and Yeomanry, later the Territorial Army, nowadays the Army Reserve. Britain's volunteer military reserve.

trot A group of large buoys secured together to provide buoyancy to a boom or A/T or A/S net.

WSS War Signal Station. An observation post manned by Naval or Coastguard personnel to observe and report on the movement of shipping.

W/T Wireless Transmission/Transmitter.

Part I

‘IN TIME OF WAR . . .’

‘In time of war a Fleet can only operate efficiently if [its] base … is defended in such a way as to provide security and thus confidence and rest.’[1]

Chapter 1

THE FORTH

1.1 Introduction

To allow the unimpaired mobility of sea, land and air forces, defended bases were necessary at strategic points throughout the Empire. The purpose of coast defences was to allow such places to protect themselves until the main fleet could arrive – the 'period before relief' – against the 'estimated scale of attack' likely on a specific port, and also to deter sudden capture or raiding.[2] Our book sets out to tell the story of the 'most powerful naval fortress … in the British Empire', as it was described in 1922, referring to its state in 1916, whose role as one of Britain's most important 20th-century naval bases is gradually fading from popular memory.[3]

After the Napoleonic War the river was largely undefended until concerns about potential French and Russian aggression prompted the beginnings of the modern defence of the estuary in 1880, at Kinghorn and on Inchkeith. From that time, the strength of the defences grew through the last decade of the 19th and the first decade of the 20th centuries.

The importance of the Forth grew as the emphasis shifted from the defence of the vulnerable south coast against the French, to the possible threat from France's ally, Russia, and then to an expansionist Germany. The Rosyth Naval Base was the response, and the protection of that asset from German raiding on the Forth became a key aim of the defences. The Germans, indeed, were planning for such raids in 1908 (Fig 1.1).[4]

In the years before 1914, the estuary was well defended, and in the first half of the First World War significant additions were made. When it was decided in early 1916 to move the Grand Fleet from the anchorage at Scapa Flow, the Forth was made impregnable.

Although the defences were scaled down between the wars, the estuary continued to be relatively strongly defended. The surface naval strategy of the Second World War was not focused on the North Sea, but on keeping German warships out of the Atlantic. Although Scapa Flow would again be the main fleet anchorage, the Forth was still of high strategic importance and was hurriedly rearmed in 1938–9, remaining at high alert into 1943. Some of the guns in place since before the First World War continued to form part of the armament, but batteries of the most up-to-date guns were put in place to tackle motor torpedo boats. The defences were extended to encompass the important convoy mustering area in Largo Bay.

The coast defences were run down after the war and finally wound up in 1956, but the capacity to erect an anti-submarine barrier across the river was only finally abandoned in 1977.

An important feature of the Forth defences is that they closely reflected contemporary developments and controversies in defence. The defence of the southern naval bases was compromised in the earlier part of the period 1880–1956 by the presence of large-scale forts, only recently built at vast expense, but almost immediately outmoded. The nature of the narrative in the Forth is surprisingly different: it is a story of the construction of fortifications *de novo*, and generally speaking of relatively rapid rates of upgrading and reinforcement. Our intention is to relate what was built, upgraded, downgraded, abandoned, reoccupied or repurposed in the Forth to the wider political and military context so as to give meaning to what happened, rather than merely to document the development of disparate sites.

The strength of Coast Defence waxed and waned as two schools of defence strategy struggled for precedence: the 'Blue Water' school, for whom a large fleet was the answer to every question, and the 'Bolt from the Blue' school, which wanted to develop a larger standing Army for home defence and to act abroad. The fortunes of the defences between the wars also reflected the bitter controversy about the capacity of air power to replace ships and coast defences, and documented the shift from preparation for a theoretical war with France in the 1920s to the belated recognition of the renewed threat from Germany. From the beginning of the 20th century, aviation played an increasingly important role in warfare. While we touch on the role of aircraft, both friendly and enemy, in the story of the fortification of the Forth, the histories of air defence and of naval aviation are immense subjects, beyond the scope of our book.

The defences of the Forth have been described in a number of brief articles or in passing in books covering wider topics.

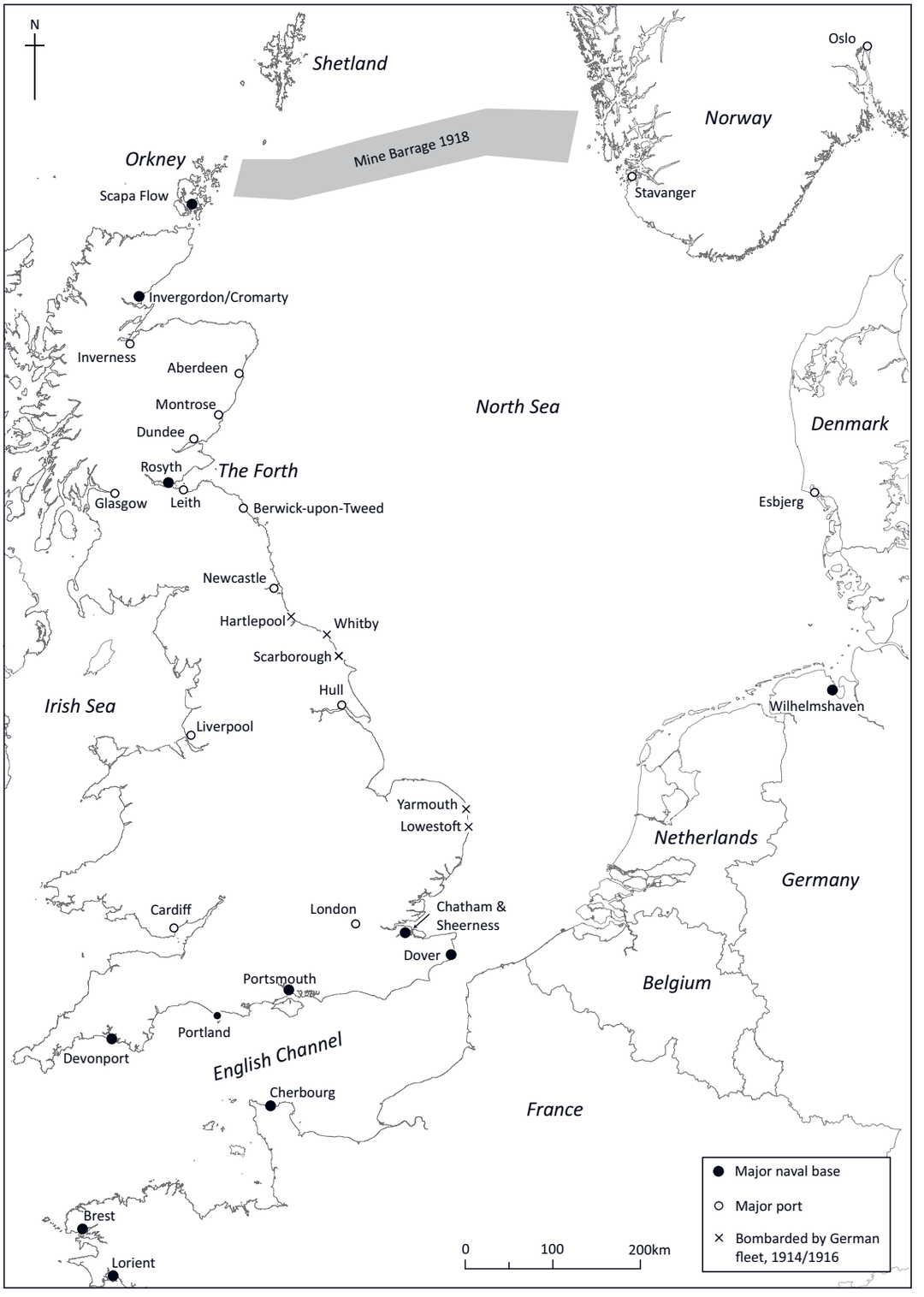


Figure 1.1

The Forth in its strategic position in the North Sea basin. The map shows the location of major British, French and German naval bases operational in the first half of the 20th century, as well as other major ports and places mentioned in the text. The five English towns bombarded by the German fleet in 1914 and 1916 are marked. The location of the US/British mine barrage between Orkney and Norway, completed in 1918, is also shown (© Gordon Barclay)

General Scott-Moncrieff first described the defences of the Forth up to the end of 1918 in an official report and in a popular article.[5] In more recent times, there was a flurry of activity in the 1980s, with Saunders' summary, Smith's account of the defences from 1880–1910 and Clark's of the 20th century.[6] Individual elements of the defences have been the subject of particular studies: one of us, RM, has published accounts of the Charles Hill and Kincraig batteries, and the wartime history of the May Island.[7] Pollard and Banks described the defences of Inchkeith, in the context of a report of excavations on selected parts of them.[8] The most recent is Stevenson's article, 'Some Defences of the Firth of Forth'.[9] The role of the Forth and its defences were also described by Lavery in his *Shield of Empire*.[10]

The modern coast defences of the UK and Ireland have been the subject of only one book, *The History of Coast Artillery in the British Isles* (1959), by Maurice-Jones, now very out of date.[11] Saunders, in 1989, summarised the history of artillery fortification in the British Isles.[12] Two detailed accounts have been written of the modern coast defence of England; the first (including Wales), by Hogg, some 40 years ago, and more recently, an unpublished manuscript report by Dobinson on the more limited subject of 20th-century 'coast artillery' in England and Wales, comprising an introductory text and a detailed inventory (relating to the period 1900–56).[13] Dobinson's volumes were part of a larger project to document 20th-century defence sites in Britain, and are complemented by gazetteers of the Scottish defence sites.[14]

While the Fort Record Books of the batteries and other contemporary military, naval and political records must be the basis of any accurate account, we have found that they can be internally inconsistent and can contradict each other as well as the accounts of people who served in the defences. We have also found that contemporary aerial photographs and mapping, as well as intensive fieldwork, can show omissions in the written records. We have found that the best result comes from combining not only a thorough study and comparison of the records, but also 'ground-truthing' what they say using other sources, fieldwork and oral history.

Our account is based on a thorough trawl of the archives, libraries and other sources listed in the acknowledgements section above, and on the close reading of the contents of hundreds of official files and the extraction of what we believed were relevant data. The most productive sources for the layout of the defences of the Forth, however, from the plans of individual gun sites at one end of the spectrum, to the overall structure of the defences of the estuary, were Royal Engineer plans, War Office maps and plans, aerial photographs and historical Ordnance Survey maps and Admiralty charts. Some 150 data layers were combined in a Geographical Information System run on the ArcMap platform, which allowed the complex history and layout of the defences and of individual sites to be laid out phase by phase. The overlaying of data of different periods makes easy the detection of what has changed and what has not over time. The GIS outputs formed the basis of the maps of the Forth illustrating Chapters 5 and 7 and the maps of the more complex sites in Chapters 9 to 12. As we have written and revised our text we have continued to come upon further sources of information, in publications, archives and in individual collections. It is certain that more documents, photographs, maps and official and personal accounts remain to be found. Our account of the history of the Forth's defences cannot be definitive, but we believe it to be the most thorough and accurate yet attempted. Cross-references to the National Grid References and to the site numbers in the national heritage database 'Canmore' are given in the Annex.

Our coverage of the anti-aircraft defence of the Forth is limited both by space and by the focus of this book. In the First World War, the limited anti-aircraft defence of Forth was very closely tied in with the naval infrastructure, and we have provided some information on the development of this aspect of the defence. In the Second World War, the scale and scope of the air defence of the UK makes it a subject of study in its own right; for that period, we have described only the anti-aircraft defences supplied to the islands and the other coast batteries, not the wider anti-aircraft defence of southern Scotland.

1.2 The Forth Estuary

In 1916, the Royal Navy defined '*The Firth of Forth*' as 'All the waters bounded on the east by a straight line joining Elie Ness on the North and Fidra Lighthouse on the South, and extending westwards as far as the tide flows' – that is, just west of Stirling – an area over 500 sq km in extent; '*The Forth*' was defined as all the waters bounded on the east by a straight line, Kinghorn Ness–Inchkeith–Anthony Beacon, on the Lothian coast (*c* 116 sq km). '*The Port*', otherwise '*The Rosyth Dockyard*', was defined as lying between two lines: on the east, a line drawn true south through the south point of Carron Harbour (a tiny harbour just west of Burntisland, Fife); to the west, a line drawn true south through Carriden House (an area of water *c* 72 sq km) (Fig 1.2).[15]

For the purposes of our study, we define the Forth Estuary as the body of water west of a line drawn between Fife Ness and St Baldred's Boat, a rock on the coast near Tantallon Castle, dog-legged a little to the east to include the May Island, which played an important part in the defence.

Although the surface of this great body of water gives an impression of uniformity, it conceals a complex 'landscape' of deep channels and extensive shallows which determined the ways in which the estuary could be used and constrained the sorts of attacks that might be made. In all the maps of the estuary we have prepared, we have included bathymetric information (Fig 1.2).

To the north and south of the May Island and between the island and the Elie–Fidra line the water is, apart from

Figure 1.2

The estuary, showing the formal boundaries of 'The Port', 'The Forth' and 'The Firth of Forth' as defined by the Admiralty. The green dashed line shows the line we have chosen to define our study area. The Forth is tidal to Stirling. The place-names in red are the sites of major naval and military installations in the first half of the 20th century. The red dots are significant naval ports and installations. The three aerodromes are the Royal Naval Air Stations operational from the First World War. The maximum extent of the rail network is shown. The depth of the water is given in fathoms and metres (© Gordon Barclay)

the coastal shallows, up to 60m deep. Nowhere are there obstructions in the channel that would hinder navigation of surface vessels, nor significantly hinder the free manoeuvring of a submerged submarine.

West of the Elie–Fidra line the channel, as defined by the 20m isobath (underwater contour), begins to narrow. South of Methil the 20m channel narrows to 10km wide; 3.9km further to the west, the depth across the whole estuary drops to less than 20m, although it increases again. From this point, shipping is split to north and south of the island of Inchkeith. To the north of the island the depth of the river increases to between 20m and 48m in the North Channel, which runs westward between Inchcolm and Inchmickery, where it is between 30m and 40m deep. The dangerous Blae Rocks lie just north of the channel.

To the south of Inchkeith, the South Channel, in modern times used by ships with a draught less than 10m, registers depths of 14–31m to a point north of Leith Docks, to the west of which it reduces to less than 10m. Continuing westwards, the South Channel leads into the 'dead end' of the shallows of the Drum Flat and Drum Sands; Drum Sands dry out at low tide, while Drum Flat has only 1m of water (above chart datum) over much of it. The South Channel has dangerous shallows and rocks close to both sides.

Between Inchcolm and the Forth Rail Bridge the water is between 16m and 23m deep. To the west of the bridge, on the Fife side, lay the important sheltered anchorage known as St Margaret's Hope. After 1909 the northern, shallower part of the anchorage was largely occupied by the Rosyth Naval Base. The naval anchorage west of the bridge extended from the Hope, unencumbered by obstructions and at a minimum depth of 9.1m, 1,700m wide and 6,500m long to the Tancred Bank; the anchorage continued westwards to north and south of the Bank, towards the formal western boundary of 'The Port'. In 1914, 16 moorings for large ships were available.[16] By September 1918, there were, west of the bridge, 38 numbered moorings for capital ships and another 63 smaller moorings, mainly for destroyers.[17]

The defence of the Forth was made more difficult because the estuary itself was a major obstacle to the movement of land forces. Until 1885 (the opening of the railway bridge near Alloa), the lowest crossing of the Forth was the medieval bridge at Stirling. What could not be moved by rail relied on ferry crossings at Queen's Ferry (steam or motor-powered ferries in operation between 1821 and 1964) and between Granton and Burntisland (from 1850 to 1939 – until 1890, the ferries could carry whole railway trains). Work on the present Forth Bridge began in 1882 and it was completed in 1890. It is a major feature in the waterway, at the estuary's narrowing at Queensferry, and its planning and construction overlapped the first modern coast defences in the river. There was a constant fear that the bridge might be 'dropped' by enemy action, trapping the fleet upriver or, later, blocking access to and from the dockyard. The bridge had great strategic value, in

allowing the rapid movement of large numbers of troops and quantities of equipment across the estuary and along the east coast. The strategic bottleneck was ameliorated in 1936 when the Kincardine road bridge was completed. Throughout most of our study period the coast defence installations, including those on the mainland, were linked by boat to each other and to HQ in Leith.

1.3 The naval infrastructure

The Forth contained the largest concentrations of naval installations in northern Britain. Some of these places have already had their history written; others deserve their own.

Rosyth

Approval was given in 1903 for the construction of the naval base and dockyard at Rosyth. Between 1905 and 1907 the major elements of the design were finalised and work began in 1909. The geology of the site was complex and on the outbreak of the First World War the dockyard was still at least two years from completion, although the contractor had already got the programme 18 months ahead of target. The main basin was flooded on 16 September 1915. Dredging of the approach channel was completed on 25 March 1916.[18] The dockyard was the target of the first air raid on Scotland, by six German airships on the night of 2/3 April 1916, although none of them reached their target.[19]

The facilities comprised a basin 21.6ha in extent, over 2km of wharfage, and three graving docks. There were also extensive tidal facilities for docking. A major fuel storage facility, with a capacity of 250,000 gallons, was completed in 1919. The dockyard went into care and maintenance in 1925 but was reopened in 1938, as Britain rearmed to face a resurgent Germany. From 1 July 1926, Rosyth was the home of HM Boom Defence Training School.[20] During the Second World War, Rosyth played a vital role as a relatively 'bomb-free' repair yard; after 1940 there were no major air attacks on Rosyth and all five battleships commissioned during the war were fitted out at Rosyth, as were most of the aircraft carriers (Fig 1.3).[21] The naval base finally closed in 1994.

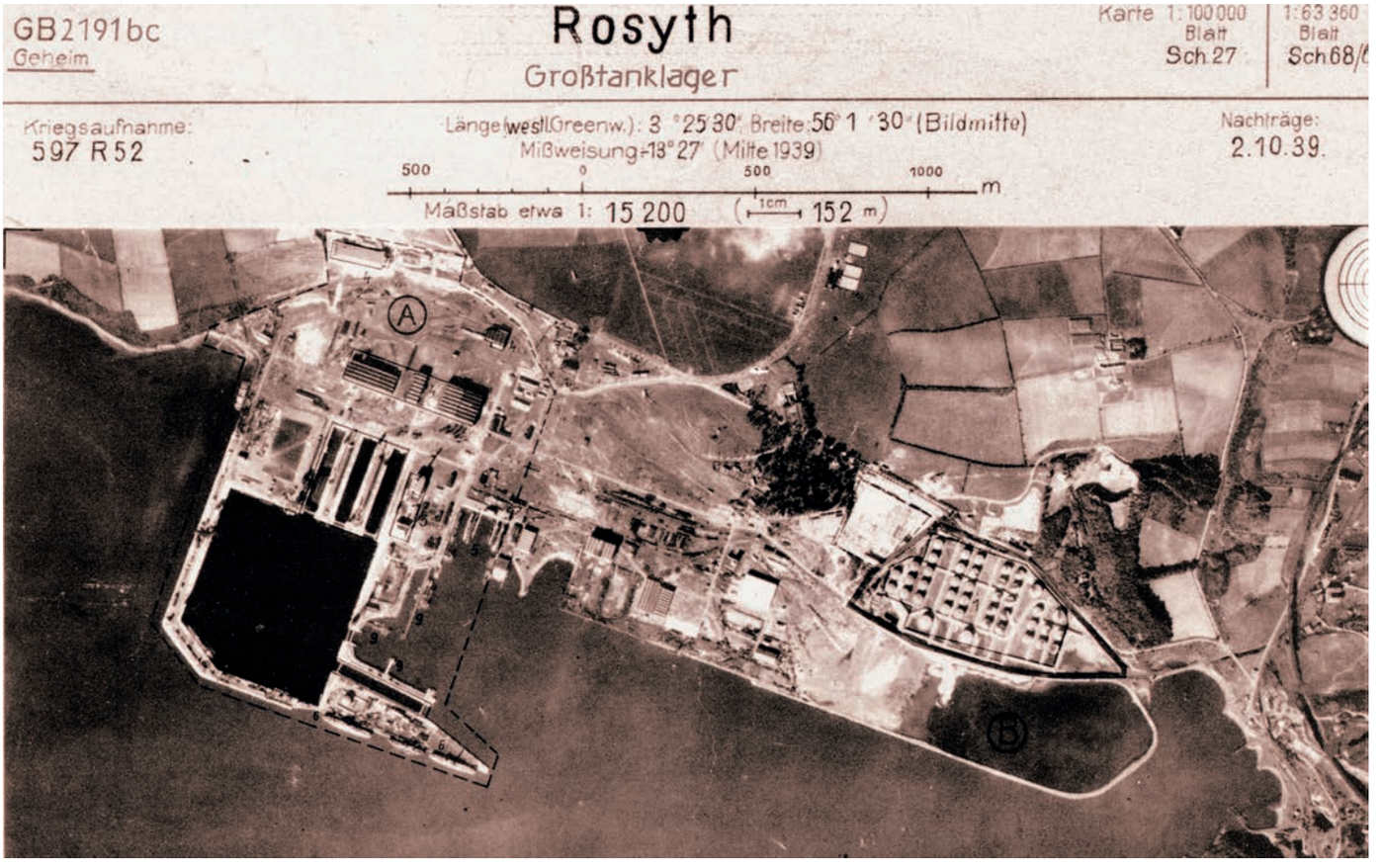


Figure 1.3
Rosyth Dockyard in October 1939. A detail from a German Air Force reconnaissance photograph (Nigel Clarke collection: www.hitlersukpictures.co.uk)

RNAD Crombie

About 5km upriver from Rosyth, and on the same side of the estuary, Royal Naval Armaments Depot (RNAD) Crombie was established in 1916 to store ammunition for the Grand Fleet. A map detailing the landward defences of the depot dated 28 May 1916 shows the dozen principal buildings stretched out along the shore, with about 25 further smaller buildings and 'military hutments', presumably for the guards who manned the five blockhouses and patrolled the barbed wire boundary fence. The 1916 map also shows the location of the depot's anti-aircraft defences. The risk of air attack later prompted the construction of underground magazines at a number of RNADs, and six of these, almost 40m long and over 10m wide, were built at Crombie, reached by curving tunnels in which railway tracks were laid.[22] There was, at this date, a single L-shaped pier stretching 750m out into the river. A second L-shaped pier, totalling 950m in length, was built after the Second World War. Crombie is still in operational use as a 'Defence Munitions' centre.

RNAD Bandeath (Throsk)

RNAD Bandeath was established during the First World War on a terrace in a bend of the Forth, 26km west-north-west of Rosyth, and remained in use until 1978.[23] The camp's extensive internal railway system served all the main storage and assembly sheds, and was linked to the nearby main line across the Forth, to Crombie and Rosyth. Ammunition for the fleet was also loaded onto small auxiliary vessels at a specially constructed pier for transport downriver, along the initially rather narrow, shallow and twisting channel.

The earliest part of the complex comprised 36 buildings in the 'Magazine Area' arranged in six lines across the northern part of the peninsula (Fig 1.4; Fig 1.5). Three of these buildings were surrounded, probably at a later date, by earthwork

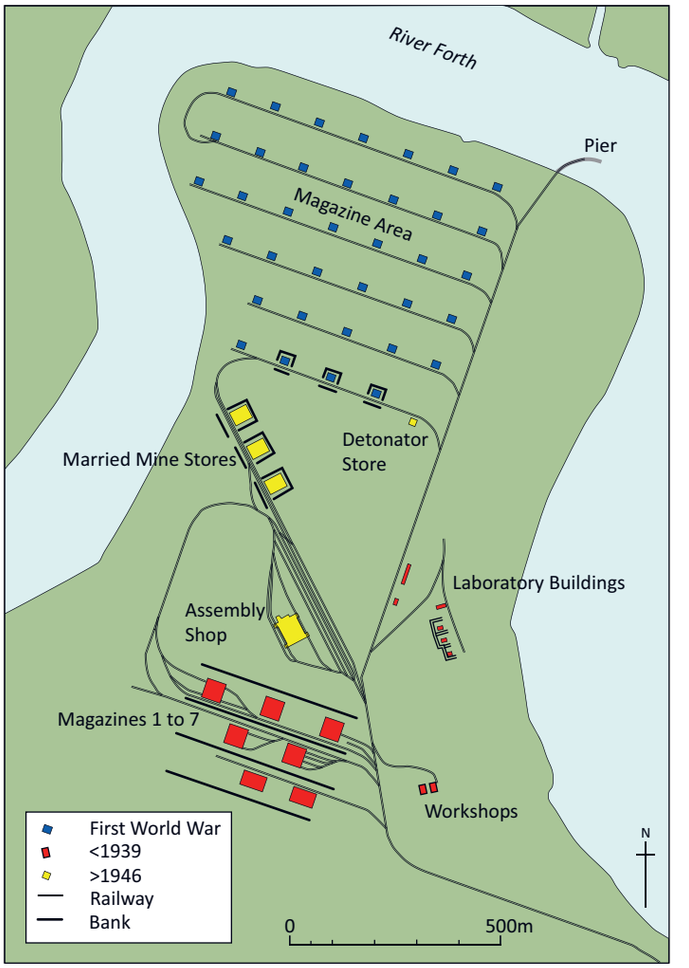


Figure 1.4
Royal Naval Armaments Depot, Bandeath, in a loop of the River Forth, showing the main structures in place in 1960. The phasing of buildings has been worked out using aerial photographs taken during and after the Second World War. The rail network is shown in slightly simplified form and the limited number of internal roads is not shown (© Gordon Barclay)

Figure 1.5
First World War munitions storage magazines, RNAD Bandeath, 2016. The small brick structure in the foreground has been identified as a pillbox, but we believe that it is more likely to be a refuge, in case of fire and possible explosion (© Gordon Barclay)

Figure 1.6
Postcard of the destroyers in their pens at Port Edgar, 1920 (Valentine & Sons, via Frank Hay)

embankments, to deflect the blast from an explosion in any shed. Most of the buildings survive, albeit in a dilapidated condition. Near the southern boundary of the site is a group of seven more substantial buildings within earthwork embankments, labelled Magazines 1 to 7. A small group of 'Lab[oratory]' buildings was in place by 1939, to the east of the main complex. Further buildings beside the railway track were laboratories and a 'Cartridge Examination Room'. One medium-sized building was labelled as the 'Transfer & Shell Painting Room'.

Further structures were built between 1946 and 1960: three large sheds ('Married Mine Store' numbers 1 to 3) surrounded by earthen banks; and the largest building on the site, the 'Assembly Shop', presumably also for mines. Substantial parts of the complex survive, many buildings now being in commercial use.

Port Edgar

The first pier at Port Edgar was built in 1810. By the end of the century, the two large enclosing breakwaters had been built. After initial enquiries in 1911, the harbour was bought by the Admiralty in 1916 and commissioned in 1917 as HMS *Columbine*, a base for torpedo boat destroyers (Fig 1.6). A naval hospital at Butlaw, just to the south-west of the harbour, was in operation from at least 1905 (Fig 1.7). The naval hospital closed in 1938 but was reopened in the Port Edgar barracks in 1939. In that year, Port Edgar was recommissioned as a naval training establishment, and in 1943 became HMS *Hopetoun*, a combined operations training base. After 1945, the harbour was the base for the minesweepers employed in removing wartime mines from the east coast and, in 1960, became the Navy's only minesweeping training establishment. It closed in 1975.

Methil and Largo Bay

Methil Docks was one of the more important commercial ports on the Forth. Between 1883 and 1912 three large modern docks were constructed, mainly to ship coal from the Fife collieries, with a length of quay totalling over 2.5km. By the beginning of the First World War, it was Scotland's largest coal port.

Discussions were set in train in 1924 about the provision and defence of a convoy anchorage off Methil, in Largo Bay. It was to be the main east coast assembly port for convoys from the Thames and from east and west coast ports. The assembly point had to be capable of accommodating between 120 and 130 vessels, of which about 70 would be large ocean-going

Figure 1.7
Postcard of the naval hospital at Butlaw, near Port Edgar, *c* 1914 (J Wilson, South Queensferry, 'Forth Series')

vessels. An area of sea of *c* 10 sq km was needed. Largo Bay was chosen (despite concerns about the difficulty and expense of making it secure from attack by sea) not only because of its capacity, but its accessibility by rail; its location allowed the reduction of transit times for cargoes travelling via the north of Scotland, and reasonable protection from the weather. The Largo Bay convoy mustering area was used intensively during the Second World War.[24] At different times during the war, convoys operated to and from the Thames (Southend), Bergen (until the fall of Norway), Loch Ewe, Belfast, the Clyde and the Tyne.[25]

Grangemouth

Grangemouth, now Scotland's largest container port, has been one of Scotland's most important ports for over a century. In 1790, the small village became the eastern terminal of the Forth and Clyde Canal and direct access to Glasgow along the canal led to swift expansion. Cargoes from Europe were landed, while coal and manufactured goods from the interior were loaded for export. Between 1843 and 1906, major expansion of the dock system was undertaken, the last, the Grange Dock, doubling the previous wharfage. By the latter date, the industrial development of the town had also begun.

In August 1914, Grangemouth Docks was turned over wholly to military use and closed to merchant vessels altogether on 11 December. While Aberdeen became the main railhead for the fleet in Scapa Flow in January 1915, Grangemouth was the main coaling port for the fleet; a Dreadnought class battleship could use up to 30,000 tons of coal a month. The first consignment of an eventual 2,306,000 tons arrived on 10 August 1914 for onward shipment by sea. The port was also used for the storage of vast quantities of flour and other victuals.[26]

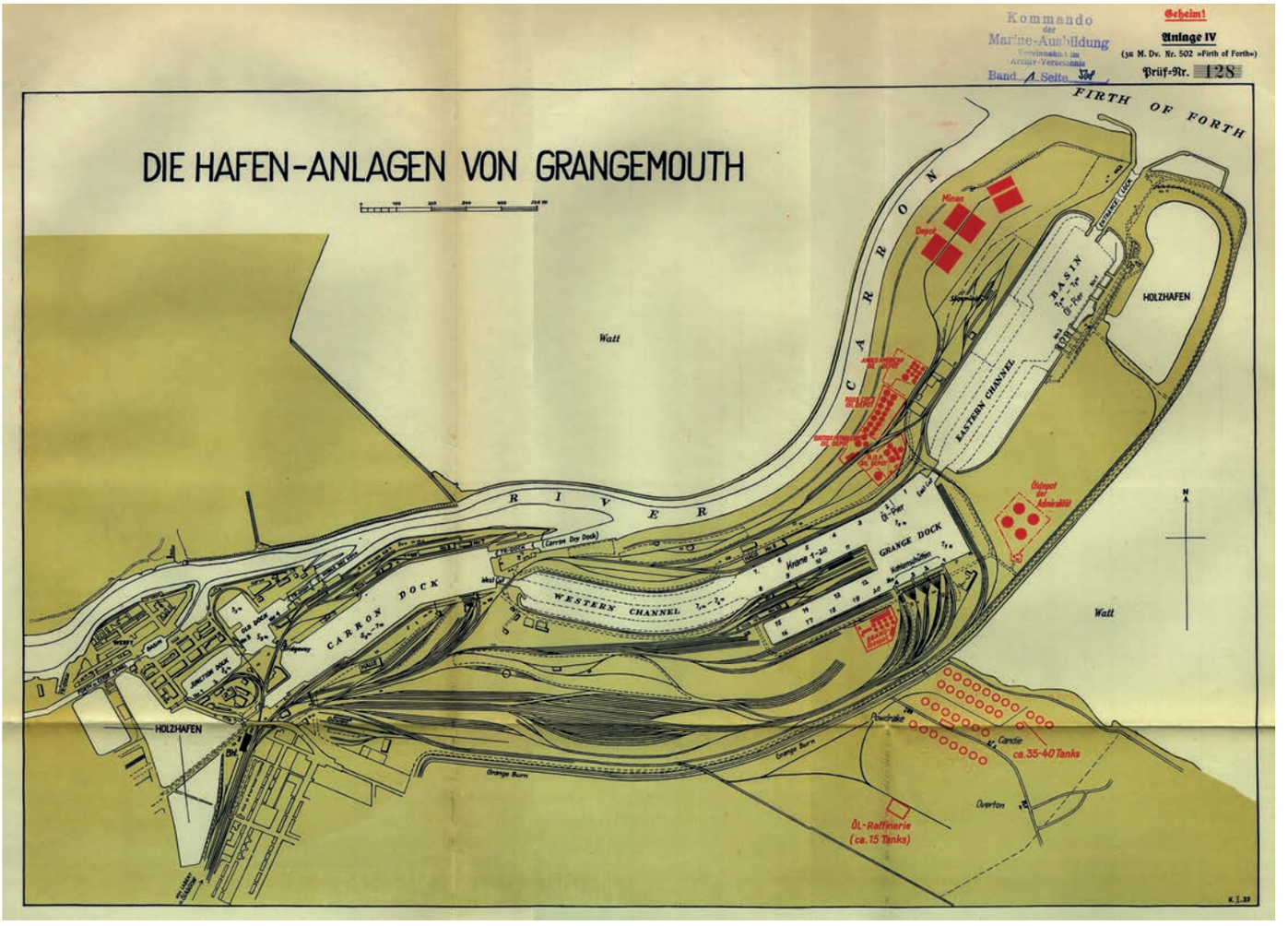


Figure 1.8
The harbour at Grangemouth, its mine depot and oil storage tanks, as mapped by German naval intelligence in March 1939 (Oberkommando der Kriegsmarine, via A Liebold)

The large-scale shipment of naval ammunition and mines to and then out of Grangemouth began in March 1915 and in January 1916 Grangemouth became a Royal Naval Mine Depot, with workshops set up for the assembly and storage of mines. It is estimated that 60,000 mines passed through Grangemouth during the war.[27] In 1918, a Royal Naval minelaying squadron was established at Grangemouth, which took part in the laying of the great mine barrier between Orkney and Norway to close the northern entrance to the North Sea to German U-boats (Fig 1.1). Training was also provided there for US Navy personnel engaged in this work.[28]

As the British fleet converted from coal to fuel oil for propulsion, Grangemouth was also the port from which supplies of fuel oil were despatched. Oil arrived from the USA at the port of Bowling on the Clyde and was transported in specially converted barges along the canal to storage in Grangemouth, for shipment to the fleet. About 137,514 tons of oil were moved in this way. To increase the supply of oil, in 1918 an 8-inch diameter oil pipeline was laid along the towpath of the canal from Bowling to Grangemouth. Although only completed days before the war ended, it conveyed 220,000 tons of oil in the five months in which it was used.[29]

During the Second World War Grangemouth continued to be an important port and the mine depot became a Royal Naval Armaments Depot administered from Crombie. There was also an important victualling depot. The shipyards of the port were active in new-build, fitting out, repair work, fitting ASDIC instruments and arming 'Defensively Equipped Merchant Ships'.[30]

Granton

Granton Harbour was built between 1836 and 1863 as a commercial and fishing port and, after 1850, a ferry terminal. The harbour was a naval base from August 1914 to July 1919, at first as a base for trawlers and other small vessels engaged in patrol work, minesweeping and the maintenance of the permanent and temporary anti-submarine booms and nets to protect the fleet. From 1915, it also became a base for the fitting out and operation of 'Q' Ships, merchantmen and trawlers fitted with hidden weapons designed to lure in and then attack German submarines.[31]

The main naval hospital in Scotland in the First World War was also attached to the Granton base. The Royal Naval Hospital Granton occupied the buildings of the Leith Public Health Hospital (built 1894–96), which was taken over by the Navy in October 1916. Cases from all over Scotland were treated here, including injured men from the naval divisions serving on the Western Front.[32]

In the Second World War, Granton was once again a base for minesweeping and patrol vessels.

Burntisland

During the First World War, Burntisland harbour was largely used for work by the Government. Of the two docks, one was for the most part devoted to the vessels of the boom defence, their maintenance, coal supply, stores and repairs. The other dock was used to ship coal out to the fleet. During 1918, almost half a million tons of coal were shipped, of which 215,593 tons were high-quality Welsh steaming coal.[33]

Royal naval and other air stations

This book is not concerned with the wider defence of Scotland in both wars, nor the development of military and naval aviation in Scotland, and the air defence of the country is a study in itself, but air stations were an important part of the naval infrastructure in the Forth. From before the First World War, the Royal Navy was interesting itself in the role of flying machines, both fixed-wing and balloons, in naval warfare. By 1914, the Royal Naval Air Service (RNAS) had 39 land plane and 52 seaplane bases in the UK. In the Forth, seaplane bases had been established at Port Laing (Carlingnose) by October 1912, Rosyth, Leven (temporarily in the summer of 1913), Granton and Hawkcraig (near Aberdour). Most seaplanes were used for reconnaissance.[34]

During the First World War, substantial naval air stations were built at Donibristle and Leuchars (a Torpedo Training Station). Turnhouse, by 1918, was a Fleet Aeroplane Depot. Kite balloons, observation balloons towed behind warships, were stationed at Rosyth and Methil. East Fortune was the main RNAS base in south-east Scotland, and housed not only a major rigid airship station, but also fixed-wing aircraft.[35]

Donibristle, after a period in care and maintenance after the First World War, was active again by 1928; it remained operational until the 1950s. In the Second World War, Crail was a major RNAS aerodrome, and the estuary, of course, was defended by fighter and bomber units deployed at the many RAF stations.[36]

Castlandhill

The history of the Royal Naval wireless communication centre at Castlandhill is sketchy. In 1908, a Low Power Station had either recently been built or was planned, as it was to be added to the existing list of such stations.[37] It was presumably this station that was reported as 'to be installed' in the *New Zealand Evening Post* on 20 March 1909, to provide a direct link with the Admiralty in London, the fleet at sea and the new naval base. A mast 160ft (48.7m) in height and consisting of three lengths of Oregon pine was to be erected. By May 1915, the station had been upgraded to a High Powered Shore Station.[38] The complex was heavily defended in the First World War, being integrated with the defence of the Forth Bridge

and the Carlingnose/Coastguard battery complex (Fig 9.26). Although it came out of naval use in 2006, three original First World War pillboxes survive on the site.

War Signal Stations in the Forth

Signalling stations were the first line of the naval defence, from which trained observers would alert the Port War Signal Station (PWSS: see below) of the approach of friendly, neutral or enemy shipping. They were first established in the Forth during the Revolutionary and Napoleonic Wars.[39] Signalling methods used by the Navy and Army developed through the 19th and 20th centuries and by the 1870s wired telegraph lines on which messages could be sent using Morse Code were established on land to complement flags, lamps, mechanical telegraph or semaphore and beacons. When wireless telegraphy was developed in 1905, it revolutionised naval communication, at first using Morse Code and, later, voice radio. It was, however, necessary to retain some means of visual signalling, including flag and lamp semaphore, for use during times when radio silence was required.

Each naval base or defended port had a Port War Signal Station manned by naval or Coastguard[40] personnel. Its main function was the identification of shipping approaching or within sight of the port. The Extended Defence Officer, the naval officer who controlled the 'floating' defences (at various times, the booms, controlled minefields, and active and passive anti-submarine defences) was stationed at Inchkeith.[41] The (Naval) PWSS was responsible for passing information about the movement of friendly shipping, or the possibility of enemy activity, to the (Royal Artillery) 'Selected Military Officer'.[42]

PWSS were often supported by a network of satellite War Signal Stations (WSS), to which they were linked by telephone. During the First World War, there were three PWSS in the Forth, on Inchkeith and Inchcolm and at Carlingnose, adjacent to the Fire Commands for the three lines of defence, which had authority to challenge any warship approaching their line and, if need be, to alert the coast artillery to open fire.[43]

The Firth of Forth Defence Scheme of 1900 listed War Signal Stations at St Abb's Head, Dunbar and North Berwick. Stations were also listed for Fife Ness and Elie, but these were within the Tay defences at that time.[44] The 1909 revision of the Defence Scheme recorded that the PWSS for the Forth Defences was at Inchkeith and that all information received there was to be communicated to the Fire Commander on the island by telephone. By that date, the two WSS at Fife Ness and Elie were within the Forth Defences.

During the 'Precautionary Period', when there was an imminent threat of war, the PWSS at Inchkeith and the naval wireless communication centre at Castlandhill were to be protected by the garrisons at Inchkeith and Carlingnose respectively. On mobilisation, along with the War Signal Stations at North Berwick, St Abb's Head, Elie and Fife Ness, they were each to be guarded by small parties from Territorial infantry units.[45]

In May 1913, only Inchkeith PWSS and a Naval Challenge Station at Carlingnose Battery were recorded.[46]

A Board of Trade list, revised in manuscript to 1917, included Elie (WSS), May Island (WSS), Anstruther, Fife Ness (WSS & W/T), Inchkeith (WSS, PWSS & W/T), Inchcolm (WSS & PWSS), North Queensferry (PWSS), Rosyth (Castlandhill) (W/T), North Berwick, Fidra, Dunbar, Cockburnspath and St Abb's Head (WSS & commercial work for Lloyds).[47]

By April 1926, St Abb's Head was the only WSS listed for south-east Scotland, all others having been stood down after the end of the First World War.[48] During the Second World War, the PWSS building on Inchkeith was enlarged and reused (Fig 11.30) and appears to have been supported by a WSS at Kinghorn (Fig 11.80), although we have found no information about the latter establishment. A WSS was again established on the May Island, along with a subsidiary look-out at Gin Head (Canty Bay). Naval signalling was also carried out by Royal Marine personnel from the Battery Observation Post at Kincraig Battery as part of the Examination Service. The approaches to Rosyth Dockyard appear to have been controlled by a WSS at Battery Hill, North Queensferry, although once more we have found information difficult to come by.[49]

Below, we provide more information on selected WSS sites.

Seacliff

In October 1912, a state-of-the-art signalling station was erected in the vicinity of Seacliff Old Tower. The building, which was of stone with black plaster dressing, consisted of a large sleeping room on the ground floor fitted with bunks and a watch-room on the first floor. The roof was of reinforced concrete with a stone parapet and was equipped with a semaphore. Only the base of the tower survives. In 1917, HMS *Seacliff* was the landfall site of the easternmost line of hydrophones laid across the seabed at the entrance to the Firth of Forth to detect U-boats. HMS *Seacliff* was also used as a training establishment in the art of navigation.

Canty Bay

Early in 1940 the Admiralty requisitioned land and buildings at Canty Bay, previously used as a Scout camping facility, for the purposes of coast defence.[50] The camp became known as HMS *Canty Bay* or RN Station Canty Bay and was initially run by Lieutenant Braid, RN. A power-house was built on the braes above the camp. The Navy set up a watch-keeping facility at Canty Bay which was probably at the summit of

Gin Head, which forms the eastern boundary of the bay. This establishment came under the direct control of May Island, although very little is known about it. It supported the May Island WSS, covering the channel between Bass Rock and the Lothian coast. By November 1945, the land and buildings had been de-requisitioned.

Bass Rock

The Admiralty established a WSS in a look-out hut on the summit of the Bass Rock during the First World War. It seems that the Coastguard signallers were billeted in a short row of apartments, possibly built for the men constructing the lighthouse, in 1900–2, against the interior curtain wall of the castle ruins. The look-out hut survived until at least 1924.[51] Telephone cables were laid to provide intercommunication between the Bass, Seacliff and North Berwick WSS, but these were removed after the war, along with the men. The Rock was not reoccupied during the Second World War.[52]

North Berwick

There had been a signal station on the summit of North Berwick Law during the Napoleonic War.[53] A WSS for North Berwick was planned under the Forth Defence Scheme, in 1900, and the Admiralty applied to the North Berwick Town Council for a site for it.[54] It may be that the WSS was co-located with the look-out post at the summit of North Berwick Law.[55]

Fidra

Fidra was listed as a Coastguard Station in 1911 and 1917. It was a small affair which operated mainly as a look-out post during the first half of the First World War. It was probably no more than a small hut located at the highest point of the island a short distance east of the lighthouse. In August 1914, workmen laid communication cables between the look-out post and mainland. The island's importance grew in 1916 when anti-submarine obstructions were laid across part of the estuary, on the line from Fidra to Elie, and a hydrophone listening station was proposed for the island. The existing look-out post was upgraded to a properly equipped War Signal Station for the remainder of the war. To reduce costs and to economise on manpower, the Admiralty decided to exchange Fidra's Coastguard personnel with Seacliff War Signal Station a few miles further east on the Lothian coast. Seacliff had proved to be of little value for signalling purposes, but had a larger complement of coastguards than Fidra. To accommodate the increased manpower on Fidra, the Northern Lighthouse Board agreed to evacuate the island's two lightkeepers and make their dwellings available to the Admiralty. The Hydrophone Shore Station was closed in December 1918. Fidra was not occupied during the Second World War, although the name was applied to the 6-inch gun battery on the adjacent mainland.

Elie Ness

Under the Defence Scheme for Scottish Defended Ports in 1900, Elie was planned at that time to have a WSS, as part of the Tay Defences. By 1909, Elie was included in the Forth defences.[56] During the First World War, a WSS and wireless hut were erected near the small lighthouse at Elie Ness and manned by coastguards, with satellite stations at Anstruther and a WSS on the May Island. The Elie station was under the command of a Naval Chief Petty Officer. A photograph depicting the crew of 'Elie Radio Signal Station' in 1914 shows one officer, six coastguards and one civilian. Elie Ness was, for a short time in the summer of 1915, provided with a hydrophone listening station. It was re-established in December 1916 and, with Fidra Hydrophone Station, became operational in February 1917. It was apparently located in a separate listening and observation hut manned by a Lieutenant, RNVR, one Sub-Lieutenant and six Chief Petty Officer operators. The Hydrophone Shore Station was closed in December 1918. The WSS may have continued in operation until 1923, as it was the parent station for May Island which apparently closed at about that time. Elie Ness was not reoccupied during the Second World War.

Notes

1 ADM 116/4113.
2 CAB 2/4. A 'raid' was defined as 'a secondary operation of war, by means of which an enemy seeks to deal a blow at our naval or military power, or to influence in his favour operations taking place in a main theatre of war elsewhere', with objectives which include damaging, destroying or capturing fixed defences, like those in the Forth; destroying magazines stores and factories; creating panic such as to prevent an expeditionary force being sent overseas; to destroy wireless and telegraph cable installations (this is the 1911 definition, in the 'Memorandum on the Principles Governing the Defence of the United Kingdom' WO 33/515).
3 Scott-Moncrieff 1922, 497–500; 515–28.
4 Kennedy 1974: 65.
5 WO 32/5528; Scott-Moncrieff 1922.
6 Saunders 1984; Smith 1985; Clark 1986.
7 Heddle and Morris 1997; Morris 2004; Morris and Ramage 2009.
8 Pollard and Banks 2008.
9 Stevenson 2014.
10 Lavery 2007: 231–3.
11 Maurice-Jones 1959.
12 Saunders 1989: 40.
13 Hogg 1974: 13; Dobinson 2000: the status of Dobinson's document is unclear. It has no ISBN and copies are not lodged in the copyright libraries, nor could we could find a source for a digital download.
14 Redfern 1998.
15 WO 192/101.

16 ADM 137/994.
17 ADM 137/1647.
18 Hunter 2005: 77.
19 Cole and Cheesman 1984: 122. Robinson 1971: 137.
20 ADM 244/2.
21 Lavery 2007: 318.
22 WO 78/4937.
23 For the entire life of the site, the Ordnance Survey maintained the cartographic fiction that the site was still agricultural land. Aerial photographs were taken of the site in 1939 (by the German air-force: NCAP-000-000-153-184 *St Ninians, Stirlingshire, Scotland [Bandeath]*. National Collection of Aerial Photography, Historic Environment Scotland), by the RAF in 1941 (NCAP-000-000-161-023 1941 *Throsk House, St Ninians, Stirlingshire, Scotland [Bandeath]*), 1942 (NCAP-000-000-161-115 1942 *South Cockspow, St Ninians, Stirlingshire, Scotland [Bandeath]*) and 1946 (NCAP-000-000-114-638 1946 *Bandeath Industrial Estate, St Ninians, Stirlingshire, Scotland*). There is also a set of three detailed Ordnance Survey 1:2,500 maps printed in February 1960 for the Admiralty by the Ordnance Survey (Stirlingshire Archives).
24 ADM 116/2493.
25 Downie ND; Hague 2000.
26 Pratt 1921: 542, 546. Bailey ND.
27 Pratt 1921: 547–8.
28 Fullinwider 1920: 102.
29 Pratt 1921: 548.
30 Bailey 2013: *passim*.
31 Girvin and Cosens 1919: 21, 3, 38–44, 58–62, 71.
32 Whelan 1918: 184–92.
33 *The Scotsman*, 6 January 1919.
34 Fife 2007: 73.
35 Delve 2010: 281.
36 Delve 2010: 102.
37 Anonymous 1908.
38 Kent 1993: 47.
39 Morris and Barclay 2017.
40 The organisation was, into the 20th century, known as the Coast Guard. From 1850 to 1923, it was administered by the Admiralty and operated as a sort of naval reserve.
41 WO 33/491.
42 Maurice-Jones 1959: 184
43 WO 33/491.
44 WO 33/173.
45 WO 33/491.
46 WO 78/5179.
47 Department of Transport correspondence with RM, 28 December 1990. There are some anomalies in this list. By 1917, Fidra was operating as a War Signal Station (WSS) and a WSS that had by then been established on Bass Rock was not included.
48 CAB 13/3.
49 Morris 2004: 41; Morris and Ramage 2009: 39, 41.
50 Evans 1950. The site is at NGR NT 5859 8521.
51 Morris et al 2007: 23.
52 Morris and Bruce 2006: 75.
53 Morris and Barclay 2017.
54 *Hansard* 13 Dec 1906, Vol 167; WO 33/173.
55 WO 33/491; Seaton ND.
56 WO 33/173; WO 33/491.

Chapter 2

THE NAMING OF PARTS

2.1 The guns of the Forth

The Forth was armed with a variety of guns between 1880 and 1956. The eight types described here were those on which the defences relied for that period. In each case, the version most common in the Forth is described, although other variants are referred to. All but the last type, the 6-pdr twin (a light quick-firing anti-boat gun with two barrels developed during the 1930s), were adaptations of naval guns. The maximum ranges listed are theoretical: the effective range was limited by the distance to which fall of shot could be observed, the capacity of range-finding equipment, visibility and any assistance given by aerial observation or, later, by radar.

10-inch RML

The 10-inch Rifled Muzzle Loading (RML) gun was the armament installed on Inchkeith and at Kinghorn in 1880, when the new forts were built. The guns had been made in 1868. The last two were removed from Kinghorn in 1903–4. The gun fired a shell of 181–186kg to a maximum range of *c* 5,500m. Figure 2.1 shows the gun emplaced in the North Battery on Inchkeith, as set out for the firing trials by HMS *Sultan* in 1884, demonstrating the arrangements for hoisting the charge and shell up to the mouth of the gun using the gun's 'muzzle derrick'. The gun crew comprised a Gun Captain, Gun Layer and nine other men.[1] In the centre of the floor of the gun emplacements was an iron post on which a wrought-iron sliding carriage was pivoted on an iron platform with four wheels. The whole platform could be turned like a railway turntable and elevation and depression were achieved by the use of a worm-wheel gear. The recoil was checked by hydraulic buffers secured to the platforms.

Breech-loading (BL) guns

Modern coast defence guns were divided by weight and role. 'Counter-bombardment' guns were designed to engage enemy ships attempting to bombard coastal targets or anchorages at long range; in the Forth, this was the role of the 9.2-inch guns and, in the Second World War, of the modern 6-inch guns on 45° mounts at Kincraig. 'Close defence' guns were intended to engage enemy vessels attempting to enter a harbour, or to block it, or to smash boom defences. In the Forth, these were mainly the 6-inch guns (and 4.7-inch and 4-inch in the First World War). 'Anti-MTB [motor torpedo boat]' guns (as they were called in the Second World War) were designed to tackle light fast-moving boats attempting to enter a harbour to attack shipping or dock gates; in the Forth, these were 12-pdr and (from 1940) 6-pdr twin guns.

9.2-inch BL Mk X

Although the 9.2-inch gun was the main counter-bombardment gun (p xix), the decreasing likelihood of capital ships being used to bombard the coast meant that they were more likely to tackle enemy heavy cruisers. A single Mk I gun was mounted on Inchkeith in 1893. The Mk X, which was to remain in service until 1956, was introduced in 1899[2] and

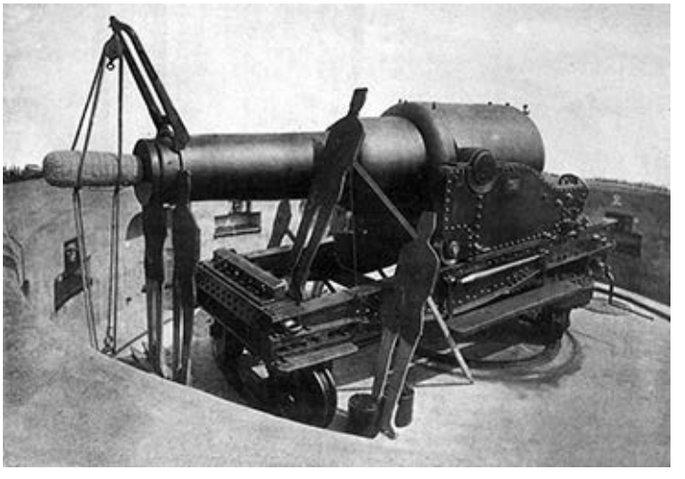


Figure 2.1
A photograph from the official report of the HMS *Sultan* firing trials in 1884, showing the 10-inch RML gun in the North Battery on Inchkeith, as set up prior to the commencement of firing, with dummy crew and shell in the process of being loaded

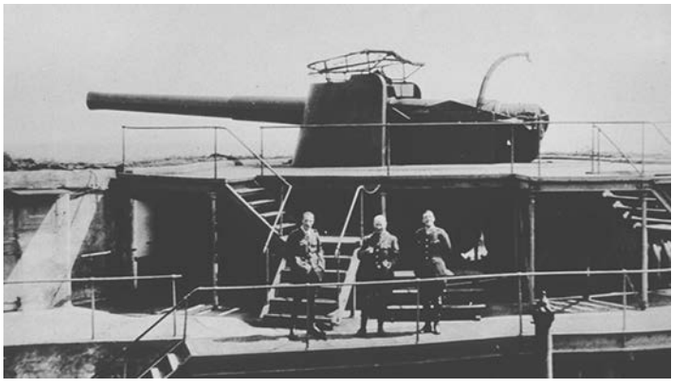


Figure 2.2
The 9.2-inch BL Mk X gun, on Mk V Central Pedestal mount at Kinghorn, shortly before the Second World War (© Bruce Stenhouse Collection)

seven guns of this mark were installed on Inchkeith and at Kinghorn and Braefoot between 1903 and 1915, the Inchkeith guns remaining in service until after the Second World War.

The Mk X 9.2-inch gun delivered a shell weighing 172kg. Maximum ranges given by different authorities using the Mk V mount (with a maximum elevation of 15°) vary significantly, between 15,900m and 26,500m.[3] The range at which there was a 33% chance of hitting a target 30 ft (*c* 9.1m) high was 11,500 yards (*c* 10,500m).[4] A firing rate of 2–3 rounds per minute could be achieved.

The gun was set on top of a high pedestal in a deep emplacement (Fig 2.2); the men who served the gun worked on a steel platform over the top of the pit; the large space below the gun platform (the emplacement floor) was used for the storage of ready-use ammunition, around its wall or in niches.

Cartridges in silk bags (kept in protective cases until they reached the gun) and shells were stored in separate spaces below ground and were transported to the emplacement floor by separate lifts. They were moved by trolley to hoists on the gun mounting, which would be used to lift them to the loading level.[5] Different sizes or numbers of bags could be loaded behind the shell to increase or decrease its range and power.

In July 1916, the complement at Kinghorn to man the single 9.2-inch battery was two officers and 36 other ranks.[6] The gun detachment was of 15 men, five of whom had a role in aiming the gun: Gun Captain, Rocking Bar [Sight] Layer, Auto-Sight Layer, Setter for Range, Setter for Training. The other ten 'gun numbers' were mainly employed in handling ammunition. Three men were needed to ram the shell and cartridge home into the breech. Nine men – the ammunition detail – were employed below ground in the magazines. On guns where only one lift was provided from below ground, it was used exclusively for shells, the cartridges being carried up to the emplacement floor by hand in their protective cases.[7]

6-inch BL Mk VII

The Mk VII 6-inch BL guns were intended to fight light cruisers and to tackle block-ships and boom-smashers (p xix). As enemy ships became more powerful, 6-inch guns were relegated to deal with heavy modern destroyers. The first 6-inch guns mounted in the Forth were Mk II guns, on Elswick Hydro Pneumatic disappearing mountings, on Inchkeith. All 6-inch gun installations between 1898 and 1942 were of Mk VII guns, usually on Central Pedestal Mk II mountings, set in an emplacement (Fig 2.3). The loaders worked on the gun floor, either a steel platform or directly on the concrete of the emplacement; ready-use ammunition was stored in niches around the gun emplacement. The guns could be fired at nearby targets using an auto-sight, or at more distant targets with information from sights mounted on the gun or from the Depression Position Finders.[8]

In the 6-inch batteries in the Forth built up to the end of the First World War, the silk-bagged cartridge and the shell were lifted from the underground magazines using separate lifts, the former to the emplacement floor (the silk bags held in their storage containers), the latter usually to the gun platform (see the 'ladder lift' on Inchkeith, below (Fig 11.19; Fig 11.20)). Cartridges and shells were manhandled from the lifts into the loading position.[9]

The Mk VII 6-inch gun delivered a shell weighing 45kg to a range of up to 11,000m, using the 15° elevation Mk II carriages in use in the Forth.[10] The range at which there was a 33% chance of hitting a target 30ft (*c* 9.1m) high was 8,500 yards (*c* 7,700m).[11]

In July 1916, the complement at Kinghorn of the two-gun 6-inch battery was three officers and 55 other ranks.[12] The 13-man gun crew comprised five men who had a role in aiming or firing the gun: Gun Captain, Rocking Bar Layer, Auto Sight Layer, Setter for Range, Setter for Training; and eight other 'numbers' in the crew, mainly involved in handling ammunition. There was an eight-man ammunition detail below ground.[13]

Figure 2.3
One of the 6-inch guns at Kinghorn, within its relatively small Mk II shield, with Inchkeith just visible on the horizon. Probably taken in the 1930s (© Bruce Stenhouse Collection)

Two Mk XXIV 6-inch guns were mounted at Kincraig in 1943, in mounts that allowed 45° elevation and a longer range. These guns were provided with radar aiming systems.

Most of the guns in the Forth were equipped with Mk II shields (Fig 2.3) until 1931, when, as part of the implementation of the Interim Defence Scheme, some Mk IV shields were mounted. The Mk IV was a larger round-fronted shield that wrapped round the sides of the gun and provided overhead protection.

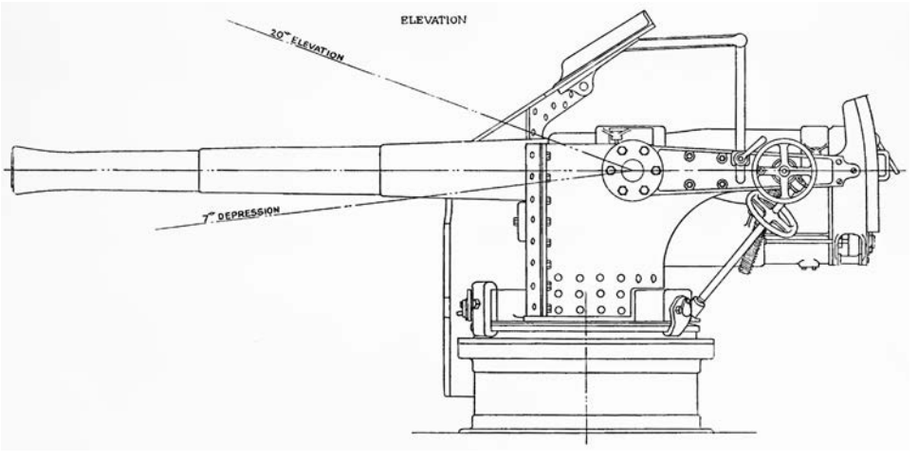


Figure 2.4
The cross-section of a 4.7-inch QF gun, from the 1901 Royal Artillery handbook for the gun

QF (Quick-firing) guns

QF guns were provided with a rapidly operating (or even semi-automatic) breech which allowed for rapid firing. The ammunition of all these guns, apart from the 4.7-inch, was in a single piece, the shell fitted into a brass cartridge case. The 4.7-inch QF had, like the larger guns, ammunition in two parts – with separate shell and bagged cartridge.

4.7-inch QF

The 4.7-inch QF gun was intended to assist the 6-inch guns against light cruisers, block-ships and boom-smashers, and also to target torpedo boats and destroyers (Fig 2.4). Four 4.7-inch QF guns were mounted in the Forth, at Inchkeith (Mk IVb) and Kinghorn (Mk IIIb). The four guns were moved, in 1903 and 1915, to Dalmeny and Downing Point respectively. All four moved again, in the restructuring of the Forth's defences, in 1916, when they all went to Inchcolm. They were still part of the approved armament of the river in November 1927, and were removed with the rest of the armament in 1930.[14]

The 4.7-inch gun delivered a shell weighing 20kg to a range of 10,790m.[15] The range at which there was a 33% chance of hitting a target 30ft (*c* 9.1m) high was 7,500 yards (*c* 6,860m).[16] The complement of the two-gun battery at Dalmeny, in July 1916, was three officers and 38 other ranks.[17] The crew of a single gun would comprise ten men.[18]

12-pdr QF

The 12-pdr QF gun was introduced in 1894 on ships and in coast defence to deal with fast-moving torpedo craft. In 1902, 12-pdr guns were mounted in the Forth to provide cover for the controlled minefields and to sink any small vessels trying to grapple and drag the mines out of the way. After 1906 they were repurposed to provide defence against torpedo boats. These guns were usually assisted by electric lights – either fixed, to illuminate an area, or moving, to pick up and follow a target.

The 12-pdr was on a 'free' mounting, which allowed the gunner to push it round using his shoulder and thus follow a fast-moving target. It had a shield of 3-inch steel plate to protect the crew (Fig 2.5).[19]

The gun delivered a 5.4kg shell up to a range of *c* 7,300–9,230m (depending on which authority one follows) and could reach a rate of fire of 15 rounds per minute.[20]

The gun's crew comprised the Gun Captain and Gun Layer (both NCOs) and five other men. The Gun Captain had control of the pistol grip trigger and the sight fitted on the shield. The Layer had control of the other sights.[21]

12-pdr (Naval) 18cwt

These high-velocity naval guns were mounted in the Forth between 1915 and about 1921. While the 12-pdr (12cwt) gun described above was also a naval gun, it had been adapted for coast defence use with the addition of auto-sights to aid the targeting of fast-moving craft. The 12-pdr (Naval) 18cwt was provided as a stop-gap and, although more powerful, was not so equipped. The 5.4kg shell could be fired a distance of around 8,500m, and a rate of fire of 15rpm is reported.[22]

In July 1916, there were 14 12-pdr (Naval) 18cwt guns, organised in seven Gun Groups in the Forth. Each Group had two officers and between 28 and 30 other ranks, including gun crew, their reliefs, and men handling the ammunition.[23]

4-inch QF

In July 1916, there were four 4-inch Mk II guns on Inchgarvie (Fig 2.6), split into two Gun Groups; one group had two officers and 36 other ranks, while the other had two officers and 32 other ranks.[24] The 4-inch gun was a mainly naval weapon with

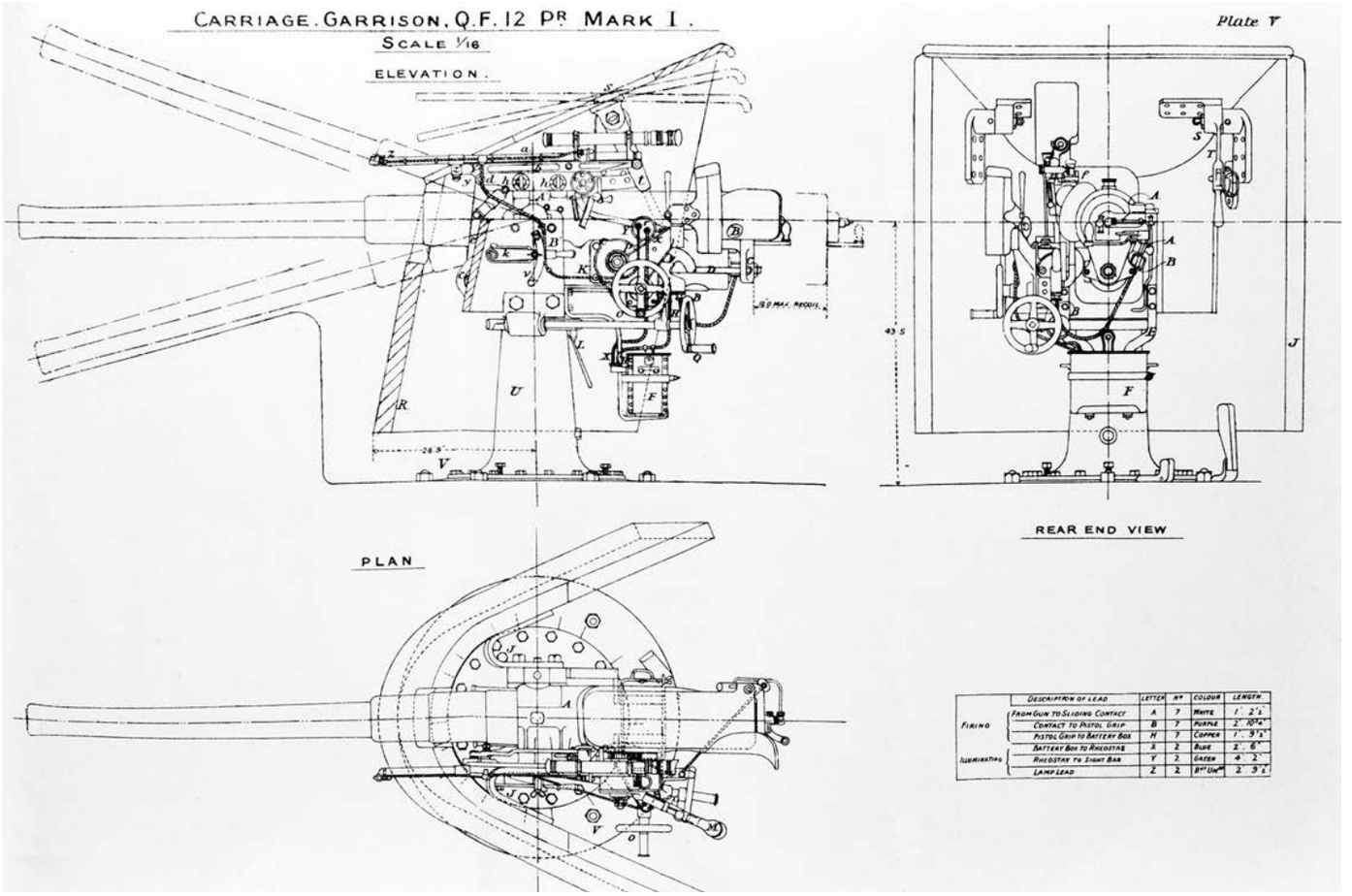


Figure 2.5
The cross-section, rear elevation and plan view of a 12-pdr 12cwt QF gun, on a Mk I carriage, of the kind used at Coastguard and Inchgarvie Batteries, from the 1903 Royal Artillery handbook for the gun

a range of *c* 8,780m and a weight of projectile of between 11kg and 14kg. A rate of fire of 8–10 rounds per minute could be achieved.[25] The gun crew comprised Gun Captain and Layer (both NCOs) and six other members. The guns were moved to Inchcolm in the reorganisation of the defences in 1916.

Twin 6-pdr

This was the only gun used in the Forth originally designed for coast defence work, to deal with small fast-moving motor torpedo boats or other fast coastal craft. The existing 2-pdr 'pom-pom' gun was effective against such craft, but its weight of shell was considered inadequate. Development of the 6-pdr twin began in 1925 and the first units were built in 1933.

Trials that year compared the effects of a pair of 12-pdrs and the new 6-pdr twin guns on coastal motor boats. The new 6-pdr was found to be very satisfactory, achieving, in bursts of 10–12 seconds, a rate of fire equivalent to 65rpm. The modernised 12-pdr equipment was capable of firing 13rpm per gun. The conclusion was that the new 6-pdr twin was 'definitely superior' to the 12-pdrs, which had, however, performed very well. These conclusions determined the light armament of the Forth in 1939–45.[26]

The two barrels of the 6-pdr twin were mounted side-by-side in a rotating steel cabin (Fig 2.7; see also Fig 10.34), open at the back but providing good cover for the crew. Behind the guns were trolleys on rails, on which the ready-use ammunition was carried when the gun was in action. Although the rounds were loaded singly by hand, the design of the semi-automatic breech allowed the very high rate of fire. The guns were operated by two independent teams, who had merely to throw the round into the breech and pull the firing lever as soon as the breech closed. The gun was laid using data from a separate director and range-finder mounted in the Director Tower behind the gun. In the Italian raid on Malta on 25–6 July 1941, the 6-pdr twin defences sank five motor torpedo boats in less than two minutes.[27] The standard

Figure 2.6
One of the 4-inch guns on Inchgarvie, in one of the former 12-pdr emplacements, at a date between July 1915 and early 1917. Note the ready-use ammunition stored on trolleys. The original caption reads '"F2"2 12 pdr 18cwt Q.F. 1st and 2nd Battle Cruiser Squadrons', referring to the ships moored in the background (© Bruce Stenhouse Collection)

emplacement, as built in the Forth, provided concrete cover to sides and rear, and over the rear part of the cabin.

2.2 Terminology and conventions

In the list of abbreviations and key terms (p xix) we have tried to provide a glossary of the main acronyms and terms in use from 1880 to the closure of Coast Defence in 1956. There are three sets of terms that might cause confusion.

Defence Electric Lights (DELs) were the searchlights, some moveable, some fixed (albeit moveable by one or two degrees), used to illuminate targets for the guns at night. In 1940, they were renamed Coast Artillery Search Lights (CASLs) but we have decided not to reflect this change in the description of every battery, and use 'DEL' throughout.

Second, there is the changing nature and nomenclature of battery command buildings. Towards the end of the 19th century, batteries began to be provided with Battery Control Posts, open spaces provided with a pillar to which a Depression Range Finder could be attached. These could also be referred

Figure 2.7
One of the few remaining surviving 6-pdr twin installations, at Battery Belmont, Fort Rodd Hill, British Columbia (© John Stanton)

to as Battery Commander's Posts,[28] and in time more complex roofed buildings, known as Battery Command Posts, were provided, often incorporating posts from which the DELs were controlled. For the 6-pdr twin guns of the Second World War, the equivalent structures were termed Director Towers. The later nomenclature, Battery Observation Post, could refer to a pre-existing Battery Command Post or to a structure with a role in a more complex arrangement of battery command. For example, the Kincraig Battery, the only permanent 6-inch gun battery built in the Forth after 1916, had not only three different Battery Observation Posts (Close Defence, Counter-Bombardment and Radar) but also a Control Post (where the Commander was based) and a Battery Plotting Room.

Third, throughout the text we refer to the 'approved armament' of the Forth and what was actually 'mounted'. The former was what was officially determined as the armament of the estuary; what was actually 'mounted' might be more or less than what was 'approved'. Plans to increase or decrease the number of guns, or to change the calibre of guns, might have to wait for years before funds could be found. Often, the 'approved armament' would be changed again to take account of new defence needs or new technology before the previously

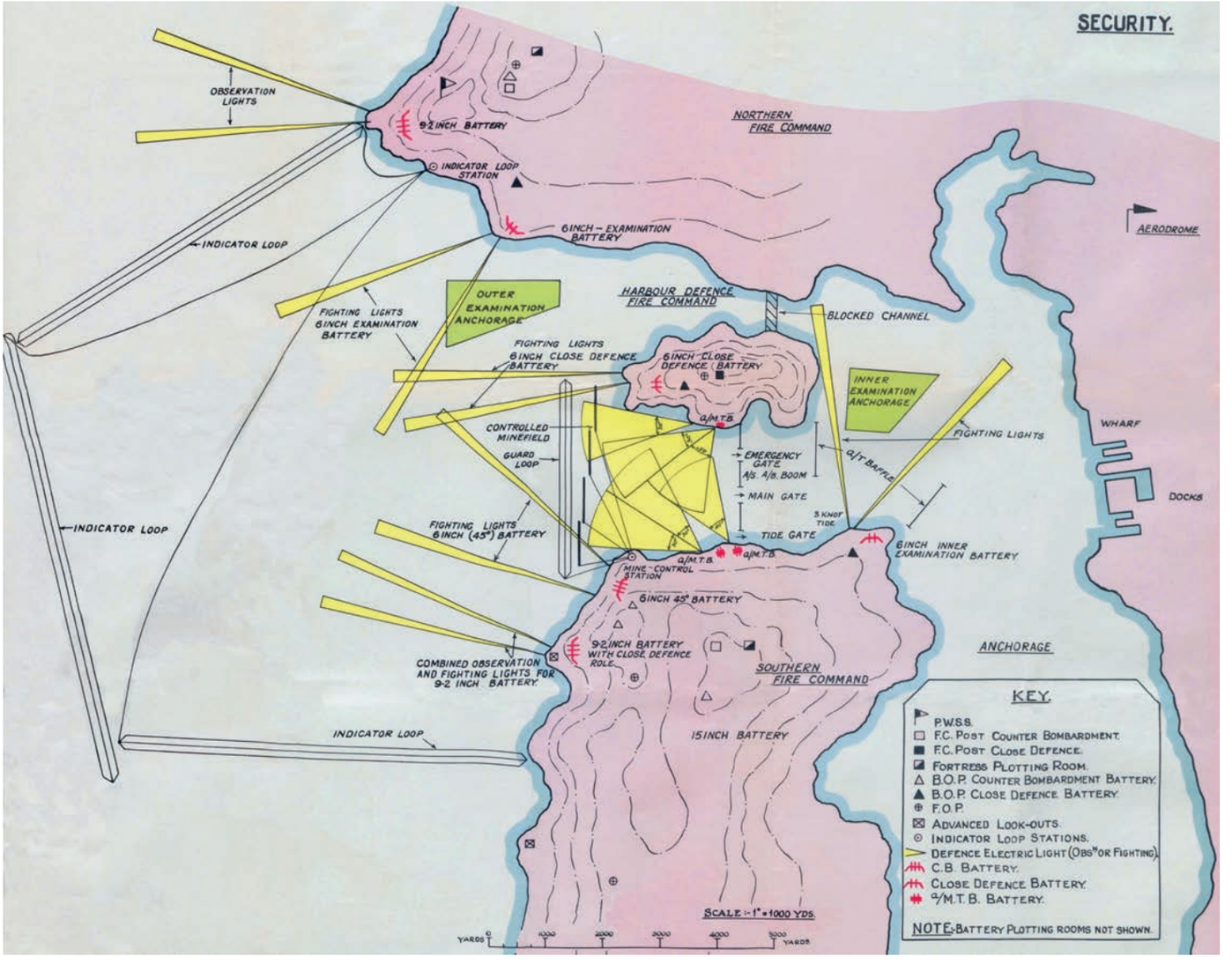


Figure 2.8

The ideal layout of a defended harbour, as set out in a Royal Engineers manual of 1943. The key elements, working from outward (left) are: Indicator Loops to detect submarines; Counter Bombardment batteries of 9.2-inch guns; the Examination Anchorage covered by 6-inch guns; a Guard Loop; controlled minefields ('Mine Loops'); Close Defence batteries of 9.2-inch and 6-inch guns, with Coast Artillery Search Lights; Anti-MTB guns, with lights; Anti-submarine and anti-boat booms, with gates. The guns are shown as divided between three Fire Commands 'Northern', 'Harbour defence' and 'Southern'. There is also an Inner Examination Anchorage (War Office 1943 *Military Engineering (Vol II) Supplement (Coast Defence*)

approved changes had been made. On the other hand, guns taken off the 'approved armament' might remain mounted (without ammunition or men to crew them) for many years, heavily greased and protected from the weather.

In the text, we give metric equivalents for measurements given in Imperial units in original documents and use metric units for modern measurements. Where an Imperial measurement is clearly an approximation, we give an approximate metric equivalent, rounded up or down.

2.3 How the defences were intended to work

This section is intended to give the reader an idea of how the defensive system of the estuary was intended to operate in its heyday. More detail on the technology and installations is given in subsequent chapters.

In the earliest stages of defence, from 1880 until the turn of the century, the three forts on Inchkeith and that at Kinghorn were intended to fight independently, their commanders choosing targets for their guns. All four forts were defended as separate entities. As the power, number and rate of fire of guns increased from the last decade of the 19th century, and modern range-finding equipment was available, the guns were increasingly fought as part of a single complex, in a series of Fire Commands. The Forth was one of the first British fortresses to be organised in this way.

The organisation of the defence of the river remained largely the same for the first four decades of the 20th century, although the role of devices to detect the passage of vessels, aerial reconnaissance and finally radar did extend the capacity of the defences to detect enemy ships at greater ranges, in poor weather, submerged and at night. Manuals for the organisation and fighting of coast defences are preserved in the National Archives, published by the War Office in 1911 ('Provisional'), 1914 and 1930, and what follows is taken from these documents.[29] There are, additionally, a Second World Manual, couched more in terms of principles, and a military engineering supplementary pamphlet on Coast Defence, published in 1943.[30] It is from the latter document that Figure 2.8 is reproduced. It illustrates the ideal arrangement of the defences of a port, and the defences of the Forth in the Second World War conformed closely.

The artillery defences of the Forth were commanded by the Fortress Commander. Executive command was exercised by his subordinates, the Fire Commanders, who each commanded a number of batteries; each Fire Command comprised the batteries firing on one area of water. In the First World War, there were three Fire Commands in the Forth: at Inchkeith (Outer), on Inchcolm (Middle), and at Carlingnose (Inner). The role of the Fire Commander was to co-ordinate the fire of his batteries to ensure that all suitable target vessels were engaged by the correct combination of guns. This was particularly important for the Quick Firing guns of smaller calibre designed to tackle swarms of small boats, where the Gun Commanders knew which targets they were to aim at, so that, for example, two guns were not firing at the same vessel while another target passed the guns unscathed. A chart of all the water covered by a Fire Command would be gridded so that the Fire Commander could determine in which square a target was located and identify that target to a battery using the grid number. The chart was positioned under the Position Finding instrument in the Fire Command HQ.

The Fire Commander's orders would be passed to the Battery Commander (for medium guns) or to the Gun Group Commander for the lighter QF guns. These officers were responsible for transmitting the Fire Commander's orders to their guns, choosing the type of projectile and the point of attack on a particular target, and for maintaining fire as long as directed.

The movements of an enemy force towards a defended port would be detected visually from a War Signal Station or other observation post (such as a Coastguard Station), by a naval vessel, or, from about 1912, by naval aerial reconnaissance. As more civilian vessels were equipped with radio, the number of ships capable of making a timely report of enemy activity increased. Such sightings would be passed to the Port War Signal Station and specifically to the Extended Defence Officer (the XDO), who was a naval officer responsible for the maritime elements of the defences (patrol vessels, anti-submarine and anti-boat booms, including the operation of the gate vessels in the booms, controlled mining, hydrophones, guard loops). He would alert the naval defences and the Selected Military Officer, usually the Royal Artillery officer in command of the outermost Fire Command. In the Forth, this would be the Fire Commander on Inchkeith, close to the PWSS.

During the First World War, technology was developed and deployed in the Forth which provided the XDO with information to supplement purely visual observations. Hydrophones (First World War) mounted on the seabed and on defence vessels could passively detect the sound of vessels, including submerged submarines; between the wars ASDIC improved on this by creating a sound wave that would hit a submerged submarine and be reflected back. Harbour Defence ASDIC sets were mounted on the seabed. Finally, detector loops, developed in 1918, could detect the passage of a steel vessel over cables laid on the seabed. Any inexplicable detection by any of these instruments would lead to the gun defences and the naval defences being brought to full alert.

The outer gun defences would comprise counter-bombardment guns, usually 9.2-inch and 6-inch guns, intended to fire at enemy warships standing off a port to bombard it from a distance. In the Forth, these guns were, from 1916 to 1939, concentrated at Kinghorn, Inchkeith and Leith Docks. These guns would also fire in a 'Close Defence' role should enemy ships come closer to the batteries, perhaps with the intention of running past them into the naval anchorage.

The 6-inch batteries were provided with 'fighting lights', powerful searchlights which could be moved to illuminate a fast-moving target at night.

A battery of 6-inch guns in these Outer Defences would also act in support of the naval Examination Service. Examination vessels would stop any neutral or otherwise suspicious vessel and, where necessary, search it for any materials (such as explosives) or persons likely to be a threat. This search would be carried out in the Examination Anchorage under the guns of the Examination Battery. In the Forth, the Examination Anchorage was moved on a number of occasions, but was most often sited just west of Inchkeith, under its guns.

The guns of the Outer Defences were organised, by 1911, in a single Fire Command on Inchkeith (previously split into two around 1905). The Fire Commander would establish the number, size, course and speed of the enemy vessels approaching and would distribute targets to the individual Battery Command Posts. The system was designed in such a way that if communications broke down between the Fire Command and the Battery Command Post, or if the Battery Command Post was knocked out, individual Gun Group Commanders had operating instructions that determined the types of target they were to engage and, if there were more than one, the order in which they were to be engaged.

In the Second World War, a modern 6-inch battery from 1942 with radar, in a Counter Bombardment and Close Defence role, was established at Elie, mainly to protect the Largo Bay convoy anchorage.

At the level of Inchkeith enemy vessels on the surface or submerged would find a strong and complex series of obstructions – booms, nets and, in both wars, controlled minefields (which could be set off by an operator on shore).

It was thought unlikely that the enemy would risk elements of its main battle fleet in an attack on a port. The defences were designed to stop armoured cruisers, destroyers and fast-moving torpedo craft. It was feared that the latter two classes might attack in 'swarms' to overwhelm the defences, and that they would be accompanied by larger vessels (for example merchantmen) to break through booms or to be sunk in the entrances to docks. The defences further upriver were designed to deal with these threats – 6-inch guns to sink block-ships and boom-smashers and to try to tackle cruisers (which over time began to become too powerful for 6-inch guns to deal with); 4.7-inch and 4-inch guns to tackle destroyers; and 4-inch and 12-pdr guns to tackle torpedo boats (with the specially designed 6-pdr twin gun in the Second World War).

The Fire Command at Inchcolm controlled the fire of batteries on Cramond Island, Inchmickery, Inchcolm itself and (from 1939) a battery on the Fife mainland at Charles Hill. In both wars, the islands were armed mainly with QF guns intended to cover the anti-submarine and anti-boat booms that closed the river at that point. The areas of water between the batteries in the Fire Command were provided with fixed Defence Electric Lights, which illuminated a large area in front of and between the guns, as well as with moveable fighting lights, which could pick up and follow a target, and were also used to illuminate the booms between the islands. The lights would be powered up whenever an alert was received, but the shutters of the emplacements would not be opened to allow the lights to shine out until the Battery Commander decided it was the right time. While the moveable lights could be controlled from their emplacements, they were usually controlled remotely from the Electric Light Director Post, usually co-located with the Battery Command Post.

In the First World War, the Inner Defences at the Forth Bridge formed a third Fire Command. The guns here had initially been deployed to cover a controlled minefield which protected the main naval anchorage, which at that time lay upriver of the bridge. Until 1916, the guns were a mixture of 6-inch, 4.7-inch, 4-inch and 12-pdr guns, provided with fighting and fixed lights; after 1916 the guns of larger calibre (4-inch and upwards) were moved out to the Middle and Outer lines, to be replaced by 12-pdr guns moved from the Inchcolm Fire Command. The Inner Defences were disarmed before the Second World War.

Finally, through most of the period under discussion, the batteries were given the power to defend themselves. Firing positions, smalls arms, barbed wire entanglements, pill-boxes, machine guns, even land minefields and field guns were provided to ensure that the coast defences could not be neutralised by attacking enemy infantry or marines.

2.4 Who manned the guns?

Throughout the history of modern British coast artillery, it was never the intention that Regular trained artillerymen would man them.[31] Batteries would have a small Regular cadre, responsible for the maintenance of the guns and ammunition and for the training of the locally based volunteer artillerymen who would form the majority of the garrison in times of war.

In 1899, the Royal Artillery was divided in two: Royal Horse and Field Artillery, and Royal Garrison Artillery (siege, mountain and, forming 80% of the corps, coast artillery). The coast artillery was manned by Royal Garrison Artillery (RGA) Volunteers. With the establishment of the Territorial Force in 1908, Territorial RGA units associated with specific fortresses and batteries were expected to take their place alongside the small Regular RGA companies based at each battery.

The reader will see below that in most batteries built before the First World War, only limited accommodation was provided for the Regular RGA company (Adjutant, NCOs Master Gunner, instructors and so on) or even only for a caretaker. During the First World War, extensive camps were built at many batteries to accommodate the permanent wartime complement.

The increasing complexity of coast defence required not only training for specialist functions (such as range-finding) but also the involvement of Royal Engineers, to operate the Defence Electric Lights, the engine rooms that powered them, the telephone system and so on. During most of the period in which the Forth was defended, detachments of Royal Engineers shared life on the batteries, although usually accommodated separately. The plan of Downing Point (Fig 9.32 below) shows that the other ranks of the Royal Artillery, Royal Engineers and the infantry garrison all had their own separate accommodation, cookhouses, dining rooms and ablutions, while the officers messed together. The Territorial Royal Engineer units were reinforced by men transferred from the Submarine Miner Royal Engineer companies, disbanded after 1905.[32]

In the 1920s, the Royal Garrison Artillery ceased to exist as a separate entity, coast artillery was integrated back into a unified Royal Artillery, and the coast artillery was handed over wholly to Territorial units of the Royal Artillery and Royal Engineers. In December 1939, it was decided that the Royal Artillery would take over the operation of the searchlights and the engine rooms from the Royal Engineers, most of the Territorial Fortress Engineers being absorbed into the Royal Artillery. During both wars, conscripted men served on the batteries and, in the Second World War, as the need for coast defence reduced and the need for artillerymen to man field batteries grew, the Territorial and conscripted men in the coast defences were to some extent replaced, where possible, by Home Guard, either to reinforce a Royal Artillery garrison or even to replace it.

2.5 Visiting the surviving remains

It is possible to visit many of the defence sites as they lie on land treated as publicly accessible or on well-used public paths. Because of natural decay and deliberate destruction, surfaces are uneven and there are pieces of sharp exposed metalwork. There are few remaining safety handrails and some of the structures are high. Infestation by pigeons and gulls causes significant health hazards from their excrement and dozens of rotting carcasses. The removal of manholes or ventilators for scrap and the disappearance of stairways has left many fall hazards. Wooden and metal stairways, if still surviving, are unsafe. There may be exposed asbestos.

Of the Inner Defences, at the Forth Bridge, Dalmeny is the best preserved. At the time of writing, the site was in the process of being sold to Network Rail for their new Forth Bridge visitor centre; we have been assured that the battery will be conserved and interpreted for the visitor. Inchgarvie is private property. It is very unsafe to land on and to explore, and landing should not be attempted; it can be seen very clearly from the water. Coastguard is almost wholly buried, although one or two buildings are visible from the public road, and the searchlight housings are clearly visible from the sea. The gun emplacements and underground structures survive at Carlingnose, but they are on private property and in gardens. The Battery Command Post is visible from the public road.

In the Middle Defences, Hound Point and Downing Point are on land visited extensively by walkers, and the latter is now being kept clear of vegetation by an active local management group. Hound Point has trip and sharp metal hazards but is quite well preserved. Cramond Island, although privately owned, is much frequented by visitors, but there are fall hazards and safety issues raised by vandalism. Inchmickery is managed as a bird sanctuary by the Royal Society for the Protection of Birds, who discourage access. It is very well preserved but is very dangerous to explore, having the whole range of possible fall, metal and other hazards. Inchcolm is opened to the public by Historic Environment Scotland; although the defence sites do not in the main fall within the area under their guardianship, they do undertake conservation and interpretation for the visitor; nevertheless, the ground is uneven and there are some pieces of exposed sharp metal. Charles Hill is on private land but is in an area frequented by walkers. Work by Fife Council has made the site cleaner and safer than most, but there are fall and sharp metal hazards.

One can explore the quiet streets of Kinghorn Ness looking for the traces of the fortress, but not much is left. The searchlight emplacement with surviving shutters in very difficult to access. Inchkeith is privately owned and is very unsafe to visit. No trace remains of Leith Docks Battery.

The Kincraig Battery and its surviving searchlight housing are on a coastal footpath. The ground is very uneven in places and care must be taken. Some parts of the battery are very well preserved. The Fidra Battery is on private land. Visits to the May Island are permitted by Scottish Natural Heritage in the season, and the few surviving remains are worth seeing.

Notes

1 Royal Regiment of Artillery 1903a: 72.
2 Hogg 1998: 180
3 Maurice-Jones 1959: 172; Hogg 1978: 198.
4 WO 33/513.
5 Hogg 1998: 181–2.
6 WO 33/766.
7 Royal Regiment of Artillery 1913c. Two British Pathé Gazette newsreels of guns being fired have been made available on YouTube (accessed June 2017). First, in 1935, a one-minute ten-second clip shows the loading and firing of a 9.2-inch gun (https://www.youtube.com/watch?v=eG1NTpq5lro) Newsreel No. 43–33, from 1943, on the subject of 'South Africa Coast Defence', includes a 40-second sequence of the firing of a 9.2-inch gun (although a 6-inch also briefly appears) (https://www.youtube.com/watch?v=osyQ1lINFQc.). Interestingly, the range-finding in South Africa was being undertaken by female service personnel.

8 Hogg 1998: 182.
9 Royal Regiment of Artillery 1913a.
10 Hogg 1998: 184.
11 WO 33/513.
12 WO 33/766.
13 Royal Regiment of Artillery 1913a.
14 CAB 36/18.
15 Hogg 1998: 180.
16 WO 33/513.
17 WO 33/766.
18 Royal Regiment of Artillery 1917.
19 Royal Regiment of Artillery 1903b.
20 Maurice-Jones 1959: 173; Hogg 1978: 189.
21 Royal Regiment of Artillery 1913b.
22 DiGiulian 2015.
23 WO 33/766.
24 WO 33/766.
25 DiGiulian 2015.
26 WO 196/26.
27 Hogg 1978: 186–7.
28 WO 78/5157.
29 WO 33/513; WO 33/697.
30 WO 287/84.
31 This short section is summarised from Maurice-Jones' account in his *History of Coast Artillery in the British Army* (1959).
32 Brown 1910: 274.

PART II

THE DEVELOPMENT OF THE FORTRESS, 1854–1977

'The United Kingdom must always be liable to raids when at war with a European maritime Power whose sea power has not been practically destroyed.'[1]

Chapter 3

FRANCE AND RUSSIA

3.1 'The most extensive injury to shipping', 1854–80[2]

Following the dismantling of the batteries at North Queensferry, Inchcolm, Inchgarvie, Blackness Castle and Dunbar after the Napoleonic Wars, the Government experienced considerable pressure from concerned local municipal and commercial interests about the defenceless state of the Firth of Forth. The Government remained indifferent to these concerns until the outbreak of the Crimean War in October 1853, which prompted some reconsideration of the situation.[3]

Leith Fort and the Martello Tower still survived from the Napoleonic period, but the former was now too far from the sea (the docks had been extended seaward in front of it, while the tower had been unarmed for most of its existence).

In 1854, General Burgoyne, Inspector General of Fortifications, prepared a *Report on the Defences of the Principal Commercial Ports of Great Britain*, the object of which was to address concerns that one or two warships might commit 'the most extensive injury to shipping and stores, and then [retire] with impunity …'. He wrote of the Forth:

> At Leith there are at present twelve heavy guns, mounted for the protection of the harbour and roadstead at Leith Fort and on a tower; it would be, however, very desirable to establish two batteries and a small barrack on the Island of Inch Keith.[4]

As a consequence, the Board of Ordnance approached the Duke of Buccleuch in February 1855 requesting permission to place two batteries and a guardhouse on Inchkeith. Nothing further was done.[5]

In November 1856, Captain Westmacott, RE, wrote a *General Report upon the Defence of the Commercial Harbours in the United Kingdom*, noting, 'In North Britain, the valuable anchorage of the Frith [*sic*] of Forth, and the trade of the Clyde demand protection …'. In describing the Forth he noted:

> [Existing] provisions … leave the Upper Forth, and the important anchorage under Inch Keith, without protection. It is proposed to provide two batteries for six guns each on the Inch Keith, for guns of heavy calibre, to act in connection with a third battery for six guns on Kinghorn-ness opposite, to be associated with floating defences.[6]

In 1856, Lord Palmerston's Government, in the person of Lord Herbert of Lea, Secretary of State for War, finally pledged itself to constructing defences in the Firth of Forth. In 1860, it bought an area of 1.23ha on Inchkeith for four batteries and a group of barrack huts (Fig 11.2).[7] The Forth was not, however, included in the recommendations of the Royal Commission on the Defences of the United Kingdom of 1860, which concentrated its attention on the southern ports more vulnerable to French attack.[8]

In April 1879, the Duke of Buccleuch sold the War Department three further parcels of land on Inchkeith incorporating those already purchased, totalling a little over four hectares. It was also proposed that enough ground might be bought for the government to establish colliery workings on the island to exploit undersea coal deposits. This odd idea never came up again.[9]

Concerned voices were raised about the Government's inaction during subsequent years.[10] In March 1871, the Lord Provost of Edinburgh requested Captain A Moncrieff, City of Edinburgh Artillery Militia and inventor of the Moncrieff 'disappearing' gun carriage, to consider how he might apply his system of fortification to the defence of the estuary.[11] Moncrieff reported that the estuary was without any defence and that its remoteness from reinforcement made it vulnerable to attack and indeed to its being used as a forward base by an enemy. Moncrieff's prescient defence proposals foreshadowed much that would be developed in the estuary in subsequent decades. He also felt it advisable that the Government should purchase the whole island of Inchkeith.[12]

After an inspection on 18 March 1871, Moncrieff identified three positions on which his disappearing gun mountings could be built. He believed that these batteries, in conjunction with mines in both channels and a battery of five guns at Kinghorn Ness, would form a line of defence that could only be forced with difficulty. He proposed a second line of defence, consisting principally of mines covered by a small battery, sited at Inchcolm or further upriver.[13]

Moncrieff's report was the subject of a motion in the House of Commons, on 21 April 1871, by Mr Robert McFie, MP for

Leith Burghs: 'in the opinion of this House, Her Majesty's Government should take into their immediate consideration the present defenceless state of the Firth of Forth, with a view to erecting such defences as appear necessary'. Sir Henry Storks, MP, for the Government, informed the House that the Firth of Forth had been seriously considered along with other parts of the coasts of the Kingdom but, in the light of the vast sums of money already voted that year for military purposes, it was impossible for the Government at that time to spend money for the defence of commercial harbours. Another Scottish member noted that, 'The success which had attended the attempts of Paul Jones [the American naval officer who had terrorised the Forth in 1779 in former times without the advantage of steam should not be forgotten'.[14]

During the Russo-Turkish War of 1877–8, France's alliance with Russia raised concerns about a concerted attack on Britain from the north-east. The Inspector General of Fortifications, General Nugent, on 23 April 1877, summed up the Forth's importance: not only was it the ninth most important commercial port in the UK, but was an important harbour of refuge, gave immediate access to Edinburgh, and its location left it open to an unopposed assault from the Baltic or the Elbe.[15] This, following 25 years of local agitation, finally persuaded the Government to proceed with their plans for fortifying Inchkeith and Kinghorn Ness.[16] Colonel John Yerbury Moggridge, Commander Royal Engineers in Scotland, was instructed to prepare plans for the coast artillery works on Inchkeith and at Kinghorn, based on the original sketches and suggestions made in 1861, and construction began in 1878.

3.2 Technological advances, 1859–80

The second half of the 19th century, and especially its last quarter, saw the maturing of the technology of modern coast defence, much of which would serve until the disbanding of the Coast Artillery 1956. The introduction of iron-clad ships in the French Navy in 1859 prompted radical rethinking of the armament and design of coast defence works[17] – guns of much greater range, accuracy and penetrating power were needed. The major bases in the south had a legacy of older casemated fortresses – muzzle-loading guns pointing through holes in walls – in which it became increasingly difficult to house the new guns.

Rifled Muzzle Loading (RML) guns were introduced in 1866, and existing smooth-bored cannon, now made obsolete, were converted to RMLs by the insertion of a sleeved liner. New pointed ammunition was developed, in due course with hardened tips to increase penetration.[18] The ever-higher velocity shells needed to penetrate growing thicknesses of ship armour became increasingly difficult to manage within the design constraints of muzzle-loading guns and by 1878 work began at Woolwich on the design of a breech-loading gun. The Armstrong armaments company also submitted designs for 8-inch and 6-inch breech-loaders. The latter design caused great interest and the Royal Gun Factory at Woolwich to begin work on its own 6-inch design.[19]

Powerful lights, to illuminate fast-moving torpedo boats and submarine minefields so as to assist lighter QF guns, were developed through an extensive series of tests in ports across the Empire in the years around 1890.[20]

3.3 The Forth, 1880–1903

Between 1878 and 1881, batteries mounting six 10-inch Rifled Muzzle Loading (RML) guns were built at Inchkeith and Kinghorn, to be manned largely by volunteer artillerymen. These forts are described in Chapter 11.

During the 1880s three significant sets of proposals were prepared for the further defence of Kinghorn, Inchkeith and Edinburgh, approved by the necessary bodies and even by the Secretary of State for War, but which were then not proceeded with.[21] They included arming the Leith Martello Tower with a 6-inch Rifled Breech Loading (RBL) gun, placing three 10.4-inch RBL guns on Inchmickery; and building two batteries, both armed with a 9.2-inch and two 6-inch BL guns, at Portobello and Granton (the east and west edges of Edinburgh). Proposals were also made that the inner waters of the Forth should be protected using submarine mines protected by gun batteries. An armament of 10-inch RML and 6-inch BL guns was approved in 1884, but not installed.[22]

In 1887, the Royal Artillery and Royal Engineers Works Committee reviewed the defences of the Forth twice, in February and, after they had actually visited the Forth, in December. In their later report, they recommended that a 9.2-inch BL gun should be added to Kinghorn's armament (this was agreed in 1888 but it was finally mounted only in October 1904), that two heavy QF guns were needed to cover the submarine minefield between Kinghorn and Inchkeith – two 4.7-inch guns were ready for action in 1893, and that light QF guns were necessary to protect the minefield at the Bridge.[23] This was in part because, in the 1870s and 1880s a new threat had been identified – fast craft launching self-propelled torpedoes that, operating in swarms, could overwhelm the defences of a capital ship at sea or in port. At sea the response to 'Torpedo-craft' were 'Torpedo Boat Destroyers', the first of which in the Royal Navy were HMS *Daring* and HMS *Decoy*, ordered in 1892. Torpedo boats were too fast and agile to be hit by slow, cumbrous large guns, and therefore smaller 3-pdr Hotchkiss and 6-pdr Nordenfeldt quick-firing guns were installed on ships and at ports.[24]

Submarine mining in the Forth, 1887–1905

It had been recommended in 1882, by the Morley Committee, that the Forth should be defended by controlled mines, as part of the Empire-wide adoption of submarine mining.[25]

Figure 3.1
Photograph of a test-firing of a line of 16 controlled mines off the Isle of Jura in 1931. The mines were at a depth of about 30ft (Admiralty 1938 *Handbook of Controlled Mining*)

In October 1887 the Forth Volunteer Division (Submarine Miners) Royal Engineers was raised, to be based at Leith, in the old mine depot ship *Dido*, moored in Albert Dock.[26] Submarine mines were laid to block or to narrow channels into anchorages. It was claimed to be both cheap and effective.[27] There were three phases of submarine mining in the Forth: 1887 to 1905; 1915 to 1919; and 1938 to 1945.

In the first phase of mining, from 1887 to 1905, submarine mines were not laid permanently; the volunteer miners only trained to lay their mines, which would be ordered into position when there was believed to be a risk of attack. A shore-based controller could set off a group of the Controlled Mines if an enemy vessel entered the minefield. The Controlled Mines contained 500lbs (*c* 227kg) of gun cotton and had a destructive radius of 30ft (just over 9m). Six mines at 120ft (*about* 36.5m) spacing (to avoid sympathetic detonation) would close a channel 720ft (*about* 220m) across.[28] Fig 3.1 shows the effect of a line of 16 mines being blown in 1931;[29] until 1928 mines had been blown in sets of eight.

In the First and Second World Wars the mines were laid for long periods, being recovered only for maintenance. 'Controlled Mines' were also known as 'Observation Mines', the explosion of which was controlled from a shore station.[30] The first submarine mining station in the Forth was on Inchkeith. On 21 July 1888, about 100 volunteers out of an establishment of 154 went under canvas on Inchkeith for their first annual training camp, which lasted two weeks.[31] The mine testing station on Inchkeith was completed in 1890 in an artificial cave formed well above sea-level, the open end being closed up by a granite wall (Fig 3.2).

In 1887 The Royal Artillery and Royal Engineers Works Committee considered the risk of submarine mines being cleared, under cover of smoke, by enemy launches sufficiently armoured to resist machine-gun fire. They recommended that batteries of Quick Firing guns be established specifically to protect minefields, and that field gun batteries be provided until permanent works could be built: in the Forth, these were to comprise four 6-pdr and one 3-pdr QF guns near the Bridge, and seven 3-pdr QF guns split between Kinghorn and Inchkeith.[32] What was actually installed, both temporary and permanent guns, is shown in Table 1.

Towards the end of 1897 a minefield for instructional purposes was established 1.2km east of the Forth Bridge. The War Office also proposed to establish a submarine mining base at Carlingnose and in the following year they acquired the land. A dedicated mining pier was built in 1903 (Fig 3.3).[33] The mining buildings were erected in the northern part of the

Figure 3.2
The Submarine Mining Testing Station on Inchkeith. The artificial cave was, by 1911, used as a small arms ammunition store. The photograph was taken in the 1980s, before the front was obscured by vegetation (© Ron Morris)

Figure 3.3
The surviving head of the mining pier at Port Laing, Carlingnose, in 2016. The upturned terminals of the tram tracks are visible (© Gordon Barclay)

Table 1

The approved armament of the Forth in 1894, as recorded by the Joint Naval and Military Committee in their report, showing the significant changes recommended by the Committee. (CAB 18/22A 1891–1903) The three 10-inch RML guns listed for North Queensferry may have been carried over in error from an earlier document – this had, indeed, been 'approved' in 1884, but had apparently dropped off the list by 1888. The 'approved armament' in 1888 also included a recommended armament of two 12-pdrs at Inchgarvie, which the 1894 Committee's table omitted for some reason.

Outer Defences	**'Approved' before the Joint Committee, 1894**	**Notes**	**1894 Joint Committee Recommendation**
Site near Portobello	1 x 9.2-inch BL 2 x 6-inch BL	First proposed by the Joint RA/RE Works Committee 1887	No longer considered necessary
Leith Docks			2 x 6-inch
Leith Martello Tower	1 x 6-inch BL	Proposed 1882	2 x 6-inch guns should be mounted at Leith Docks instead
Site near Granton	1 x 9.2-inch BL 2 x 6-inch BL	Joint RA/RE Works Committee 1887; originally suggested for Inchmickery 1882	1 x 9.2-inch BL 2 x 6-inch BL
Inchkeith	1 x 9.2-inch BL 2 x 6-inch BL 2 x 10-inch RML 2 x 4.7-inch QF		Two further 6-inch guns should be mounted instead of the 2 x 10-inch RMLs
Kinghorn	1 x 9.2-inch BL 4 x 10-inch RML 2 x 4.7-inch QF		No longer intended to mount the 9.2-inch gun
South Queensferry	2 x 3-pdr QF	On field mountings	2 x 12-pdr QF
North Queensferry	*3 x 10-inch RML* 2 x 6-pdr QF	10-inch guns carried over in error; see caption	2 x 6-inch guns at Carlingnose; 2 x 12-pdr QF at Coastguard
Inchgarvie	*(2 x 12-pdrs)*	Not included by Committee, see caption	3 x 12-pdr QF

ground already bought for the Carlingnose battery, linked to the pier by a tramway.[34] The Observation Post for controlling the minefield approaches still survives on the high ground near the battery. Submarine mining was a victim, in 1905, of the hubris of the 'Blue Water' school of defence, which asserted that strong fixed defences were unnecessary because of the predominance of the Navy. The Royal Navy also believed that the mines posed a threat to its own vessels. Submarine mining was halted immediately, although the volunteer Forth Submarine Miners continued in existence until they were converted into the Forth Division (Electrical Engineers) (Volunteers) in 1907, to operate the Defence Electric Lights of the fortress.[35]

On an armament chart for the Forth dated June 1903, two areas just below the Forth Bridge were marked as 'EC Mines' and 'Controlled Mines', respectively (Fig 3.4). The red hatched area of the EC Mines covered an area 1,725m by 340m extending across the whole width of the river, between 350m and 760m below the bridge; the controlled mines occupied an area 840m by 285m in the northern channel, to within 220m of the Forth Bridge.[36] Electro-contact (EC) mines were set off by contact from a vessel, but groups of the mines could be turned 'on' and 'off' from the shore station, and when off, they were inert.

The Stanhope Committee – 1887

By 1887 the state of Britain's coast defences was parlous, showing the results of years of lack of investment, and the Secretary of State for War, the Rt Hon Edward Stanhope, convened a committee 'to consider Plans for the Fortification and Armament of our Military and Mercantile Ports'.[37] The total cost of the works they recommended was £4.9M (around £7bn in modern values), plus submarine mining costs of £238,468.

The witnesses to the 1887 committee were unanimous in agreeing that the defences needed strengthening, although the Committee had to weed out a number of improbable contingencies that some witnesses had insisted as needing addressing.

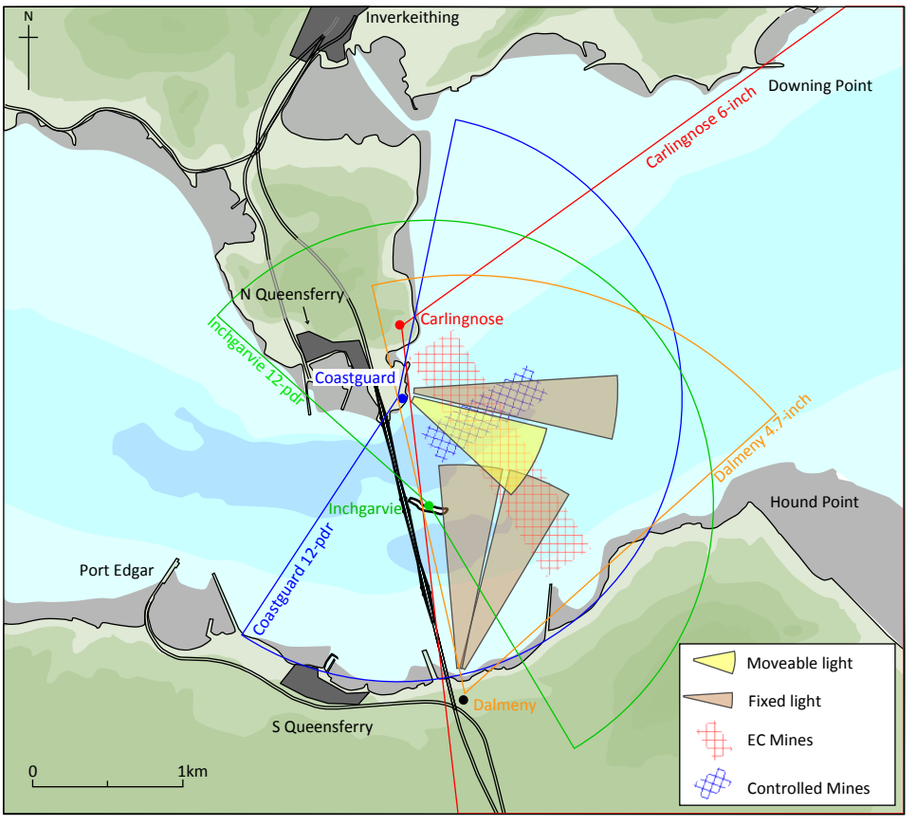


Figure 3.4
The location of the controlled (blue hatch) and EC (red hatch) minefields, as well as the arcs of fire of the guns and areas of illumination of the lights of the inner defences, in 1903. To make the figure comprehensible, the arcs of each pair of guns have been combined to show the total area of water commanded by each battery. Controlled mines could be set off by an observer on shore; 'EC' mines could be set to explode when struck by a vessel, or could be set to 'safe' (the chart is redrawn from an original on file WO 78/5179)

When the Committee turned to the mercantile ports, it noted that, apart from the submarine mining works, nothing had been done to implement the recommendations of the Morley Report of 1882. A sum of £6,937 had been spent on submarine mining in the Forth by this date, with a further £19,163 needed to complete the arrangements. The proposed expenditure on the Forth had not, however, been included in the annual estimates for 1887–8.

The papers of the Committee included a strongly worded report by Sir Lothian Nicholson, Inspector General of Fortifications, about the need to replace muzzle-loading with breech-loading guns, which had:

> caused a complete revolution in artillery … making it possible for ships … armed with these guns to bombard … our coast defences without coming within range of the short RML guns with which the works are armed … The introduction of new type BL guns of long range and high penetrative power into the armament of our coast defences, is therefore obviously of the highest importance and most pressing necessity …[38]

Although some replacements were made, it was not until a decade later, in 1899, that a coherent programme for the prioritised replacement of RML guns was set out (see below).

The Stanhope Committee recommended that the armament of the Forth should have added to it one 9.2-inch BL, two 6-inch BL and two 4.7-inch QF guns, and should lose four 10-inch RMLs. These changes would achieve a reduction in personnel of 15 from the previous armament, and would cost £30,000, plus the cost of works (£12,000).[39]

Further technological advances

As mentioned already, in the 1880s there began a brief fad for guns on disappearing mountings, where the force of a gun's recoil pushed it down into a pit where it could be reloaded under cover, before it was lifted by counterweights or, later, by a hydro-pneumatic ram, back into its firing position. While tests in 1885 showed that HMS *Hercules* did not score a single hit on a disappearing gun, it was not remarked at the time that

the ship did not hit the non-moving parts of the emplacement either; the chances of a ship's gun hitting something as small as a coast gun are very slight. The Hydro-pneumatic ('HP') mount designed by the Elswick Ordnance Company, was, however, adopted for both 9.2-inch and 6-inch guns in 1886. Not many were installed in the UK, but three were used on Inchkeith: for two 6-inch breech-loading guns in the forts on the East and West Stells, and the 9.2-inch installed near the southern end of the island. The complexity of the mechanism, the slow rate of fire, and the restrictions on the firing elevation of guns led to the design falling out favour.[40]

Sir George Clarke, Superintendent of the Royal Carriage Department at Woolwich, oversaw in 1894 the development of a totally new style of coast artillery mounting – where the gun pivoted on a central pedestal and recoiled along its axis against hydro-pneumatic dampers. This is the origin of the Central Pedestal mounting that served until 1956.[41]

To match the new longer-range breech-loading guns, better range-finding equipment was required. Triangulation of distance by two observers on a long horizontal baseline was tried with limited success, but Captain H S S Watkin, RA, realised in 1873 that, if the observing station was raised above sea level, it formed an upright triangle with the observer at one vertex, the second vertex at sea level directly below, subtending a right angle to the third vertex – the target. Measuring the angle of depression from the observer would give the range, if the curvature of earth and the rise and fall of tides were corrected for. The 'Watkins Depression Rangefinder', patented in 1876, became standard equipment in every defended port. At first mounted on a moveable tripod, permanent pillars in standardised sunken emplacements were introduced in 1887;[42] later examples are illustrated in Figs 11.31, 11.34 and 11.35.

Watkins proposed a development of his range-finder which not only calculated the distance to the target, but also took account of its movement and the time taken for the shell to travel. The new instrument was trialled between 1879 and 1887. The 'Depression Position Finder' was to be installed in a well-concealed and protected 'Cell' (the Position Finding Cell, or PFC) sited some distance from the gun (to prevent its view being obscured by gun-smoke) and manned by skilled observers: one kept a sighting telescope trained on the target as it steamed along while the other observer read the plot, which gave the target's position at a selected time corresponding to how long the shell would take in flight.[43] The system, albeit improved, remained in service for the rest of the time that coast artillery was in use. The standard design of a PFC was a small building, partly sunken, with a low wide opening which had to give a clear view of the whole arc of fire of the gun or gun-group it served. Cells had sloping turf-covered roofs, to provide both protection and camouflage (Fig 11.29). The guns were fired by closing a switch in the PFC once the gun was loaded and ready to fire. Position Finding equipment was also mounted in Fire Command Posts to allow the Fire Commander

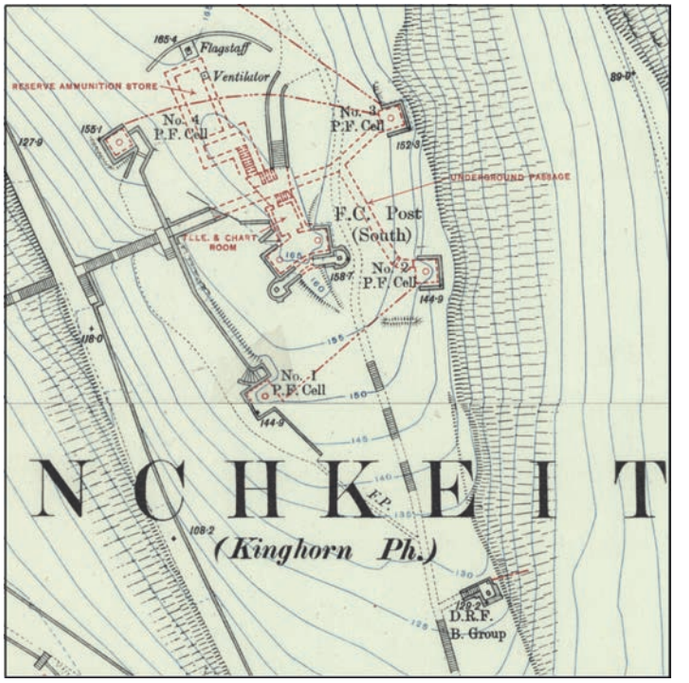


Figure 3.5
The Position Finding Cell complex in the southern part of Inchkeith, as mapped in 1911. The four PFCs are linked by covered passages to Fire Command South. The two northern cells served the middle 9.2-inch gun (firing either east or west), the two northern cells, the southernmost 9.2-inch gun, Group B. To the south is that Group's Depression Range Finder position ('D.R.F. B. Group'). Before the construction of the overhead protection in the Second World War, the two southern 9.2-inch guns could fire over a wide arc from north-east round by south to the north-west, restricted only by the higher ground (Reproduced by permission of the National Library of Scotland)

to determine which battery was best positioned to tackle a particular target. In the Position Finding instruments in the Fire Command Posts, there were often three concrete columns to support an integral chart table, on which was mounted a gridded chart of the water covered by the guns.[44]

The best-preserved PFC complex in the Forth is that on Inchkeith (Fig 3.5), where Fire Command South (between the two southern 9.2-inch guns) was linked by covered passages to four PFCs, which were arranged to cover a large area of water, from the north-east round by the south to the north-west, serving the southern and middle 9.2-inch guns. One pair of PFCs faced east, the other to the west, as the guns had a very large arc of fire (see also Fig 11.28; Fig 11.29). The PFC positions at Kinghorn and on Inchkeith are unique in Scotland (where 9.2-inch guns were a rarity).

At the same time, the 'auto-sight' was developed on the same principles, mainly for the QF guns: the Gun Layer pointed the sighting telescope at the bow wave of the target ship and the gun was given the correct elevation to hit it. Once again, this sort of sight remained in service until 1956.[45]

The 1890s

There was a flurry of meetings in Edinburgh in June and July 1888 to discuss the defence of the Forth in the context of wider national defence issues, with senior representatives of the Admiralty and War Office (Admiral Sir R Vessey Hamilton[46] and General Sir Lothian Nicholson[47]) and the commanding officers of the local Volunteer regiments and artillery batteries.[48]

At this stage, defence proposals included fitting out and manning patrol vessels and the provision of a brigade of Royal Naval Artillery Volunteers to man them. The War Office had already suggested there should be batteries of QF and machine guns to protect the submarine mines and the Admiral felt the War Office should also provide long-range guns in batteries at Leith and on each side of the Forth, on Inchkeith and at Kinghorn and Queensferry.[49]

The press announced, at the beginning of 1889, that the Firth of Forth would be equipped with new guns. Inchkeith was to have one 9.2-inch and two 6-inch breech-loading guns, the two 10-inch RMLs already on-site, two QF guns (of unspecified calibre), and one machine gun. North Queensferry was to receive three 10-inch RMLs, four QFs and two machine guns, while Leith Fort was to be armed with one 6-inch BL gun and 32-pdr smooth-bore guns. In the end, nothing was provided for North Queensferry for over a decade, but the Inchkeith guns were put in place in 1891 (6-inch guns), 1892 (9.2-inch gun) and 1893–5 (4.7-inch QF guns). A 6-inch gun for Leith Fort continued to appear as 'approved' but not mounted, until 1899, when it was dropped.[50]

The Admiralty and War Office were at this time agreed that floating defences in addition to the land batteries and the new third arm of defence, the corps of Submarine Miners, were the only means by which the Firth of Forth could be adequately defended.[51]

The development of the Forth as a naval base and a defended fortress must be seen against wider developments in military and naval organisation and the larger drivers in foreign and domestic politics. The Navy and the Army were in competition for resources. On the one hand, the supporters of a strong navy, the 'Blue Water' school, argued that Britain needed only a strong fleet for the security of the home country, the colonies and the dominions. In the view of the 'Blue Water' school, only a small army was needed, sufficient for colonial policing, its funding always to come second to the needs of the Navy. On the other hand, the 'Large Army' or 'Bolt from the Blue' school claimed, from about 1890 onwards, that Britain was vulnerable to invasion without warning from continental Europe, and that the fleet could not guarantee to prevent a landing. In the first decade of the 20th century, these two schools also reflected the two competing philosophies of British foreign policy: on the one hand, the traditional British 'splendid isolation'; that is, independence from continental alliances and entanglements, foreign policy being designed to prevent any one power dominating Europe and thus posing a risk to British interests; on the other hand, from 1904, the increasing closeness to France and later also to Russia in the face of a growing threat from Germany, and the consequent need to be able to send an expeditionary force to France's aid.[52]

Between 1890 and 1911, the two schools' changing fortunes had significant impacts on the defence of the Forth. The enemy against whom war planning (such as it was) was directed, also changed in this period. From the 1850s, war was considered possible with France, meaning any significant threat was likely to be directed towards the south and south-east coasts of England or southern Ireland. Between 1892 and 1894, France and Russia negotiated an alliance in response to the 1882 Triple Alliance of Germany, Austria and Italy. Britain became increasingly concerned that France and Russia might act in concert against her east coast. As a militant Germany became more of a threat to European stability, France and Britain became formally allied in April 1904 (the *Entente Cordiale*). In 1907, when the Anglo-Russian Convention ended the struggle between the two countries in the Middle East, the Triple *Entente* was established between France, Russia and Britain. Discussions between the French and British General Staffs began in 1905, directed towards co-operation in the event of a war with Germany.

The Joint Naval and Military Committee on Defence reported in 1891 on 'the Defence of Certain Harbours and Positions' at the request of the Secretary of State for War, who had sought advice on 'what sort of defence is it considered will make our defended ports safe against torpedo boats …?'. A notable feature of the Committee's paper was the greater stress than hitherto on the importance of defending Britain's trade and the commercial ports, and Britain's dependence on imported food:[53]

> The Committee are much impressed with the importance of providing for the safety of trade and commerce during a period of war – indeed, the necessity for protecting our exports and imports is of vital consequence to the nation.

Proposed changes in the armament rumoured in 1891, as usual, came to nothing: the arming of the Martello Tower (disarmed since 1869) with a 9.2-inch BL gun, searchlights to be fitted at Leith Fort, and the fortification of the May Island and the Bass Rock. Searchlights and guns at the Forth Bridge were put in place only years later.[54]

The Scotsman reported in February 1892 that despite the importance previously attached by the Navy to the provision of the 'floating defence' – the patrol vessels – the Admiralty now declined to attach any vessels permanently to the Forth, leaving the Army with the whole responsibility.[55]

By late December 1892, the work announced in 1889 – to enlarge and alter the fortifications at Inchkeith and Kinghorn Ness – was nearing completion.

The Joint Naval and Military Committee reported again in 1893 and 1894 on general principles and on the actual defences recommended for each naval and commercial port. Key principles addressed, first, the greater likelihood of raids by cruisers or torpedo craft rather than by capital ships: QF guns with lights mounted to tackle torpedo craft were the priority. The four most important mercantile ports, however (Tyne, Mersey, Clyde and Forth), also required 'a few somewhat heavier BL guns, although not such powerful guns as the 9.2-inch'. The specific section on the Firth of Forth noted that the Forth harbours were, combined, the seventh most important commercial port in the UK, with imports/exports exceeding £20,000,000 in value (around £2bn now) and several enemy cruisers that had escaped the vigilance of British ships might risk an attack. The Committee recommended changes, including lights at North Queensferry to illuminate the water in front of the Forth Bridge.[56]

The coast defences were in a state of flux at the end of the 19th century. Table 2 shows what was mounted and what additions and reductions had either been approved or proposed in 1898 and 1899.[57] The seven different types of gun mounted for training at Leith Fort in both years (Table 2) reflected the bewildering variety of weapons in use at this time: smooth-bored guns had apparently been *added* to Leith Fort between 1898 and 1899! The funds allocated in the Naval Construction Acts of the 1890s allowed, if not a clean sweep of such antique guns from the defences, at least their relegation to the reserve, and ensured that the first line of defence was equipped with the best available: 12-pdr QF, 4.7-inch QF, 6-inch and 9.2-inch BL guns of the latest marks on the most modern mountings.[58]

As noted above, in January 1899, a Joint Naval and Military Conference considered the replacement of muzzle-loading guns by breech-loaders, a potentially very costly project that required careful prioritisation and planning. The BL guns were much superior to the RMLs; for example, the conference noted that a quarter-worn 9.2-inch BL Mk IX or X had a penetrative effect 50% greater than a new 12.5-inch RML, could be fired three times as fast, and its projectiles cost less than half the money. The 6-inch BL Mk VII, when quarter worn, had a penetrative effect about 20% greater than a new 10-inch RML gun, could be fired nearly six times as fast, and its projectiles cost about a quarter of the 10-inch.[59]

The conference recommended that, first, heavy BL guns (9.2-inch calibre and upwards) were to be mounted to cover the approaches to: dockyards and principal naval bases; secondary naval bases; and ports of refuge and strategic harbours, which were liable to be exposed to attack by armoured ships. It was also determined that QF guns and 6-inch guns should cover channels to prevent armoured ships running past and suppressing the fire of the defence's 9.2-inch guns with their own QF guns.[60]

The conference recommended that the Forth was:

> to be defended as a commercial port and secondary naval base. Our ships of war should lie above the minefield at the Forth Bridge, 9 miles from Inchkeith Island, which lies in the centre of the entrance to the Forth.[60]

The conference considered that the armament of the Forth was inadequate, in particular covering the channel between Inchkeith and Kinghorn (Table 2). Even the changes then in hand (the South Fort on Inchkeith getting new 6-inch BL guns; replacement of four 10-inch RML at Kinghorn with a 9.2-inch and two 6-inch BL; two 6-inch at Carlingnose) would not, in their view, be enough. In particular, the guns in the southern part of Inchkeith were 'not a sufficiently strong defence for a port of the importance of Leith, with an import and export trade of £14,000,000 sterling …' The conference considered that the 4.7-inch QF guns on Inchkeith were in the wrong place in the estuary for their anti-torpedo craft role, and recommended that 9.2-inch BL guns of the latest type should be sited there instead, which would command not only the approaches but the North Channel.[60]

It was suggested that the two 4.7-inch QF guns on Inchkeith could, with advantage, replace the two 12-pdrs approved (but not yet installed) for South Queensferry (Dalmeny). This would result in the Inner Defences covering the minefield being: North Queensferry: two 6-inch Mk VII BL; two 12-pdr QF; Inchgarvie: two 12-pdr QF; and South Queensferry: two 4.7-inch QF.[60]

The proposals of the conference were largely carried through: the two 9.2-inch guns were added to Inchkeith in 1903–4; the single Mk I 6-inch gun in the north fort was replaced by a pair of Mk VII 6-inch guns in 1903 (the other Mk I 6-inch in the west fort remaining in situ on its disappearing mounting); the 4.7-inch QF guns were mounted at Dalmeny in 1900. Proposals to mount two 6-inch guns on the Martello Tower were not, however, implemented.[61]

In December 1900, a joint conference between the Admiralty and War Office convened to reconsider the forms of more localised attack that Britain faced rather than full-scale invasion.[62] The general threats identified at this meeting, albeit with changes in emphasis and detail, remained much the same for the next 20–30 years.

With the French still considered the most likely enemy, the Forth was believed to be at risk only from torpedo craft or destroyers, even before war was formally declared. It was this risk of pre-emptive action that led the conference to develop the idea of the 'Precautionary Period' before a state of war, during a state of growing tension, when there would be 'every probability' of torpedo attack. In that period, consequently, anti-torpedo armament would be fully manned and booms would be placed.[63]

The result of the deliberations up to the end of 1900 was a flurry of activity in the Forth at the turn of the century as new batteries were built and existing ones re-equipped. Table

Table 2

Summary of the official armament lists showing what was actually mounted in 1898 and 1899, and what was recorded as 'approved' or 'proposed' in 1899. Being 'approved' did not mean that the guns would eventually be mounted: circumstances or underlying principles might change before the money was found. The close-defence machine-guns for the batteries are not shown. (CAB 18/19 1898–1910)

	Mounted 1898	**Mounted 1899**	**Alterations approved/proposed 1899**	
			Additions	**Reductions**
Leith Fort	2 x 10-inch RML†	2 x 10-inch RML†	1 x 6-inch BL Mk II†	
	3 x 80-pdr RML†	3 x 80-pdr RML†		
	2 x 64-pdr RML†	2 x 64-pdr RML†		
	2 x 40-pdr RBL‡	2 x 9-inch RML†		
	1 x 9-pdr RML†	4 x 32-pdr SB†		
		1 x 68-pdr SB†		
Near Granton	Proposed 1898	Cancelled		
Martello Tower			2 x 4.7-inch QF	
Inchkeith	1 x 9.2-inch Mk I BL	1 x 9.2-inch BL Mk I	2 x 9.2-inch BL Mk X	
	2 x 10-inch RML	2 x 6-inch BL Mk VII ‡		
	2 x 6-inch BL Mk VI	2 x 6-inch BL Mk VI	2 x 6-inch BL Mk VII	
	2 x 4.7-inch QF	2 x 4.7-inch QF		2 x 4.7-inch QF
Kinghorn	2 x 10-inch RML ‡		1 x 9.2-inch BL Mk X	4 x 10-inch RML
	2 x 10-inch RML		2 x 6-inch BL Mk VII	
	2 x 4.7-inch QF			
South Queensferry	2 x 3-pdr QF§	2 x 3-pdr QF (on loan to Glasgow)	2 x 4.7-inch QF	2 x 3-pdr QF
Inchgarvie			2 x 12-pdr QF	
North Queensferry	2 x 6-pdr QF§	2 x 12-pdr QF	2 x 6-inch QF	

(† = drill only; ‡ = dismounted; § In Army Ordnance Depot charge)

Table 3

The mounted armament of the Forth on 1 December 1901 and in December 1902, with additions and reductions approved or proposed. Between December 1901 and 1902 Inchgarvie and Carlingnose had been armed; Coastguard had been added to the list, and armed with two 12-pdr QF guns. One of the Inchkeith 4.7-inch guns had been removed, and the other was noted as being due for removal. The 9.2-inch Mk I and two 6-inch Mk VI guns on Inchkeith (in italic) were *still* on disappearing mountings. The 1901 list was the last in which guns for drill and practice were included; note the bewildering range of training weapons mounted at Leith Fort, including five SB (smooth bore) guns.

1 December 1902	**Mounted 1 /12/1901**	**Mounted 1/12/1902**	**Alterations approved/ proposed 1902**
Leith Fort	2 x 12-pdr		
	2 x 10-inch RML ‡	Drill and practice guns not shown in 1902 list	‡ = for drill only
	2 x 9-inch RML ‡		
	3 x 80-pdr RML ‡		
	2 x 64-pdr RML ‡		
	4 x 32-pdr SB ‡		
	1 x 68-pdr SB ‡		
Inchkeith	*1 x 9.2-inch BL Mk I on disappearing mount*	*1 x 9.2-inch BL Mk I on disappearing mount*	
	2 x 6-inch BL Mk VII	2 x 6-inch BL Mk VII	
	2 x 6-inch BL Mk VI on disappearing mount	*2 x 6-inch BL Mk VI on disappearing mount*	Two 6-inch BL Mk VII guns approved/proposed to replace these.
	2 x 4.7-inch QF	1 x 4.7-inch QF	Two 9.2-inch BL Mk X approved/ proposed to replace this; one of the 4.7-inch guns already removed.
Kinghorn	4 x 10-inch RML	4 x 10-inch RML	Approval/proposal recorded to replace these with one 9.2-inch BL Mk X and two 6-inch Mk VII
	2 x 4.7-inch QF	2 x 4.7-inch QF	
Dalmeny	2 x 3-pdr QF (on loan to Field Arty depot, Glasgow)	2 x 4.7-inch QF	2 x fixed DELs
Inchgarvie		2 x 12-pdr QF	
Carlingnose		2 x 6-inch BL Mk VII	
Coastguard	Not listed	2 x 12-pdr QF	2 x moveable DELs

3 shows the defences of the Forth in December 1901 and a year later, in December 1902, recording a mixture of completed and yet-to-be-completed improvements.[64]

The earliest known scheme for the electric lighting of the Inner Line (1903) comprised two fixed beams just below the Dalmeny Battery, each of 16° dispersion at water level, controlled from a station in the battery, and, on the north side, two beams, one moveable through a 30° arc and the other fixed, with a 16° dispersion (Fig 3.4).[65]

The way in which the defences were to be used, and how they fitted into a larger plan, were set out, as far as we can tell for the first time, in 1899. The first 'modern' defence scheme for Scotland for which we have found a surviving copy, however, was the 'Scottish District Defence Scheme' dated 1900, a

revision of the 1899 document. It included detailed plans for the defence of the Forth, Clyde, Tay and Aberdeen (no attack was expected north of Aberdeen or the Clyde) against Russia and/or France, perhaps with Denmark as an ally. The general scheme of defence was to man the existing guns, lay submarine mines in the three estuaries, and to concentrate large land forces near the larger towns (Aberdeen, Dundee, Edinburgh, Glasgow and Greenock) to act against any enemy landing.[66]

The defence of the Forth was arranged into 'Outer', 'Inner' and 'Mobile' elements, to deal with attack by two or three cruisers and possible landings by 1,000–1,500 men. The Outer Defences comprised the guns at Inchkeith and Kinghorn (see below), with infantry garrisons for their protection (575 on Inchkeith, firing from prepared positions on the high ground of the island). Larger forces would be placed behind entrenchments inland from the coasts to protect important dockyards and towns. The Inner Defences were to protect the minefield and the Forth Bridge, but it was recorded that the armament was at that date 'not yet mounted'. The 'mobile' element comprised bodies of Regular and (mainly) volunteer infantry, and volunteer cavalry and artillery, placed in postures of defence around Edinburgh and Kinghorn.[67]

'The Portsmouth of the north to be'[68] *– the announcement of the new Rosyth naval base*

By the turn of the 20th century, the Royal Navy had grown so much that British naval bases were becoming overcrowded, and a committee on the capacity of naval anchorages and dockyards had recommended the formation of another naval base, the most advantageous position for it being in the Firth of Forth. In January 1902, Admiral Wharton, the Hydrographer of the Navy, advocated the choice of a site above the Forth Bridge, and on 2 March 1903 the Navy Estimates, which included mention of a new dockyard, were laid in the House of Commons by the First Lord of the Admiralty. On 5 March 1903, Prime Minister Arthur Balfour announced in the House of Commons that a new naval base would be built at St Margaret's Hope, Rosyth, and that the Government had been 'for some months in negotiation for the land'.[69] Two days later, the local press noted that the defence of the Forth had in recent years come into great prominence; Inchkeith had been transformed into a powerful fortress and Kinghorn Ness had also been armed with Quick-Firing, Breech-Loading guns of great range, 'while from the more recently constructed forts guarding the Forth Bridge, where the river narrows, an enemy in the estuary could be completely swept and riddled with shot and shell'.[70]

The occasionally expressed assumption that the Forth's armament grew as a consequence of the decision to build Rosyth can be shown to be false. As noted below, the armament actually reduced.[71]

'The problem of Home defence is part of the greater problem of Imperial defence . . .':[72] *the Committee of Imperial Defence*

At the same time as proposals were being developed for Rosyth, another profound change to Britain's military and naval organisation was being made which would affect the planning and implementation of the defence of the Forth. It had been clear since the 1880s that greater co-operation was needed between the Navy and Army, beyond the occasional joint conference of the kind mentioned above. No formal mechanism existed below Cabinet level for the co-ordination of naval and military strategy. Attempts to improve matters were blocked by vested interests in the services and amongst their supporters (including the Royal family).[73]

The disastrous failures in military planning and co-ordination in the Boer War (1899–1902) woke up British politicians and the largely un-militaristic British public to the country's potential weakness and vulnerability. The final straw was the embarrassingly public exposure of the chasm between the Royal Navy and Army at the Imperial Conference of 1902 when, in front of senior representatives of the Empire, the two forces presented completely opposing and unco-ordinated views of the defence needs of the Empire.[74]

The response was the development, between 1902 and 1904, of the Committee of Imperial Defence (CID), generally chaired by the Prime Minister not only with the political heads of the armed forces (the Secretary of the War Department and the First Lord of the Admiralty) and other key political members, but with the professional heads of the services, the First Sea Lord and the Chief of Staff, sitting as equal members. It also had its own secretariat to organise business and take and circulate minutes. At this date, and indeed until the middle of the First World War, the Cabinet did not have a secretariat nor formal minutes.[75]

Much of the CID's early work was concerned with Home Defence, and the development of the Forth's defences is chronicled in the CID minutes. In 1909, a Home Ports Defence sub-committee was established, chaired by the CID's secretary, with the Directors of Naval Intelligence and Naval Ordnance and the Assistant Director of Torpedoes (all from the Royal Navy) and the Directors of Military Training, Artillery, and Fortifications & Works from the War Office. This became the forum for discussions that would determine the type and level of defences of naval and commercial ports. Unfortunately, the CID did not solve all the problems of co-ordinating naval and military policy.[76]

Notes

1 WO 33/515.
2 WO 33/5.
3 Smith 1985: 90.
4 WO 33/5.

5 GD 224/514/12.
6 WO 33/5.
7 RHP 48586.
8 Saunders 1984: 472.
9 T1/15865.
10 Saunders 1984: 472.
11 In a 'disappearing' mounting, a coast artillery gun was visible only at the moment it was aimed and fired; the firing recoil forced the gun down on its carriage into the gun pit, where it was reloaded under cover, before being returned to the firing position. The counterweights of Moncrieff's system were replaced by hydro-pneumatic pistons in the more sophisticated Elswick disappearing mount, which was widely adopted.
12 Moncrieff 1871 (Edinburgh City Archives).
13 *The Scotsman*, 10 April 1871; Morris and Barclay 2017.
14 Hansard April 1871 'Scotland: Defences of the Firth of Forth – Observations', *Hansard* HC Deb 21 April 1871 vol 205 cc 1520–8.
15 Referred to in Stevenson 2014; we have not located the original reference.
16 Smith 1985: 91.
17 Hogg 1974: 27.
18 Hogg 1974: 39–41.
19 Hogg 1974: 72.
20 WO 396/5.
21 WO 33/39; CAB 18/22A.
22 CAB 18/22A.
23 WO 33/396/3; CAB 18/22A. The Royal Artillery and Royal Engineers Works Committee was established in 1884, to bring 'into closer relations the departments of Inspector-General of Fortifications and Director of Artillery', because of the 'number and intricacy of the questions in which both departments were concerned … were great and growing'. The standing committee comprised officers from both departments and, interestingly, the naval officer attached to the Inspector-General's staff.
24 *The Times*, 5 June 1885.
25 WO 33/39; Brown 1910: chapter 3.
26 *The Scotsman*, 10 October 1887; Brown 1910: 182.
27 Brown 1910: 1.
28 Admiralty 1914.
29 Admiralty 1938.
30 In the Second World War, the two terms referred to different things – the term 'controlled mines' was used to differentiate those laid within a detector loop from 'observation mines', which relied, as in the past, on a shore observer seeing a vessel or partly submerged submarine within the minefield to blow the mines.
31 *The Scotsman*, 25 July 1888.
32 WO 33/396/3.
33 WO 78/3548; Registers of Scotland. Fife, search sheet 14771; MT10/883/4.
34 *Fife Free Press*, 7 March 1903.
35 Brown 1910: 182.
36 Brown 1910: 182; WO 78/5179; WO 78/5183.
37 CAB 7/6.
38 CAB 7/6.
39 CAB 7/6.
40 Hogg 1974: 76–8.
41 Hogg 1974: 78–9.
42 Moore 1995; Moore 1998.
43 WO 396/5.
44 Moore 1995: 82–3.
45 Hogg 1974: 83.
46 An officer with a distinguished service in the Far East, who became First Sea Lord in July 1889.
47 A Royal Engineer officer with a distinguished career in the Crimea and in India, who at this time was Inspector-General of Fortifications.
48 *Fife Free Press*, 30 June 1888.
49 *Fife Free Press*, 30 June 1888; *The Scotsman*, 5 July 1888.
50 *Fife Free Press*, 12 January 1889; CAB 18/19.
51 *The Scotsman*, 10 December 1889.
52 Dunlop 1938: 152; Johnson 1960: 37.
53 WO 32/6355.
54 *Fife Free Press*, 23 May 1891; 29 August 1891.
55 *The Scotsman*, 15 February 1892.
56 CAB 18/22A.
57 CAB 18/19.
58 CAB 18/19; Hogg 1974: 89.
59 CAB 7/6.
60 CAB 7/6.
61 CAB 7/6.
62 CAB 38/1/4; WO 106/44; WO 33/189.
63 CAB 38/5/83.
64 CAB 18/19.
65 WO 78/5179; Barclay and Morris forthcoming.
66 WO 33/173.
67 WO 33/173.
68 *London Illustrated News*, 26 August 1905: 288.
69 The myth has grown up that the 'invasion novel', *The Riddle of the Sands* (Childers 1903), was influential in the decision to establish a North Sea naval base, an idea given retrospective credence by Winston Churchill. The book, however, was published in May 1903, two months after Balfour's speech and 16 months after Wharton's report.
70 *Fife Free Press*, 7 March 1903.
71 CAB 18/19.
72 WO 33/2857.
73 Johnson 1960: 15, 30.
74 Johnson 1960: 6, 31, 49.
75 Johnson 1960: 49.
76 Johnson 1960: 58, 94–5.

Chapter 4

THE GERMAN THREAT, 1903–14

'German is a thundering great nation,' he said; 'I wonder if we will ever fight her.'[1]

4.1 The defences at their greatest pre-war strength, 1903–5

In the first decade of the 20th century, there was renewed discussion of the defence of ports and the types and scales of attack to be countered. First, the conclusions of the joint Admiralty/War Office conference in 1900, already described, were revisited by the Committee of Imperial Defence in 1904; then, in 1905, the influential Owen Committee; and, finally, in discussions of the standard of defences (1909). Defence Schemes (like that for 1900, already described) were promulgated for the Forth in April 1903, November 1905 (with a revision in September 1907) and in 1909.

By 1905 virtually all the authorised replacements and upgrades of coast defence armaments in the Forth had been completed (Table 4). There were three Fire Commands in the Forth at this stage: 'North', at Kinghorn (covering the passage between Inchkeith and the mainland); 'South' on Inchkeith (covering the south channel); and 'Inner' at Carlingnose.

In the *Forth Defence Scheme* promulgated on 1 November 1905, the 'fortress to be defended' was bounded by a line drawn from Elie to North Berwick, classified as a 'Secondary Naval Base'. During the Precautionary Period, the risk to the Forth was from 'Minor raids made by a few daring men …', while in the 'War Period' the risk grew to include an attack by cruisers and torpedo boats, or an attack on Edinburgh or the batteries of the Forth by a landing party of up to about 2,000 men, supported by cruisers. The forces available to the Fortress Commander totalled 11,704 men, comprising 476 Yeomanry (volunteer cavalry), 1,286 artillerymen, 353 engineers and 9,589 infantry.[2]

Twelve hundred Royal Garrison Artillerymen (200 of whom were Regulars), 330 Royal Engineers (28 Regulars) and 19 volunteer Royal Submarine Miners would man the coast defences; with the abandonment of submarine mining, these 19 men were to assist the Royal Engineers (RE) Coast Battalion by manning the Defence Electric Lights (DELs). The batteries all had a complement of Regular gunners from No. 21 Company Royal Garrison Artillery, the larger batteries having contingents from locally based RGA volunteers (1st Edinburgh City at Inchkeith; 1st Fifeshire at Kinghorn and Carlingnose; 1st Midlothian at Dalmeny). Inchgarvie and Coastguard batteries had purely Regular complements. Whichever Regular battalion was currently garrisoning Edinburgh Castle was to provide guards for Inchkeith (56 men), Kinghorn (22) and Carlingnose (including the Forth Bridge – 89 men).[3]

A map bound into the *Defence Scheme* showed the various beaches considered to be vulnerable to enemy landings along the Fife, Lothian and Berwickshire coasts. Plans were also made to safeguard the batteries from land attack, plans of individual defences being kept on the Fort Record Books. These are described in the detailed battery descriptions below.[4]

4.2 General Owen's Committee and the weakening of the defences, 1905–9

The next important development in defence strategy marked the highest point of the 'Blue Water' school, when the fixed defences would fall to their lowest level prior to 1930. In December 1905, the report of General Owen's Committee on coast defence was published. The purpose of the committee had been to examine the defence needs for ports, consequent upon the decision of the Committee of Imperial Defence, promulgated on 1 March 1905, that submarine mining would no longer form part of the Empire's coast defences.[5]

The premises on which the report was based were that:

> The Admiralty must be the sole authority for advising as to what class of hostile ships may reasonably be expected to attempt to enter certain waters and whether the attempt to enter such waters would ever be made.

And that:

> It should be assumed throughout [the Committee's deliberations] that the maritime supremacy lies with us and that we are in a position to effectively frustrate any movements of the enemy's ships on a large scale within a brief period of their commencement.

As a consequence:

Table 4

The armament return for the Forth, dated 1 April 1905. The close defence MGs are excluded. The coast defence artillery reserve comprised '2 Heavy batteries, Royal Garrison Artillery (Volunteers); 8 x 4.7-inch Q.F. guns' on field carriages, held in the King's Park (at Holyrood in central Edinburgh). (CAB 18/19 1898–1910)

	Mounted	**Additions**
Inchkeith	1 x 9.2-inch BL Mk I on Mk I Hydro-Pneumatic (HP) (disappearing) mounting (southernmost 9.2-inch)	Still to be replaced by a 9.2-inch BL Mk X on Mk V barbette mounting
	2 x 9.2-inch BL Mk X on barbette Mk V mounting	
	4 x 6-inch BL Mk VII on Central Pedestal Mk II mounting (North and South Forts)	
	1 x 6-inch BL Mk VI on Mk IV HP (disappearing) mounting (West Fort)	Apart from the 9.2-inch gun, this was the last disappearing mounting in the Forth.
Kinghorn	1 x 9.2-inch BL Mk X on Mk V barbette mounting	
	2 x 6-inch BL Mk VII on CP Mk II	
	2 x 4.7-inch QF Mk IIIb on QF Mk III mounting	
Dalmeny	2 x 4.7-inch QF Mk IVb on QF Mk III	
Inchgarvie	2 x 12-pdr QF 12cwt on QF Mk I	
Carlingnose	2 x 6-inch BL Mk VII on CP Mk II	
Coastguard	2 x 12-pdr QF 12cwt on QF Mk I	

> A very moderate scale of defence would answer the threat of an attack by a lone cruiser attempting a rapid raid on a more isolated station. [into which category the Forth fell at this stage]

The committee recommended the removal of most 6-inch guns at 'A' and 'B' class ports and the removal of all 12-pdr QF guns, as the 4.7-inch QF had more shell power to tackle larger modern destroyers.

As a consequence, the Forth lost six Mk VII and one Mk VI 6-inch guns, two 4.7-inch QF guns from Kinghorn (which were felt to be too far downriver) and the four 12-pdrs from Coastguard and Inchgarvie. The Committee considered that, until Rosyth was completed as a first-class naval base, the existing 9.2-inch armament at Inchkeith and Kinghorn provided an adequate defence; it was recommended, however, that once the naval base was completed two further 9.2-inch guns should be added. The existing medium armament near the Forth Bridge was considered necessary to deal with unarmoured raiding cruisers by night but only the two 6-inch guns at Carlingnose and the two 4.7-inch QF guns at Dalmeny were recommended for retention.

The announcement of the Rosyth Naval Base in 1903 had not led to any increase in the defence of the Forth – all the guns had been emplaced, or work had begun, before then. Because of the Owen report, the defence of the river would now diminish. As will become clear later, the Owen Committee was quickly seen as having gone too far and the Navy as having overstated its capacity to defend the coasts. It was, as Dobinson has put it, the Beeching Report of coast defence.[6] Fortunately, in this case, at least in the Forth, the lines were not torn up.

The printed armament return of 1 April 1906 (which was the same as shown in Table 4) recorded the defences of the river at their pre-1914 peak, before the recommendations of the Owen Committee were implemented. The entire approved armament proposed over the first five or six years of the century was now in place, apart from the third Mk X 9.2-inch gun on Inchkeith, whose predecessor (the old Mk I 9.2-inch with a disappearing mounting) had already been removed to make way for it by the date of the list.

A classification of types of possible attack and principles of port defence had emerged from the Owen Committee and were re-presented in 1907 in a fuller and clearer form (Table 5). They reflected experience gained in the Russo-Japanese War, in which motor torpedo boats had been used and in which a naval anchorage had been subject to long-range bombardment (the Japanese had attacked Port Arthur twice, firing from

positions in which they could not in turn be fired against, at ranges of 13–14,000 yards (around 11,900–12,800m) and 17–18,000 yards (around 15,550–16,450m).[7] These principles would remain the basis of British planning for some time.

As it was still assumed that British naval forces would be adequate to prevent any movement of enemy ships on a large scale:

> Fixed defences at ports of the British Empire are not … required to provide complete protection against prolonged operations [but] should be sufficiently formidable to act as a powerful deterrent to attack by hostile warships …[8]

In July 1907, the CID discussed the risks of invasion by Germany which, since the previous discussions in 1902–3, had become the likely aggressor. The CID considered the possible timetable for the concentration, embarkation and transit of an invasion force, and the likely tonnages of shipping needed for a force of about 100,000 men. The committee noted the consequent need to be able to gather quickly adequate naval forces in the North Sea.[9]

In September 1907, a full revision of the *Scotland Coast Defence Scheme* was promulgated. The Forth had been reclassified as a 'defended commercial port' until the naval base might be established. Prior to 1907 the Forth had not been included in the list of ports liable to torpedo craft attack, but the increase in number and size of such vessels now necessitated a reconsideration as 'Rosyth becomes a more important objective for the enemy's attack'.[10] Coast defence troops were expected to have to face no more than 5,000 enemy raiding troops, and the scheme described three main defensive positions near the Forth: inland from Kinghorn; positions near the northern end of the Forth Bridge; and the Aberlady–Haddington line, covering Edinburgh.

The Forth was at risk during the Precautionary Period from boat-borne landing parties aiming to damage dock equipment, the DELs at Dalmeny and Carlingnose, or the Forth Bridge. Once war was declared, an attack by an armoured cruiser might be expected, or the capture of Inchkeith by a *coup de main*, or a raid on Edinburgh. Apart from the RE and RA troops in the batteries, 321 Imperial Yeomanry and 5,523 infantry would be available to defend the fortress.[11]

On 23 September 1907, the Admiralty wrote to the War Office in relation to the provision of coaling bases:

Table 5
Summary of the forms of attack, and appropriate defensive responses, set out by the Committee of Imperial Defence in 1907. (CAB 38/13/16 1907)

Type of Attack	**Type of Defence**
Class (A) Attack – by battleships, to be expected only on naval dockyards, from ranges between 10,000 and 18,000 yards.	Armour-piercing shells from a 9.2-inch Mk X gun were capable of penetrating Krupp cemented armour 6 inches in thickness up to 6,000 yards. As such attacks were only likely to be mounted in daylight, no fighting lights would be needed.
Class (B) Attack – by armoured cruisers, but it was considered improbable that such important ships would be risked in an attack on a defended port.	
Class (C) Attack – by unarmoured cruisers; as these vessels were less important, they might be risked in subsidiary enterprises.	Considerable shell power and rapid fire would be needed – the 6-inch Mk VII was the most suitable gun. Electric light would not be needed in all cases, but such batteries should be manned day and night.
Attempts to block the entrance channels to harbours by large vessels sent in darkness to be sunk in the fairway.	Mk VII 6-inch most suitable weapon. Blocking would only be attempted at night or in thick weather – therefore essential that electric lights be provided. Concentrated moveable beams.
Attacks by Boom-smashers – to clear the way for attack by torpedo boats.	
Attack by Torpedo Craft with a radius of action of *c* 300 miles. Fixed defences were to be erected at naval bases within this radius, to take account of flotillas evading British destroyers.	Booms protected by quick firing guns and electric lights. The 12-pdr QF gun so far deployed was now losing its effectiveness against larger, modern torpedo craft; the 4-inch QF gun, in spite of its lower rate of fire, was recommended. 6-inch guns could also be used. The necessary electric lights should be fixed beams, illuminating a definite area of water.
Boat attack – to seize or destroy shipping; reasonably probable where the value of ships or cargoes was sufficient to induce such an attack.	Best dealt with by moveable armament and machine-guns, acting in conjunction with infantry disposed in entrenched or concealed positions.

> … the defences in the neighbourhood of the Forth Bridge have recently been modified in consequence of the recommendations of General Owen's Committee. The four 12-pr guns at Inchgarvie and Coast Guard Batteries have been removed with the concurrence of the Admiralty on the ground that the Forth was not liable to attack by sea-going torpedo craft, and … considerable reductions have been approved in the medium armament of the outer defences at Inchkeith and Kinghorn.
>
> In order to meet the new conditions [the need to defend the Forth, and Rosyth, against torpedo-craft attack] it will be necessary to bring the inner defences back to about the same strength as that in which they were prior to the report of the Owen Committee; that is to say, the four 12-pr guns (QF) must be replaced, or preferably 4-inch guns mounted, and a further rearrangement of the existing electric lights, now used as fighting lights, will be required.[12]

Although the guns had been removed from the list of 'Approved Armament' of the Forth, they had been left in situ (Table 6). The armament returns for 1 April 1908 and 1 April 1909 recorded, respectively, that the 12-pdrs at Coastguard and Inchgarvie had been restored to the approved armament.[13]

In September 1909, the *Defence Scheme for the Scottish Defended Ports* was revised again.[13] The Forth was expected to be an anchorage for the fleet in war even before Rosyth was completed. The likely objects of an attack were:

- creation of panic;
- destruction of docks and shipping;
- destruction of the Forth Bridge;
- destruction of the works of defence and electric lights;
- attack upon warships at anchor;
- destruction of, or damage to, the works in progress at the naval base.

Detailed provision was once again made for the infantry defence of the fortress installations, the War Signal Stations at North Berwick, St Abb's Head, Elie and Fifeness, the radio station at Castlandhill, above Rosyth, and an entire battalion of the Royal Scots was to garrison Inchkeith.

The apotheosis of the Owen Committee came in 1909, when a joint committee of the Colonial Defence Committee and the Home Ports Defence Committee reconsidered the threats that developments in naval armament now posed. The current defences of the Empire at this date conformed to the Admiralty's previous assumption that 'we should be able to assert our superiority at sea over the naval forces of any combination of hostile Powers likely to be arrayed against us …'. By 1909, however, the United States, Germany and Japan had become first class naval powers and Britain was no longer able to ensure naval superiority in all places at the same time. It was therefore considered necessary that ports might have to defend themselves for longer periods before naval support could arrive.[15]

Table 6

The armament return for 1907. Most of the guns removed from the 'approved armament' by the Owen Committee are clearly still mounted, but presumably without crews or stores. The 5-inch, 6-pdr and 3-pdr guns on Inchkeith were those mounted in the Practice Battery recorded on the island at this time, for volunteer RGA training. The School of Gunnery moved from Leith to Broughty Ferry in 1909, and these practice guns then were removed. (CAB 18/19 1898–1910) (WO 78/5195 01 January 1916 – 31 December 1916)

Name	Mounted	Approved
INCHKEITH		
9.2-inch Mk X	3	3
6-inch Mk VII	4	0
5-inch BL Mk III	4	0
6-pdr Nordenfelt QF	2	0
3-pdr Hotchkiss QF	2	0
KINGHORN		
9.2-inch Mk X	1	1
6-inch Mk VII	2	0
4.7-inch QF	2	0
DALMENY		
4.7-inch QF	2	2
INCHGARVIE		
12-pdr QF	2	0
CARLINGNOSE		
6-inch Mk VII	2	2
COASTGUARD		
12-pdr QF	2	0
Total	***28***	***7***
Reserve		
King's Park		
15-pdrs	8	
4.7-inch		8

4.3 The anchorage east of the Forth Bridge, 1909–12

It was in 1908 that the Admiralty first expressed its desire that additional moorings, east of the Forth Bridge, be available in wartime. The Admiralty had originally informed the War Office that when it was necessary to anchor vessels east of the Forth Bridge, ships would employ their own anti-torpedo nets to protect each vessel individually, but this was no longer considered adequate.[16] In June 1909, 'the Admiralty were considering the advisability of erecting a line of booms

and obstructions on the line John Dea's Craig – Inchcolm – Hound Point to protect the anchorage east of the Forth Bridge …' The obstruction was to be formed by dumping spoil from the excavation of the dockyard basin at Rosyth on a line from Hound Point north-east along Drum Sands to end in a seaward dolphin (p xx). The matter was referred to the Home Ports Defence Committee.[17]

It was not until two years later, in August 1911, that the Home Ports Defence Committee reported back. The delay had been occasioned by the need to obtain detailed estimates for the various schemes of works that had been proposed; unfortunately, the preferred scheme was expensive (£130,000 in capital expenditure, and £18,000 annually thereafter) but could provide 'only a partial measure of security'. The Defence Scheme was designed to protect moorings for 24 battleships and six armoured cruisers in three lines; this number of moorings was eventually provided during the First World War.[18]

By 1911, the Whitehead Torpedo in use by the Royal Navy had a range of 8,000 yards (*c* 7,300m), and foreign navies were expected to match this in due course. In ports with a long, straight approach, like the Forth, it had become necessary to site guns far enough out to tackle torpedo craft before they could come within torpedo-launching range. It was considered impossible at that time to stretch an anti-torpedo net far enough east across the Forth.[19]

The report considered two variants ('C' and 'D') of the scheme originally discussed in 1909. Scheme 'C' comprised an obstruction of dumped material from Hound Point along the Drum Sands, with a battery built in a 'fort' at the seaward end, an anti-boat boom from the 'fort' to Inchcolm, QF gun batteries on Inchcolm, and a boom from Inchcolm to the Fife shore. Defence Electric Lights were to be installed as necessary. In total, there would be 18 QF guns and 14 DELs. The alternative scheme, 'D', was to consist of a chain of batteries on Inchcolm, Oxcars, Inchmickery and Cramond Island, covering an anti-boat boom, with accompanying electric lighting; in total there would be 30 4-inch QF guns and 19 DELs. It was only later realised that neither Inchmickery nor Oxcars could hold the number of guns originally planned for them.[20]

Neither option provided a complete defence. Scheme 'C' would still allow enemy torpedo craft to creep up under cover of dark and discharge torpedoes into the crowded anchorage before they would become vulnerable to fire from the new batteries; scheme 'D' could engage enemy boats much further east, but, as Oxcars rocks offered no prospect of supporting a battery, there would be a 2,500yd (*c* 2,300m) gap between the Inchcolm and Inchmickery guns. The building of piled obstructions was considered but dismissed as not cost-effective. The use of lights and guns on moored craft was considered, but dismissed as impractical.

In the end, because 'no practicable measures could make the anchorage east of the Forth Bridge secure', the Committee of Imperial Defence decided that 'a better plan would be to dredge extra accommodation for the fleet in an anchorage west of the bridge …'.[21]

The same 1911 Home Ports Defence Committee also considered the heavy guns of the defence, restating earlier recommendations that two further 9.2-inch guns were needed to strengthen the defences of the increasingly important naval station. (These two guns would later be mounted as the Braefoot Point Battery.) It is interesting to note, that even in 1911, the discussion of the defence of the estuary could still explicitly exclude consideration of the threat of attack by submarine, because their range and capability were still underestimated and the possibility of attacks by submarines on war vessels in harbours was considered 'remote owing to the hydrographical difficulties which prohibit their navigation below the surface on the approach to harbours'.[22]

In 1911, officers commanding and serving in coastal fortresses were issued with a manual for their work, *The Organization and Fighting of the Fixed Armament of a Coast Fortress or Defended Port (Provisional)*. In 65 pages, the reader was introduced to everything from the grand strategy that made coast defence necessary ('to free the Navy from the duty of protecting ports …') to ranging and firing the guns and operating the DELs.[23] The manual was superseded in 1914.

4.4 The run-up to war, 1912–July 1914

Further consideration was given to the Inner Defences of the Forth by the Home Ports Defence Committee in October and December 1912, although 'The exact extent of the naval anchorage, which it will be a function of the inner defences to protect against torpedo attack, has not yet been defined by the Admiralty …'. The risk uppermost in the mind of the Committee was, as before, that of an attack by torpedo craft on the anchorage above (west of) the bridge, the southern part of which was vulnerable to torpedoes launched from around Inchcolm.[24]

On 1 April 1912, the armament of the Inner Line comprised two 6-inch guns, two 4.7-inch QF guns and four 12-pdr QF guns (Table 7). Both Army and Navy agreed that the defences were not commensurate with the Forth's importance. The Inner Defences of the Forth were at this time, 'directed primarily against torpedo craft and other hostile vessels entering the navigable waters enclosed within the triangle Hound Point – Coastguard Battery – Dalmeny Battery'.[25]

The officer commanding Scottish Coast Defences, with the approval of Scottish Command, proposed remedies to the perceived deficiencies of the Inner Defences:

(a) Inchgarvie should be reconstructed to take four 4-inch QF guns;

(b) Inchgarvie should be provided with three 45° or 30° DELs;

Table 7

The mounted and Approved Armament of the Forth, 1 April 1912. Although Braefoot appears on the list as an approved alteration there was, in contrast to other approved changes, no information on the table about when it was expected to be completed. In fact, its construction was not even begun until 1914. The removal of 6-inch guns on the recommendation of the Owen Committee had left only the two at Carlingnose. The list for 1 April 1914 showed the same mounted armament. Information from National Archives files. (WO 33/3264; WO 33/593; CAB 13/1; WO 33/683)

Name	Mounted	Approved Alterations
Outer Line		
Inchkeith	3 x 9.2-inch Mk X	
Kinghorn	1 x 9.2-inch Mk X	
Inner Line		
Dalmeny	2 x 4.7inch QF	
	2 x Dispersed (fixed) lights	
Inchgarvie	2 x 12-pdr QF	
Carlingnose (examination battery)	2 x 6-inch Mk VII	
Coastguard	2 x 12-pdr QF	
	2 x Fighting (moveable) lights	
Braefort [*sic*] (Braefoot)		2 x 9.2-inch Mk X

(c) the existing lights at Dalmeny and Coastguard should be altered to fit with the new Inchgarvie lights;
(d) fixed-beam and moveable defence lights should be provided at Hound Point.

The General Officer Commanding (GOC) Scottish Command also personally proposed an additional battery at Hound Point.

The proposal for 4-inch QF guns on Inchgarvie did not meet with favour at that time,[26] but the Committee recommended mounting guns at Hound Point and Middle Point (the latter battery would eventually be sited at Downing Point, 315m to the east).[27] The annual return of 'Approved Armaments' of 1 April 1913 noted that the substitution of the Inchgarvie guns and the establishment of Hound Point was 'under consideration'.[28] Nothing was done immediately but 4-inch guns and new DELs were in place on Inchgarvie in December 1914, Hound Point was ready for action in November 1914, and funds for the Downing Point battery were allocated in September 1914. This planning committee work done in 1911–12 meant that by or shortly after the outbreak of war, the work on the Inner Defences was already under way, along with the 9.2-inch guns at Braefoot.

During August 1913 the threat posed by submarines to shipping in the Forth and to the Rosyth dockyard was finally demonstrated in a mock attack undertaken by a Royal Navy submarine. It travelled unmolested from Dundee into the Forth, past the defenders of Inchkeith and the look-outs on the battleships moored by the Forth Bridge, and reached Rosyth Dockyard itself.[29]

In September and November 1913, and again in May 1914, Admiral Lowry, commanding at Rosyth, pressed the view, with the support of the then Commander-in-Chief Home Fleet (Vice-Admiral Sir George Callaghan), that new defences be put in place for the anchorage below (east of) the bridge. We know the detail of what he proposed only from later references, but a key feature was the arming of a line of defences across the river at Inchcolm with 4-inch QF guns.[30]

Notes

1 Childers 1903: 40.
2 WO 33/381.
3 WO 33/381.
4 WO 33/381.
5 ADM 1/8879.
6 Dobinson 2000: 25.
7 CAB 38/13/16.
8 CAB 38/13/16.
9 CAB 38/13/27.

10 WO 33/444; CAB 38/19/53.
11 CAB 18/19; WO 78/5195.
12 CAB 13/1.
13 CAB 3/2.
14 WO 33/491; Ordnance Survey 1909 *War Office. Maps to Accompany the Scottish Coast Defence Scheme.*
15 CAB 13/1.
16 CAB 38/19/53.
17 CAB 13/1.
18 CAB 13/1; CAB 38/19/53; CAB 3/2.
19 CAB 38/19/53. A distance 8,000yds (*c* 7,300m) east of the Forth Bridge takes one to Inchmickery, where the estuary is *c* 8,000yds wide. As was demonstrated in the First World War, it was by no means impossible to obstruct the Forth at this point.
20 CAB 38/19/53.
21 CAB 13/1 (Mtg. 115).
22 CAB 38/19/53. WO 33/515.
23 WO 33/513.
24 CAB 13/1.
25 CAB 13/1.
26 CAB 12/1.
27 CAB 13/1.
28 WO 33/639.
29 *The Scotsman*, 26 August 1913.
30 ADM 137/1075; ADM 137/994. Admiral Sir Robert Swinburn Lowry was Commander-in-Chief Rosyth from July 1913 until 1916, and was the key officer from whom, or through whom, all the major defence initiatives would emerge in this period.

Submarine activity in the Forth, 1914–18

During the First World War U-boats varied greatly in size, radius of action and armament. The three classes that concern our story were U-, UB- and UC-boats. Almost all carried torpedoes and mounted deck guns. The U-boats were the largest types and eventually could travel great distances. The UB-boats were a smaller type that operated chiefly in the North Sea and the UC-boats were minelayers.[1]

At the beginning of the war Britain had considerably underestimated the operational range and capabilities of the U-boat and initial reports of sightings were treated with scepticism. When U-21 penetrated the Firth of Forth as far upriver as the Forth Bridge on the evening of 2 September 1914, sightings were disbelieved.[2] U-21 was one of two boats posted in a standing patrol off the Forth and, during the evening of 2 September 1914, it crept into the Firth.[3] There was as yet no boom defence in place and U-21 reached the Forth Bridge by about 10.30 p.m., where its periscope was sighted. The batteries of the Inner Defences opened fire and U-21 retreated. The battle cruiser HMS *Invincible*, which was in harbour at the time, sent out picket boats to hunt for the submarine without success.[4]

A submarine, probably U-21, was seen on the surface east of the May Island on two separate occasions on the afternoon of 4 September, but the crews of both trawlers and crewmen from a Royal Navy torpedo boat who were consulted assumed it was British.[5]

On the next day, U-21 was on the surface recharging its batteries when a look-out spotted smoke from the funnels of the light cruiser HMS *Pathfinder* on the horizon. The submarine dived. *Pathfinder* was followed by elements of the 8th Destroyer Flotilla, but at midday they parted company. The Commander of the U-21, Hersing, resolved to make an attack on the cruiser and at 3.43pm fired a single 50cm Type G torpedo at a range of *c* 2,000 yards (*c* 1,800m). Lookouts on board the cruiser spotted the torpedo heading towards the starboard bow but evasive action was too slow and it struck the ship beneath the bridge, setting off a more massive explosion in the forward magazine. Broken in two, *Pathfinder* sank within four minutes, taking all but 11 of her crew of 272 down with her. *Pathfinder* was the first ship to be sunk by a self-propelled torpedo fired by a submarine.[6] The failure by the British sailors to realise the importance of the sightings on 4 September was regretted at the Court of Inquiry as, had they been reported, it was probable the loss of the *Pathfinder* the next day could have been averted.[7] Despite the sinking of the *Pathfinder* only three days later, U-21's initial penetration of the Forth was not believed by British naval authorities until it was substantiated after the war.

On 23 September, U-22 and U-19 arrived off the May Island on a further mission but were spotted by the naval trawler *Defender*, and destroyers were sent out to search for them. U-22 had to hide overnight on the bottom of Largo Bay before travelling up the Firth the next day as far as Inchkeith. Having found no suitable target, she returned to Largo Bay for the night. On 25 September, U-19 fired a torpedo at HM Torpedo Boat 33 off the Bass Rock; the torpedo struck its target but failed to explode. That afternoon, the destroyer HMS *Vigilant* and three others were off the May Island when a torpedo was fired at her, but missed. Fifteen minutes later, the destroyer HMS *Stag* successfully evaded two torpedoes at long range. That night, the U-boats left the Firth. Reports of submarines and torpedoes continued for several days and one officer based at Granton commented, 'We had very little rest, day or night, in those days; everybody was seeing submarines. Ladies saw them from trains, children from the coast, and farmers from their farms.'[8]

Following another spate of supposed submarine sightings in mid-March 1915, the Admiralty censured the naval officers on the spot for 'want of resource, brains and energy', as they had not succeeded in destroying a U-boat. Admiral Lowry at Rosyth defended his officers, but the last word went to the authors of the Official History, who had access to captured enemy documents after the war and commented tartly:

> The real cause of the failure of the hunting forces in the Firth of Forth to destroy a submarine on this occasion was neither the want of resource, brains or energy imputed to the officers concerned in the Admiralty telegram, nor the difficulties detailed by Admiral Lowry, but the simple fact that, in spite of all appearances, which at the time seemed quite conclusive, there was no submarine in the neighbourhood.[9]

By mid-June 1915, the efforts of the Royal Navy destroyer and Auxiliary Patrols, along with the other defences of the Forth, although they had not destroyed a single U-boat, had been effective enough to make the Forth an unhealthy place for them.

The 15 UC Type I U-boats started laying mines in June 1915 along the coast of England and gradually extended their mining areas further north.[10] In April 1916, the improved Type II UC-boat minelayer appeared, which could travel further afield and carry 18 mines; submarine-laid mines began to turn up all the way up the east coast, and a mine from one of these boats may have accounted for the loss of HMS *Hampshire* on 5 June, north of Orkney.[11]

Submarines were very active off the Forth in the Jutland campaign, when Admiral Scheer planned, by raiding the north-east coast of England, to entice the Battle Cruiser Squadron out of the Forth into the teeth of waiting U-boats. Eight U-boats were to be stationed off the Forth, and U-72 and U-74 were sent to lay mines at the mouth of the estuary. Weather and sea conditions, engine trouble, other technical problems and the loss of one submarine by an accident hampered the U-boat flotilla. Attacks on the light cruisers HMS *Galatea* and HMS *Phaeton* were unsuccessful and, in the end, the scheme, of which so much had been hoped, failed.[12]

During 1918 Germany made a desperate bid to bottle up the Grand Fleet in the Firth of Forth by laying an extensive minefield well to seaward (and hence out of sight of land). Minelaying began in April and continued until October with a procession of U-boats sailing across the North Sea to lay their loads of mines in pre-arranged positions. Fortunately, the mines were discovered almost as quickly as they were laid, and were secretly swept up. Following the Armistice on 15 November 1918, the German Rear-Admiral Hugo Meurer sailed in the cruiser SMS *Königsberg* to meet Admiral Beatty at a rendezvous off the Firth of Forth. He arrived late with the apology that he had proceeded southward to avoid a German minefield, completely unaware that British minesweepers had cleared it away.[13]

U-21 survived the war and was due to be surrendered to the Royal Navy. While under escort from Kiel to Harwich, Hersing ordered the boat's valves to be opened and, despite British attempts to save her, U-21 was scuttled in the North Sea.[14]

Text Box Notes

1 Campbell 1928: 18–19.
2 Chatterton 1923: 18–19.
3 Massie 2004: 127.
4 Corbett and Newbolt 1920: 163; Chatterton 1923: 18–19.
5 WO 137/3106.
6 Chatterton 1923: 18–19; Massie 2004: 127; Lavery 2007: 236–7.
7 WO 137/3106.
8 Lavery 2007: 237.
9 Lavery 2007: 238–9.
10 Corbett and Newbolt 1920, vol 3: 55
11 Corbett and Newbolt 1920, vol 4: 20; Hurd 1921–9: 231, 260.
12 Tarrant 1995: 55–60; Massie 2004: 560–1.
13 Hurd 1921–9: 261.
14 Anonymous ND.

Chapter 5

THE FIRST WORLD WAR, 1914–19

'In the case of those ports which are vital to the maintenance of our naval and military power, no risks can be taken …'[1]

5.1 Introduction

The coast defences were brought to action at about 2 p.m. on Thursday 6 August 1914, two days after war was declared, when a gun of the Inchgarvie Battery was fired to bring to a Danish cargo steamer going upstream towards the bridge. Later in the afternoon, the vessel proceeded upriver, followed on shore by crowds of townspeople and visitors who had followed events from the moment the shell from Inchgarvie was fired.[2]

As would happen again in the early months of the Second World War, the second half of 1914 saw the appearance of some absurd fears. By November 1914, 54 cases of 'enemy' aircraft had been reported, mainly at night. The supposed appearance of enemy aircraft over Scapa Flow, Invergordon and Loch Ewe in the first months of the war, and the impossibility of these being based in Germany, led to an extraordinary John Buchan-type story gaining credence: that the enemy had established secret air bases and/or wireless stations in remote parts of Orkney, Shetland or the northern mainland, or that seaplanes were working from a 'depot ship'. There were also reports of aircraft in the Forth in the second week of September, at Leven, Carlingnose Battery and Inchkeith, where an airship was supposedly heard at 1.20 a.m., and again at 2.33 a.m., on the 14th. After close enquiry by an officer of the Royal Flying Corps, he concluded that all the reports in Scotland 'were based on quite unreliable evidence, and might be regarded as unfounded'.[3]

The defences of the Forth during the war can be considered broadly in two phases: first, from 1914 to early 1916 and, once it was decided to move the Grand Fleet to the Forth, from 1916 to 1918. The defences in the later period were significantly stronger and more complex, but the changes were more incremental than has often been stated.

After the German raid on the east coast in December 1914, Britain's battle cruiser fleet of ten ships was moved from Cromarty to the Forth as a 'sop to public opinion'.[4] Battle cruisers were large capital ships but provided with lighter armour than the fleet's battleships to allow them to make higher speeds. The battle cruisers were accompanied by three squadrons each of four light cruiser, and two flotillas each of 20 destroyers. In addition, there were minesweepers, colliers (one per capital ship, one collier between two cruisers), depot ships for the destroyers, drifters and other auxiliary vessels.[5]

5.2 The state of the defences in the early months of the war

In the autumn of 1914, the mobile phase of the land war on the Western Front had settled into the stalemate of trench warfare, and the possibility of a speedy military victory by either side had receded. It was only as the war began to enter this phase that the defences of the Forth were brought up to an appropriate state of readiness (Table 8). A conference to discuss anti-submarine defences was convened in late October 1914, and in early November Scottish Command was asked to appoint officers to command the Forth's Outer Defences and the overall fortress. In late November, the Forth was closed to commercial traffic west of Oxcars for the security of the anchorage and bridge and also to prevent neutral shipping from entering, possibly to gather intelligence.[6]

In October 1914, a revised *Manual of Coast Defence* was published by the War Office, setting out all the necessary information required for a Fortress Commander to manage every aspect of the defences of a fort, and we can see that the Forth defences were built or adapted in line with these published instructions.[7]

Within the estuary, from the bridge to Inchkeith, the defences were at first split between the Inner Defences, at the bridge, and the Outer Defences, on Inchkeith and at Kinghorn. The Middle Line, at the line of islands, Cramond, Inchmickery and Inchcolm, was put in place from 1914 onwards. As will be seen below, the Forth presents an interesting contrast between the speed with which changes were implemented and Dobinson's account of the slowness of developments elsewhere, in some cases with defences not reaching their wartime planned state until 1921.[8]

On 16 December 1914, the coast defences of Britain were tested when the Imperial German Navy, as part of a plan to draw the British Grand Fleet into an ambush, bombarded

Table 8
The state of the defences of the Forth in August 1914, as reconstructed from a number of different documents

Name	Armament (intended)	DELs	Notes
Dalmeny	2 x 4.7-inch QF Mk IV	2 fixed beam	
Inchgarvie	2 x 12-pdr (12cwt)	none	Work in hand on the first two of four 4-inch emplacements
Coastguard	2 x 12-pdr (12cwt)	2 moveable beams; 1 fixed beam (experimental – see Part D)	
Carlingnose	2 x 6-inch Mk VII 2 x .303 Maxim on field carriages	none	
Downing Point	Not yet armed	1 moveable beam; 1 fixed	2 x 4.7-inch work started September
Hound Point	Not yet armed	2 or possibly 4	2 x 6-inch Mk VII under construction
Braefoot	Not yet armed		2 x 9.2-inch Mk X under construction
Inchkeith	3 x 9.2-inch Mk X	Nil	
Kinghorn	1 x 9.2-inch Mk X 2 x 6-inch Mk VII† 2 x 4.7-inch QF†	Nil	6-inch guns brought into approved armament 8 August. 4.7-inch guns moved to Downing Point, November 1914

† mounted for drill and practice only on 4 August 1914

three towns, two undefended: Scarborough, Whitby and Hartlepool.[9] Hartlepool was defended by three 6-inch Mk VII guns, a pair at Heugh Battery and a single gun at the Lighthouse Battery. Having received warning of the attack, live ammunition was issued at 4.30 a.m. At 7.46 a.m. two German battle cruisers (SMS *Seydlitz* and *Moltke*) and an armoured cruiser (SMS *Blücher*) were sighted, and at 8.10 a.m. they began to bombard the town. Two shore guns fired at the leading ship, while the third fired at the armoured cruiser. The gunners were hampered by a rising cloud of smoke and dust around them, affecting visibility, and found that their shells had no effect on the armoured sides of the ships, so instead aimed at masts and rigging. The coast batteries fired 143 shells. To avoid the accurate firing of the third gun, SMS *Blücher* moved behind the lighthouse to prevent further hits. Two of her 6-inch guns were disabled, while the ship's bridge and another 8-inch gun were damaged.[10]

5.3 Guns, nets and booms 1914–16

'Once the lines were established in the Forth, no submarine ever succeeded in penetrating the inner waters …'[11]

Obstructions

While the heavy guns on Inchkeith and at Kinghorn were intended to tackle any large surface ships, attacks by submarines or light torpedo craft were more likely, and the key element of the defence against these threats was the complex of obstructions created in the estuary and the systems put in place to detect submerged intruders. Many of the more substantial First World War obstructions were still marked on the 1919 Admiralty charts and, as late as April 1921, captains of vessels proceeding up the estuary were complaining about the failure of the authorities to remove them.[12]

There were three inter-related parts of the system: *Offensive Obstructions*, which came into use first, in the 1870s; *Passive Obstructions*, which were first put in place in the early 20th century; and forms of *Detection*, which were developed during the First World War. The first category included mines and torpedoes controlled from the shore;[13] in the second were booms and nets to prevent submarines, small surface boats and torpedoes from penetrating the anchorages; in the last were various mechanisms for detecting the presence or passage of enemy craft, either submerged or when the river could not be observed, at night or in poor visibility. The second and third categories were later combined, for example, from 1918, when submarine detection had become precise enough to determine when controlled mines might be detonated.

The Forth had three kinds of *Passive Obstruction*: anti-boat booms (A/B), anti-submarine nets or booms (A/S) and anti-torpedo (A/T) nets. These were supported in a variety of ways, depending on the depth of the water, the weight of the obstruction and the strength of the tides. Booms or nets were supported by 'trots' or in shallower water by 'dolphins' or 'hurdles' set on the seabed.[14]

Anti-boat booms were formed of heavy baulks of timber, or later by steel hawsers fitted with star-shaped, spiked cutters (Fig 10.52), forming a continuous barrier on the surface

designed to stop light, fast vessels (especially motor torpedo boats) from rushing the anchorage at speed. In the Forth, permanent anti-boat defences of concrete pylons or blocks and of steel rails were also built in both wars.

Anti-submarine nets were designed to force a submerged vessel to the surface, where she could be dealt with by the supporting craft. The nets were usually formed of, at first, a 12ft (*c* 3.7m) square steel mesh (after 1929, 8ft (*c* 2.45m) diagonal mesh) hung to various depths from floating supports or, in shallower water, from dolphins (Fig 5.1).[15] They were placed to cover channels that were deep enough to allow a submerged submarine to enter the anchorage. Most nets were fixed and were intended to withstand a submarine hitting them. To overcome this, submarines were fitted with cutters of various kinds to try to penetrate the nets. In the First World War, many nets and booms were constructed on the 'yielding principle'; when a vessel hit the obstruction, its tension would be released slowly, to absorb the vessel's momentum. For this reason, winch-houses were built on Inchcolm, Inchmickery and Cramond Island, to tension and manage the nets and booms.

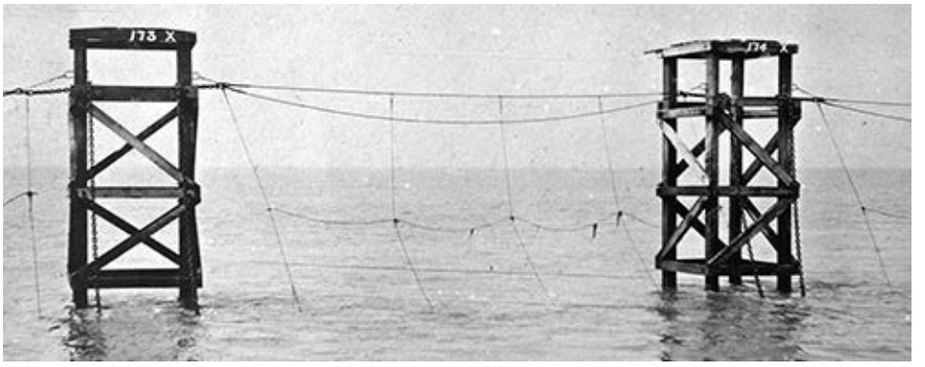


Figure 5.1
A section of anti-submarine net suspended from the line of 'dolphins' between Leith and Inchkeith, 1917 (Reproduced by permission of MOD Naval Historical Branch)

'Indicator nets' were a sub-type of A/S net, designed not to stop a submarine, but to break off in sections when hit by one (Fig 5.2). These usually had a 12ft (*c* 3.7m) square mesh, in 300ft (91.4m) sections and up to 120ft (36.6m) deep. The sections were joined by clips designed to part when a strain of 150lb (*c* 68kg) was applied. They were deployed from the holds of fishing drifters, and either moored to the seabed or held in position temporarily by drifters. Floats kept the top of the net at surface level or at a set level below the surface (for example, to allow surface vessels to pass unimpeded over the top of the net), and the nets were fitted with a variety of devices that would alert the boats guarding the net, first, that a submarine had broken the section of net off and, second, where the submarine was. The most successful was a 'pram buoy' that held 1.8kg of phosphide of calcium, which would catch fire when wetted and be towed behind the net on the surface. The intention was that the submarine would then be chased down and sunk or forced to the surface. Tests against 9ft (2.7m) and 12ft (3.7m) mesh indicator nets in the First World War showed that the broken off section would wrap itself round the submarine and might foul rudders and diving vanes. Some indicator nets were fitted with contact mines, which contained 20.4kg of TNT, designed to explode when the net wrapped itself round the submarine.[16] There was a total of 18 miles (*c* 29km) of permanent indicator net deployed in the Forth.[17]

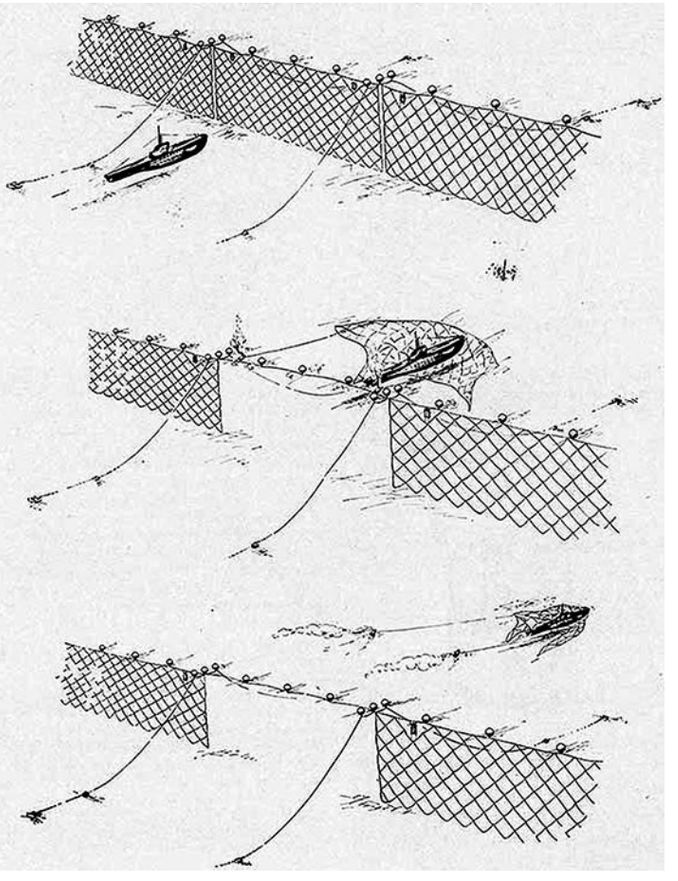


Figure 5.2
How indicator nets work: (top) the submerged submarine approaches the moored net; (middle) the submarine hits the net and the clips holding the net sections together part; (bottom) the 'pram buoys', filled with phosphate of carbide, burn on the surface, showing the location and course of the submarine (US Bureau of Ordnance 1944 *Net and Boom Defenses*)

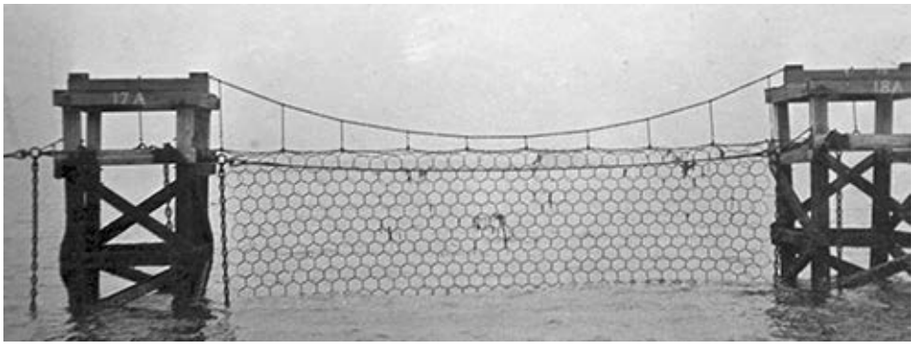


Figure 5.3
A section of anti-torpedo net suspended from two 'dolphins' on the Drum Sands–Inchmickery boom line (Reproduced by permission of MoD Naval Historical Branch)

In the Forth, A/B and A/S booms were placed at several points in the estuary. 'Gates' were provided through the nets and booms that were opened when vessels needed to enter or leave the anchorage. Gates were of two types: either a 'swinging or pivoting gate', where a section of net opened like a hinged door, or a 'vertical gate' dropped and raised by winches. The latter type was quicker to open and close but provided a less sure defence when closed and could foul a passing vessel when open at low tide.[18]

The final net type was the anti-torpedo net, designed to stop torpedoes being fired into an anchorage. A/T nets were of a much smaller mesh size (Fig 5.3). They were generally hung from floats or from dolphins. In the First World War, mobile A/T nets were moved around by the naval trawlers to screen the fleet while it was exercising in the outer part of the estuary.[19]

The Forth nets and booms

The fixed gun batteries at the bridge had first been mounted at the beginning of the century to prevent an enemy from grappling and clearing the controlled minefield. When, in the First World War, obstructions were built to impede submarines and torpedo craft, these obstructions also required protective batteries and accompanying fighting lights.

An A/S net was planned for the two spans of the Forth Bridge (Fig 5.4 (a and b)) and, by late October 1914, the net for the south span was already in place.

Some months before, in May 1914, Admiral Lowry had raised again the need for the defence of the Inchcolm–Inchmickery–Cramond Island line, armed with 4-inch QF guns, and he renewed his efforts in the early months of the war. His argument was that the Forth should be able to accommodate the whole Grand Fleet at once for coaling and supply. The current Commander, Jellicoe, did not agree, but this had been the view of Jellicoe's predecessor. There were, according to papers on file, only 16 berths for large vessels west of the bridge at that time, and more could only be made available east of the bridge if that area could be defended.[20] Lowry's concern was that the fleet had been driven to the west coast to seek shelter from the submarine threat, and 'It appears to me to be essential that the defence of the Ports on the East Coast should be sufficient to render safe the supplying of the Grand Fleet when it is required to re-enter the North Sea'.[20]

Lowry's representations bore fruit, and in October 1914 the Admiralty told the War Office that an anti-submarine net would be established to protect the anchorage downriver (that is, to the east) of the Forth Bridge, armed with 14 12-pdr QF (Naval) 18cwt guns on pedestal mountings, with four searchlights. Although these guns were significantly more powerful than the normal 12cwt naval 12-pdrs used in coast defence, they lacked the auto-sights (see Section 2.1 above) needed to track fast-moving vessels.[21] The 18cwt naval guns were very much a stop-gap in the absence of what he believed to be the more appropriate 4-inch guns.

Admiral Lowry suggested that the net, its gate and guns mounted on light vessels should be manned and maintained entirely by the Navy. He justified this because no military force had been trained for the purpose and he thought it desirous that the men operating these defences should have some sea knowledge. He was also of the view that the guns and lights on the islands should be manned by Royal Marines.[22] While the General Officer Commanding Scottish Coast Defences felt it was desirable that the defences of the Fortress should be entirely under the control of the (Army) Fortress Commander, Forth Defences, he agreed; as the guns were not fitted with the automatic sights that Royal Artillery coast defence gunners were used to, they should be manned by Royal Marines until more permanent arrangements could be made.[23]

In early November 1914, Lieut-Colonel E R Poole, RGA, and H Cartwright-Reid, Superintending Civil Engineer, surveyed the islands for the new defence scheme. Inchcolm was to receive eight 12-pdr (Naval) 18cwt guns, six of which were to be sited on the elevated plateau at the island's east end, while the remaining two were to be sited on the south side of the island's western lobe. Three searchlights were also to be mounted at the east end, two of which were to be fixed-beams, while the third was to be moveable. The fixed lights were to illuminate areas in front of the net defences to the north and south of the island, while the searching beam was to face eastwards to sweep the approach channels. At Inchmickery, four 12-pdr (Naval) 18cwt guns were to be sited on the elevated part of the island to command the net defences. Two

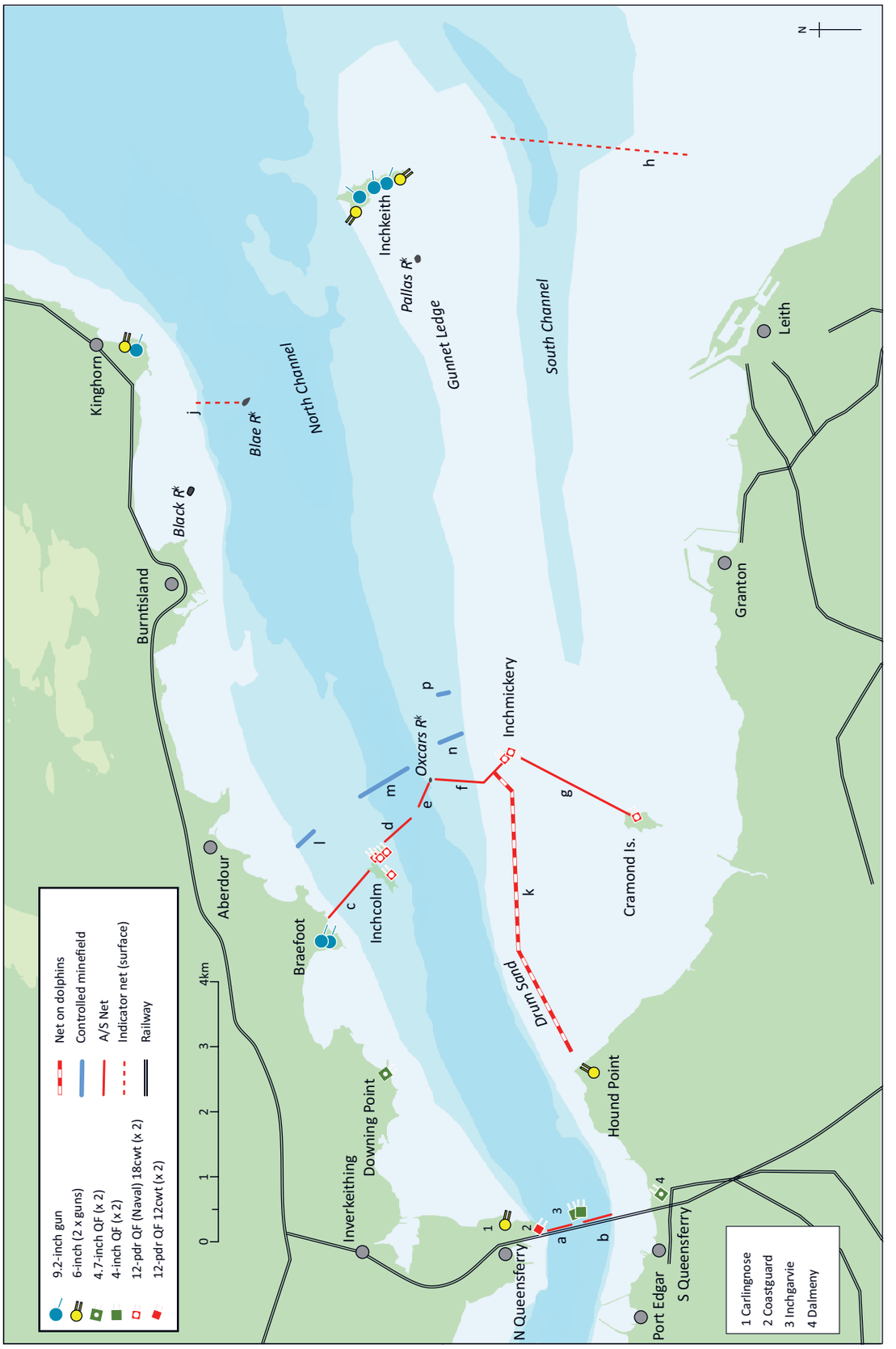


Figure 5.4
Map of inner estuary in 1915 showing the location of anti-submarine nets, anti-boat booms and built obstructions (© Gordon Barclay)

searchlights were also to be mounted, one being fixed and the other being moveable. The fixed light was to illuminate the area in front of the nets between Inchmickery and Oxcars Rocks to the north, while the other was to search the eastern approach. Cramond Island was to be armed with two 12-pdr (Naval) 18cwt guns at its north-eastern corner, along with one fixed searchlight to illuminate the water between Cramond Island and Inchmickery.[24]

Of the six searchlights required, four were to be provided by the Navy, while the other two were (reluctantly) transferred from Hound Point. By 11 November, four 36-inch searchlights and gear had been assembled at the new line.[25]

In addition to providing the guns and four lights, the Admiralty agreed to provide 500 rounds of high-explosive Lyddite shell per gun, which was the normal allowance for anti-torpedo craft guns. Unfortunately, no Lyddite shell was then available and 300 rounds of less powerful 'common pointed' shell were provided instead.[26]

Work began before the end of 1914. There were practically no buildings for the accommodation of officers and men on any of the islands, nor any suitable piers.[27] The islands' natural water supplies were also extremely limited and quite inadequate for the war-time garrisons. Even with water collected from the roofs of buildings, 2,000 gallons per day had to be taken to the islands in a small tank vessel capable of working close in under the lee of the islands, from which hoses were run up to the tanks. It was felt necessary always to have a seven-day supply in the islands' tanks in case supplies were interrupted by bad weather or enemy action.[28]

By 19 November 1914, arrangements were being made to construct a 'Challenge' Signal Station at the highest point at the west end of Inchcolm to ensure that enemy torpedo craft were not tagging along into the port with a swarm of British torpedo craft. The station was in operation before March 1915.[29]

In February 1915, the net under the south span of the Forth Bridge was damaged, probably having become entangled at low water with scrap metal discarded during the construction of the Forth Bridge. While it was being repaired, three lines of indicator nets were laid to provide some defence.[30]

In January 1915, Admiral Lowry wrote again about the need to improve the Forth's defences to tackle destroyers. He requested that four 6-inch guns be mounted in the existing 6-inch emplacements at the North and South Batteries on Inchkeith, empty since 1909. The earlier requests he had made for new batteries in 1913 and in 1914 had now all been met (two 6-inch guns at Kinghorn; two 6-inch at Hound Point; two 4.7-inch QF at Downing Point) and the new Inchkeith guns were rapidly approved; work was in hand by 1 March. [31]

On 2 April 1915, Lowry informed the Admiralty that some of the indicator netting supplied to Rosyth had been used to block permanently the channel south of Inchkeith. The accompanying *Note to Mariners* noted that the net ran from two cables south of Briggs to the 3-fathom (*c* 5.5m) line north of Big Bush shoal, 1.5 miles in length (Fig 5.4 (h)). On 14 April, the Admiral wrote again, noting the laying of permanent indicator nets from Blae Rock (on the north edge of the North Channel, south-south-west of Pettycur) to the 3-fathom line on the North Shore, a distance of *c* ½ mile (Fig 5.4 (j)).[32]

Three, or possibly four, controlled minefields were established in the river just east of the Middle Line, the control stations on Inchcolm and Inchmickery being recorded on War Office maps of the islands published in 1918 (see the entries for both batteries, below) (Fig 5.4 (l–p)).[33]

In July 1915, Lowry suggested that a minefield should be laid between Cramond Island and Inchmickery to prevent a 'rush' of hostile destroyers, which might reach this area without facing the heavy guns at Kinghorn or Inchkeith.[34] By September 1915, an alternate proposal had been approved for a physical barrier of dolphins laid across Drum Sands (along similar lines to the scheme proposed in 1911, described above). Work on this structure was well under way in November (Fig 5.4 (k)).[35]

By November 1915, the defences of the anchorages west and east of the bridge had been transformed: the rearming of Inchgarvie with four 4-inch guns was now complete; the two 6-inch guns at Hound Point, the two 4.7-inch guns at Downing Point, and the two 9.2-inch guns at Braefoot were now in place. Additionally, the Middle Line was now armed with 14 12-pdr (Naval) 18cwt guns. And Inchkeith and Kinghorn had had six 6-inch guns installed or returned to the approved armament since 1914 (Table 9).[36]

The construction of the dolphin boom across Drum Sands was already in hand by 23 November 1915 and almost complete by 10 March 1916.[37] The local defence commander and Admiral Lowry wished to ensure that it was adequately illuminated at night and proposed that five new 16° dispersed beams lights should be built on Inchcolm and one on the north-west corner of Inchmickery.[38] These seem to have been installed.

The discussion in late 1915, concerned as it was with the risk posed by a destroyer attack, prompted reconsideration of the purpose of the Middle Line, hitherto understood to be for defence solely against submarines, not destroyers. The Admiralty decided that an anti-destroyer capability might be provided either by altering the mountings of the 12-pdr (Naval) 18cwt guns to take auto-sights, or, better still, to substitute 4-inch guns.

In mid-March 1916, Lowry again pressed for the upgrading of the armament of Inchcolm to 4-inch and 6-inch guns, but not at the expense of weakening the Inner Line at Dalmeny and Carlingnose. Although he was strongly opposed to the 4-inch guns on Inchgarvie being removed to Inchcolm, the Admiralty agreed to the weakening of the Inner Line to reinforce the Middle Line. These were the last changes planned

Table 9
The peak armament of the defences of the Forth prior to the re-organisation of 1916–17, in April 1916 (WO 33/746; WO 33/755)

Name and Group	Armament	DELs
Inner		
Hound Point 'A' Group	2 x 6-inch Mk VII	2 or possibly 4
Dalmeny 'B' Group	2 x 4.7-inch QF	2 fixed beam
Inchgarvie 'F' and 'H' Groups	2 x 4-inch QF	none
Coastguard 'L' Group	2 x 12-pdr (12cwt)	2 moveable beams; 1 fixed beam (experimental)
Carlingnose 'M' Group	2 x 6-inch Mk VII	none
Downing Point 'O' Group	2 x 4.7-inch QF	1 moveable beam; 1 fixed
Middle		
Inchcolm	8 x 12-pdr (18cwt)	3
Inchmickery	4 x 12-pdr (18cwt)	2
Cramond	2 x 12-pdr (18cwt)	2
Braefoot	2 x 9.2-inch Mk X	none
Outer		
Inchkeith	3 x 9.2-inch Mk X 4 x 6-inch Mk VII	none
Kinghorn	1 x 9.2-inch Mk X 2 x 6-inch Mk VII	none

before the decision was made to upgrade the defences of the Forth to allow it to become the base of the Grand Fleet.

Outermost defences

The first anti-submarine obstruction in the outer part of the estuary was a line of indicator nets placed in April 1915 on a line between Ruddon's Point (Largo Bay) and Still Point (Inchkeith), *c* 3.2km long and starting *c* 800m off Ruddon's Point. This obstruction was removed in May 1915 (Fig 5.5 (q)).[39]

In May 1915, Admiral Lowry requested the supply of indicator nets to create:

- a line of 60ft (18.2m) indicator nets, two miles (*c* 3.2km) in length, from East Vows to 'Position Y'; (Fig 5.5 (r));
- a line of 60ft indicator nets, two miles in length, supplemented by 84ft (25.6m) nets where necessary, from Eyebroughy to 'Position X'; (Fig 5.5 (s));
- between 'X' and 'Y' four miles (6.4km) of 84ft indicator nets with their tops submerged to a depth of 40ft (12.2m) below the surface at low tide (Fig 5.5 (t)).

These nets were in place by November 1915 but it was expected that they would have a life of only ten to 12 weeks.[40]

From at least late 1915, the Army Council and the Admiralty were in consultation over a new line of defences at the mouth of the Firth of Forth consisting of four heavy guns to be sited on the Elie–Fidra line. These would prevent enemy heavy ships lying off the mouth of the Forth and bombarding naval and commercial shipping and docks, Edinburgh or the coast defence guns. After preliminary surveys suggested a cost of about £100,000, no further work was done.[41]

The armoured train

The defences of the Forth were strengthened for most of the war by an armoured train armed with two 12-pdr QF guns and two Maxim machine-guns (Fig 5.6). The train, 'Norna', or 'No. 1 Armoured Train', was the second of two built and operated in Britain. The train was first mentioned in the Annual Return of Fixed Armaments dated 21 February 1915; by 1 April 1916 it was still recorded as 'mounted' although no longer 'approved', and at that date was temporarily reinforcing the defences of the Nobel factory at Ardeer on the Ayrshire coast. We know that its complement in July 1916 was two officers and 13 other ranks. It was recorded in April 1918 as still being 'additional' to the approved armament and based at Craigentinny in Edinburgh. It was formally attached to No. 19 (Forth) Fire

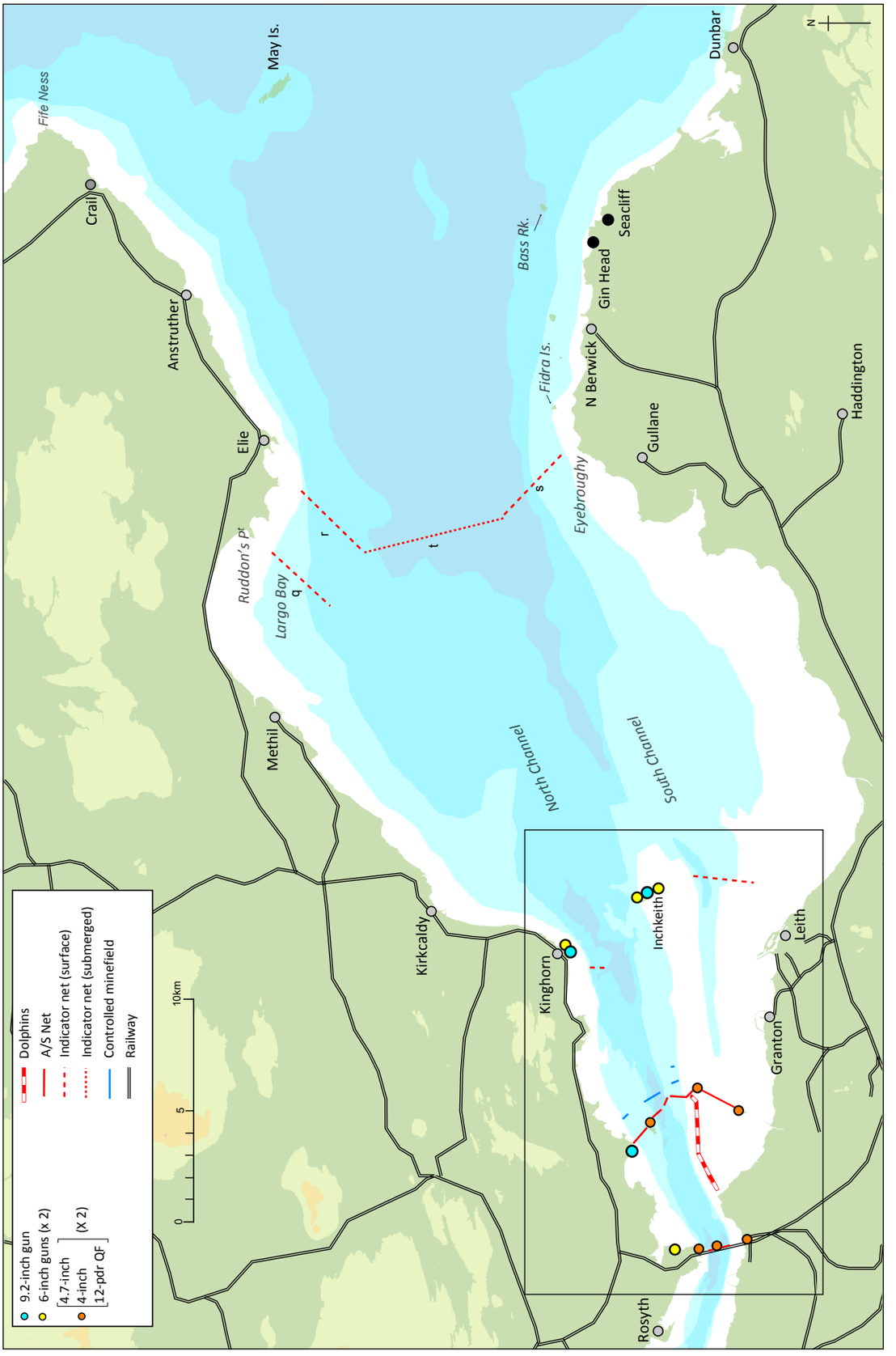


Figure 5.5
Map of the outer estuary in 1914–16 showing the location of anti-submarine nets, anti-boat booms and built obstructions. The defences of the inner estuary are shown only in general (the area covered by Figure 5.4 is marked). The short length of indicator net protecting Largo Bay was only in place in April–May 1915 (© Gordon Barclay)

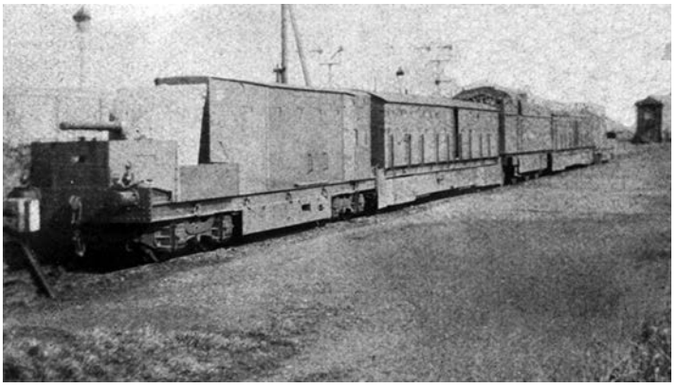


Figure 5.6
The armoured train attached to the Forth Defences, at the Craigentinny Depot (© Bruce Stenhouse Collection)

Command (that is, the Outer Defences, with its HQ on Inchkeith) and the Bruce Stenhouse collection contains copies of the formal authority for the train unit to draw 3lb of tea from the Professional & Civil Service Stores in George Street, Edinburgh in March 1918.[42] Two photographs of the train are known, showing one of the standard coast defence 12-pdr QF 12cwt guns mounted in the open portion of an eight-wheel wagon, the rest of which was steel-sided and provided with firing loops. The Maxim gun occupied a compartment at the other end of the wagon in which the 12-pdr was mounted.[43]

Submarine mining in the First World War

When, towards the end of 1914, it was realised that shipping was at severe risk from attack by submarines or raiders, the Admiralty proposed to revive the former system of controlled minefields, but this time under naval control. A new unit was raised within the Royal Marines, based on a cadre of retired former Royal Engineer Submarine Miners. Colonel F G Scott, a former submarine miner, was appointed to command the Royal Marine Submarine Miners, which came into existence on 5 February 1915. The relatively small force (in 1917, 300 men) had its HQ in Newcastle-upon-Tyne.[44]

The reputation of the unit was, unfortunately, marred by corrupt behaviour by Colonel Scott and others. Membership of the Corps conferred benefits: special rates of pay; being able to live near home; and, above all, avoiding the dangers of front-line combat; and evidence was gathered that men could pay a fee to Scott to enter the Corps. Scott, one of his captains and a RMSM private were all convicted and imprisoned.[45]

During the First World War, progress was made using hydrophones and magnetophones in conjunction with controlled minefields, the former giving the shore-based operator a better chance of blowing a set of mines when a submerged submarine was in the minefield, the latter a sound-operated minefield.[46] But it was the development of detector loops that brought controlled minefields into their own in the closing months of the First World War (see below).

The first use of hydrophones, 1915

The development of hydrophones – devices capable of detecting vessels by the noise they made passing through the water – took place largely in the Forth, at HMS *Tarlair*, near Aberdour. *Tarlair* was also the training centre for hydrophone operators.[47]

Table 10 lists the hydrophone stations established in the first phase of deployment in the Forth with their dates of operation. The hydrophones were withdrawn in May–August 1915 because Vice-Admiral Beatty believed they were giving too many false alarms.[48]

5.4 '. . . a matter of the first Naval importance':[49] defences for the Grand Fleet, 1916–18

According to Lord Jellicoe's memoirs, towards the end of 1915 or early in 1916 he discussed with Sir Henry Jackson (then First Sea Lord) the disadvantages of basing the Grand Fleet so far north as Scapa Flow. Both men felt that with the fleet at the northern base, the difficulties in intercepting the German High Seas Fleet during coast raids and of dealing with landing raids covered by the High Seas Fleet were so considerable as to make it desirable to base the whole fleet further south. A discussion of the defences necessary to secure the Forth Estuary took place at Rosyth on 5 April 1916 (see below), and Jellicoe recorded that he suggested a scheme of submarine obstructions across the Firth of Forth that would allow berthing the whole Grand

Table 10
The first phase of hydrophones installed in the Forth (after Hackmann 1984)

Station	Established	No. of Instruments	No. of Operators	Closed
Oxcars	March 1915	4	4	May 1915
Inchcolm	May 1915	5	4	August 1915
Elieness	May 1915	5	4	August 1915

Fleet in that anchorage and allow gunnery and torpedo practice to be carried out with a considerable degree of safety in the Forth. Despite the concerns of some senior officers, Jellicoe decided that the strategic advantage outweighed the objections, and the scheme was proceeded with.

The Germans were aware that the dockyard was nearing completion and tried to damage it. Three Zeppelins set off to raid Rosyth on the night of 5/6 March 1916, but were diverted by high winds; on the night of 2/3 April four airships set off to bomb the dockyard and the bridge. Two reached the Forth: L14 failed to find the intended targets and bombed Edinburgh and Leith; L22, having bombed empty fields near Berwick-upon-Tweed, dropped its few remaining bombs on Edinburgh.[50]

The 5 April 1916 conference was attended by representatives of the Admiralty, GHQ Home Forces, Commander-in-Chief Rosyth and GOC Scottish Coast Defences, who discussed the strengthening of defences to allow ships to anchor below (east of) the bridge. It was decided that heavier guns from the Inner Line would be moved eastwards to strengthen the Middle Line, with lighter guns from the Middle Line being moved west: two 6-inch guns would be moved from Carlingnose to a new battery at Pettycur; four 4.7-inch QF (two each) from Dalmeny and Downing Point to Inchcolm; four 4-inch QF Mk III from Inchgarvie to Inchmickery, these four being replaced by two 12-pdrs from Inchcolm and two from Inchmickery.[51]

Lowry also suggested that extra guns were needed: two 4-inch QF to replace the remaining two 12-pdr QF on Inchcolm (this was not done); two 6-inch on the north end of Inchkeith – a site for one 6-inch already existed, and there was room near it for a second. There were also changes in the DELs: lights were moved from Carlingnose and Dalmeny to the Inchcolm line, and two more were added. There was also to be a new 48-inch searchlight at the south end of Inchkeith to cover the observation minefield.

As noted above, the plans to strengthen the boom and net defences of the estuary, in particular to reduce the vulnerability of ports to a 'rush' by a pack of fast destroyers, had been developed in 1915. These plans were now given added impetus to prepare for the Grand Fleet. The conference now decided that an anti-destroyer boom should be placed in every channel, except where piling would provide both an A/B and A/S obstruction.

At the end of April 1916 and again in May, the Admiralty stressed the extreme urgency of making the improvements to the defences: 'The early completion of the Defences is a matter of the first Naval importance, as upon it depends the redistribution of the Fleet in Northern waters'. But by late June 1916 the Admiralty was expressing concern that, 'Military Authorities unable to give any approximate date for completion of work on new defences'.[52]

Concerns about delays continued to grow in July and August, prompting explanations from the War Office of the considerable difficulties faced: the want of workmen and transport; the absence of piers to land 30–40 tons of materials safely every day; and the dependence on good weather. It was even difficult at this stage of the war to source adequate lengths of suitable timber in the UK for the dolphins. Despite drafting in additional works companies, it appeared that all the military labour available would be absorbed at Inchcolm and Inchmickery. The War Office felt that the best way the Admiralty could assist was to take over entirely the work on Inchmickery from the Army. The Admiralty agreed on 29 July.[53]

In mid-September 1916, Admiral Lowry reported to the Admiral Commanding-in-Chief, Grand Fleet, that the Admiralty works department would complete all the work on Inchmickery in January 1917 (if 5,000 tons of materials could be safely landed over the autumn and winter). The War Office estimated, in November, that all work would be completed by the end of the year, except the gun on the West Stell of Inchkeith, which would not be finished until early January.[54] Work did not progress as quickly as hoped, and it was only at the end of May 1917 that the Outer Line of defence was approaching readiness: all the new 6-inch guns (two at Leith, two on Inchkeith, and two at Pettycur) were mounted, even if not formally 'in action'. On the Middle Line, the new 6-inch and 4-inch guns on Inchcolm were 'practically in action', six of the seven DEL emplacements were near complete or well under way, and two of the four 4.7-inch guns would be ready to fire by late June; on Inchmickery, the four 4.7-inch guns were in action, with temporary lights. The Inner Defences (Inchgarvie and Coastguard) were ready.[55]

The new Commander-in-Chief Rosyth, Admiral Hamilton, in January 1917 proposed amendments to the scheme of obstructions then under construction, including the omission of the anti-destroyer boom between Inchcolm and Inchmickery, because the risk of an attack by destroyers or other surface craft was now considered negligible. The abandonment of the duplicate destroyer boom was approved by the Admiralty in February.[56] By mid-July 1917, an A/T net had been affixed to the Mickery Pile Boom. In the same month, a new concern began to occupy those responsible for the defence of the Forth – the threat of 'skimmers', coastal motor boats. The booms in the Forth did not have hawsers at the surface that could obstruct such shallow-draft boats, and it was considered that the existing jackstays would have to be raised. The part of the scheme of obstructions that would protect the fleet while exercising was completed by December 1916, and the whole scheme of new obstructions was in place by July 1917. Jellicoe, in his memoirs, suggests that this was a year later than planned, but this is an unjustified criticism, as the scheme of obstructions had only been put in train in May 1916.[57]

The formal completion of the revision of the defences of the Forth was marked by an exchange of letters between the Admiralty and the War Office in November 1917.[58] Table 11

shows the changes in gun strength and location between 1915 and 1917. The Battle Fleet, as it was by then known, finally sailed into its new base on 12 April 1918. The fleet that sailed out from the Forth on 24 April comprised 193 ships. The Grand Fleet assembled in the Forth on 11 November 1918 comprised 246 ships: [59] the Battle Fleet of 30 battleships, three armoured cruisers, 15 light cruisers, and six aircraft carriers; the Battle Cruiser Squadron, of 11 battle cruisers, 19 light cruisers; Destroyer Command comprising two light cruisers and 160 destroyers, divided into seven flotillas.

All these ships could be accommodated behind the defences of the Forth.

Figure 5.7 and Figure 5.13 summarise the location of A/S, A/B and indicator nets in 1916–18 and show the moorings protected by them. We have not found any chart that shows the locations of controlled minefields.

The final arrangement of obstructions was strong and comprehensive. We describe them using the contemporary terminology and with reference to Figure 5.7.

Inner defences

Figure 5.7 (a) and (b) the '*Bridge Boom*': below the two spans of the Forth Bridge were heavy A/S nets, both of which (from 1916) could be lowered to allow ships to pass through.

Middle defences

Figure 5.7 (c) – (g) The '*Islands Boom*': comprising five elements.

(c) the '*Mickery Pile*' or '*Drum Sands*' boom which ran west–east across the Drum Flats from Hound Point to Inchmickery (Fig 5.8). Formed of a line of dolphins set 60ft

Table 11
The armament of the Inner and Middle Defences of the Forth before and after the re-organisation of 1916–17 (WO 192/100; WO 192/108; WO 33/746; WO 33/755; WO 33/828)

Battery	1915	1917
Inner		
Hound Point	2 x 6-inch Mk VII	2 x 12-pdr (Naval) 18cwt
Inchgarvie	2 x 4-inch Mk III QF	2 x 12-pdr (Naval) 18cwt
Inchgarvie 'B'	2 x 4-inch Mk III QF	2 x 12-pdr (Naval) 18cwt
Coastguard	2 x 12-pdr (12cwt)	2 x 12-pdr (12cwt)
Downing Pt	2 x 4.7-inch QF	2 x 12-pdr (Naval) 18cwt
Carlingnose	2 x 6-inch Mk VII	Disarmed
Dalmeny	2 x 4.7-inch QF	Disarmed
Middle		
Cramond Island	2 x 12-pdr (Naval) 18cwt QF	2 x 12-pdr (Naval) 18cwt QF
Inchmickery	4 x 12-pdr (Naval) 18cwt QF	4 x 4-inch QF Mk III
Inchcolm	8 x 12-pdr (Naval) 18cwt QF	2 x 6-inch Mk VII
		4 x 4.7-inch QF
		4 x 4-inch QF Mk V
		2 x 12-pdr (Naval) 18cwt QF
Braefoot	2 x 9.2-inch Mk X	Removed
Outer		
Inchkeith	3 x 9.2-inch Mk X	3 x 9.2-inch Mk X
	4 x 6-inch Mk VII	6 x 6-inch Mk VII
Kinghorn	1 x 9.2-inch Mk X	1 x 9.2-inch Mk X
	2 x 6-inch Mk VII	2 x 6-inch Mk VII
Pettycur	–	2 x 6-inch Mk VII
Leith	–	2 x 6-inch Mk VII

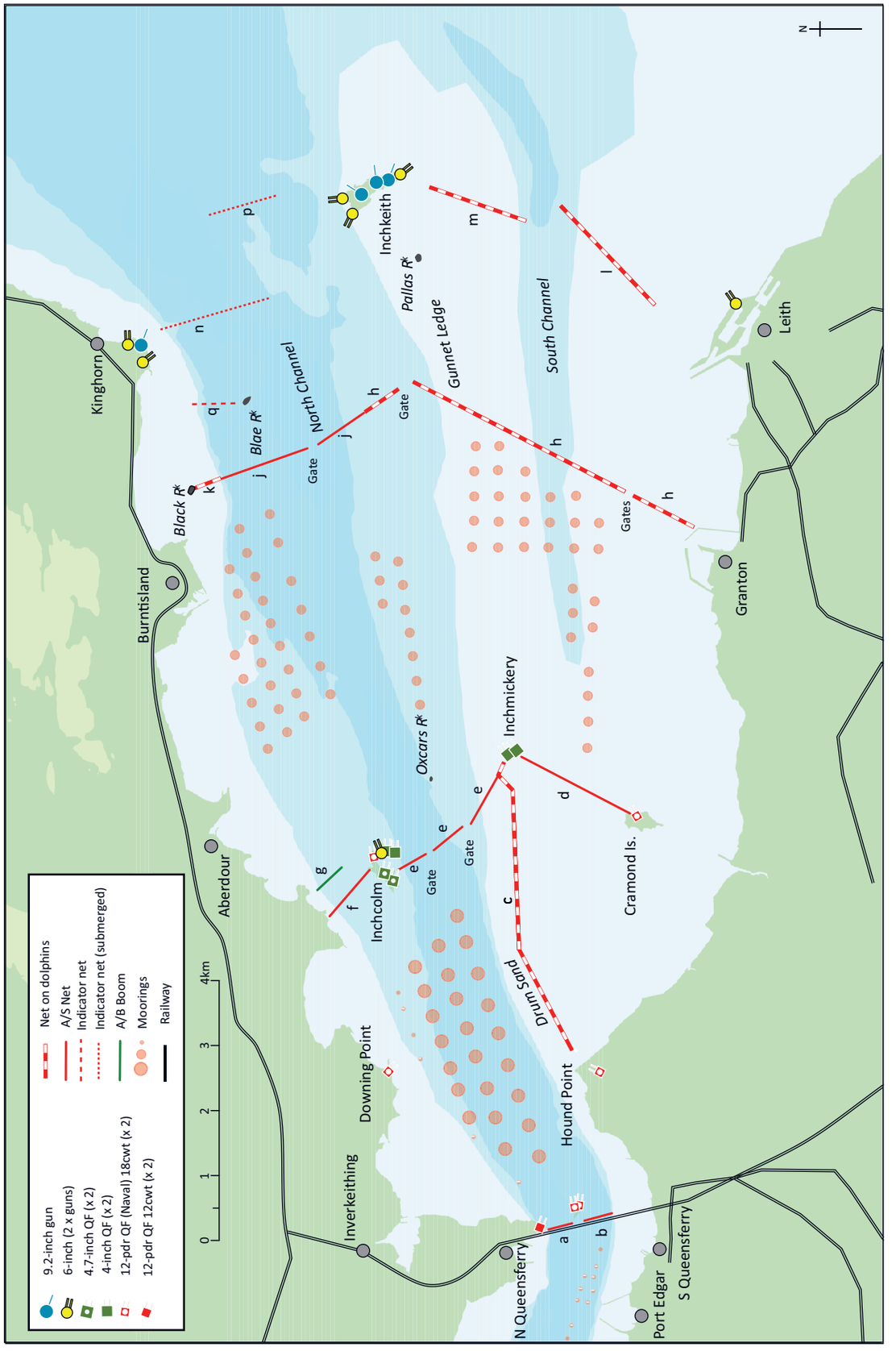


Figure 5.7

Map of the inner estuary in 1917, showing the location of anti-submarine nets, anti-boat booms, and built obstructions. The additional moorings for warships (between the Forth Bridge and the Middle Line) and the Fleet Auxiliaries (between the Middle Line and the Black Rock – Granton boom) recorded on the 1919 Admiralty chart are also shown. There had been a further 48 warship moorings above the Bridge in 1913, and over 90 by 1918 (© Gordon Barclay)

(18.3m) apart linked by steel hawsers and supporting 'T' type A/T net, providing both A/T and A/B defence.

(d)–(f) the '*Oxcars Boom*', in three segments from Cramond Island, (d) a floating A/S boom/net; (e) a floating A/S boom/net, to the south side of Inchcolm, with two gates through the nets, for the channels north and south of Oxcars; (f) a floating A/S boom/net from Inchcolm to Braefoot Point. (g) In advance of (f) there was a length of A/B boom, anchored at the north at Vault Point, where the northernmost section of the boom was formed of concrete blocks and steel girders.

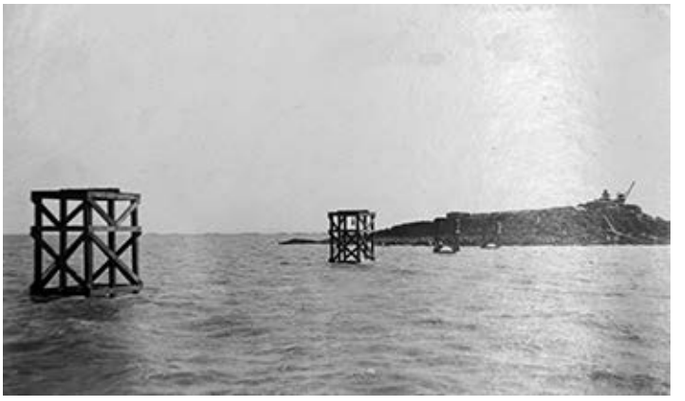


Figure 5.8
The easternmost section of the Drum Flats – Hound Point dolphin boom – where it turned south towards Inchmickery, which is in the background. The island is clearly in the throes of its major rebuilding of 1916–17 (Reproduced by permission of MOD Naval Historical Branch)

Outer Defences

Figure 5.7 (h) – (k) The '*Black Rock Boom*', which ran from the north-east corner of Granton Harbour to the Black Rock on Burntisland Sands. The southern section, 6.7km long (Fig 5.7 (h)), was a barrier of dolphins set on the bottom of the river, linked by 5-inch hawsers and supporting A/S nets, with two gates immediately beside each other, on both sides of a Gate ship (Fig 5.9). A second '500ft [*c* 152m] gate' was located near the northern end of the dolphins. The next section, some 2.5km long, ran from the northern end of the dolphin line, and was formed by a floating net supported by a line of 12 moored trawlers (Fig 5.7 (j); Fig 5.10) There was a '500ft [*c* 152m] gate' where the net crossed the North Channel. The northernmost part of the barrier, across Burntisland Sands to the Black Rock, was formed by dolphins (Fig 5.7 (k); Fig 5.11).

Figure 5.7 (l) and (m) The '*Inchkeith Pile Boom*' was in two parts (Fig 5.12), both comprising a line of dolphins linked by steel hawsers and supporting A/S nets, forming a continuous boundary between Big Bush rocks at Leith and Inchkeith, a gap of *c* 570m between them, at the South Channel (the main approach to Leith Docks).

Figure 5.7 (n) – (q) Up to three lines of indicator nets (surface and submerged) restricted the width of the North Channel north of Inchkeith.[60]

The strengthening of the Outer Line of defences between Granton and Black Rock provided moorings for Fleet

Figure 5.9
The Gate Ship at Granton, painted by Charles Pears in 1918. The scarlet-painted ship that operated the gate is passed by a sailing ship entering the river. The anti-submarine boom, supported on 'dolphins' set into the bottom of the river, is clearly visible (Imperial War Museum. Art 1358)

Figure 5.10
A portion of one of the Forth A/S nets held in place by a line of trawlers (Reproduced by permission of MOD Naval Historical Branch)

Auxiliaries between the Outer and Middle Lines. Figure 5.7 shows the moorings recorded on the 1919 Admiralty chart (29 moorings in four lines, south-west of Burntisland; ten moorings in two lines along the Oxcars Bank, east of Oxcars Rock; 31 moorings in six lines north and north-west of Granton).[61]

The outermost defences

Immediately after the April 1916 meeting about the strengthening of the defences, it was proposed that an anti-submarine net should be established in two sections between Elie Ness and Fidra (Fig 5.13 (v and x)), with a two-mile-wide (*c* 3.2km) gap (the 'Fidra Gap') in which an indicator net would be run, its top 40ft (12.2m) below the surface (Fig 5.13 (w)). This barrier was described as running approximately parallel to, and one mile to the east of, the existing lines of indicator nets (Fig 5.13 (s, t and u)). The position was considered too exposed for gate-vessels, moored stem and stern, to be used. The line of the boom was established at a conference at Rosyth on 12 May 1916, chaired by the First Sea Lord. Its purpose was to 'enable vessels of the Home Fleets to carry out gunnery practices, etc in the Firth of Forth'. Material for the boom was identified in nets, buoys and other material recovered from the Dover Straits Boom, which was being replaced by a minefield. The barrier was to be 'as nearly as possible on the Dover Strait lines'; the Dover Boom was described in a US Navy history of boom and net defences as consisting of 'heavy baulks … to be connected by heavy jackstays and support anti-submarine nets',[62] and later as 'a heavy boom of considerable strength, with large square iron bound floats of Oregon pine attached to each other by an upper and a lower jackstay' (Fig 5.13 (v and x)).[63]

Figure 5.11
The northernmost section of the Black Rock Boom, showing the final 'bracing' of the hawser, with Black Rock in the background. Dated 30 May 1917 (Reproduced by permission of MOD Naval Historical Branch)

Figure 5.12
The northern section of the Inchkeith Pile Boom, under construction, with Inchkeith in the background. Dated 20 June 1917 (Reproduced by permission of MOD Naval Historical Branch)

When the fleet was exercising, a two-mile length of surface indicator nets was to be drawn across the Fidra Gap; together with the permanently installed deep water indicator net, this would close the Firth to submarines.[64] Personnel were to be diverted from the Folkestone and Boulogne boom depots, which were being closed.

The North Sea was the site of offensive and defensive mining by both sides on a large scale. The 1919 Admiralty chart of the east coast from St Abb's Head to Aberdeen marks areas as 'Prohibited (Sunken Mines)'. The largest of these occupies a slightly dog-legged area measuring 11.5km by 4.5km running a little east of north from the East Lothian coast towards the May Island (Fig 5.13). We believe that this marks the site of a First World War minefield, the effect of which would be to restrict the width of the navigable channel (over 20 fathoms; that is, *c* 36.6m) south of the island. The channel to the north, between Crail and the May Island, is nowhere more than 20 fathoms.

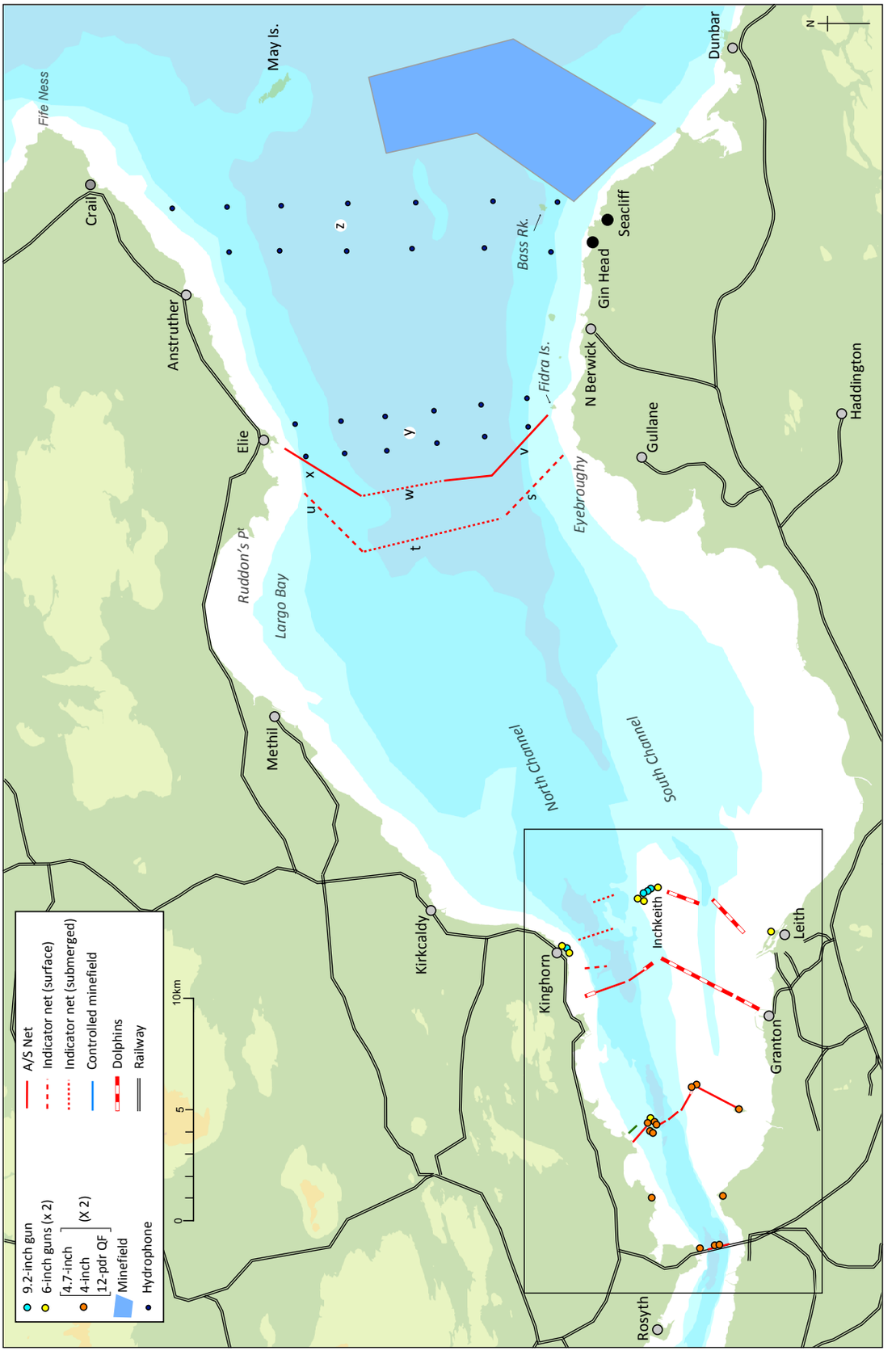


Figure 5.13
Map of the outer estuary in 1916–18 showing the location of anti-submarine nets, anti-boat booms and built obstructions. The positions of hydrophones is approximate, based on a written description of their location. The extent of Figure 5.7 is indicated (© Gordon Barclay)

The Fidra Boom was refurbished between November 1917 and March 1918 and proposals were revived in November 1917 for the provision of heavy gun defences for the Elie–Fidra line; 9.2-inch guns could not, however, be ready for a year or more. The need for these heavy guns was restated in July 1918 by the Commander-in-Chief, Scottish Command, supported by the naval Commander-in-Chief Rosyth, 'As the FIRTH OF FORTH has become probably the most important Naval base in the United Kingdom … I consider it absolutely vital that this additional protection be given to the Fleet and Dockyards and am of opinion that nothing less than this will suffice'. The Armistice in November 1918 saw the sudden end of discussion of the proposals.[65]

Hydrophones, 1916–18

In 1916, Vice-Admiral Beatty suggested that hydrophones should be reinstalled in the Forth, given the level of submarine activity detected off the estuary in June. Although they had originally been withdrawn in 1915 at Beattie's request because of the level of false alarms, the technology had improved.[66] Hydrophones could detect a vessel at ranges of up to three miles (4.8km) in good weather. The new hydrophones were positioned in two arrays just west of the May Island, between Crail and Seacliff, and between Elie Ness and Fidra, in November 1916 (Fig 5.13 (y and z)).

Hackmann records that the outermost hydrophones were arranged between Crail and Seacliff, where the control stations were established (seven operated from Crail, six from Seacliff).[67] Our best approximation of the location of the hydrophones is shown on Figure 5.13.

The other array of hydrophones was laid between Elie Ness and Fidra in conjunction with the A/S boom on the same line, with listening stations at Elie Ness and at Fidra. Three huts were to be provided at each station for two officers and six Chief Petty Officer operators.[68] The location of the lines was described as follows, on 18 July 1916:

> From the stations at Elieness and Fidra, a double line of Hydrophones each consisting of six instruments should be laid … 3 of the instruments on each line being connected to Elieness and Fidra stations respectively. The two lines should be about 4,000 yards (*c* 3,660m) apart and the Hydrophones in each line about 2,330 yards (*c* 2,130m) from each other …

Both stations were manned by a Lieutenant RNVR, a Sub-Lieutenant and six Chief Petty Officer operators, to allow a continuous watch. The stations were linked to each other by a submarine telephone line so that the operators could compare the sounds picked up by their instruments and so determine the course and direction of a submarine moving in mid-channel. Both stations had telephone links to the Extended Defence Officer at Inchkeith, who was responsible for the anti-submarine defences in the Forth.

A further set of three hydrophones was proposed in the spring of 1916, to lie south of Inchkeith, to 'act as a sentry to the Pile Boom and Net Obstruction which will block the gap across the "Narrow Deep"' and to act as sentry to a controlled minefield proposed to north and south of Blae Rock'. In the end, it was decided in September 1916 that these hydrophones were not needed.[69]

Detector loops

The physics of the detector loop (the induction of a current in a cable as a magnetised vessel moved over it), was first applied experimentally in the Firth of Forth by the Scottish physicist Alexander Crichton Mitchell at HMS *Tarlair* in 1915. Unfortunately, his report on the potential of the technology to detect submarines was misunderstood at the Board of Investigation and Research (BIR). William Bragg of BIR suggested the re-examination of the report in 1917, and a successful detector loop was developed at the research establishment at Harwich by mid-1918. Its first operational use was at Scapa Flow, when, in combination with controlled mines, it led to the sinking of the German submarine U-116 in October.[70]

5.5 Anti-aircraft defence

In February 1915, the anti-aircraft gun defence of the Forth (at least that element of it under Army control) comprised

Table 12
Hydrophones operating in the second phase of deployment, 1916–18 (after Hackmann 1984)

Station	Established	No. of Instruments	No. of Operators	Closed
Inchkeith	November 1916	5	6	December 1918
Elieness	December 1916	6	6	December 1918
Fidra	February 1917	6	6	December 1918
Crail	May 1917	7	6	December 1918
Seacliff	August 1917	6	6	December 1918

Table 13
Anti-aircraft defences of the Forth, mainly for the defence of naval installations and the anchorage, and for Edinburgh, at two dates in the First World War (ADM 137/1170; WO 33/828)

Site	May 1916	June 1917
Crombie	3-inch	18-pdr QF
Culross	–	18-pdr QF
Hillock Point	3-inch	3-inch (20cwt)
Rosyth	3-inch	–
East Camps (near Dunfermline)	–	18-pdr QF
Mastertown (near Rosyth)	–	3-inch (20cwt)
South Fod (near Rosyth)	–	18-pdr QF
Inverkeithing	3-inch	–
Inchmickery	3-inch	–
Inchcolm	–	3-inch (20cwt)
Inchkeith	3-inch	3-inch (20cwt)
Leith	–	3-inch (20cwt)
Arthur's Seat (east Edinburgh)	3-inch (site uncertain)	3-inch (20cwt)
Corstorphine (south-west Edinburgh)	3-inch	18-pdr QF
Borrowstown (Bo'ness)	–	18-pdr QF
Easter Dalmeny (south-east of Forth Bridge)	–	18-pdr QF
Mannerston	–	3-inch (20cwt)
Echline (south of Port Edgar)	–	3-inch (20cwt)
Ferry Hill (North Queensferry)	–	3-inch (20cwt)
Polmont (south of Grangemouth)	–	18-pdr QF
Grangemouth	–	18-pdr QF
East Fortune Aerodrome – Sherriff Hall	–	3-inch (20cwt)
East Fortune Aerodrome – East Linton	–	3-inch (20cwt)

two 6-pdr QF guns at Rosyth (one for the dockyard and one at the oil tanks) and two 1-pdr pom-pom guns on travelling carriages at the Armaments Depot at Crombie. A map of 1915 shows the Crombie guns on the raised beach north of, and higher than, the ammunition sheds.[71]

In the spring of 1916, the AA defence for the Rosyth dockyard comprised four 6-pdr guns manned by naval ratings. Revised arrangements under Army control provided, by May 1916, eight AA sites armed with 3-inch guns (Table 13). All of the AA sites were at least 20 miles from the mouth of the estuary, and Admiral Lowry suggested that the redundant 6-pdr guns could be deployed with naval ratings at St Abb's Head, Fife Ness and on the May Island and on the Bass Rock or at Seacliff. Zeppelins had made landfall near these places to fix their position before carrying out raids over the east of Scotland. The request was turned down.[72] By 1 June 1917, the number of AA guns in the Forth had increased to 20 (Table 13).

Notes

1 WO 33/515.
2 *Fife Free Press*, 8 August 1914.
3 ADM 137/992.
4 Hough 2000: 130.
5 Andrew Kerr, pers comm.
6 ADM 137/992.
7 WO 33/697.
8 Dobinson 2000: 45.
9 Eighty-six civilians were killed and 424 wounded in Hartlepool, along with seven soldiers killed and 14 injured.

10 Massie 2004: 321–31.
11 Girvin and Cosens 1919: 57.
12 *Fife Free Press*, 30 April 1921.
13 In the early years of mines and torpedoes, until the 1870s, all forms of explosive apparatus for use in the water could be termed 'torpedoes', and the two terms could be used interchangeably.
14 Office of Naval Intelligence, Navy Department 1917.
15 Bureau of Ordnance 1944.
16 ADM 186/377; ADM 137/1045.
17 Girvin and Cosens 1919: 61.
18 Office of Naval Intelligence, Navy Department 1917.
19 Girvin and Cosens 1919: 59, 61.
20 ADM 137/994.
21 ADM 137/1170.
22 ADM 137/994.
23 ADM 137/994.
24 ADM 137/994.
25 ADM 137/994.
26 ADM 137/994.
27 ADM 137/994.
28 ADM 137/994.
29 ADM 137/994; ADM 137/1075.
30 ADM 137/1075.
31 ADM 137/1075.
32 ADM 137/1075.
33 ADM 137/1075.
34 ADM 137/1170.
35 ADM 137/1170.
36 ADM 137/1170.
37 ADM 137/1264.
38 ADM 137/1170.
39 ADM 137/1075.
40 ADM 137/1045.
41 ADM 137/1892.
42 WO 33/873.
43 WO 33/766; WO 33/755: 814; Osborne 2017: 90–1.
44 ADM 137/1075.
45 ADM 178/26,
46 Magnetophone-controlled mines were laid at Cromarty and Scapa Flow; Friedman 2014: 342.
47 Maxwell 2014: 6. 1,090 officers and 2,731 naval ratings were trained at Tarlair.
48 ADM 137/1217.
49 ADM 137/1170.
50 Robinson 1971: 137; Cole and Cheesman 1984: 122–3.
51 WO 192/101; WO 192/108.
52 ADM 137/1170.
53 ADM 137/1217; ADM 137/1892.
54 ADM 137/1170.
55 ADM 137/1892.
56 ADM 137/1280.
57 Jellicoe 1918: 78.
58 ADM 137/1372.
59 Andrew Kerr, pers comm.
60 ADM 137/1217.
61 Hydrographic Office 1919 *Admiralty Chart 114b, Firth of Forth – Fisherrow to Port Edgar 1919*; ADM 137/1217.
62 Bureau of Ordnance 1944: 6–7.
63 ADM 137/1170; ADM 137/1372.
64 Morris et al 2007: 36.
65 ADM 137/1372.
66 ADM 137/1217.
67 Hackmann 1984: 65, table 3.2
68 ADM 137/1217.
69 ADM 137/1217.
70 Walding 2009: 140–5.
71 WO 33/706; WO 78/4396.
72 ADM 137/1170.

Chapter 6

MUCH ADO ABOUT NOTHING, 1919–38

6.1 Stasis, 1919–29

In the months following the end of the war, the naval establishment in the Forth began to wind down. On 30 January 1919, the Admiralty decided that in view of the urgent necessity to demobilise as many ranks and ratings as possible at Scapa Flow, Cromarty and the Firth of Forth, all coast and harbour defence measures including booms could be suspended. However, some guns and searchlights were to be kept fully manned. In the Firth of Forth, the two 6-inch guns on Inchcolm and their searchlights were to continue in operation. In May 1919, it was agreed by the Navy and Army that the coast defences of the Forth could be stood down. In June 1919, the boom defence establishment was closing.[1] Dobinson notes that in England some coast defence projects were unfinished, and these, in general, were allowed to go on to completion.[2]

The history of coast defence from 1918 to 1931 was set out in the latter year by Lt Col Sir Maurice Hankey as the first paper presented to a sub-committee of the Committee of Imperial Defence, established under the chairmanship of Sir Stanley Baldwin to examine the 'whole coast defence situation'. Hankey's paper provided a useful summary of developments in thinking (although rarely of any action) in those 13 years.[3]

On 1 July 1919, the Annual Returns recorded the defence of the Forth as unchanged from the Armistice, although the list records that the 12-pdr (18cwt) Naval guns had been approved for the fitting of auto-sights and 'rigid mountings', suitable for their coast defence role – a little late one would think. The Coastguard, Hound Point and Downing Point batteries were also listed as having had their personnel withdrawn. Interestingly, the Forth is recorded in the same document as having two 12-pdr (12cwt) guns at Leith Fort for drill purposes (no longer listed in 1922) and a 64-pdr smooth-bore gun on Inchkeith for signalling purposes.[4]

A year after the Armistice, on 1 November 1919, the War Office wrote to the Home Ports Defence Committee to inform it that it intended that the coast defences would be reduced to care and maintenance. The defences had served their purpose in the late war and would be 'sufficient and adequate until the further advance of scientific mechanical invention has resulted in a considerable change in the methods of attack and defence of coastal areas'. Consequently, the Army Council did not propose 'to effect any alterations whatsoever in the existing Coast and Harbour Defence of the United Kingdom'. There were, however, plans to regularise the ownership of batteries built on land held under the Defence of the Realm Act, including Cramond Battery, Inchmickery and Inchcolm of the Middle Defences, and Leith Docks and Pettycur in the Outer.[5]

In August 1919, the Government, at the insistence of the Chancellor of the Exchequer Winston Churchill, promulgated the rolling 'Ten Year Rule', which meant that the armed forces should prepare their annual estimates 'on the assumption that the British Empire would not be involved in a great war' for the following ten years. The application of the rule led to major cuts in defence spending and to a lack of long-term investment. It was finally abandoned in 1932.

A Joint Committee of the Home and Overseas Defence Committees was set up in March 1920 to consider the future needs of coast defence. During the next decade, this Committee produced a series of reports, starting with basic principles, in 'Forms of Attack and Forms of Defence', finalised December 1922.[6] Starting in February 1923, and completed in eight reports between 1924 and 1931, the Joint Committee reviewed the defences of individual ports on the basis of these principles. At the time of writing his summary in 1931, however, Hankey could report that although plans had been drawn up for the revision of almost all the coast defences of the Empire, none had been implemented: 'For practical purposes the coast defences, which were out of date at the end of the War, are still in the same state. They are armed with guns … outranged by modern cruisers and battleships, and not provided with up-to-date shell.'[7]

Although the Forth could be described in 1918 by General Scott-Moncrieff (Director, Fortifications & Works, War Office, from 1911 to 1918) as 'probably the most important Naval base in the United Kingdom',[8] the strategic importance of the North Sea diminished rapidly, as the German and Russian

navies were negligible forces. France and her large bomber force became the likeliest threat and consequently southern bases again became the focus of interest.

In 1922, the last year for which traditional annual returns of Fixed Armament were published, all the Inchkeith 9.2-inch and 6-inch guns were in care and maintenance, as were the 6-inch guns at Pettycur. The Kinghorn 9.2-inch and 6-inch guns and the 6-inch guns at Leith Docks were for 'Training and Practice'. All the guns of the Middle Defences were in care and maintenance, apart from Coastguard (by this date included in the Middle Line), for Training and Practice; the 12-pdr guns and carriages on Cramond and on Inchcolm were noted as 'deficient'.[9]

The Washington Treaty (ratified in 1923) limited the relative sizes of the fleets of the main naval Powers (Britain, the USA, Japan, France and Italy), the maximum sizes of ships, and a maximum armament of 16-inch guns. The effect of the limitations on the Royal Navy meant that, should Britain be at war with Japan, the fleet left at home would barely be equal to that of France.[10] While the British Battle Fleet was expecting to face France in the Mediterranean, its cruisers would be stationed nearer home to protect shipping; but a concentration of modern French cruisers in Home Waters might cause problems for the Royal Navy; these were of 10,000 tons displacement, with eight 8-inch guns, and their modern gunnery control could ensure that 70% of shells would fall within 100 yards (*c* 91.4m) of their target.[11] Despite this, coast defence was not considered a priority for spending.

In 1925, a Joint Committee paper confirmed that, 'The North Sea [had] ceased to be the most important strategic area in Home Waters, and the fleet anchorages employed in the late war [were] no longer suitable'. Scapa Flow was to be replaced as the fleet anchorage by Berehaven (Co Cork), which would provide a base for operations in the Channel and in the Atlantic, and was out of range of French air attacks.[12]

Rosyth, beyond the range of French land-based air attack, was initially to continue in use as a naval docking and repair port but the Committee of Imperial Defence decided that Rosyth should be placed in care and maintenance in October 1925.[13]

Although Rosyth had diminished in strategic significance, Largo Bay in the Forth was selected in the mid-1920s as the main convoy assembly point on the east coast. In any war with France, all British trade through the English Channel would immediately be rerouted around the north coast. Largo Bay was chosen because of its capacity, its accessibility by rail, its location (allowing the reduction of transit times for cargoes travelling via the north of Scotland) and its reasonable protection from the weather.[14]

This convoy anchorage required defence. It was to be able to accommodate up to 130 vessels and, despite its distance from France, 'this anchorage offers so promising an object of attack to any hostile cruiser which had penetrated into the North Sea that the provision of defences to meet a heavy scale of cruiser attack is essential'. Largo Bay was seen as vulnerable to bombardment by ships of the line, minelaying, bombardment by submarines and attacks by coastal motor boats (CMB).[15] The convoy anchorage could not, however, easily be made secure, as it was outside the existing outer line of the Forth defences. Separate anti-torpedo defences for the naval and convoy anchorages would cost between £600,000 and £700,000, and it was considered more economical to concentrate the defence in one line at the May Island. The provision of an anti-submarine boom across the estuary there (eight miles (12.9km) long in difficult waters), 20 anti-submarine patrol vessels and a controlled minefield 11.3 miles long (*c* 18.2km), as well as over 200 miles (*c* 322km) of detector loop, would cost £297,500.

A wholesale move of the Forth defences eastwards was proposed by the Naval Staff in July 1925 to meet possible French attacks by armoured cruisers, destroyers or submarines: the Inchcolm Fire Command would be completely disarmed, and the few remaining guns at the bridge would be replaced by a 6-pdr twin gun, once such a weapon was available. Inchkeith would lose all but two of its 6-inch guns. The most significant proposals were the addition of a single 9.2-inch gun at both Caiplie (Fife) and Gin Head[16] (Lothian) to cover the May Island minefield, along with a further eight 6-inch guns at these two sites, on the May Island and at 'Lady's Folly', on Greenside Hill, south-east of Cockburnspath, capable of firing into the southern approaches to the May Line. The provision of guns on this outermost line (using only 6-inch guns at Caiplie, on the May Island and at Gin Head) was again discussed in 1927.[17]

In April 1930, the 'approved scheme' for the defence of the Forth provided for 'Outer Defences on the Line FIFENESS – MAY ISLAND – CAM HEAD [that is, Gin Head]; Defences on the Line KINGHORN – INCHKEITH – LEITH DOCKS and a single battery of twin 6-pdrs at INCHGARVIE Battery' but ominously, 'it will be some considerable time before any work is likely to be commenced on the installation of the new armament' … 'The Military Authorities are therefore working on an Interim Defence Scheme utilising the existing Guns and Lights …'.[18] This Interim Defence Scheme would form the basis of the defence until the Second World War, and is set out in Table 14.

The decade closed with the publication of the *Manual of Coast Defence (Provisional)* in 1930, superseding the edition of 1914. The greatest difference from the earlier version was the addition of defence against aerial attack and co-operation between guns and spotting aircraft.[19]

In December 1931, the politician Sir Stanley Baldwin, who had been prime minister in 1923–4 and 1924–9 and would be again in 1935–7, was appointed by the Prime Minister of the National Government, Ramsay MacDonald, to chair a small sub-committee of the Committee of Imperial Defence,

Table 14
Table showing both the 'Interim Defence Scheme' of April 1930 and the detailed armament table of 1934 (WO 192/252 1931-1955). A further document suggests that only four of Inchkeith's 6-inch guns were to be employed: A1, A2, L2 and M1 (WO 192/251)

	Interim Defence Scheme of April 1930		**Armament Table June 1934**	
Battery	**Guns**	**Notes**	**Gun Group**	**Armament**
Outer Defences				
Leith Docks	2 x 6-inch Mk VII 2 x DELs	Covering the channel between Inchkeith and Leith	'X'1 and 'X'2	2 x 6-inch Mk VII
Inchkeith South	2 x 6-inch Mk VII 2 x DELs		'A'1 and 'A'2	2 x 6-inch Mk VII
Inchkeith	3 x 9.2-inch Mk X	Covering the east and west of Inchkeith	'B'1, 'F'1 and 'H'1	3 x 9.2-inch Mk X
Inchkeith North	4 x 6-inch MK VII 2 x DELs	Covering the channel between Inchkeith and Kinghorn	'L'1 and 'L'2 'M'1 'O'1	2 x 6-inch Mk VII 1 x 6-inch Mk VII 1 x 6-inch Mk VII
Pettycur	2 x 6-inch Mk VII		'S'1 and 'S'2	2 x 6-inch Mk VII
Kinghorn	2 x 6-inch Mk VII 3 x DELs	Covering sea area east of Kinghorn	'Q'1 and 'Q'2	2 x 6-inch Mk VII
Kinghorn	1 x 9.2-inch Mk X		'R'1	1 x 9.2-inch Mk X
Inner Defences				
Coastguard	2 x 12-pdr QF 2 x DELs	In defence of North Channel under Forth Bridge	'H'1 and 'H'2	2 x 12-pdr QF
Inchgarvie	4 x DELs			

on coast defence. Baldwin had been chairman of the CID for much of the previous decade.[20] The new committee's remit was:

> to examine the whole coast defence situation, in particular developments resulting from the introduction of air forces, with a view to making recommendations for improving the security of the defended ports throughout the Empire.[21]

It was for this small committee that Sir Maurice Hankey (the sub-committee's secretary) produced its first paper, the summary of developments between 1918 and 1931, mentioned at the beginning of Chapter 6.[22]

A key issue in earlier discussions had been the extent to which enemy capital ships would be risked in attacking coastal targets; now, the development of powerful cruisers, whose loss would not seriously damage an enemy's fleet, was believed actually to have *increased* the possibility of an attack by bombardment.

The sub-committee oversaw a bitter argument over the asserted superiority of aeroplanes over fixed artillery for coast defence. The controversy had been sparked off in January 1925, when the Joint Committee had been considering the defences required for the proposed naval base at Singapore, a key element in British naval strategy in the Far East.[23] The Chief of the Air Staff pressed hard for this to be undertaken by torpedo aircraft, which had a range of 150–200 miles, rather than 'locking up the valuable resources represented by six or eight 15-inch guns'. The claims by the Air Staff as to the anti-ship capacity of aircraft were, to put it mildly, optimistic. The Naval and Military Staffs responded with concerns about 'the unproved power of aircraft to achieve decisive results against modern ships … and to the poor results that have hitherto characterised bomb-dropping experiments against mobile targets'. They were also worried that the Chief of the Air Staff relied on moving air assets when an emergency arose, rather than basing them at any port, and that aircraft were ineffective at night and in poor weather.

Although the Baldwin Committee eventually decided in favour of co-operation between the services rather than the wholesale replacement of guns by aircraft, 'the whole question of revision of Coast defence in the Dominions was brought to a standstill'.[24]

6.2 Developments affecting the Forth, 1930–8

In 1928 and again in 1932, the area between Canty Bay on the East Lothian coast, and the Bass Rock was used to test new developments in controlled mining. No controlled minefield or detector loop had apparently been laid since the end of the war, and the officers and ratings had little practical experience. The 1928 trials of detector loops and controlled mines were only moderately successful but, by the end of 1931, sufficient

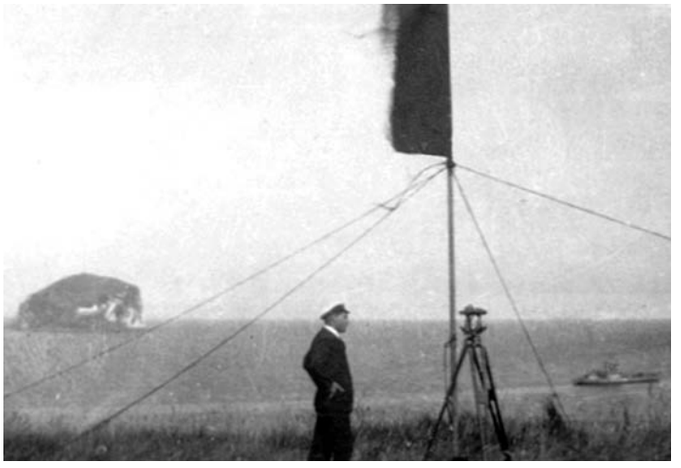


Figure 6.1
The Bass Rock viewed from the Canty Bay tented base-camp, 1932, with a range-finder visible at the left-hand edge of the image (© Trustees of the National Museum of the Royal Navy)

technological progress had been made to warrant further trials.

Two series of tests were carried out: Series 'A' was to test the use of double galvanometers to eliminate 'perturbation' problems, and to trial the 'Firing Rule', which determined when the mines would be fired in relation to a detected crossing of the loop. Series 'B' was for 'AE Units', a non-contact magnetic mine trigger sensitive to a vessel's magnetic field. (In the end AE triggers were never employed.)

The trial party was based in tents in the bay, with support facilities at Rosyth, two minelayers and two 'target' vessels, submarine L20, and an 'R' class destroyer, HMS *Skate*, which made hundreds of crossings of the test area. Six standard mine loops were laid (detector loops of the kind laid round a line of mines, although the mines were not actually laid for the tests). Two guard loops were laid in advance of the mine loops. The results showed that loops laid by trained personnel using standard equipment could obtain a high level of detecting efficiency. The tests, over nine weeks in August to October, provided a strong basis for the Admiralty's deployment of workable equipment from 1938 onwards, in the run-up to the Second World War.[25]

In a 1935 report on the state of defence of key ports, the Forth was considered likely to be attacked by cruisers, merchant cruisers and smaller vessels. Its 'Defences Required' and 'Present Provision' showed a woeful lack of preparedness. The cost of providing an A/S boom, A/T nets, two HDAs and 'hurdle' obstructions was estimated at £107,800.[26] There is a hint in a document of July 1939 that at least the cables for four detector loops and three HDAs had been laid in 1937.[27] The actual installation of a third HDA is recorded in August 1939.[28]

A list of gun ranges on a map (dated 1 April 1936) provides us with a picture of the planned heavy armament of the Forth (four 9.2-inch guns on Inchkeith and Kinghorn; 12 6-inch guns at Kinghorn, Pettycur, on Inchkeith and at Leith Docks). The map also showed the two proposed 6-inch batteries at Caiplie and 'Cam Head' (that is, Gin Head), which had been approved in 1930. Interestingly, the site of the battery built at Kincraig in 1940 is marked in pencil on the map, although the date of the amendment is not clear.[29]

Notes

1 ADM 137/1892.
2 Dobinson 2000: 48.
3 CAB 16/105. Sir Maurice Hankey (later Lord Hankey) (1877–1941). In 1931, Secretary to the Committee of Imperial Defence, former Cabinet Secretary and Royal Marine Artillery Officer. One of the great British public servants of the 20th century (Dictionary of National Biography).
4 WO 33/873; WO 33/942. We believe these two guns may have been those later recorded as being mounted for drill and practice on Inchkeith in the late 1930s.
5 CAB 13/2; CAB 12/1.
6 CAB 16/105.
7 CAB 16/105.
8 WO 32/5528.
9 WO 33/1006.
10 CAB 36/17.
11 CAB 36/17.
12 CAB 36/17. Berehaven was one of three 'Treaty Ports' retained by the UK under the terms of the Anglo-Irish Treaty of 1921. The ports were given up in 1938.
13 CAB 36/17; CAB 3/4.
14 ADM 116/2493.
15 CAB 36/17.
16 Gin Head was marked as Gun Head or Cam Head on various military maps and naval charts, leading to considerable confusion for many years.
17 CAB 36/16; CAB 36/17; CAB 36/18.
18 ADM 116/2493.
19 WO 33/1186.
20 CAB 2/5.
21 CAB 16/105.
22 CAB 16/105.
23 CAB 16/105.
24 CAB 16/105; CAB 24/231/39.
25 ADM 253/14; A1977/060 1932 (Royal Navy Submarine Museum); Cowie 1949: 103–4.
26 ADM 116/4113.
27 ADM 1/9848.
28 ADM 1/9849.
29 WO 78/5179.

Chapter 7

THE SECOND WORLD WAR, 1938–45

'The Firth of Forth represents the most militarily and economically important area of the Scottish east coast for British warfare.'[1]

7.1 Growing tension, March 1938 to 1939

The reoccupation of the Rhineland in 1936 was the first indication that the Nazi regime in Berlin was prepared to risk the use of force to occupy or, in its terms, reoccupy 'German' territory. There followed the *Anschluss* with Austria in March 1938, the occupation of the Sudetenland in October 1938, the invasion of the rest of Czechoslovakia in March 1939 and Germany's ultimatum in the same month to Lithuania, to 'return' a province lost to Germany in 1919. From 1938, Britain began seriously to prepare to defend itself and on 31 March 1939 Britain and France guaranteed Polish independence.

References in an Admiralty file suggest that four indicator loops and three Harbour Defence ASDIC units had been laid in the Forth in 1937 in 25 fathom water (*c* 46m), and that they were due for urgent maintenance by August 1939.[2] Early in the war six Harbour Defence ASDICs were placed on the seabed west of the May Island loops.[3] The position of four of the six HDA instruments was recorded on a chart of an anti-submarine exercise on 8 June 1943, just west of the inner line of guard loops (Fig 7.1).[4]

Work on other parts of the anti-submarine defences began in 1938; for example, moorings were placed for the booms on the bottom of the main channel. Instructions had been issued in May to prepare the Rosyth boom defences, beginning with the A/S equipment across the main ship channel southward of Inchcolm – laying trots and other moorings in Mortimer's Deep and across the main channel south of Inchcolm, and the gate moorings between Inchcolm and Cramond. A scheme was developed to bring the anti-submarine, anti-boat and anti-torpedo boom defences to a high state of readiness by March 1939. The guard loops were already in position and a portable control station was stored at Rosyth which could be installed at 24 hours' notice. Work was still needed to complete the Port War Signal Station on the May Island, to be completed in 1939. It was at this stage that the decision was made to erect an anti-boat boom of concrete pylons between Cramond Island and the mainland.[5]

On 12 October 1938, naval authorities in the east of Scotland emphatically denied rumours, which had apparently gained some currency, that a German submarine had ventured into the Forth during the international crisis preceding the Munich Agreement and became trapped in the boom defences, with loss of life. The Navy vigorously denied it: 'It is utter rubbish, and definitely harmful that such a story has gained currency.'[6] From our research, it seems certain that no booms or nets were in place in 1938.

German naval intelligence had, by March 1939, built up a detailed, if not wholly accurate, picture of the ports, installations and defences of the Forth.[7] Their conclusion was that:

> The Firth of Forth represents, militarily and economically, the most important area of the Scottish east coast for British warfare. The Rosyth war harbour, situated to the west of the Forth Bridge on the north bank of the Firth of Forth, had been closed down until 1925–27. With the port on the south bank, Port Edgar, it is the most important naval base of the entire British east coast, and possesses the most modern state shipyards [in Britain]. The Firth of Forth is still the only anchorage for a large fleet in the northern section of the British east coast.

While the report had the broad outline of the defences correct, any German force attacking the river would have faced one or two surprises, particularly as the defences were weaker than their intelligence suggested. There had been sufficient indications to lead the Germans to expect coast batteries at Fife Ness, Crail and Dunbar, the latter having supposedly had six 6-inch guns during the First World War. The batteries of Inchkeith and Leith were described accurately, the latter having been photographed from nearby in the docks (Fig 11.86), the former mapped in some detail, with annotated photographs of the north and west sides, although three torpedo tubes observed on the pier in 1936 were imaginary. Batteries were supposed to exist on the Middle Craig rock and at Portobello. Both the 'Battery Point' (Coastguard) and Inchgarvie batteries were recorded as still each being armed with two light guns with protective shields.

In July 1939, it was recorded the Forth had by that date four indicator loops and three Harbour Defence ASDIC sets in

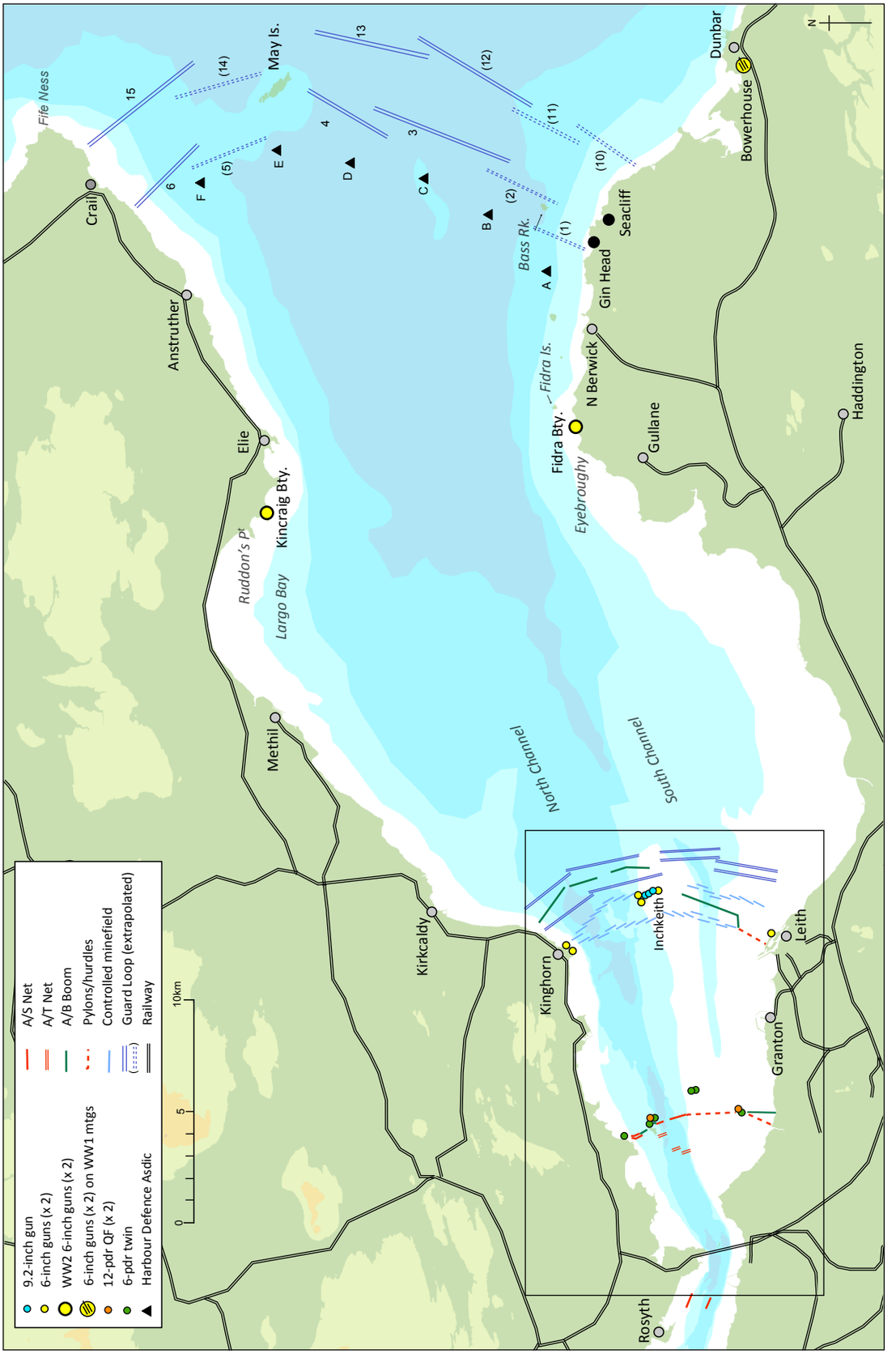


Figure 7.1
Map of the outer estuary in the Second World War, showing the location of anti-submarine nets, anti-boat booms and built obstructions. The extent of Figure 7.3 is indicated (© Gordon Barclay)

position, and that 73 nautical miles of loop cable had already been laid in 1937.[8]

The War Diary of the Forth Fixed Defences recorded the preparations in the days leading up to the declaration of war, starting on 22 August 1939 with the receipt of the code-word 'HASTINGS'; the cancellation of all leave on the 23rd; the guarding of vulnerable points and the issuing of the code-word 'PLUMER' on the 24th;[9] Inchgarvie, Coastguard, Kinghorn and Pettycur were ready for action on the 25th; the infantry defence and the Examination Service was in place on 1 September; the warning at 9 a.m. on the 3rd, 'Expect hostile action after 0900 hours'; and finally the signal at 1.20pm on the same day from the War Office: 'WAR HAS BROKEN OUT WITH GERMANY.'[10]

In November 1939, the Forth's defences were listed as three 9.2-inch guns, 12 6-inch guns (with 15° mountings); four 12-pdr QF and two 2-pdr QF 'pom-poms' of First World War vintage, on Inchcolm, in an anti-motor torpedo boat (MTB) role. In a list of priorities for further guns, the Forth was first for 6-pdr twins, above the Humber, Harwich and the Thames; it was not, however, a priority for further medium or heavy armament – Scapa Flow, for example, was listed as the first priority for 6-inch guns in the UK.[11]

In December 1939, it is recorded that an experimental RDF (radar) station was to be situated for testing between Crail and Caiplie, in Fife: 'preliminary trials indicate that it may be possible to plot the position of surface craft between May Island and the north shore under all conditions of visibility'. In the meantime, five 'look-out trawlers' were requested to supplement the A/S trawlers on visual watch over the 'proposed loop system'.[12]

At the outbreak of the Second World War the anti-submarine defences of the Firth of Forth were in a far more advanced state than at the outbreak of the previous conflict (Table 15).[13]

British losses in home waters were high from both U-boats and mines, but the U-boats were withdrawn for the Norwegian campaign and were subsequently deployed in the Atlantic, operating from captured bases in France. The U-boats began operating again in British coastal waters during late 1944, after they had lost their French bases and had been relocated to Norway. From this time until the end of the war, a concentrated attack on British coastal waters took place, which was later known as the 'Inshore Campaign'.[14]

Curiously enough, it was a new U-21, following in its predecessor's footsteps, which succeeded in penetrating the Firth at the beginning of the Second World War. On the night of 4 November 1939, it laid nine mines around 15km east-north-east of Inchkeith before escaping. Her mines have been credited with two sinkings and the damage caused to the light cruiser HMS *Belfast* on 21 November 1939. U-21's successes apparently resulted in the doubling of the indicator loops at the mouth of the Forth soon afterwards.[15]

During the Second World War, the German Air Force took over the role of laying mines, starting in November 1939 with the laying of the first magnetic mines off the east coast of England. Despite countermeasures, these parachute mines remained a threat throughout the war, with reports of mainly Heinkel HE-111 aircraft dropping them in the Forth, especially during the period 1940–1. From the spring of 1940, references begin to be made to a degaussing range near Inchkeith, to demagnetise ships' hulls (for example, on 13 May 1940, 'Destroyer JUNO was detached *en route* to run the D.G. Range at Inchkeith').[16]

There is an anecdotal report of a parachute mine exploding (presumably prematurely) *c* 1,000ft (*c* 300m) above Inchcolm Abbey. It did not cause any damage to the historic monument but a number of service personnel were taken to hospital suffering from concussion.[17]

7.2 Indicator loops, ASDIC, booms and mines, 1939–45

A series of reports by the Commander-in-Chief Rosyth on the defensive armament of Rosyth Command (that is from Invergordon to the Berwickshire coast) from August 1941 to March 1943 included not only the gun armament and the booms, but also indicator loops, minefields and booms at minor harbours, and show the defences at their peak,

Table 15
War Office table of armament mounted in 1937–9, May 1940 and November 1940, as well as what was 'approved' in February 1941 (CAB 44/47 1948)

Allocation 1937–9	In Position May 1940	In Position November 1940	Approved (but not all eventually mounted) February 1941
3 x 9.2-inch (35°)*	3 x 9.2-inch (15°)	3 x 9.2-inch (15°)	4 x 9.2-inch (35°)
1 x 9.2-inch (15°)†		2 x 6-inch (Naval)‡	4 x 6-inch (45°)
16 x 6-inch (15°)	14 x 6-inch (15°)	14 x 6-inch (15°)	12 x 6-inch (15°)
	4 x 12-pdr§	4 x 12-pdr	4 x 12-pdr
6 x twin 6-pdr		6 x twin 6-pdr	6 x twin 6-pdr

* Inchkeith; † Kinghorn; ‡ Fidra; § Inchcolm and Cramond

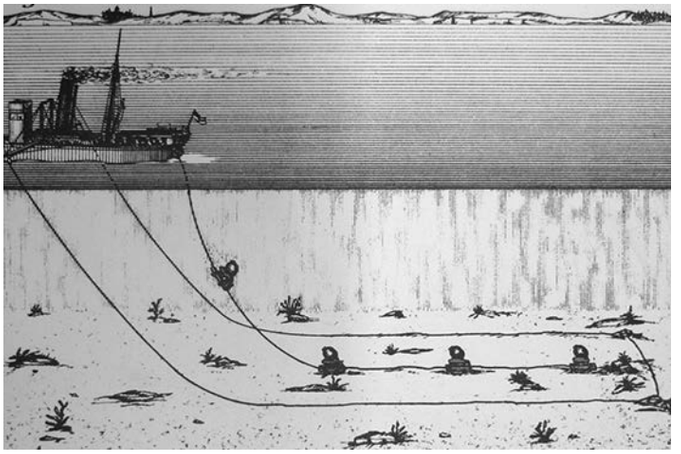


Figure 7.2
The method of laying a line of controlled mines within the detector loop round them (Admiralty 1938 *Handbook of Controlled Mining*)

before the 'Flood Tide' reduction programme (Fig 7.1) (Table 16).[18]

In 1941 to 1942, even the smallest harbours in the Forth were to some extent defended by booms or had barriers of some kind ready to block the entrances. Dunbar was also equipped with a flame projector at the Victoria entrance. The value of these defences and the need to expend scarce resources on them must be doubted.[19]

In the Second World War, three armoured trains were deployed to provide mobile artillery support for the anti-invasion defences. Two of them, based at Stirling and in Edinburgh, could bring their pair of short-barrelled 6-pdr guns to bear on any part of the Forth coast where there was a railway line.[20]

The development of indicator loops at the end of the First World War transformed the effectiveness and value of controlled mines. 'Guard loops' were simple indicator loops set in advance of the minefield to give warning of an approaching vessel. 'Mine loops' were laid around sets of controlled mines in such a way that the operator would know when a submarine had entered the controlled minefield and the mines could be detonated (Fig 7.2). All the mines in a set of 16 mines would be blown at once; to avoid leaving a hole in the defences, the lines of mines were overlapped (see Fig 7.3 (l, m, n and o)).

The controlled mining handbook issued in June 1938 shows the arrangement of a 'standard 16 mine loop', individual mines being 112ft (34.1m) apart (to avoid sympathetic detonation), within a rectangle of cable 640 yards (585.2m) long and 25 yards (22.9m) wide, the cables extending 120ft (36.6m) beyond the last mines. Guard loops, covering the whole front of the controlled minefield, could be of any length up to *c* 3,000 yards (*c* 2,750m). The standard mine contained 500lb (226.8kg) of explosive and had a life under water of about a year before maintenance or replacement was required. The control stations in the Forth were portable and comprised a control hut, a power hut containing engines and batteries, and a telephone. Purpose-built mine control towers were built in other ports, but not in the Forth. A normal single station could control up to eight separate mine loops and two guard loops. Each 16-mine loop was supposed to overlap by 160 yards (146.3m) but the lines had to be 100 yards (91.4m) apart to avoid sympathetic detonation. Each mine had a destructive circle of 35ft (10.7m) radius in all directions.[21]

There were also guard loops at the May Island. These were laid in pairs, the two loops overlapping along a centre line, thus allowing the operator to determine in which direction a submarine was moving. There were two lines of these double loops, one in advance of the other. Six of these loops are mapped on a chart recording a submarine penetration exercise and are marked on Fig 7.1 (labelled '3', '4', '6', '13', '15', and one un-numbered, probably No. 12). The chart seems only to show the specific loops used in the penetration exercise, and we have marked the likely positions of six further loops implied by the numbering system, by the testimony of servicemen who operated the loops, and a mention of the establishment of a loop guarding the gap between the Bass Rock and the coast.[22] We do not yet know where loops 7, 8 and 9 were located, and future research may reveal a different pattern from that which we propose.[23]

Whereas the hydrophones in use in the First World War were 'passive' detectors, merely detecting the sounds made by a ship, the breakthrough in using sound to detect submarines came with 'active' methods, known at first as ASDIC, and later as SONAR, developed towards the end of the First World War; in ASDIC, the set generated one or more sound signals and the time taken for the signals to return and their direction provided accurate information on the location of submarines. Although ASDIC was almost exclusively mounted on warships, Harbour Defence ASDIC (HDA) was installed on the seabed to detect submarines in the vicinity of ports. HDA was developed in Britain in the 1920s and used in the Forth in the Second World War.[24] The HDA sets controlled from the May Island were switched on when the guard loops detected a possible submarine (Fig 7.1 (A–F)).[25]

There were two complete lines of physical obstructions across the Forth in the Second World War, one across the river at Inchkeith and the other at Inchcolm (Fig 7.3).

At Inchkeith, a vessel approaching the anchorage by the North Channel would first have to cross guard loops, which would alert their operators to a developing attack; the guard loops were arranged in double lines (Fig 7.3 (g and h)). Between the guard loops in the North Channel there was an anti-boat boom in three parts (Fig 7.3 (p)); this is marked on two charts of the defences, and is included in a list of defences dated 1 March 1942. It is explicitly stated that a 'dummy boom' had been put in place earlier and was replaced by the light A/B

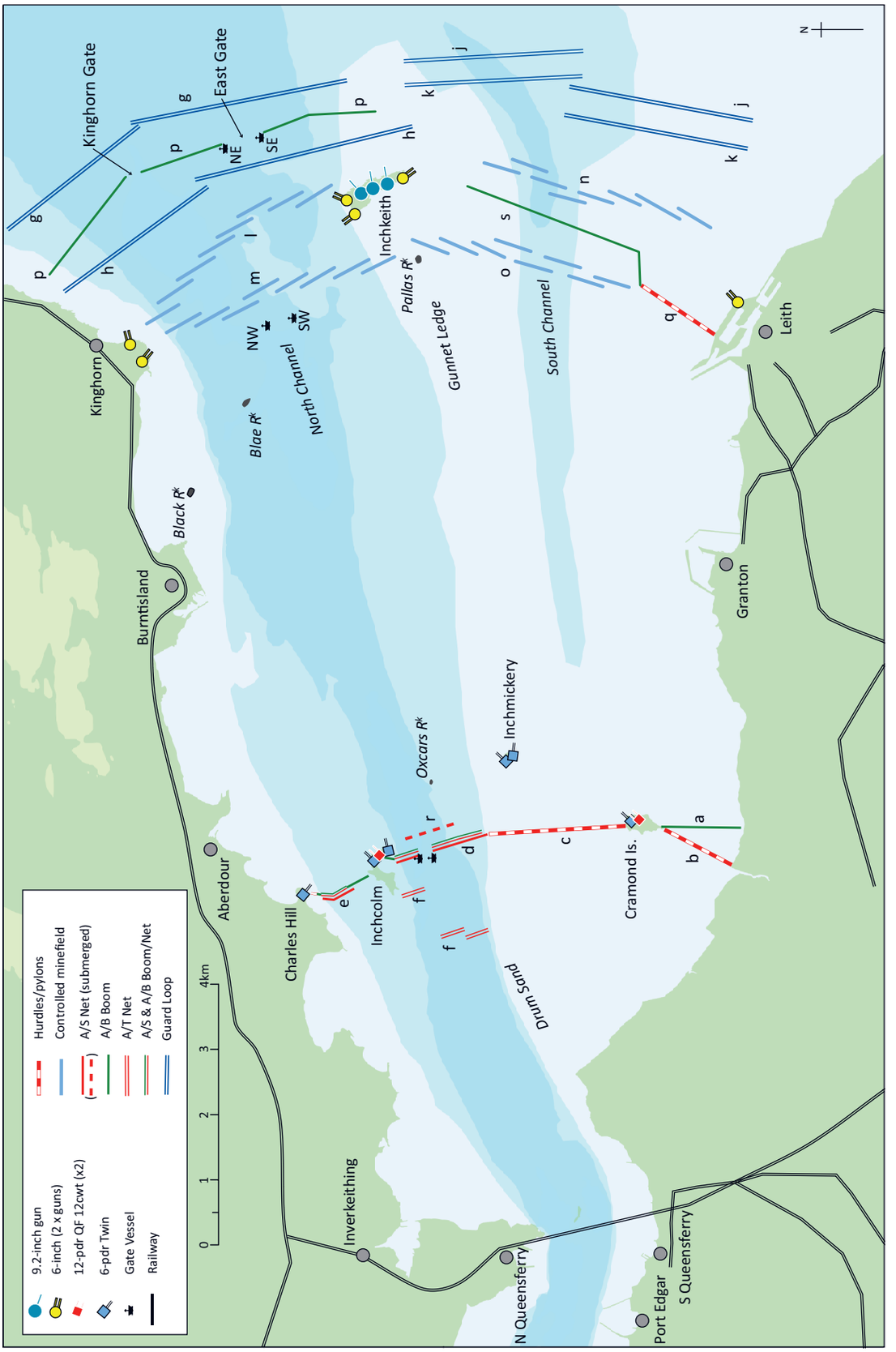


Figure 7.3
Map of the inner estuary showing the location of guns, anti-submarine nets, anti-boat booms, controlled minefields, guard loops and built obstructions, around 1942 (© Gordon Barclay)

boom by May 1942. The 'East Gate' through this boom was provided with two gate vessels (labelled 'NE' and 'SE'), while the 'Kinghorn Gate' to the north was intended for emergency use. Another double line of guard loops covered the area south of Inchkeith (Fig 7.3 (j and k)).[26]

Once it had passed the guard loops, an enemy submarine would then face the teeth of the defences – a series of 32 sets of overlapping controlled mines, in two double lines, each set within its own detector loop (Fig 7.3 (l, m, n and o)). The mines were controlled from Kinghorn, Inchkeith and Leith. Between the two southern lines a further boom is marked on one chart and as a 'proposed' boom on another (Fig 7.3 (s)). This boom was anchored at the northern end of the Leith rail barrier, constructed of lengths of railway line, which ran out from the edge of the docks for a distance of *c* 1,500m (Fig 7.3 (q)). The rail barrier itself is marked as an obstruction on the Admiralty Chart of 1946 and was still, in 2017, being salvaged for scrap.[27]

All the defences near Inchkeith were contained within a 'Dangerous Area', the north-east and west limits of which were marked on one of the charts. A number of charts and tracings show that there was a very closely defined safe course, two cables (371m) wide, from east-north-east to west-south-west. Where this route passed out of the Dangerous Area, there were two further gate vessels ('NW' and 'SW', Fig 7.3).

The inner boom was on the Inchcolm line. In the absence of an obstruction across the Drum Sands, the gap between Cramond Island and the mainland was blocked for the first time to prevent the passage of torpedo craft at high tide; initially, there was a floating boom anchored at both ends, until a permanent barrier of concrete pylons was built (Fig 7.3 a and b respectively; Fig 10.9).

The main Second World War anti-submarine and anti-boat booms ran direct from Cramond Island to Inchcolm, and then to the Fife coast. In the first section, out to the 10 fathom (*c* 18.2m) isobath, the boom was supported on hurdles (Fig

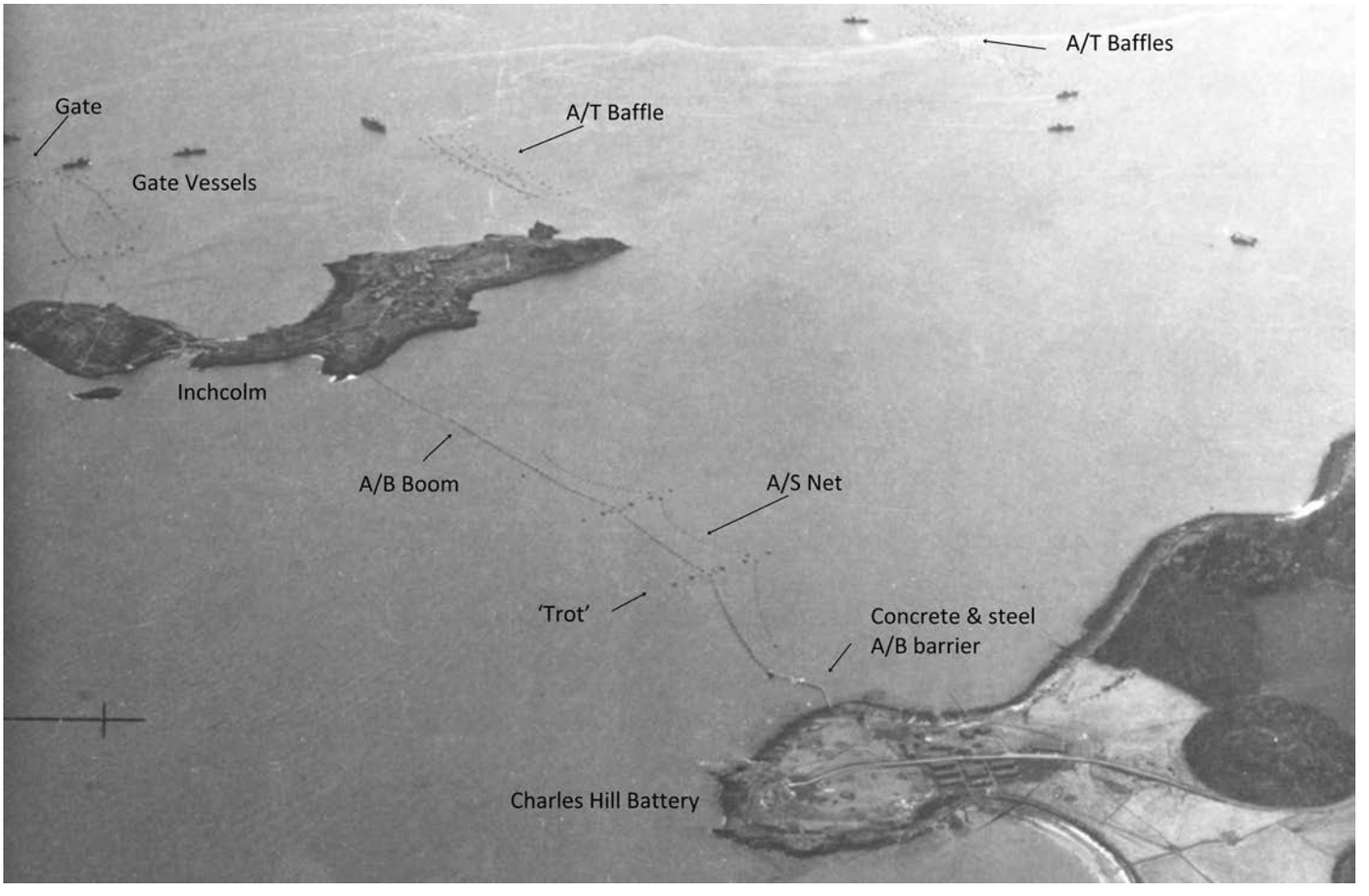


Figure 7.4
A detail from an RAF aerial photograph dated 6 April 1941, showing the anti-boat (A/B) and anti-submarine (A/S) obstructions between Charles Hill and Inchcolm, the main gate beyond, and the anti-torpedo (A/T) 'baffles'. In the foreground is the First World War A/B barrier of concrete and steel, re-used in the Second World War as the northern anchor point of the boom (© National Collection of Aerial Photography 000 000 158 003 www.ncap.org.uk)

Table 16
The defences at their Second World War peak, as recorded in November 1941 (ADM 1/12930 1941–43)

Name	Approved Armament	DELs	Notes
Outer line			
Kincraig	2 x 6-inch 15°	2 x moving concentrated beams	Examination Battery, then Close Defence. 45° mountings and Mk XXIV guns by 1/3/1943
Direlton (Fidra)	2 x 6-inch 11°	2 x moving conc. AA type searchlights	ex-Naval guns of unknown Mark. By 1/3/1943 complement reduced; Home Guard reinforcement if needed
Middle Line			
Kinghorn	2 x 6-inch 15°	2 x moving concentrated beams	Examination battery, then Close Defence. In care and maintenance by 1/3/1943
Pettycur	2 x 6-inch 15°	2 x moving concentrated beams	By 1/3/1943 complement reduced; Home Guard reinforcement if needed
Inchkeith	3 x 9.2-inch 15°: 6 x 6-inch 15°	6 x concentrated beams	North Guns were an Examination Battery
Leith Docks	2 x 6-inch 15°	2 x moving concentrated beams	
Inner line			
Inchcolm	2 x 12-pdr: 2 x 6-pdr twin	4 x fixed dispersed beam; 1 x moveable dispersed beam; 1 x moving concentrated beam	
Charles Hill	1 x 6-pdr twin	3 x fixed, dispersed; 1 x moving – Lyon Beach Defence Light	
Inchmickery Cramond Island	2 x 6-pdr twin 2 x 12-pdr 1 x 6-pdr twin 1 x 75mm (fixed)	6 x fixed dispersed; 2 x moving concentrated 3 x fixed dispersed; 3 x moving concentrated. 1 x concentrated Beach Defence Light	
Methil	1 x 12-pdr on railway truck at north-east corner of docks		Manned by DEMS (Defensively Equipped Merchant Ships) ratings. Marked as removed by 1/3/43
Port Seton	1 x 4-inch		Normally used for instruction of DEMS ratings

7.3 (c)). Across the deeper channel there was a double boom, the A/B to the east of the A/S, supported on 'trots', large buoys anchored to the seabed (Fig 7.3 (d)). To the north of Inchcolm, a length of A/B boom was linked to a combined A/S and A/B boom and then anchored to the First World War concrete and steel A/B barrier at Charles Hill; part of the boom was doubled up behind by a second A/S barrier (Fig 7.3 (e)). Behind the main gate south of Inchcolm there were three lines of A/T 'baffles' to prevent a submarine firing through the main gate when it was open (Fig 7.3 (f)). Figure 7.4 shows very clearly the boom between Charles Hill and Inchcolm, the main gate and the A/T baffles. One file notes the presence of a 'submerged net', that is, an anti-submarine net with its top at a depth of 50ft (*c* 15m) below the surface, some 1¼ cables (*c* 230m) to the seaward of both the main and the emergency gates (Fig 7.3 (r)) (the emergency gate lay immediately to the south of the main gate).[28] This submerged net was intended to make it more difficult for a submarine to pass through the gate, submerged, when it was opened for a surface vessel.

Smaller observation minefields (that is, traditional controlled minefields where a shore-based observer had to see an enemy vessel enter the minefield) were put in place in the main approach channel to Rosyth and in the approaches to Methil and Burntisland docks. Methil and Burntisland were also armed with fixed torpedo tubes; one battery of three tubes at Burntisland and two at Methil (on the breakwater and on a moored barge). Booms to allow the closing of harbour mouths were put in place at every small port in the Forth below the

boom, from Kirkcaldy at the largest to places as small as Fisherrow and North Berwick.

The various fixed defences were patrolled by small craft: three river patrol boats operated between Stirling and the boom; seven patrol craft observed the boom; and 36 boats of the Mine Observation Patrol operated between the boom and the May Island, searching for mines dropped by German aircraft or submarines. In addition, a varying number of larger vessels patrolled the area near the guard loops to attack any submarine detected.[29]

From May 1940, in the period of near-panic as the possibility of a German invasion became apparent, a series of emergency batteries was built round the coast, armed with surplus naval 6-inch and smaller calibre guns.[30] At first, ten 6-inch batteries were planned for Scottish Command, at Wick, Peterhead, two on Shetland, Montrose and Berwick-upon-Tweed (at this stage still in Scottish Command). Batteries were also to be added to ports already defended, Aberdeen, Cromarty and Dundee.[31] The tenth was to be at Gin Head. This battery was actually installed near Dirleton and is described in Chapter 12.

7.3 Changes: 1941–5: 45° mountings, 'Ebb Tide', 'Flood Tide' and 'Neap Tide'

A major impediment to the effectiveness of coast artillery was the invisibility of its targets on the surface at night or in bad weather. Defence Electric Lights provided a partial solution to one problem, at least in narrow waterways, but at night in the outer waters of the Forth and in bad weather, the defences were blind. As early as December 1939, however, experiments were being carried out in the Forth into the use of radar for detecting surface vessels. The experimental radar (RDF) station between Crail and Caiplie was primarily for the detection of aircraft, but the opportunity was taken to investigate the value of the station 'in co-operation with the May Island Indicator Loop System'. Whenever poor visibility precluded visual confirmation of a 'surface' crossing of the loop, the RDF station carried out a sweep over the area. In every case, the radar station was able to confirm accurately that a ship was in the area; detection was possible at ranges from *c* 7¾ miles (*c* 12.5km) to over 10 miles (*c* 16km). The Commanding Admiral at Rosyth was so impressed that he sought approval for the installation of a RDF station on the May Island, specifically to cover the detector loops. Unfortunately, production difficulties with the sets resulted in this installation being cancelled, and the help of the experimental site continued to be sought.[32] The first radar set on the May Island (a Type 31 Low Power set) was installed in the spring of 1942 and a more powerful Type 41 set was later installed beside it.[33]

The only coast artillery site to be equipped with specialist gun control radar was Kincraig, from September 1942. This is described in more detail in Chapter 12.

As early as October 1941, the Home Forces Coast Defence Committee was trying to cut the number of men engaged in coast defence from 38,000 to its new official complement of 35,000. Western Command, Scottish Command and Northern Command were those from which men were to be taken first. Anti-MTB defences were not to be reduced and main fleet bases were to be excluded; thus the Forth was to be protected.[34]

In November 1941, the Committee was considering the provision of 6-inch guns on 45° mounts, which gave the guns a much-increased range. At that time, 65 guns and mountings had been placed on order and their distribution was up for discussion. Kincraig was the only battery in the Forth equipped with two of these guns (with a housing for a third, never occupied).[35]

At 14 minutes past midnight on 23 September 1942, a look-out reported that Inchmickery had exposed its searchlights and revealed three small vessels, not showing their signal lights, approaching the gate in the boom. Urgent enquiries were then made with the duty officer at Inchcolm Fire Command and with the Inner Gate Vessel, asking if they had any information regarding the three vessels, which was met with a negative response. The vessels were recognised as patrol types, possibly friendly, but they continued their approach. The Fire Commander then ordered Kent Battery (on Inchcolm) to fire a 'bring-to' round from No. 1 12-pdr gun. The round was fired, upon which the three vessels stopped. It transpired that the vessels were Royal Navy patrol craft sent out from Granton without the Fire Commander having been informed.[36]

The first coherent programme to reduce the number of men in Coast Defence, to allow them to be reallocated to Field Regiments, was called 'Ebb Tide', in 1942. Its avowed aim was to reduce Coast Defence manning from 40,000 to 25,000.[37] In January 1943, the War Office was looking for a further 5,000 men from Scottish Command's batteries.[38]

In February 1943, it was proposed that some batteries in Scottish Command should either have their complement reduced or be put into care and maintenance; in this phase both Inchkeith South and West (already due to be placed in care and maintenance under Phase III of 'Ebb Tide') were included. Kinghorn was to be retained, in part because Pettycur had already had its complement reduced.[39]

From the summer of 1943, as the need for Royal Artillery field batteries grew and the risks of an attack on coastal installations diminished, further proposals were made to reduce the number of men employed in coast defence, from the 27,000 actually achieved under Ebb Tide to 12,000, nationally.[40] It was proposed that all 9.2-inch guns and virtually all the 'emergency' 6-inch batteries built in 1940–1 (in the Forth, only Fidra) should go into care and maintenance, with a reduction in other 6-inch batteries to provide the lowest practicable close defence and examination capacity. Only the

9.2-inch guns in the Dover Straits were retained and in the end a close defence capacity was to be retained only at ports from the Wash around to Land's End. Anti-MTB defences were to be retained only between the same points, and in Orkney. The examination batteries in the Forth were to be reduced to a single gun.[41]

The Commander-in-Chief Rosyth expressed his concerns in November 1943 about the proposed reductions, asking that the capacity to illuminate the booms at the Middle Line be maintained in case of attacks by 'human torpedoes' or coastal motor boats. By September 1944, it was proposed that only one 12-pdr and three searchlights be manned on Inchcolm, and one 6-pdr twin and three searchlights on Cramond.[42]

By 20 March 1944, Inchkeith West, Fidra, Kinghorn, Kent (Inchcolm) Inchmickery, Dalmeny (Cramond) and Charles Hill were all in care and maintenance, and HQ Coast Artillery Forth was disbanded by 20 April 1944.[43] On 27 September 1944, under Operation Neap Tide's 'Reorganisation of Coast Artillery Equipments in Home Guard Batteries', Pettycur and the Leith Docks 6-inch batteries (already Home Guard-manned) were also reduced to care and maintenance.[44] On 4 November 1944, under Operation 'Neap Tide II', both 6-inch guns at Kincraig, one of the 12-pdrs at Kent (Inchcolm), two 6-inch guns at Inchkeith North and one 6-pdr at Cramond were reduced to care and maintenance. Only a limited number of DELs were to be retained.

In January 1945, only Kincraig, Inchkeith North, one 12-pdr of the Kent Battery on Inchcolm were in action, and Kincraig was placed in Care and Maintenance in February 1945.[45]

7.4 The final act

In the worst days of the war, in February 1941, the Port Defence Committee had felt it necessary to consider the heavy gun defence requirements for 15 ports believed liable to attack by modern battleships, battle cruisers and lesser ships. One must wonder which navy was thought to be in a position to risk its major capital ships (the *Tirpitz* for example) on an attack on a British defended port? The list included, in Scotland, Scapa and the Forth. The Forth's four 9.2-inch guns were to be increased to six, four of which (two new and two removed from Inchkeith) were to arm two new batteries at Gin Head or Fidra on the south shore, and at Fife Ness on the north. The planning was for the long term, as the forecast date for the provision of all the 9.2-inch guns required was mid-1946! The Committee returned to the subject over the next three years with what can only be considered, in retrospect, decreasing relevance.[46] In August 1942, there was another round of the apparently endless discussion about whether the gun was still the primary coast defence weapon or whether aircraft had displaced it. In the light of the exaggerated claims made by the Air Staff in the 1920s and 1930s, an Air Ministry statement that 'attack by [our] aircraft could not be regarded as an adequate guarantee against the bombardment of ports at home by enemy warships' – was realistic and modest.[47]

In November 1944, discussion had moved on to what the next generation of coast defence guns would be. It was unlikely that the Navy would have a future use for 9.2-inch guns, and hence the Army alone would have to bear the cost of developing new variants. The Army moved to adopt the naval 5.5-inch gun: one mounting was designed solely for anti-aircraft work, while the other (the Mk 1B in an armoured turret) was dual-purpose anti-aircraft/coast defence. A few of the dual-purpose guns were mounted in 1944–5, including at South Shields and Gibraltar.

The Firth of Forth, having been the location of the first loss of a warship to a torpedo, in 1914, was also the location of Germany's final controversial action in the U-boat war. On 4 May 1945, U-boat HQ had signalled all operational submarines to cease hostilities and to return to base in advance of Germany's final unconditional surrender three days later.[48] On 1 May, U-2336, of the new, smaller Type XXIII class, had sailed from Larvik in southern Norway for operations near the Firth of Forth. Her Commander, Emil Klusmeier, had been a U-boat staff officer who had developed tactics for the new type of U-boat, and this was his first command. The Type XXIII carried only two torpedoes, and was designed to attack two targets in quick succession.

Two hours before the end of the war in Europe, at about 10 p.m. on 7 May, Convoy EN91 left Methil for Belfast. It comprised five freighters escorted by three armed trawlers; HMT *Angle*, *Wolves* and *Leicester City*. The crews were relaxed for the first time in years, as the news of Germany's order to cease fire at sea was then common knowledge.[49] At about 10.50 p.m., when the convoy was about 3.2km south of the May Island, Klusmeier fired a torpedo at the Canadian freighter SS *Avondale Park*, striking her on her starboard side and causing a large explosion. The Norwegian collier *Sneland I*, which was following the *Avondale Park*, was forced to alter course to port to avoid the sinking vessel, but three minutes later she was struck by Klusmeier's second torpedo and sank within two minutes. Over the next hour, HM Trawler *Leicester City* and the Norwegian destroyer HNoMS *Stord* pursued ASDIC contacts, but U-2336 escaped unscathed. Two days later, Klusmeier claimed to have received his first news of Germany's capitulation and surrendered at Kiel on 14 May.

Nine men died on the two ships, including *Sneland*'s captain; Klusmeier's claim that he had not received the 4 May order to cease fire, nor its repeat transmissions over subsequent days, has not generally been believed.[50]

Thus, the Firth of Forth saw both the first German U-boat sinking by torpedo of a British warship in 1914, and the last, with Klusmeier's murderous attack in May 1945.

Notes

1 German Naval Intelligence report, March 1939 M.Dv.502 1939 (ZMSBw).
2 ADM 1/9848.
3 ADM 1/12930; Morris 2004: 46–7.
4 ADM 1/13135.
5 ADM 116/5590; ADM 1/9505.
6 *Fife Free Press*, 15 October 1938.
7 M.Dv.502. 1939 (ZMSBw).
8 ADM 1/9848.
9 The code-word 'HASTINGS' meant that senior formation Commanders were recalled from leave, and duty officers had henceforth to be available by telephone at all Regular and Territorial units; 'PLUMER' meant that Passive Air Defence measures were put into operation.
10 WO 166/2058.
11 ADM 1/9856; WO 192/254.
12 ADM 1/10392.
13 CAB 44/47.
14 White 2008: 24–5.
15 Baird and Baird 2009: 75–6, 135–6.
16 Kindell 2012.
17 Bruce Stenhouse, pers comm.
18 ADM 1/12930.
19 Barclay 2013: 64, 72–7.
20 Barclay 2013: 79–82.
21 Admiralty 1938.
22 ADM 1/9855.
23 ADM 1/13135; Morris 2004: 45.
24 ADM 1/12930; Walding 2009.
25 Morris 2004: 47.
26 ADM 1/12930.
27 Bill Simpson, pers comm.
28 ADM 1/12930.
29 ADM 1/12930.
30 Dobinson 2000: 62–3; Barclay 2013; 72–7.
31 WO 166/11.
32 ADM 1/10392.
33 Morris 2004: 28.
34 WO 199/1110.
35 WO 199/1110.
36 WO 166/7128; WO 192/108.
37 Dobinson 2000: 71.
38 WO 199/2673.
39 WO 199/2673.
40 Dobinson 2000: 72.
41 ADM 1/15298.
42 WO 199/1171.
43 WO 32/10376.
44 WO 199/528.
45 WO 199/930.
46 ADM 1/16723.
47 ADM 1/16723.
48 Morris 2004: 57.
49 Paterson 2008: 159–61.
50 Morris 2004: 57–8; Baird and Baird 2009: 150–7.

Chapter 8

GROWING IRRELEVANCE, 1945–77

As Maurice-Jones has written, during the Second World War, the 'British Coast Artillery had reached its highest eminence just before it was to become extinct', its role being usurped by rocket-driven ballistic and guided missiles. It took, however, a decade to die.[1]

After the end of the war, the Coast Artillery Investigation Committee considered the level of protection required for future coastal artillery emplacements, in the light of the design of German coastal artillery emplacements, and the effect of Allied bombing and shelling on them. In the end, the committee recommended that any future guns should be turreted, with the cupola as small and low as possible, and all battery structures underground.[2] The likely effectiveness of heavy bombs developed in the later years of the war, and likely future developments, meant that the levels of protection necessary on fixed defence guns would be prohibitively expensive. The discussion seems to have faded away, and no modern coast defence guns on this kind were built in Britain.[3]

By October 1946, the number of Regulars in Coast Defence had been reduced to a total of 1,589, officers and men, of whom 95 were in the mainland part of Scottish Command.[4]

By 1950, the post-war organisation of Coast Defence had been settled, with the naval bases provided with their necessary defences, in care and maintenance, manned by 18 Territorial coast artillery regiments and six Regular maintenance units, but by the middle of the decade, modern aeroplane and missile technology had made the guns obsolete. On 17 February 1956, the Minister of Defence announced in the House of Commons that coast artillery was to be disbanded, and on 31 December it ceased to exist.[5]

Preparations for the Navy's defence of its bases did not, however, end in 1956. In 1951, the Admiralty was considering possible improvements to the boom defences of Loch Ewe and the Firth of Forth. An Admiralty file contains a chart of the Forth boom that would be erected when needed, very much following the line of the 1939–45 Cramond–Inchcolm–Charles Hill boom, with the position of the gate clearly marked.[6] A file concerning the defence of Granton and Leith in a future war, dated 1954, noted that a Forth boom was to run near Oxcars; Seaward Defence HQ would be at Pettycur; the secondary Seaward Defence HQ was planned for the May Island. Inner guard loops were already laid across the Forth in the vicinity of Inchkeith. Outer guard loops and HDAs would be laid across the Forth near the May Island ('one outer guard loop is laid at present; December 1953'). The PWSS would be on Inchkeith, with a WSS on May Island. There would be a Seaward Defence Radar capacity at Pettycur, Inchkeith and May Island. The Convoy Anchorage would be in Methil Roads/Largo Bay, with a 'Night Convoy Arrival Anchorage' in Largo Bay. Six examination vessels were to be stationed across the Forth between Inchkeith and the May Island. The file included a map of the anti-aircraft 'Gun Defended Area', which included Rosyth, the river and the city of Edinburgh as far east as Musselburgh.[7]

In October 1961, an exercise titled 'Drum Flats II' was held on those tidal sands in the Forth to test the capacity to erect the A/T net defence, which was planned, in time of war, for Loch Ewe, Milford Haven and the Forth (the A/S nets were to be held in store). The exercise was designed to see how quickly the nets could be deployed. Three specialist boom defence ships of the 'Bar' class and launches were used, in collaboration with the Boom Defence Depot at Rosyth. The ships were active from 9 a.m. on the 11th, working right through the night, completing their tasks in just under 26 hours, 35 minutes.[8]

The boom was intended to provide A/T and A/B capacity, but the arrangements on the surface would mimic the full suite of A/S defence, although the A/T nets were only 50ft (*c* 15m) deep. It was described as 'a very satisfactory trial', showing clearly the desirability of fairly frequent exercises to maintain the necessary skills.[9]

The capacity to erect a boom across the Forth was given up only in 1977, when the Admiralty wrote to the Scottish Development Department (then the custodians of Inchcolm Abbey) giving up the boom anchors on the island.[10] Thus ended the use of traditional forms of defence of the estuary as an actual or potential naval base.

Notes

1 Maurice-Jones 1959: 275.
2 WO 32/11674.
3 WO 32/11674.
4 WO 33/2577.
5 Maurice-Jones 1959: 276–7.
6 ADM 1/22932.
7 ADM 1/25641.
8 ADM 1/28103.
9 ADM 1/28103.
10 DD 27/3715.

Part III
THE BATTERIES

The third section of our book describes the individual batteries and some of the ancillary installations, from the Forth Bridge outwards, towards the east:

- the Inner Defences, also known as Carlingnose Fire Command and 21 (Forth) Fire Command;
- the Middle Defences, also known as Inchcolm Fire Command and 20 (Forth) Fire Command; known in the Second World War as the Inner Defences;
- the Outer Defences, also known as Inchkeith Fire Command and 19 (Forth) Fire Command, known in the Second World War as the Middle Defences;
- what we have termed the Outermost Defences, first developed in the First World War, and known during the Second World War as the Outer Defences.

We have, as far as possible, organised our material under these four groupings. Although the batteries were the teeth of the defences, and their massive emplacements are the most visible remnant, they were only a part of a complex fortress. Indeed, in some instances, the guns were in a sense secondary – for example, to cover a minefield or a boom. This reflects the military dictum that any obstruction, to be effective, must be covered by guns, to prevent the enemy clearing it away.

Chapter 9

THE INNER DEFENCES (CARLINGNOSE FIRE COMMAND; FIRE COMMAND (INNER); 21 (FORTH) FIRE COMMAND)

9.1 Carlingnose Battery and the Inner Defences Fire Command Post

The Inner Defences of the Forth were grouped together into No. 21 (Forth) Fire Command which, in April 1918, had an establishment of 14 officers and 254 other ranks of the Royal Artillery (the establishment list does not include the Royal Engineers or other arms).[1] The battery at Carlingnose was also the site of the Fire Command Post for the Inner Defences.

Pre-First World War

The battery at Carlingnose was established in the first decade of the 20th century as one of the heavier elements of the Inner Line of defence. Shortly after its establishment, the site also became the submarine mining base for the river, and then the HQ of the Edinburgh (Fortress) Royal Engineers Company (TF), which grew out of the disbanded submarine mining unit.[2] An area of 36 acres (14.5ha) was bought by the War Department in July 1896.[3] The battery was armed with two 6-inch BL Mk VII guns, mounted at about 58.5m above sea level (Fig 9.1). In 1911, it was stated that 'the original object … appears to have been the defence of the minefield just below the Forth Bridge'.[4]

The key source for the Carlingnose Battery as built is a series of Royal Engineer 'Record Plans' of the battery, dated 16 April 1904, recording the outline of the War Office land and the main structures of the battery: men's quarters; barrack block; canteen; guardhouse; food and machine-gun stores; and caretaker's quarters, as well as the guns themselves, with their arcs of fire (100°, centred east-south-east). The location of a further Royal Artillery Store is marked in pencil. The 'top plan' of the battery shows the two emplacements, detailed plans of the magazines and stores lying underneath, the location of the Battery Command Post and so on.[5] As was often the case, the main plan of the battery included detailed information

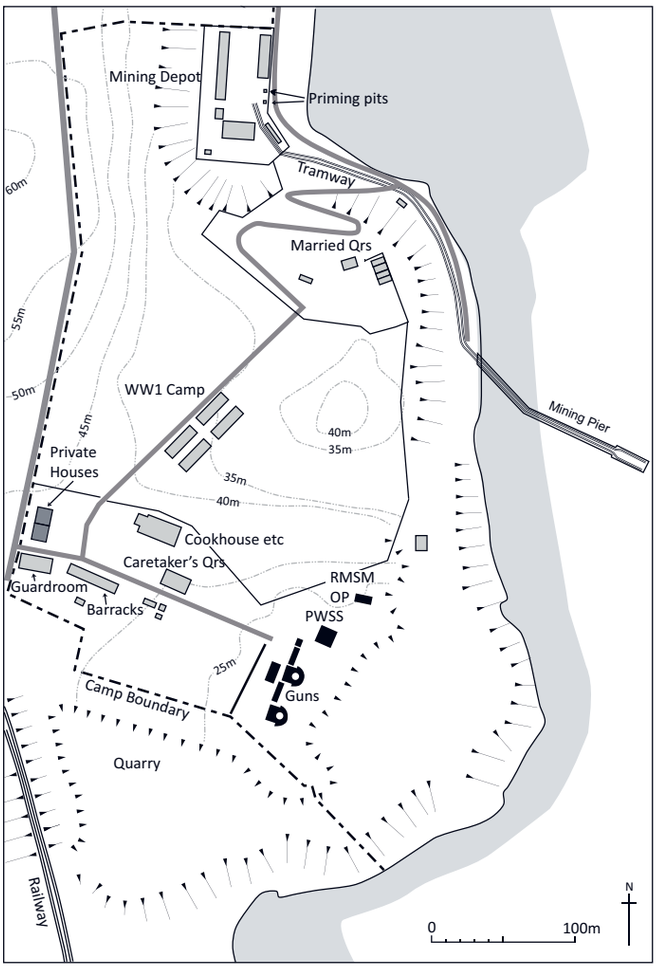
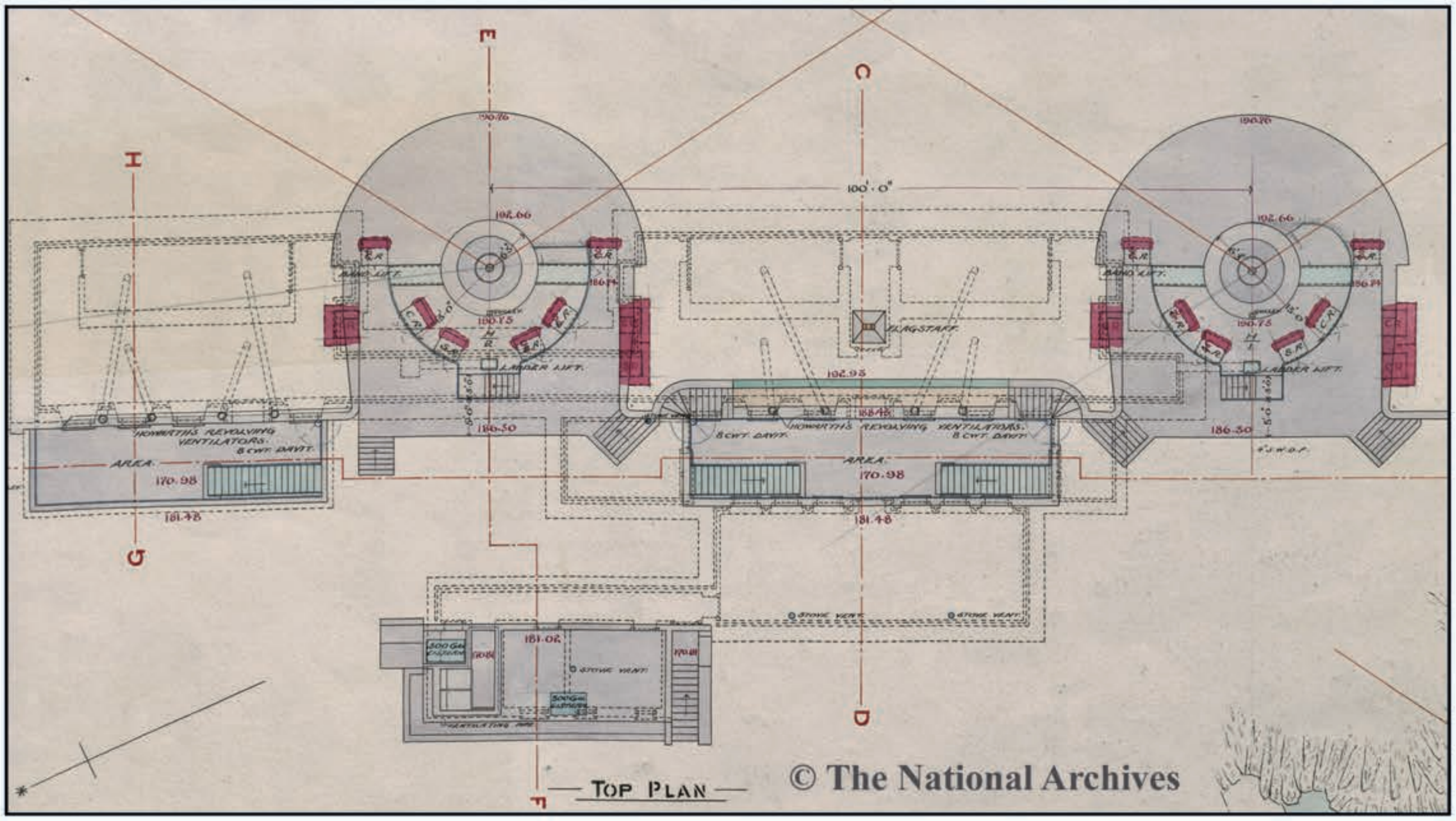
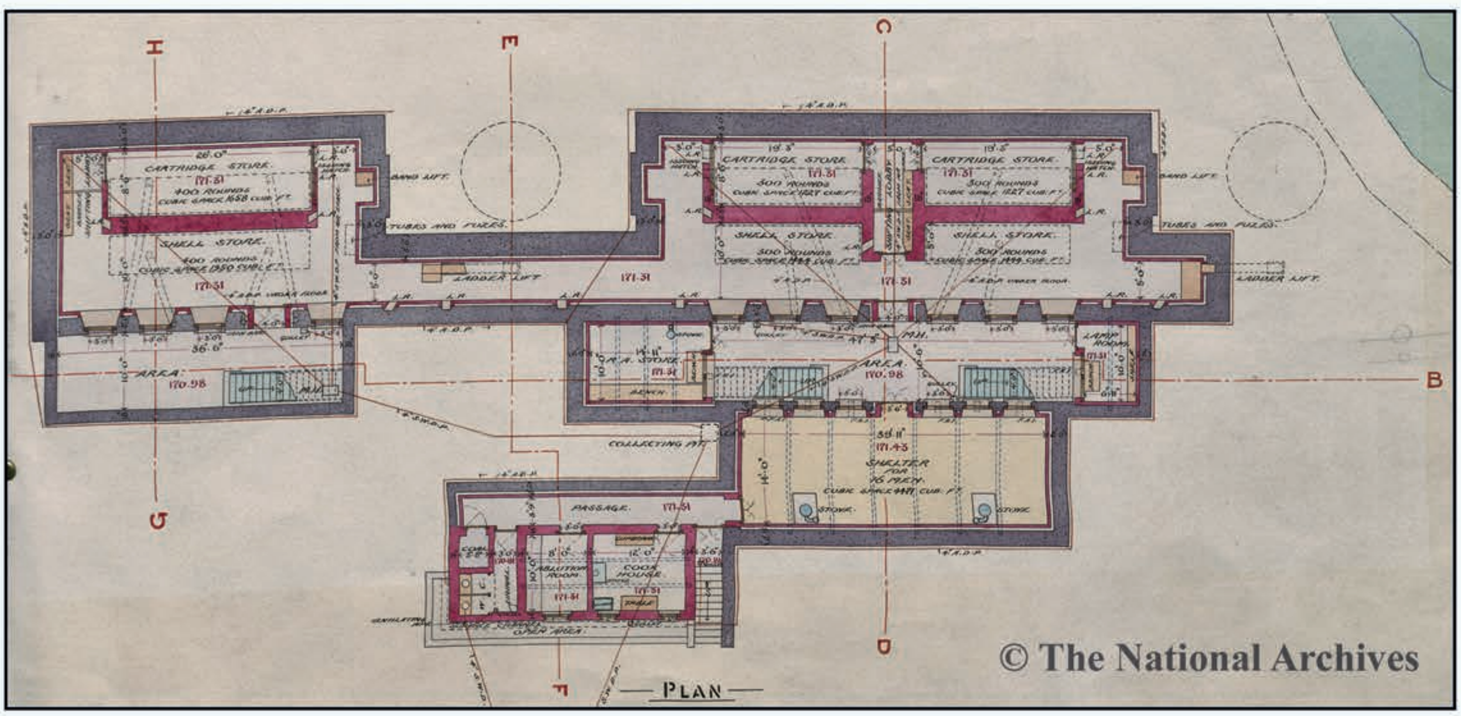
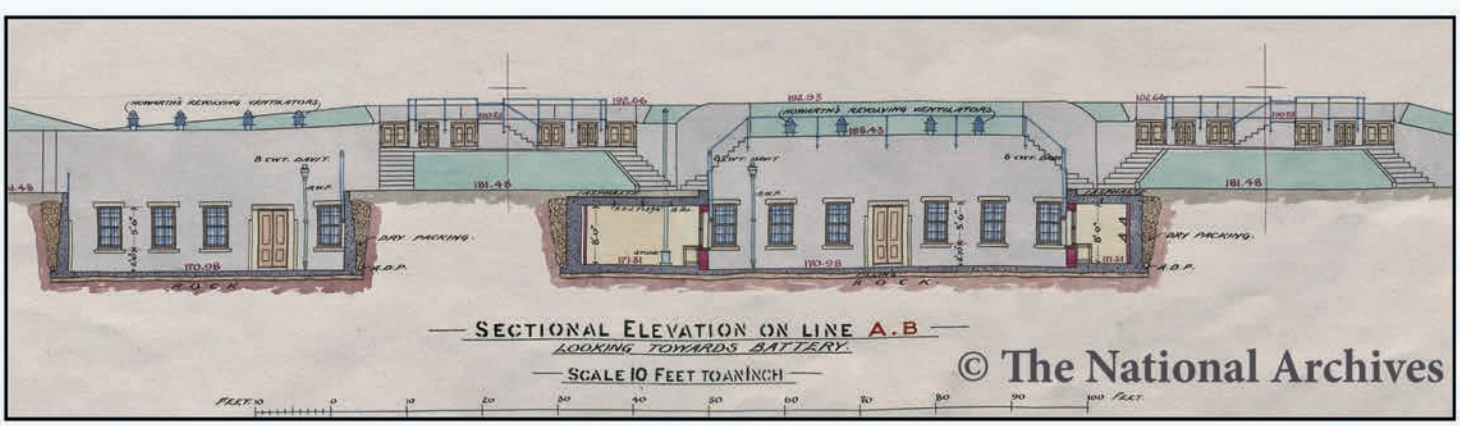


Figure 9.1
Plan of the Carlingnose site. The Submarine Mining Depot was repurposed in 1905, when mining was discontinued. The buildings shown are those in place by *c* 1908. The location of the First World War camp of four huts is also shown. The 'RMSM OP' is the observation post for the First World War controlled minefield; the PWSS is the Port War Signal Station (© Gordon Barclay)


TOP PLAN
HOWARTH'S REVOLVING VENTILATORS.
FLAGSTAFF
LADDER LIFT.
AREA
© The National Archives


CARTRIDGE STORE.
SHELL STORE.
TUBES AND FUZES.
LADDER LIFT.
AREA.
SHELTER
COLLECTING PIT.
PASSAGE.
COOK HOUSE.
OPEN AREA.
PLAN
© The National Archives


HOWARTH'S REVOLVING VENTILATORS.
DRY PACKING.
ROCK
SECTIONAL ELEVATION ON LINE A.B
LOOKING TOWARDS BATTERY.
SCALE 10 FEET TO AN INCH
© The National Archives

about the construction process: authority had been given for construction on 29 April 1899; work had commenced on 23 May 1899 and had been completed on 8 July 1901, at a cost of £7,856 1s 9d. Figure 9.2 shows the gun emplacements and subterranean structures, on plan and elevation.

The two 6-inch BL Mk VII guns were received from Woolwich on 21 May 1901 but not mounted until July 1902. The permanent peacetime garrison of the battery was 14 NCOs and men (the full complement of gunners being supplied by the volunteer Royal Garrison Artillery). This total included a detachment of one Regular NCO and five men for Inchgarvie. A large barrack building was also built for 10 NCOs and 40 men of the Royal Engineers (Volunteer) Submarine Miners.[6]

The Fort Record Book contains information about how the battery was to be manned and defended in the 'Precautionary Period' prior to the outbreak of war and in the 'War Period'. There is a plan, dated 22 May 1907, showing the physical defences – wire entanglements, firing trenches, loop-holes and so on, to be prepared in the Precautionary Period, as well as cross-sections and elevations of the defences. The 1905 Defence Scheme records that Carlingnose and Coastguard batteries would have 360 men for their defence, with two Maxim machine guns.[7] Shrapnel shell was to be provided for the 6-inch guns for close defence, and plans were put in hand for the destruction or temporary disablement of the battery if it had to be abandoned.

In 1902 to 1903, a new submarine mining depot was built at the northern end of the perimeter of the Carlingnose Battery compound, linked by a tramway to the pier (built in 1903[8]) provided with cranes for loading the mines. After the decision to abandon submarine mining, General Sir John Owen's Committee, in December 1905, recommended the retention of the Carlingnose guns, 'to deal with the attack of unarmoured cruisers by night on shipping above the bridge, against which form of attack the Outer Defences cannot be considered as providing an adequate security on account of the impossibility of illuminating the approaches'.[9]

The large area owned by the War Department at Carlingnose was also used for Territorial Army training camps.

In April 1908, proposals were made to alter the emplacements to allow the guns to fire on a much larger arc, in particular to fire on 'the landward fronts'. A map on file from 1913 shows that the guns, indeed, had very much wider arcs of fire, between them covering about 300°, from Inverkeithing, round by the south, to Dalgety Bay.[10]

At some point between 1909 and May 1913, a Naval Challenge Station was set up at the battery and located in the former Submarine Mining Look-out Post, located a short distance north-east of the battery's north 6-inch gun. This Challenge Station is not mentioned in the Defence Scheme of 1909, but features on maps of 1913.

Figure 9.2
Extracts from the plans, sections and elevations of the Carlingnose 6-inch battery, dated 1902 (© The National Archives, WO 78/5175)

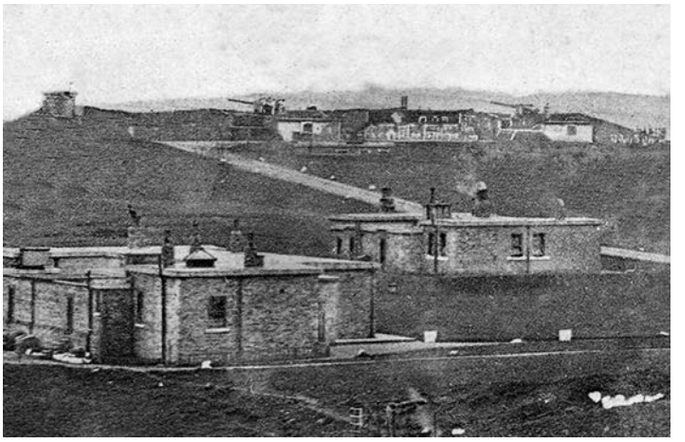


Figure 9.3
Detail of postcard showing the Carlingnose barracks and battery, at a date after 1908, but before the battery was disarmed in 1916. The building in the foreground contained men's quarters, canteen and cookhouse, with the caretaker's quarters behind. The Battery Command Post (see Figure 9.5) is on the horizon at the left (via Frank Hay)

First World War

On the outbreak of war, the approved armament of Carlingnose remained two 6-inch BL Mk VII guns on CP Mk II mountings and two .303-inch Maxim machine guns on field carriages.[11] Shortly after, the Naval Challenge Station was being referred to in naval correspondence as a Port War Signal Station with responsibility for dealing with sea traffic upriver from Inchkeith.[12] In 1917, a new signal tower was apparently built a short distance to the north of the existing buildings and it is presumed that Carlingnose PWSS was transferred to this location (Fig 9.1).[13]

In July 1916, the battery, at that time manned only at night, had a garrison of three officers (Battery Commander and relief, and a Gun Group Commander) and 42 other ranks (three men of the Depression Range Finder detail; 22 men in the gun detachment; eight ammunition supply men, storeman, lamp-man and so on). The Fire Command was a separate formation and had a staff of three officers (the Fire Commander and two assistants) and 16 other ranks (ten telephonists, three orderlies, Master Gunner and two officers' servants).[14]

In the general revision of the armament of the Forth, the two 6-inch guns at Carlingnose were removed to the new battery at Pettycur on 5 and 12 November 1916. The two Maxims were left in position to defend what was still the Fire Command Post for the Inner Defences, but the battery was never rearmed.[15]

Figure 9.4
The northern gun emplacement at Carlingnose in 2016 (© Gordon Barclay)

Inter-war

Although no longer an active battery, Carlingnose remained an important installation. The relatively large site allowed it to be used for training by the City of Edinburgh (Fortress) Engineers. For example, between 23 July and 6 August 1921, the Engineers held their first post-war training camp there. The Works Company was engaged in the practice construction of various works required for the defences, including fire trenches, entanglements, trestle bridging and shelter dug-outs, as well as demolitions with explosives, while the Electric Light Company manned several of the Defence Electric Light stations, running them on 'all night mannings' as in time of war.[16] In November 1927, Carlingnose was still listed as mounting a single concentrated moveable DEL.[17]

Figure 9.5
The Battery Command Post at Carlingnose in 2016 (© Gordon Barclay)

The final mention of Carlingnose as the 'home station' of the City of Edinburgh (Fortress) Royal Engineers was in 1938.[18]

Survival

The Carlingnose Battery survives in good condition, although almost the whole of the original War Department site has now been built over. The magazines are in use as a holiday home and as the office of a water engineering consultancy. In the latter, many features survive, such as shell and cartridge lifts, now hidden behind removable modern hatches. The gun pits are in good condition and these examples are of considerable importance because they are the only surviving 'standard' 6-inch gun positions in the Forth without Second World War overhead protection.

Some of the ancillary subterranean buildings, however, are not in such good condition, showing considerable water penetration. The simple Battery Command Post (a single-roomed building with a Depression Range Finder on the roof) survives in good condition (Fig 9.5). To the north, the

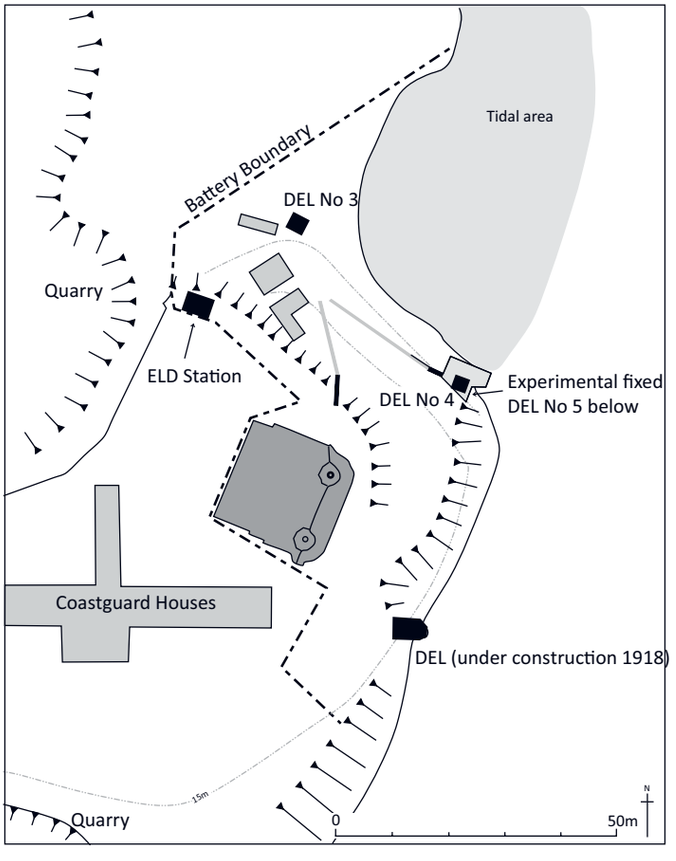


Figure 9.6
Plan of the Coastguard Battery site (© Gordon Barclay)

Figure 9.7
The site of the Coastguard Battery from the water in 2016, showing the location of the battery. On the shore at the left is the brick-built DEL housing noted as being under construction in 1918; to the right is the 'experimental' DEL housing, which was a fixed beam protected on its seaward side by a solid 1.8m wall of concrete. On the top right is the War Signal Station, now incorporated into a house (© Gordon Barclay)

Submarine Mining Observation Station survives, albeit in a ruinous state.

9.2 Coastguard Battery

Pre-war

Coastguard is one of the least well-documented batteries in the Forth, despite being the battery in the Inner Defences which was in the approved armament for the longest period (Fig 9.6). The Fort Record Book contains only five items: a plan of the battery; a delicately drawn panorama of the view from the battery in August 1923; a plan of the gun emplacements; a sketch-map of the arcs of fire of the guns; a 'History of the Work'; and, inexplicably, the best plan we have of Leith Docks Battery.[19]

The two 12-pdr QF battery had been part of the 'approved armament' of the Forth since 1898, to protect the controlled minefield just below the Forth Bridge.[20] Construction of the battery began on 21 June 1900. In 1905, it was considered superfluous by Sir John Owen's Committee, but was reinstated on 10 March 1908 at the request of the Admiralty to deal with the threat of attacking torpedo craft.[21]

In 1903, the battery was recorded as having two lights (Fig 3.4), one a fixed beam of 16° dispersion, the other a moveable beam covering an arc of 30°.[22] The Coastguard battery was described in documents in 1911 and 1912 as having two fighting lights with moveable beams.[23] By May 1913, an additional

Figure 9.8
Aerial photograph of the compact Coastguard Battery in 1948. The emplacements are empty, but the structure survives in good condition. The Battery Command Post between the guns is an addition to the original arrangements (© Aerofilms/National Collection of Aerial Photography www.ncap.org.uk)

light, described as an experimental dispersed beam, had been installed (Fig 9.7).

Unfortunately, no Royal Engineer drawings of the kind so helpful on other batteries survive for Coastguard; there are only two plans on the Fort Record Book, one of the site and one of the main structure. There is no cross-section. There is a 1948 aerial photograph (Fig 9.8) that shows the empty emplacements and, between them, a simple concrete Battery Command Post.

The battery was of a particularly compact design (Fig 9.9). On the topmost level were the two gun emplacements. Under the guns was a watch shelter; behind this superstructure was a platform on which there were a number of other buildings, including what seem to have been temporary barrack blocks for ten men and four NCOs. There was an open area (over which the Gun Group Commander's post was somehow suspended) with a staircase giving access to a lower floor, with shell and cartridge stores under the guns, and a handling lobby between them, an engine room, switch-room and stores, through one of which there was direct access to the outside.

Elsewhere in the battery compound there were relatively few other structures: to the north was an ELD post, and to the north-east a fitter's workshop and two buildings of unknown function.

First World War

The battery remained in service for the whole of the war, the only change being in September 1915, when newer guns of the same calibre, which were being removed from Inchgarvie, were exchanged with the older guns at Coastguard.

The complement of DELs varied (Fig 9.6): in 1911 and 1913 there were two moveable lights (known as Nos 3 and 4, Nos 1 and 2 being at Dalmeny), while the third dispersed 'experimental' beam was being used as a temporary measure.[24] In October 1916, the battery was described as having a single concentrated fighting light[25] but in May 1917 is recorded as having two, of which only one was 'approved'.[26] In February 1917, only one DEL was in action, with a RE garrison of two officers and 15 sappers.[27] In 1918, four DEL emplacements were mapped on the site, three of which had subsequently been annotated 'obsolete' are marked 'EL Empt. No 3' and 'No 4', square on plan, and marked 'Tempy', that is, temporary. Physically beneath No. 4, in the same building,

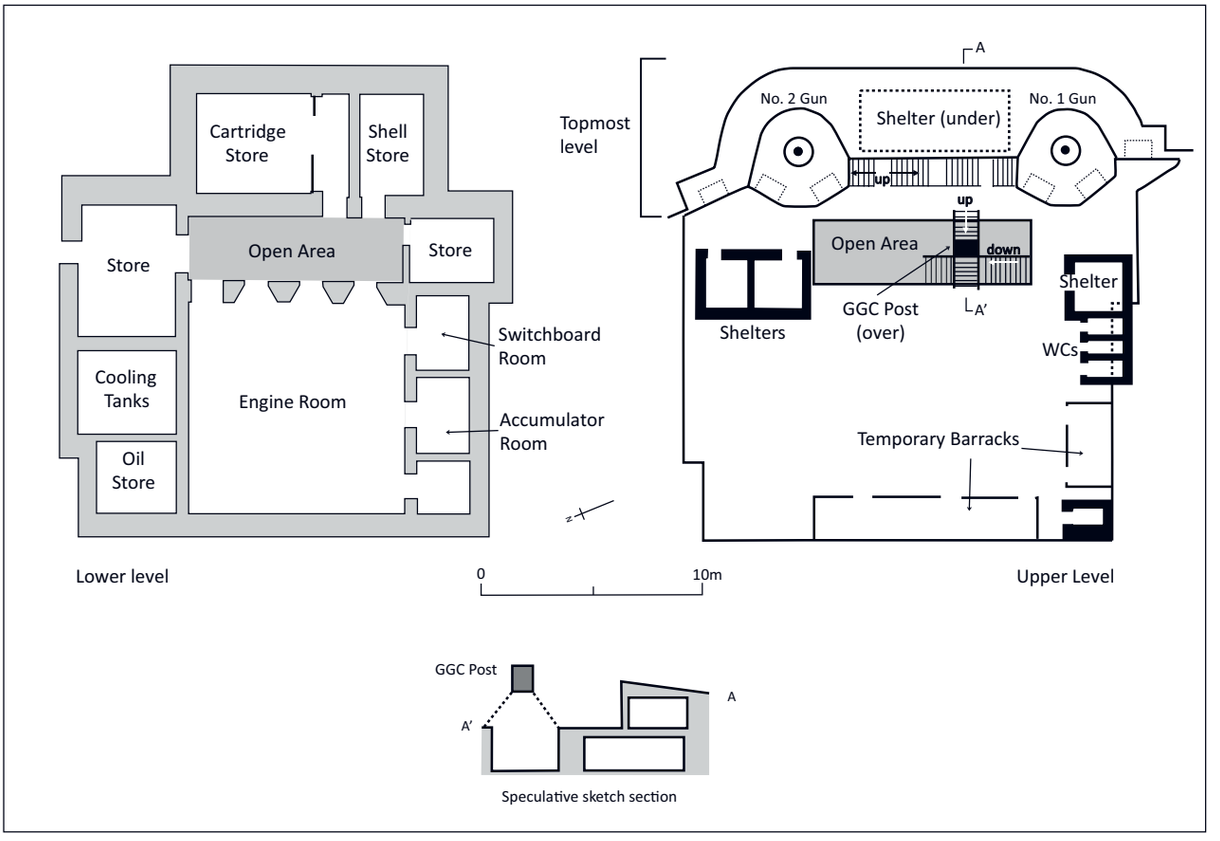


Figure 9.9
Plan of the main Coastguard Battery structure, with a speculative cross-section, after a plan dated February 1918, on file WO 192/104 (© Gordon Barclay)

Figure 9.10
The Coastguard Battery in the 1930s (Douglas Grant. Reproduced with permission)

the experimental light was described as 'EL Empt No 5 Fixed Beam'; that is, a light capable of only limited traverse. Finally, to the south-east of the battery a more conventionally shaped emplacement for a moveable DEL (a rectangle with chamfered corners) was marked 'under construction' on the 1918 map (Fig 9.7). The EL Directing Post would not have been able to direct the light of this emplacement, as it was out of sight. This light probably dates from late in the war, or could even be for post-war training at the battery. This emplacement survives as a substantial brick-built structure at sea level. The 'experimental' fixed beam emplacement also survives; it comprises a substantial concrete emplacement, with a wall *c* 1.8m thick facing the sea, and providing protection for the light, which shone through a simple rectangular embrasure (Figs 9.6 and 9.7).

In July 1916, the RA garrison numbered two officers and 24 other ranks.[28] The battery is recorded on 1 July 1918 as having had its personnel withdrawn.[29]

Inter-war

In July 1920, authority was given for the work to be retained for drill and practice.[30] It was listed in January and September 1921 as mounted in reserve, and 'In action for drill' respectively.[31] It was listed as part of the 'approved armament' in November 1927, but to be removed 'ultimately'.[32]

The battery was listed as being part of the Interim Defence Scheme of 1930, and made its last known formal appearance in a list of the approved armament in June 1934, when it was one of the four batteries remaining in the river (with Inchkeith, Kinghorn and Leith).[33] In May 1938, two 12-pdrs were still listed as part of the armament of the Forth, and it is certain that these were the two at Coastguard.[34] There is a single photograph of the Coastguard battery, probably taken in the late 1930s (Fig 9.10). It would appear that the battery was disarmed in the autumn of 1939, when the two guns were moved to Cramond.[35]

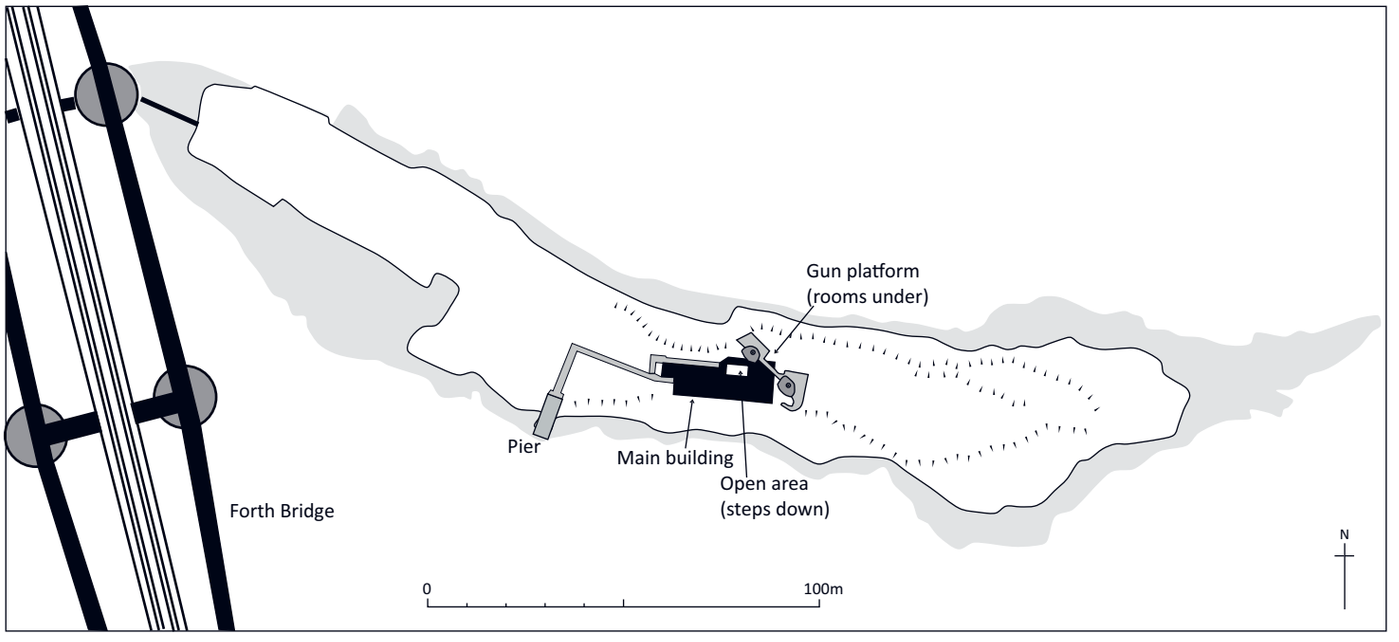
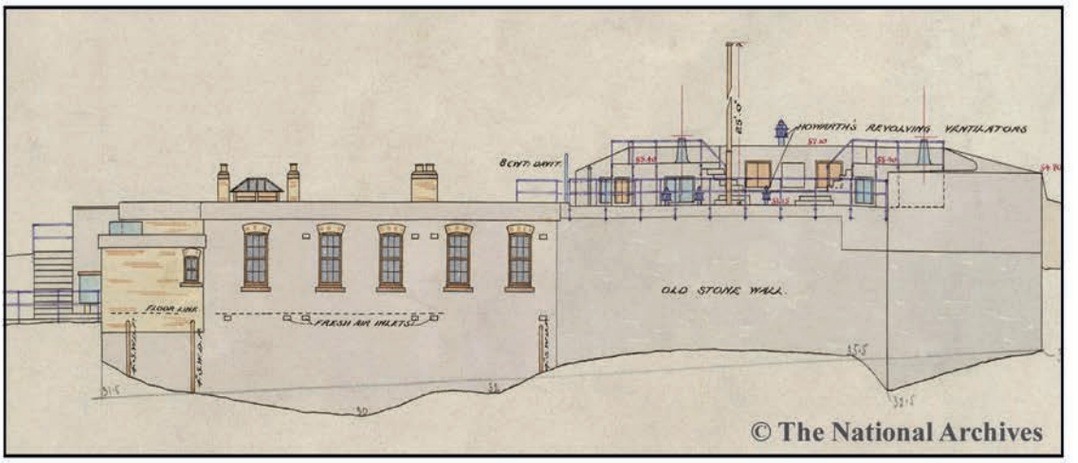
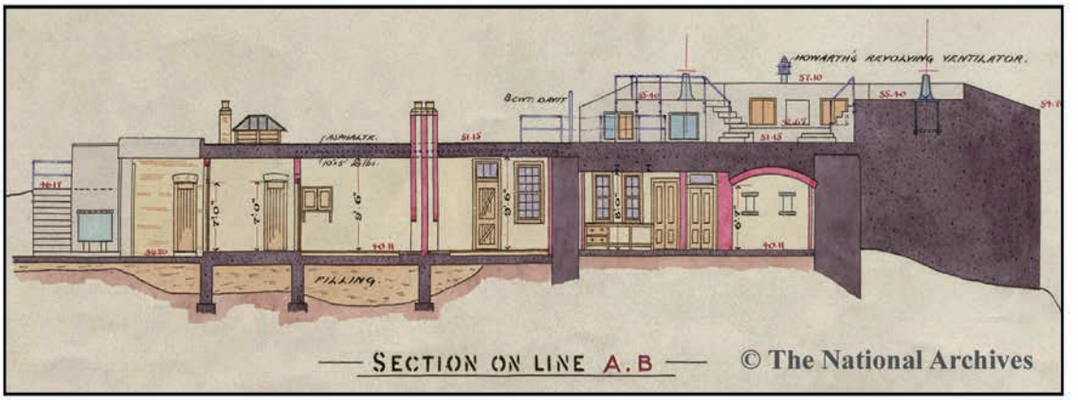


Figure 9.11
Plan of Inchgarvie in 1904, compiled from plans on files WO 78/4316, WO 78/5172 and WO 192/100 (© Gordon Barclay)





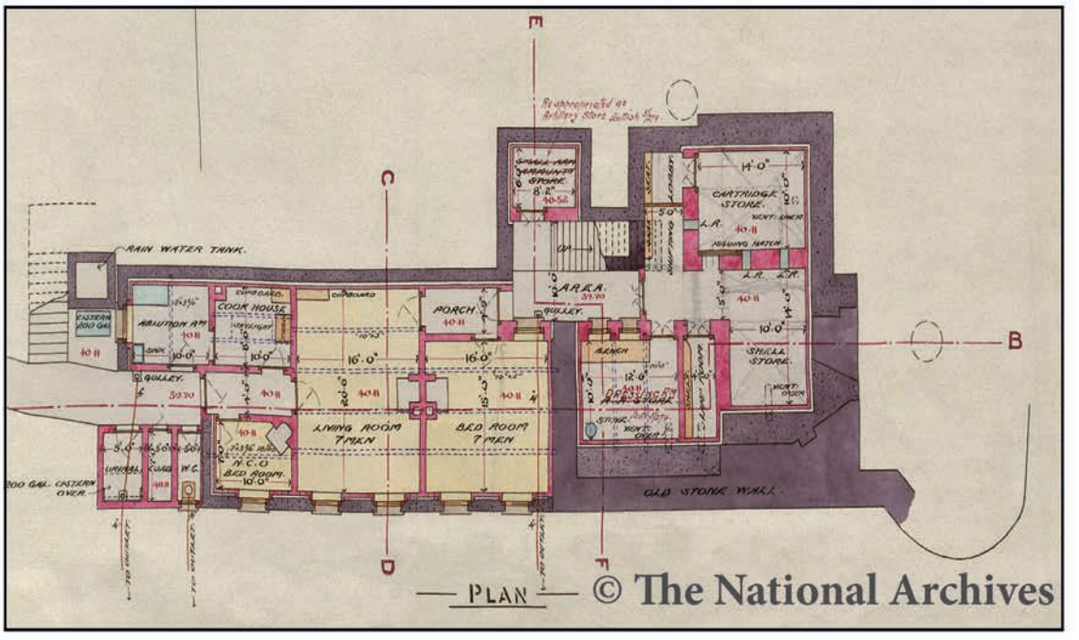


Figure 9.12

Plans, elevations and cross-sections of the main building on Inchgarvie, below the original 2 x 12-pdr, 12cwt, guns, 1904, with the original functions of the rooms indicated. At this date the entire permanent garrison of the battery was accommodated in this building (The National Archives, WO 78/5172)

9.3 Inchgarvie

Pre-war

Inchgarvie is an island in the middle of the Forth, which has the middle pier of the Forth Bridge built upon its western end. It was fortified at the beginning of the 16th century and again in the Revolutionary and Napoleonic Wars.[36]

The battery on Inchgarvie was built in 1900–1 to protect the controlled minefield just below the bridge (according to a document of 1911), the necessary portions of the island having been purchased in March and October 1900.[37] It was armed with two 12-pdr QF guns with two .303-inch Maxim machine guns for close defence (Fig 9.11).[38]

According to the annotations on the Royal Engineers Record Plan, authority was given for the construction of the battery on 6 February 1900; work began on 27 June 1900 and was completed on 31 October 1901 (different pages of the Fort Record Book state February or May 1902, but this may refer to different stages of the finishing of the work). The work cost £2,846 10s 1d for the battery and £476 8s 1d for the pier. The completed battery was recorded on a series of plans dated 16 April 1904, which show it occupying only part of the eastern half of the island, with a clearly defined boundary (marked by two boundary stones) between War Department property and that of the 'Forth Bridge Railway Coy'. A path was marked crossing the company's property for use of War Office personnel to reach the shore on the bridge 'when weather renders access by boat impracticable'.[39]

The part of the island used for the battery had a steep rocky spine into which the northern parts of the structures were cut, and over which the southern parts of structures were built up. Part of the wall of the earlier castle was reused in the eastern part of the complex. The battery comprised a pair of gun emplacements built partly over the eastern end of a dense complex of rooms (Fig 9.12).[40] The eastern 'working' end of the building contained the cartridge and shell store, with the accompanying handling and lamp lobbies; machine-gun ammunition and small arms stores were later repurposed as dressing rooms and an artillery store. Separated by a small internal lobby were, to the west, a bedroom and living room for the permanent Regular garrison of seven men, and beyond that the bedroom for the NCO, a cookhouse, ablutions, WC and urinal, with a rainwater tank. At this stage, the guns of the island had to rely on the DELs sited at Coastguard and Dalmeny batteries for illumination.

In 1905, the battery was considered superfluous by General Sir John Owen's Committee but it was reinstated in 1908 at the request of the Admiralty, to deal with the threat of torpedo craft attacking the anchorage to the west of the bridge.[41] The guns had remained in place in the intervening years (Table 6).[42]

The Home Ports Defence Committee recommended, in December 1912, that deficiencies in the anti-torpedo defences near the bridge should be addressed by rebuilding Inchgarvie to take four 4-inch guns and three 45° or 30° defence lights, with the lights at Dalmeny and Coastguard being adjusted to take account of the new ones.[43]

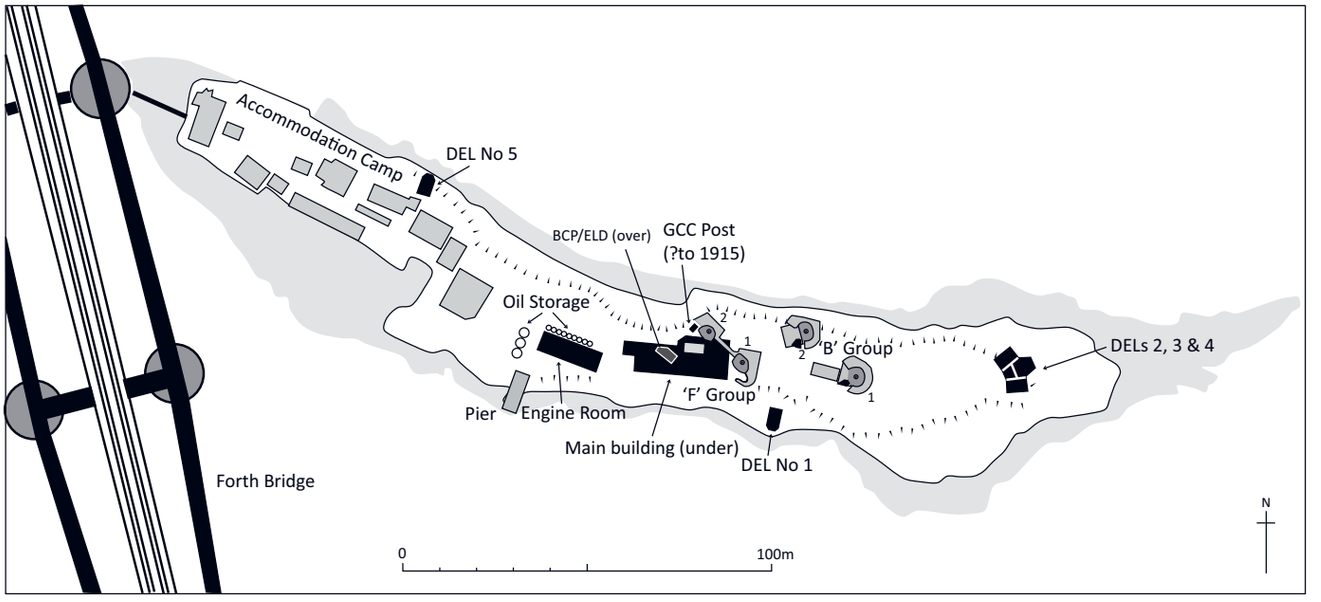


Figure 9.13
Plan of Inchgarvie in 1916, collated from plans on files WO 78/4316, WO 78/5172 and WO 192/100 (© Gordon Barclay)

Figure 9.14
The two easterly (later) emplacements on Inchgarvie. The housing for three DELs and a telephone room is visible on the easternmost point of the island. This image shows the island as it was in the 1980s (© Ron Morris)

Figure 9.15
The rear of the western (older) pair of guns on Inchgarvie, as it survived in the 1980s (© Ron Morris)

Figure 9.16
The Battery Command Post and Electric Light Director in 1915–16 (© Bruce Stenhouse Collection)

The proposals were developed in a series of plans, although what was built differed again: the accommodation was built further west than originally proposed, in wooden huts on the flat western half of the island. The accommodation comprised three huts for 82 men of the RGA, a hut for eight NCOs, a dining room (with cookhouse and drying room included), ablutions and a food store. One hut was provided for 40 men of the Royal Engineers, one for four NCOs, with dining room. Officers' quarters were also built. Between the old building and the new huts, an engine room was built to power the DELs and the battery.

Figure 9.17
The Battery Command Post and Electric Light Director as it survived in the later part of the 20th century. The roof of the tower has been changed since 1915–16, and an external stair and steel screen had been added (both have since fallen) (© Ron Morris)

First World War

Construction of the two new 4-inch emplacements to the east of the original pair, each with its own shell and cartridge stores, was already in hand when war broke out in August 1914, the plan being to leave the two existing 12-pdrs in position until the first two 4-inch emplacements were ready. Two 4-inch guns were delivered on 14 September 1914 and were ready for action in December (Fig 9.13 ('B' Group); Fig 9.14). The other two 4-inch guns were, through the use of specially designed plates, mounted in the two existing 12-pdr emplacements between July and September 1915 (Fig 9.15). The two 12-pdrs, originally due to be returned to store, were exchanged with the two at Coastguard, which were wearing out.

The Gun Group Commander's post, at the north-east edge of the westward guns, was replaced at some point by a combined Battery Command Post and Electric Light Director

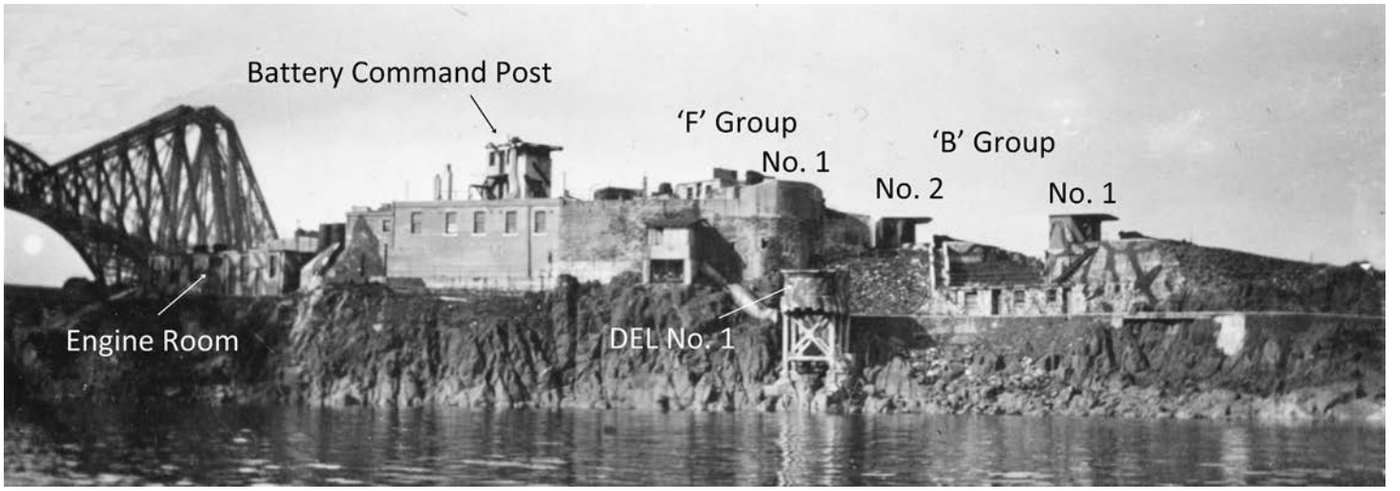


Figure 9.18
Inchgarvie from the south, annotated to show the location of significant features, 1915–16. Note that the emplacements of 'B' Group seem to be empty at this date. The original image is titled 'The point and gun groups' (© Bruce Stenhouse collection)

in a tower, sitting above the original accommodation building just behind the guns. By the time the battery was abandoned, the BCP had been reworked with a differently shaped roof and an external steel structure; that is, largely the form in which it survives (Fig 9.16; Fig 9.17).[44]

In 1915, a mains water supply was taken along the bridge from the North Queensferry town main.[45] A series of photographs was taken of Inchgarvie and its officers in the middle of the First World War; the layout of the battery visible in the photographs conforms to the layout after the number of

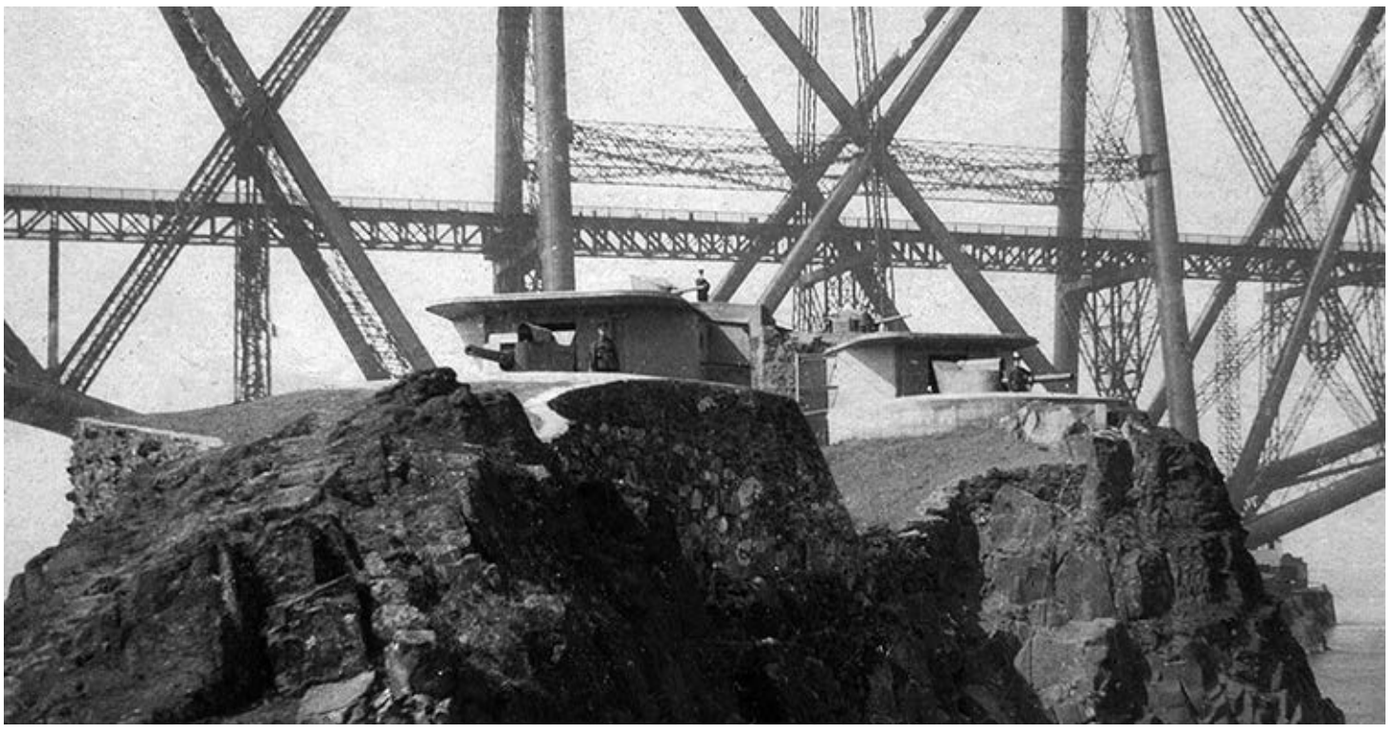


Figure 9.19
An undated view of the two eastern guns on Inchgarvie ('B' Group), post-1915 (Sgt J B Adams, Forth RGA. Bob Adams collection. Reproduced with permission)

Figure 9.20
Undated image of the 'domestic' end of the island, during the First World War (© Bruce Stenhouse Collection)

guns was increased to four, and the guns pictured appear to be the 4-inch Mk III weapons in place between September 1915 and August 1916.

In the image reproduced here (Fig 9.18), the two eastward emplacements ('B1' and 'B2') are shown as having partial cover, but seem not to be armed, placing the photograph either around September 1915 or August 1916. An undated photograph shows the two easternmost (that is the 'new') emplacements, armed, apparently, with 12-pdr guns (Fig 9.19). Another photograph shows the more 'domestic' end of the island (Fig 9.20). In July 1916, the garrison of the island was organised in two Gun Groups, both with two officers each (Gun Group Commander and relief) and 32 and 36 other ranks respectively.[46]

In the general revision of the Forth defences, four 12-pdr QF (Naval) 18cwt guns (two from Inchmickery and two from Inchcolm) were moved to Inchgarvie between August 1916 and January 1917. The four 4-inch guns were moved to Inchmickery. No major reconstruction seems to have been necessary.

Inchgarvie started off with no DELs of its own, relying on those mounted at the Coastguard and Dalmeny batteries to north and south. The precise sequence of development of the lights on Inchgarvie is not entirely clear, as important documents are not dated. There were apparently five lights, although the island's generators had the capacity to run only four for any length of time, and the fifth was to be used only in emergencies. A single building containing three fixed lights with dispersed beams was built at the eastern end of the island; the central light was the one only to be run in emergencies. An emplacement for a further single moveable light was built on a concrete platform on the southern side of the island (Fig 9.18). A fifth light was built on the northern shore of the island, apparently housed in a wooden shed. The lights were under the control of Fire Command (Inner) at Carlingnose, but the Battery Commander could move the northern and southern lights to illuminate the booms under the bridge.

Even after the removal of the guns, four DELs on Inchgarvie were listed as being ready for action in February 1917, with a RE garrison of two officers and 60 sappers. Three RE telephone operators were also stationed there.[47]

Figure 9.21
Inchgarvie from the south in 2016, from a position similar to Figure 9.18 (© Gordon Barclay)

Figure 9.22
One of the Maxim machine guns used for close defence, in a post on the northern side of the island (Sgt J B Adams, Forth RGA. Bob Adams collection. Reproduced with permission)

Despite its position in the middle of the river, the island was provided with close defences: the two Maxim machine guns already mentioned and barbed wire entanglements round the lighthouse at the island's western end, extending south-east, to restrict access from the bridge to the island and vice versa (Fig 9.22).

Inter-war

The Fort Record Book records that the 12-pdr (18cwt) guns (which were Royal Navy property) were removed to the Royal Naval depot at Crombie on 12 May 1920, and the mountings to Rosyth on the day before.[48] An armament table dated January 1921, however, still listed Inchgarvie as fully armed.[49] A further table, dated September 1921, suggested that 'B' Group may have been still in place, but that 'B2' might be the only active gun; the entry, however, is annotated 'Guns returned to Navy'. By 1927, Inchgarvie was shown as disarmed, but it was proposed that it be armed in future

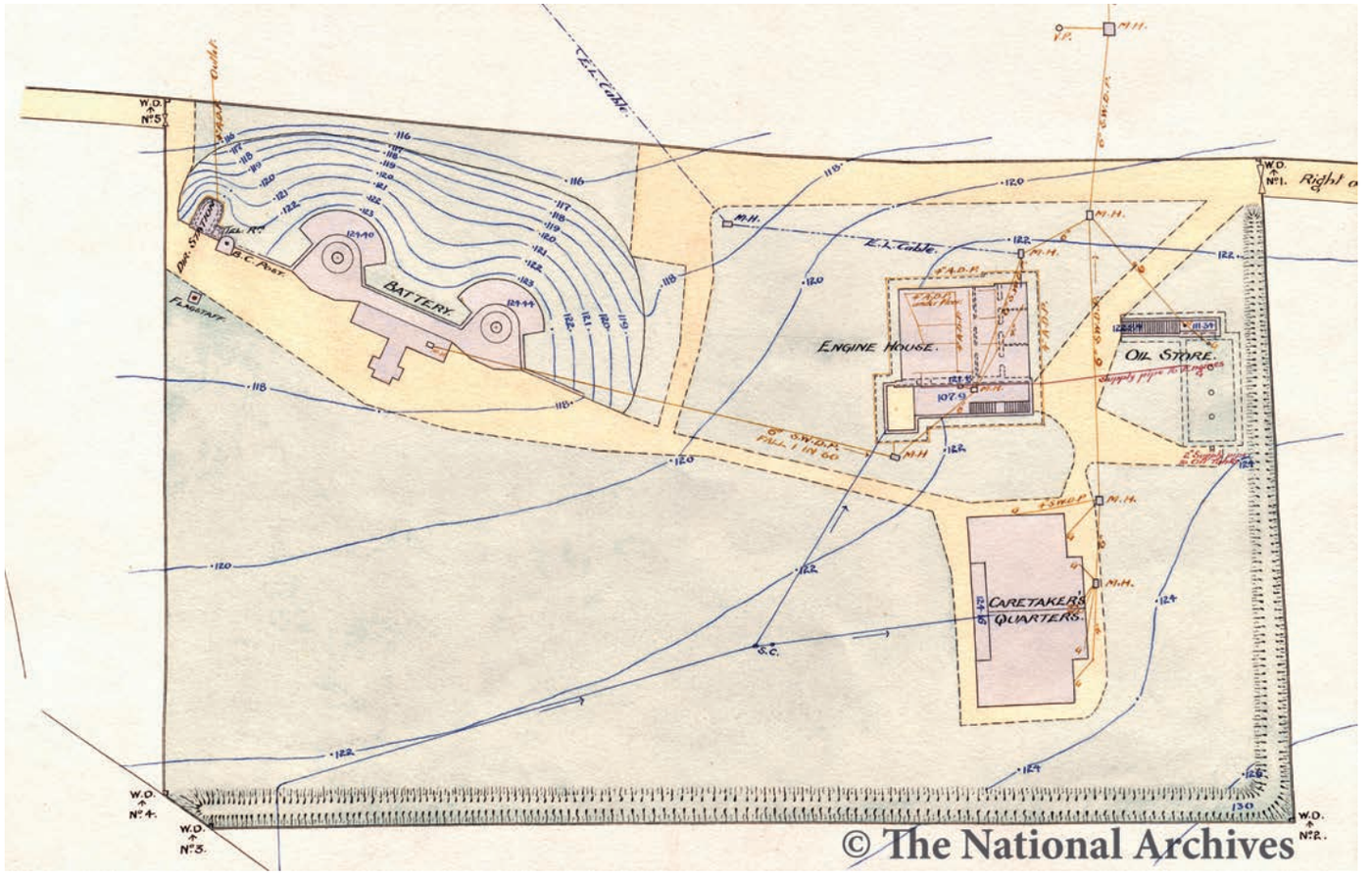


Figure 9.23
Part of one of the Royal Engineer Record Plans of Dalmeny, dated 23 January 1903, showing the detailed layout of the battery. Note that there was no permanent accommodation, apart from the caretaker's quarters, as the gun was manned by volunteers (© The National Archives, WO 78/5166)

Figure 9.24
Rear view of the Dalmeny battery, as restored, 2016 (© Gordon Barclay)

with a 6-pdr twin gun of the kind eventually mounted in the Second World War on what was then the Inner Line (Inchcolm, Inchmickery, Cramond Island and Charles Hill). The same document showed proposals to withdraw one of its two moveable searchlights.[50]

In 1930, the Interim Defence Scheme for Inchgarvie was still recorded as having four active DELs.[51]

Two 12-pdr guns were recorded as being mounted in 1933, although not part of the approved armament, and two old .303-inch Lewis guns were also noted as being on the island on 14 November 1936;[52] all were mounted for drill purposes. Charles Grant (pers comm), who was a gunner on Inchkeith in 1940, said that the only other island that he landed on was Inchgarvie, where he went for a 'practice shoot' on a 'couple of 12-pdrs' prior to the beginning of the Second World War.

1939–45

When Inchgarvie was reoccupied in 1939, Douglas Grant was sent to become Battery Commander of the island and the armament at that time comprised only a single 'Drill Purpose' Lewis machine gun. When he and his fellow servicemen arrived at the island, they found the conditions very basic.[53] The DELs were still operational.[54]

On 16 October 1939, nine German bombers flew over the Forth Rail Bridge at *c* 300m, before turning around and dropping bombs on the cruisers HMS *Southampton* and *Edinburgh*, then moored east of Inchgarvie. Grant gave instructions for the 'drill' Lewis gun on Inchgarvie to open fire, as did the Battery Commander at Coastguard. They were, thus, the first gunners to open fire on enemy aircraft over Britain during the war. Their bullets went up only to 200–250m, not nearly high enough to reach the German aircraft. Grant recalled, 'It was like using a pea-shooter'. About 750 rounds had been discharged at the aircraft, with most of the spent shell casings falling over the cliff on which the gun was mounted and ending up in the sea, leaving Grant with only 300 cases to return. He was 'severely reprimanded' for losing the shell casings, as the Army was still on peacetime accounting for its ammunition. About February 1940 Grant was transferred to Charles Hill Battery, where he took command. Apparently Inchgarvie was finally abandoned at this time.[55]

Survival

The defence structures on Inchgarvie are very well preserved: the gun platforms, control tower, searchlight housings and the original accommodation/magazine complex all survive, albeit in a dangerous condition, and deeply befouled by bird excrement. As the pier has collapsed, landing should not be attempted.

Figure 9.25
The original unusually decorative 'unclimbable fence' round Dalmeny, as restored, 2016 (© Gordon Barclay)

9.4 Dalmeny

Two batteries bore the name 'Dalmeny'. This, the first, was in use from 1901 and disarmed in December 1916; the second 'Dalmeny Battery' (see Section 10.3 below) was one of the batteries built on Cramond Island in the Second World War. A battery on the south shore had been in the approved armament of the Forth since 1888 (as 'South Queensferry').[56] Authority for the commencement of construction was finally given on 1 May 1900: work started on the 21st and was completed four months later, at a cost of £4,807 1s 4d (Fig 9.23).[57]

Originally designed to be armed with two 12-pdr QF guns, the 1899 Joint Committee on Armament (see above) recommended that the two 4.7-inch guns, at that time being removed from Inchkeith, would serve better. Dalmeny was first recorded in the June 1903 armament table as mounting two 4.7-inch QF guns and a .303-inch Maxim machine gun on a parapet mounting, for close defence.

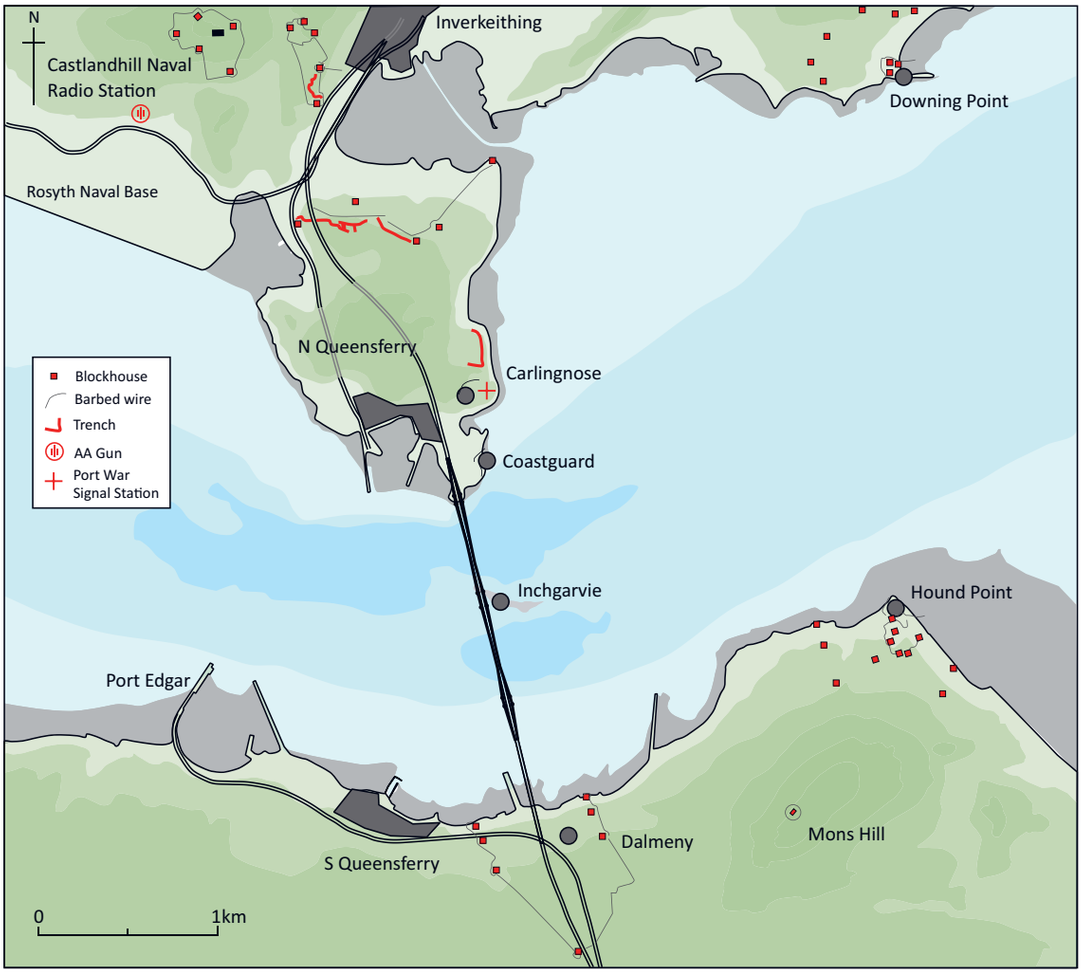
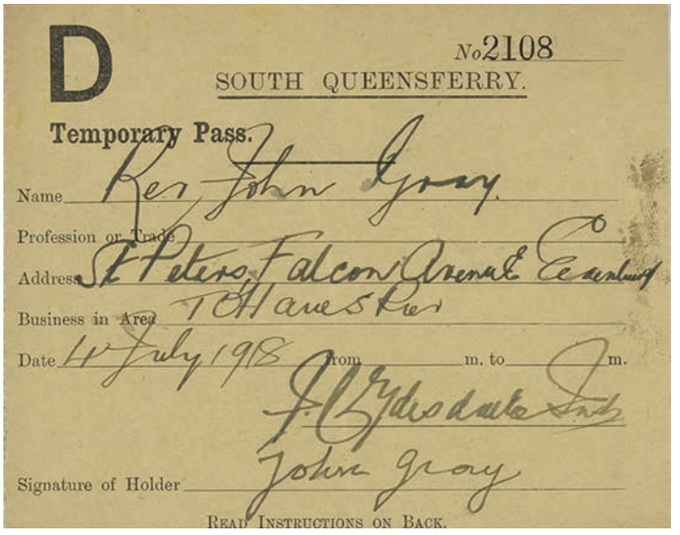


Figure 9.26
The defences of the approaches to the Forth Bridge and nearby coast batteries in the First World War (© Gordon Barclay)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No 2108

SOUTH QUEENSFERRY.

Temporary Pass.

Name Rev John Gray

Profession or Trade

Address St Peters Falcon Avenue Edinburgh

Business in Area

Date 4th July 1918 from m. to m.

Signature of Holder John Gray

READ INSTRUCTIONS ON BACK.

Figure 9.27
A pass issued to the Reverend John Gray, a prominent Roman Catholic clergyman in Edinburgh, to enter the restricted area at South Queensferry in the First World War (English Province of the Order of Preachers. Reproduced with permission)

The battery compound was sited on the cliffs at an elevation of *c* 19m, and contained the gun positions, with the magazine beneath and the Battery Command Post just to the west. The engine house, oil store and caretaker's quarters completed the structures (Fig 9.23). A cable ran down the hill to provide power to the two DEL emplacements situated on the seashore, almost beneath the rail bridge;[58] they were recorded in January 1913 as 'fixed' with an arc of coverage of 16° (No. 2 being able to traverse by a few degrees).[59]

In the 1905 Defence Scheme, an infantry garrison of 159 men was to be detailed for the defence of the battery.[60]

First World War

At the outbreak of war, the two 4.7-inch QF guns were still there.[61] In late 1915, the War Office asked whether the battery could be dispensed with as it was 'somewhat retired' and in thick weather so out of the way as not to be able to participate in the defence. Admiral Lowry, however, wished it to remain in action until improvements were made in the defences of Inchcolm Fire Command.[62] In July 1916, the garrison of the battery comprised three officers (one Battery Commander, Gun Group Commander and GGC relief) and 38 other ranks (including a three-man DRF detachment and 18 men in the gun detachment).[63]

In the general revision of the Forth defences, the two 4.7-inch QF guns were transferred to Inchcolm in December 1916, leaving only the Maxim machine gun. One searchlight was still recorded as being in position on 30 May 1917, but was due to be moved shortly thereafter.[64] The battery was never rearmed.

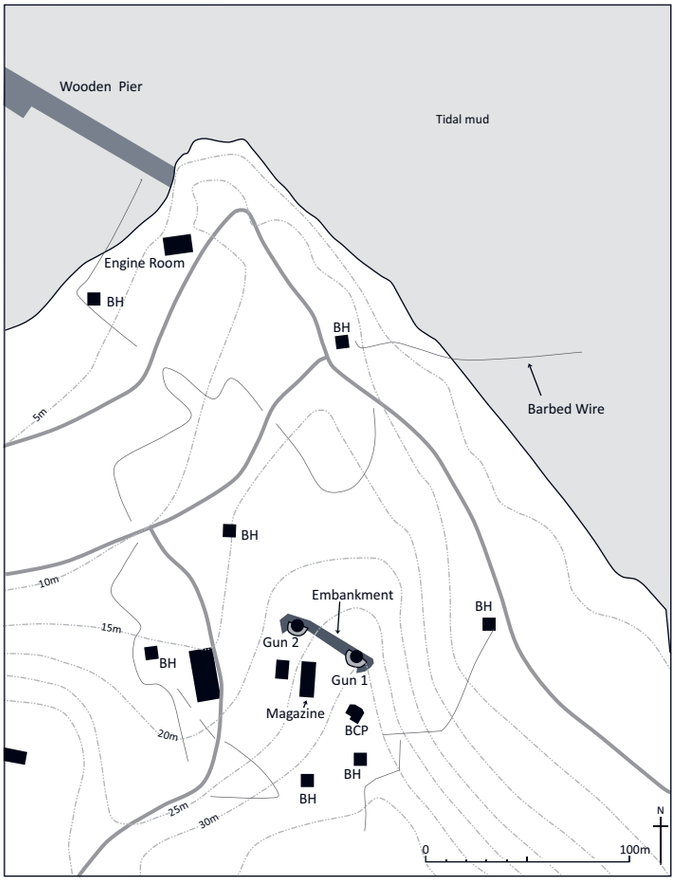


Figure 9.28
Plan of Hound Point in 1915. 'BH' marks a blockhouse (after WO 79/4396) (© Gordon Barclay)

Survival

The gun positions and most of the underground buildings have been cleaned out and carefully restored by the present owner (including renovating old safety railings and making matching replacements) (Fig 9.24). A unique feature of the site is that the original 'unclimbable fence' has been renovated around most of the battery perimeter (Fig 9.25).[65] In 2017, the battery site was sold to Network Rail, to be part of their 'Forth Bridge Experience'.

9.5 Landward defences of the Forth Bridge

The battery and PWSS at Carlingnose had close defences, as did Coastguard and, in the First World War these

were incorporated into the overall defence of the northern approach to the Forth Bridge.[66] The main defence line lay across the isthmus from West Ness (at the entrance to Inner Bay) and was formed of barbed wire entanglements, entrenchments and five blockhouses. To the north there were two further defended areas, to the east and west of the main road towards North Queensferry. The larger, to the west, was around the naval wireless station at Castlandhill, the large barbed wire enclose of which was defended by five blockhouses (Fig 9.26).

The whole area around the southern end of the bridge, including the Dalmeny battery, was surrounded by a barbed wire entanglement and seven or eight blockhouses.[67] About mid-way between Dalmeny and Hound Point Batteries there was a strong point, named 'Mons Hill', which was connected to the defence's telephone system.[68]

Access to the defended area around the Forth Bridge was restricted in the First World War, and a special pass had to be issued to a non-resident seeking to enter (Fig 9.27).

In April 1914, a small detachment of three officers and 40 men of the 6th Battalion (Territorial Force) The Black Watch spent a few days at their War Station near the Forth Bridge for the purpose of testing the mobilisation scheme and railway arrangements. This proved of great value, and when the real call came on 4 August, the scheme of mobilisation ran without a hitch. On the 5th, men were pouring into their Company HQ, and by the evening of the 6th, Battalion had become an organised unit. In the busy first few weeks at Queensferry, the men built blockhouses, dug-outs and fortifications, and guarded the approaches to the Forth Bridge, landing places and other points as far west as the dockyard at Rosyth. The Special Service Section under Captain J Hally maintained a continuous coast patrol from the week preceding the outbreak of war.[69]

9.6 Hound Point

First World War

In December 1912, the Home Ports Defence Committee, in reviewing the anti-torpedo craft defences of the Forth, recommended that 'sentry and search beams' be installed

Figure 9.29
Hound Point, gun tower No. 2, at the northern end of the battery. The gun was on the top level; on the storey below were the ready-use lockers for ammunition; on the bottom floor was the shelter for the crew (© Gordon Barclay)

Figure 9.30
First World War photograph of Hound Point, when armed with 12-pdr (18cwt) Naval guns (© Bruce Stenhouse Collection)

at Hound Point.[70] None of the plans show exactly what was built.

The construction of a battery for two 6-inch guns here had been approved before the war. Construction was in hand when war was declared and the guns were mounted in November 1914. There is no Fort Record Book for Hound Point, but there is a brief history of the battery on the Fort Record Book for Inchcolm Fire Command. The extant plans do not show what was actually built.[71] The emplacement is of a kind unique in the defences of the Forth: the two gun emplacements, situated on the crest of the north-north-west end of a hill (at *c* 25m over sea level) take the form of cylindrical concrete towers, with the gun holdfasts set into their tops. More substantial towers were built than had been shown on plans, with a concrete lower storey larger than the platform area above (Fig 9.29). A single photograph of the

Figure 9.31
The Hound Point magazine. The steel doors on the left closed off niches which were glazed on their inner side, giving light safely into the powder store. The shell store was to the right (© Gordon Barclay)

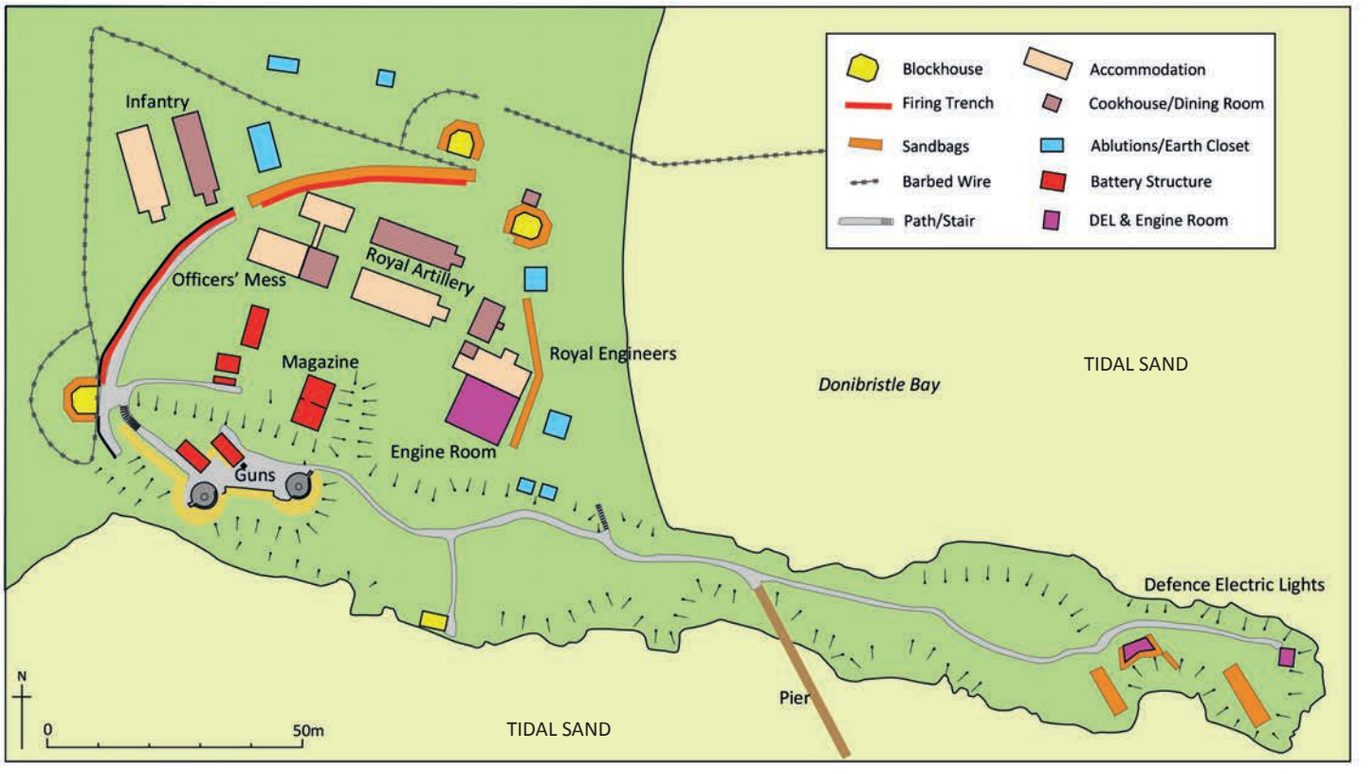


Figure 9.32
Plan of the Downing Point battery and camp in 1915. Accommodation for the Royal Artillery, Royal Engineers and infantry garrisons was provided in three separate complexes. The whole area below the high tide mark was exposed sand at low tide (© Gordon Barclay)

battery from the First World War shows it fitted with 12-pdr (Naval) 18cwt guns after 1916 (Fig 9.30). The photograph also shows that the two emplacements were linked by a flat-topped earthen bank, faced by vertically set timber fencing, which provided partly protected access between the guns. There were shelters for the crews in both towers at the lower level.

The magazine and engine room were built in the shelter of the hill (Fig 9.31). The ammunition was manhandled from the magazine up the hill to the ready-use storage below the gun platforms. The combined Battery Command Post and Electric Light Director Post was built south of the eastern gun, on the nose of the hill (Fig 9.28).

In July 1916, the Royal Artillery garrison comprised three officers (Battery Commander, Gun Group Commander, GGC relief), 22 gun crew, eight men in the ammunition supply detachment, storeman and lamp-man – in total 42 other ranks.[72] In February 1917, the Royal Engineer garrison for the two active DELs comprised two officers and 30 sappers, with an additional three RE telephonists.[73] The officers' mess was accommodated in the estate cottage on the shore, to the east.[74]

A map dated May 1916 shows that Hound Point was surrounded by a double ring of 12 wooden blockhouses, six in each ring.

In the general revision of the defences of the Forth in 1916–17, it was decided that the two 6-inch guns would be removed from Hound Point to arm the new battery at Leith Docks. They were replaced by two 12-pdr QF (Naval) 18cwt guns removed from Inchcolm, in action 22 and 27 November 1916.

Post-war

The 'history' of the defences states that the 12-pdrs were dismounted and returned to naval store, but on an unspecified date. In July 1919, the battery was recorded as having had its personnel withdrawn.[75] A list of armaments dated January 1921 shows the battery still fully armed but, by September, the approved armament was recorded as only one of the guns ('A2' Group), but later annotated 'Guns returned to Navy. Site disposed of'.[76]

Survival

The battery is now in mature woodland and no modern survey of the site exists; fortunately, modern OS mapping has fixed the exact positions of the gun towers and magazine. The two

gun towers (marked 1 and 2 in faded white paint) survive in good condition, although the safety handrails on the top and lower floors have now mostly collapsed. Both holdfasts are visible. The BCP seems to have been bulldozed into a heap of concrete to one side of its site. The magazine building is the only other structure which has survived. It is a simple rectangle with a central door leading into a short passage separating two rooms. The left-hand room was clearly the cartridge store; in the absence of a lamp passage, the illumination was provided through four internally glazed niches, the outer sides of which were sealed by steel doors. The external wall below the niches bears the impression of a corrugated iron-roofed lean-to reaching to below waist height, where lamps, fuel and other stores were probably kept. The right-hand room, probably the shell store, has large barred windows.

9.7 Downing Point

First World War

A battery in this part of the Fife coast to strengthen the Inner Defences was first suggested at Middle Point in 1912, 315m to the west of Downing Point.[77] The history of the defences of the Forth on the Inchcolm Fort Record Book[78] notes that the GOC Forth Garrison had, in 1914, suggested the construction of a modified form of 4.7-inch QF battery at Downing Point, and an allocation of £450 was approved for this by the War Office on 5 September. The holdfasts were to come from Northern Command, while the guns and carriages were to come over from Kinghorn, where they had been part of a battery reduced to 'drill and practice'. Work proceeded very quickly on what was a very simple structure, and the guns arrived and were mounted on 11 October 1914.[79]

The guns were set in two shallow pits provided with a concrete glacis and, raised on a platform behind, a concrete pillar for a Depression Range Finder (Fig 9.32; Fig 9.33). Behind the rocky ridge on which the guns were placed, the magazine and the ancillary buildings of the battery lay protected, surrounded by a barbed wire fence and defended by four blockhouses.

In July 1916, the Royal Artillery garrison comprised three officers (Battery Commander, Gun Group Commander and GCC relief) and 34 other ranks (including 18 in the gun detachment, and eight handling ammunition).[80] The Royal Engineer garrison for the operation of the DELs was recorded in February 1917 as two officers and 32 other ranks (there were also three RE telephonists).[81]

In the general revision of the Forth defences, it was decided that the two 4.7-inch QF guns should be swapped with a pair of 12-pdr (Naval) 18cwt guns from Inchcolm. Over a busy few days in mid-June 1917, the pairs of guns were exchanged; the 12-pdrs were mounted on 9 July and ready for action on the 11th.[82]

Although there is no Fort Record Book, two maps dated 17 January 1915 and a further map and plan of 1916 provide a very detailed layout of the guns, buildings, barbed wire perimeter,

Figure 9.33
The battery at Downing Point viewed from behind the Direction Finder (visible on the left) towards the eastern emplacement, showing ready-use storage between the emplacements (© Gordon Barclay)

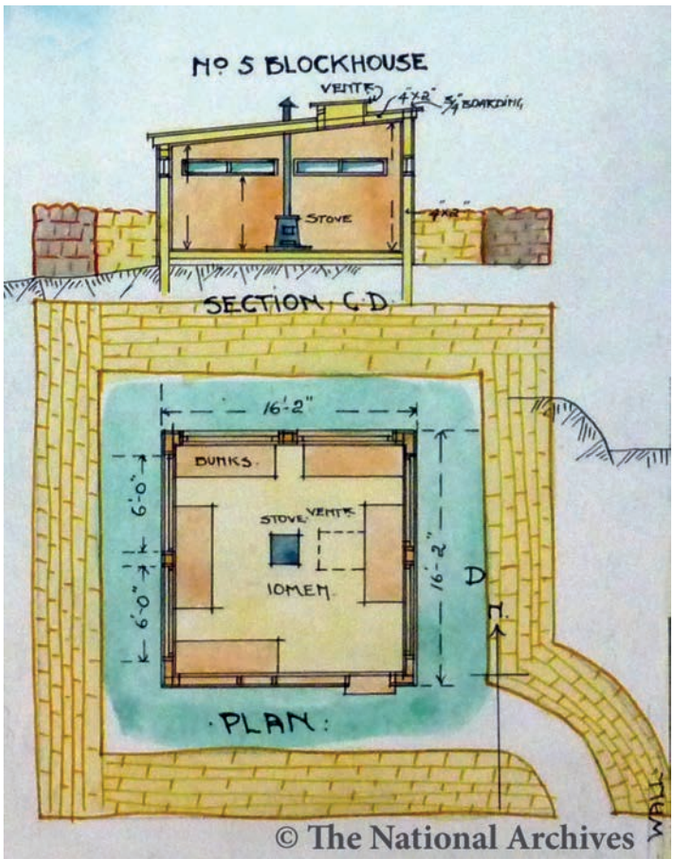


Figure 9.34
Blockhouse No. 5 of the defences of Downing Point. The blockhouses were clearly intended to provide accommodation for their small garrisons (© The National Archives, WO 78/4396)

four blockhouses within the perimeter, the location of the two DELs, and six further blockhouses forming an outer line of defence, some 300m to 450m out from the battery. The 1916 map also has a series of exquisite plans and sections of the six outer blockhouses, showing their internal arrangements. All the blockhouses were designed to accommodate resident garrisons of ten men (Fig 9.34).[83]

The information on the Defence Electric Lights is contradictory. The plan of the battery dated 17 January 1915 shows one DEL as a fixed-beam, the other as a moveable fighting light. On the armament table attached to a chart dated October 1916, the DELs are both described as concentrated fighting (that is, moveable) lights.[84]

Inter-war

In July 1919, the battery is recorded as having had its personnel withdrawn,[85] but it was still armed with two 12-pdrs in January 1921. By September, in the history of the Forth Defences on the Inchcolm Fort Record Book, only one of the 12-pdrs ('Group L2') is listed as still in the approved armament of the river: an undated note in the 'Remarks' column states 'Guns returned to Navy. Site disposed of'. It is likely that the final abandonment took place in the early 1930s, as elsewhere in the Forth. The site was not reoccupied in the Second World War.

Survival

The gun positions and ancillary DRF position survive in good condition. The rest of the battery structures have been demolished. The battery and the site of the camp are now in the care of an active local community group which is managing the site.

Notes

1 WO 33/873.
2 CAB 13/1.
3 Registers of Scotland search sheet 2714.
4 CAB 38/19/53.
5 WO 78/5175.
6 WO 192/101; WO 78/5175.
7 WO 33/381.
8 Registers of Scotland. Fife, search sheet 14771.
9 WO 32/6295.
10 WO 78/5179.
11 WO 192/108.
12 ADM 137/994.
13 Buildings at Risk Register for Scotland 'Signal Station Guard House, Battery Road, North Queensferry'.
14 WO 33/766.
15 WO 192/108.
16 *The Scotsman*, 2 August 1921.
17 CAB 36/18.
18 *The Scotsman*, 2 July 1938.
19 WO 192/104.
20 CAB 18/19.
21 CAB 38/19/53.
22 WO 78/5179.
23 CAB 38/19/53; WO 33/3264.
24 WO 33/510; WO 33/626.
25 WO 78/5179.
26 ADM 137/1892.
27 WO 33/810.
28 WO 33/766.
29 WO 199/2672.
30 WO 192/104.
31 WO 78/5179; WO 192/108.
32 CAB 36/18.
33 WO 192/252.
34 ADM 116/4113.
35 WO 192/108.
36 Morris and Barclay 2017.
37 Registers of Scotland. Fife, search sheet 12357.
38 WO 192/100.
39 WO 78/5172.
40 WO 78/5172.
41 CAB 38/19/53; WO 192/100.
42 WO 33/444.
43 WO 78/4316; WO 78/5172.
44 WO 192/100.
45 WO 78/5172.
46 WO 33/766.
47 WO 33/810; WO 33/861.
48 WO 192/100.
49 WO 78/5179.
50 CAB 36/18.
51 ADM 116/2493.
52 WO 192/104.
53 Douglas Grant, pers comm.
54 Grant ND.
55 Douglas Grant, pers comm.
56 CAB 7/6.
57 WO 78/5166.
58 WO 78/5166.
59 WO 33/626.
60 WO 33/381.
61 WO 192/108.
62 ADM 137/1170.
63 WO 33/766.
64 ADM 137/1892.
65 Bill Clements has drawn our attention to other surviving examples of 'unclimbable fences' which are far less decorative than that preserved at Dalmeny.
66 WO 192/101.
67 WO 78/4396.
68 WO 78/4396
69 Wauchope 1925: 125–8.
70 CAB 13/1.
71 WO 78/4331; 78/5173.
72 WO 33/766.

73 WO 33/810.
74 There is an annotated image of the cottage in the Bruce Stenhouse Collection.
75 WO 33/873.
76 WO 78/5173.
77 CAB 13/1.
78 WO 192/108.
79 WO 192/108.
80 WO 33/766.
81 WO 33/810.
82 WO 192/108
83 WO 78/5165.
84 WO 78/5179.
85 WO 33/873.

Chapter 10

THE MIDDLE DEFENCES (INCHCOLM FIRE COMMAND / 20 (FORTH) FIRE COMMAND)

10.1 The Middle Line (1914–31)/The Inner Line (1939–56)

Inchcolm Fire Command included, in both wars, the guns of Inchcolm, Inchmickery and Cramond Island, and in the Second only, a further battery at Charles Hill on the Fife coast. In both wars, the primary purpose of the batteries was to protect the boom that crossed the Forth at this point and to tackle submarines and the sort of small fast-moving boats that the boom was intended to stop. In the first period of its existence, it was the Middle Line of defence. In the Second World War, it formed the Inner Line. From 1915 to 1917, the 9.2-inch battery at Braefoot lay immediately behind the northern terminal of Inchcolm Fire Command, and its description is included below.

Proposals had been made in the first decade of the 20th century (see Chapter 4 above) to use moorings below (east of) the Forth Bridge, but the Admiralty decided not to proceed with their plans.

Admiral Lowry again raised the matter of defending the line in May 1914, but it was only in October that the Admiralty decided to install an anti-submarine net and to arm the islands to protect it. The defences were built over the winter and were ready by the early spring of 1915. The defences comprised fourteen 18cwt naval 12-pdrs, larger and with a higher muzzle velocity than the 12cwt guns used for coast defence, but lacking auto-sights, thus making them less effective at finding and holding a fast-moving target.

The first detachment of the garrison of the islands, 72 Royal Garrison Artillery and 22 Royal Engineers, went out on 16 March 1915, under the overall command of Major Horne, RGA, who was the first Fire Commander, in charge of what was termed 'No. 2 Section, Forth Defences'.[1] We have not been able to identify a separate Fire Command Post on the island in 1915, and it may have occupied the same space as the Battery Command Post. The mounting of the guns on the middle islands had been done under the supervision of Acting Gunner J Griffiths, RN, who wrote on 23 March 1915 begging 'to report that all the 12-pdr 18cwt guns are mounted on the "Chain of Islands" defences' and that all stores and ammunition had been handed over to the military garrison. Gunner Griffiths was commended by the Admiralty 'for the care and attention with which he has carried out work of somewhat unusual character to the Naval service', that is, mounting ships' armament on an island.[2]

By 19 November 1914, arrangements were being made to construct a Challenge Signal Station at the highest point at the west end of Inchcolm to check smaller naval vessels. This new Challenge Signal Station was to be in addition to the PWSS at Carlingnose.[3] It was in operation before March 1915[4] and was replaced during 1916 (see below). The Extended Defence Officer (Inchkeith) was to pass to the Naval Officer in charge of the Inner Forth War Signal Station at Inchcolm information regarding movements of hostile ships, which he in turn could communicate to the Fire Commander.[5]

In July 1916, the Fire Command Post had a staff of three officers (Fire Commander and two assistants) and 11 other ranks, including four telephonists, three orderlies, a Master Gunner, an Artificer and two officers' servants[6]

Figure 10.1 shows the gun coverage in the Middle Line in 1915, before the revision of the defences. An equivalent for the Second World War is included as Figure 10.3, but it is not possible to provide a meaningful map for the period 1916–18 because the gun coverage was so dense: between the islands and seaward to a range of 3,500–4,500m, no area of water had fewer than seven guns covering it, usually at least eight to ten, and in one area up to 13. The gun emplacements and the ancillary buildings (magazines, battery posts and so on) were also on a much more substantial scale than the structures they replaced and the work took some months to complete. As part of the upgrading of the defences, a new Fire Command Post was built on the western lobe of Inchcolm, in the impressive new Port War Signal Station (Fig 10.2). A contract had been placed on 12 August 1916 for the erection of a Joint Naval and Military Port War Signal Station on the island, to be completed in three months.[7]

In April 1918, the Royal Artillery establishment of No. 20 (Forth) Fire Command was 25 officers and 362 other ranks; this does not include Royal Engineers or other arms.[8]

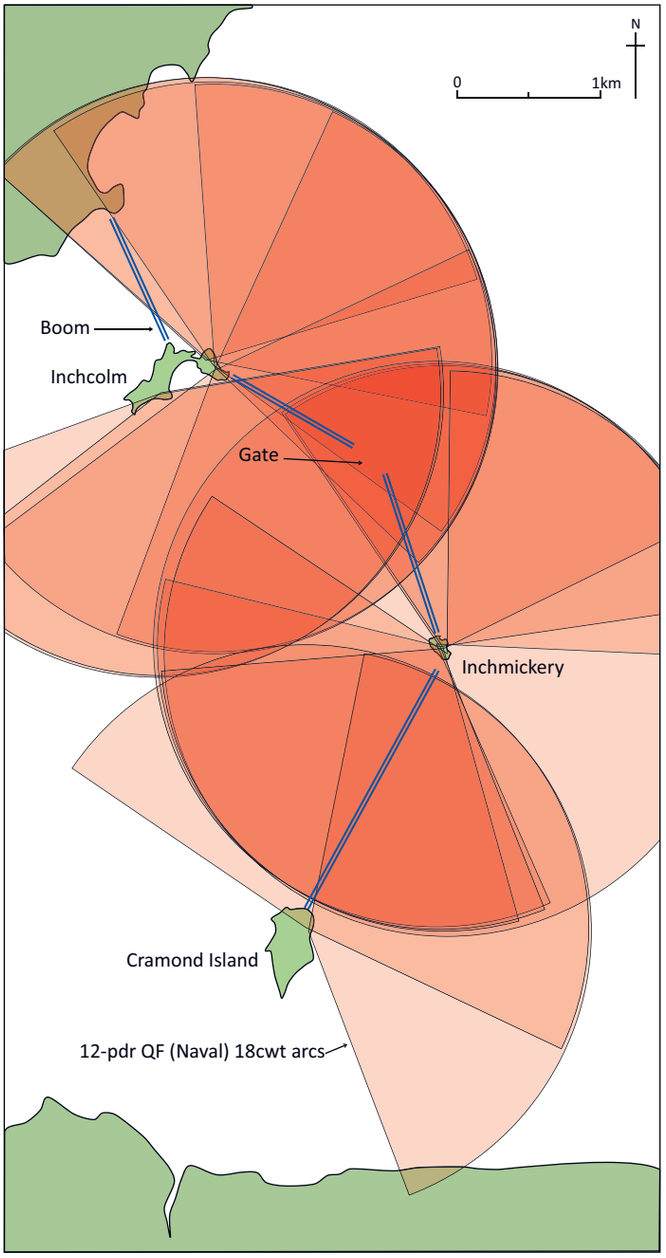


Figure 10.1
Chart of the guns and arcs of fire of the Middle Line in 1915, based on a chart in file WO 78/5179. All three islands were armed with 12-pdr (Naval) 18cwt guns, not well-suited to coast defence role, as they had no auto-sights fitted. The 9.2-inch guns at Braefoot are not included (© Gordon Barclay)

The armament of the Fire Command remained in place after the end of the First World War (see Section 2 above), but the batteries were decommissioned (and on Inchcolm removed and/or buried) by 1931.[9]

As international tensions grew in the late 1930s and consideration was being given to preparing the Forth for war, plans were made in February 1938 for the re-establishment of anti-MTB batteries on Cramond, Inchmickery and Inchcolm. A fourth battery, at Charles Hill on the Fife shore, was added to the scheme shortly after the outbreak of war. A mixture of pre-First World War 12-pdr (12cwt) guns and modern 6-pdr twin guns was to be mounted, to deal with fast boats. As in 1915–18 the main task of the batteries was to cover the anti-boat/anti-submarine booms and nets stretched across the river between the southern shore and Cramond Island (later replaced by a concrete barrier), between Cramond Island and Inchcolm (missing out Inchmickery), and between Inchcolm and Charles Hill, reusing the old First World War concrete blocks at the last site.

The arrangement of 6-pdr twin guns (effective range *c* 1,270m) and 12-pdr QF guns (effective range *c* 1,830m) set out in October 1939, created a significant overlap in fields of fire in the channels between the islands (Fig 10.3).[10]

The imposing Port War Signal Station building on Inchcolm, which contained the Fire Command Post, had been demolished in the 1930s by the Ministry of Works in their

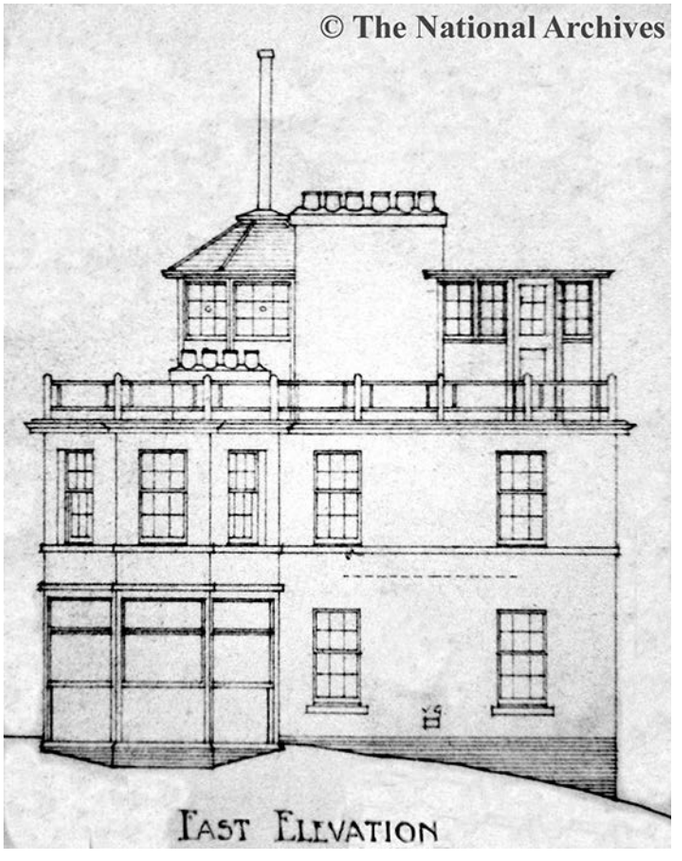


Figure 10.2
Elevations of the impressive Port War Signal Station on Inchcolm (© The National Archives, WO 78/5171)

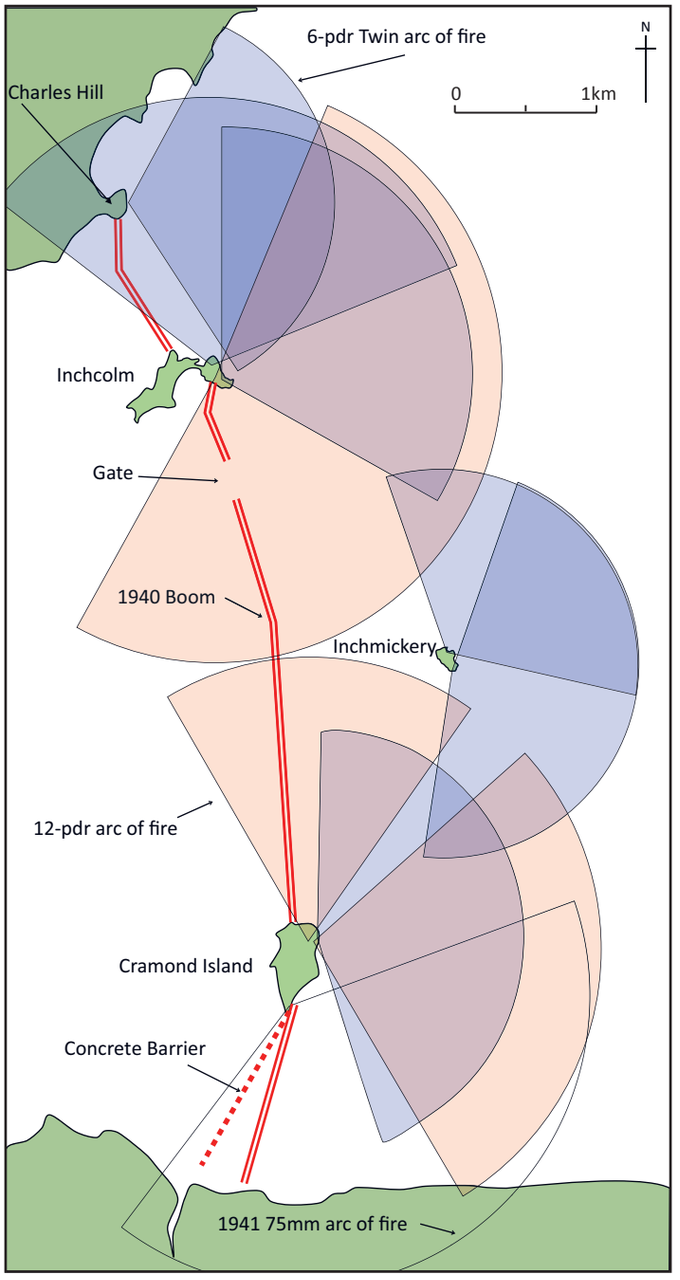


Figure 10.3
Chart of the guns and arcs of fire of the Inner Line, 1939–41. The arcs of fire are those recorded in the Fort Record Books in November 1943, which are greater than those in the original plans. The chart includes the concrete anti-boat boom south of Cramond island, and the 75mm gun installed in October 1941 to cover it. Based on a chart in file WO 78/5163 (© Gordon Barclay)

campaign to 'tidy up' the island. The new FCP was housed in the reused Battery Command Post of the First World War 4.7-inch QF battery. The FCP had a telephone exchange that served the Command, linked by submarine telephone cables to the other batteries, and to the public telephone system. It was also linked to the Battery Command Post of each battery by a separate 'Fighting Line' which would be kept open during any action, separate from the 'Admin Line'. Radio communications were also installed during the Second World War in case telephone communication was interrupted. In the final resort, visual signalling would be used, and each individual Gun Group had instructions as to what types of target to aim at, if all communication was lost with higher command. The Inchcolm FCP telephone exchange also had a direct link to the Middle Line at Inchkeith, which in turn was linked to the Commander of Coast Artillery at Pitreavie Naval HQ, and to the batteries of the Middle and Outer Lines.[11]

In September 1940, the complement of the whole Fire Command (including the garrisons of the three islands and Charles Hill, and 46 men in the Fire Command itself), was 533 men, 23 of whom were officers.[12] As the threat of attack diminished, and the need grew for artillerymen in field batteries, and for infantry, it was announced in October 1943 that the whole Fire Command would be disbanded, with the exception of four of the DELs to illuminate the boom north of Inchcolm and between Inchcolm and Cramond. By 11 December, the whole Fire Command was in care and maintenance. A document relating to this process reveals that the Fire Command had had both its own RAMC medical officer and its own Army chaplain. The medical officer made routine visits to all four batteries. Inchmickery and Cramond both had a trained Royal Army Medical Corps nursing orderly on the island, to give first aid.[13]

The Ministry of Defence finally withdrew from Inchcolm in 1957.[14] The capacity to put an anti-submarine barrier in place was, however, maintained until 1977, at which point coast defence as envisaged in the late 19th and early 20th centuries finally ended.[15]

10.2 Close protection, landward defence and anti-aircraft defence

There are no records for the First World War that suggest that the three islands – Inchcolm, Inchmickery and Cramond – were given any self-defence capability. There was a barbed wire fence marking off the southern end of the military area on Cramond Island (which was accessible on foot at low tide) but no hint on any of the plans of the 'fire-trenches' and barbed wire on Inchkeith or around Kinghorn. Braefoot, not formally part of Inchcolm Fire Command, was more heavily defended from the time of its construction, with security fencing and blockhouses, described in more detail below. None of the islands was recorded as having anti-aircraft defence in February 1915.[16]

In the Second World War, as part of the preparations to face a German invasion, defences were erected on British beaches considered vulnerable to full-scale invasion or to

raiding from the sea.[17] It is certain that in the early stages of the war the batteries of what was the Inner Line (the island line, at Inchcolm) had basic security provisions, such as barbed wire fences to the landward side (at Charles Hill) and along the shoreline, slit trenches for protection from air attack and for use as firing trenches, and light anti-aircraft defences. The garrison would also have been armed with small arms, although the proportion of men issued with rifles and sub-machine guns in the early stages of the war would have been low. As is seen in other areas of home defence, the elaboration, and indeed over-elaboration, of the defences of the batteries continued into the middle years of the war.[18] In discussing the provision of close defences on the islands and at Charles Hill, we were struck by the way in which men who had served on (or even commanded) batteries had little or no memory of defence provisions. Most of these informants had left the batteries in 1942, when efforts were already being made to 'comb out' men to go to front-line units, and it is notable that formal Land Defence Schemes preserved on the Fort Record Books date from 1942 onwards (for example, Cramond 19 July 1942; Charles Hill 5 March 1943). These schemes mention the presence of French First World War 75mm field guns (supplied in 1940 by the USA) on three of the four batteries (Inchmickery was too small and crowded), there being two (or at one stage possibly even three) on Cramond and, in addition, a 4.5-inch howitzer and a Spigot Mortar at Charles Hill; the Cramond mobile 75mm gun is first mentioned in a document dated 5 February 1943, and then appears in Land Defence Schemes dated May and August 1943. Spigot Mortars came into use in late 1941 and remained in use, mainly with Home Guard units, for the rest of the war.[19] The 75mm guns were first used to equip British and Polish artillery units after Dunkirk, for whom there were then no supplies of the standard 25-pdr gun. These guns were freed up when 25-pdr guns became available. Frequent practice on the 75mm guns is recorded on the files and we wonder whether the guns were intended as much to give men experience prior to transfer to field artillery units as to provide close defence. The 75mm issued to Cramond for a very specific defence role in a fixed position, covering the anti-boat barrier to the south of the island, was supplied in October 1941. It seems unlikely that guns for less specific purposes would have been issued before then; it is more likely that they were issued in 1942. The 'Lay-out of the Fort' described in the Cramond Fort Record Book on 18 April 1941 makes no mention of landward defence.

Charles Hill, being the only mainland battery in the Fire Command, was clearly felt to be more vulnerable to attack, and part of the landward approach was blocked by a minefield.[20] But even Inchmickery was capable of self-defence. The island had two Bren light machine guns; two Thomson and one Sten sub-machine guns; two Solothurn AA machine guns;[21] and 144 rifles, one for every second man; 422 grenades; and almost 30,000 rounds of small arms ammunition.[22] Cramond alone makes mention of an infantry garrison, a detachment of the Royal Scots, in a document dated 19 July 1942.

Two guns, of types usually associated with anti-aircraft defence, were placed on Inchcolm; however, the two 2-pdr pom-pom guns and a Bofors gun were more probably deployed in an anti-MTB role prior to the deployment of the new 6-pdr twin guns in 1940. Douglas Grant, indeed, remembered that the Bofors could not be elevated for AA firing.[23] Documents, either undated or from 1942 onwards, suggest that AA defence was handled at first by light machine guns and added to in 1943 by Unrotated Projectile (UP) installations.

The UP weapon was developed in the 1930s to supplement light AA weapons on ships, although they were found to be not particularly effective. The high explosive rockets were 32 inches (0.8m) long with a 3-inch (76mm) diameter. The installation comprised a steel cabin in which the operator sat, with a rack of 20 rockets to one side, the rockets being fired in salvoes of ten.[24] The Fort Record Book of Inchcolm Fire Command contains sketches of an Unrotated Projectile weapon being moved carefully through the abbey ruins to its position at the Fire Command Post in June 1943, where the holdfast is still visible, on the summit of the western lobe of the island (Fig 10.4).[25]

Solothurn AA machine guns, along with generous allocations of 7.92mm ammunition, are recorded in the armament of Cramond, Inchmickery and Charles Hill. Inchcolm seems only to have had Bren guns for both close defence and AA work. As it turned out, the Luftwaffe only made sporadic and generally unsuccessful attacks on the Forth; there were only a couple of dozen incursions over the Forth during the war, at least ten of which involved aircraft losses to British fighters of 43, 602 and 603 Squadrons, and to AA fire (none of it, as far as we are aware, from the islands).[26]

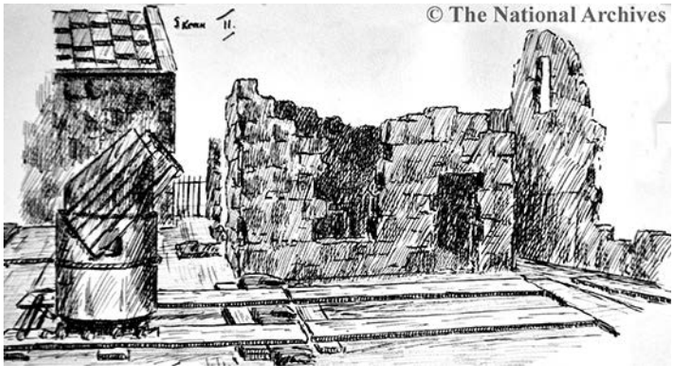


Figure 10.4
An Unrotated Projectile weapon being manoeuvred through the Inchcolm Abbey ruins to its site near the Fire Command Post in June 1943 (© The National Archives, WO 192/108)

10.3 Cramond

Cramond Island is a tidal island lying 1,150m off the Lothian coast. The island was occupied and farmed as a small-holding until the death of the last farmer in 1904. The houses were used as holiday homes until the Second World War, although some of the land was used to raise experimental crops by the East of Scotland College of Agriculture.[27]

First World War and after, 1914–31

Two out of a total of 14 12-pdr (Naval) 18cwt QF guns in the Middle Line were mounted on Cramond, to protect the anti-submarine boom laid across the river from Cramond Island to Inchmickery.[28] A progress report on the defences records that, by 19 December 1914, two guns and platforms had been landed on Cramond Island.[29]

A map dated 30 July 1915 shows the location of the two guns with an accompanying shelter for the men and the officer on watch.[30] No. 1 gun faced east, while No. 2 gun covered a northern arc over the boom. The boom itself is shown as meeting the island at a small concrete building – which we know to be the winch-house for the boom – at the north-east corner of the island, just north of a DEL emplacement (marked as being of wood), the light having a wide arc of movement to north and east. The concrete engine room, providing power for the light, lay near the north-west corner of the island (Fig 10.5). The winch-house was provided to tension and, when struck, slowly slacken the boom.

There were half a dozen accommodation buildings near the centre of the north part of the island, comprising a large hut to accommodate six NCOs and 39 men. There was a separate ammunition store *c* 17m to the north of the

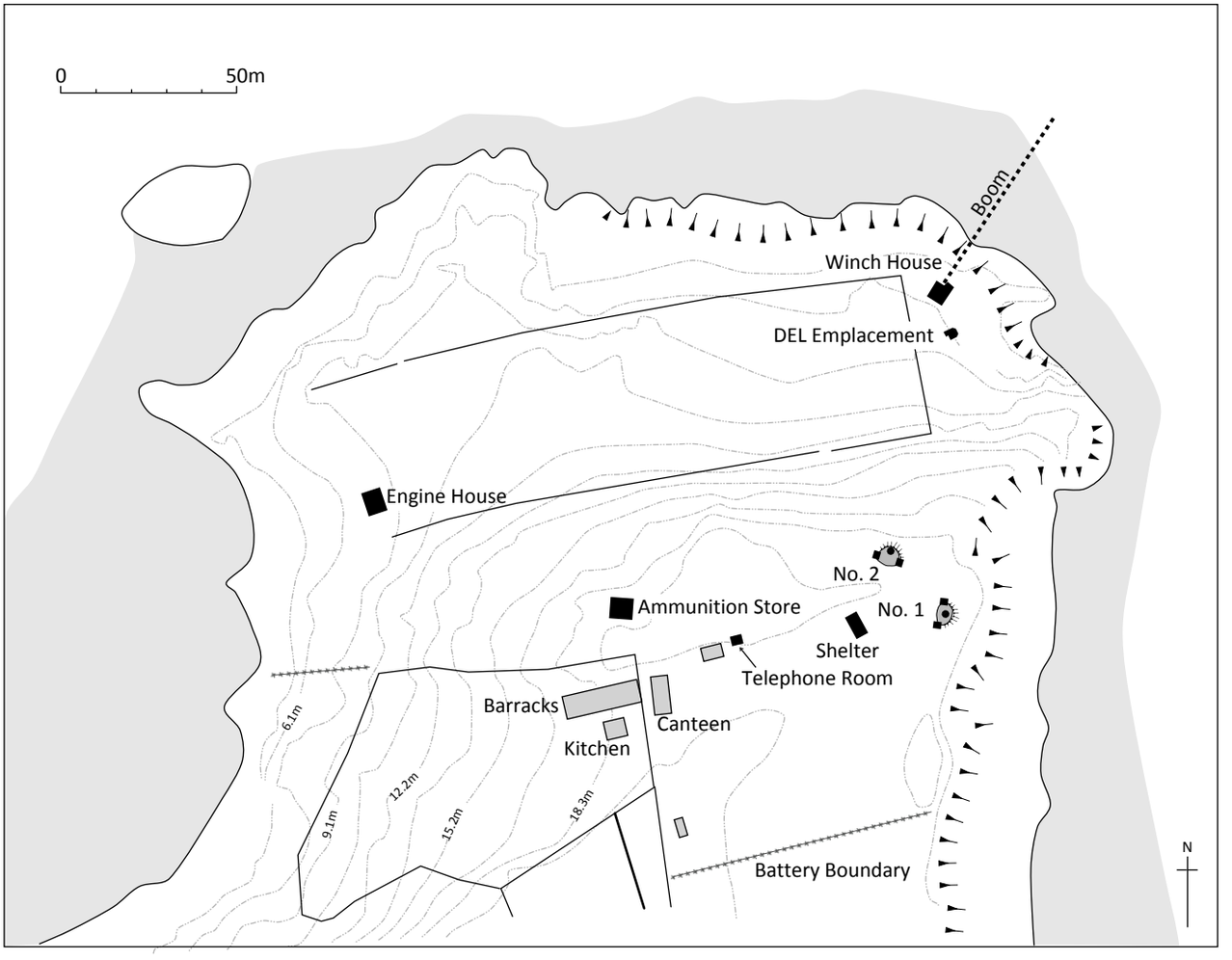


Figure 10.5
Plan of Cramond battery in 1915, showing No.1 and No. 2 guns, electric light and buildings. The layout of Cramond did not change significantly during the First World War (© Gordon Barclay)

accommodation, a small hut for two officers and a 'telephone hut'. South of this a low barbed wire fence marked the southern boundary of the battery, a line beyond which 'no civilian allowed'. The Royal Artillery garrison of the island in July 1916 comprised two officers (the Gun Group Commander and his relief) and 30 other ranks (12 men in the gun detachment plus six reliefs) and various other personnel, including telephonists, orderlies and an officers' servant).[31]

The armament was unchanged in the general revision of the Forth Defences in 1916–17 but, in an armament table for the estuary dated October 1916, Cramond is shown as having acquired a 'concentrated fighting light'.[32] In February 1917, one Royal Engineer officer and 15 other ranks operated the lights on Cramond.[33]

In June 1920, the Ministry of Munitions advertised for sale in *The Scotsman* many huts and other materials on Cramond Island and Inchmickery, to take place at 10.30 a.m. on Friday 18 June.[34]

The approved armament of the estuary in January 1921 still included the two 12-pdr (Naval) 18cwt guns on Cramond but by September 1921 it had been reduced to one ('Group A2'). The two 12-pdr guns were still part of the approved armament of the Forth in November 1927.[35] Local tradition is that the guns were removed and surplus equipment sold in 1926–7. An undated annotation in the Inchcolm Fort Record Book records, 'Guns returned to Navy'.[36] It was necessary for civilians to obtain a pass to access the island until 1926; the Cramond Heritage Trust has a copy of one dated 1920.[37]

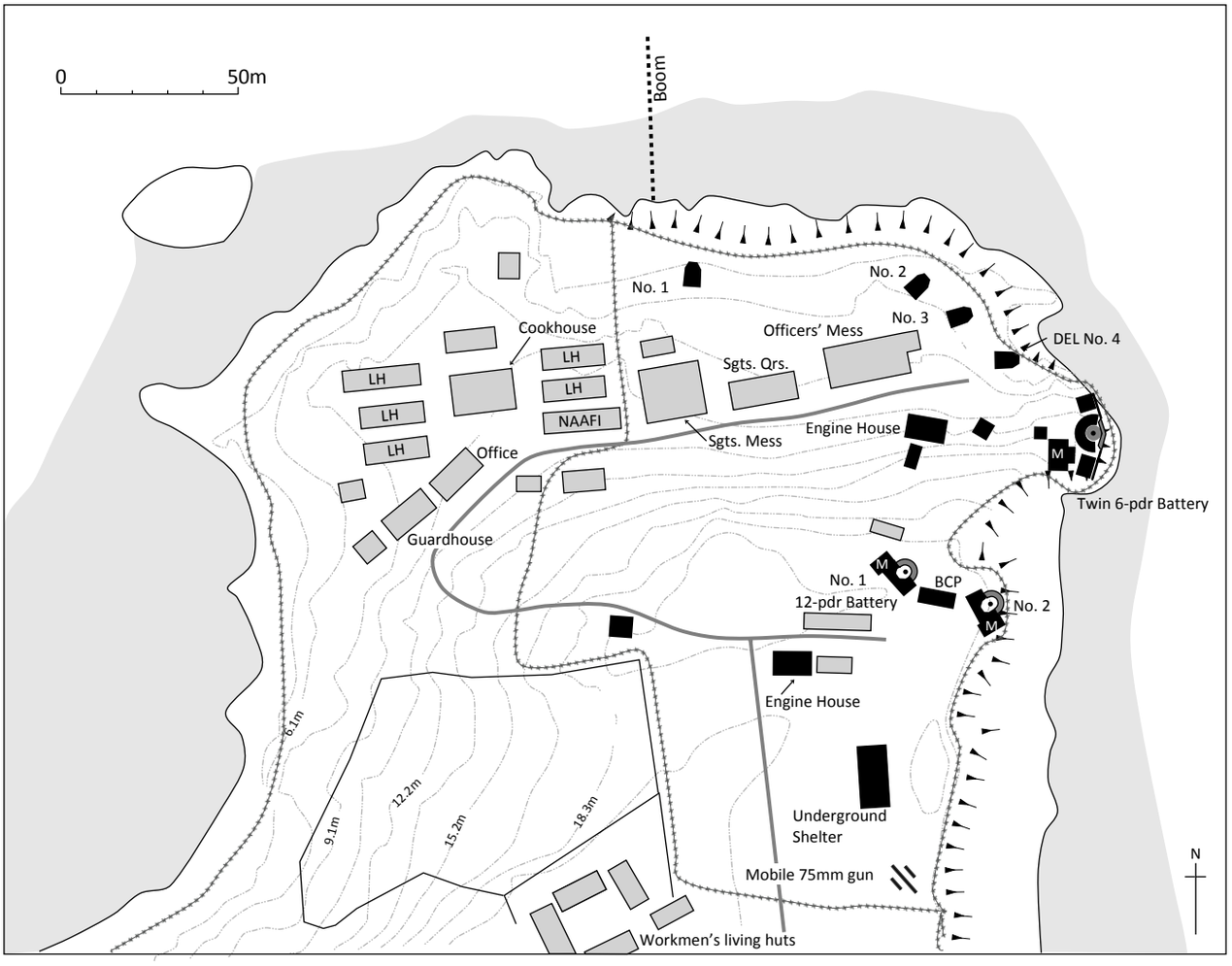


Figure 10.6
Plan of Cramond battery in *c* 1941. The southern, fixed 75mm is not shown – it covered the anti-boat boom at the southern end (see Figure 10.10). The second, mobile 75mm is shown, although it was probably not in position until 1943 (© Gordon Barclay)

Figure 10.7
The 6-pdr twin emplacement on Cramond Island. Its overhead protection has been removed. The two rails carried a trolley on which ready-use ammunition was carried (© Gordon Barclay)

Second World War

The 'History of the Work' on the Fort Record Book states that the site was reacquired by the War Department in the summer of 1939, although design work for the battery layout had been under way for some months.[38] According to the Cramond Fort Record Book, in the autumn two 12-pdr (12cwt) guns moved from Coastguard Battery[39] were mounted on the existing emplacements to form what was to be called 'Dalmeny Battery'.[40] According to Douglas Grant (pers comm), however, it was the Inchgarvie guns which went to Cramond and the Coastguard guns which went to Inchcolm. John Dods' close reading of the Fort Record Book suggests that the 12-pdrs were only placed on the First World War mountings until new emplacements were built.[41] The available plans do indeed show that the 1939–40 emplacements were in slightly different locations with different alignments.

It was intended from the first that the armament of the island would also include a twin 6-pdr (Fig 10.7). This was installed in the summer of 1940, as 'Cramond' battery (Fig 10.6).[42] The armament of Cramond was 'sited to cover the floating boom to the north and Concrete Boom to the south against MTB and submarine attack, operating to the north in conjunction with INCHCOLM and INCHMICKERY'.

By April 1941, the Dalmeny Battery (the 12-pdrs) had been provided with overhead cover against air attack and the island also had an 'AA Projector'; although at first sight this might be taken to be an anti-aircraft 'unrotated projectile' rocket weapon, other references suggest it was a further searchlight, to illuminate the adjacent tidal sands (see below, in relation to the 'Lyon Light'). An undated document in the Fort Record Book does, however, note the presence of four 3-inch AA rocket 'projectors' at some point. A 2-pdr pom-pom noted on one map is not mentioned again and, like the pom-poms on Inchcolm, was probably included in the armament in an anti-MTB role prior to the deployment of the twin 6-pdr guns. Subsequently, the only AA guns mentioned are 'AA LMGs [light machine guns]', that is, either Bren or Lewis guns on AA mountings or captured enemy weapons.

In June 1941, there were four DELs on the island: three fixed dispersed beams, illuminating an area off the north-east corner of the island, and one moveable 'sentry and search'

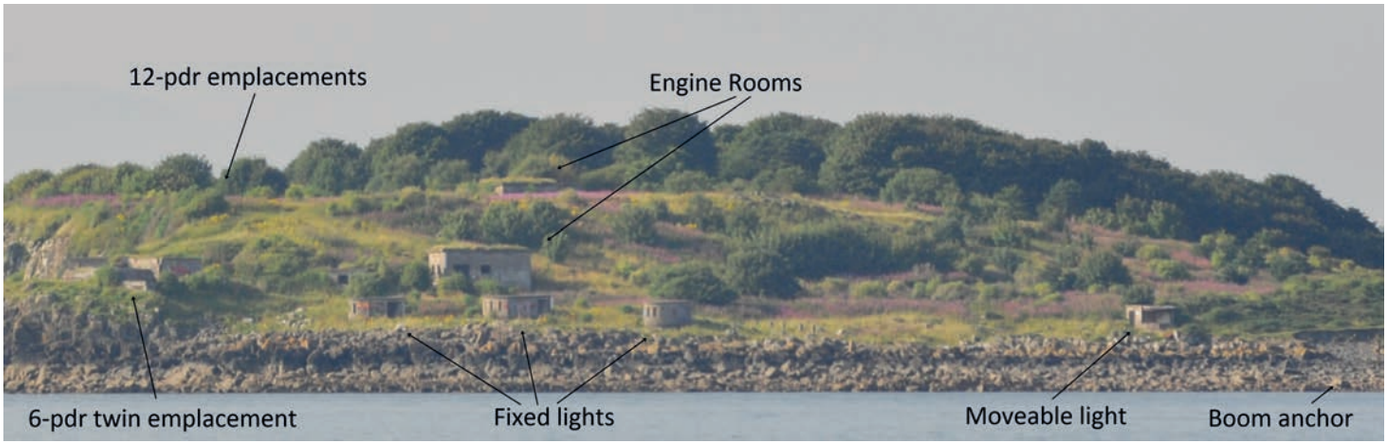


Figure 10.8
The northern end of Cramond Island, showing the 6-pdr twin emplacement, three fixed beam DEL housings, the engine room, an ancillary building and, at the right-hand end, the moveable beam covering the boom to Inchcolm, the anchor of which is also marked (© Gordon Barclay)

light, illuminating the boom to the north (Fig 10.8). In May 1943, five DELs were listed on the Fort Record Book, with a supplementary sheet listing Nos 6 and 7, new concentrated fighting lights. One of these extra DELs was placed to illuminate the concrete boom (Fig 10.10); a 'Lyon Light' emplacement, for a relatively light beach searchlight, is marked as lying just south of No. 2 12-pdr, in 1942.[43]

The most striking feature of the Cramond defences is the line of concrete pylons running from the foreshore at Cramond to the island, to provide a substantial barrier to fast motor torpedo boats (Fig 10.9; Fig 10.10). Local tradition is that work on the boom began in 1938,[44] although the island was not reacquired by the War Department until 1939. The work was undertaken by 'the Yorkshire Hennibique Contracting Co … The Oldest Ferro-Concrete Contractors in the United Kingdom'.[45] It comprises many concrete pylons cast in two parts; the lower (visible on Fig 10.10) having a slot on the side to hold reinforced concrete slabs.

Figure 10.9
The Cramond concrete boom under construction in 1940–1. The slots in the sides were to hold reinforced concrete slabs, some of which survive in situ, most of which have now been removed to support a post-war sewage outlet pipe running parallel. The pylons were built on a continuous concrete foundation. The pylons had a further 'stage' built on top (see Fig 10.10). In the background the floating anti-boat boom is visible, at this stage of the tide lying on the sand (Crown Copyright, Historic Environment Scotland © HES)

A floating boom was put in place to the east of the pylons while they were being built. Both booms are visible on an aerial photograph of the island dated 19 June 1941[46] and the floating boom was still there in February 1942.[47] It had been removed by May 1943.

In the Second World War, the boom across the Forth ran directly between Cramond Island and Inchcolm. The Cramond end was shackled to a substantial concrete block which was in turn 'moored' by a chain bedded deep in the rocks of the beach, immediately north of DEL No. 1 (Fig 10.6).

The 12-pdr and 6-pdr guns covered the floating boom to the north, while a fixed 75mm covered the concrete boom: 'Fire will be opened on any unidentified vessel attempting to pass over the floating boom (now dismantled) and the line of Concrete Pillars'.[48] The initiative for the provision of a 75mm gun on a pedestal or wheels to protect 'the obstruction between Crammond [*sic*] Island and the mainland' came from an inspection of batteries in June 1941 by the Major General Royal Artillery at GHQ Home Forces. A 75mm on wheels was to be provided immediately.[49] This was recorded as being ready for action on 8 September 1941.[50] It is not clear how long the gun was used on its wheels before being mounted on a pedestal in a specially built bunker covering the concrete boom (Fig 10.10).

A second mobile 75mm field gun was first recorded in February 1943 to cover either the maritime approaches or to act in an anti-tank or anti-personnel role. A Defence Scheme dated 25 August 1943 recorded two mobile 75mm guns for close defence. None of the former personnel from Cramond who spoke to RM mentioned either of the mobile 75mm guns that were clearly on the island in 1943, perhaps because they had left the island in 1942, probably before first mobile 75mm arrived.

The entire perimeter of the island was surrounded by barbed wire entanglements and there was also a second line of wire surrounding the area containing the guns of the battery and the 75mm mobile field gun. Cramond was guarded until December 1942 by one warrant officer and 18 other ranks of 30th (Home Defence) Battalion, Royal Scots.[51] In 1940, the battery personnel numbered 66 of all ranks, including 12

Figure 10.10
The northern end of the barrier of concrete pylons. The two-stage casting of the pylons is clearly visible. The anchor point is just visible at the end. Above the barrier is the housing for the pedestal-mounted 75mm gun and, below it, the housing for the fighting light (© Gordon Barclay)

Royal Engineers.[52] In May 1943, the garrison of the island was two officers and 88 other ranks.[53]

In the 'Flood Tide' reduction of coast defence armament, the Cramond Battery (the twin 6-pdr) was still, in June 1943, fulfilling its anti-MTB role, while the 12-pdr guns of Dalmeny Battery were reduced to cadre. A summary list of batteries in January 1944 shows the Cramond and Dalmeny Batteries as in care and maintenance, and the DELs still manned by Regulars.[54]

The life of the battery

We are fortunate in having the reminiscences of James T Potter, as recorded by RM in 1989, about life on the battery:

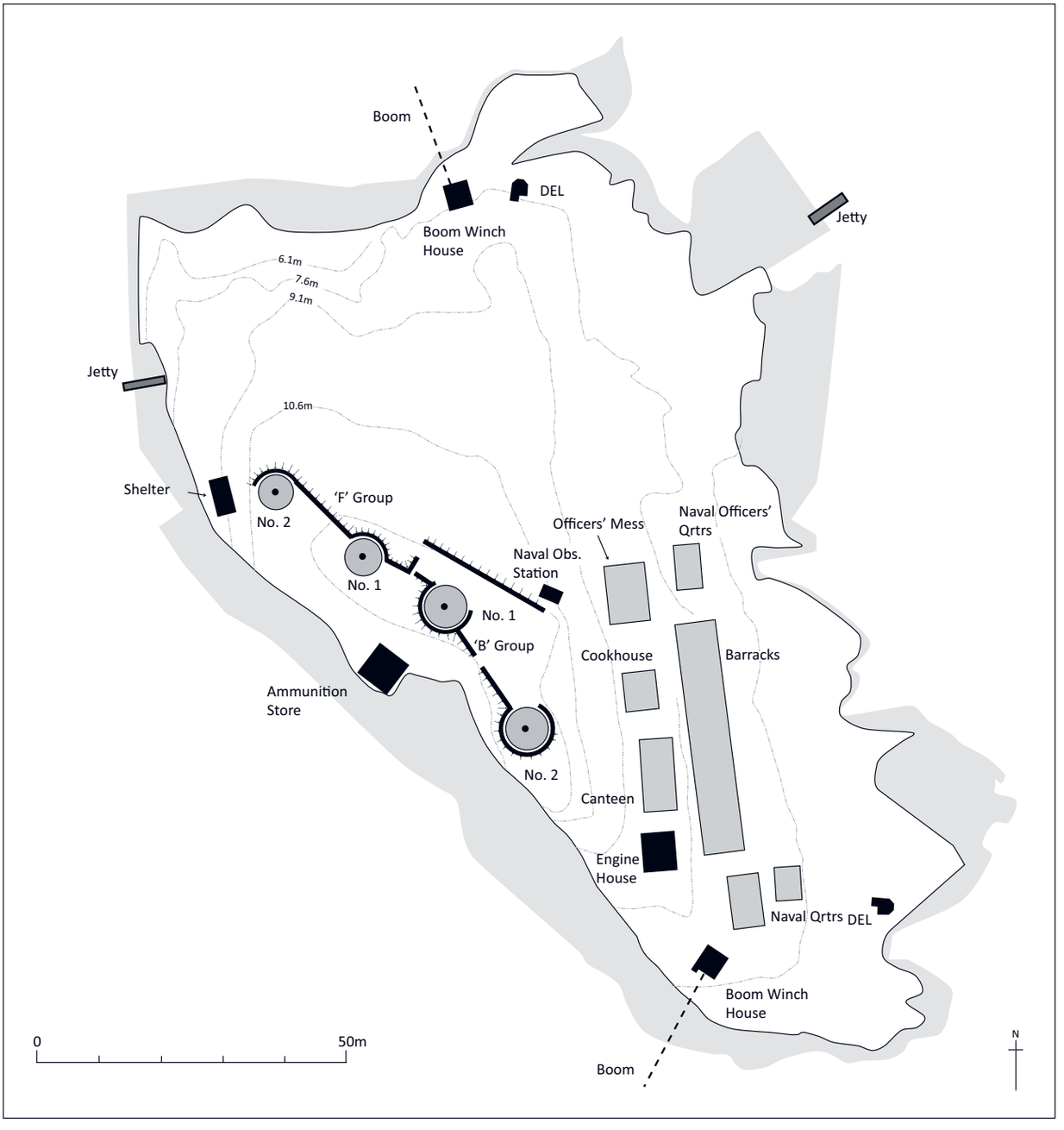


Figure 10.11
Plan of Inchmickery, 1915–16. Structures associated with the fighting of the battery or the operation of the booms are in solid black, more domestic structures in grey (© Gordon Barclay)

Being stationed on Cramond Island meant we qualified for 'island service' benefits of slightly more pay and leave, etc., due to the isolated locations and time involved in getting on and off the island. Cramond Island was a welcome posting in this regard because during our off duty time, at low tide we could walk ashore and go to the pub in Cramond, or go further afield …

We manned two 12-pdr guns before the twin 6-pdrs arrived. There was some concern amongst the men over the fact that 12-pdrs were not suitable for engaging torpedo boats and other fast craft, so we were lined up on parade and were ordered to produce our drill books. Then we were ordered to open the page where it stated "*12-pdr guns are* not *suitable for engaging fast torpedo boats*". [paraphrased] Then were ordered to draw a pencil line through the word "not", and so we turned an unsuitable weapon into an efficient one!

At the beginning of the War the island was very busy with contractors building the various works. We were ordered to assist them in order to make the camp ready as soon as possible. The civilian workforce was earning a pound for every shilling we received as pay. Some of them were getting £40 a week! One day the civilian workers were so discontented with the conditions they were working under that they went on strike and threatened to leave the island. The Major, on seeing this and realising the importance of the work, ordered two men to take a Lewis gun to the south end of the island and shoot anyone who attempted to leave. Once the civilian workforce saw he was deadly serious they resumed work and we didn't have much trouble with them after that.

There was a soldier (from Edinburgh) whose wife was having an affair with another soldier, also stationed on Cramond Island. One night the soldier was on guard duty at the south end of the island and shot [dead] the other man who was returning to the island after having been ashore visiting the soldier's wife. The matter was all hushed up and it was said the dead man had failed to give the correct password. It was a clear case of murder, but it was wartime.

During a practice shoot, the grass on the magazine roof caught fire. Someone (correctly) shouted 'Fire' and someone else (correctly) fired a salvo!

Post-war and survival

In November 1952, the 12-pdr guns were listed as surplus to the 'Basic & Reserve Scale of Defences' and detailed for disposal. The precise dates of disposal are not recorded on the Fort Record Book.

The Cramond Battery is surprisingly well preserved, considering it is the most easily accessible of the batteries of the Middle Line. The concrete pylons forming the anti-boat barrier survive in good condition. Some have broken along casting lines, while a group near the middle has been removed to allow the passage of small boats.[55]

10.4 Inchmickery

The small island of Inchmickery lies between Inchcolm, to the north-north-west, and Cramond, to the south-south-west.

The primary sources for Inchmickery are Royal Engineers plans from before and after the reconstruction of 1916,[56] a War Office special survey of the island dated 1918,[57] the history of the Middle Defences on the Inchcolm Fire Command FRB,[58] a series of plans of the island in the Second World War,[59] and aerial photographs from both World Wars. There are also Ministry of Works files from 1928 to 1957, when the island was included in the lease for Inchcolm Abbey.[60]

First World War

In common with the other islands of the Middle Line, work began on the fortification of Inchmickery in 1914.[61] By 19 November, 'One shed [had been] erected, and excavations for guns completed'.[62]

The earliest plan of the island, dated July 1915, shows the location of the four simple gun emplacements, an ammunition store, two DEL emplacements, winch-houses for the booms to north and south of the island, and all the ancillary buildings (Fig 10.11). The plan helpfully marks those that were in occupation by the Army and by the Navy (mainly the boom winch huts, their accommodation, and an 'Observing Station (Naval)').[63] At this stage, the northern group of guns was 'F' (facing north), the southern, 'B' (facing south and west). The guns could fire almost all round, their arcs of fire restricted only by the other guns.

In July 1916, the RA garrison of the battery comprised two officers (the Gun Group Commander and his relief) and 29 other ranks (including 12 in the gun detachment, with six reliefs, and six in the ammunition handling detachment).

At this stage the island was equipped with two DELs with moveable beams, one on the south-east tip of the island, the other on the north beside the northern boom winch-house. There was an ammunition store on the south-west slope of the island behind the guns. The island is shown as being accessed by a landing stage on the north-east side of the island, equipped with a winch and trolley on rails.

The general revision

By September 1916, significant changes were either completed or in hand, as part of the general revision of the defences of the Forth (Fig 10.12):[64] completely rebuilt emplacements to take four 4-inch QF Mk III guns from Inchgarvie, with a much more substantial sub-structure of magazines and shelters for the men on watch; and four new DEL emplacements, to replace the original two (marked for removal).

The new four gun positions, in two groups of two ('F' to the north, and 'B' to the south), lay in a slightly crooked line along the crest of the island, at a height of *c* 12–14m above sea level. The guns were made ready for action between 23 November 1916 and 2 February 1917. The whole west side of the island had been rebuilt to extend the space available and a much larger engine house had been built, as had a new

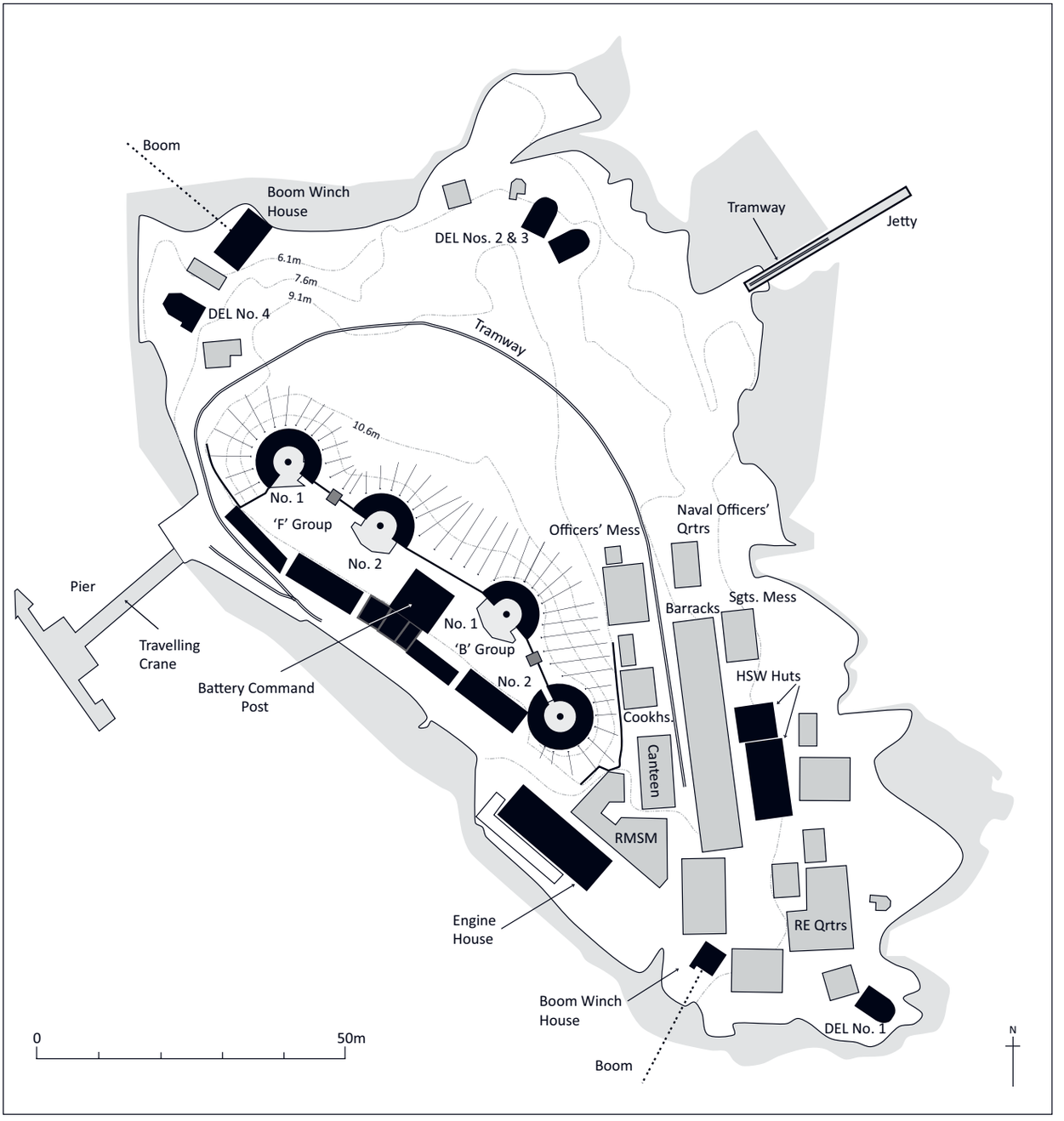


Figure 10.12

Plan of Inchmickery, 1917–18. Structures associated with the fighting of the battery or the operation of the booms are in solid black, more domestic structures in grey; the latter category includes former DEL emplacements and one of the boom winch houses, now given new functions (© Gordon Barclay)

combined Battery Command Post and Naval Observation Station. The accommodation of the island had remained relatively unchanged. The Mine Observation Station (for the controlled mines) is mentioned as being in action by 30 May 1917 and at the same date four DELs were nearly ready, the engines being moved to the new engine house.[65]

An undated Royal Naval Air Service aerial photograph shows the island in the transitional phase of work (Fig 10.13): the new emplacements and the Battery Command Post appear to be under construction; the guns are not yet mounted; a tramway runs from the new pier, which is an advanced state of construction; the new DEL emplacements and winch-house

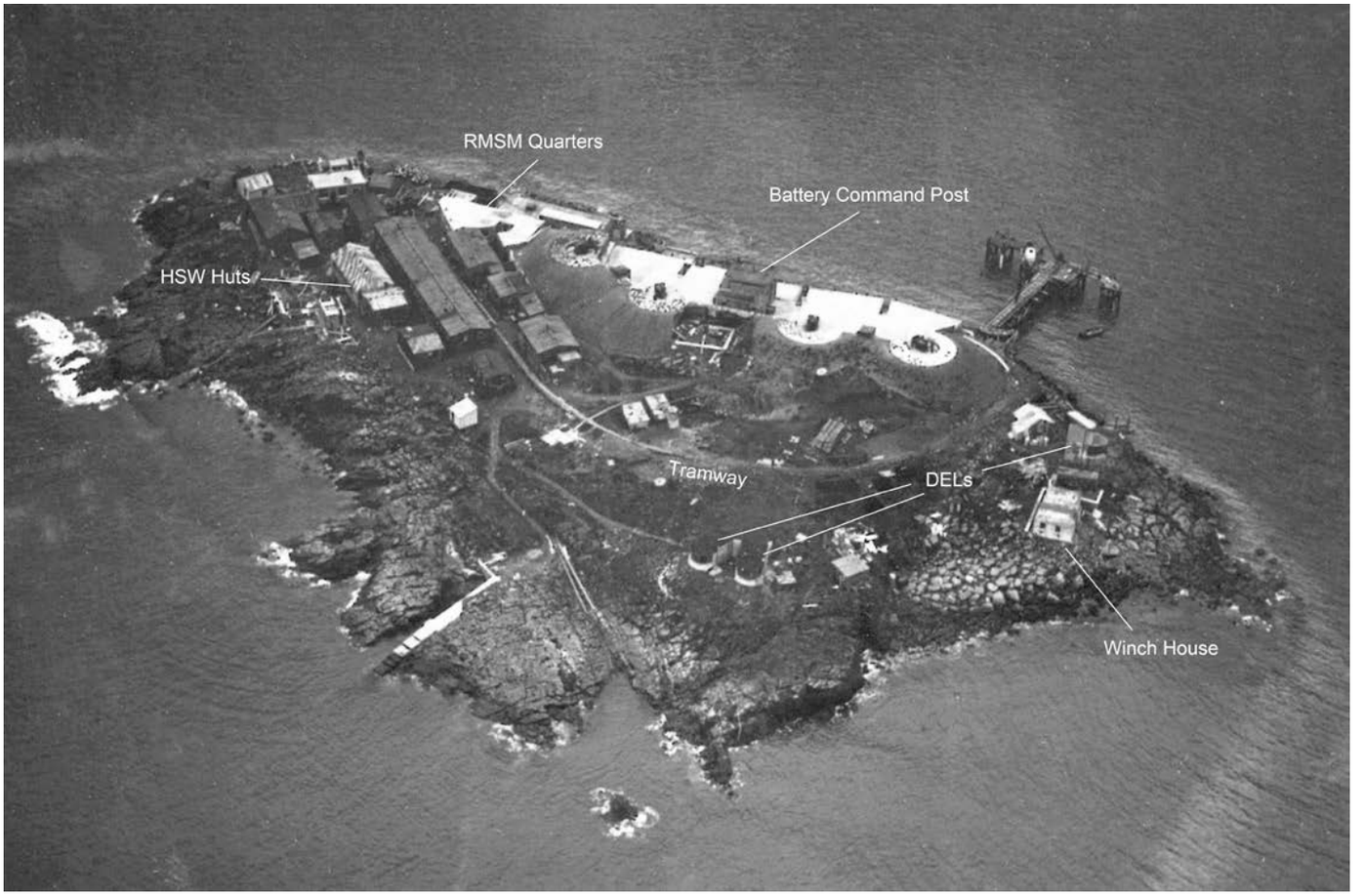


Figure 10.13
Aerial photograph of Inchmickery, from the east. The work of reconstruction of 1916–17 is in an advanced state: the mountings of the guns seem to be in position, although the guns themselves are not yet there. The DEL emplacements, tramway and buildings are complete. The water tank to be buried between the two-gun groups, however, is incomplete (RNAS)

Figure 10.14
Inchmickery from the west, in 2015. Major features of the First and Second World Wars are marked. There is no evidence whatsoever for the widespread belief that the island was deliberately made to look like a ship (© Gordon Barclay)

are visible. A photograph of the construction of the boom north of Inchmickery also shows the island busy with cranes (Fig 5.8).

A definitive map of the battery, printed by the Ordnance Survey as a War Office 'Special Survey' in 1918, shows in precise detail the location and purpose of all the structures erected to that date. Some of the accommodation buildings had survived on more or less the same ground plan since 1915, but many others had appeared. Four DEL emplacements were recorded as being in operation (two concentrated moving and two 'fixed' 16° lights, nevertheless capable of very limited traverse) (Fig 10.12);[66] the four lights together seem to have provided 360° coverage.[67] Two of the earlier DEL emplacements, marked for removal in 1916, survived, labelled as 'stores'. The location is marked of the 'winch house' for the 1916–17 pattern boom to the north of the island; the original boom winch-house was by 1918 a 'smithy'.

Figure 10.15
The Inchmickery 1916–17 Battery Command Post with, in the foreground, the steel Gun Group Commander's shelter between the 'F' Group guns. The GCC would command his two guns from here if the Battery Command Post was knocked out. Beyond is one of the Second World War Director Towers for a 6-pdr twin gun (© Gordon Barclay)

In February 1917, the four DELs were operated by two Royal Engineer officers and 60 other ranks.[68]

The height of the guns above the rest of the island's accommodation allowed the northernmost and southernmost guns to have very large arcs of fire – around 270° (Fig 10.14). The tower contained not only the Battery Command Post but, below it, the DEL Director Post and, on the ground floor, the telephone exchange and rooms for the on-watch officers of the RGA, RE and Royal Marine Submarine Miners.

Between each pair of guns was a small structure labelled 'G.G.C. Shelter' (Gun Group Commander), the post of the junior officer commanding each pair of guns, from which the guns would be controlled if the BCP was put out of action. What survives on-site is a simple steel shelter (Fig 10.15). A small complex of buildings marked on the 1918 map was the quarters of the Royal Marine Submarine Miners. There is a pair of huts on the 1918 plan, both titled 'H.S.W Hut', which we believe were hydrophone huts. A 'Hydrophone Station' is marked on the equivalent map of Inchcolm and what may be hydrophone installations are marked 'Microphone Hut' on the equivalent maps of Inchkeith.

Inter-war

In January 1921, Inchmickery's armament was still recorded as four 4-inch Mk III QF guns.[69] By September, the approved armament had been reduced to two guns, B2 and F2, with the comment 'Guns stored at Inchcolm'. By 1924, the War Department was trying to regularise its land-holdings, taking out a lease that year (backdated to 1922) for 99 years, for Inchmickery and Inchcolm, for a rent of £35 per annum, of which £5 was for Inchmickery.[70]

Although the 'History of the Work' on the Fort Record Book states that the battery of four guns was dismantled in 1926, the approved armament of the island was recorded in November 1927 as still comprising the four 4-inch QF guns.[71] All the other structures on the island were abandoned to nature.

On 19 June 1931, the lease for Inchmickery and Inchcolm was passed by the War Office to the Ministry of Works, who had taken Inchcolm Abbey into the guardianship of the state in 1924.[72]

Second World War

In September 1938, the War Department approached the Ministry of Works with a view to reoccupying parts of Inchcolm and the whole of Inchmickery, this being formally agreed to in October 1939.[73] Plans were drawn up in February 1939 for the rearmament of the island. Twin 6-pdr gun No. 1 was to be built in the north-east corner, immediately behind and partly over the sites of two First World War DEL emplacements. This gun was to be provided with three new

Figure 10.16
Plan of Inchmickery in the later part of 1941, after 'Nissenisation'. The operational buildings are marked in solid black (the magazines labelled 'M'), more domestic buildings and stores in grey. LH = living hut. The 'Billiard Room' in one of the Nissen huts is a notable addition

DELs (with fixed dispersed beams) powered by their own engine room. These provisional gun positions were changed by a few meters by the Royal Artillery (Fig 10.16)

The other twin 6-pdr was built over the southernmost of the 4-inch gun emplacements but required concrete pillars to hold up the front of the gun platform (Fig 10.17). The original 4-inch emplacement seems to have required little adaptation and the ready-use lockers seem to have remained in use. The southern gun was provided with four DELs, three fixed dispersed beams facing south, and one concentrated fighting light facing east. The engine room for this group of DELs was built over the 1916–17 First World War engine room.

Figure 10.17
The southern 6-pdr twin gun-house, incorporating the southernmost 4-inch emplacement, and built out upon concrete pillars, with the Director Tower behind (© Gordon Barclay)

The armament of the island had begun in August 1939, before the formal agreement was concluded with the Ministry of Works, when a detachment of 12 other ranks from the City of Edinburgh (Fortress) 585 Coy RE under the command of Sergeant Wilson landed with a supply of food and water, 'to make the place habitable, conditions being then so bad that only three days [at a time] could be spent on the island'. Equipment was issued at North Queensferry but difficulties were constantly met in transporting material to and from Inchmickery. The Edinburgh firm of John Best, Contractors, submitted a tender to the War Department in October 1939 to build installations on Inchmickery and Inchcolm.[74] The completion date, originally March 1940, was extended to 18 June 1940. According to the Inchmickery Fort Record Book, engines and defence lights in six temporary wooden emplacements were ready by March 1940 (two lights each at the north-west, south-east and on the east shore).

Figure 10.18
Inchmickery Second World War DEL emplacements Nos 1 and 2, erected amidst WC stalls and bath-houses of an earlier period, and partially demolished to make room. The small stone enclosure below the WC cubicles at the left is a First World War *pissoir*, accessed down steps and cleaned out by the tide (© Gordon Barclay)

In March 1940, a detachment of 160 Heavy Battery, RA, who had taken over Cramond in November 1939, went to Inchmickery to assist in the installation of the two twin 6-pdr Mk I guns. The description on the Inchcolm FC Fort Record Book describes the situation in the spring of 1940:

> the RE Detachment under Serjeant [sic] Wilson were installing Engines, Searchlights and laying surface cables, while civil contractors … were building accommodation – huts, cookhouses, latrines etc, and the island was thoroughly overcrowded. Night and day pneumatic drills were working, and so great was the noise that [illegible] on Cramond were kept awake.[75]

The guns were landed on the island with some difficulty in April 1940, the concrete jetty which would have made the task easier not being completed until July. No. 1 gun was moved to its position on a track of sleepers, while No. 2 gun was taken along a pre-existing path past the engine room. When the jetty was completed, it was provided with a tramway along both its arms, linked by a turntable to a length of track that ran to the jetty's eastern end.

The first manning parade on the island was on 10 May 1940. Accommodation was still 'far from satisfactory' and all water had to be brought from the mainland and stored in tanks. The food was 'rough but good'.[76] By July 1940, two further DELs were in action (one each at north-west and south-east) and the permanent engine room was ready (Fig 10.16). The final two DELs (facing east) were ready in February or April 1942 (bringing the total to ten).[77] Six of the DELs were fixed diffused beams with a 30° coverage (Nos 1–4, 7, 8); two had a 16° diffused beam, and two were moveable fighting lights with 3° beams (Nos 5 and 6). The island now had two engine rooms: one on the site of the former engine room at the south, and a new one at the north.

The ancillary works and the wooden accommodation huts of the battery were completed by June 1941. A number of buildings of the 1916 reconstruction of the island survived wholly or partly, presumably in use but not marked on the Second World War plans – notably WCs and *pissoirs* located at the east side and south end of the island, as well as bath-houses. The former Royal Marine Submarine Miners' building is one of the few shown as surviving from the First World War and it still survived in 2017. The apparent calm was short-lived.[78] A low-level aerial photograph dated September 1941 (Fig 10.19) shows the island almost completely crammed with standard wooden Army huts. These were considered to be a fire risk, and the wholesale 'Nissenisation' of the island began, apparently in July 1941:

> Inchmickery was beginning to take on the appearance of a real station. All were glad that the noise and bustle were finished and that the RA had the island to itself. Alas! For their fond hopes! Higher authority decreed that the wooden huts constituted a danger through risk of fire and overcrowding. Accordingly, in July 1941 huts were pulled down, paths were torn up, painstakingly constructed small gardens were ruthlessly buried under debris and Nissenisation has begun.[79]

Figure 10.19
RAF aerial photograph of Inchmickery, 13 September 1941, filed in the Fort Record Book (© The National Archives, WO 192/256)

In October 1941, the island was taken over by 196 Battery, RA, under the command of Lieutenant Pike. In December 1941, the island was described as resembling 'a well blitzed area'. On the 22nd of that month, 247 Battery, RA took over the station. The construction work, by 585 Edinburgh (Fortress) Coy, was completed in May 1942 (Fig 10.16).

The Nissenisation reduced the amount of accommodation on the island; henceforth, one-third of the personnel was always off the island, at Charles Hill, for a week at a time.[80] The complement of the island is recorded on 18 September 1940 as four RA officers and 111 other ranks, with 12 engine room personnel.[81]

The two twin 6-pdrs on Inchmickery are recorded as part of the armament of the Forth in June 1943, but were not listed by September 1944.[82]

The anti-aircraft defence of the fort included two Bren guns on AA mounts on the roof of the magazine of No. 1 gun, and two Solothurn AA machine guns[83] on the roof of the gun store of No. 2 gun. There were two Unrotated Projectile rocket weapons (the holdfasts for which are still visible) located on the 'top parade ground' (that is, on the old 4-inch battery) and on the 'Quiet Room roof' (the former First World War Royal Marine Submarine Miners' building).

Inchmickery was so crowded with buildings in the Second World War that there was no room for the sort of close-defence structures (trenches, field guns etc) found on the other Inchcolm Fire Command batteries. Some efforts were made, however, to protect the battery. A small narrow pillbox with four loop-holes was built against the 1916–17 magazine structure, probably in 1940–1, to cover the approach to the island along the pier. In front of the pillbox, the engineers erected a triangular stone marked: 'No. 10 Section, 2 Company, C[ity] of E[dinburgh] (F[Fortress]) Engineers. 1939–1940'. On the eastern seaward side of the island, a wall running south from No. 2 gun (in the north-east part of the island) abutting the high brick foundations of a building to the north of the dining hall) presented a high, unclimbable and loop-holed face against any enemy assault.

Inchmickery was listed in January 1944 as being in care and maintenance.[84]

Post-war

There is little information on the closure or disposal of the site. The lease of Inchmickery was still held by the Ministry of Works, along with Inchcolm, until 1960, when it was handed back to the Moray Estates. A note on a Ministry file records that in December 1955 'there are still a few soldiers stationed' on Inchmickery [85] and members of the Territorial Army practised on the twin-6pdr guns.[86]

Survival

The structures of the second (1916–17), third (1939–41) and fourth (1941–2) phases of activity on the island survive very well. Of the First World War guns, the three northern 4-inch gun emplacements survive in very good condition, albeit with some later changes. The front of the battery has been rather disrupted by the recent collapse of a water tank that had been built within the protective embankment. The southernmost emplacement has been adapted for the southern of the two Second World War 6-pdr twin emplacements but most features are still recognisable. The 1916 Battery Command Post survives in very good condition, the external concrete steps and the wooden ladder to the top floor all surviving in situ. External steel platforms attached to the eastern side of the building have collapsed. The magazines, shelters etc built behind and below the level of the guns survive in excellent condition, some with internal tanks and fittings.

At the southern end of the island, the irregularly shaped building assigned to the Royal Marine Submarine Miners in 1916 was reused in the Second World War and is still roofed and in reasonable condition. The southern group of Second World War DEL housings survives, albeit with all metal fittings removed. The DEL housings have been inserted rather crudely into the pre-existing buildings, leaving some odd survivals. DEL No. 3 partly overlaps what we believe to be the foundation of DEL No. 1 of the 1916–17 layout. The seaward edge of the foundations of the southern winch-house (1914–15 and 1916–17) may be visible below and just in advance of DEL No. 1.

The Nissen huts of the 1941–2 rebuilding survive as brick foundations and some end walls (notably of the cookhouse). Curved steel roofing trusses from the Nissen huts lie scattered around the site.

The two 6-pdr twin emplacements and their accompanying magazines and battery Director Towers are the best preserved in the Forth, although the curved roofs that provided protection to the rear of the guns have collapsed into the emplacements. Although the Director Towers survive to full height, their steel external access stairs have been removed. The foundation slabs of 1916–17 DELs Nos 2 and 3 are partly visible under the northern 6-pdr twin emplacement. The concrete pillars that hold up the front of the southern 6-pdr twin emplacement are showing signs of movement.

At the northern end of the island, three Second World War DELs, an oil storage tank and an engine house occupy an area that in 1916 had a DEL, a store, offices and the 1916–17 boom winch-house, the low walls and concrete floors of which are visible under and between the later structures. Second World War DEL emplacement No. 8 still has green and brown camouflage paint on its rear wall. All have heavily turfed roofs within a border a single brick high, while No. 7 has a sign painted on its inside wall '(7) BEARING 52°'.

10.5 Inchcolm

The sources of information for Inchcolm are two Fort Record Books (one for Inchcolm, including an aerial photograph and plans showing the proposed and actual arrangements in the Second World War)[87] and the other for Inchcolm Fire Command);[88] and maps drawn in 1915[89] and 1918.[90]

First World War

In the fortification of the middle islands, the island of Inchcolm was ideally situated to provide the headquarters and

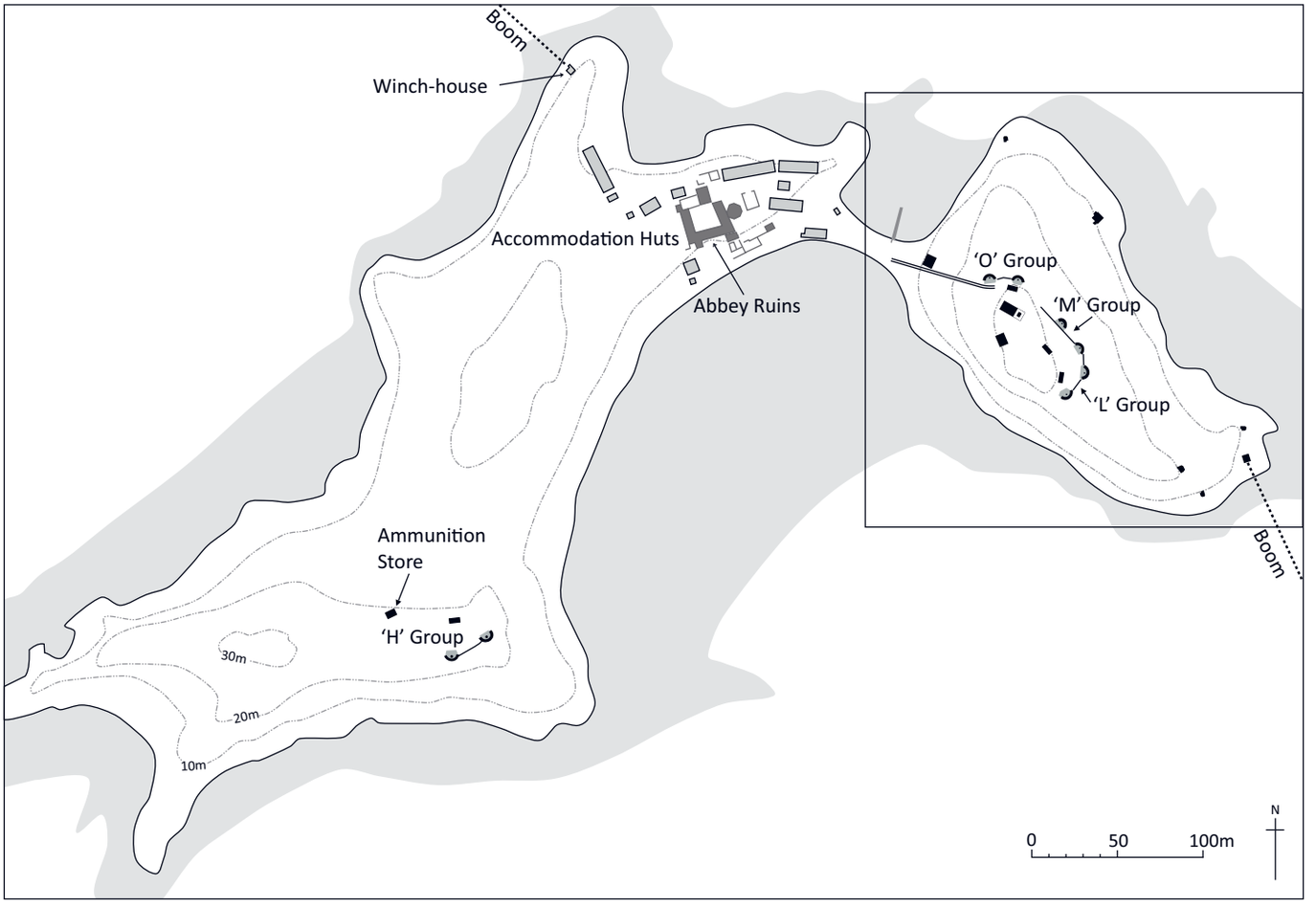


Figure 10.20
Map of Inchcolm, 1915. The box shows the extent of Figure 10.21 (© Gordon Barclay)

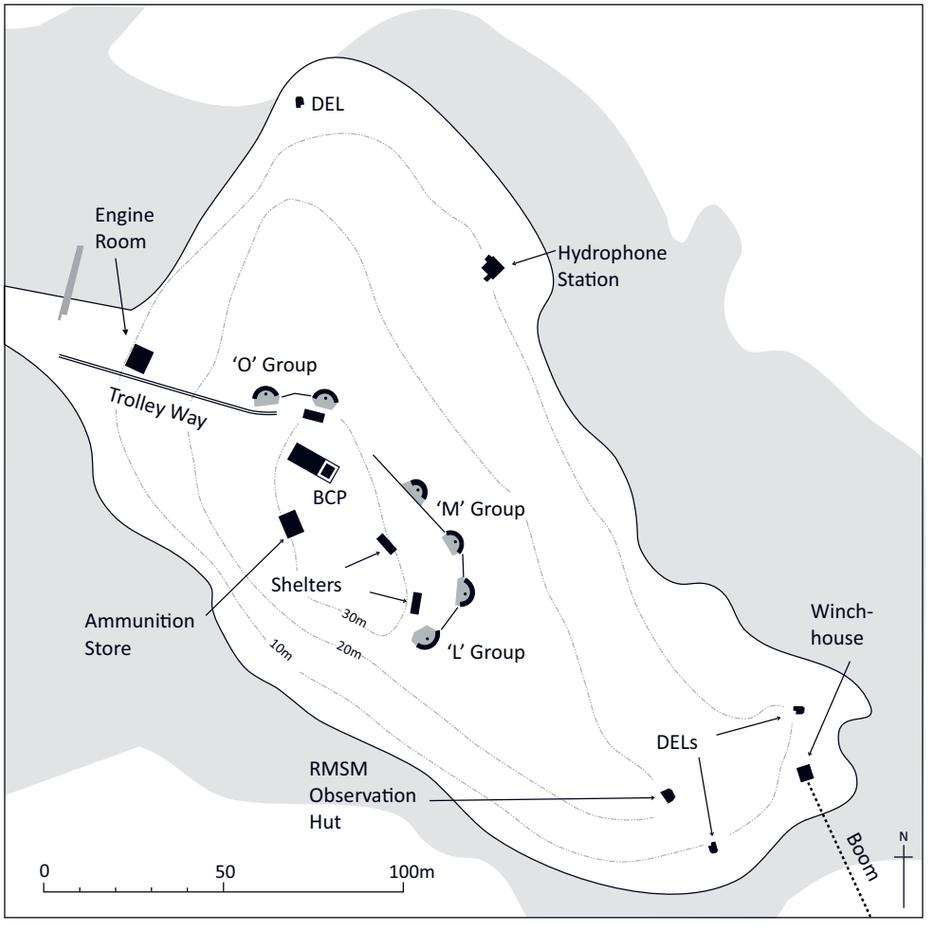


Figure 10.21
Detailed plan of the eastern lobe of Inchcolm, 1915. The few structures in addition to the six 12-pdr (Naval) 18cwt guns and their ancillary structures, include the hut for the hydrophone operators and the observation hut for the controlled minefield (© Gordon Barclay)

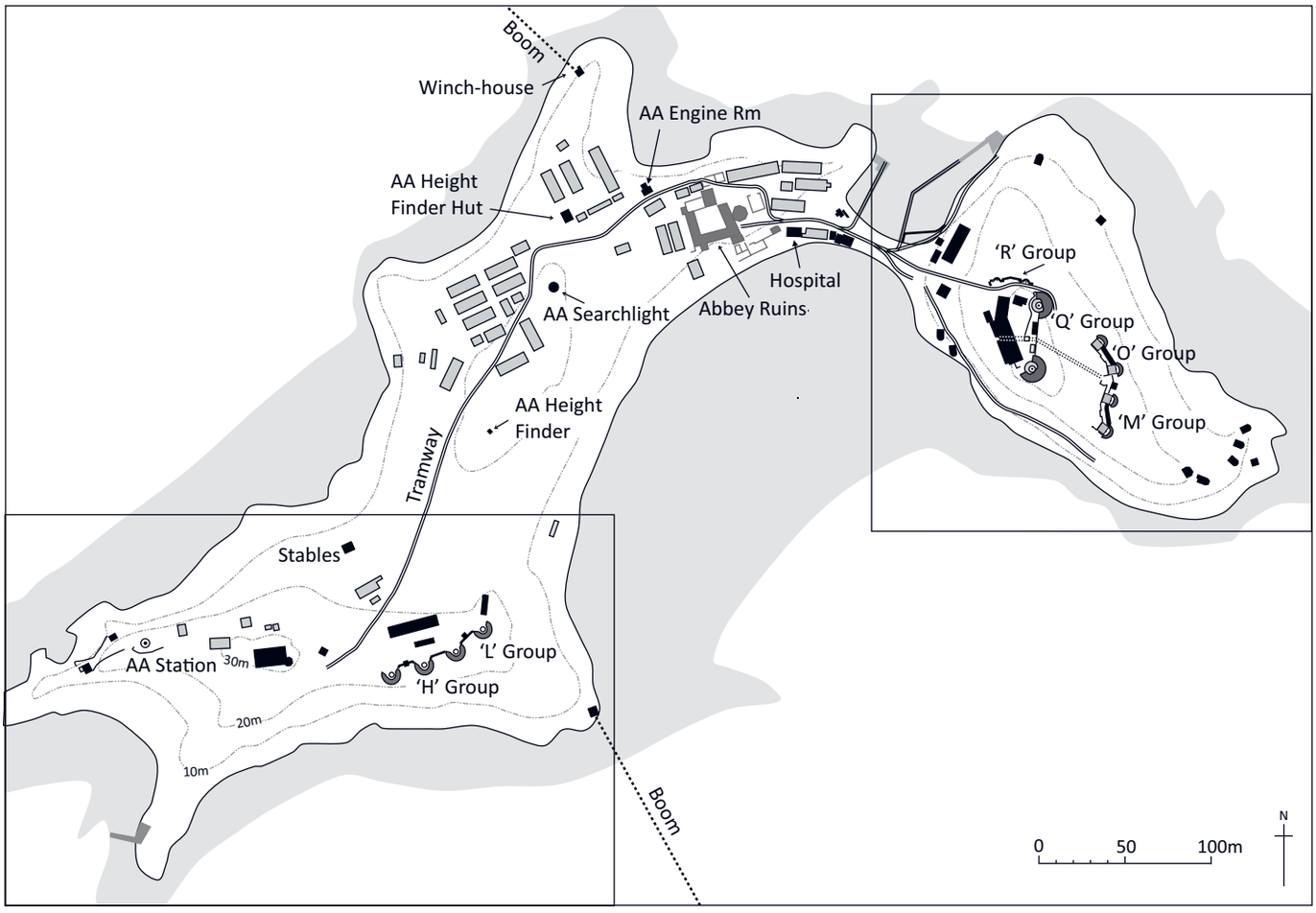


Figure 10.22
Map of Inchcolm, 1917–18. The boxes show the extent of the two detailed maps, Figure 10.23 and Figure 10.27 (© Gordon Barclay)

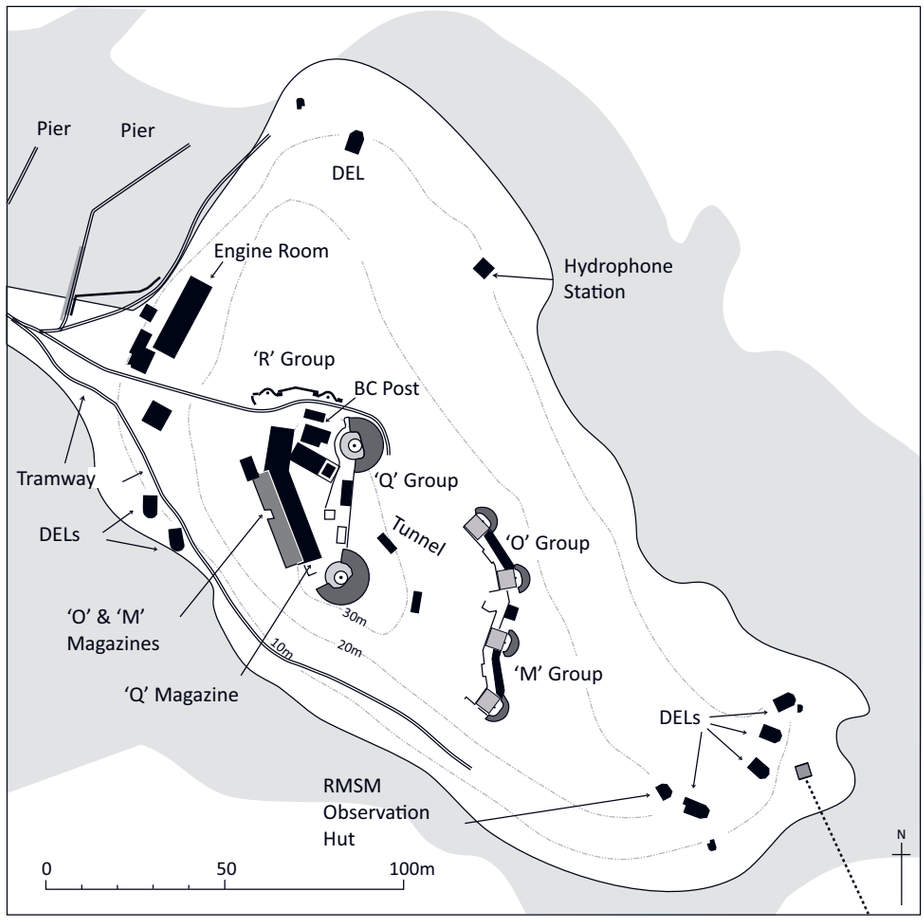


Figure 10.23
Detailed plan of the eastern lobe of Inchcolm, 1917–18, rather more crowded with structures. The magazines for 'Q' Group, the 6-inch guns, lay partly above the magazines for 'O' and 'M' Groups, the 4-inch guns reached by the tunnel. 'R' Group is the pair of 12-pdr (Naval) 18cwt guns, the only remnant of the 1915 armament (© Gordon Barclay)

Figure 10.24
The access tunnel through the eastern lobe of Inchcolm, viewed from its western end. Where the tunnel narrows there was originally a shaft up into the heart of the 6-inch battery, which was provided with a swivelling hoist on top. The original plan was to run a branch of the tramway system through the tunnel to the 4-inch battery at its eastern end, but this was probably not built (© Gordon Barclay)

strongest point in the line. The island has two 'lobes' of higher ground linked by a low, flat area partly occupied by the ruins of St Colm's Abbey (Fig 10.20). Of the 14 12-pdr (Naval) 18cwt guns in the Middle Line, eight were mounted on Inchcolm, with two DELs to illuminate targets. A progress report on the defences dated 19 November 1914 noted, 'Landing place at Inchcolm commenced, 6 guns and platforms landed, and excavations for gun foundations commenced'.[91]

Typically, the 1914–15 batteries on Inchcolm were very simple open emplacements with limited numbers of other buildings.[92] On the west lobe, there were two 12-pdr emplacements linked by a low wall ('H' Group, guns 1 and 2), provided with a small ammunition store to the north-west, a small shelter for the watch and their officer, and, a little to the north-north-east, an 'earth closet'. A winch-house for the boom between Inchcolm and the Fife coast was located near the northernmost tip of the island.

The eastern lobe contained the main armament, comprising six 12-pdr guns, in three groups of two (from north to south, 'O', 'M' and 'L' Groups), curved along the eastern side of the summit of the hill, the overlapping arcs of fire covering from north-west to east to south-west (Fig 10.21). Behind the guns were three watch shelters, one for each group and, at the west edge of the summit, a single ammunition store.

The only other substantial building on the summit was the Battery Command Post, of three stories: the ground floor contained a naval office and store, and the Royal Artillery store; the first floor the Battery Command Post at its south-east end, with naval and RA offices behind, and the Electric Light Directing Post on the roof.

There was a hydrophone station on the north-east face of the eastern lobe that listened out for enemy submarines, operational between May and August 1915.[93] An observation hut for the Royal Marine Submarine Miners lay near the south-east end of the eastern lobe, watching a controlled minefield to the east-north-east. The winch-house for the 1915 anti-submarine boom to Inchmickery lay between the two DELs on the easternmost tip of the island.

A simple 'trolley way' ran up the steep hill from the landing stage to behind 'O' Group. The engine room for three DELs (rather than the two originally planned) lay at the bottom of the hill of the east lobe.

Figure 10.25
The eastern lobe of Inchcolm, from the western, showing the terraces created in 1916 as part of the remodelling of the defences: (1) First World War Battery Command Post for the 4.7-inch guns, repurposed in Second World War as the Fire Command Post; (2) engine house, 1916, raised and repurposed as Ministry of Works tearoom and then, in 1939, as a casualty clearing station; (3) Second World War engine house; (4) First World War DEL housing (foundations only); (5) buildings associated with the Second World War 12-pdr battery; (6) visible edge of First World War 6-inch/Second World War 12-pdr emplacement; (7) visible edge of westernmost First World War 4-inch emplacement; (8) Second World War engine-house; (9) Second World War moveable beam searchlight emplacement; (10) Second World War boom anchor (see Figure 10.32) (© Gordon Barclay)

The small hutted accommodation camp was built in the central part of the island, around and to the west of the abbey (Fig 10.20). Four barrack blocks provided accommodation for *c* 180 men, with a cookhouse and canteen. The southern and western ranges of the abbey provided accommodation, kitchen and a mess for the officers and the mess staff. There was also a barrack hut for 20 naval personnel, with a separate cookhouse/dining room and separate accommodation for three naval officers and a Petty Officer. Immediately to the south-west of the abbey were the quarters for three officers and a Petty Officer of the Royal Marine Submarine Miners (marked as such on both 1915 and 1918 maps of the island). There was a small telephone hut near the north bay.

The General Revision

The armament of Inchcolm was radically reordered and strengthened in the general revision of the armament of the Forth in 1916. Two of the 12-pdrs remained in situ on the original light emplacements (formerly 'O' Group, now 'R' Group) (Fig 10.23). Ten other guns were added in more substantial emplacements. There were also other improvements, including the construction of two substantial piers in the bay north of the spit joining the two lobes of the island.

The four 12-pdr (Naval) 18cwt guns that had formed the 1915 'M' and 'L' Groups were replaced by four 4-inch guns ('O' Group and 'M' Group) in more substantial emplacements, in an irregular line downhill from the previous 12-pdr emplacements (Fig 10.23). While it was originally intended to mount Mk III guns on Mk I mounts, by 15 November 1916 the plans for the emplacements had been amended to allow the mounting of more up-to-date Mk V guns on Mk II mounts, and new guns were issued from store. They were mounted in December 1916 and ready for action between April and July 1917. The gun emplacements had overhead protection.

Because the 4-inch guns were in such an exposed position, the magazine for the battery was located safely behind the crest of the hill, linked to the battery by a tunnel (Fig 10.24). The tunnel survives to an incomplete length of 66m and has a dog-leg 45m from the intact eastern entrance; it is constructed with a brick vault, except at the western end, where a steel channelling roof bears the weight of the magazines of the 6-inch guns above. The 4-inch shell store and cartridge store were sited on either side of the tunnel. An open shaft rose from the tunnel into the middle of the 6-inch battery above it; from this point eastward the tunnel narrows. Above, in the 6-inch battery, there still survives a vertical spindle which probably mounted a hoist or small crane for raising material through the shaft; the fittings for a manual hoist also survive in the shaft itself.

It was originally intended that a tramway would run through the tunnel to the 4-inch battery,[94] but no such tramway is marked on the 1918 map of Inchcolm. The tunnel was dug by the RE (Cornwall) Works Coy, who placed a plaque recording their work at the east end of the tunnel. It is likely that the same unit remodelled the western side of the east lobe of the island. Formerly, this area had been a steep rocky slope and the southern point of the island could only be reached by an exposed path on the east side. The two terraces were created in 1916–17 by the removal of considerable quantities of rock (Fig 10.25).

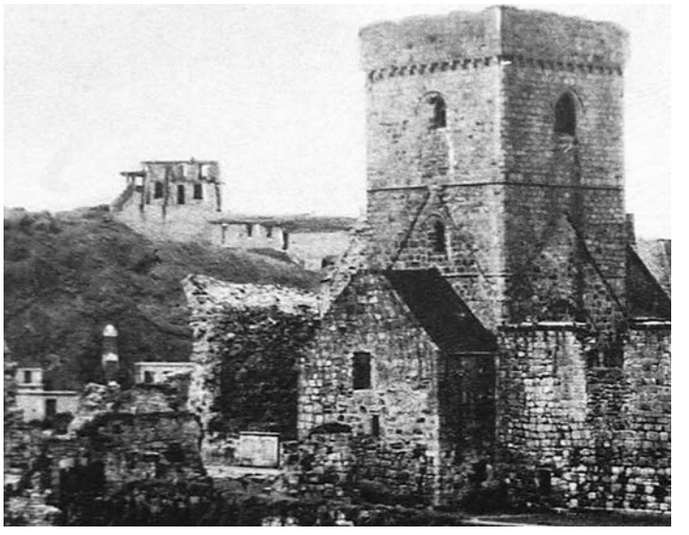


Figure 10.26
Detail of an inter-war postcard of Inchcolm, showing the Battery Command Post for the 6-inch battery visible in the background. This building was demolished by 1931

The top of the eastern lobe was chosen as the site for a pair of 6-inch guns ('Q' Group) with a substantial magazine behind, partly dug into the hillside, above the 4-inch magazine and the tunnel below. The new Battery Command Post building lay behind the northern 6-inch emplacement (Fig 10.26).

A large new engine room was built to power a new set of seven DELs on the eastern lobe. Two of these were situated to the south of the engine room and one to the north. The remaining four were grouped at the easternmost tip of the island. In February 1917, four Royal Engineer officers and 105 other ranks were recorded as being required to operate them.[95]

On the western lobe of the island, the two 12-pdrs in the old 'H' Group were replaced in 1917 by four 4.7-inch guns transferred from Dalmeny and Downing Point batteries. As everywhere else in the revision, the structures associated with the new guns were more substantial than those they replaced. The first two guns were mounted in January/February 1917, the second pair in late July (Fig 10.27; Fig 10.29). A new Battery Command Post was built.

To the west of the Battery Command Post, a new Port War Signal Station was built on the highest point of the western lobe, the contract being let in 1916. The imposing building

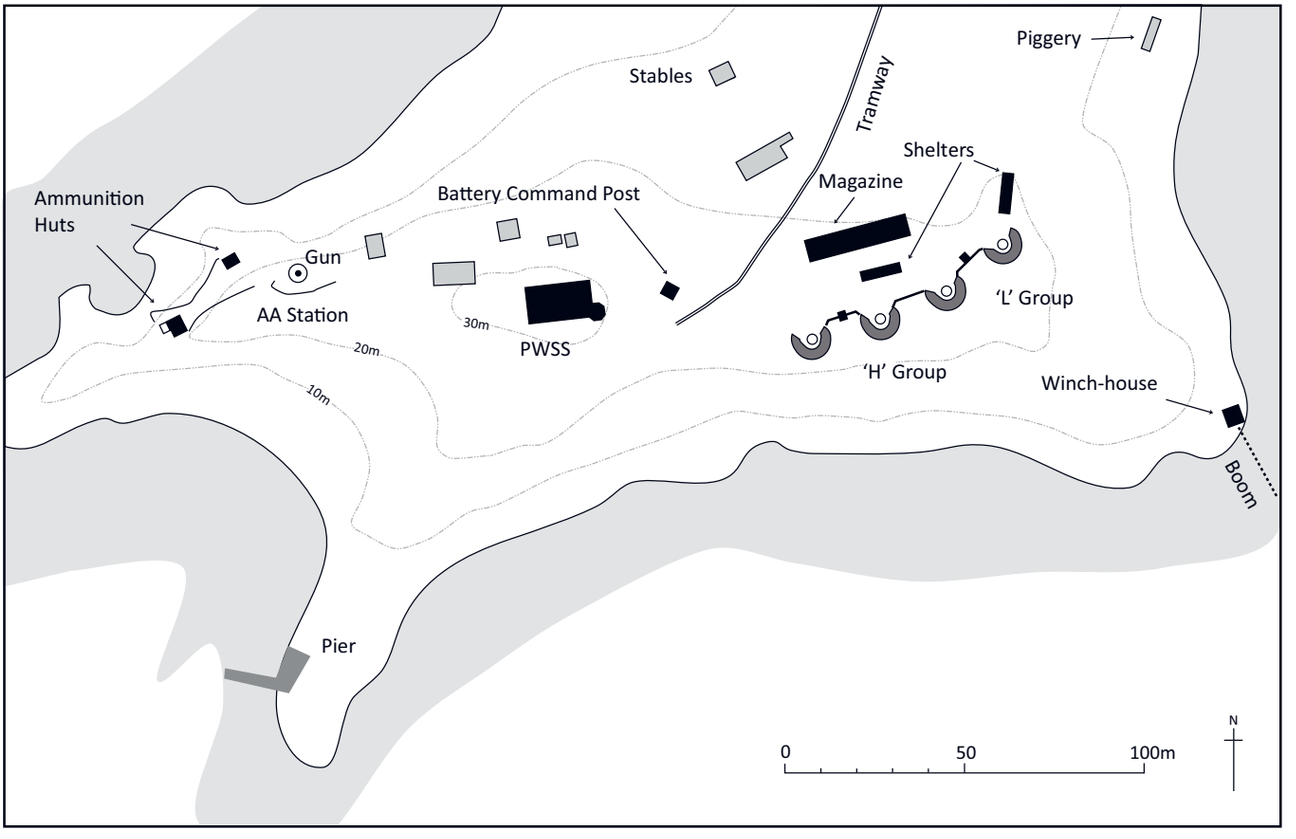


Figure 10.27
Detailed plan of the western lobe of Inchcolm, 1917–18 (© Gordon Barclay)

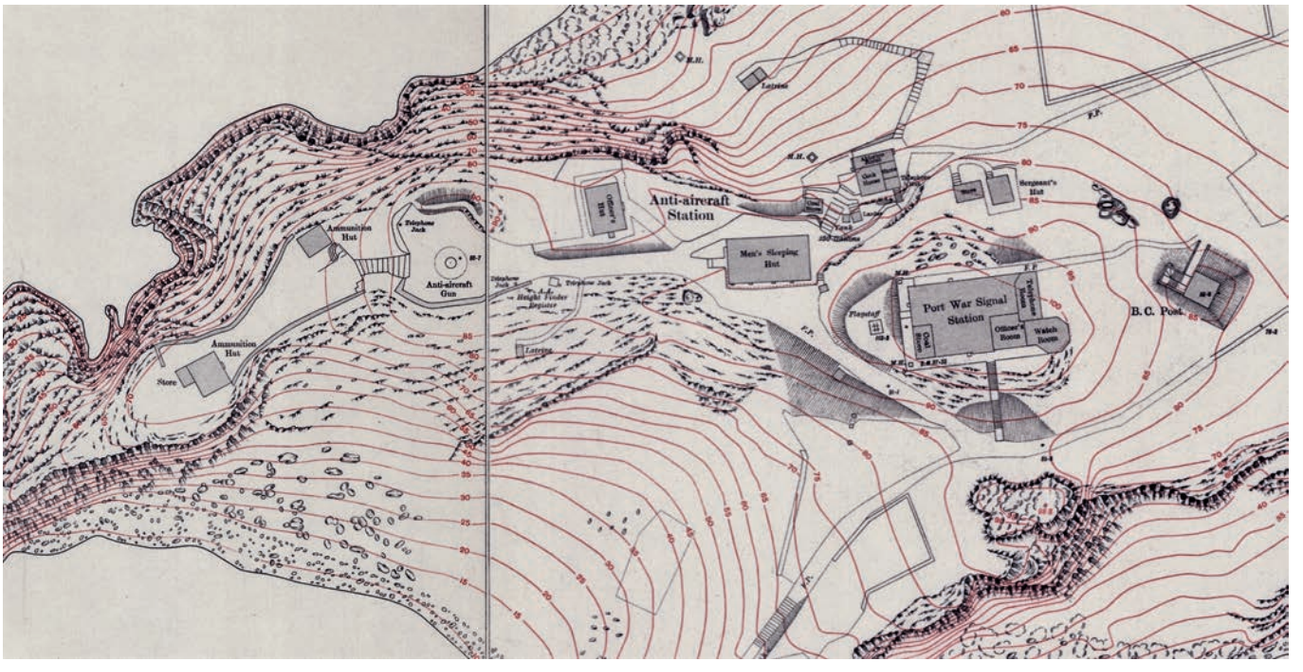


Figure 10.28
An extract from the War Office map of 1918, showing the Anti-Aircraft Station at the western end of the island, the Port War Signal Station, and the Battery Command Post for the 4.7-inch QF guns (Reproduced by permission of the National Library of Scotland)

was rather more than a 'signal station': it had accommodation for naval signallers (officer, boatswain, yeomen of signals and signals ratings) on the first floor and a 'semaphore room' on the roof; the ground floor also accommodated the Fire Commander's Post, the Fire Commander's 'Retiring Room' and a telephonists' room (Fig 10.2).[96]

Elements of Inchcolm's anti-aircraft defences were scattered around the western lobe of the island. The anti-aircraft gun itself was sited on the narrow north-westernmost point of the island, comprising an emplacement within a low walled area, two ammunition huts, an officers' hut, men's sleeping hut, sergeant's hut, cookhouse and so on (Fig 10.28). Two 'Telephone Jack[s]' – presumably into which telephone instruments could be plugged – were recorded on the 1918 map. A third jack was located beside a small hut labelled 'AA Height Finder Register'. This seems to have been the 'output' end of a system whose other elements were located to the north-east; a feature labelled as 'AA Height Finder' lay 235m to the north-east on the central ridge of the western lobe, accompanied by a further telephone jack. There was also an anti-aircraft searchlight position with its own telephone link, and just north of the abbey ruins was a small 'AA Engine Room' (Fig 10.22). In the main camp, the 'AA Height Finders' [Accommodation] Hut' was also marked on the 1918 map.

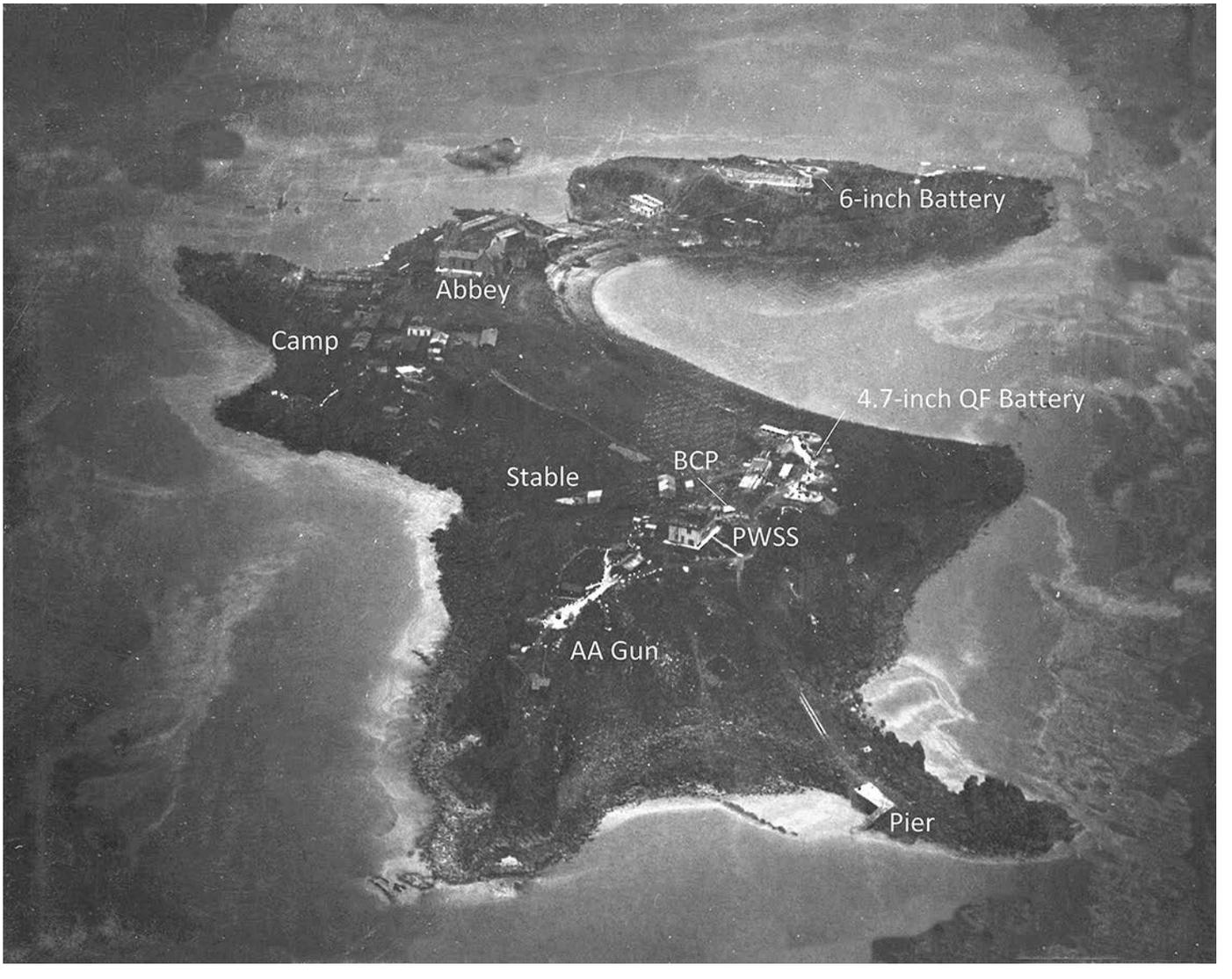


Figure 10.29
Aerial photograph, probably from the 1920s, showing the hutted encampment round the abbey ruins, the Port War Signal Station, on the summit of the western lobe of the island, the anti-aircraft site, and the western pier in the foreground (RNAS. Out of copyright)

A winch-house was built on the southern side of the western lobe of the island as the anchoring point for the second boom-line established in 1916–17. The most unusual new structure on the western lobe was a 'Piggery'.

On the flat area in the centre of the island, the post-1916 accommodation camp was significantly larger than before. There were 18 numbered barrack huts (incorporating the earlier camp) as well as new officers' quarters in two large huts west of the abbey. The buildings were accompanied by cookhouses, ablutions and toilet facilities, and messes, as well as a canteen and recreation hut. A small hospital building was built on the spit joining the two halves of the island. Finally, a building marked 'Drying Hut' still survives on the northern edge of the camp.

A notable feature of the post-1916 arrangements on the island was the construction of a complex tramway system, already referred to in relation to the tunnel (Fig 10.22). The tramway ran the full length of both piers, westward to and through the abbey ruins and the hutments, to the magazine and BCP of the 4.7-inch battery. To the east, three lines ran along part of the northern and southern shores (passing a small 'Magazine' on the shore), and up to the 6-inch battery and the magazines on the east lobe (Fig 10.23). A hut marked 'Stables' near the western end of the tramway was, we believe, for ponies used to pull the wagons (Fig 10.27). A further pier is marked on the 1918 map (not having been marked on the 1915 map) at the south-west tip of the island, with a smooth ramp or footpath running up the steep side of the island towards the PWSS; its date of construction and purpose are not clear. The style of the stonework is consistent with other work from the First World War and the path looks very worn in Figure 10.29.

Inter-war

The Naval Commander-in-Chief, Coast of Scotland wrote to the Admiralty on 12 April 1919 to ask if it was intended to retain the two 6-inch guns on Inchcolm and, if so, for how long. This developed into a correspondence into May about the de-manning of all the guns and lights in the Forth and at Cromarty, which was agreed to.[97]

On 11 October 1920, the Ministry of Munitions advertised in *The Scotsman* the sale by auction of a large number of huts of various sizes and types on Inchcolm: barrack huts, dining rooms, ablutions, offices, sectional huts, stables, sentry boxes, gun shelters, store huts and so on.[98]

In January 1921, the armament of the island was unchanged: two 6-inch; four 4.7-inch; four 4-inch; and two 12-pdr (Naval) 18cwt guns.[99] By September, the approved armament had been reduced by 50% – one gun from each group of two had been put into care and maintenance (although the weapons were still in position). The table had been later annotated (after 1927, see below) to record that the two 12-pdrs had been returned to the Navy and that the rest had been reduced to care and maintenance. The War Department retrospectively leased the island for 99 years from the Moray Estates from Whitsunday (15 May) 1922.

The history of Inchcolm between the wars is complicated by the presence of the historically important abbey ruins. In 1922, it was agreed by the Moray Estates that the ruins of Inchcolm Abbey and the central part of the island would come into state 'Guardianship', under the terms of the Ancient Monuments Act of 1913; the Deed of Guardianship was dated 15 March 1924.[100] The Ministry of Works file records, 'I rejoice that this famous building is to come under the Department. It is one of the most charming and significant monuments in Scotland; and although access is far from easy, it should become a great tourist and educational resort'. In relation to the military occupation:

> One can only be thankful that the place has escaped injury so much more successfully than one would have expected considering the amount of rock blasting which was necessary to make gun emplacements and to store ammunition … I therefore feel we owe a debt of gratitude for the care with which

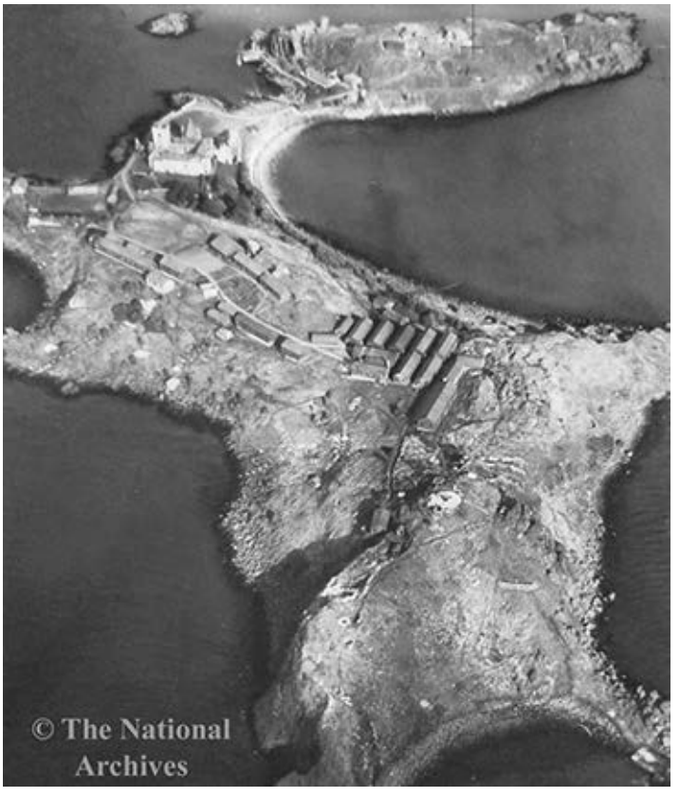


Figure 10.30
RAF aerial photograph of Inchcolm, from the western side of the island, dated 2 October 1941, from the Fort Record Book. The boom between Inchcolm and Inchmickery is visible at the top right. The ramp up from the pier at the bottom right has been blocked by a breastwork of sandbags (© The National Archives, WO 192/254)

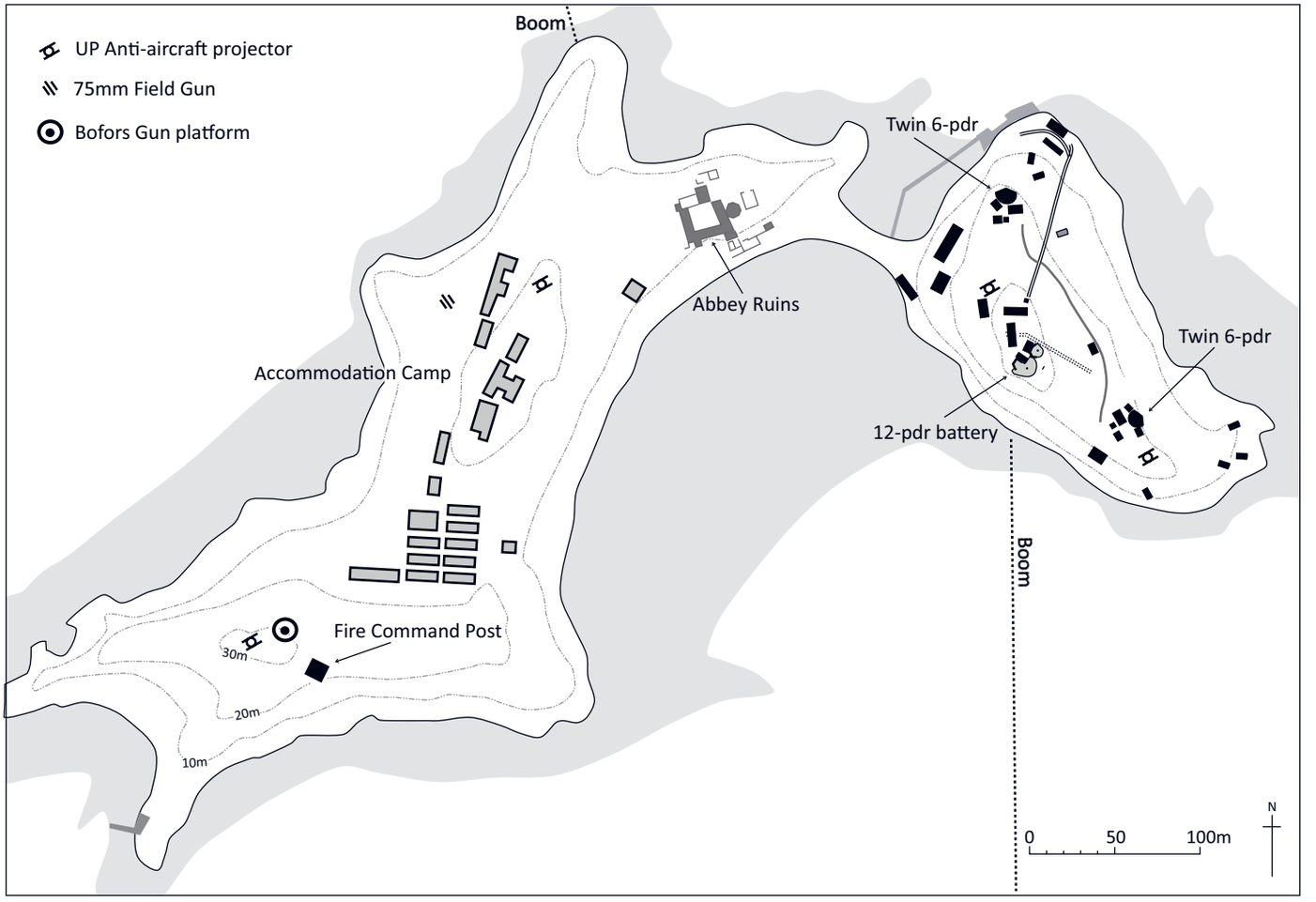


Figure 10.31
Inchcolm in 1942. The area outlined is shown in more detail in Figure 10.33 (© Gordon Barclay)

> the buildings were safeguarded, and I can readily forgive the soldiers for the tonnage of tin cans and jute bags, for those foetid heaps of indescribable rubbish, even for their jamming a turpitude right up against the Anchorite's Cell.

The writer had 'never seen waste to compare with the squandering maniacs of the RGA [Royal Garrison Artillery] and the [Royal] Army Ordnance Corps'.[101]

In November 1927, the 'approved armament' of the island was two 6-inch, four 4.7-inch, four 4-inch and two 12-pdr guns,[102] all of which were recommended for removal. This was done in 1930, with the 6-inch guns being transferred to Inchkeith, the 4-inch guns back to a naval depot and the 4.7-inch guns (which had been first mounted at Kinghorn and Inchkeith in the 1890s) broken up for scrap.[103]

With constrained post-war public finances, the Ministry of Works did not have the resources to undertake much 'tidying up' beyond the immediate environs of the abbey. Although the guardianship area was not extended to cover the whole island, as the Ministry wanted, the War Department transferred the lease of the whole island to the Ministry of Works in 1930 and a radical programme began to remove or bury the defence-related structures.[104]

The fate of the substantial Port War Signal Station was specifically addressed: in January 1930 it was 'in comparatively good condition, and could be habitable again with very slight expenditure'. The key problem, particularly in relation to any use of the building, was the inadequacy of the natural water supply of the island, which was '*just sufficient* to supply the custodian's house and the tea room and water for our workmen who live on the island'. Crucially, 'from a pictorial point of view the Island would be more picturesque without the Signal Station, as the latter to a certain extent competes with the Monastery'.[105] The building was demolished in 1931.

By 18 February 1932 it could be reported that:

> … we are now nearing the completion of the demolition of the War Department buildings. The method of demolition has been in the main blowing up the heavy magazines and gun implacements [*sic*] and owing to the contour of the ground it has been possible to arrange the fallen debris in such a manner that very little carting or moving of the material was necessary. Hollows have been filled in and soil spread over the fallen debris.[106]

On 26 April 1932, *The Scotsman* reported, approvingly, the progress of the Ministry's 18-month campaign. By then, the former engine room near the pier had been considerably heightened during 1931 and turned into a refreshment room for tourists. Areas formerly occupied by military structures had been seeded with grass and sea buckthorn.

Figure 10.32
The southern of the two Second World War boom anchors on Inchcolm (© Ron Morris)

Second World War

In 1938, as part of the planning to establish anti-motor torpedo boat defences in the Forth, the War Department approached the Ministry of Works to discuss the partial reoccupation of the island.[107] As in the First World War, the anti-submarine and anti-boat boom touched at Inchcolm. The southern anchor comprised a heavy chain firmly embedded in a mass of sandbags filled with cement and then wetted (Fig 10.32); the northern anchor was a loop of heavy steel bar. Both survive.

The HQ of Inchcolm Fire Command was again located on the western lobe of Inchcolm, as it had been in the First World War, reusing the Battery Command Post of the First World War 4.7-inch QF battery. The contract issued in January 1940 by the War Department to the Edinburgh builder Messrs John Best, 'for structures at Inchcolm and Inchmickery Islands', included the construction of a Fire Command Post, but there is no evidence that a new structure was built. Best was also to build two 6-pdr emplacements, two 12-pdr emplacements, two Director Towers for the 6-pdrs, a Command Post for the 12-pdrs, two engine rooms, six DELs, stores, workshops, latrines, electrical services and, as extras, water supply, drainage and a

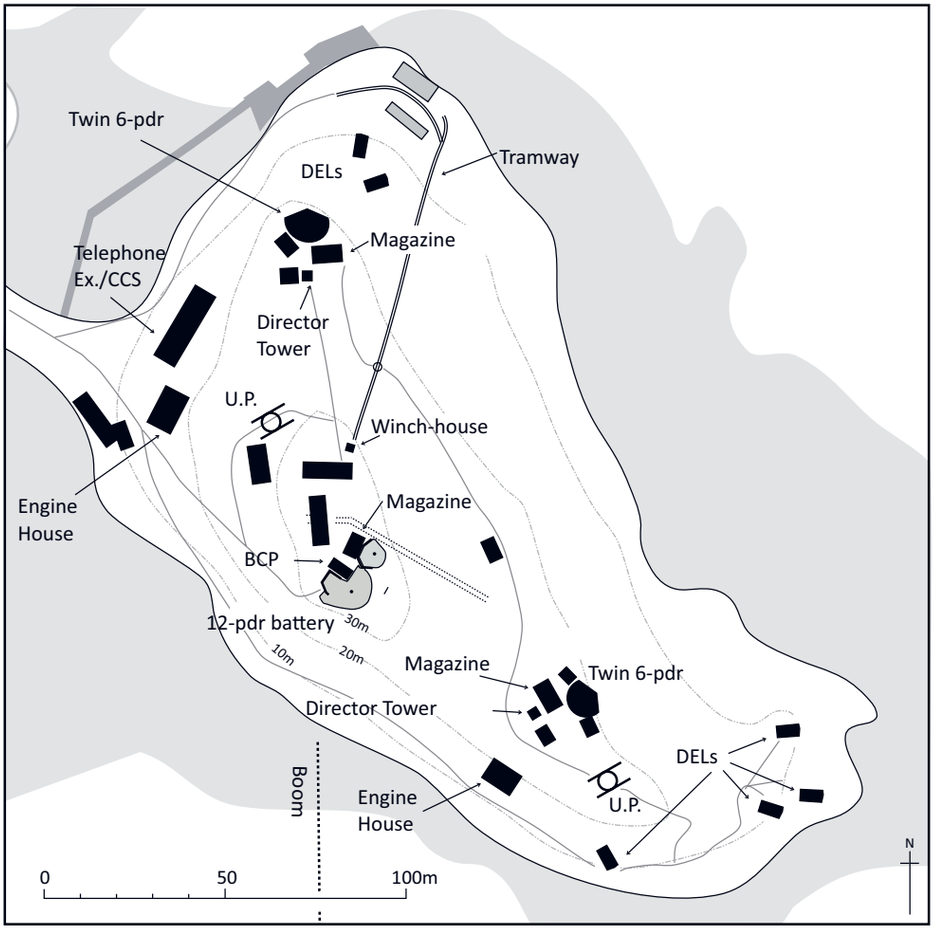


Figure 10.33
Detailed plan of the eastern lobe of Inchcolm, *c* 1942 (© Gordon Barclay)

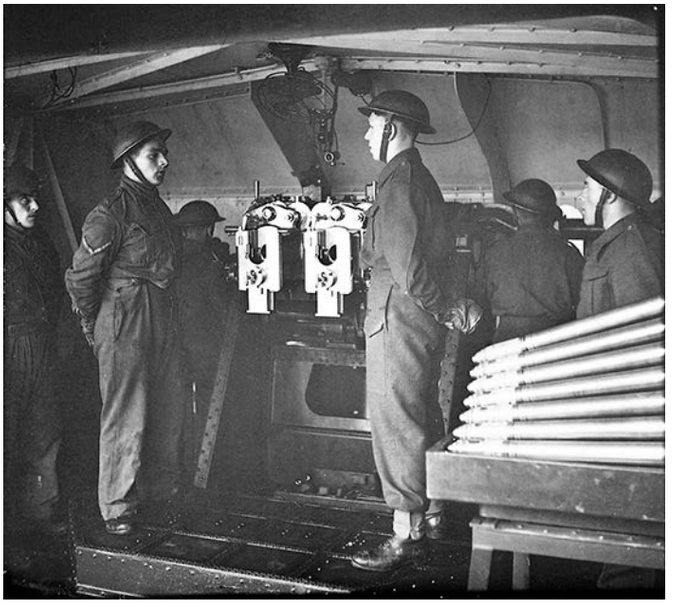


Figure 10.34
The interior of the cabin of one of the Inchcolm 6-pdrs, November 1940 (© Imperial War Museum H5510)

Figure 10.35
The southern of the two Second World War 6-pdr emplacements on Inchcolm, as it was in the 1990s (© Ron Morris)

Figure 10.36
Fixed beam emplacements Nos 2 and 3 near the easternmost point of Inchcolm (© Gordon Barclay)

winch-house (probably that at the head of the tramway (Fig 10.33). The total cost of the works was set at £21,880.[108]

In the Second World War, offensive armament was restricted to the eastern lobe (Fig 10.31; Fig 10.33). The Edinburgh Fortress Company, RE, arrived shortly after the beginning of the war to start work on the island. Temporary DELs were installed in wooden huts and these were operational when the Royal Artillery took over on 20 October 1939. The garrison at that stage comprised three officers and 60 other ranks. Two 12-pdr guns and two 2-pdr pom-pom guns of First World War vintage were mounted and manned the following weekend, the latter deployed in an anti-MTB role, until the 6-pdr twin guns were ready.[109] The 12-pdr battery was installed on part of the First World War 6-inch battery and was called the Kent Battery after the Duke of Kent, who is recorded as firing its first shot at 11.45 a.m. on 27 October 1939.[110] Grant remembers that the Inchcolm 12-pdrs were from Carlingnose (Coastguard).[111] This is contradicted by the Cramond Fort Record Book, which states that the Coastguard guns went to Cramond Island (which Grant states received guns from Inchgarvie).

To accommodate the 12-pdrs, part of the emplacement of the southern 6-inch was cut away. Both guns were provided with high walls to the flank and rear, visible on the contemporary photographs, to provide cover for the crew from air attack and splinters.

Immediately behind the 12-pdr guns were two magazines, the southern with the Command Post above. To the north-west were a shelter and gun store, with a RA store and workshop a little further to the north, beside the winch-house for the tramway, which ran up the steep eastern face of the hill from the shore. A curved extension at the lower end turned towards a Second World War landing stage. Clearly marked on one of the Second World War plans there is, part way up the tramway ramp, a small turntable (still visible on the ground). There were not, however, tramway rails from here to the two 6-pdr gun emplacements; the paths from the turntable were smooth concrete, *c* 60cm across.

The Fort Record Book records that the two 6-pdr twin guns were installed during 1940, along with a Bofors gun placed on the former PWSS site. The two twin 6-pdrs were known as 'Colm No. 1' and 'Colm No. 2'.[112] The installations were built to a pattern standard in the Forth, with a circular emplacement, the rear arc covered by a concrete roof, and shelters and magazine behind; behind the gun was the Director Tower (now demolished) (Fig 10.34; Fig 10.35). The 6-pdrs relied on power from two separate engine rooms.

Six DELs in concrete housings were installed on the island. Of these, No. 1 (on the south-west side of the eastern lobe) was a narrow-beam (3°) moveable light, with a *c* 2,300m range, and Nos 2–4 (on the easternmost point of the island) were fixed-beams with a 16° dispersed beam and a range of *c* 1,650m (Fig 10.36). No. 4 was built on almost exactly the same site as its First World War predecessor. No. 5 (on the northern point of the eastern lobe) was also a fixed light while No. 6 (also on the same site as its predecessor) had a 3° moveable beam with a range of 1,300 yards (*c* 1,200m). The equipment included 'Fighting Light No. 7', an anti-aircraft-type light connected to the north engine room. The size and internal arrangements of the DEL housings vary; the northern and western have internal rooms, but some of these may date from later use by the Northern Lighthouse Board. No. 3 has a unique survival of glass prisms in its central window. All the other windows on the island are of plain glass. Emplacements Nos 2–4, uniquely in the Forth, have surviving steel doors and internal steel shutters, and even metal grids covering cable channels in the interior (Fig 10.37).

The complement of the Inchcolm batteries, on 18 September 1940, was 109, including four officers and 12

Figure 10.37
DEL emplacement No. 3 on Inchcolm, with its central prism-filled window and its internal steel shutter (© Gordon Barclay)

Figure 10.38
The large hold-fast (eight bolts in a circle *c* 1.5m in diameter) near the western end of Inchcolm, for the First World War 3-inch anti-aircraft gun. This photograph was taken in the 1980s (© Ron Morris)

engine room personnel. Inchcolm Fire Command was under the command of a Lt Colonel, with two Majors, four further officers and 39 other ranks, including a Royal Army Ordnance Corps Instrument Mechanic, who presumably maintained all the range-finding instruments in the Command.[113]

In November 1943, it was decided, as part of the run-down of coast defence, that Inchcolm Fire Command (504 (The Fife) Coast Regiment) would be progressively disbanded. Only two DELs (No. 1 to the south and No. 6 to the north) were to be left in use, to illuminate the boom, with No. 2 (to the east) as a reserve. All other equipment was reduced to care and maintenance by 11 December 1943.[114]

Defensive measures

There is a local Defence Scheme on the Fort Record Book, dated 15 July 1943, with a map showing platoon and other positions. The scheme refers to a larger garrison of 13 officers and 223 other ranks. The island was surrounded by a perimeter of barbed wire, which formed the first line of physical defence. A reserve of 12 days' rations was held in the Abbey, in case it was impossible for the daily ration boat to reach Inchcolm from Leith. In common with Cramond and Charles Hill, Inchcolm was provided with a 75mm field gun. It had a prepared position north of the officers' mess, with an arc of fire northwards, and was provided with 340 rounds of HE and 60 rounds of AP shell. By July 1943, four Unrotated Projectile anti-aircraft weapons were recorded, along with four AA light machine gun posts (Fig 10.4).[115]

Figure 10.39
The more accessible, southern, of the two surviving DEL housings from the First World War on Inchcolm. This emplacement was built during the 1916 reconstruction of the defences. This photograph was taken in the 1980s or 1990s. The structure is now more overgrown (© Ron Morris)

Post-war

In March 1951, during the Korean War, there were short-lived proposals to build 12 huts, to accommodate about 100 men, on the western lobe. The Ministry of Works was deeply concerned. It was mentioned in passing that the guns and magazines were still in position.[116] In November 1952, the 12-pdr guns were determined to be surplus to the 'Basic and Reserve Scale of Defence', and marked for disposal. The guns were sold to a contractor in April 1954 for scrap.[117]

On 3 July 1957, the Command Land Agent, Scottish Command, wrote formally to the Ministry of Works that 'it is now possible, formally, to hand back this island to your Ministry'. Two huts were to be passed over free of charge for the Ministry's use elsewhere in its estate.[118]

It is generally reckoned that the disbandment of Coast Defence in 1956 saw the end of all defence measures relating to the estuary, but Ministry of Works files for Inchcolm show that naval interest at least continued for some years. The Navy Works Department at Rosyth wrote to the Ministry of Works in September 1962 about the marking of the anti-submarine boom, should it have to be re-established, using the anchors still in situ on the north and south sides of the island. It was not until 4 February 1977 that the Ministry of Defence wrote to the Ministry of Works that the boom anchors were no longer required.[119]

Survival

Fortunately, the inter-war and post-war campaigns of 'tidying up' by the Ministry of Works were not as destructive as at first appears. From west to east, the First World War AA gun emplacement survives, along with the gun's holdfast, albeit much overgrown in 2017 (Fig 10.38). The PWSS has been completely removed; its site is occupied by the base for a Second World War UP projector, which in turn has been used as the base for a modern mast. The 1939–45 Fire Command Post (previously the 1916–17 4.7-inch Battery Command Post) survives, as do the emplacements of those guns. The contour of the ground suggests that elements

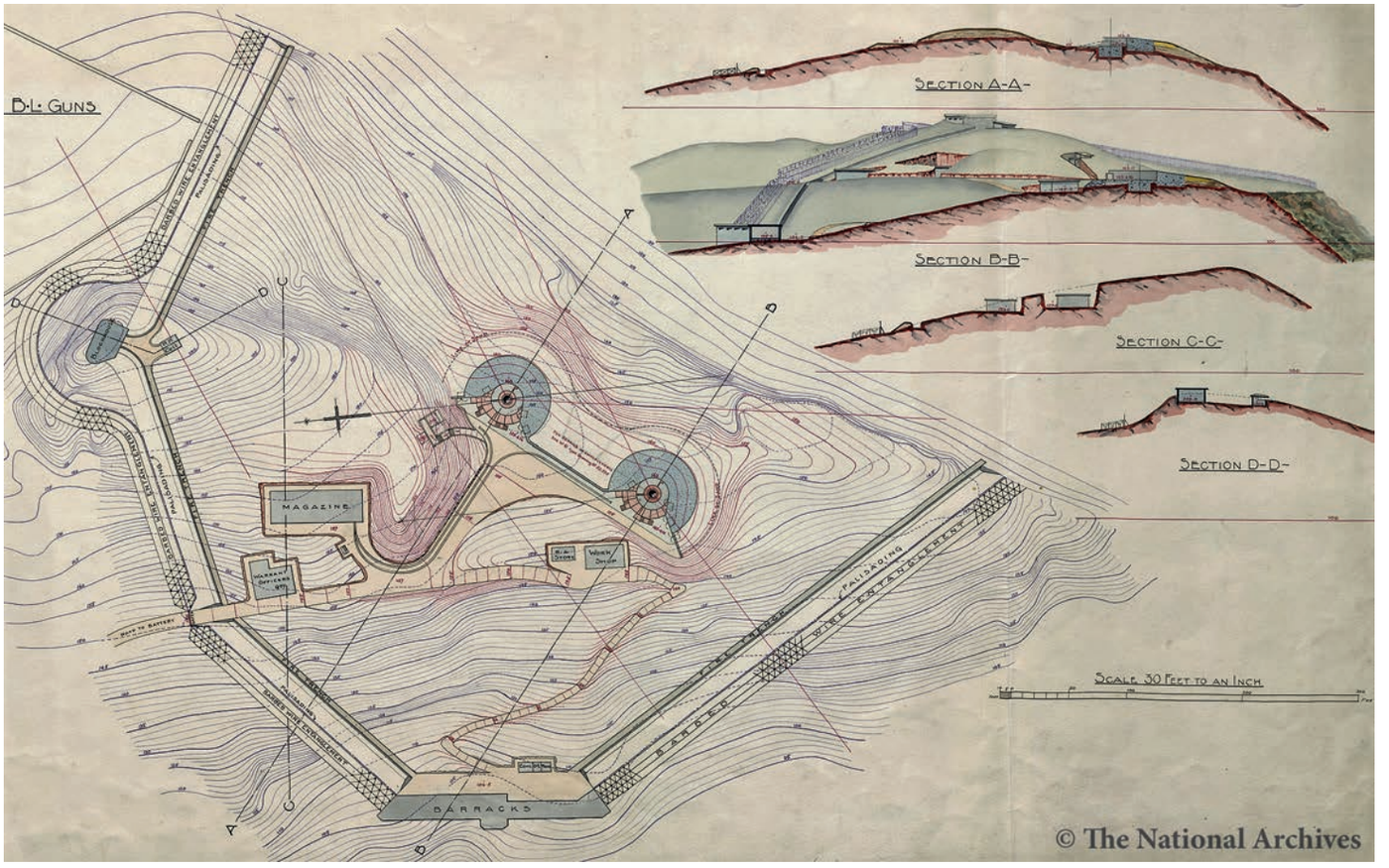


Figure 10.40
Royal Engineer plan of the proposed battery at Braefoot, 1912 (© The National Archives WO 78/5169)

of the 1916–17 magazine and shelter buildings might survive under mounds of rubble behind and to one side of the guns.

A brick-built building, identifiable as the quarters of the NAAFI staff, survives in the camp with, behind it, a substantial concrete underground water tank. In the main camp area, the 1916–17 drying room building survives.

To the east of the abbey the 1916–17 engine room (later, in the Second World War, the telephone exchange and casualty clearing station) now lies below the Historic Environment Scotland shop and display area, accommodating toilets and storage. A modern-looking metal-clad hut to the south of this building, now used for the storage of the HES tractor, trailer and mowers is, inside, clearly a First World War wooden hut, with astragalled windows, a unique survival in the Forth Defences. The internal wooden panelling is painted green below and cream above a dado line. The Second World War north engine room is still in use as the engine room for the island, now accommodating modern diesel generators. Both engine rooms have, uniquely, their complete suite of steel shutters and door.

Both overhead canopies for the 6-pdr emplacements have been demolished, and both Director Towers were blown apart by Territorial Army Royal Engineers. The magazine of the southern battery survives. The buildings associated with the 12-pdr emplacements survive, although the high brick walls protecting the rear of the emplacements have been removed. The First World War 6-inch and 4-inch magazines to the west of the hilltop seem to have been reduced into their own shells and the resulting profiles smoothed. The tunnel survives in good condition for most of its length. The 1916–17 4-inch battery at the east end of the tunnel seems to survive in good condition, but was in 2017 so overgrown by scrub as to be almost invisible.

The flat areas formerly occupied by the First World War hydrophone and RSMS huts are identifiable. Only two of the DELs from 1916 survives, just below the path along the southern side of the eastern lobe (Fig 10.39 – the two marked just south of the engine room). The six DEL emplacements from the Second World War survive in very good condition, although those for the moveable beams are showing signs of corrosion on their metal fittings. One

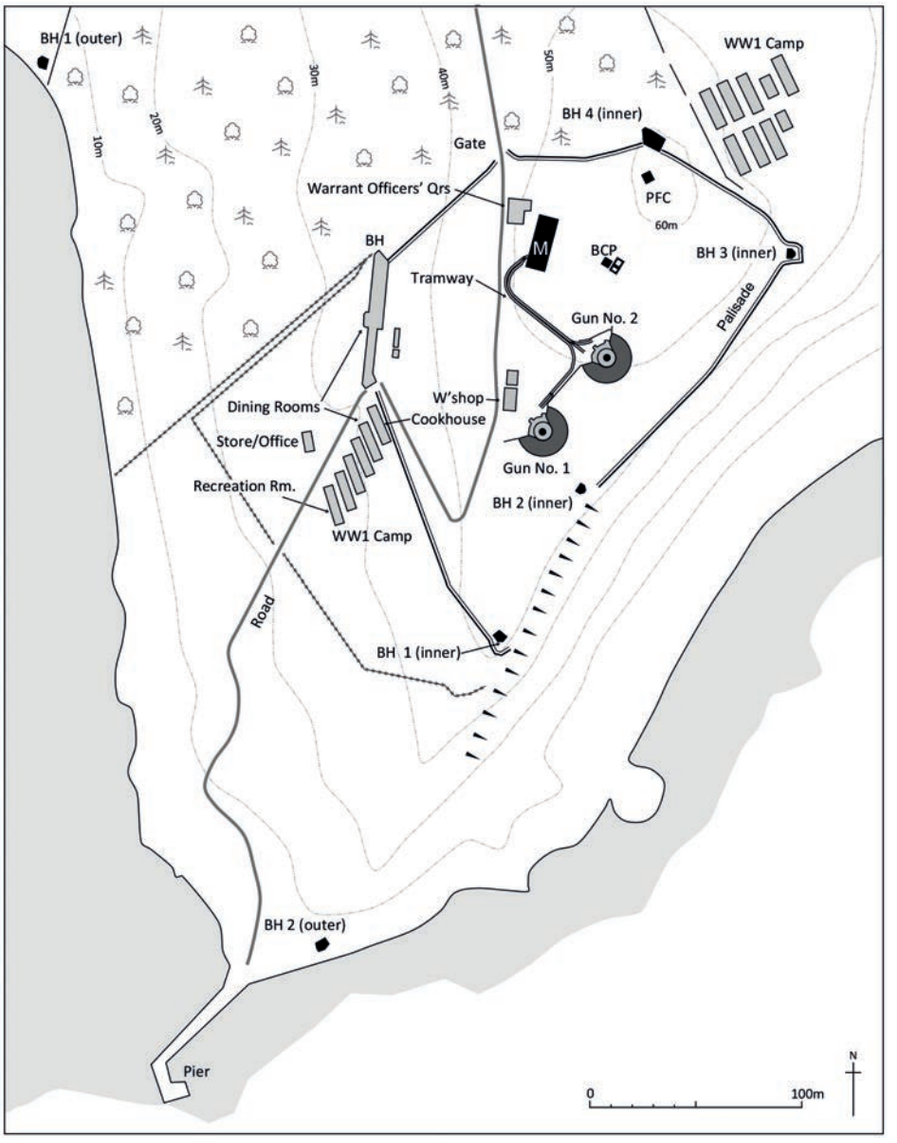


Figure 10.41
Plan of Braefoot, based on the 1918 War Department/Ordnance Survey plan. The four inner blockhouses (BH) are shown, and two of the six outer line. The palisade was part of the original plan in 1912; the barbed wire and the additional accommodation huts had been added by 1918 (© Gordon Barclay)

of the fixed-beam DELs has its central vertical slit filled with original glass prisms, which we believe may be a unique survival, if original.

10.6 Braefoot

Pre-war

The Braefoot Battery of two 9.2-inch guns was not part of the Inchcolm Fire Command, but was co-located with it. There is no known Fort Record Book but plans, sections, elevations and panoramas survive, dated 1 April 1912, for the proposed battery (Fig 10.40).[120] The land for the battery was purchased in April 1914.[121] The report of the Owen Committee in 1905 had recommended the strengthening of the Forth's heavy defences (then three 9.2-inch guns on Inchkeith and one at Kinghorn) by the addition of two further 9.2-inch guns, one more at each existing site.[122] In 1911, the Home Ports Defence Committee reiterated the need for these extra guns, but suggested instead 'a more retired site in the neighbourhood of Vault Point'.[123] At

Figure 10.42
Braefoot. One of the 9.2-inch emplacements, from the rear. Ammunition was stored at ground level, on the emplacement floor, to where it was transported by tramway from the magazine. The gun floor, on which the Setter, Layer and other crew worked, was at the level of the cornice visible just below the parapet. See Fig 2.2 (© Gordon Barclay)

Braefoot, just west of Vault Point, the 9.2-inch guns could be mounted at a height of between 45m and 50m above sea level, capable of firing over Inchcolm.

The battery was built in close conformity to the plans prepared in April 1912. Two gun emplacements set just below the summit of the ridge were linked to the magazine behind the crest of the hill by a tramway (Fig 10.41; Fig 10.42). The warrant officers' quarters lay immediately beside the magazine, with a Royal Engineers store and workshop just behind the guns. Accommodation for the permanent garrison was provided in a long single-storey stone-built barrack building along the western perimeter of the battery, behind the ridge (Fig 10.43). The 1912 plans are unusual in setting out in detail the landward defence of the battery. The loop-holed barrack building was included in a strong defensive perimeter, formed (from the inside) by a firing trench, a palisade and a

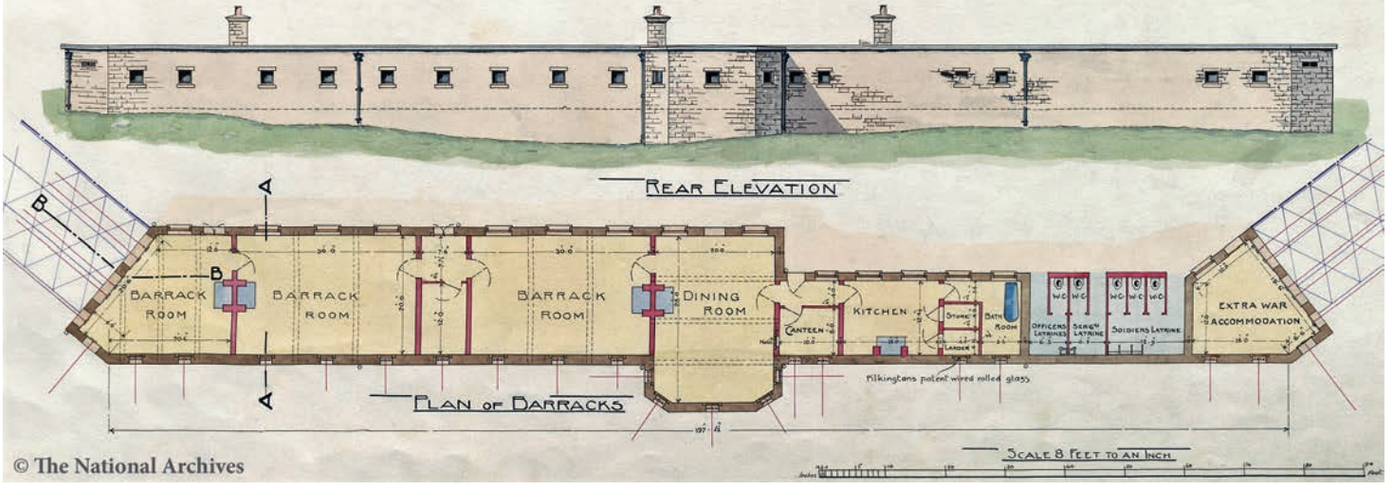


Figure 10.43
Plan and elevation of the proposed barrack block at Braefoot, 1912. It was built to this plan and survives in good condition. Both ends and the outer wall were pierced for firing loops (© The National Archives, WO 78/5169)

Figure 10.44
The loop-holed western end of the barrack block (© Gordon Barclay)

barbed wire entanglement (Fig 10.40; Fig 10.41).[124] The western wall of the barrack building and both ends were loop-holed for defence, and a small loop-holed outshot on the north-west side (the dining room) allowed the wall to be enfiladed (Fig 10.44).[125] A blockhouse was also built at a corner of the perimeter, on the highest point of the site (Fig 10.45).

By 1918, a Position Finding Cell had been built in the northern part of the compound, on the highest point of the ridge, with the Battery Command Post (with officers' quarters behind) between the guns and the magazine and slightly uphill.[126]

The battery, in common with others on the Forth, was provided with a pier, linked to the battery by a road. It still lies just to the south of Blockhouse 2 (outer) (Fig 10.46), which was probably positioned both to cover the pier and the shore to east and west of Braefoot Point.

First World War

After the site was acquired in April 1914, the pedestals for the guns reached Aberdour railway station by January 1915 and work was sufficiently far advanced for them to be mounted at the battery on 1 February.[127] The gun mountings themselves reached the battery on 23 April 1915 and 23 May 1915. The first gun was mounted on 28 May, the second on 6 July 1915. 'Navvies' were still being advertised for, to work at Braefoot, in the *Edinburgh Evening News* dated 28 October 1915.

The elevated site of the battery meant that No. 1 gun had an arc of fire of 168°, covering the water from the north edge of the rail bridge all the way around to Kinghorn, and No. 2 gun covered the water from Drum Sands on the southern shore around to Kinghorn, an arc of 123°.[128] Unfortunately, a large part of the arc of fire faced Edinburgh and Leith, and concern was expressed that ricochets might reach the towns, causing damage and alarm.[129]

The landward defences of Braefoot were recorded in 1916 on a plan that also showed the location of two groups of huts additional to the stone-built barracks and the boundary of the site (rather larger than the original compound), and the location of six outer blockhouses.[130] More detail of the appearance of

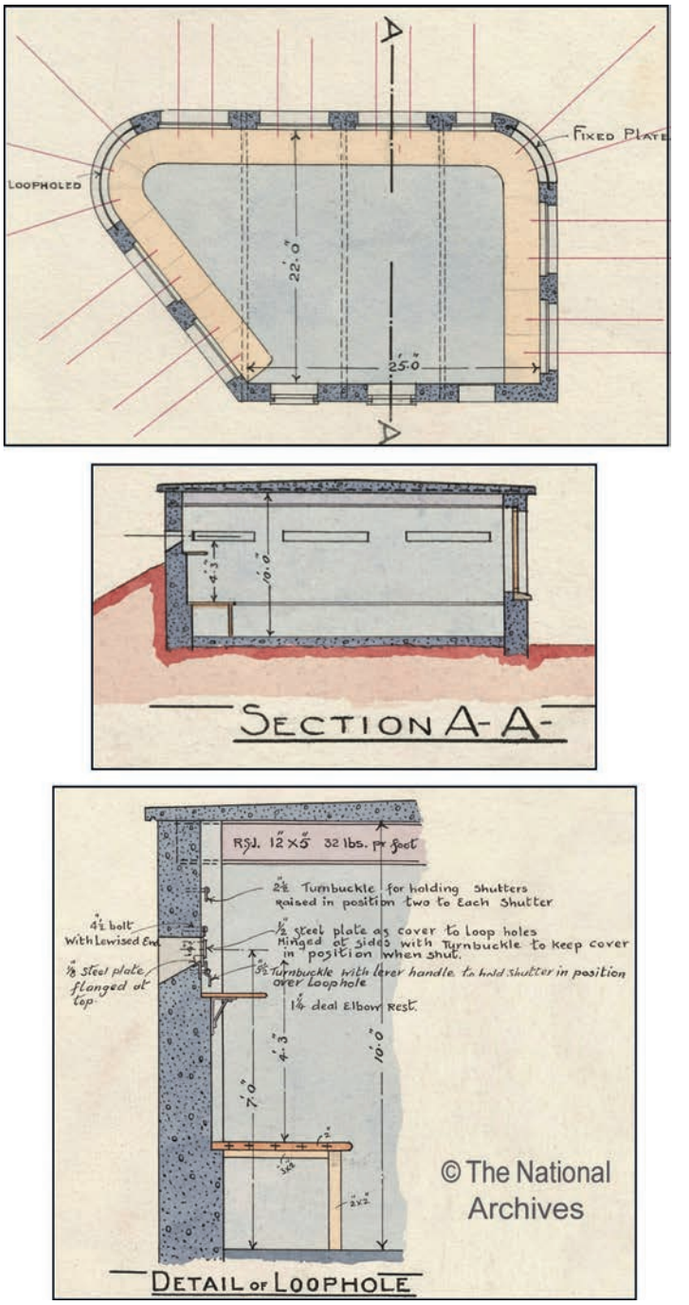


Figure 10.45
Plan and cross-sections of what was to become Blockhouse 4, a large structure on the summit of the hill. As built, it was provided with large windows, even on the outer side. The curtailed labels on left and right of the plan read 'Fixed plate Loopholed' (© The National Archives, WO 78/5169)

the battery at its greatest expansion is provided by a series of nine plans at a scale of 30 inches to the mile (1:360) prepared for the War Office by the Ordnance Survey in 1918.[131]

Although the original palisaded fence was still in position in 1918, by then a larger area had been enclosed within a barbed wire entanglement that enclosed a larger camp. Additional huts (five for men, one for sergeants and two for officers) had been built down the reverse slope of the hill to the east and, just within the old compound, a telephone exchange. There was another camp of nine huts to the north-east (Fig 10.41).

In April 1916, the Reverend Donald Rose of Dalgety Parish Church was appointed officiating clergyman to the Presbyterian troops at Braefoot Battery. The Royal Artillery garrison of the battery was recorded in July as comprising four officers (Battery Commander and Gun Group Commander, both with their relief) and 61 other ranks (the position-finder and range-finder each had a three-man detachment, six

Figure 10.46
The blockhouse at the shore, covering the beach and the pier (© Gordon Barclay)

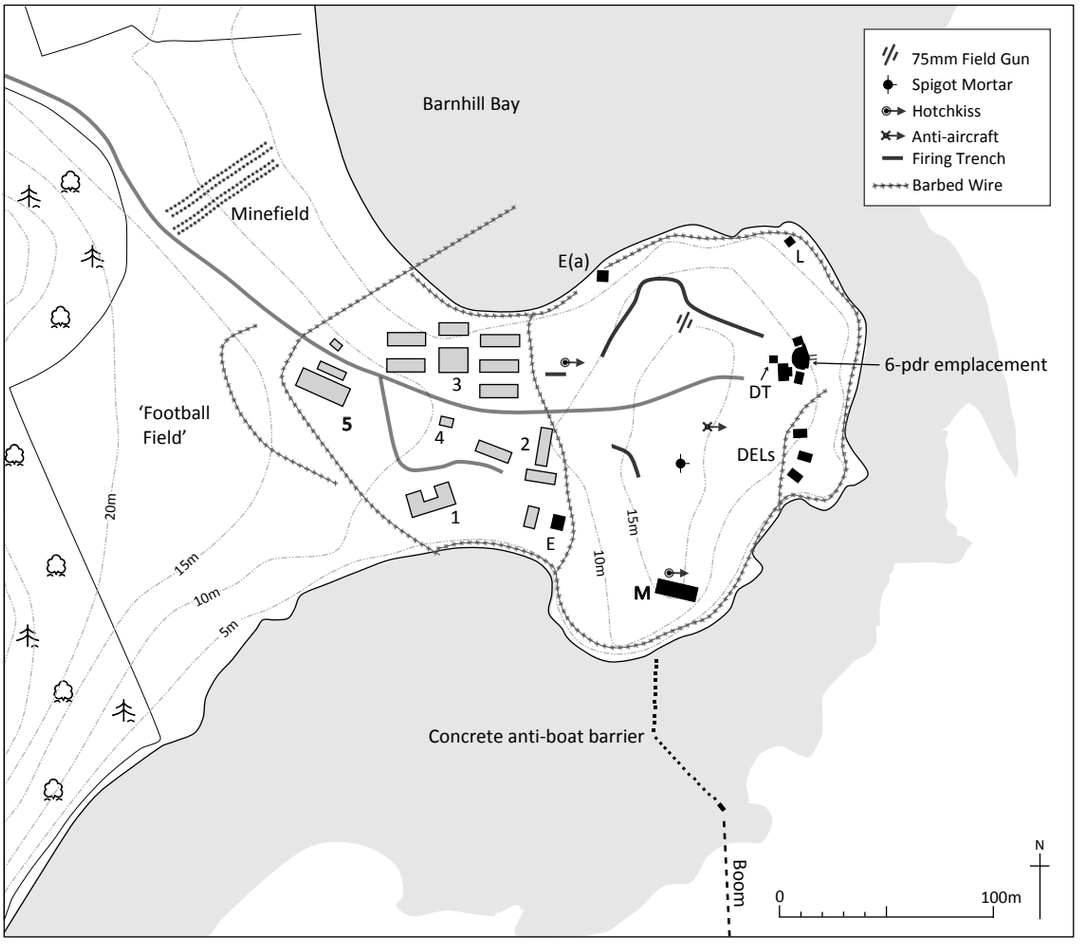


Figure 10.47
Plan of the Charles Hill battery, showing the layout of battery buildings, the gun and lights, and the defences reflecting the position in 1941–2. Where the plans and sketches disagree as to the precise location and orientation of buildings, the April 1941 aerial photograph (Fig 3.85) has been taken as definitive. 'Domestic' structures are marked with numbers; battery structures with letters (© Gordon Barclay)

telephonists, 26-man gun detachment, 16-man ammunition detachment, storeman, lamp-man and two officers' servants).[132]

In the general revision of the defences of the Forth in 1916–17, the GOC of the Forth defences suggested that the battery was no longer appropriately located. His suggestion that the battery should be done away with was not approved immediately, but on 4 October 1917 the War Office directed that the guns should be removed to store. The guns were taken to Aberdour Station on 5 and 11 November 1917, although the mountings remained.[133] Braefoot was not rearmed.

Survival

The stone and concrete buildings of the Braefoot Battery are very well preserved: the two linked emplacements; behind the southern emplacement, a smithy and store, both roofed; to the north, the magazine, the warrant officers' quarters and the Battery Command Post. To the west, the original stone barrack-block; storage rooms adjacent to the barracks; the telephone exchange; the Battery Command Post; and the four blockhouses of the Inner line, and one of the Outer (No. 5 at the pier).

10.7 Charles Hill

First World War

The Charles Hill site was not occupied during the First World War, but the landward defences of the Braefoot Battery extended onto the site. In that war, the channel between the Fife coast and Inchcolm was blocked by a line of anti-submarine nets and, to the east, by an anti-boat boom. The former ran between Braefoot and Inchcolm, the latter between the Meadulse Rocks and Vault Point, where it was anchored on a line of concrete pylons linked by steel rails (reused in the Second World War) (Fig 10.47).

Second World War

Charles Hill was the fourth and last element of the Second World War Inchcolm Fire Command. It was sited on a small peninsula with, to the north, Barnhill Bay, a sandy beach that clearly caused some concern in relation to a possible enemy assault. The battery was described in 1997 in a comprehensive article by Heddle and Morris, and that account considerably informs what follows, although our account differs in some details.[134]

The history of the fort is known from the Fort Record Book (including four plans),[135] first-person accounts gathered by RM from people who served on the battery, and from the physical remains. There is also a series of clear low-level aerial photographs dated 21 April 1941.[136]

At the outbreak of the Second World War, a Territorial camp was nearing completion at Charles Hill; a road had been built to the peninsula and a hutted encampment was erected on both sides of the road. The camp office, guardhouse and stores were located in one long building on the south side of

Figure 10.48
The three DEL emplacements at Charles Hill (© Gordon Barclay)

the road at the camp entrance (Fig 10.47 (5)), with a sentry post sited on the opposite side of the road. A little way beyond the camp office, a second road led from the main road through the southern half of the camp to the officers' mess and quarters (Fig 10.47 (1)), miniature firing range and training hut, NAAFI canteen and staff quarters (Fig 10.47 (2)), before terminating at the main engine room (Fig 10.47 (E)). On the north side of the main road, four living huts, the sergeants' mess, ablution block, cookhouse and dining-room were grouped together to form the main accommodation site (Fig 10.47 (3)). The hutted camp provided accommodation for three officers and 88 other ranks. In 1942, the establishment of the battery was two officers and 68 other ranks.

After hostilities had broken out, it was decided to convert Charles Hill into a coast defence unit within Inchcolm Fire Command. No permanent emplacements had been completed by December 1939, and two 12-pdr guns were temporarily emplaced on the camp's football field, between the camp and the nearby woodland. They were identified as 'DP' guns; in this context, probably meaning guns for 'drill and practice' (the term used on Armaments Tables) or 'drill purposes' (a term used amongst artillerymen in the Forth). It is possible that these two guns were those that are known to have been mounted for drill and practice on Inchkeith in the 1930s.

The completed battery was armed with a twin 6-pdr gun on a site partly excavated from the side of the hill at a height of 12.5m above sea level. Three fixed-beam DELs in concrete emplacements (each with three vertical slits) were provided to illuminate the boom and the channel between Charles Hill and Inchcolm (Fig 10.47; Fig 10.48). Nos 1 (southern) and 3 (northern) had dispersed beams of 30° and ranges of *c* 1,600m (main bearing 124° and 084°); No. 2, between them, had a 16° dispersion and an approximate range of 1,920m (bearing 104°). The middle one is longer (6.3m) than the two to either side (4.87m) and the light slits in the outer emplacements are closer together.

Each searchlight was manned at night by a lamp attendant with a single NCO on duty in the lamp directing station. Electric power for the searchlights and the battery generally was provided by two 60kw Ruston Hornsby engines and a 5kw Lister engine in the engine room (Fig 10.47 (E)). A second Lister was housed in an auxiliary engine room at the north side of the peninsula (Fig 10.47 (E(a)).

Work to complete the camp (including the plumbing), emplacements and DELs was done in the first five months of 1940, and the battery was handed over to the gunners by the Royal Engineers in May 1940.

The housing of the twin 6-pdr gun is a standard pattern (Fig 10.50), with a half canopy to protect the crew from the rear. Beside the emplacement were a duty watch room (to the south), a gun store (north) and a magazine (west). The Director Tower (Fig 10.47 (DT)) was just to the west, with the Searchlight Directing Station on the floor below.

Figure 10.49
Aerial photograph of Charles Hill, 1941 (© The National Archives, WO 192/258)

An undated sketch map of the battery shows the location of features related to the landward defence of the battery, including a 'triple wire fence' on the landward side of the camp, and a fence of Dannert wire (coiled barbed wire) between the camp and the battery area and around the entire beach frontage of the camp and battery, with an additional line isolating the DEL emplacements. The 1941 aerial photograph shows a different location for the fences, but it seems likely that they reflect arrangements at different times. Interestingly, a formal inspection by the Major General Royal Artillery, UK Home Forces reported in September 1941 that more barbed wire was needed for close defence in the Forth, as the batteries reported that they could not obtain any.[137]

Figure 10.50
The 6-pdr emplacement at Charles Hill. The canopy over the rear of the emplacement has been removed (© Gordon Barclay)

Figure 10.51
The emplacement for a Lyon Light covering the vulnerable beach to the north of the battery (© Gordon Barclay)

The sketch map also shows the location of a Spigot Mortar in the centre of the battery area, the site of the 75mm field gun (provided for landward and beach defence and probably also against boats), and two 'Hodgkiss' posts, probably the sites of two Hotchkiss machine guns, probably M1909 pattern weapons (Fig 10.47 (H)). One of these guns was sited to cover the vulnerable landing beach. The position of an anti-aircraft machine gun is also marked. A Lyon Light was emplaced in a concrete emplacement on the north side of the peninsula to illuminate the vulnerable beach of Burnhill Bay (Fig 10.47 (L); Fig 10.51). There was also a minefield, covering the approach to the battery from the north. By August 1943, a 4.5-inch howitzer (another First World War veteran) had been added to the landward defences. There were also, by this time, two 3-inch Unrotating Projectile anti-aircraft weapons, and what may be the platforms for these weapons survive. The medieval 'Monk's Cave' was used as a store for the rockets fired by this weapon; a short flight of concrete steps was built at the south side of the cell (Fig 10.47 (M)).

Concerns were raised by the most senior artilleryman in Scottish Command, Brigadier Rolliston, RA, in February 1941 about the weakness of the coverage of the DELs over the water between Charles Hill and Inchcolm. He made various suggestions about realigning the DELs and adding two new ones, at Charles Hill and on Inchcolm, but nothing seems to have come of this.[138]

From May 1942, Charles Hill provided accommodation for personnel from the increasingly cramped island of Inchmickery; the island's garrison was divided into three sections, each spending two weeks on the island and one week at Charles Hill.[139]

By January 1944, Charles Hill had been reduced to care and maintenance.[140]

Post-war

The battery seems to have survived for some time after the war, and the Fort Record Book documents the handover of the battery to 268 Independent (Maintenance) Battery on 26 September 1950. The ammunition for the gun (recorded as 2,000 rounds in 1948/49) was returned to Woolwich Arsenal on 23 September 1956, which presumably marked the final dismantling and abandonment of the site.

Survival

The surviving structures of note are the twin 6-pdr emplacement with its ancillary magazine and shelter, the three searchlight emplacements, the Lyon Light emplacement, a concrete pillar for the Spigot Mortar, the presumed bases for the UP rockets and the Monk's Cave. The First World War anti-boat boom survives as a line of tall concrete pillars linked by steel beams (Fig 10.47). The southernmost block is larger, with additional brickwork built onto the outermost pillar in the Second World War, when it was reused to anchor the boom.[141] Substantial dumps of Second World War anti-torpedo net and the anti-boat boom survive on the foreshore (Fig 10.52). A square section metal pin *c* 30cm tall set in concrete just north of the Monks' Cave may be the mount for one of the other weapons.

Notes

1 WO 192/108.
2 ADM 137/1075.
3 ADM 137/994.
4 ADM 137/1075.
5 ADM 137/1892.
6 WO 33/766.
7 ADM 137/1892.
8 WO 33/873.
9 WO 95/5457.
10 WO 78/5170.
11 WO 192/258; WO 192/256.
12 War Office 1940.
13 WO 192/256; WO 192/253.
14 DD 27/1209.
15 DD 27/3715.
16 WO 33/706.
17 Barclay 2013.
18 Barclay 2013: 64.
19 Osborne 2009: 99–100.
20 WO 192/258.
21 The Solothurn 7.92mm machine gun was a Swiss-made gun not used by the British Army, and it is likely that these were guns captured in North Africa or Italy from German or Italian forces and reissued to coast artillery batteries. A Solothurn 7.92mm AA machine gun is mentioned as being in a display of 'Captured Enemy Equipment' in the *Gippsland Times*, Victoria, Australia, on 5 October 1944.
22 WO 192/256.

Figure 10.52
Surviving torpedo nets and (inset) a spike of the anti-boat boom, piled against the concrete anti-boat boom at Charles Hill (© Gordon Barclay)

23 Grant 2004.
24 Bishop 2016: 188.
25 The holdfast comprises eight bolts in a 1.5m diameter circle that, on the summit of the western lobe, now acts as the base for the mast of an automated weather station. A better-preserved example lies on the high ground immediately west of the abbey ruins.
26 Taylor 2010.
27 John Dods, pers comm.
28 WO 192/108.
29 ADM 137/992.
30 WO 78/4417.
31 WO 33/766.
32 WO 78/5179; WO 33/861.
33 WO 33/810.
34 *The Scotsman*, 12, 16 and 18 June 1920.
35 CAB 36/18.
36 WO 78/5179.
37 John Dods, pers comm.
38 WO 192/253.
39 This is the only reference we have for the date of the disarming of Coastguard.
40 Confusion has arisen between this battery and the original battery named 'Dalmeny' nearby on the mainland, operational between 1901 and 1916–17 (eg Saunders 1984: 476) – see Chapter 9 for information on the first Dalmeny Battery.
41 WO 192/253; John Dods, pers comm.
42 WO 192/253.
43 WO 192/253.
44 John Dods, pers comm.
45 John Dods, pers comm.
46 Aerial photograph NCAP-000-000-154-606 1941 *Cramond and Booms*. National Collection of Aerial Photography, Historic Environment Scotland.
47 WO 192/253.
48 Standing Orders of 22 May 1943.
49 WO 199/942.
50 WO 166/1706.
51 WO 192/253.
52 War Office 1940.
53 WO 192/253.
54 WO 199/954B; WO 199/527; WO 199/528.
55 John Dods, pers comm.

56 WO 78/4417; WO 78/5163.
57 Ordnance Survey 1918 *War Office. Plan of Special Survey Inchmickery, Firth of Forth. 1:360*.
58 WO 192/108.
59 WO 192/256; WO 78/5163.
60 DD 27/1209; MW 1/441; MW 1/1033.
61 WO 192/108.
62 ADM 137/992.
63 WO 78/4417.
64 WO 78/5163.
65 ADM 137/1892.
66 WO 33/861.
67 WO 78/5163.
68 WO 33/810.
69 WO 78/5179.
70 DD 27/1213.
71 CAB 36/18.
72 MW 1/441.
73 MW 1/1033.
74 GD 310/30.
75 WO 192/108.
76 WO 192/108.
77 WO 192/108.
78 WO 192/108.
79 WO 192/108.
80 WO 192/108.
81 War Office 1940.
82 WO 199/527; WO 199/528.
83 See Chapter 10, note 21.
84 WO 199/954B.
85 MW 1/441; MW 1/1033.
86 Undated newspaper cutting in Stenhouse collection.
87 WO 192/254.
88 WO 192/108.
89 WO 78/4417.
90 Ordnance Survey 1918 *War Office. Plan of Special Survey Inchcolm, Fifeshire. 1:360*.
91 ADM 137/992.
92 WO 78/4417; WO 192/254; WO 192/108; Ordnance Survey 1918 *War Office. Plan of Special Survey Inchcolm, Fifeshire. 1:360*.
93 Hackmann 1984: 65.
94 WO 78/5181.
95 WO 33/810.
96 WO 78/5171.
97 ADM 116/2073.
98 *The Scotsman*, 11 October 1920.
99 WO 78/5179; WO 192/108.
100 MW 1/441.
101 MW 1/439.
102 CAB 36/18.
103 WO 192/254.
104 MW 1/441.
105 MW 1/441.
106 MW 1/439.
107 MW 1/1033.
108 GD 310/30.
109 WO 192/254.
110 WO 166/2058. Although some sources state 'November 1939', the War Diary of the Forth Fixed Defence gives the date as 27 October 1939.
111 Grant 2004.
112 WO 192/254.
113 War Office 1940.
114 WO 199/954B.
115 WO 192/108.
116 DD 27/1213.
117 WO 192/254.
118 DD 27/1213.
119 DD 27/3715.
120 WO 78/5169.
121 Registers of Scotland. Fife, search sheet 9669; *Manchester Courier*; the *Daily Record & Mail*; the *Birmingham Daily Post*, all 20 April 1914.
122 CAB 38/19/53.
123 CAB 38/19/53.
124 WO 78/5169.
125 WO 78/5169.
126 WO 78/5169.
127 WO 192/108.
128 WO 78/5169.
129 ADM 137/1075.
130 WO 78/4396.
131 The central sheet covering the core of the battery is in the collection of the British Library (BL Map X.490), while the other eight, and an index map, are in the National Library of Scotland (C18:13(5)).
132 *The Scotsman*, 8 April 1916. WO 33/766.
133 WO 192/108.
134 Heddle and Morris 1997.
135 WO 192/258.
136 For example, NCAP-000-000-158-193 1941 *Charles Hill and Booms*. National Collection of Aerial Photogpraphy, Historic Environment Scotland.
137 WO 199/943.
138 WO 199/1171.
139 Heddle and Morris 1997: 214.
140 WO 199/954B.
141 Heddle and Morris 1997: 213.

Chapter 11

THE OUTER DEFENCES (INCHKEITH FIRE COMMAND/19 (FORTH) FIRE COMMAND)

The two original fortresses of the Outer Defences, Inchkeith and Kinghorn, were strengthened over time and were joined by the battery at Leith in 1916, when the defences of the Forth reached their greatest power. In the First World War, this was the line of the Outer Defences; in the Second World War, this was the Middle line. In April 1918, the Royal Artillery complement of No. 19 (Forth) Fire Command was 32 officers and 530 other ranks; this number did not include Royal Engineers or other arms.[1]

11.1 Inchkeith

Sources

Inchkeith is the second largest island in the Forth, after the May Island. It is *c* 1,150m long and a maximum of *c* 370m wide at the north, narrowing to the south (Fig 11.1). Much of the length of the island is occupied by a steep ridge, which reaches a maximum height of 55m at the lighthouse and falls towards the southern end of the island. The Cawcans Ridge, at the north-west of the island, reaches a height of 40m.

The island was mapped three times at a scale of 1:500 by the Ordnance Survey for the War Office, published in 1893 (surveyed in 1891), 1911 (revised 1910) and 1918.[2] The base mapping in 1893 and 1911 was accompanied by simultaneously produced 1:2,500 summary maps of the whole island; there is also an intermediate revision of the 1911 map to 1914.[3] Maps at both scales were used to draw out proposals or to record implemented schemes at dates between editions. For later periods, we have relied on a detailed plan of August 1941, a set of three low-level vertical aerial photographs taken in September 1941 (which show more than the plan) and a map of the layout of the island in 1947.[4]

There are no detailed engineering plans of the three original Victorian forts built in 1878–81, but the 1893 and 1911 Ordnance Survey maps show their general layout, and there is an early plan of the West Fort (Fig 11.5). The North Battery has been altered most but its layout in the 1880s and 1890s can be reconstructed. From 1900–3 onwards, there are Royal Engineers plans, sections and elevations of structures

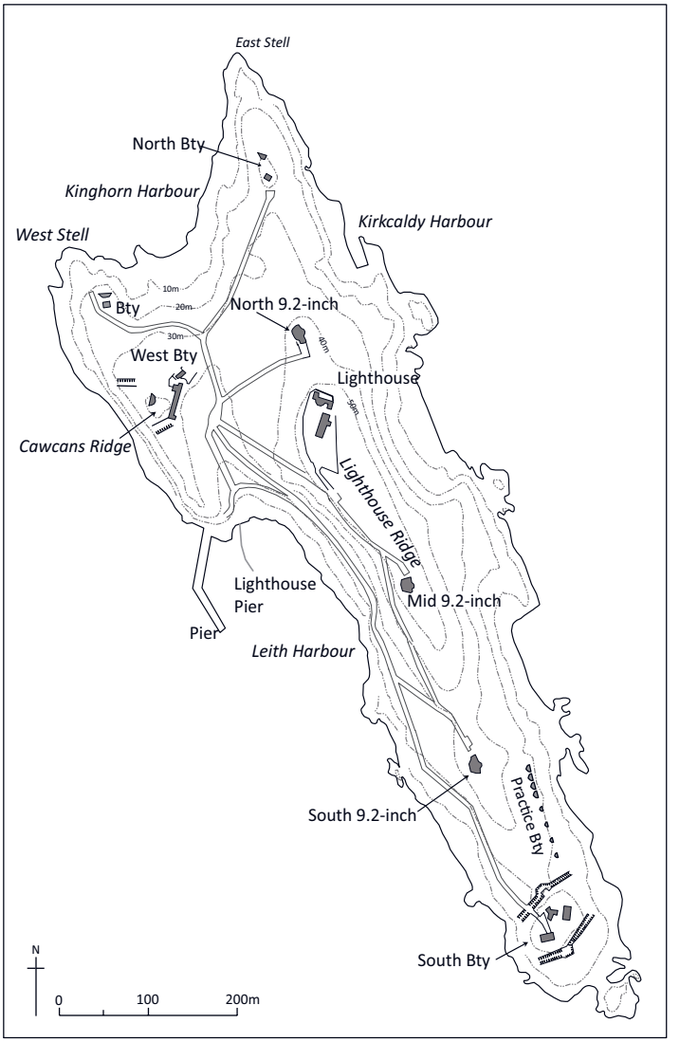


Figure 11.1
The main geographical features of Inchkeith. The location of the batteries, the practice battery and the road system are also shown. The contours are at 5m intervals (© Gordon Barclay)

on Inchkeith, either setting out proposals or recording what had been built.[5]

The forts and batteries were described using different terms throughout their lives. Before 1899 they were referred to as No. 1, No. 2 and No. 3 Forts (clockwise from the West Battery) and were also known around that time as West/North-West, North/North-East, and South/South-East Forts. As a consequence of an Army order in 1899, guns were assigned 'Group' identifications, normally in pairs, although the 9.2-inch guns each comprised their own Group. The Group identification letters of the South Battery (A Group), and the southern (B) and mid (F) 9.2-inch guns remained the same throughout the period. The identification letters for the groups north of the lighthouse were, however, changed on several occasions, which has caused confusion, especially as at least one Army document used identification codes that had been superseded years before. To avoid further confusion, we have decided to use a single set of terms throughout the text, as set out in the first row of Table 17.

Property Transactions

The island of Inchkeith passed from the ownership of the Duke of Buccleuch to the War Department in three transactions (Fig 11.2). First, on 31 December 1860, the Duke sold five pieces of ground, totalling 1.25ha, for four batteries and a barracks area. On 2 April 1879 (*after* construction work had begun), the Duke sold three further areas, incorporating

Table 17

The changing terminology for the various Gun Groups on Inchkeith, 1884–1945, with sources. That for 1921 seems to be an error, referring back to the 1916 codes, rather than those for 1918.

Our Term Date/File	South Battery	South 9.2-inch	Mid 9.2-inch	North 9.2-inch	North Battery	West Battery	West Stell Battery
1884 WO 396/2	No. 3 Fort	–	–	–	No. 2 Fort	No. 1 Fort	–
1893 WD/OS Map	(Map not available)	–	–	–	No. 2 NE Battery	No. 1 NW Battery	–
1900 FRB & **1903** WO 78/5162	A	B	F	I	L	H	–
1905 WO 33/381	A	B	F	I	L	H	–
1906 WO 78/5160		B	F	L			–
1908 WO 78/5157+8		B	F	L			–
1909 NLS I.88.34	A	B	F	L	M	H	–
1911 OS 1:2500	A	B	F	L	M	H	–
1913 WO 76/5179		B	F	L			–
1914 OS 1:2500	A	B	F	L	M	H	–
1916 WO 78/5179	A	B	F	L	M	H	H Adv
1918 OS 1:500	A	B	F	H	M	L	O
1918 WO 199/2672	A	B	F	H	M	L	O
1921 *WO 78/5179*	*A*	*B*	*F*	*L*	*M*	*H*	*H Adv*
1934 WO 192/252	A	B	F	H	M	L	O
WW2 FRB	South 6-inch	South 9.2	Middle 9.2	North 9.2	North Gun 1	West Guns	North Gun 2

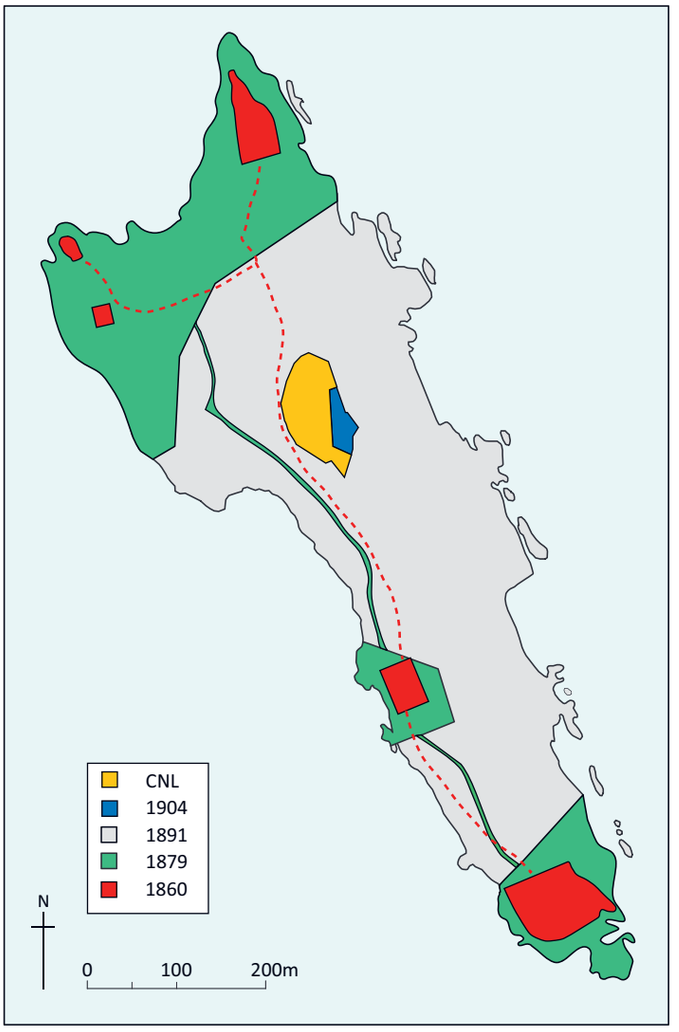


Figure 11.2
The War Department's land purchases on Inchkeith. The scattered 1860 holdings (linked by a right of way, the dashed red line) were subsumed within the larger holdings of 1879. The rest of the island, apart from the yellow and blue areas, was sold to the War Department in 1891. The blue area was sold by the Commissioners of Northern Lighthouses (CNL) to the Admiralty in 1904, to accommodate the Port War Signal Station (© Gordon Barclay)

those already purchased, totalling *c* 4.4ha. This combined the three northern areas into one. Larger areas were also bought to accommodate a more extensive barracks area and a larger southern fort. In February 1891, the Duke sold the remainder of the island to the War Department, apart from the area feued to the Commissioners of Northern Lighthouses.[6]

Having acquired the whole island, the Government decided to designate it as a fortress of the first class, and consequently the Secretary for War decided in July 1891 that picnic and other pleasure parties were no longer permitted to land on the island. That month, the manager of the Galloway Saloon Packet Company made application to the headquarters of the Royal Engineers for permission to land passengers on Inchkeith but was refused.[7]

In October 1904, the Commissioners of Northern Lighthouses sold an area of *c* 1,288 sq m to the Admiralty, an area consistent with the easternmost portion of the lighthouse ground, for the construction of the Port War Signal Station.

Inchkeith, 1878–81

The Royal Engineers surveyed the site in May 1878 and construction began in July. The site for the originally planned North-West Battery (on the West Stell) was changed to a new site on the Cawcans Ridge at the west side of the island, approximately mid-way between the main harbour and the West Stell. Single 10-inch, 18-ton Rifled Muzzle Loading

Figure 11.3
The lighthouse pier, over which most of the materials and guns for the Victorian forts were landed. The modern pier was not built until after 1892 (© Gordon Barclay)

Figure 11.4

The eastern wall of the West Battery and the southern of the two rock-cut ditches (to the left, lined with masonry). The masonry elements are of the original building; the structures built of brick date from 1916 or later. The 1941 overhead protection for the gun within the old fort is visible behind the tall battery control tower, as are the concrete cubes which probably supported the Second World War 3-inch AA gun. The Victorian entrance is off-centre in the eastern wall; to the right is a secondary door (© Gordon Barclay)

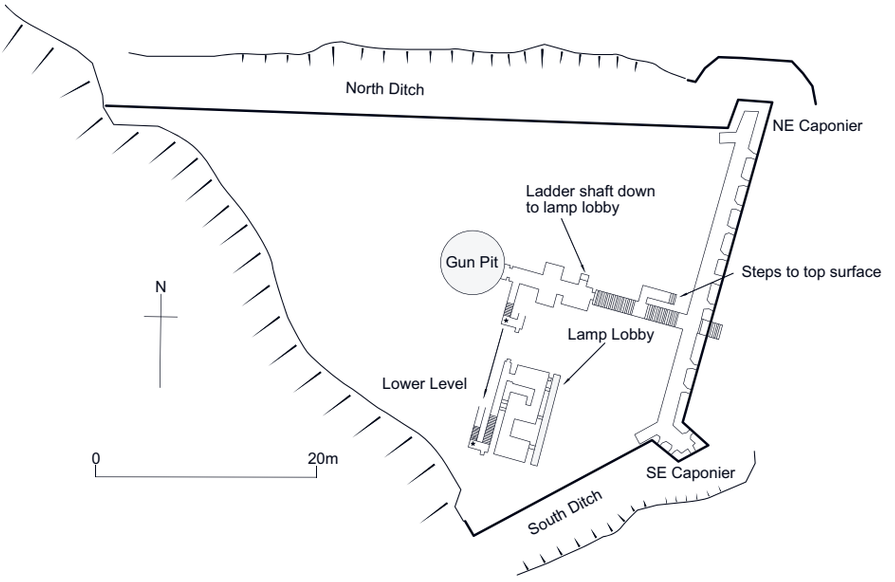


Figure 11.5

Redrawn from a survey drawing of the West Battery, apparently in its original form, annotated by us to show significant features. The element of the plan to the right shows the upper storey of the fort wall. The lower, magazine, floor and the lamp passage are shown as a detached feature below the passage to the gun; the common point in the two levels is marked with a star. The original plan was amongst papers given to RM by Bruce Stenhouse, and we do not know its original source. The plan resembles one on National Archives file WO 78/4751 but is different from it. Redrawing was necessitated by the poor quality of the original. We have taken the opportunity to correct the original's distortion of the outline of the fort

(RML) guns were to be mounted in the North and West Batteries and a pair in the South Battery.

The project was planned to take a year. A workforce of 120 men was accommodated in a series of double-lined felt-covered wooden barracks in the relatively flat area between the lighthouse and the West Stell (Fig 11.1). A ship's cook employed by the contractors prepared the meals. 'Deliciously cool and refreshing' fresh water was obtained from the island's wells, which had been cleaned out and deepened, and from an abundant spring.[8] The workmen were transported off the island to Leith from Saturday night until Monday morning.[9]

The first task was the construction of the military road, 2.4km long, which linked the three forts. The main landing at the island was the small exposed jetty mid-way down the west side, which served the lighthouse (Fig 11.1; Fig 11.3). Landing could only be effected in small boats at certain states of the tide and weather. The harbour beach was initially used to store rails, tackle and other items of equipment, and mules with panniers were used to move material, as the steep slopes of the island rendered it unsuitable for horses;[10] four two-year-old donkeys, bred on the island, were advertised for sale in July 1884.[11]

On the morning of 17 October 1879, the Duke of Cambridge, Commander-in-Chief of the Army, having inspected Leith Fort, sailed for Inchkeith to inspect the works. At the time of his visit, the military road had been completed and a tramway laid between the forts, the North Battery was nearly completed, the other two were in a forward state, and the foundations for the barracks were being laid.[12]

The newspapers of the day described the works, noting the 'new feature' of mounting of the guns *en barbette*, rather than in embrasures, thus commanding a wide field of fire.[13] The North Battery's rock-cut ditch, measuring approximately 7m wide by 7m deep, was described, along with its *caponier*, which was provided with musketry slots to defend the trench.[14] The ditch has long since been filled in and very few traces of

Figure 11.6
The corridor to the north of the entrance of the West Battery. Visible on the left are the firing loop-holes and the secondary entrance to the fort. The main entrance to the fort is beyond the wooden doors and to the left (© Gordon Barclay)

the original fort are obvious. However, part of the stone wall forming the west end of the ditch boundary survives.

The West Battery (known from early in its life as No. 1 Battery or the North-West Fort) on the crest of the Cawcans Ridge was protected by two ditches, also *c* 7m by 7m, cut through the ridge, on the north and south flanks (Fig 11.4); on the seaward side, these ditches ended at the top of high cliffs. The mound on which the gun position was sited was fronted to the east (inland) side by a thick wall, containing a vaulted passage providing access to loop-holes covering the open field of fire to the east (Fig 11.5; Fig 11.6). Above the wall, the mound of the battery sloped up steeply. The entrance to the fort was through a heavy armoured door, on the eastern wall, which faced into the island. Above the entranceway there is still a large stone bearing the inscription 'VR 1880'.

Inside the fort door, a steep stairway leads up to an intermediate landing (Fig 11.7) from which a stair to the right leads up onto the reverse slope of the battery. At the top of the stairs there is to the right a vertical shaft with a ladder down to the lamp corridor, from which light was provided through glazed apertures to the magazines. Just short of the gun, a passage and stair lead to the left from the main corridor down to the shell and cartridge stores. As there were no ready-use ammunition recesses in the emplacement, additional shell storage racks were later placed in the lobby and in the main corridor. No lifting mechanism has been detected for this phase of the battery, and it must be presumed that the shells and cartridges were brought up by hand. Smith suggests that voice-pipes, often associated with shell lifts, have been noted.[15]

The ditches and the eastern face were covered by *caponiers* at the north-east and south-east corners of the fort, which could provide enfilading fire. Their ground floor rooms were accessed along the passage through the east wall of the fort. The south-east *caponier* (to the left on Fig 11.4) is a tower, roughly square on plan, with large openings near ground level, fitted with steel bars fronting a sash-and-case window, and firing slits near the top, facing along the south ditch and along the front of the fort. The upper part of the tower's wall

Figure 11.7
The stairs within the West Battery, leading up towards the gun; the passage and stairs down to the magazine lead off from the first landing, just visible. This photograph was taken in the 1980s, when the building was less befouled by birds, vegetation and human visitors (© Ron Morris)

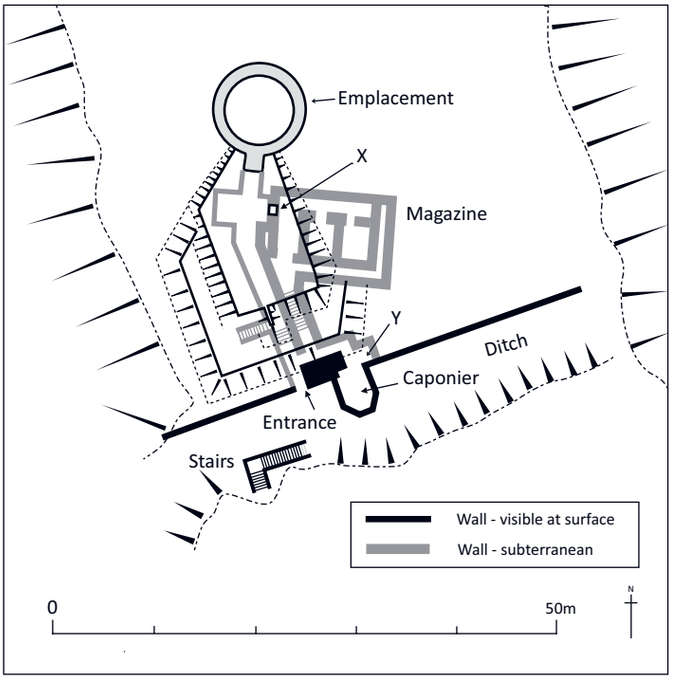


Figure 11.8
A reconstruction of the North Fort in its earliest form using the Ordnance Survey maps of 1893 and 1911, and drawings on WO 396/2 and WO 78/5180. The subterranean features are shown in a dark grey tone. 'X' marks the location of the probable lift; 'Y' the location of the surviving firing loop (© Gordon Barclay)

is in later (probably 1916) brick, and this is surmounted by a flat roof. The top of the tower seems originally to have been open.[16] The north-east position is flush with the front wall of the fort, but projects into the northern ditch, and small-arms fire could be directed along the ditch from small windows. The eastern end of the northern ditch was largely filled in by later buildings when the battery was extended in 1916, and the western part of the ditch has been partly backfilled.

The emplacement to hold the disappearing mounting, which measured 17ft 6in (5.33m) in diameter, is marked on a later war accommodation plan of 1911; there are what appear to be characteristic niches of this type of mounting at nine o'clock and three o'clock on the circumference, measured 1.37m deep, with mouths 1.54m across, widening to 1.97m at the rear.[17]

The North Battery (known as No. 2 Battery or the North-East Fort) was built on the East Stell. It is the most altered by later modifications. As built, its single 10-inch emplacement was defended by a rock-cut ditch with a *caponier*. A plan of the fort was made in connection with the HMS *Sultan* firing experiments in 1884, and there are also drawings for later work on the fort which differentiate the structures belonging to its earliest phase.[18] Careful analysis of these sources and the 1893 OS maps allows us to reconstruct the North Battery as it was in the 1880s (Fig 11.8), and again in the 1890s (see below). The fort was entered by a door just west of the *caponier*, access to the bottom of the ditch being obtained by a flight of steps. Immediately inside the door a right-hand turn led to the *caponier* and to the gated top of the stairs down to the magazine. Although the *caponier* has been removed, a single firing loop in the fort wall just to its east survives (Fig 11.8, 'Y'; Fig 11.9). Above the top of the fort wall, an earthen bank rose up

Figure 11.9
The single surviving original loop-hole in the underground fabric of the North battery. The dead-end in which its survives was at first absorbed into the reconstructed, but was later walled off. Modern explorers have broken through that wall (© Gordon Barclay)

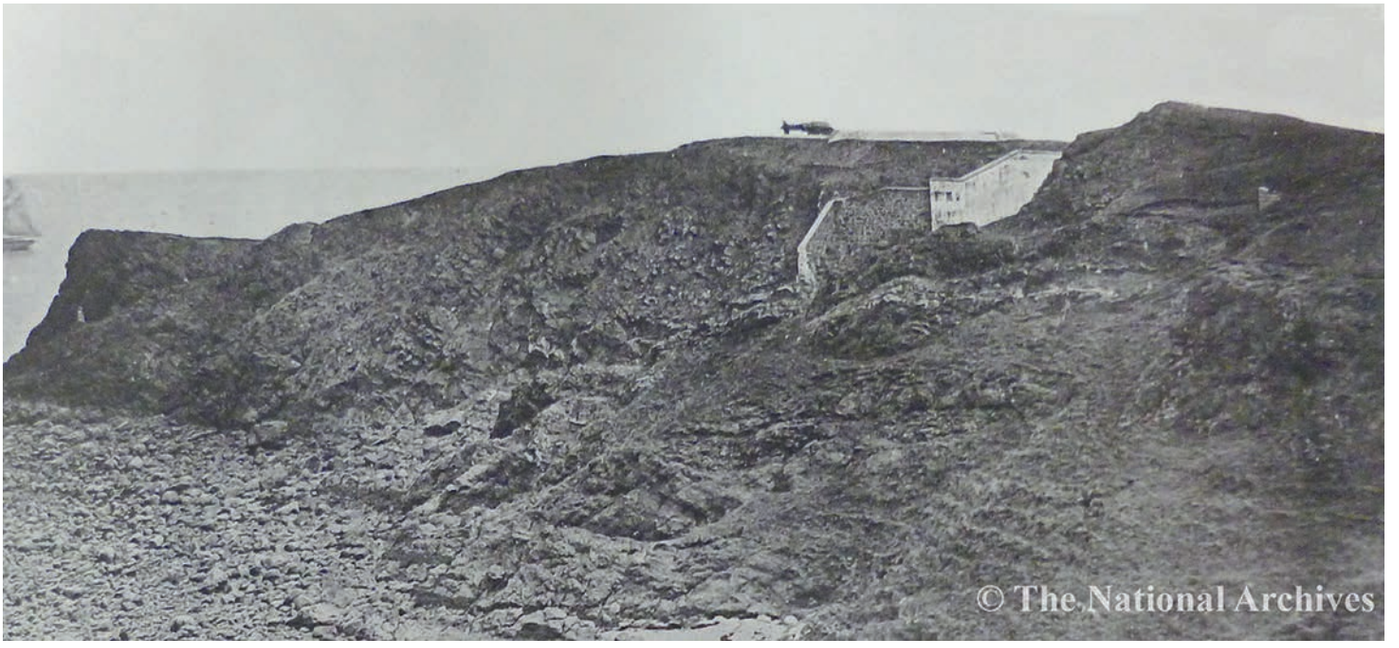


Figure 11.10
View of the North Battery in 1884 at the time of the HMS *Sultan* firing experiments. The flat platform behind the gun is clearly visible, as are the inner face and terminal of the rock-cut ditch, now absorbed into later fabric. This image demonstrates the fallacy of the need for disappearing mounts: the gun is the only feature of the battery visible, and would have been at only limited risk of a hit (© The National Archives, WO 396/2)

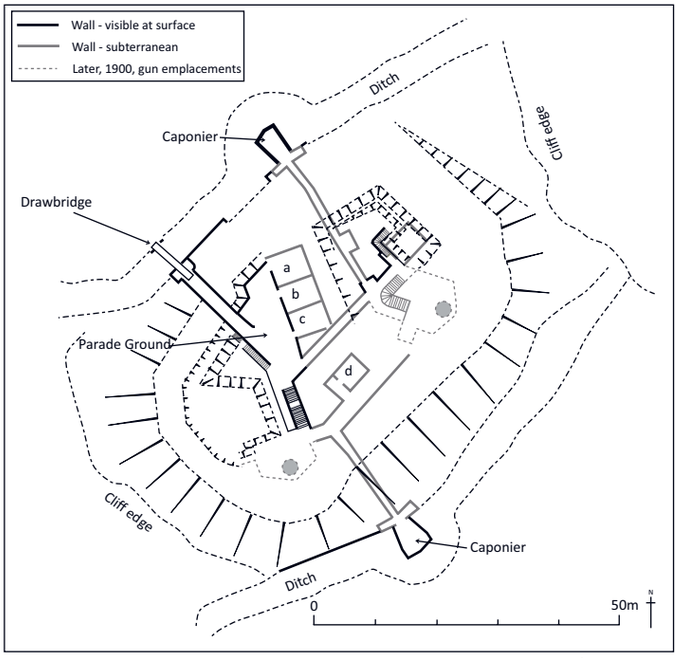


Figure 11.11
Plan of the South Battery in the 1880s, reconstructed from a number of sources. Fabric visible on or from the surface is shown using black lines; subterranean fabric is dark grey. We have not been able to provide a complete plan of the original underground fabric, where it had been removed by later expansion. We have no source for the shape of the gun emplacements – the grey dashed lines show the outlines of the 1900 6-inch emplacements. The features marked 'a'–'c' are the three casemates; 'a' was a store, while 'b' and 'c' were originally living accommodation for the small permanent garrison. 'd' is the original magazine. The earthworks on the top of the battery were shaped to provide cover for the working areas.

to a platform behind which yet a further superstructure rose, a flat-topped concrete surface to the rear of the gun pit (Fig 11.10). The gun pit itself was accessed from the underground complex.

At the magazine level, a narrow lamp passage served both the shell and powder magazines. Unlike at the West Fort, we have found evidence of a possible shell lift, at the point 'X' on Fig 11.8; the former site of the shaft is marked by patches of brickwork in the walls at both magazine and gun pit levels. At the upper level, the niche into which the shaft opened was later shelved for shell storage.

Figure 11.12
The northern of the rock-cut ditches of the South Battery, with the well-preserved musketry *caponier* (© Gordon Barclay)

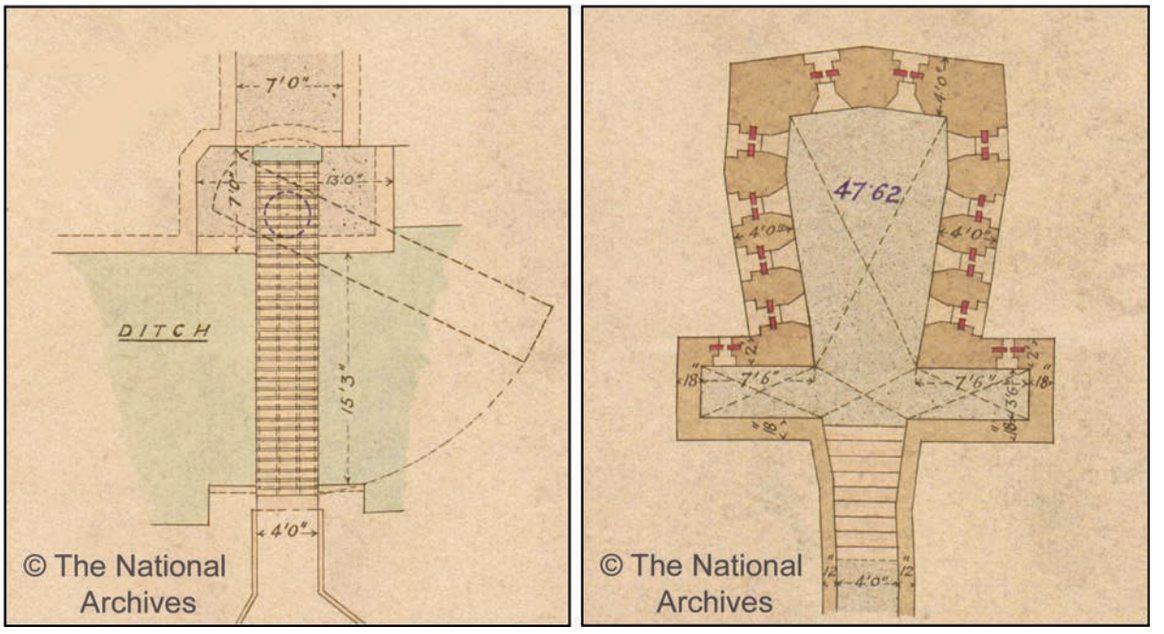


Figure 11.13
Details of the South Fort's 1880 drawbridge and the *caponier* in the north ditch, as recorded in 1900 (© The National Archives, WO 78/5159)

The South Battery was at the lowest elevation of the three, near the island's south-eastern end. Although the earliest representation of the fort (the 1893 1:2,500 map) shows little detail, the plans for the reconstruction of the battery in 1898–1900 differentiated between existing and new fabric, and it has been possible to suggest an outline plan of the battery as built (Fig 11.11).

The fort was protected by two rock-cut ditches on its north and south sides. Both ditches had a single projecting *caponier* with musketry loop-holes, which survive in good

Figure 11.14
The casemates in the South Fort, as they were in the 1980s. The gate and the passage from the drawbridge are visible to the top left. The central casemate provided the editorial offices of the First World War newsletter of the Forth defences, the *Inchkeith Lyre* (© Ron Morris)

condition (Fig 11.12). Entrance to the fort was by means of a drawbridge across the northern ditch (recorded in detail, along with the *caponiers*, in the drawings of 1898–1900 (Fig 11.13)) and then through an armoured door. As at the West Fort, above the arched entranceway the letters and date 'VR 1880' are inscribed. Immediately inside, there is a downward gradient to a small, sunken courtyard which once served as a parade ground, to the east side of which are three original casemated accommodation rooms, ablutions and so on (Fig 11.14). A covered passage led to a long winding staircase down to the deeply buried magazines. The *caponiers* were accessed through even narrower, darker tunnels.[19]

According to Grant, the two guns at this fort were placed on granite platforms with, in a hollow between, a bomb-proof subterranean magazine, where the shot, shell and cartridges were stored.[20]

Along the back of the magazines, and separated from them, was the lamp lobby, served by independent stairs, from which there was no direct access to the magazines. Here, the lights for the magazine could be safely handled and placed in niches, glazed on the magazine side. Between the guns was an open-topped passageway, which was loop-holed for musketry defence. It could also be used for safe transit from one gun to the other and to store small arms. Mid-way along it was a Gun Group Commander's post. The passageway itself has been filled in, but the GGC post survives.[21]

All three forts were originally designed to be defended by their garrisons in isolation while continuing to fire upon enemy shipping, even if the rest of the island should be captured by an enemy. It appears that each fort had its own supply of fresh water which was reported to have gushed plenteously from the rocks.[22] However, other sources suggest that an enterprising landing party armed with a few machine guns, if it gained control of Lighthouse Ridge, would probably have been able to prevent the detachments in the North and West Batteries from firing their heavy guns, which at that time had no overhead or rearward protection.[23]

Inchkeith, 1881–7

On Tuesday 27 June 1881, a detachment of two officers and 60 men from Landguard Fort in Harwich arrived at Granton and was transported out to Inchkeith in the steam tug *Express* to receive and mount the six 10-inch guns, which were expected to arrive on the Friday (four of which were to be mounted on Inchkeith, two at Kinghorn Ness).[24] It was not until 18 July, however, that the Government screw steamer *Lord Panmure* arrived from Woolwich with the guns.[25]

The original decision to erect barracks for a wartime garrison at the south-west of the island had been countermanded by the Government to save money. The planned caretaker staff of one sergeant and three or four men was billeted in two of the casemates of the South Battery, one for the sergeant and his wife and the other for the artillerymen.

The distance between the guns at Inchkeith and Kinghorn Ness was a little over 3,800m, with the guns being sighted at up to 4,800 yards (*c* 4,390m), or nearly three miles. Although it is unlikely that a 10-inch RML would engage a target beyond 2,000 yards (*c* 1,830m), mainly owing to the difficulty of observing the fall of shot,[26] the whole of the width of the channel between Inchkeith and Kinghorn could be covered by fire. The channel between Inchkeith and Leith Docks is *c* 5,500m wide and it is doubtful that the guns on Inchkeith could have fired very effectively on targets, even in that part of the channel over 10 fathoms deep (at a range of *c* 2,750m).

On 10 July 1883, the first cargo of 4cwt shells was delivered to Inchkeith. A team of 28 Royal Artillerymen from Leith Fort took over a week to get the heavy shells to the magazines. In the absence of barrack accommodation, the men were transported by tug to the island in the morning and returned to Leith at night.

The test-firing of the guns at Inchkeith and Kinghorn Ness was scheduled for late July 1883,[27] but the guns were not practice-fired until May 1884.[28] At the time of the forts' completion, it was considered that 'if the Forth be held at Inchkeith no further defence is necessary'.[29] The Inchkeith batteries were first used for training in July 1884, when Regular artillerymen from 51st Brigade (Scottish Division) Royal Artillery practised on the heavy guns. The guns were tested with heavy battering charges and 400 lb Palliser shot. Everything stood the strain satisfactorily and the lighthouse was not affected by the concussion.[30]

Volunteer artillerymen drilled on the Inchkeith guns for the first time in 1885; on three successive Saturdays in August and September, detachments of up to 150 men of the 1st Midlothian Coast Artillery Volunteers had a series of drills on the guns and practised signalling using flags to Calton Hill, Edinburgh and to Kinghorn.[31] The batteries on Inchkeith could be made ready for firing within half an hour after the landing of a detachment from Leith Fort.[32]

Soon after the guns had been mounted at Inchkeith and Kinghorn Ness, critics complained that, unassisted by other measures of defence, the 10-inch RML guns could do little injury to the modern, heavily armoured vessels of European navies, armed with newer, more powerful breech-loading guns. It was asserted that French warships could attack the island with impunity.[33]

On 3 June 1885, Admiral Hamilton, Colonel Malcolm, RE, and Captain Ruck, RE, enquiring on behalf of the Government into the state of the coast defences, visited the fortifications on Inchkeith. They were not in any doubt about the efficiency of the Inchkeith defences, but concluded the system of defence for an estuary like the Forth was incomplete without additional protection provided by armed cruisers and torpedo boats. As noted in Chapter 3, the Government was, in

Figure 11.15
The stone-built Drill Hall in Kinghorn Harbour, on Inchkeith, built in 1890, as it appeared about 100 years later. It later served as an Officers' Mess. The large building to the left is the First World War northern engine room; the brick-built building in front, a contemporary petrol store. The brick building to the right is a salt-water pump intake (© Ron Morris)

the 1880s, in favour of establishing a Naval Volunteer Force with the necessary vessels.

The need for a proper harbour and barracks at Inchkeith had been a regular subject of concern since the Government abandoned the original plans in 1880, as it would be difficult to land and house a large body of men and stores during an emergency. The Forth Volunteer Division Submarine Miners (RE) experienced a great deal of inconvenience unloading the heavy stores necessary for their training in 1880, as the small jetty dried out at low water and access from it to the upper parts of the island was difficult (Fig 11.3).[34] In July 1889, when 140 Submarine Miners were on Inchkeith for a 15-day training encampment, the officers' mess tent was almost blown down.[35] Finally, in November 1889, the War Office arranged to construct masonry buildings to accommodate 100 Regular soldiers and volunteers on the island.[36] Work on seven buildings was in hand by February 1890, to be ready for the summer's training season,[37] and was almost completed by 25 March, along with a stone-built drill hall at the north end of the island (Fig 11.15).[38] At the beginning of August 1891, it was reported that the War Office had determined that the construction of a pier at Inchkeith should be at once proceeded with.[39] The pier had, however, not been completed by the time the OS map of the island was prepared in 1892–3.

1887–1906

The inadequacy of the original armament of Inchkeith was acknowledged in December 1887, when the Royal Artillery and Royal Engineers Works Committee recommended that two of the 10-inch RMLs should be withdrawn and a 9.2-inch gun and two 6-inch guns be mounted in Elswick hydro-pneumatic disappearing mountings and two 12-pdrs be mounted to cover the controlled minefield in the North Channel. By 1890, it was decided that two 4.7-inch guns should be employed instead.[40]

The installation of the new guns on Inchkeith was reported upon in the press, who noted approvingly that the disappearing mountings meant that 'the element of danger to gun and gunners would be minimised as the recoil caused the gun and carriage to disappear, thus ensuring loading operations were carried out with perfect safety'. The fallacy underlying the fad for disappearing mountings has already been discussed.

Plans drawn for the later replacement of the HP disappearing mountings in the North Battery show the changes made in the size of the gun pit. The HP pit was larger, and presumably much deeper, with two substantial 'niches' on opposite sides of the gun pit (Fig 11.16); the *c* 1903 plans show these larger pits had been partly filled in to accommodate the Mk VII 6-inch guns on CP mountings.[41] *The Scotsman* reported the successful testing of 'the new breech-loading guns mounted on hydro-pneumatic carriages' under the supervision of senior Royal Artillery officers: 'The working of these guns and mountings, reported to be of a very complicated nature, was carried out in a most satisfactory manner.'[42] The work was begun on 29 July 1891 and was completed on 6 February 1893, at a cost of £8,264.[43]

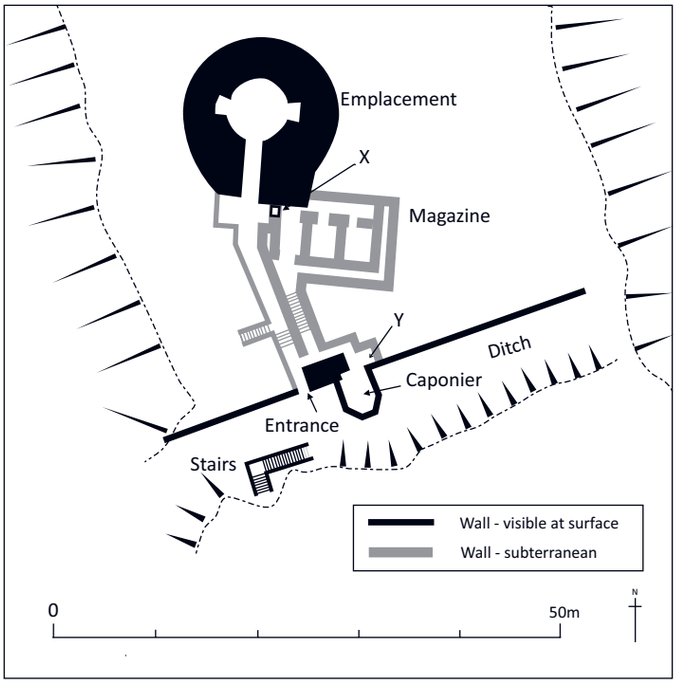


Figure 11.16
The North Battery on Inchkeith, as it was in about 1891, after the replacement of the 10-inch RML gun with a 6-inch Mk VI gun on an Elswick HP disappearing mounting. WO 78/5180; WO 396/2; OS 1:500 plan of 1893). 'X' marks the location of the probable lift; 'Y' the location of the surviving firing loop (© Gordon Barclay)

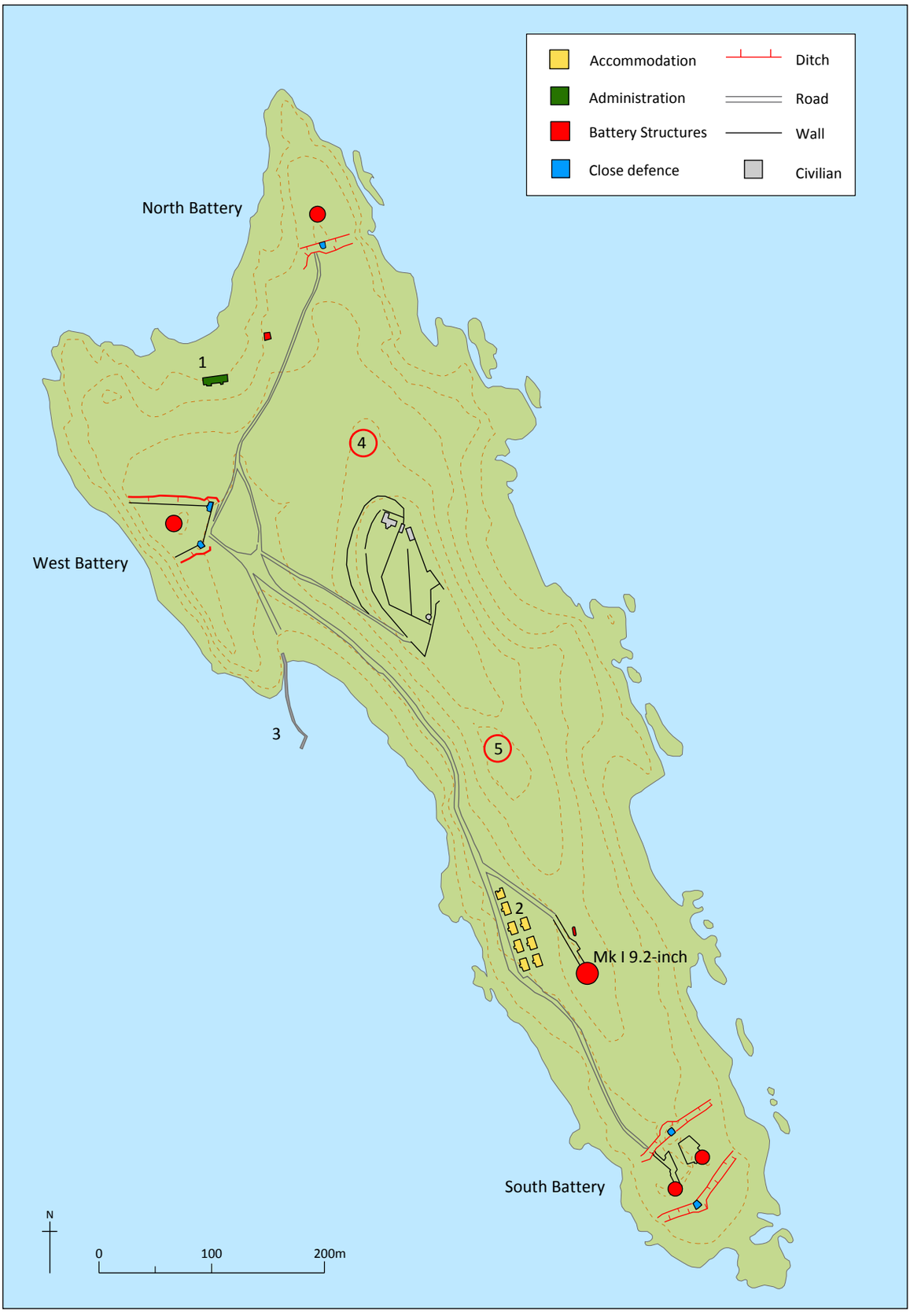


Figure 11.17

Map based on the 1893 Ordnance Survey 'Special Survey' maps of Inchkeith for the War Office, showing the main features and the metalled road linking the various complexes. (1) the Drill Shed; (2) the main complex of stone-built accommodation huts, (3) the lighthouse pier, (4) and (5) the sites of the two 4.7-inch guns, under construction at this date; they were mounted in 1895, but we have no drawings of their shape, ancillary buildings or access routes (© Gordon Barclay)

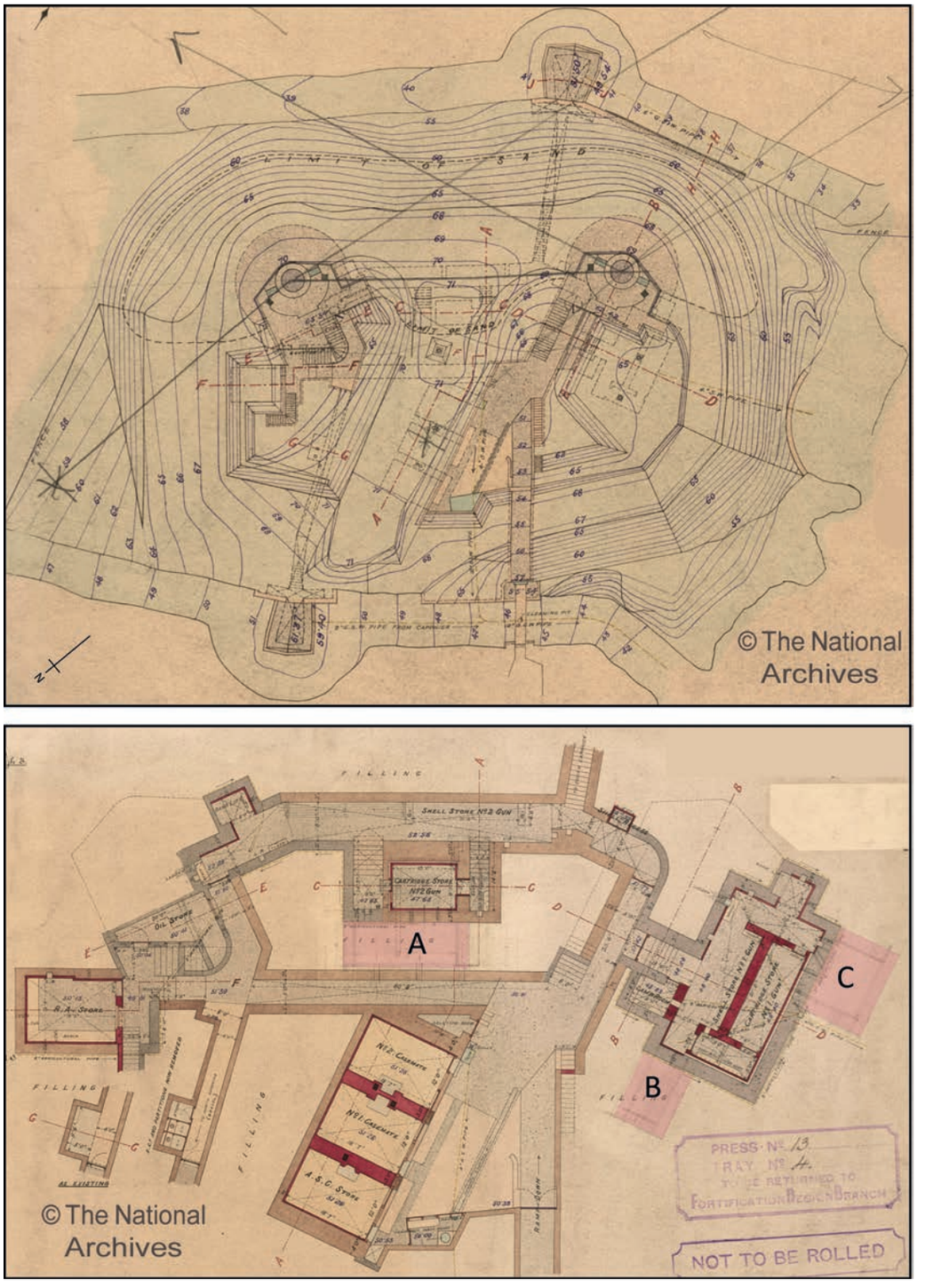


Figure 11.18

The top plan and magazine (lower) level of the reconstructed South Battery, as recorded in May 1901. They are reproduced at different scales, to allow the lower plan to be read more easily. On the lower plan, the original 1880 fabric is toned brown, while the new structures are in grey. An oddity of the lower plan is that in the newly built magazine on the right-hand side, and in the centre, beside the original shell store, three extensions are recorded in pencil. These were in place by 1918, but it is not clear when they were built. We have highlighted these areas in a pink wash on the lower drawing, and marked them 'A', 'B' and 'C' (© The National Archives, WO 78/5159)

Figure 11.19
The bottom of the obliquely angled 'ladder lift' carrying shells from the magazine to the gun platform in the South Battery (© Gordon Barclay)

The Scotsman reported that the 9.2-inch gun had been safely transported to Inchkeith in December 1892 and moved with difficulty to its position on the southern part of the crest of the island. The press reported that the gun was expected to have a range of 11 miles (almost exactly twice its actual range!) and could command the whole of the South Channel and a great part of the North Channel.[44] There is no contemporary plan of the 9.2-inch emplacement at that date and it is difficult to know how much of what was later recorded, in 1908, was original, although the total cost of the alterations then was only £820, implying the need for only relatively limited work.[45] The magazine is recorded as having been enlarged in 1904 at a cost of £400 and it is not clear whether the Depression Range Finder Post recorded in 1908 had just been built, or was built in the 1890s. This 9.2-inch emplacement is unusual in having two vertical ladders in concrete shafts, one linking the emplacement floor with the magazine level below and the other from the DRF Post down into a room below (recorded in 1908 as a RA Store). These features are almost certainly original.[46] The DRF Post was a round-ended, open, concrete-walled enclosure with a DRF pillar at both ends, and the shaft with the ladder accessed below a hatch in the centre. By 1911, it was marked as the 'Former DRF B Group', and had been replaced by a structure further north.[47]

During a busy schedule on 23 September 1893, His Royal Highness the Duke of Cambridge inspected the new fortifications on the island.[48] The 1893 1:2,500 Ordnance Survey map (Fig 11.17) shows a comparatively bare island. The North and West Forts were both mapped, showing the locations of their rock-cut ditches and the emplacements for the two 6-inch Mk VI guns in their disappearing mounts. In the bay between the two forts, the stone-built 'Drill Shed', one of the few substantial structures on the island at this date, was shown. Dug into the cliff of the same bay was the 'Test House' for the submarine miners (Fig 3.2). On the 1:2,500 map, the permanent stone-built hutments (eight buildings, one of which is marked as 'Officers' Mess') are shown, immediately beside the emplacement of the 9.2-inch Mk I gun. Finally, at the southern point, there are the double emplacements of the South Fort for the two 10-inch RMLs within its two rock-cut ditches. At this date, there were only civilian buildings on the summit of the island, associated with the lighthouse.

In January 1899, the armament of Inchkeith comprised one 9.2-inch Mk I (disappearing mount), two 6-inch Mk VI (disappearing mounts, North and West batteries), and two 4.7-inch QF guns. The two 10-inch guns in the South Battery had been dismounted between January and June 1898,[49] when work began on reconstructing the fort to accommodate two Mk VII 6-inch guns on CP mountings. This work was completed on 14 July 1900, at a cost of £5,116 (Fig 11.18).[50] Additional

Figure 11.20
The top of the 'ladder lift' where shells would emerge onto the gun platform, South Battery (© Gordon Barclay)

underground stores and shelters were built in the South Battery. The Royal Engineers 1901 plan of the underground structures differentiates between pre-existing (brown) and newly built (grey) structures but was, as our fieldwork has shown, incomplete. The original, relatively small, magazine was adapted as the cartridge store for the No. 2 gun, with the shells stored on shelving in the broad corridor outside it. The shells and cartridges had to be manhandled to new lifts (the 'ladder lift' for the shells, the 'band lift' for the cartridges) (Fig 11.19; Fig 11.20), which took them directly to the gun floor and the emplacement floor respectively.[51] The No. 1 gun, to the west, was provided with a newly constructed magazine, with the two lifts more conveniently located.[52] The 1901 plan of the magazines has, marked faintly in pencil, the outlines of three additional rooms, which were in fact built and which survive, but whose date is unclear (Fig 11.18, A, B and C). They were not recorded in a detailed plan of the battery in September 1911, but were in place by the plan of 1918, included in the Fort Record Book.[53]

At some point in the 1890s, the 6-inch HP 'disappearing' gun in the West Fort was provided with a Depression Range Finder Post of the simple kind seen elsewhere on the island – a small, concrete-walled, open enclosure containing a DRF pillar; it was linked by a staircase down the rear slope of the battery to a telephone room, which still survives, at the base of the 1916 Battery Command Post tower.[54] The top of the DRF Post's walls and the pillar are almost completely buried, but were just visible in 2016. The 1911 OS map of the island shows a similar structure to the south-west of the gun, and it is possible that this was used for range-finding in the south-east arc of firing.

The Conference on Coast Defence held in January 1899 concluded that Inchkeith's two 4.7-inch QF guns were in the wrong place in the estuary; that the northern of them should be replaced by a second 9.2-inch gun; and that the two remaining 6-inch Mk VI guns on disappearing mountings (in the North and West Forts) should also be replaced by modern Mk VII guns.

In January 1900, Inchkeith's guns were given new Group designations, which were to remain unchanged until 1905 (Table 17). Subsequently, two 9.2-inch guns replaced the two 4.7-inch QF guns, and the obsolescent Mk VI 6-inch gun in the North Fort was replaced by a pair of new Mk VII 6-inch guns (the Mk VI in the West Fort remained in place until 1906).

Modern gunnery sights were supplied to the island around the turn of the century: automatic sights for the 4.7-inch QF guns in 1897 and a Mk II Depression Range Finder were supplied to 'A' Group in 1901.[55]

Two 6-pdr Nordenfeldt QF guns were issued to Inchkeith in January 1901. The 6-pdr Nordenfeldt was a light weapon (*c* 370kg) designed for use against fast, light boats. In the following month, four 5-inch BL guns (a type superseded by the 4.7-inch QF) on Vavasseur carriages – an old-fashioned

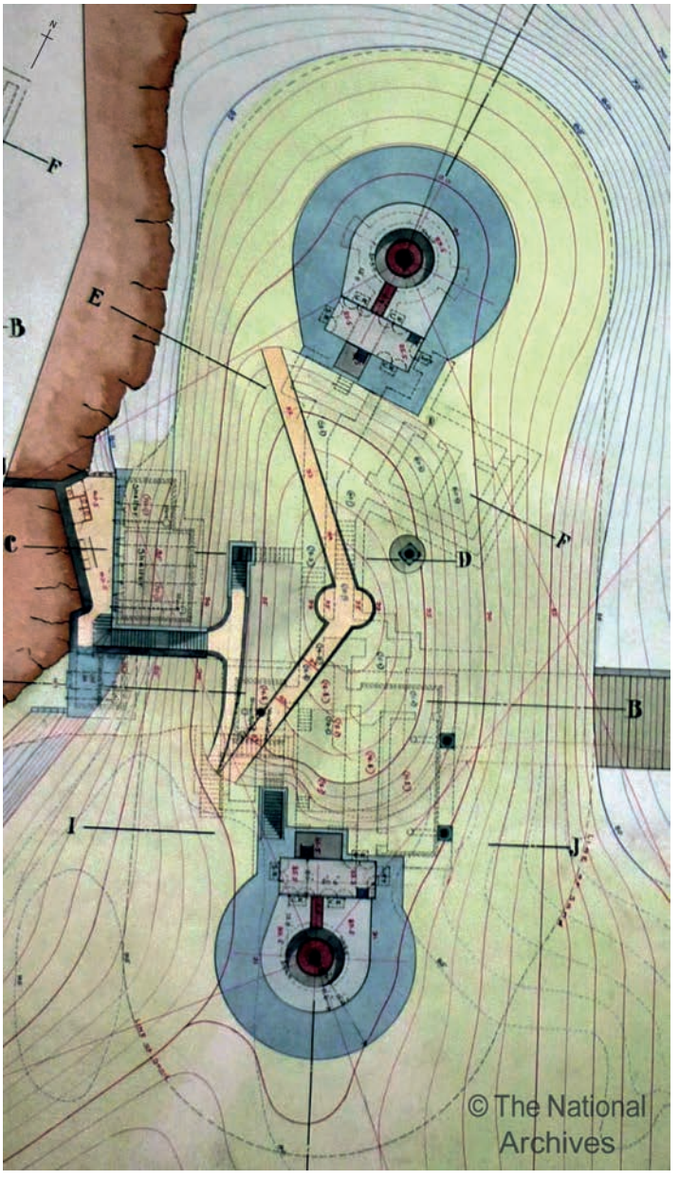


Figure 11.21
Plan of proposals, apparently implemented, for the reconstruction of the North Fort. The outline of the former Elswick HP disappearing mounting gun pit (larger than the new one) is shown lightly as a dashed line on the emplacement in the upper part of the drawing (© The National Archives, WO 78/5180)

recoil-absorbing trolley – were sent to the island explicitly to form a practice battery.[56] A 1909 list of the approved armament of the river included four 'practice' gun Groups: 'A' two 5-inch BL; 'B' two 5-inch BL; 'F' two 6-pdr QF; 'H' two 3-pdr QF.[57] These eight guns were mounted in a line along the edge of the ridge, facing east, the Groups labelled from south to north. They were mapped on the 1909–10 edition of the 1:2,500 War Department map, and also on the 1911 1:500 map, along with the battery's DRF platform, which

still survives;[58] interestingly, only the northern four emplacements (practice Groups 'F' and 'H') were marked 'Former' practice battery in 1911. It is possible that the four 5-inch guns were still in situ, although those at Kinghorn were removed in 1908. One of the 5-inch emplacements was excavated in 2001 and one of the ammunition storage huts survives.[59]

The first years of the 20th century saw the most significant phase of rearmament since the three forts were built in 1880, and detailed drawings were made of most of the emplacements and ancillary structures built in 1902–4.

The planned reconstruction of the North Battery included the removal of the old single 6-inch Mk VI gun on a disappearing mounting, and its replacement by two 6-inch Mk VII guns on CP mounts (Fig 11.21). One was on the old site, which necessitated the partial infilling of the characteristically shaped gun pit for the HP disappearing mount, to create one of a smaller diameter. The new gun of the pair lay to the south;

Figure 11.22
The northern 9.2-inch gun, from the south. The great brick 'carapace' dates from 1941. The outline of the original slightly domed *barbette* emplacement is visible under the Second World War canopy. In the distance is the North Battery; in the foreground is the Fire Command (North) building. The BCP for the northern 6-inch gun is visible in the background (© Gordon Barclay)

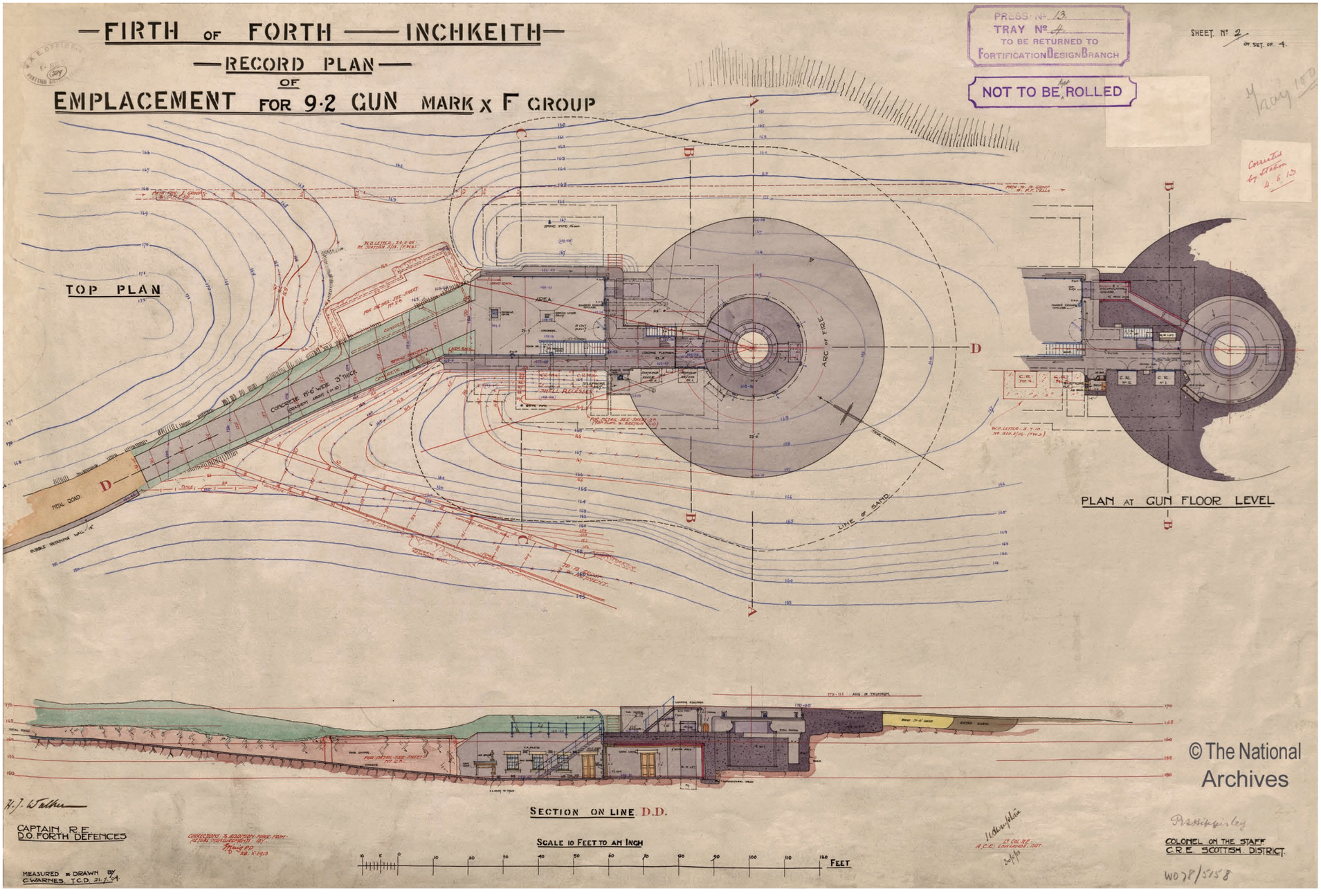


Figure 11.23

Plan and elevation of the mid-9.2-inch complex, drawn in July 1904, with additional structures planned in 1913. The plan to the right is of the gun floor level (© The National Archives, WO 78/5158)

Figure 11.24
The quick-return lift of the mid-9.2-inch gun (© Gordon Barclay)

Figure 11.25
The western observation room of the former Fire Command (North) (© Gordon Barclay)

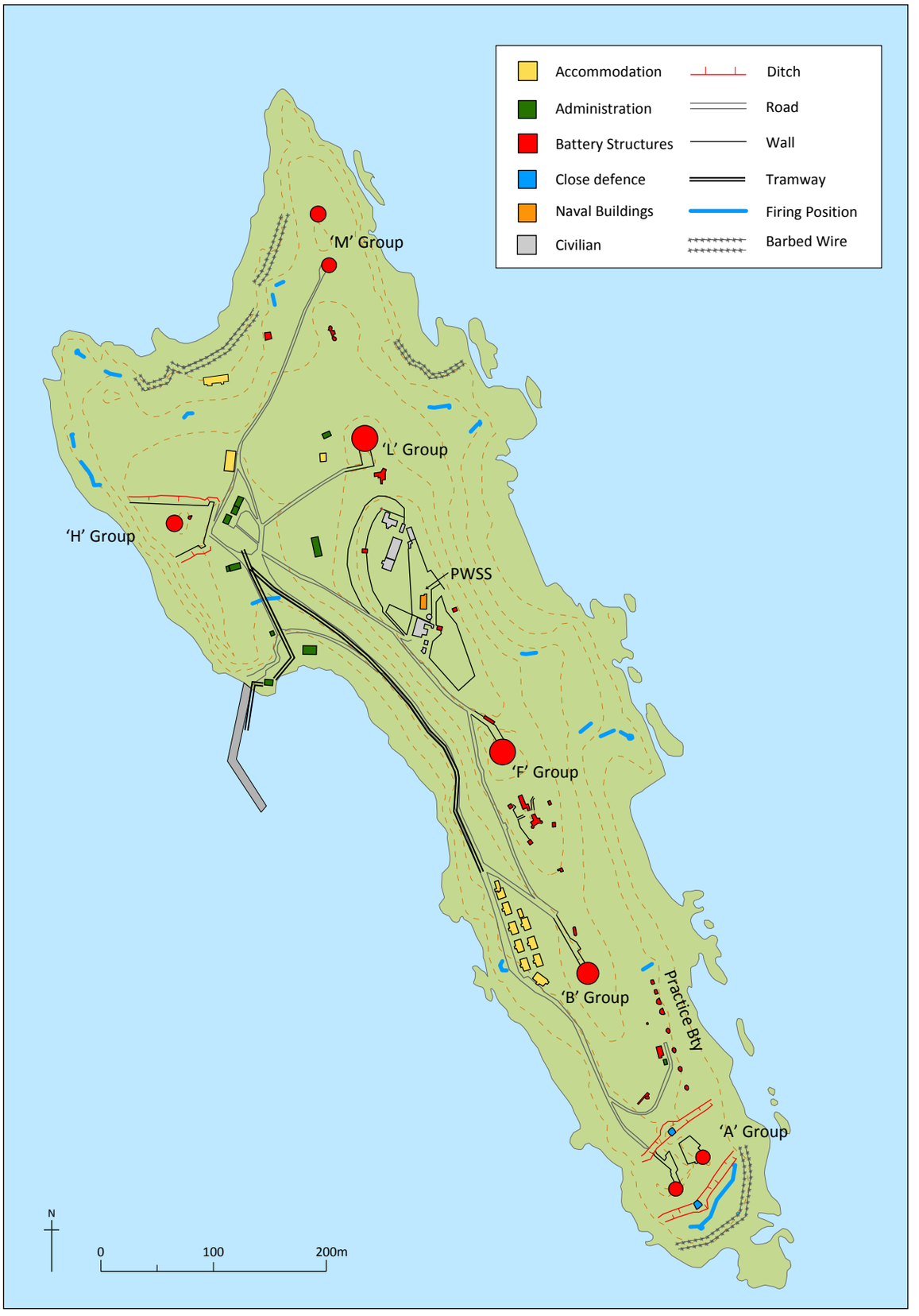
Figure 11.26
Traces of wall decoration in the Fire Command (North) Post (© Gordon Barclay)

the *caponier* in the ditch was removed; and the magazine was built partly in the rock-cut ditch and partly in newly quarried ground. An undated set of proposals for the battery is held on file and is, as far as we can tell, what was built. The new guns were included for the first time in the Armament Table for 1905.[60]

No significant alterations were made to the West Battery in this period and it continued to be armed with a Mk VI 6-inch gun on a disappearing mount until 1906.

The emplacements for the new 9.2-inch guns, to the north and south of the lighthouse, were on a far larger scale than the

Figure 11.27
Map based on the 1911 Ordnance Survey 'Special Survey' for the War Department. It shows the defences at their greatest pre-war strength around 1905–6; in 1906 the 6-inch gun batteries ('A', 'H' and 'M' Groups) were struck off the approved armament and were shortly after disarmed (© Gordon Barclay)


Accommodation
Administration
Battery Structures
Close defence
Naval Buildings
Civilian
Ditch
Road
Wall
Tramway
Firing Position
Barbed Wire
'M' Group
'L' Group
'H' Group
PWSS
'F' Group
'B' Group
Practice Bty
'A' Group
N
0
100
200m

4.7-inch QF emplacements they replaced. The complex for 'F' Group (the middle 9.2-inch gun, just south of the lighthouse) took two years and nine months to build (20 September 1900–30 June 1903), at a cost of £7,876.

Unusually, there are no record plans of the northern 9.2-inch gun complex, but the emplacement was built to a standard plan[61]

The northern 9.2-inch complex (Fig 11.22) was approached from the south-west by a rock-cut road that gave almost level access to the southern end of the rectangular open area behind the gun. Clockwise around the parade ground, the rooms opening from it were: Lamp Room; RA Store; the Shell Store passage; entrance to the entrance lobby for the Cartridge Store; Men's Shelter; Officers' Shelter; WC; Ablutions Room. In the Shell Store passage, the door into the store-room itself lay immediately to the left; further along the passage there was a quick-return lift to the upper level, just behind the gun pit. Opposite the lift was the issuing hatch from the cartridge store. There were three lamp niches from this passage into the cartridge store, which was accessed from a

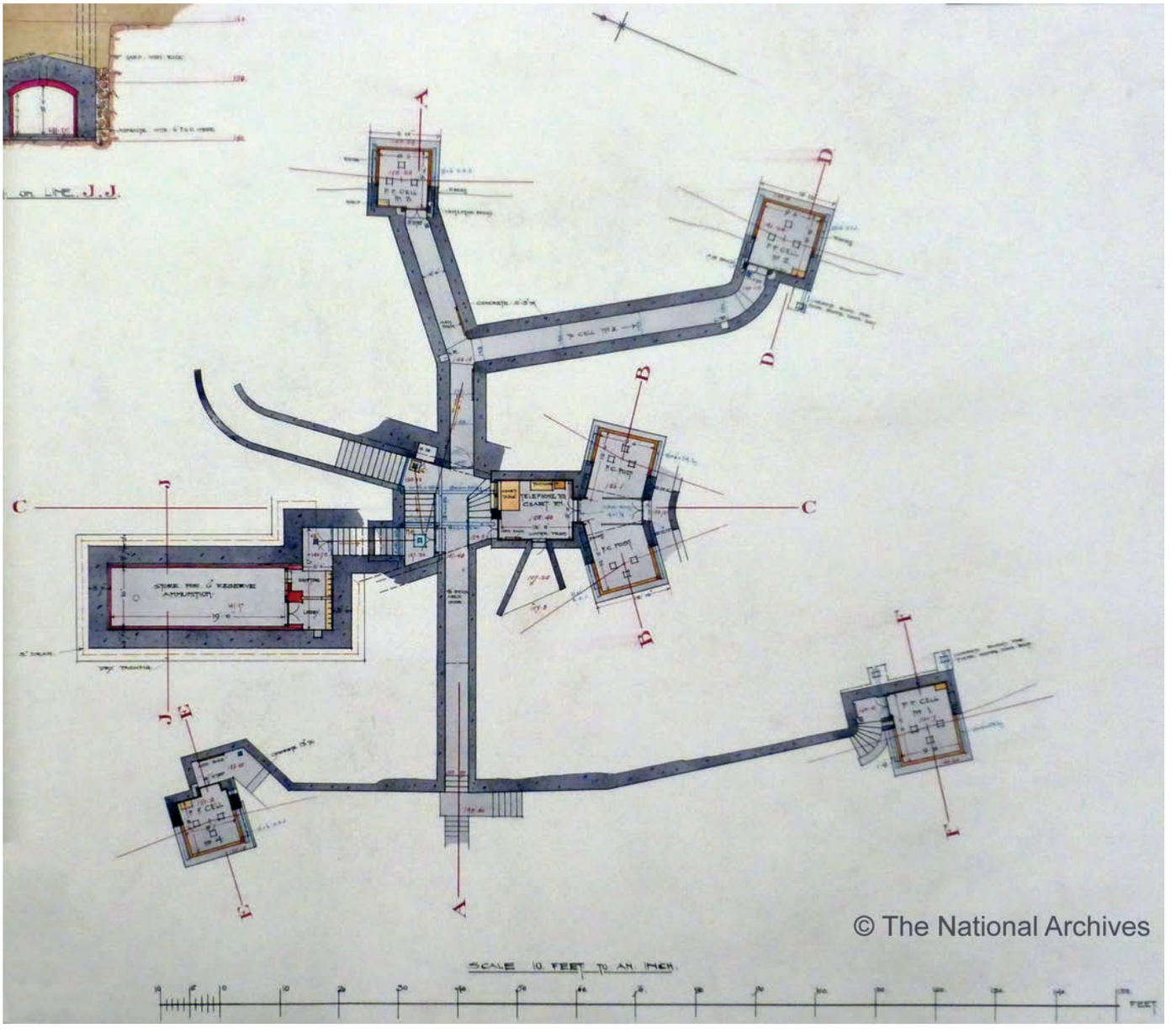


Figure 11.28
Plan of the Fire Command (South), PFC and reserve ammunition complex (© The National Archives, WO 78/5160)

Figure 11.29
PFC No. 4 on Inchkeith, facing west, to provide positional information for 'F' Group, the mid-9.2-inch gun (© Gordon Barclay)

separate entrance lobby from the parade ground. This lobby was lit by a lamp niche accessed from the Men's Shelter. The upper level was reached by a steel stair in the north-east corner of the 'area'.

The 1911 OS map records a DRF Post for 'L' Group, the northern 9.2-inch perched at the northern end of the lighthouse compound, but we do not know how this related to the Position Finding Cells built for the gun in 1902–3, also on the summit of the hill, and the new Battery Command Post (North) built in 1909 (see below).

The middle 9.2-inch gun complex was built on a similar pattern. It is approached down a shallow slope from the north into an open area (Fig 11.23). Clockwise, the rooms opening off it were: a large shelter for the men, provided with a stove; the shell store leading to the ammunition passage (with shell lift to the gun floor); cartridge store with handling lobby; RA store; and a lamp room. By 1913, the lamp room had become an officers' shelter, and a new lamp room and WC had been built along the entrance ramp. The gun was provided with a quick-return lift (Fig 11.24).

From an unknown date there were two Fire Commands in the Outer Defences: 'North' and 'South', controlling, respectively, the fire from Kinghorn and Inchkeith over the North Channel and the fire from Inchkeith over the South Channel. A North Fire Command Post was built at Crying Hill, at Kinghorn, in 1905–6. There is also a structure mapped as 'Former F.C. North' on the 1911 map of Inchkeith, immediately to the south-east of 'L' Group (the northern 9.2-inch). How the Crying Hill and Inchkeith Fire Command Posts related to each other is, as yet, unknown. The Northern Fire Command Post on Inchkeith comprises two observation rooms, facing north-east and north-west, with narrow, wide windows under sloping turf-covered roofs, and lined with pine panelling (Fig 11.25). These are linked by a large, relatively high-ceilinged room. Surprisingly, the exposed areas of plaster in this room show the remains of elaborate decorative painting (Fig 11.26).

The South Fire Command Post was located between 'F' and 'B' Groups, in the midst of a complex of structures built into the ridge between 1901 and 1905 (Fig 3.6; Fig 11.28; Fig 11.29). The Fire Command Post comprised two low-windowed observation rooms under sloping turf-covered roofs with, behind them, a chart room. In front of them were two open platforms with pillars to mount Depression Range Finders. Behind the chart room was a large lobby from which a number of passages ran, including access passages to the outside, to the north-north-east and west.

The complex included four Position Finding Cells that provided range and direction information to the middle and southern 9.2-inch guns, whether firing at targets east or west of the island. The two PFCs on the exposed eastern side were

Figure 11.30
The Port War Signal Station, viewed from the north-west. As far as can be determined the first phase comprised a the single-storey structure, with roof-top signalling post; an upper storey and parapet seem to have been added in 1916; the top floor and 'balcony' to the north seem to have been added in 1939-40 (© Ron Morris)

linked by passages to the central lobby of the complex; the two PFCs on the west were accessed along open paths.

To the north of the complex's central lobby there was a large underground magazine for reserve ammunition. Although the room was later converted to a communications centre, magazine fittings have survived, such as the standard bench for men to sit on to change their footwear and the wooden barrier controlling access to the cartridge store. Two other PFCs were built as part of the same programme of works; PFCs Nos 5 and 6, at the west and south-east sides of the lighthouse ridge, provided positioning information for the northern 9.2-inch gun.

The staff of the Fire Command was recorded in July 1916 as comprising three officers (Fire Commander and two assistants) and 22 other ranks, including eight telephonists. The men in the Position Finding Cells were not included in this number, as they were part of the battery strength.[62]

The earliest Battery Command Post for 'A' Group in the south fort was a small, open, concrete-walled enclosure with a DRF pillar and a semi-buried command post behind it, located *c* 70m north-north-west of the guns. This was in place by the time of the 1909–10 revision of the 1893 map. When the structure was excavated in 2001, stencilled lettering was noted on the wall of the command post:[64]

TRAINING
PRACTICE AREAS
A1-224 30-275 degrees
2-229-329 degrees

By 1911, the post had had telephones installed in the room behind the DRF Post.[65]

On the summit of the island, the Admiralty built the Port War Signal Station, on land that had been purchased in 1904 (Fig 11.30). The original building had a single storey, with a rooftop signal and observation station. The interior preserves a handsome corner fireplace, two telephone cabinets and even a black-out roller blind. The storey above the central part of

the building seems to have been added in 1916 and the second storey and 'balcony' in 1939–40.

The water catchment area and its complex of storage tanks was built between March and October 1903 and was extended to the north and east in 1913.[66] The 'Section Commander's Post' for 'F' Group (the middle 9.2-inch gun) was built just outside the northern wall of the lighthouse enclosure at the edge of the catchment (Fig 11.31).

1906–14

Until 1906, the gun strength of Inchkeith had continued to grow and the individual guns (apart from the 6-inch Mk VI on the West Fort and the southernmost 9.2-inch gun) had been brought up to the most modern standard. The 1905 Owen Committee, however, because of the current ideas about coast defence (described in Chapter 4 above), recommended the reduction of the fixed defences, subsequent to the abandonment of submarine mining. On Inchkeith, the consequence was that the two modern batteries, each comprising two 6-inch Mk VII guns at the north and south points of the island, and the remaining 6-inch Mk VI in a disappearing mounting at the west were struck off the approved armament. The four Mk VII guns were dismounted and replaced in June 1907 by four 6-inch BLC guns for training only.[67] These in turn were removed from the island in 1909, when the School of [Coast] Gunnery moved from Leith to Broughty Castle on the Tay. It is not clear when the 'practice battery' was disarmed; the 3-pdr and 6-pdr emplacements were marked as 'Former Practice Battery' by 1909–10; the four 5-inch emplacements were not so labelled then or on the 1911 map.

From 1907 until 1915, the only guns 'in service' on the island were the three 9.2-inch guns. These were known, from *c* 1906 as (from south to north) 'B', F' and 'L' Groups (Table 17).

The southernmost Mk I 9.2-inch gun on a 'disappearing' mount, 'B' Group, had been in place since February 1893. After the installation of the two Mk X 9.2-inch guns in 1903 and 1904, drawings dated 1904 show that 'B' Group was to

Figure 11.31

View of the water catchment area from the PWSS, in the 1980s, before it became even more overgrown. The 'Section Commander's Post' for 'F' Group (the middle 9.2-inch) is visible in the foreground. In the background is the Second World War Anti-aircraft command complex and beyond it, the middle 9.2-inch gun ('F' Group) (© Ron Morris)

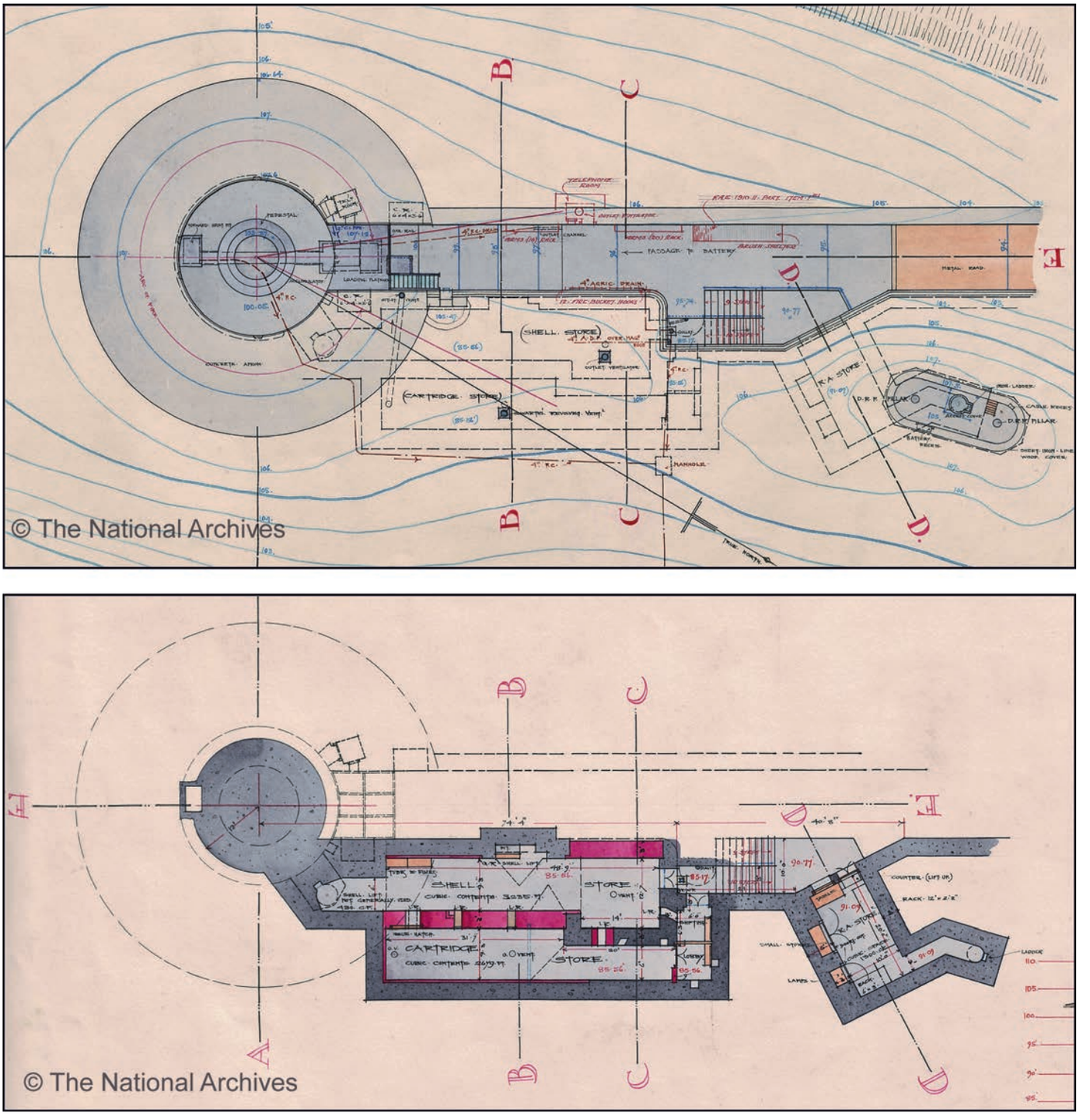


Figure 11.32
Top plan and magazine plan of 'B' Group, the southern 9.2-inch gun (© The National Archives, WO 78/5157)

Figure 11.33
View southwards along the shell store of 'B' Group. To the right is the quick-return shell lift; at the end of the passage is the vertical ladder up the other shell lift to the gun (© Gordon Barclay)

be upgraded to take a Mk X gun on a CP mounting. Royal Engineers plans for the work suggest that the adaptation for the Mk X gun required alteration only of the gun emplacement and the shell-hoist, the latter being upgraded to a modern quick-return hoist. Construction work began on 11 January 1906 and was completed on 28 March 1907 at a cost of only £820.[68] A proposal to move the Mk I gun to 'Hardines' [Harding's] Battery at Gibraltar was not carried through.[69]

On entering 'B' Group along a shallowly sloped ramp, a visitor would first find, on the left, a Royal Artillery store (Fig 11.32) linked by a vertical ladder up to the original Depression Range Finder Post. Beyond, the shell store and the cartridge store were built in parallel, accessed from a common stair down from the access ramp. The shell store had a modern quick-return lift about half-way along the west wall, with a second lift at the end near the gun, up a circular vertical shaft, equipped with a ladder (labelled 'shell lift not generally used'; this may imply that it was associated with the original 1891 layout of the magazine) (Fig 11.33). The cartridge store was

Figure 11.34
View southwards towards 'B' Group, the southern 9.2-inch gun, with its second DRF post in the foreground (© Gordon Barclay)

Figure 11.35
The Battery Command Post (North). The DRF pillar in the near emplacement has fallen. The flat roof covers the telephone room (© Gordon Barclay)

accessed only through the handling lobby and had an issuing hatch near its southern end leading into the shell store. The lighting for the cartridge store was provided by lamp niches in the common wall with the shell store.

The Depression Range Finder Post adjacent to the gun and visible on Figure 11.32 had fallen out of use by 1911, when it is mapped as 'Former DRF B Group', and a new DRF is shown 95m to the north, which comprised a DRF pillar within a simple concrete parapet (Fig 11.34).[70] The former DRF Post was marked on the 1918 map as 'Officers' Shelter'. Two-thirds of its area had been roofed over using railway sleepers, leaving a rather low and inhospitable space, and this is how it survives. It was not marked on any later maps.

In 'F' Group (the Middle 9.2-inch), new ablutions, a lamp room and stores were added to the subterranean complex in 1906.[71] A 'Section Commander's Post and DRF for F Group' was built to the north, behind the main water catchment area, only a short distance from the PWSS (the structure is visible in the foreground of Fig 11.31); a note on the drawing records that it cost £22 in the Army estimates of 1908–9. It comprises a DRF platform behind the parapet of the roof of a hut buried to about half its height. The hut (only *c* 4m by 3m internally) was subdivided into four small rooms off a central lobby; two were marked as telephone rooms.[72]

A structure labelled on the 1911 map as 'Battery Command Post (North)' was provided in 1909–10 north of 'L' Group (the northern 9.2-inch) and was linked to it and to the North Battery (at that date 'M' Group) by speaking tubes.[73] The new post took the form of two open, roughly circular spaces with a pillar for a DRF in the middle of both, with steps from both directions down to a partly buried shelter (Fig 11.35; Fig 11.36).

The details of Inchkeith's close defence were mapped for the first time in May 1907.[74] In the Precautionary Period, extensive barbed wire entanglements would bar the whole coastline, apart from where there were vertical cliffs. The three 9.2-inch emplacements were to be enclosed within two further barbed wire compounds.[75] During late February 1907, Colonel Smith Park, Commanding 1st Lanark Royal Engineers (Volunteers), received instructions that his regiment was authorised to go into camp at Inchkeith during the Glasgow Fair Week (late July), when the men would undertake the construction of permanent defensive works.[76]

By 1911, the island had a permanent quadruple-depth barbed wire entanglement covering vulnerable beaches at the south and north ends of the island, the wire itself being covered by many fire trenches (Fig 11.37).[77] These were substantial structures fronted by concrete walls and, at several places, included semi-circular observation/firing posts, many of which survive intact. The most substantial defensive structure was a concrete-lined and partly timber-roofed fire trench some 70m long covering the whole south-east front of the South Fort, outside the southern 1880 rock-cut ditch.

By 1911, the old testing room for the submarine miners, dug into the cliff overlooking Kinghorn Harbour, had become a small arms ammunition store. The drill shed in the bay had become officers' quarters. Many small buildings – especially stores and workshops for the artillery and engineers – had sprung up, and water catchment, storage and distribution infrastructure had increased in scale. A Territorial canteen,

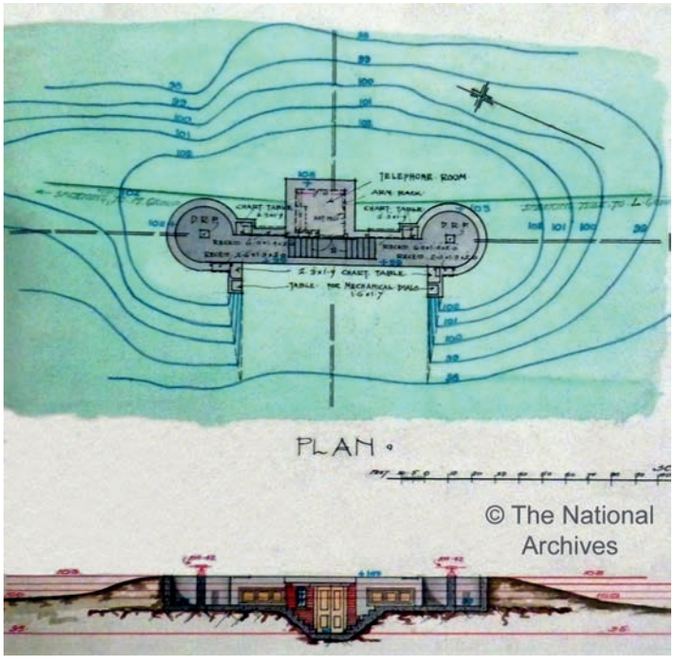


Figure 11.36
Plan and cross-section/elevation of the Battery Command Post (North) (© The National Archives, WO 78/5157)

Figure 11.37
A prepared firing position, above Kirkcaldy Harbour, Inchkeith, built before 1911; it comprises a concrete-fronted firing trench, and, at the far end, an observation post or machine-gun position, with a later brick pedestal built into it. One of the later blockhouses (No. 5 on the 1918 map) is visible beyond (© Gordon Barclay)

field kitchen (for troops under canvas) and a Royal Artillery store had been built north-west of the lighthouse and west of 'L' Group. At the top of the long straight ramp up from the harbour, an ordnance artificer's store and smithy had been erected, and just below the West Battery were three further buildings, an Examination Service and signal store, an oil and general store and a wagon shed. Down by the harbour was a large RA/RE store and a shed for repairing the gunnery targets that were towed out from the harbour. The 1911 map identified the redundant 19th-century experimental lighthouse globe as the Coastguard Watch Tower, which by that date was part of the PWSS complex.[78]

A tramway system had been built by 1911, running from the open area quarried out of the cliff behind the pier, up the steep approach path ('Heartbreak Hill' – Fig 11.38) to a turntable, and then along the low road to just short of the barrack complex. The ramp up from the harbour bisected a firing trench covering the approach from the harbour. The tramway was later much extended.

The visitors' book for the Inchkeith lighthouse contains, for 22 July 1913, the signatures of a very distinguished group: J E B Seely, Secretary of State for War; Winston Churchill, First Lord of the Admiralty; General J D P French, Chief of the Imperial General Staff; and Col M P A Hankey, Secretary of the Committee of Imperial Defence (Fig 11.39). They were accompanied by Churchill's brother 'Jack' and two people – 'Keighley' (described as 'Chief Officer') and 'Sinclair' – as yet unidentified. The visit was part of an official tour in the Admiralty yacht, HMS *Enchantress*. Within a few days, the story was spreading that Churchill, Seely and French had, quite properly, been challenged by a sentry on approaching one of the forts.[79]

Figure 11.38
The bottom of 'Heartbreak Hill' in the 1980s, with a fragment of the tramway system that then still survived (© Ron Morris)

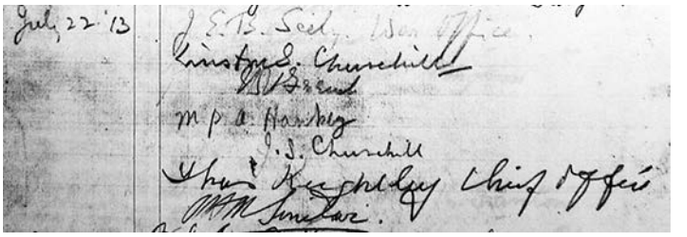


Figure 11.39
Detail of the Inchkeith lighthouse visitors' book page for July 1913, with the signatures of the distinguished party that had landed from HMS *Enchantress* (© Ron Morris)

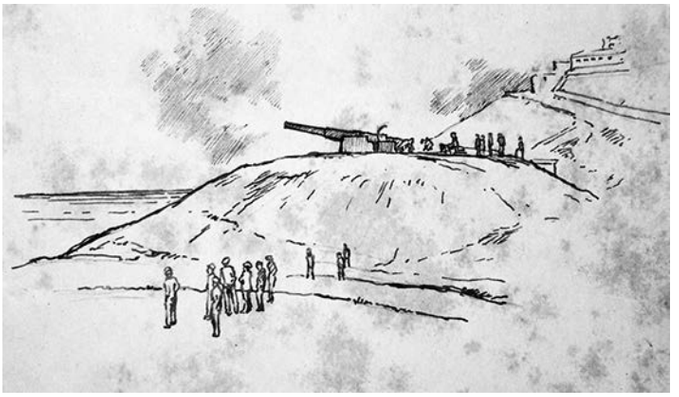


Figure 11.40
The northern 9.2-inch gun, sketched by 2nd Lt Ross In the First World War, titled '9.2 in shoot 1K' (Archibald Ross. Reproduced with permission of Fiona Buchanan)

Little was done on Inchkeith in the years leading up to the First World War. New position-finding instruments were ordered for the 9.2-inch guns, and these were installed in 1914. These were ranged up to 18–20,000 yards (roughly 16,410 to 18,300m). During late November 1913, improvements were made to improve watch-keeping in the estuary, including the upgrading of wireless communication with Inchkeith; Burntisland Coastguard Station was strengthened by the addition of two more wireless operators, who would also be available for service on the island.[80]

During the first few days of April 1914, the 1st Battalion, the Queen's Own Cameron Highlanders (at that time the Regular garrison of Edinburgh Castle), took part in defence operations on Inchkeith as part of 'certain naval exercises'. 'C' and 'D' Companies returned to the island immediately before the war, on 30 July 1914. They remained there until 8 August; at 11pm on 7 August, there was a 'scare due to a false alarm that a German flotilla was off the Forth'.

Figure 11.41
The First World War Battery Command Post in 'A' Group, the South Fort (Sgt F R Fernside. National War Museum © National Museums Scotland)

First World War, 1914–18

On the outbreak of the First World War, the approved armament of Inchkeith remained three 9.2-inch Mk X guns on Mk V mountings (Gun Groups 'B', 'F' and 'L' at this date), with four .303-inch machine guns on parapet mountings for close defence (Fig 11.40). In January 1915, Admiral Lowry, commanding at Rosyth, sought to strengthen the defence of the river against destroyer attack by the addition of four 6-inch guns on Inchkeith. The War Office approved the installation of these guns at the beginning of March 1915. Two 6-inch Mk VII guns on CP Mk II mountings were mounted on the existing emplacements in the South Battery ('A' Group – ready 12 June 1915), and another two in the existing emplacements in the North Battery ('M' Group – ready 20 June). For the first

Figure 11.42
The interior of the top floor of the BCP. Originally, this floor was the location of the DRF, with the Electric Light Directors on the floor below; once the shelters for the guns were built, the view from the lower floor was blocked. The wooden desk with circular holes, on the right, was the later ELD position (© Gordon Barclay)

time, the batteries were to be provided with Defence Electric Lights (DELs) – two at 'A' Group, with an engine room; and one each at the East Stell and the West Stell, with an engine room between them, to serve the North Battery. The date of installation and number of DELs on the island is a little confused,[81] and we try to make sense of it below. There is a map of the island dated May 1915 which shows the location of three combined Battery Command and Electric Light Director Posts at the North, South and West batteries. It is not clear why the West Battery was included, as it was not rearmed until 1916. It may be that some of the markings on the map are of a slightly later date.[82]

At the South Battery ('A' Group), the combined Battery Command and Electric Light Director Post was built just behind the two guns (Figs 11.41; Fig 11.42; Fig 11.43). The

Figure 11.43
Gun 'A2 seen by flash of A1', sketched by 2nd Lt Ross (Archibald Ross. Reproduced with permission of Fiona Buchanan)

engine room was built in the western end of the northern rock-cut ditch and an ablution block and latrine were built in the eastern part of the ditch. The underground portion of the old DRF Post to the north-west was converted into an oil store. Three accommodation huts, a cookhouse and officers' quarters were also built. The former magazine and store at the practice battery were now in use as a guard room and wood store. The two DEL emplacements (Nos 1 and 2) were built flanking the battery.

At 'M' Group, the North Battery, the combined Battery Command and Electric Light Director Post was built between the two emplacements, while the DEL (No. 3) was erected on the northernmost tip of the island, just in front of the foghorn. The engine room was built in the bay to the west. The May 1915 map also shows DEL emplacement No. 4 on the West Stell, presumably, at this date, for the North Battery, firing north and north-west.[83]

In May 1916, as part of the general revision of the defences, two further 6-inch guns were added to Inchkeith. This was to involve the rearming of the West Battery, the addition of a new emplacement there (Fig 11.45) and the building of a new emplacement on the West Stell (Fig 11.46; Fig 11.47), to receive one of the guns in the North Battery that was being removed. When the changes were being planned in June 1916, it was determined that the southern of the two guns in 'M' Group, 'M1' in the North Battery, would be moved to the West Battery, the designation of which was at this date still 'H' Group.

The West Battery had been disarmed since the removal of the old 6-inch Mk VI in a disappearing mounting ten years before. The existing emplacement (to be known as 'L2') had

Figure 11.44
The gun emplacement for 'A2' in the South Battery as it was in the 1980s. This pit seems to preserve some features of the pre-existing fittings. The brick-built shelter was erected in 1941 to provide protection for the crew from aircraft attack (© Ron Morris)

to be reconstructed to take the more modern gun and, at the same time, a new emplacement ('L1') was built just to the north of the rock-cut ditch of the fort. On plan, the guns look as though they are side by side, but the hill falls away steeply to the north and gun L1 is much lower than L2. The subterranean

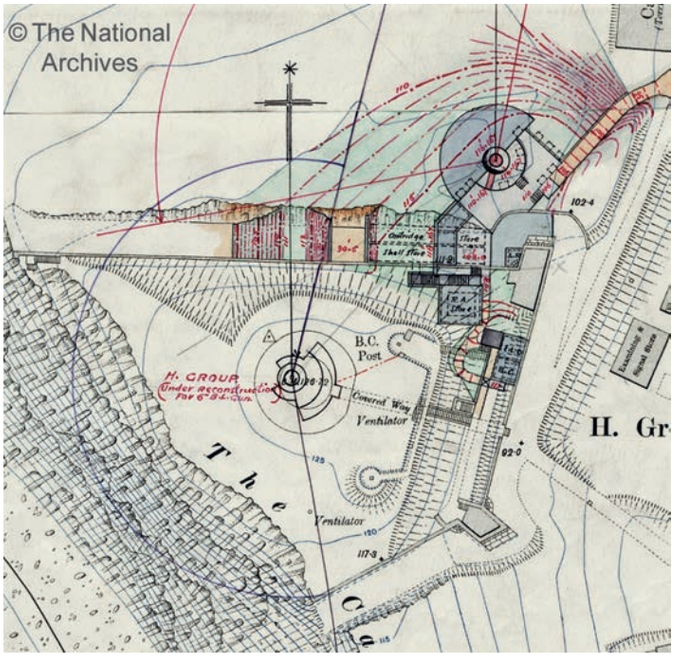


Figure 11.45
Plan showing the proposed addition of a second 6-inch gun emplacement at the West Battery, dated 1916. The ancillary buildings have been placed in the northern rock-cut ditch, thus avoiding new excavation. Although drawn on a map labelling the Fort as 'H Group', these guns would be known as 'L1' (the new emplacement) and 'L2' (© The National Archives, WO 78/5180)

magazines, stores and so on for the new emplacement were built into the northern rock-cut ditch of the old fort, although not exactly according to the Royal Engineers plan reproduced here. Gun 'M1' from the North Battery was moved to position 'L2' (inside the old West Fort) and was in action on 8 September 1916; 'L1' – the new position, to the north of the old fort – was in action on 8 December.[84]

A tower to accommodate a modern Battery Command and Electric Light Director Post for the West Battery was recorded in drawings dated August 1916, to be built above the

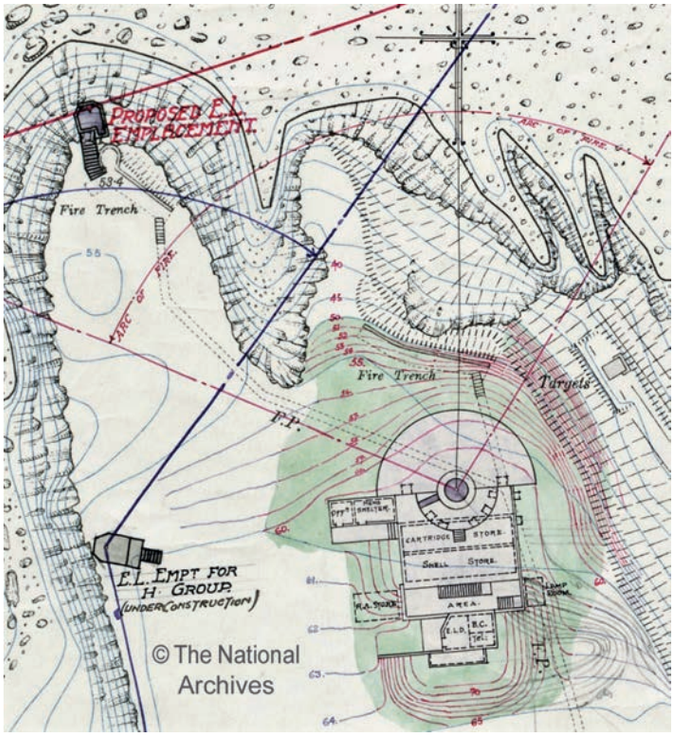


Figure 11.46
An extract from the 1911 OS map marked up with the proposed 6-inch emplacement on the West Stell, in 1916 (© The National Archives, WO 78/5180)

original fort wall: the elevation and cross-section on file show a four-storey, flat-roofed tower, with a lighthouse-like glazed signalling station on top. We do not know if it was built to its full height or whether it was provided with the glazed top storey; its surviving top level was built in the Second World War (Fig 11.48).[85]

For the second of the two new 6-inch guns, a completely new emplacement was built to the north of the West Battery, on the West Stell; it was ready for action on 23 June 1917. This emplacement was at first called position 'H Advanced', but had become Group 'O' by 1918. A new DEL was built for this gun, right on the end of the West Stell.[86] A further DEL was

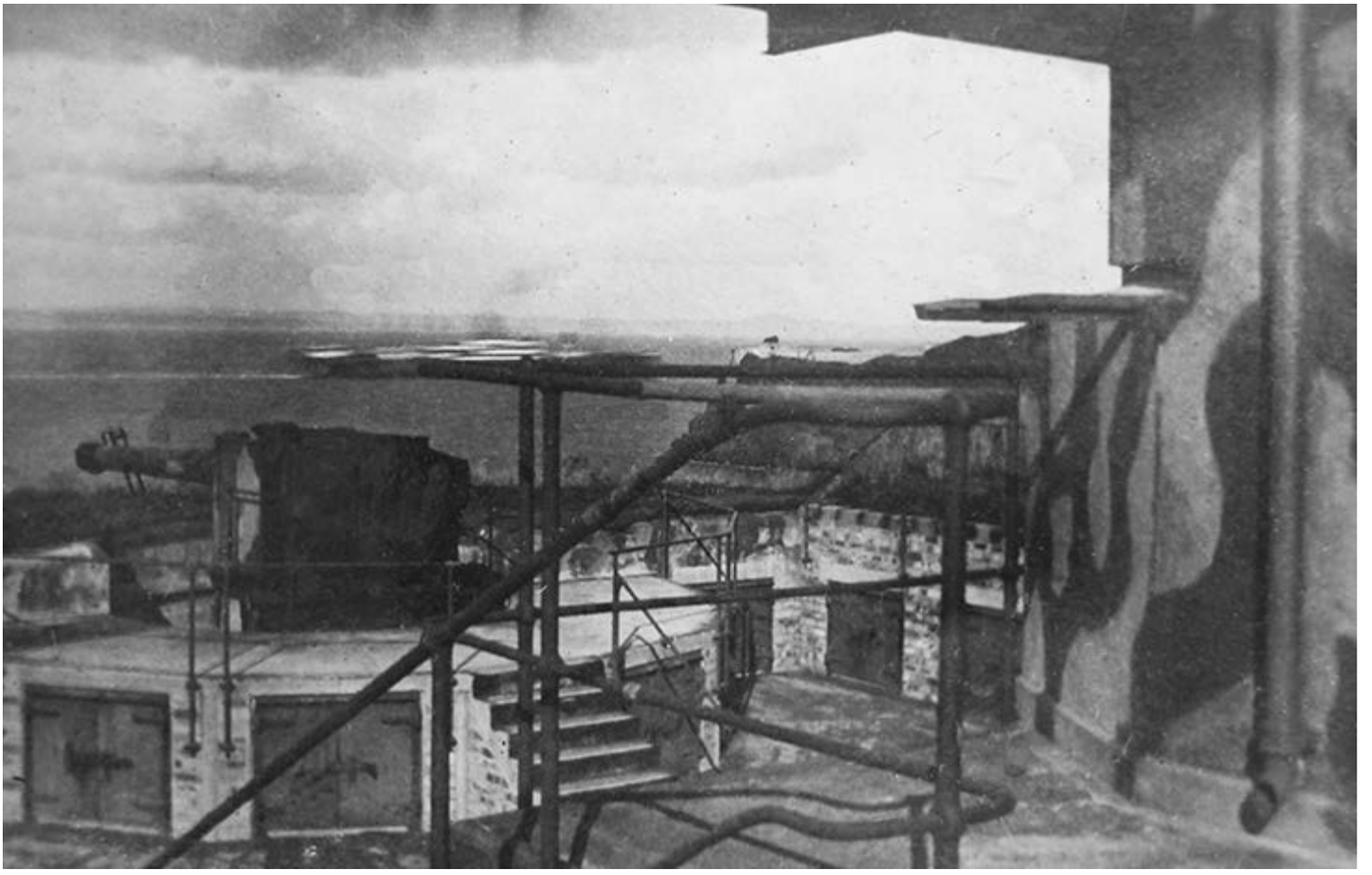


Figure 11.47
View of the new emplacement on the West Stell, at first called 'H Advanced' and, by 1918, 'O' Group (Sgt R F Fernside. National War Museum © National Museums Scotland)

Figure 11.48
The Battery Command Post for the West Battery, as it survives. The doors and stair seem to have been built to a slightly different arrangement. The concrete top storey seems to date from the Second World War, when the shelter for the guns, built in 1941, would have restricted the view from the original top floor (© Gordon Barclay)

Figure 11.49
The former experimental lighthouse, later used as a Coastguard and Naval look-out post, as it survived in the 1980s. The superstructure has since been removed to the National Museum of Scotland (© Ron Morris)

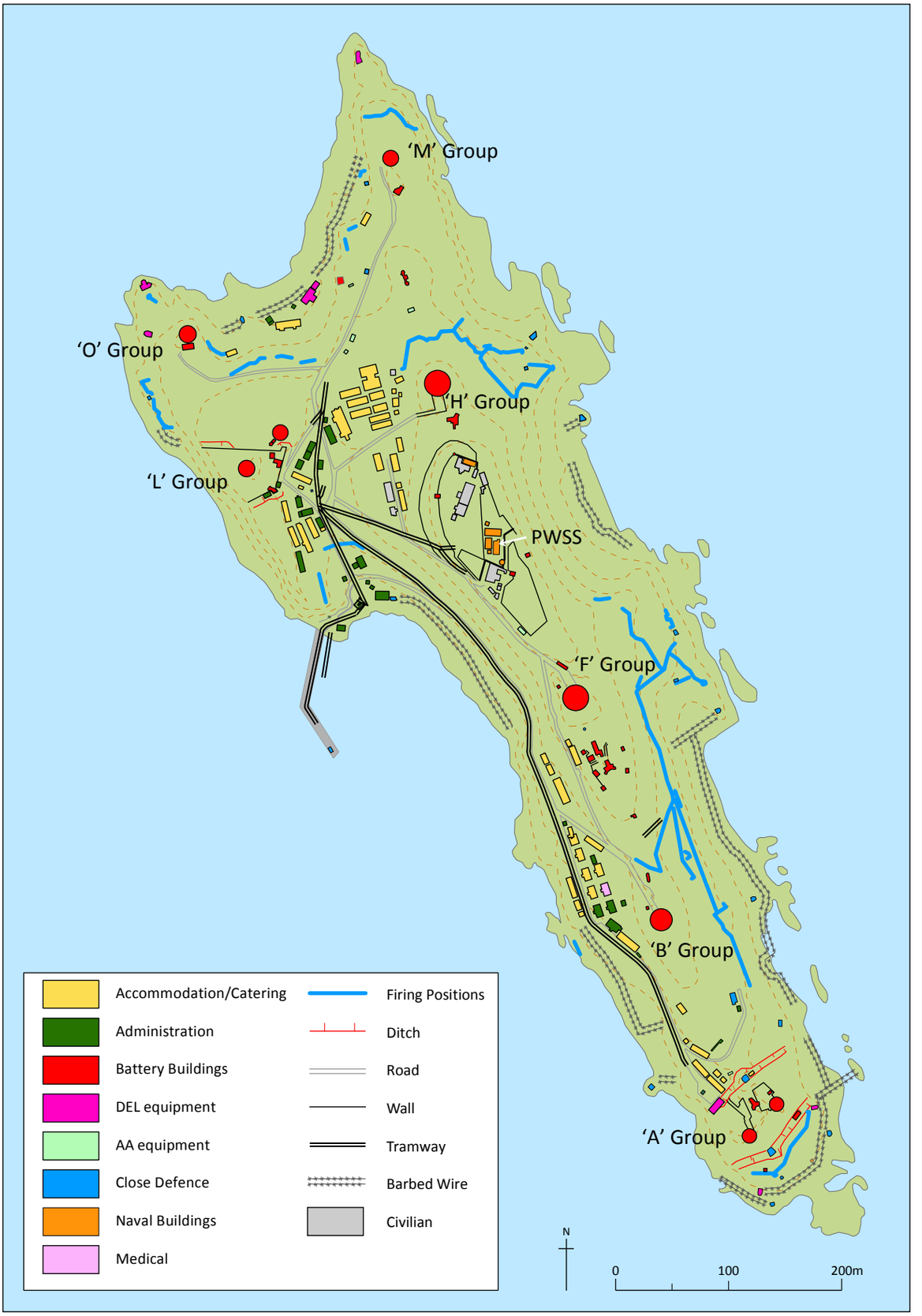

'M' Group
'O' Group
'H' Group
'L' Group
PWSS
'F' Group
'B' Group
'A' Group
Accommodation/Catering
Administration
Battery Buildings
DEL equipment
AA equipment
Close Defence
Naval Buildings
Medical
Firing Positions
Ditch
Road
Wall
Tramway
Barbed Wire
Civilian
N
0
100
200m

Figure 11.51
Inchkeith Blockhouse No. 8 (as numbered on the 1918 map) – plan and image. In the foreground of the photograph is one of the concrete firing positions shown on the 1911 map of Inchkeith, later filled in with a brick platform (© Gordon Barclay)

built immediately to the west of the gun emplacement (noted as being under construction on a plan dated June 1916).

The PWSS was also considerably extended at this time by the addition of a second-storey tower rising from the middle of the existing single-storey structure. The building resembles the 1916 Battery Command Post tower on Inchmickery, which was also built by the Admiralty. A small room on the east side straddling the ground and first floor may have been added at this time. This room contains the three pillars characteristic of a Position Finding Cell. The upper floor was reached by external steel stairs. By 1918, the PWSS site had incorporated the former Coastguard Watch Tower (the former experimental lighthouse, Fig 11.49),[87] and further naval buildings had been added: an Engine House, Wireless Station and mast, Sleeping Hut, Magnetic Hut and four other buildings to the east of the main hut.

In July 1916, the Royal Artillery garrison of the island was recorded as follows. Each of the three 9.2-inch guns had a Gun Group Commander, a six-man Depression Position Finder detachment, a three-man Depression Range Finder detachment and a telephonist. Each gun had a crew of 13 men and an ammunition detachment of eight men. In total, therefore, one officer and 39 men. The two-gun 6-inch battery had three officers (a Battery Commander, Gun Group Commander and GGC relief) and 53 other ranks (including a three-man DRF detachment and two telephonists). The gun crews totalled 22 men (with a relief of 11) and an ammunition detachment of eight men. The two single 6-inch gun batteries recorded at that date each had two officers (Gun Group Commander and relief) and 31 other ranks (including three-man DRF detachment; four telephonists; an 11-man gun detachment with six-man relief; and a six-man ammunition detachment).[88]

In October 1916, Inchkeith is recorded as having five DEL emplacements, numbered 3 to 7 at that date (Nos 3 and 4 at the South Battery ('A' Group); No. 5 at the North Battery ('M' Group); No. 6 on the West Stell for 'O' Group; and No. 7, a little to the south for the West Battery ('L' Group) (Fig 11.50).[89] (We have assumed that Nos 1 and 2 at this stage were those mounted at Leith.) The five DELs were recorded in February 1917 as having four Royal Engineer officers and 75 sappers to operate them, with an NCO and sapper for maintenance.[90] A sketch by Lt Archibald Ross shows the steep path to DEL No. 6 under construction, with a temporary DEL

Figure 11.50
Inchkeith in 1918, based on the Ordnance Survey map published in that year. The gun at the West Stell ('O' Group' had originally (1916) been termed 'H Adv[anced]', as the West Fort had been in 1916 'H' Group (© Gordon Barclay)

Figure 11.52

An extract of the 1918 map showing the complexity of the installations around the South Battery. The southern of the two Anti-Aircraft Height Finders sits on the outer lip of the north ditch. Machine gun emplacement No. 2 is marked in the firing trench south of the Battery (Reproduced by permission of the National Library of Scotland)

housing of weatherboard on the cliff above, between DELs Nos 6 and 7.[91]

By 1918, the tramway system had been extended further north to near the main accommodation area, to the south to just outside the entrance of the South Battery, and up the hill to the summit area (Fig 11.50). The line was also extended out along the pier. There were two winches to haul loads up the steepest slopes, one at the top of 'Heartbreak Hill' and one part way up the steep line to the summit;[92] elsewhere, it is presumed, the trolleys were moved by the men. At the South Battery terminus of the tramway, there is a concrete and brick structure which we believe to be the base of a third winch.

A small section of tramway was laid on the slipway for the shifting of the targets towed out to sea, and this too was provided with a winch at its head. A small detached 23m length of tramway, the purpose of which is unknown, was

mapped running north-east from the ridge at a point between 'B' Group and 'F' Group, down towards the firing trenches on the eastern coastline.

The close defence of the island was strengthened during the First World War, although it is not always clear what was built when. Pollard and Banks' excavation of a firing trench showed that it had been recut twice.[93] New firing trenches had been dug, for example, across the isthmus of the East Stell, north of 'M' Group. By March 1915, nine 'blockhouses' (concrete walled pillboxes) had been built around the coast of the island, on prominent locations closer to the water line than the firing trenches, allowing the beaches to be enfiladed (Fig 11.50; Fig 11.51).[94] Four covered the east coast; there were two at the South Battery, one on the west coast, one at Leith Harbour and the last on the north coast, overlooking Kinghorn Harbour. By 1918, a further five blockhouses had been built. A sketch by 2nd Lt A Ross depicts a portable oxy-acetylene searchlight mounted on the roof of Blockhouse No. 5 being used to illuminate the barbed wire entanglement below it; another sketch shows Blockhouse No. 3, perched on a pinnacle of rock, effectively cut off from the island by seas whipped up by gale-force winds. There were also five permanent machine gun emplacements, numbered 2 to 6 on the 1918 map (we have not found a No. 1 on the map); No. 2 was located in the concrete-lined fire trench south of the South Battery (Fig 11.52); Nos 3 and 4 were on the east coast, positioned to cover the steep slopes to the ridge; No. 5 was sited above Blockhouse 11; No. 6 was on the crest of the ridge, south-east of 'F' Group.

By 1918, the island was quite densely packed with structures (Fig 11.53), some of them associated with new forms of warfare. In the northern part of the island, between the northern 9.2-inch gun and the old BCP (by 1918 an ammunition store), was a shed labelled 'AA Light' (anti-aircraft searchlight), with what appeared to be rails to run the light into position and a telephone jack. About 60m to the west-south-west was the

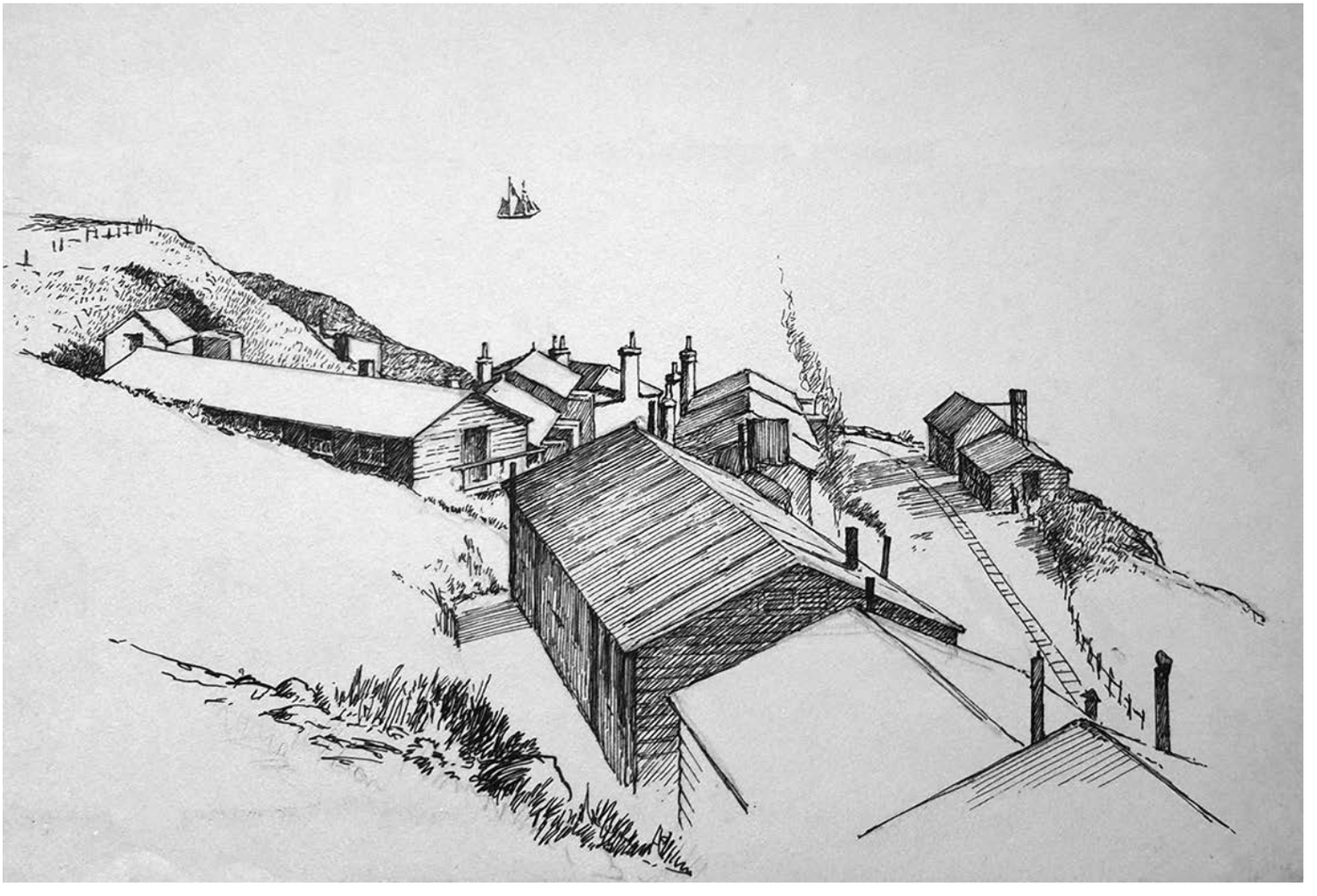


Figure 11.53
Untitled sketch by 2nd Lt Ross, showing the 19th-century barracks (in the background) and First World War timber huts in the foreground and to the left; the tram line is also shown (Archibald Ross. Reproduced with permission of Fiona Buchanan)

Figure 11.54
The concrete block, steel spindle, and slots for mounting the First World War AA Height Finding instrument, on the edge of the northern rock-cut ditch of the South Battery (© Gordon Barclay)

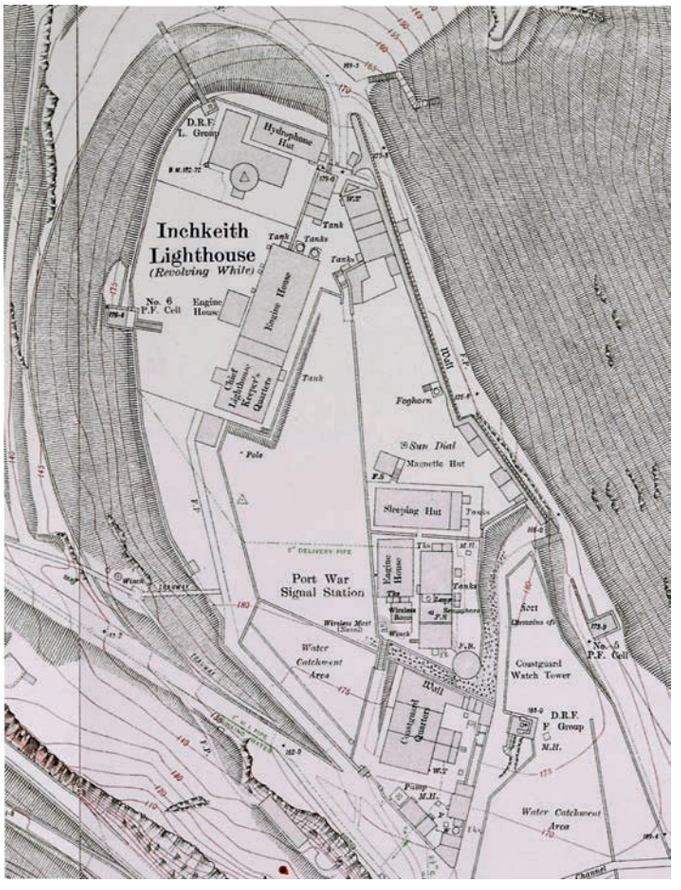


Figure 11.55
Extract from the 1918 Ordnance Survey Special Survey, showing the complexity of the Naval area on the top of the island (Reproduced by permission of the National Library of Scotland)

'AA Engine House' with a separate oil store. Some 40m to the north of the engine house was one of two 'Height Finders' for the anti-aircraft gun(s) on the island. At the southern edge of the water catchment was the 'Height Finders' Hut', either their accommodation or where their instruments were housed. A second Height Finder was located on the lip of the rock-cut ditch of the South Fort; its mounting survives (Fig 11.54).

At the end of the war, the 1918 map of the island recorded the five DELs that had been in place in 1916, now numbered one to five, anti-clockwise from No. 1 (south-west of the South Battery).[95] An undated map from a file containing papers from 1918 to 1920 records that 'Of the 5 DELs retained, one is for Training only', implying perhaps the presence of more DELs at some stage during the war.[96]

Figure 11.56
Nurses and members of the infantry garrison of Inchkeith, 1918–19, outside what is presumed to be the hospital. Photograph taken by Gunner Robert M Cochrane (National War Museum © National Museums Scotland)

In the naval area on the summit of the island (Fig 11.55), a 'Hydrophone Hut' was built just north of the lighthouse, presumably to accommodate the equipment we know was installed in 1916. The Port War Signal Station was extended with its own engine room and a naval wireless hut. A 'Magnetic Hut' was built a short distance north of the PWSS; we are not certain of the purpose of the structure, but such structures could be used in the measurement of the earth's magnetic field. A military wireless room was provided in the Fire Command Post in the southern half of the island. The greatest change was in the number of accommodation huts, dining huts, cookhouses and so on, to cope with the much larger permanent garrison. The entertainment for the men was provided in a large YMCA and an even larger 'Garrison Institute'. Curiously, a Private soldier of the 6th Royal Scots, part of the garrison of the island, was court-martialled and sentenced to 14 days in military prison in November 1914 for refusing to help erect the YMCA. He considered the task to be

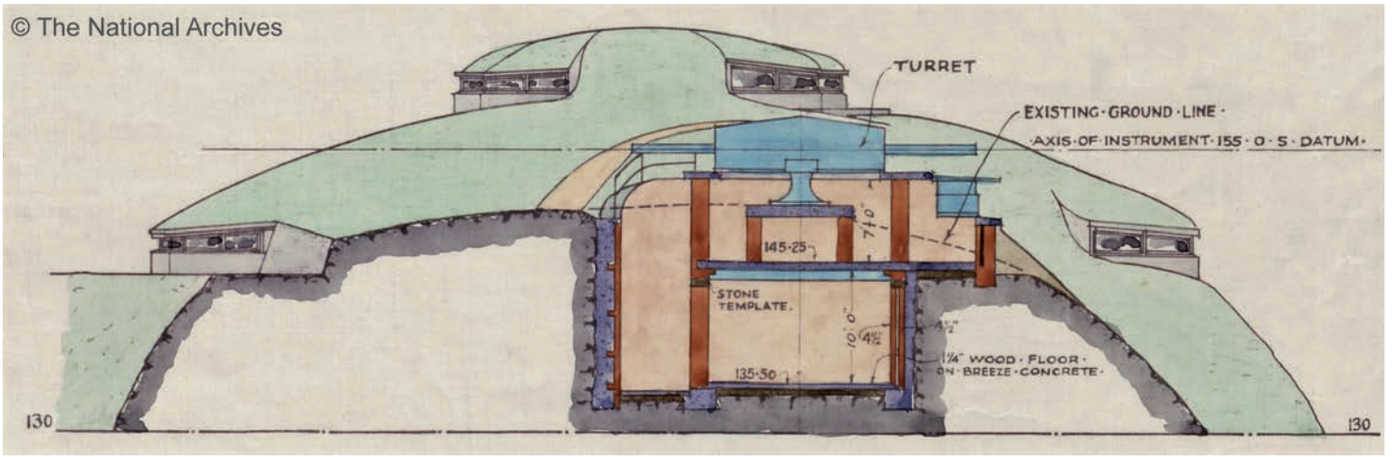


Figure 11.57
Cross-sections of the new 'B' Group Battery Command Post for 30ft Barr and Stroud range-finder, as built. The rest of the Fire Command South and PFC complex is shown in elevation behind (© The National Archives WO 78/5156)

'a civilian duty' and, as such, thought that he should receive extra pay.[97]

We know very little about the military hospitals on Inchkeith. A three-bed hospital is recorded on the island in 1899.[98] In the First World War, a 'reception hospital' is listed on Inchkeith,[99] but we know little of its operation; there is a series of photographs in the National War Museum showing the exterior and interior, with patients. In the external photographs, between three and five female nurses, one of whom is in a darker uniform and may be the sister, are shown outside the building we presume to be the hospital, in the company of kilted members of the infantry garrison (Fig 11.56). The interior, on the evidence of photographs, contained at least eight beds. The building appears to be of corrugated iron with astragalled sash-and-case windows, set up on a bank and accessed by a stair. Surprisingly, no hospital was labelled on the 1918 Ordnance Survey map of the island and we have not been able to identify which of the huts may have been used. A 'Dressing Station', however, was labelled amongst the original 19th-century barrack blocks.

In April 1918, work began on the construction of new Battery Command Posts to house 30ft-base Barr and Stroud range-finders for 'B' and 'F' Groups (the two southern 9.2-inch guns) and one 9ft base range-finder for 'M' Group (the single 6-inch gun in the North Fort). Detailed plans of the complex turreted emplacements for the 'B' and 'F' range-finders to be built, respectively, south of the South Fire Command post and between 'F' Group and the water catchment area, are preserved.[100] The 'F' Group structure would have stood where the later complex of anti-aircraft guns and AA control post was built, and we do not know if any part of the new structure was actually built. The new BCP and Barr and Stroud building for 'B' Group survives in part. It is a round-ended structure with two floors, the upper (ground) floor being dug into the hillside at the north. The southern end has subsequently been removed to allow the construction of a Second World War living hut. On the eastern wall, there was a bay window reminiscent of that on the War Signal Station on the May Island. Beneath was a large subterranean room of similar shape and dimensions, lit by windows from a narrow area and reached by a tunnel from the west side of the ridge. This was probably a communications centre, protected from gunfire (Fig 11.57; Fig 11.58). In 1920, the range-finders were removed from temporary housings and taken to storage in Leith. All the guns were put into care and maintenance.

Figure 11.58
The Battery Command Post for 30ft Barr and Stroud range-finder on Inchkeith, as it survives in 2016, looking south-east. The wall of the bay window is visible (© Gordon Barclay)

Figure 11.59
Sketch of Inchkeith, 'Sgts Mess Smoker New Years Eve 1917' , by 2nd Lt Ross (Archibald Ross. Reproduced with permission of Fiona Buchanan)

Life on the island, 1914–18

Few photographs or drawings have come to light showing daily life on Inchkeith during the war. As the text of this book was being finalised, we were put in touch with the daughter of 2nd Lt Archibald Ross, who had served in the artillery on the island and who had made many fine sketches of life there, some of which we have been allowed to reproduce (Figs 11.40, 11.43, 11.53, 11.59).[101] Another drawing shows men working on their allotments, south of 'B' Group (the southern 9.2-inch gun), with the DRF platform of the former practice battery in the background.

Provision was made for the spiritual needs of Inchkeith's garrison. Between June 1916 and April 1919, the Reverend Hannan (incumbent of St Peter's Episcopal Church, Musselburgh) made about 250 visits to the island, usually spending half a day there on Sundays when taking religious services, and on Wednesdays visiting the soldiers in their huts or at their stations. Services by the Revd Hannan, and by other chaplains for other denominations, were held in the large YMCA hut north of the lighthouse, where the Revd Hannan occasionally stayed, sharing the humble sleeping accommodation of the Superintendent and his two boys. The Revd Hannan made most trips in an old tug from Leith, which was pleasant enough in the summer, but a bit unpleasant in the winter. Occasionally he made the trip in one of the fast 'tin boats' – a motor launch. On one such occasion, it was rumoured that a hostile submarine had managed to get inside the boom and the skipper chattily informed Hannan that they had 2,000 gallons of petrol on board. His journeys back to Leith were always very cheery as he was accompanied by parties of men going on shore leave: 'It was amusing to see the haste with which the men crowded onto the pier, as if a minute would make a world of difference.'[102]

On 12 December 1914, Chaplain James Harvey made an appeal to the public for knitted woollen 'Balaclava' helmets 'for the brave fellows on the windswept island of Inchkeith'. In the early months of occupation, the weather had been comparatively pleasant but in the bitter winter days and nights

it had become hard and rigorous in the extreme.[103] Only three days later, Mr Harvey could gratefully report that every man of the 6th Battalion Royal Scots stationed at Inchkeith and Leith Fort could be furnished with one.[104]

1919–39

The garrison of Inchkeith was run down from 1919, and on 14 October 1920 two sectional wooden huts at Inchkeith were advertised for sale in *The Scotsman*.[105] In 1922, Inchkeith was listed as a wireless station and PWSS with a complement of one Grade I Warrant Officer, two Grade II Petty Officers and 13 Grade III Seamen, some of them accommodated at Burntisland.[106] In 1925, the range-finders that had been removed from the island in 1920 were restored and the guns put back into action.[107] Nothing else of significance is recorded as having been done in the 1920s.

In 1930, Inchkeith was included in the Interim Defence Scheme (also known as the Intermediate Scheme) described in Chapter 6 (Table 14).[108] The War Office file and the Inchkeith Fort Record Book are in conflict: the file suggests that all the 6-inch guns on the island were included, the FRB that only four were (A1, A2, L2 and M1). We believe that the FRB is correct, for two reasons: first, a document on the Leith Docks Fort Record Book lists L2 and M1 as being the guns of the examination battery in 1939.[109] Second, there was a great deal of activity on the island in 1931, when an Armament Withdrawal Party, under the command of Major Shrive, RA, undertook the following tasks:

- withdrawal of two 6-inch Mk VII guns and Mk II shields from 'A' Section;
- withdrawal of two 6-inch Mk VII guns from Inchcolm and mounting of them at 'A' Section with two Mk IV shields;[110]
- interchanging the guns of 'L1' and 'L2' and the replacement of Mk II shield of L2 with a Mk IV;
- withdrawal of the Mk II shield of 'M1' gun and substitution of a Mk IV;
- dismounting and checking of all the 9.2-inch guns and replacement of the air cylinders of 'F' gun.

That is, only the four guns listed in the FRB as being in the Interim Scheme were replaced or provided with modern shields. Fig 11.60 appears to show the process of gun and shield replacement at 'A' Group.

As part of the Scheme, new, more modern and effective ammunition was supplied in August 1931. In December 1932, the 9.2-inch gun in 'F' Group (the middle 9.2-inch gun) was removed and in June 1933 a new gun was mounted.[111] In October 1933, the four Maxim guns installed in 1899 were removed and returned to store, being replaced at an unknown date by obsolescent Lewis guns, which were issued in considerable numbers to coast artillery batteries for use in an anti-aircraft role; they were, however, 'relatively useless apart from their value in raising morale by allowing the troops to shoot back'.[112]

On 29 July 1931, *The Scotsman* newspaper, in making reference to naval stations that had been closed down since

Figure 11.60
The South Battery of Inchkeith, from the rear, probably recording the replacement of the shields in 1931. The Battery Command Post is in the centre. The eastern gun ('A2', left) is clearly visible in its Mk II shield. The western emplacement ('A1', right) has a hoist over it and seems to be pointing towards the photographer. In the foreground are two Mk IV shields, ready for installation (Sgt F R Fernside. National War Museum © National Museums Scotland)

Figure 11.61
The holdfast of the southern of the two 12-pdr practice guns (© Gordon Barclay)

1923, stated that the Inchkeith station 'had been completely closed down'. However, in 1933, Inchkeith PWSS was listed as a Category 'A' Port War Signal Station (although only manned in wartime by one officer and ten ratings).[113]

In the 'History of the Work' in the Fort Record Book a '12pr practice bty' was recorded as being established at some point between October 1933 and May 1939. A mid-20th-century practice battery is not marked on any map of the island, but two holdfasts of the correct dimensions (six bolts, 1m diameter) are visible, lying 17m apart within and just beyond the former practice battery (Fig 11.61).[114] There are official and personal accounts of 12-pdr drill and practice guns mounted at Leith in 1919, Inchgarvie and Coastguard in the 1930s, and at Charles Hill in 1939. It is possible that the same two pairs of drill and practice 12-pdr guns were moved around in this period. The Fort Record Book refers to the 'erection of a new Fire Command Post', but we have not identified this structure, at least not under this name.

The last addition to the 'History' of the battery on the Fort Record Book (in manuscript, in ink) was to the effect that 'All pieces on the island were replaced in May and June 1939 under the supervision of Major R Shrive MBE, MC, RA'. A typed document, 'Mounting and Dismounting Armament', has, as a pencil addition, 'Major Shrive MBE, MC, RA, changed all the guns on the island in May June 1939'. The lining tubes of the three 9.2-inch guns had been replaced only in October and November 1938 and it seems certain that the 9.2-inch guns were not replaced at this time. Also, Bruce Stenhouse (pers comm) remembered that only the inner sleeves of the 6-inch guns had been replaced. The Fort Record Book has an official table – 'Details of Equipment' – identifying the 9.2-inch guns and their mounts by their Ordnance reference numbers and giving their dates of manufacture, installation and calibration; the three 9.2-inch guns were the same as those emplaced in (from the south) 1907, 1903 and 1904.[115]

The Scotsman on 25 May 1936 described another structure, probably the former experimental lighthouse:

> The Fortress Observation Post was a little, round, glass-windowed room, perched high above the surrounding water which was kept warm by a stove. Contact with the island's batteries and searchlights and with Kinghorn was made by three telephones. In the Battery Observation Posts, lower than the main observation post and close to their respective batteries, officers, telephonists and Depression Range Finder specialists were stationed.[116]

In October 1935, the role of Inchkeith in the defences was set out explicitly:

> Inchkeith forms the central link in the chain of Defences across the Forth from KINGHORN to LEITH DOCKS. Chief points to be defended: Rosyth Dockyard; Naval anchorage off Rosyth; Depots at Crombie, Bandieth [sic], and Grangemouth; Port of Leith; Donibristle Air Station; Castland Hill Wireless and Telephone Station; Rosyth and Crombie water supply; Ports of Alloa and Bo'ness; Batteries, lights and communications of the anchorages; Examination and convoy anchorages; and the Forth Bridge[117]

Attacks by destroyers, coastal motor boats or submarines (by minelaying or torpedoes), and by minelaying by armed merchantmen, were to be prepared for on the naval installations and shipping, while Edinburgh was believed also to be at risk of long-range bombardment.

There is a 1936 chart of the Forth that shows not only the defences actually in place, but also works that were not implemented (for example, the Canty Bay Battery). On this chart, Inchkeith is recorded as having six DELs[118], their locations recorded on a 1939 map on the Fort Record Book: the DEL additional to the five recorded in 1918, is that a little to the north-west of the West Battery, approximately on the site of First World War blockhouse No. 14.[119]

As part of the March 1939 German naval intelligence survey of the installations, ports, communications and defences of the Forth, Inchkeith was illustrated by a map and a series of annotated photographs taken from sea level (Fig 11.62).

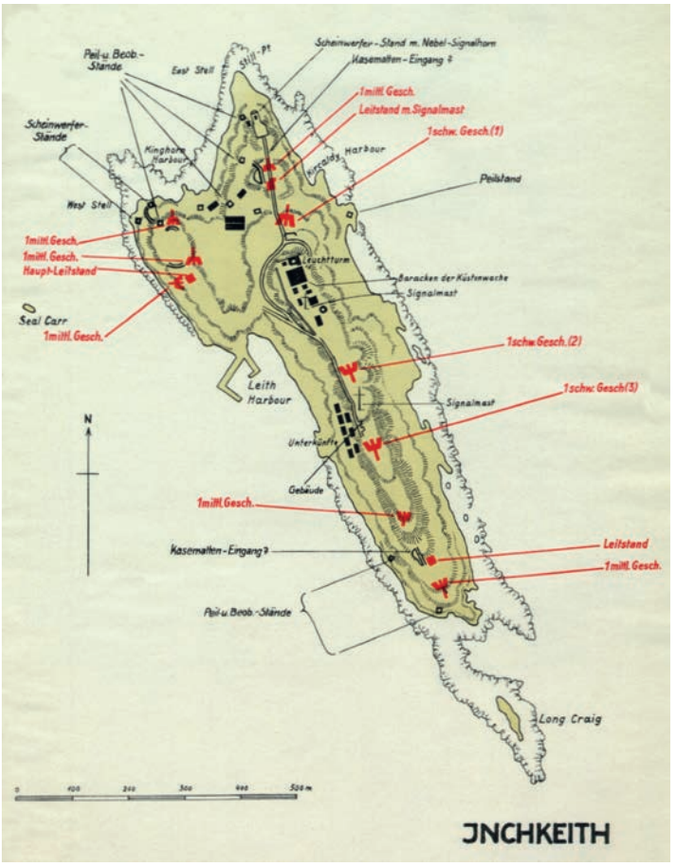


Figure 11.62
Map of Inchkeith published by German Naval intelligence in March 1939 (Oberkommando der Kriegsmarine, via Andreas Liebold)

The Second World War, 1939–45

During the early years of the Second World War, considerable additional building work took place on the island, including additions to the PWSS building; a new top storey was built as the look-out room and a 'balcony' was built out of the northern side, straddling the first and second storeys. Other buildings and huts were constructed, some traces of which are still visible, but because these were in the naval area, they were not shown on the Army maps. The former DRF Section Commander's post for 'F' Group, on the edge of the water catchment, close to the PWSS, was adapted for use as a telephone exchange. Additionally, a subsidiary Naval Signal Station was built onto the upper south-west corner of the 6-inch gun Battery Observation Post at the North Battery; this was necessary because the lighthouse building blocked the view from the look-out room at the top of the PWSS (Fig 11.63).[120]

It was announced that from noon on 15 November 1939 the channel south of Inchkeith Island was to be closed to all traffic and that all vessels proceeding to ports or anchorages to the west of Inchkeith were to proceed through the North Channel.[121]

Shortly after 9.30 a.m. on Wednesday 21 February 1940, the requisitioned trawler HMT *Peter Carey*, converted to a minesweeper, was seen heading into the Firth on a course which would eventually take her into the South Channel minefield. The trawler engaged in some erratic changes of course, as if unsure of its direction, but eventually resumed its original course, showing it was committed to entering the mined area.[122] Efforts were made to contact the trawler, which appear to have been misunderstood by its Skipper, Graham Smith Burr, Royal Naval Reserve. At South Battery, Charles Grant and some other artillerymen were cleaning their two 6-inch guns in preparation for a practice shoot when the alarm was sounded and they received the order to implement the 'bring to' procedure.[123] By now, however, HMT *Peter Carey* was approaching a zone of fire prohibited for the 6-inch guns, because of the danger of an overshot hitting the mainland. Consequently, a detachment manning an anti-aircraft gun further up the spine of the island was ordered to fire a shot across the trawler's bows, but the gun could not be depressed to a low enough angle. Having no time to consult higher authority, the young officer in charge of the South Battery ordered a sand-filled dummy 6-inch shell to be loaded in No. 1 gun and fired across the bows of the trawler.[124] 'Bring to' rounds were fired on a half charge. The gun was fired and seconds later a plume of spray rose up from the sea ahead of the trawler, causing her to turn and make for the North Channel. The gunners at South Battery congratulated themselves on their expert shooting and the prevention of disaster for the trawler and her members of crew. Meanwhile, three and a half miles away, the ricocheting dummy shell first passed through the roof of the Neptune Mills on Salamander Street in Leith, before bursting through

Figure 11.63
The Battery Command Post at the North Battery, Inchkeith, as it was probably from the later part of the First World War to the 1930s. The odd extension at the upper left side is the subsidiary naval War Signal Station, necessary because the lighthouse blocked the view northward from the Port War Signal Station (Sgt F R Fernside. National War Museum © National Museums Scotland)

the 18-inch-thick stone wall of a tenement flat at number 118, passing through the front room into the kitchen, narrowly missing the householder, Mrs Cairns, before coming to rest against some sandbags built around an Anderson shelter in the back green. Mrs Cairns and her son, suffering minor injuries and shock, were taken to Leith Hospital for treatment, from which they were discharged later in the morning.[125] An official statement issued that afternoon by Scottish Command described the dilemma faced by the young artillery officer on watch: 'He saw one of our trawlers heading straight for one of our minefields. The only possible way to stop her instantly to save the ship and the lives of the crew, was to fire a warning round across her bows. The officer had therefore, no choice as to line of fire … The presence of mind of the young officer undoubtedly saved the ship and the lives of those on board.'[126]

A handful of buildings of those mapped in 1918 survived to be mapped in 1941, including administrative, craft and storage buildings in the area between the West Battery, the lighthouse and the harbour. The area north and north-west of the lighthouse is the largest available piece of relatively flat ground on the island, and it was filled up in the Second World War with living huts, officers' messes, dining huts, the ATS canteen,[127] cooking huts and food stores, as well as the Garrison NAAFI and the Church of Scotland recreation hut. Further living huts were built near the batteries at the West Stell and north of the South Battery, presumably for their crews. Half a dozen living huts even had to be sited on a slight platform east of the 'F' Group 9.2-inch gun, on the flank of the island facing the enemy. These buildings are recorded only on a 1941 aerial photograph.

An Operational Order dated 28 November 1939 for 51 Light AA Brigade (TA) stated there were no Light AA defences on Inchkeith and the coast defences there were very exposed to attack by enemy aircraft. Two naval Vickers 2-pdr AA guns were to be sent to the island to provide protection against low-flying enemy aircraft and to deter their laying mines in the Forth. These guns were to be in action by 1 December or as soon as possible thereafter. In January 1940, two further Vickers MK II naval 2-pdr pom-pom guns were loaned to Inchkeith by the Commander Fixed Defences Edinburgh.[128] It is unknown exactly how many of these guns were actually delivered and installed on the island, though we believe most, if not all of them, were.

The defences were, however, reduced only a month later. On 25 February, Inchkeith AA Battery was to be reduced by one MK II 2-pdr gun[129] and on 31 July a single Vickers MK III gun was on order to replace two Vickers 2-pdr MK II equipments withdrawn.[130] In May 1940, the Commander-in-Chief Rosyth advised that Inchkeith's AA defence of 'two or three' pom-pom guns, was inadequate.[131]

About 2.30 a.m. on 25 October 1940, the island's anti-aircraft defences engaged an enemy minelaying aircraft passing over the island. Two parachute mines were dropped close to the south end of the island. The plane was later reported to be losing height rapidly and was believed to have crashed in the sea some miles to the east of Inchkeith. So far, we know no further details of this incident, and no aircraft was officially recorded as lost on that date.[132] According to Stenhouse, during the latter part of 1940 and possibly into 1941, the only AA defences on Inchkeith were some Lewis machine guns manned by the coast gunners and a single 2-pdr pom-pom and AA searchlight manned by one officer and about 20 men.[133] The island's AA defences were again called into action about 2.40 p.m. on 24 January 1941 when they engaged an enemy bomber flying westwards over the South Channel, without success.

In March 1941, it was decided that the AA defence of Vulnerable Point [VP] 370 (Inchkeith) would be strengthened by guns of greater range to tackle aerial minelayers in the estuary, and four 3-inch AA guns were in place by April.[134] The August 1941 map and aerial photographs show two searchlight emplacements and a pair of Lewis guns in the

Figure 11.64

View from 'B' Group (the southern 9.2-inch gun) southwards. The emplacement of the 3-inch AA gun (right of centre) has not yet been built around it. The sand-bagged emplacement was probably the AA searchlight emplacement. The BCP of the South Battery is visible (behind centre). To the left, gun A2 has not yet got its protection; to the right, gun A1's protection is under construction (© Bruce Stenhouse Collection))

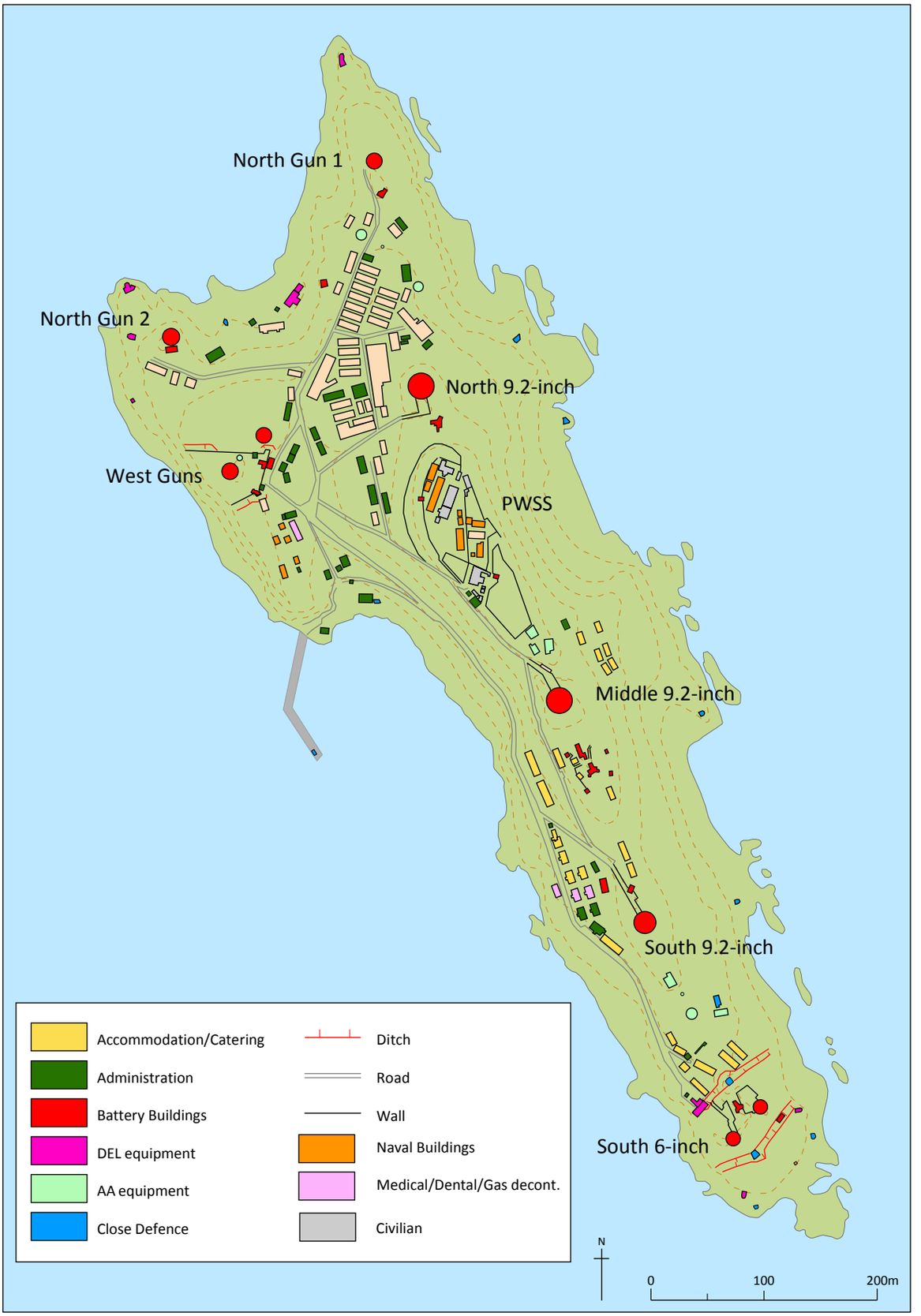
Figure 11.65
The southern 3-inch AA gun emplacement. The cube with the steel plate on top is a later alteration for a 2-pdr pom-pom or Bofors gun (© Gordon Barclay)

north; two 3-inch AA emplacements beside the AA Command Post; a 3-inch gun site immediately to the north-east of West Gun No. 2 (the southern emplacement of the West Battery); and the fourth 3-inch emplacement, a pair of Lewis guns and a searchlight were located at the south.

The AA Command Post had three levels; the bottom level comprised (on the west) a seawater cistern and, on the east, a deep-level magazine; the middle tier, still below ground level, had the unit's office, stores and rest-room. The topmost level had a cabin for the Gun Position Officer and a plotting room.[135] The two 3-inch emplacements on the surface comprised a gun holdfast on a concrete platform, surrounded by waist-high, flat-topped ammunition stores. One of the two emplacements was altered later by the addition of a large concrete block to mount a Vickers 2-pdr or a static Bofors gun.

The third 3-inch AA emplacement was positioned south of 'B' Group, the southern 9.2-inch gun. It appeared on a photograph taken in 1941 from the top of the shield of 'B'

Figure 11.66
Painting by Edward Ardizzone of the northern 9.2-inch gun on Inchkeith in 1941, prior to the construction of the overhead protection (© Imperial War Museum LD 001267)


North Gun 1
North Gun 2
North 9.2-inch
West Guns
PWSS
Middle 9.2-inch
South 9.2-inch
South 6-inch
Accommodation/Catering
Administration
Battery Buildings
DEL equipment
AA equipment
Close Defence
Ditch
Road
Wall
Naval Buildings
Medical/Dental/Gas decont.
Civilian
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200m

Group (the southern 9.2-inch gun), looking south (Fig 11.64; Fig 11.65); the southernmost 3-inch AA gun appears on its standard static mount, but its emplacement has not yet been built around it. The sandbagged enclosure to the left may protect an AA searchlight.

At the West Battery, the only sign of the recorded 3-inch AA site is a set of eight large concrete cubes, which could have supported a raised baulk platform (a feature referred to in the 36 AA Brigade orders) that would have allowed the gun to fire above the overhead cover of the 6-inch gun.

As elsewhere in the Forth, Unrotated Projectile AA projectors were installed on Inchkeith. In June 1941, it was proposed to mount 16 'Z' Projectors (a term more commonly used for the single-rocket version of the weapon).[136] We have found the settings of six projectors, although RM believes he saw up to a dozen in the 1980s.[137] Men from Inchkeith were trained on the projectors at Fernieness naval firing range in East Lothian.[138]

In January 1943, it was reported that Inchkeith was 'now fully defended by 4 × 40mm [Bofors] equipments', and by March the four 3-inch Case I AA guns were withdrawn. In August 1943, there was correspondence that concluded that 'the suggested installation of 40mm Bofors equipments on INCHKEITH ISLAND is not recommended'.[139] In September 1943, orders were received to withdraw all anti-aircraft personnel from Inchkeith, leaving two of the 40mm guns to be manned by coast defence personnel. Late in the war, in April 1945, a single 40mm Bofors gun was listed as being retained for the local defence of Inchkeith, after the winding down of the larger-scale anti-aircraft system in the area.[140]

A War Office pamphlet setting out the establishment of the whole of the Inchkeith Fire Command was published in December 1942, showing it as 598 officers and men.[141] This number did not include Royal Engineers, naval personnel or other non-Royal Artillery or Royal Army Ordnance Corps personnel, and numbers of men involved in Coast Defence had already begun to reduce. The peak garrison was 'over 1,000' according to a number of service personnel interviewed by RM.

The accommodation on the island was more complex than in the earlier conflict. Medical and related functions occupied five huts, including a dental centre, a hospital and two gas decontamination buildings (Fig 11.67).

Nine of the 15 blockhouses marked on the 1918 map were shown on the 1941 map, but it is not clear if any of these were still used as guard posts. Surprisingly, Inchkeith had a 75mm field gun of the kind issued for close defence elsewhere in the Forth. The commencement of a 'local 75mm Gun course' is recorded on 8 October 1943, when detachments from 255 and 256 Coast Batteries practised.[142] As noted above, we suspect that these field guns were issued to coast batteries not only for close defence, but to familiarise men with the very different drills for firing field guns, as many of these men were to be 'combed out' for transfer to such batteries. As early as October 1943, men from Inchkeith were recorded as having been posted away to Field Artillery units or the infantry. In January 1944, during the 'Flood Tide' reduction in coast artillery, the North Battery was still shown as manned by Regular artillerymen; Inchkeith West and South were in care and maintenance, although the DELs of the South Battery were still manned by Regulars. The 9.2-inch guns were in care and maintenance.[143]

In the Second World War, there were more buildings marked as being in naval use than occupied the naval enclave on the summit of the island; there was also a group of half a dozen 'Naval Buildings' on the Cawcans Ridge, including the Guard and Mine Loop control stations and stores. The 'Naval Lookout Hut' near the southern end of the island (built by 1911) was still in use in the Second World War, and survives today.

Until 1941, the coast artillery emplacements were open to the sky, as they had been built. This meant that the guns had a very large field of fire, restricted only by the higher ground of the island and ancillary structures. In 1940, the war artist Edward Ardizzone painted a number of watercolours of the guns and men on Inchkeith, now in the Imperial War Museum (Fig 11.66). In 1941, it was decided to provide all coast defence guns with rear and overhead cover, to protect the crew from attack by aircraft and from splinters.[144] There was some resistance to restricting the field of fire of the guns, but all the emplacements were protected. The vast hangar-like shelters for the 9.2-inch guns are still very impressive structures, albeit now structurally compromised. They were provided with many small holes for ventilation and, nearer ground level, loop-holes for close defence. The shelters were built of brick, with heavy steel beams to take most of the weight of the reinforced concrete roofs. The roofs had uneven edges and stones set into the concrete to aid with camouflage. The aprons of the guns, originally plain concrete, were covered with a skim of rough cement with inset stones for the same purpose, and the aprons were extended outwards to create uneven edges (Fig 11.22).[145]

In the Second World War, there were six DELs, of which five were in First World War emplacements. The additional light was on the site of Blockhouse No. 4.

Life on Inchkeith in the Second World War

During November 1940, a correspondent from *The Scotsman* newspaper reported on Army life on the fortified islands in the Firth of Forth;[146] one of them was Inchkeith. He described the life of the soldiers on the islands as like that of a sailor aboard a ship, although it tested morale to be within sight of the mainland and all its attractions. Morale on the island was

Figure 11.67
Map based on the 1941 map and aerial photographs (© Gordon Barclay)

high because, it was reported, the Colonel commanding the Forth Fixed Defences and his officers clearly understood the problems and devoted a great deal of time, with the support of the civil authorities, to supplying as much entertainment as possible. Concert parties visited the islands (and were sometimes seasick during the crossings) and cinema films were also supplied. On 31 March 1944, the famous actress Dame Sybil Thorndyke made the crossing to Inchkeith, apparently in gale-force winds, to give a 'recital', presumably dramatic readings.[147] There were about 50 wireless sets distributed through all the messes. *The Scotsman* correspondent noted good relationships between the officers and men, which were reflected in a practice shoot held during the correspondent's visit. Immediately after such practice shoots, the gun teams, observation post personnel and everyone else connected with it gathered in a lecture hut where the commanding officer went over the results, detail by detail, with explanations sought without blame for anything that went wrong, in order to prevent recurrence.[148]

The guns were manned night and day. In order to keep the men in practice, there was a practice room (probably the 'Aiming Drill Shed' built in the southern ditch of the South Battery, first recorded on the 1918 OS map of the island) which was rather like a large toy theatre representing part of the Firth, with artificially produced moonlight and sunrise effects and model ships silhouetted against the background. On the floor was another model of the Firth, with two model searchlights with which the men were taught to keep a beam fixed on a target while the instructor operated a tiny model ship at the back of the room in total darkness, with the searchlight operator endeavouring to keep his spotlight concentrated on it.[149]

One young doctor had responsibility for three of the islands (presumably Inchkeith, Inchcolm and Inchmickery); he reported that the health of the men was very good, there being too much fresh air and too many strong winds to make the spread of infectious disease likely. However, accidents did sometimes happen, and one night during a black-out a soldier fell and hurt his spine. At that time, the doctor was on another island, but he prescribed action by telephone and, later, had the man bound on a stretcher and taken to a hospital on the mainland, where he made a good recovery.[150]

In 1986, a further account of life on Inchkeith, by Douglas Allan, a former Sergeant-Instructor posted there in July 1941, was published in the *Edinburgh Evening News*.

The garrison on the island at that time was over 1,100 men, and in addition, a searchlight unit and a Royal Naval detachment. The military personnel were granted overnight leave on the mainland every ten days. Sometimes the drifter could not sail, cancelling all leave if the decision not to sail was taken at the jetty at Inchkeith. On the other hand, if the cancellation took place at Leith Docks, the lads gleefully accepted another night in the city. One incident during a rough crossing was recalled, when Andy, the boat policeman, was seasick and lost his false teeth overboard. When reporting his loss, he was charged with losing Government property.

The island had two canteens, one run by the NAAFI and the other by the Church of Scotland Huts Committee. Both were popular, but the Church Hut had a Quiet Room for study and an occasional church service of prayer and meditation conducted by ministers of the church. Every Sunday morning, a full parade of the batteries brought a large congregation into the main hall of the Church of Scotland Hut where the Army Chaplain took the service. This service was attended by naval personnel, including, on many occasions, Captain Lang, brother of Archbishop Lang. For these services, there was a choir and, for a spell, the choirmaster was Gunner Duncan from Edinburgh, assisted by expert pianist Gunner Tonge, a Londoner.

The extensive tramway system had fallen out of use by 1939. The roads were relaid with tarmacadam and, in 1940, a tractor with a trailer arrived on the island to pull loads. From time to time, the batteries had target practice. On one occasion, when one of the 'nine-twos' fired a shell, practically every window in the NAAFI canteen was blown in. As it went off, Sergeant Allan happened to be entering the Sergeants' Mess and got such a fright that he committed the cardinal sin of going into the mess with his cap on, which cost him five drinks, the penalty for such an offence.

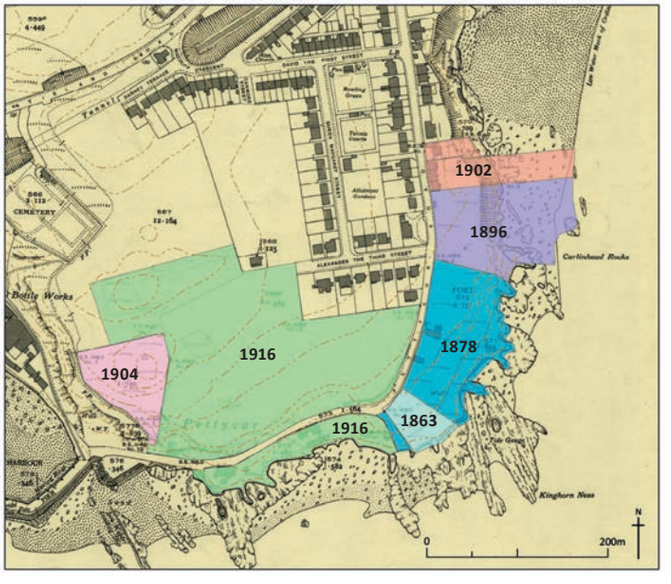


Figure 11.68
Diagram showing the different land purchases between 1863 and 1916, that made up the Kinghorn and Pettycur battery site. Map base 1947 OS 1:2500 map (© Gordon Barclay)

Post-war

The final map of Inchkeith was drawn in 1948. A few buildings shown on the 1941 map had been removed by then, but most were labelled with the same functions. We suspect that structures on this map may have been 'carried over' by a draughtsman without the benefit of site inspection: for example, the 1948 map showed 3-inch AA emplacements, which had been rearmed with lighter guns in 1943 (see above).

The Fort Record Book contained an eyewitness account, dated May 1952, of the removal, four years earlier, of the two 6-inch Mk VII and Mk VII+ guns and mountings from the West Battery.[151] The front part of the overhead protection had first to be removed and the various parts were loaded on sledges and lowered down Heartbreak Hill, which had been covered with a temporary planked surface for the purpose. By March 1953, all the remaining guns had been placed in the 'heaviest state of preservation', as they were all surplus to the 'Basic and Reserve Scales of Defence'. The 9.2-inch guns were detailed for disposal for scrap, while the 6-inch guns were to be removed to Ordnance storage.

What was by then the near-deserted state of the island was described in the *Edinburgh Evening News* of 17 July 1953:

> It bears the aspect of a deserted village, with barrack huts and battlements, canteens and cookhouses, workshops and water tanks, hydrants, cables and ventilators all waging their unequal struggle against a common enemy – the weeds. Thistles stand high for instance, like purple-capped commissionaires at the door of the main, brick-built NAAFI canteen. Here for Inchkeith's war-time garrison of some nine hundred men, was the very hub of conviviality. But now the noise of beery banter is supplanted by the chirping of sparrows through the broken windows, and by the rustle of copious vegetation outside.
>
> The footlights are still there, and the blue-painted sets, relics of ENSA parties and smoking concerts. But the stage is empty. And so it is for the rest of this huge, sprawling Army camp. Empty that is to say, but for the formidable-looking artillery maintained by Bombardier Harry Brown and Lance-Bombardier Jack Horsfield. Englishmen and Regulars both, who are – together with one National Serviceman – the only military potentates still in residence on the island.
>
> Harry Brown has been there for six years, and likes it, devoting his spare time to the cultivation of his flower garden and to the knitting of elaborate jumpers in Fair Isle and other styles. Jack Horsfield on the other hand, goes in for crab and lobster catching – with no small success, as your reporter's diet during the past few days can amply confirm.[152]

The remaining 6-inch guns were removed between 1 September and 7 November 1953.

11.2 Kinghorn and Pettycur

Introduction

These two batteries occupied one headland at Kinghorn Ness. Kinghorn was established in 1880 and Pettycur in 1916, on adjacent sites with shared facilities.

Sources

The sparse Fortress Record Book has a useful three-page 'history of the work' written in 1949, and some maps and drawings.[153] There are sets of fine Record Plans of 1890, 1902 and 1906 in the National Archives, including most of the ancillary buildings, and drawings from 1904–5 of the Fire Command Post and Position Finding Cell, which were built

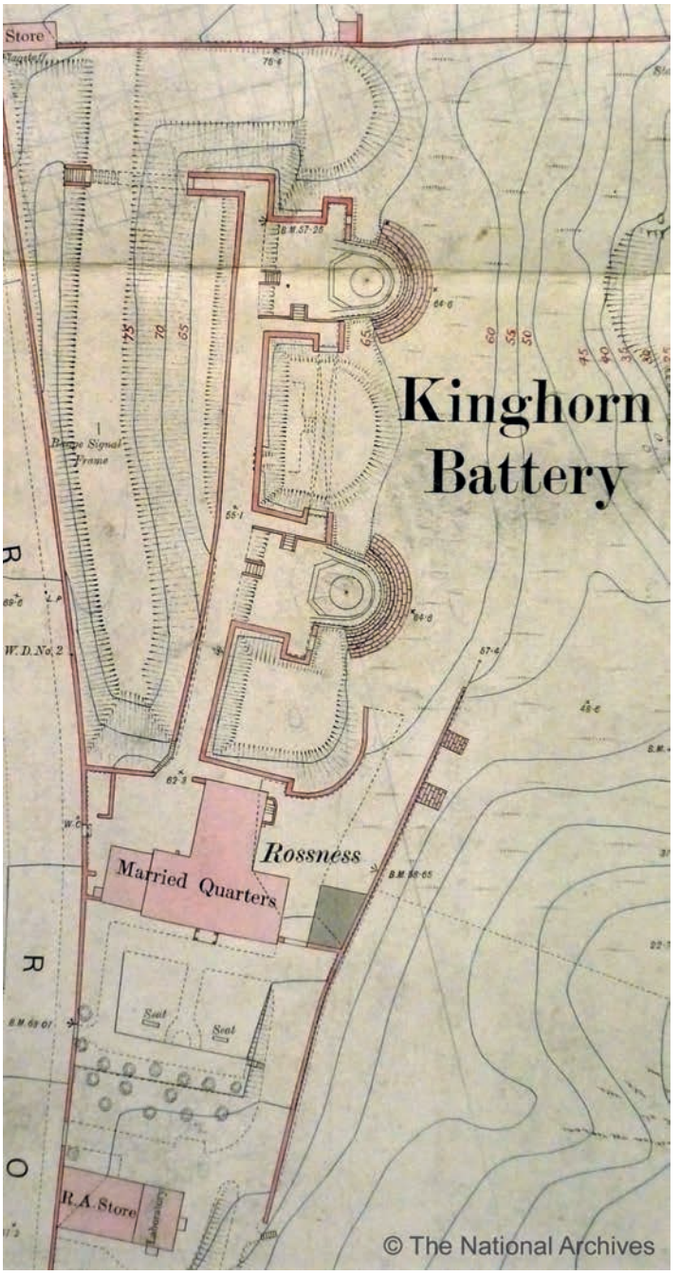
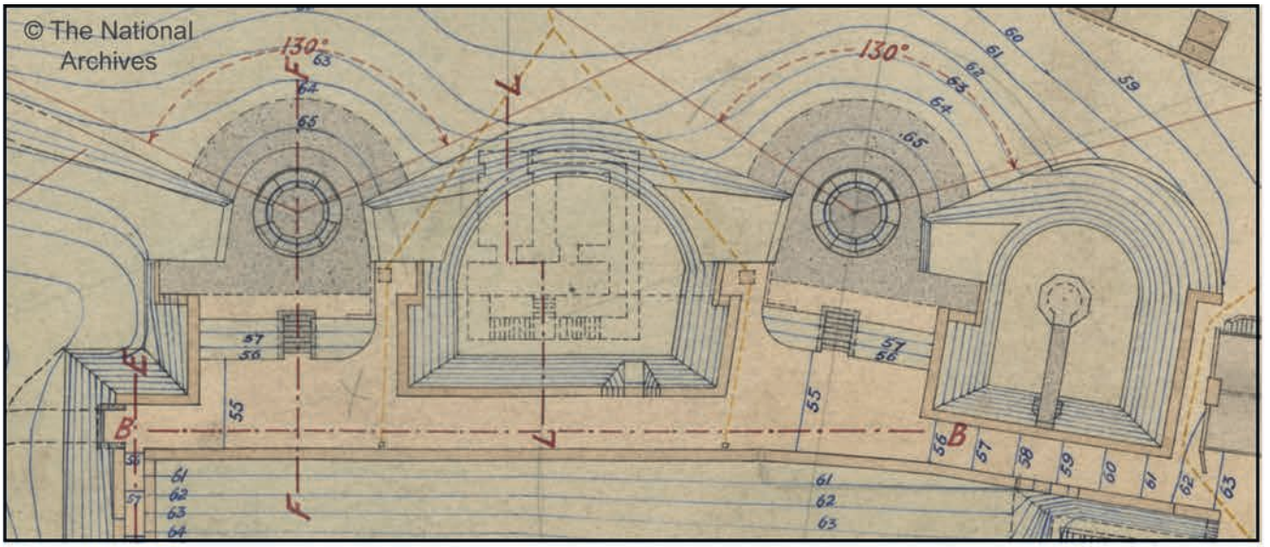


Figure 11.69
Detail of a large-scale plan of the Kinghorn Battery, drawn in 1890 (© The National Archives, WO 78/4173)

A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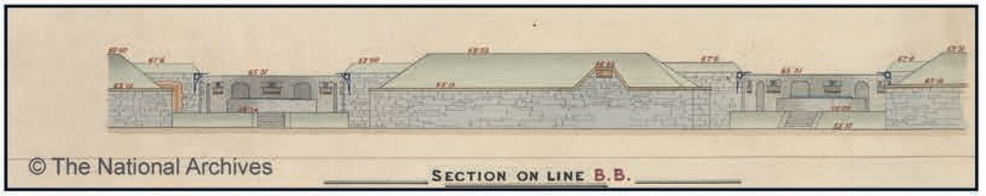
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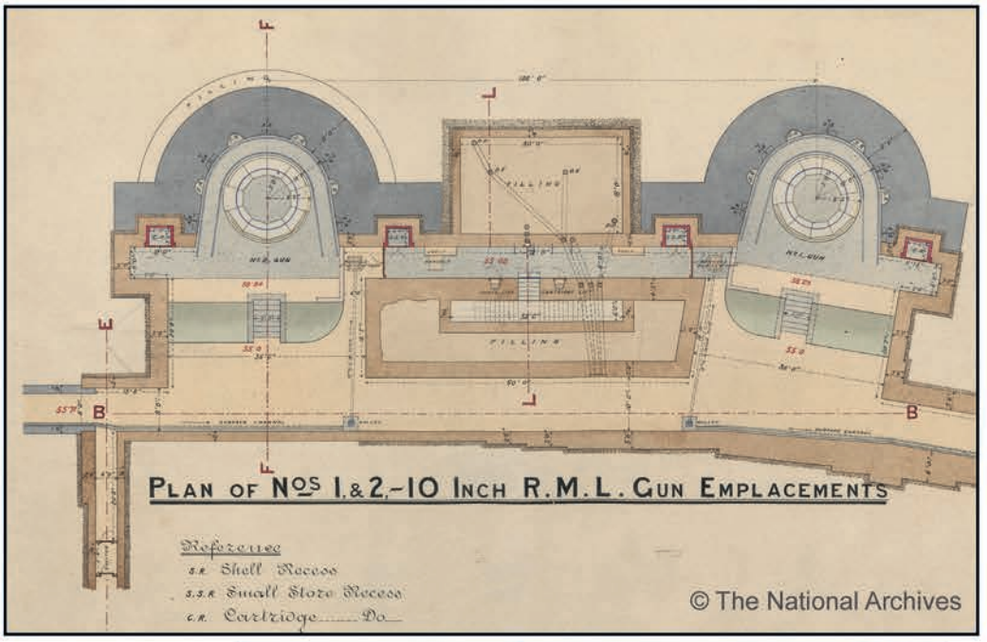
PLAN OF NOS 1.& 2.-10 INCH R.M.L. GUN EMPLACEMENTS
References
S.R. Shell Recess
S.S.R. Small Store Recess
C.R. Cartridge Do
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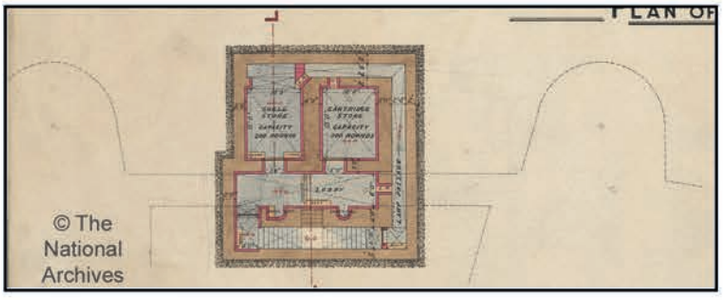
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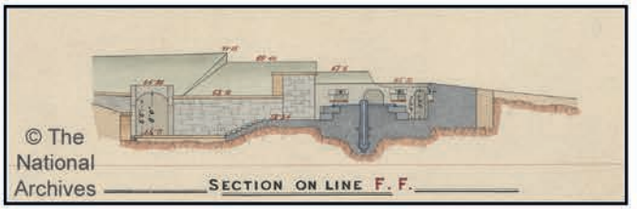
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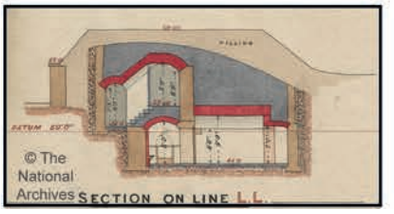
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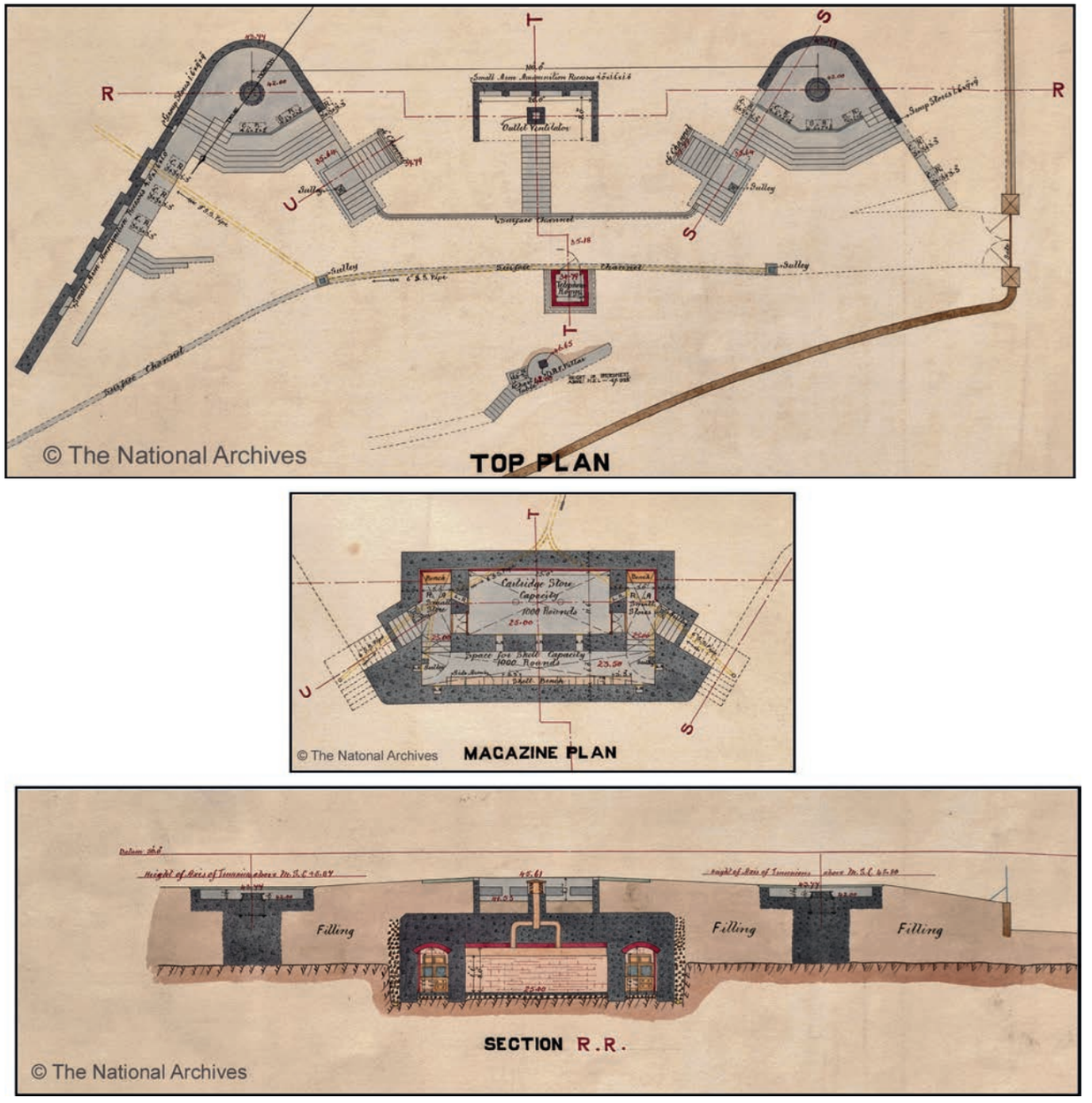


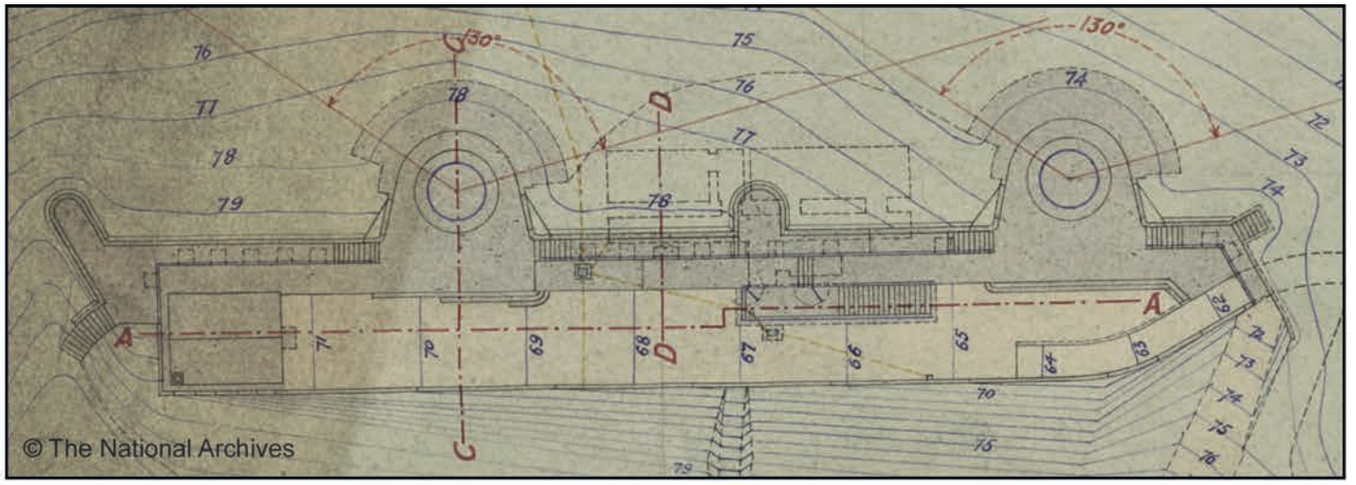
Figure 11.71
The 1906 record plan of the 1892–3 4.7-inch QF battery. The top, magazine level and cross-section are shown. The telephone room was marked as a shelter on the 1902 plan; the DRF platform was added between 1902 and 1906 (© The National Archives, WO 78/5178)

Figure 11.70
Composite record of the Kinghorn battery for two 10-inch guns, in 1880 created from the record plan of 1902, on file WO 78/4250: 'A', the 'Top Plan' showing the emplacements sunk between a central mound of soil covering the magazine and, to the south (right on the drawing), the DRF platform. The two emplacements were linked by a tunnel under the central mound, from which a stair led down into the magazine. 'B' shows the rear elevation on the line B–B. 'C' shows the ground floor plan of the battery, including the passage linking the two emplacements. The shell and cartridge lifts opened into this passage, flanking the staircase opening. 'D' shows the ground plan of the subterranean magazine, while 'E' and 'F' show, respectively, the cross-sections of the northern emplacement and the connecting passage and magazine. A DRF position had been added between the dates of the two plans, on the mound to the south of the southern gun (© The National Archives, WO 78/4173)

on a new site to the west (see below).[154] There is a plan in the Fort Record Book of the main structures of Pettycur, dated 1918, and a detailed plan of both batteries dated 1922. The best source for the Second World War is a near-vertical 1941 aerial photograph (Fig 11.84).[155]

Kinghorn, 1863–1902

The early development of this coast defence site was closely inter-linked with Inchkeith and much within the history of that site is not repeated here. The War Department bought a small parcel of land on the foreshore as early as 21 March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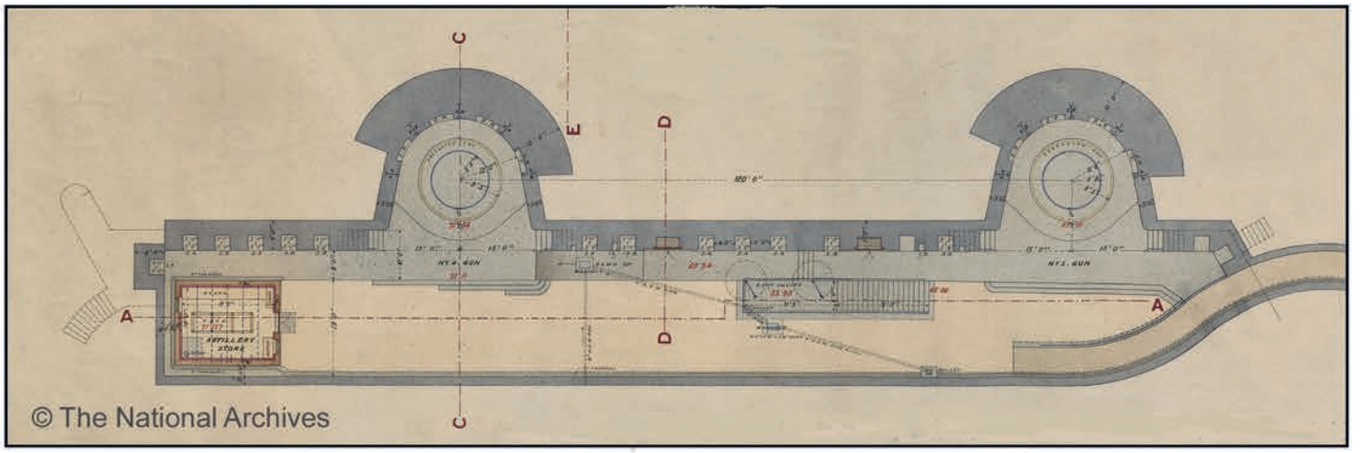
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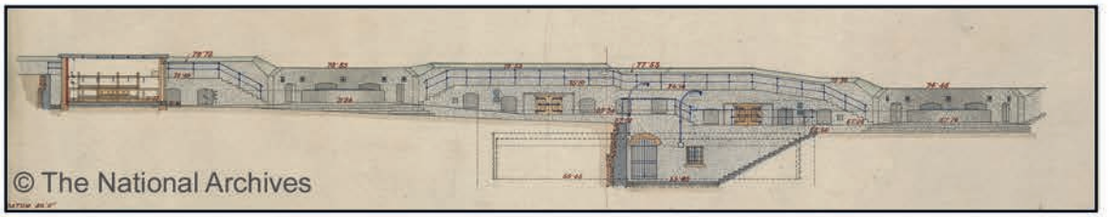
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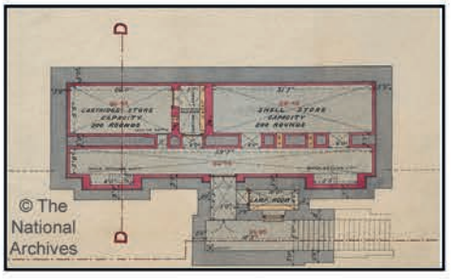
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CARTRIDGE STORE CAPACITY 200 ROUNDS
SHELL STORE CAPACITY 200 ROUNDS
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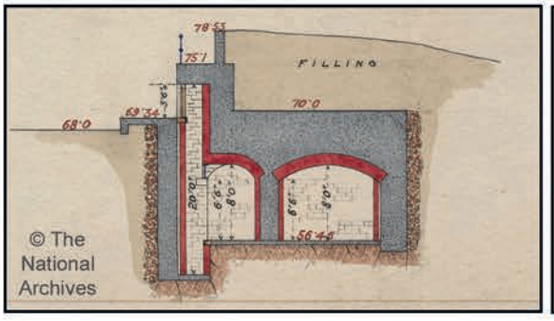
FILLING
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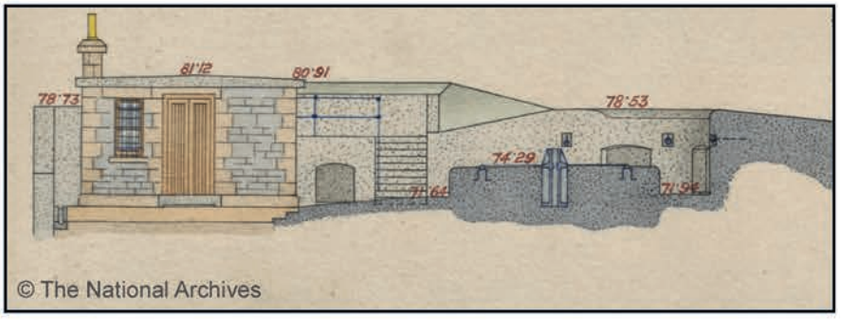
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1863 for a volunteer battery. The land for the main battery was purchased on 8 June 1878 (Fig 11.68).[156]

The construction work was undertaken by the same contractor as Inchkeith, Mr Hill of Spithead Fort Works.[157] The situation and terrain were far more accommodating than on Inchkeith, and despite the inclement and frosty weather during the autumn and winter of 1878, it was almost complete by June 1880.

The battery site incorporated Rossness House, which was used to provide accommodation for the gunners (Fig 11.69). When, on Friday 4 November 1881, a captain and 56 officers and men from the same detachment that had mounted the guns at Inchkeith arrived at the fort to mount the two 10-inch RML guns, they were quartered at Rossness House and Hayfield Cottages, nearby in Pettycur village. A further building in the garden of Rossness was also adapted for military use. A building at the south end of the battery compound (not shown on Fig 11.66) was marked 'Men's Quarters' on the 1890 map, and had an adjacent cookhouse.[158]

In 1880, the area to the north of the battery (that is, not the area bought in 1863) was occupied by an Artillery Volunteer (that is, field artillery) drill ground with, at its eastern edge, three gun platforms for muzzle-loaders on old-fashioned carriages fronted by a stone wall with an adjacent 'expense magazine'. A fourth gun platform occupied the north-west corner of the site, next to the 'Whitehouses' building. This land was bought in 1896.

The 1880 10-inch emplacement was surveyed in 1902 and it seems to have been altered only in detail in the intervening two decades. Figure 11.70 shows the different levels of the 1880 emplacement.

During early December 1886, *The Scotsman* reported that work was due to begin on erecting 'bomb-proof' barracks for over 100 men on an adjoining site, each costing £650. Only one barrack for 20 men was built, presumably the building mapped in the southern part of the battery compound in 1890. In 1902, Rossness House was recorded as a two-storey building with basement and attic in use as married quarters. A further barrack block had been built just south of the house by 1902.

The *Edinburgh Evening News* reported on 16 October 1891 that two of the 10-inch RML guns 'which had recently been removed from Inchkeith' were lying at Kinghorn Ness 'prior to being mounted on the high ground immediately adjoining the existing fort' (the Volunteer drill ground to the north).

Figure 11.72
Record plans, cross-sections and elevations drawn in 1902, showing the emplacements, built in 1899, to mount 10-inch Guns Nos 3 and 4. (A) Top Plan (damaged); (B) gun floor plan; (C) elevation of rear of battery (on line A-A shown on (A); (D) plan of the magazine; (E) cross-section of the magazine and the shafts of the quick-return lifts (on line D-D); (F) cross-section (on line C-C) through the northern gun pit ((C) The National Archives, WO 78/4250)

Figure 11.73
Surviving portion of the loop-holed boundary wall on Pettycur Road (© Gordon Barclay)

The dismounting and removal of the guns to Kinghorn was also recorded in the History of the Work on the Fort Record Book.[159] As it turned out, this second pair of 10-inch guns was not mounted until 1899. The two 10-inch guns removed from the South Fort on Inchkeith in 1898 are supposed to have been moved from Inchkeith to Montrose and Aberdeen.[160]

As described in Chapter 3, coast defence had to be able to deal with a new threat in the 1880s – the fast torpedo boat – and, between February 1892 and August 1893, an emplacement was built at Kinghorn for two 4.7-inch QF guns (Fig 11.71). Two similar guns were emplaced on Inchkeith in 1895. The 1902 Record Plan recorded what had been built at Kinghorn in 1893. Two inverted 'V'-shaped emplacements were set 30m apart, approached by broad stairs from the rear and incorporating many ready-use gun ammunition and small arms ammunition lockers. Between the two emplacements was a three-sided rectilinear enclosure sunk into the earthen carapace of the battery, with, on its seaward side, four lockers for small arms ammunition. Both gun platforms had their own stairs to a buried magazine. The staircases led into small lobbies which led on into the shell store. Both lobbies were also provided with hatches into the cartridge store. Both shell and cartridge store had capacity for 1,000 rounds.[161] As was usual in QF batteries, the ammunition was carried to the guns by hand. A separate building behind the guns provided shelter for the crews. When planned in 1902, the battery does not seem to have had a Depression Range Finder. By 1906, however, a separate DRF platform had been built behind the shelter, which by that date had been converted into a telephone room.[162] Local information suggests that the magazine of the battery still survives as the cellar of a house along the shore.[163]

The first practice shoot on the 4.7-inch QF guns – the first mounted in Scotland – was on 11 August 1894, and many officers in Scotland attended, including Major-General Hugh Rowlands, Commander of the Troops in Scottish Area, and Colonel Hobart, Commanding the Royal Artillery in Scotland. A large crowd of local people had also gathered to watch. The target was placed on the water at a distance of *c* 3,500 yards

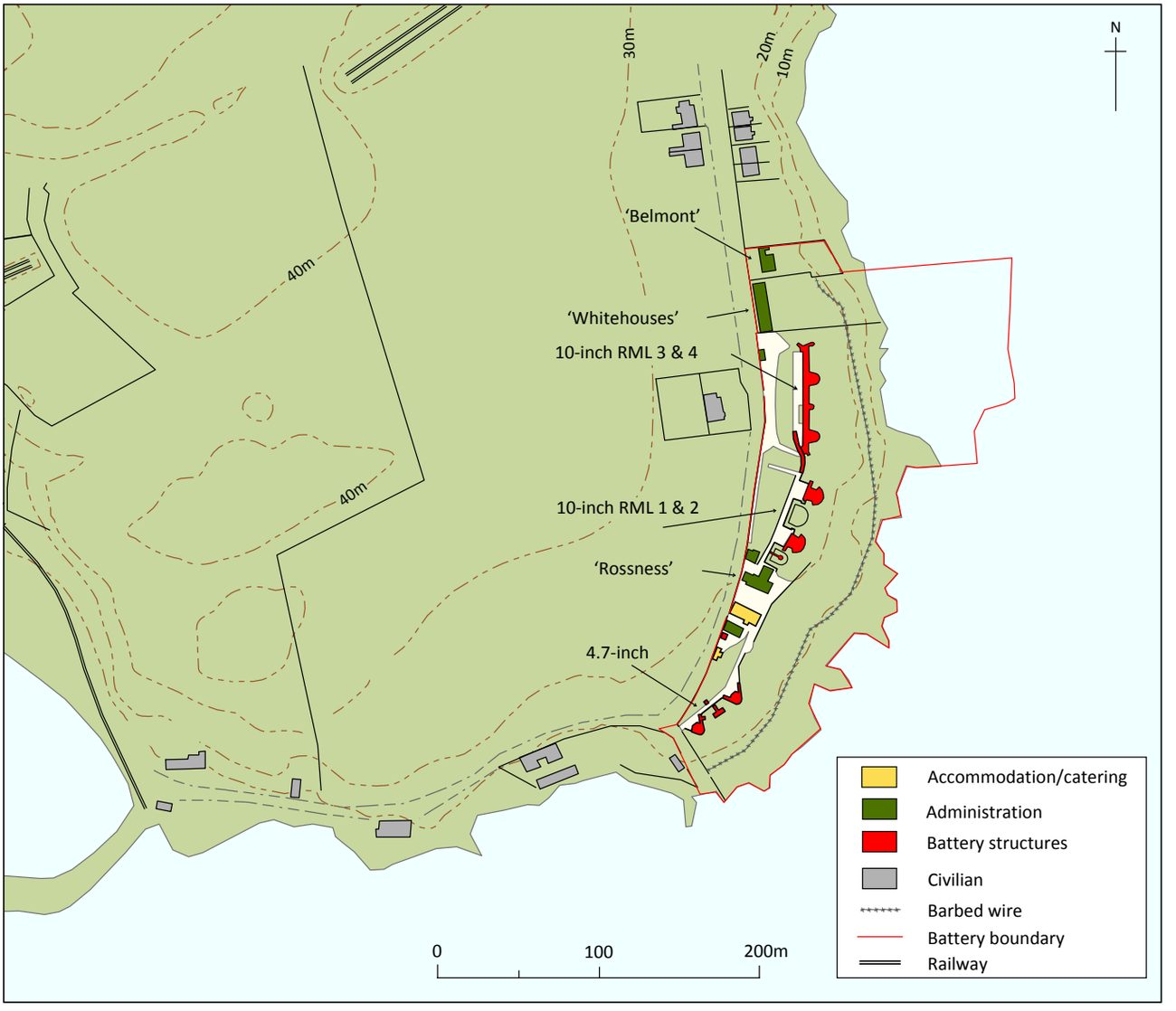
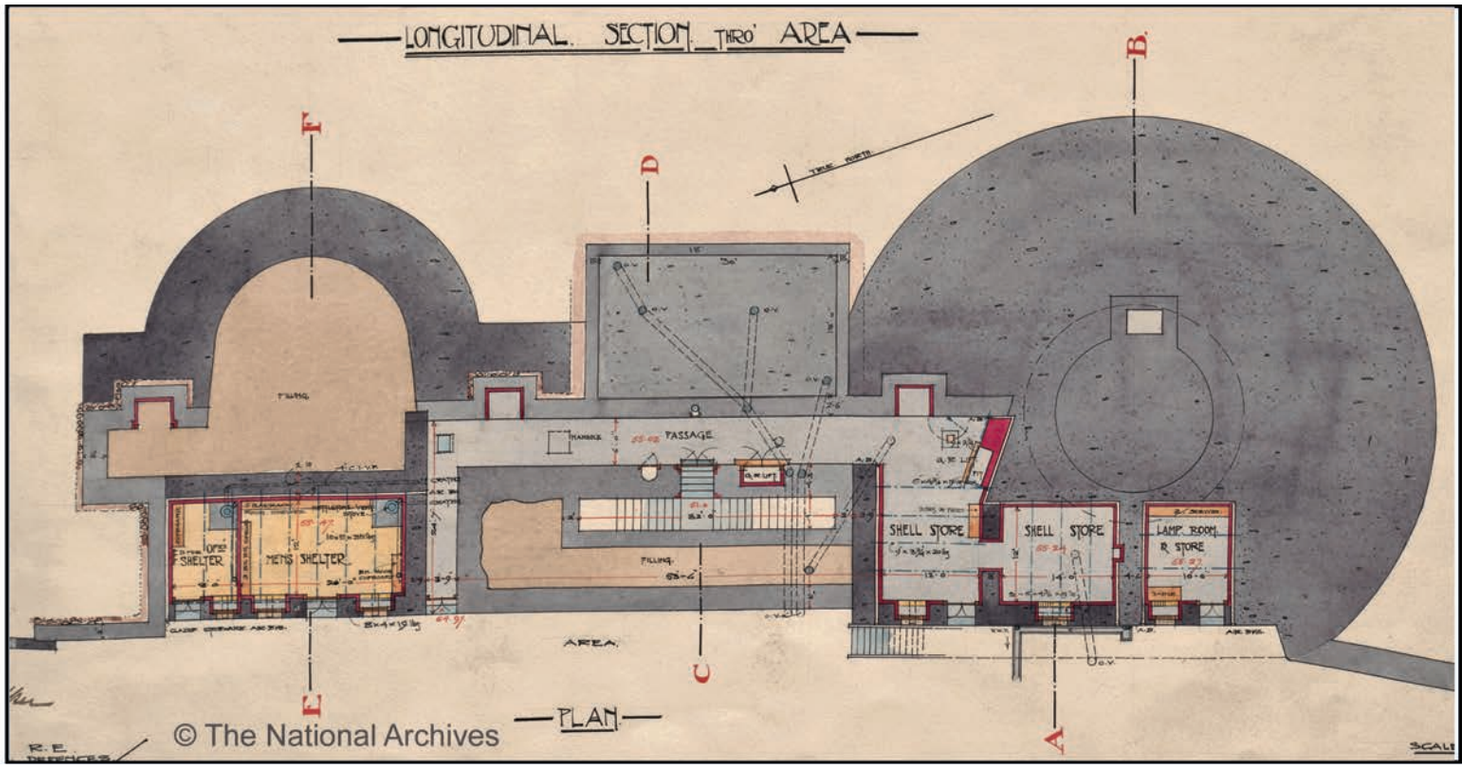


Figure 11.74
Plan of the whole battery complex in 1902 (© Gordon Barclay)

(3,200m), at which 24 shots were fired (with 'very satisfactory' results) from each gun over a period of 1¼ hours.[164] Although it was decided in 1899 that the 4.7-inch QF guns on Inchkeith were in the wrong place in the estuary, both the Kinghorn 4.7-inch guns remained in place (although dropping off the 'approved armament' in 1906) until 1914, when they were removed to arm the new battery at Downing Point.

As noted above, two additional 10-inch RML guns, withdrawn from Inchkeith, were mounted at Kinghorn in 1899 on the former Volunteer Artillery drill ground to the north, which had been purchased in July 1896 (Fig 11.72).[165] By 19 August 1899, the strengthened Kinghorn Battery was reported to be complete and ready for action. Although these two extra 10-inch guns had been part of the 'approved armament' for Kinghorn since at least 1894, the replacement of these obsolete weapons was recommended in January 1899 and they were off the Approved List by 1 December – the four 10-inch guns were to be replaced by a 9.2-inch and two 6-inch BL guns.[166]

Figure 11.75
Extract from the record drawings of the 9.2-inch emplacement at Kinghorn. (A) ground floor plan, showing the new buildings erected between 1902 and 1906, including new shell stores (the outline to the left is of the pre-existing 10-inch emplacement, which was buried); (B) rear elevation; (C) plan of the original 10-inch magazine, re-purposed; (D) cross-section A-B through the emplacement (© The National Archives, WO 78/5178)


LONGITUDINAL SECTION THRO' AREA
PASSAGE
SHELL STORE
SHELL STORE
LAMP ROOM
R STORE
MENS SHELTER
AREA
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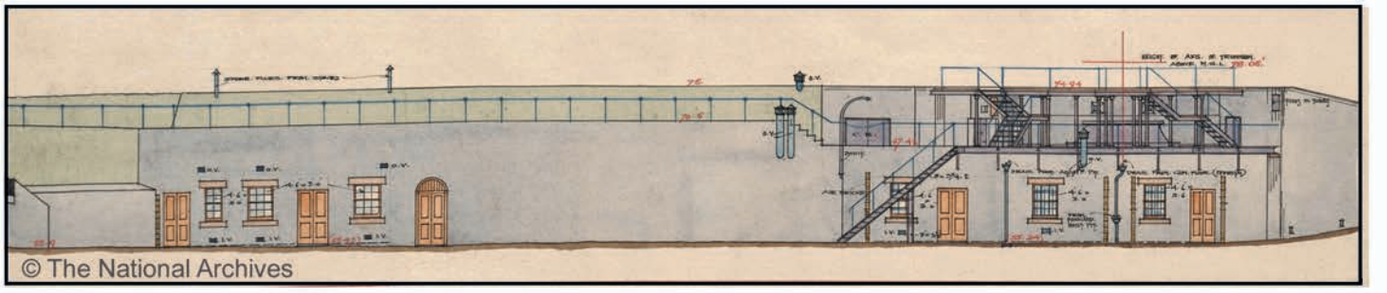
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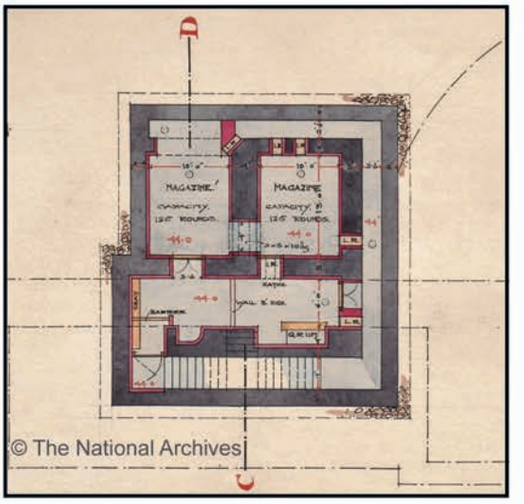
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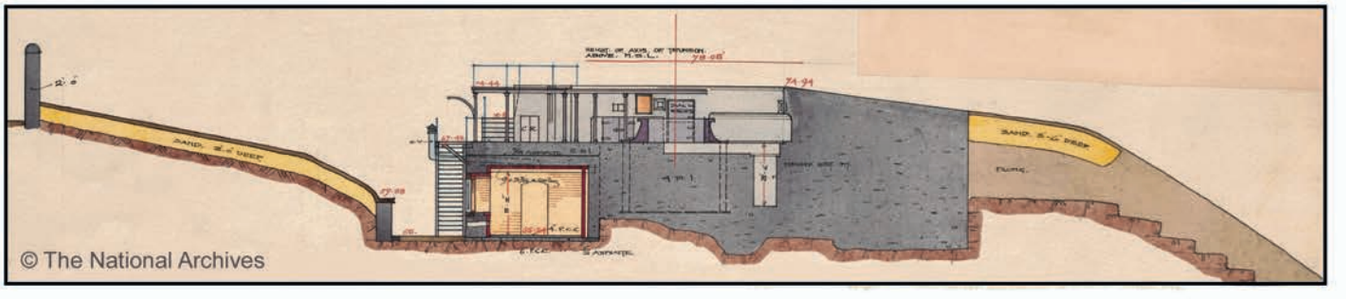
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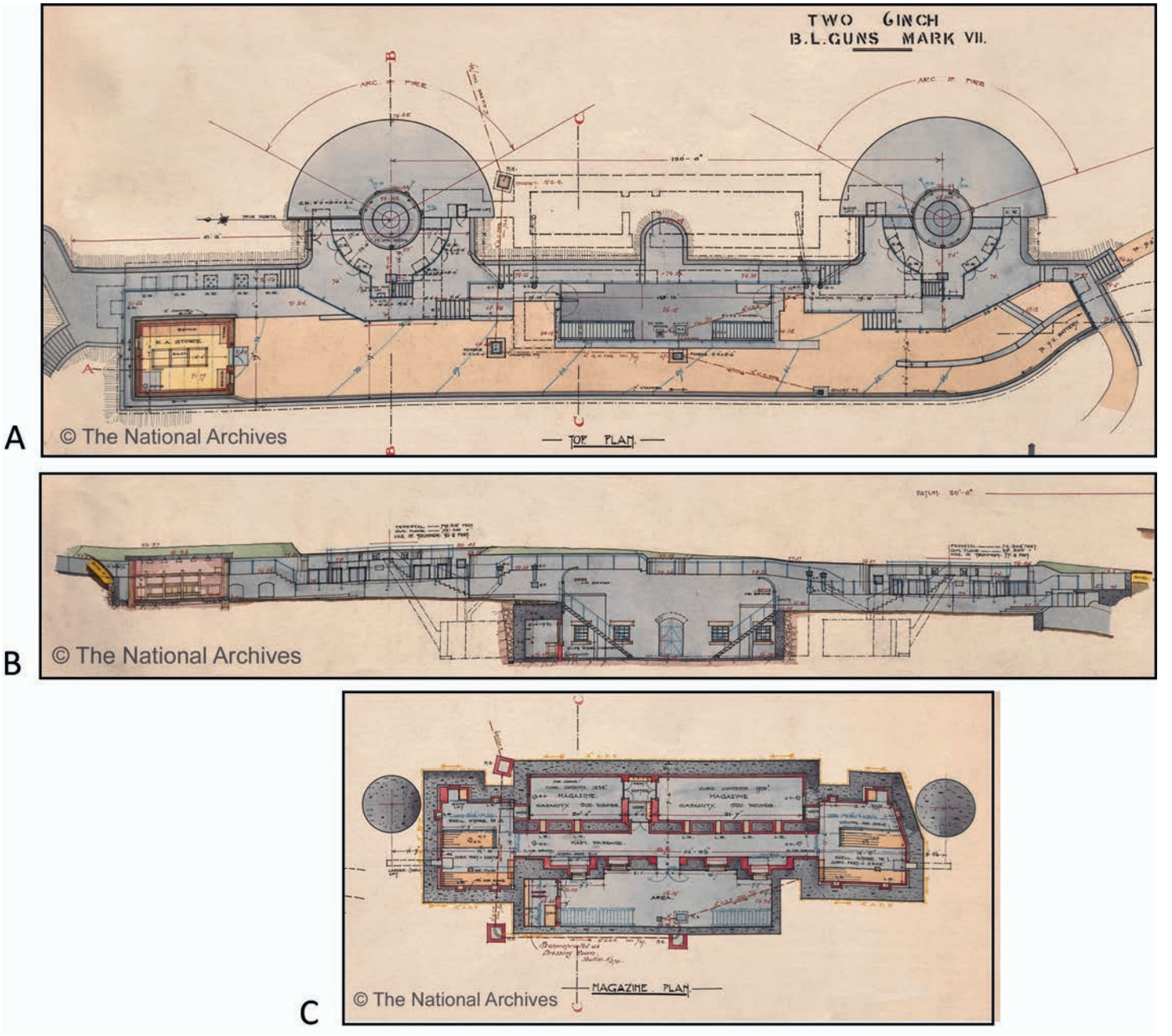

Figure 11.76
Extracts from the Record Plan of the 6-inch emplacements, as recorded in 1906. (A) emplacement level plan; (B) rear elevation; (C) plan of the magazine (© The National Archives, WO 78/5178)

The emplacements for the second pair of 10-inch guns (guns 3 and 4, which lay to the north of guns 1 and 2) were simple inverted 'U'-shapes with their open sides attached to a straight parapet. Behind the parapet and in the gun pits there were over 20 recesses for the storage of ready-use ammunition (Fig 11.72 (B)). A single stair led down to the underground magazine (Fig 11.72 (D)). At the bottom there was a lobby, from which the lamp room could be entered. The lobby led into a passage running the whole length of the magazine from south to north. This passage had two quick-return lifts, one for cartridges, one for shells. The shell store (capacity 200 rounds) was entered directly from this passage, while the cartridge store was entered through a shifting lobby. There was an issuing hatch into the passage, almost opposite the lift. A Royal Artillery store occupied the northern end of the emplacement at ground level. There was a Depression Range Finder position on the lobe at the northern end of the emplacement. The similar lobe near the centre of the battery may have been a

position from which to observe the fall of shot. The *Fife Free Press* reported on 19 July 1902 that the Fife Royal Garrison Artillery Volunteers were encamped at the Crying Hill, Kinghorn for the first time. The camp for a period of three weeks consisted of about 100 tents with hospital, guard room and canteen. The reporter described the Kinghorn Battery as 'one of the best equipped batteries or fortifications in Great Britain, where all the newish types of guns were mounted'. This was hardly a very accurate description of a battery armed with four obsolete, 30-year old, 10-inch RML guns and two 4.7-inch QFs. Instruction was given on the 4.7-inch QF and 10-inch RML guns, while others trained on the DRF, on signalling and telephoning.[167]

Provision was made for the close defence of the battery from the earliest days, when a high masonry wall, loop-holed for musketry defence, was built along Pettycur Road. A short section of the wall survives, with some of the loop-holes visible (Fig 11.73).

1903–14

The modernising and redevelopment of the battery began with the acquisition of additional property in June 1902, when the War Department bought two existing houses at the north edge of the site, known as 'Whitehouses' and 'Belmont', which were adapted as battery accommodation and offices. Work on the new 9.2-inch and 6-inch batteries began on 14 August 1903, and was completed on 31 October 1904. By 1906, a Battery Command Post had been built in advance of the front elevation of Whitehouses.[168]

The 9.2-inch emplacement was built over the emplacement of 10-inch gun No. 1, which was absorbed within a much larger concrete foundation, fronted by soil and sand (Fig 11.75). The old gun pit for 10-inch gun No. 2 was deeply buried under soil topped by sand, while the old magazine and its lift to the gun level continued in use to store cartridges; the two rooms of the structure were marked as, 'Magazine capacity 120 rounds'. A new two-room shell store and lamp room were built and there was a lift straight up to the gun pit from the passage outside the new shell store.

Fitting out the emplacement that had held 10-inch guns Nos 3 and 4 to take the two 6-inch guns involved more work than a superficial comparison of the 1902 and 1906 plans might suggest (Fig 11.72; Fig 11.76). A much larger sunken area was provided outside the magazine, and new windows were punched through the old shell and cartridge lifts. The old shell/cartridge stores were now cartridge stores, and separate shell stores for the two new guns were built at both ends of the underground complex. The shell stores were provided with 'ladder lifts' for the shells and 'band lifts' for the cartridges.

Uphill and slightly north from the 9.2-inch gun was its Battery Command Post, which had the appearance on the plans of a simple DRF platform. The 1906 plan was annotated in 1915 to show the replacement of the BCP by a more substantial structure.

As was normal, the concrete *glacis* of the 9.2-inch and 6-inch emplacements were fronted by soil topped off by *c* 1.1m of sand, so that almost nothing but the gun was visible from the front.

The final new element on the site was the provision of a battery of four 5-inch guns, for drill and practice, situated immediately in front of the main group of battery buildings but at a very much lower level, not far above sea level (Fig 11.77). Recent building work in the area has shown that the easternmost emplacement was bolted straight onto a flattened platform of the natural whinstone. It is now under a modern garage, but the owner has marked its location at the surface. The next emplacement to the west was located during the digging in of services.[169] The ammunition store for the 5-inch guns was on the shore, linked by a track to the 5-inch battery; this building survives, albeit in poor condition. The retaining wall behind the 5-inch guns was topped by concrete loop-holes for close defence; it survives.

The 1906 Record Plan (Fig 11.77) shows that the main group of buildings around Rossness House had been remodelled. Most strikingly, Rossness itself had been reduced to a single-storey, flat-roofed building.

At the end of the reconstruction programme in 1904, the battery was heavily armed with modern guns and was well equipped both for the defence of the river and for training, with adequate accommodation and all the necessary ancillary buildings (Fig 11.78).

In October 1904 (Fig 11.68), the War Department bought from the burgh the piece of ground on the promontory known as the Crying Hill, to build a new Fire Command Post and, above it, a Position Finding Cell, both partly buried (Fig 11.78).[170] The ground lay *c* 400m west of the battery, and was the highest point on the headland of Kinghorn Ness, reaching a height of 45m (that is, 10m above the battery), and had a commanding view. The site had been considered but rejected as the site of the 6-inch guns of the Kinghorn Battery.[171]

The Crying Hill structures (recorded in 1906) were of the kind familiar in the Forth – rooms provided with low, wide windows dug into the hill slope with the forward sections under sloping, turf-covered roofs. The role of the Fire Command Post here is not clear as there was also a structure mapped as 'Former Fire Command North' on Inchkeith by 1911. There were two Fire Commands in the Outer Defences until around this time, when they were combined on Inchkeith. The Scottish Defence Scheme for 1905 notes that the Fire Command Post at Kinghorn was not yet complete on 1 November.[172]

The test-firing of the new 9.2-inch and 6-inch breech-loading guns took place on 9 March 1905. It had been rumoured beforehand that the concussion of the 9.2-inch gun would be very heavy, but the firing caused no noticeable damage and the concussion was reported as not so violent

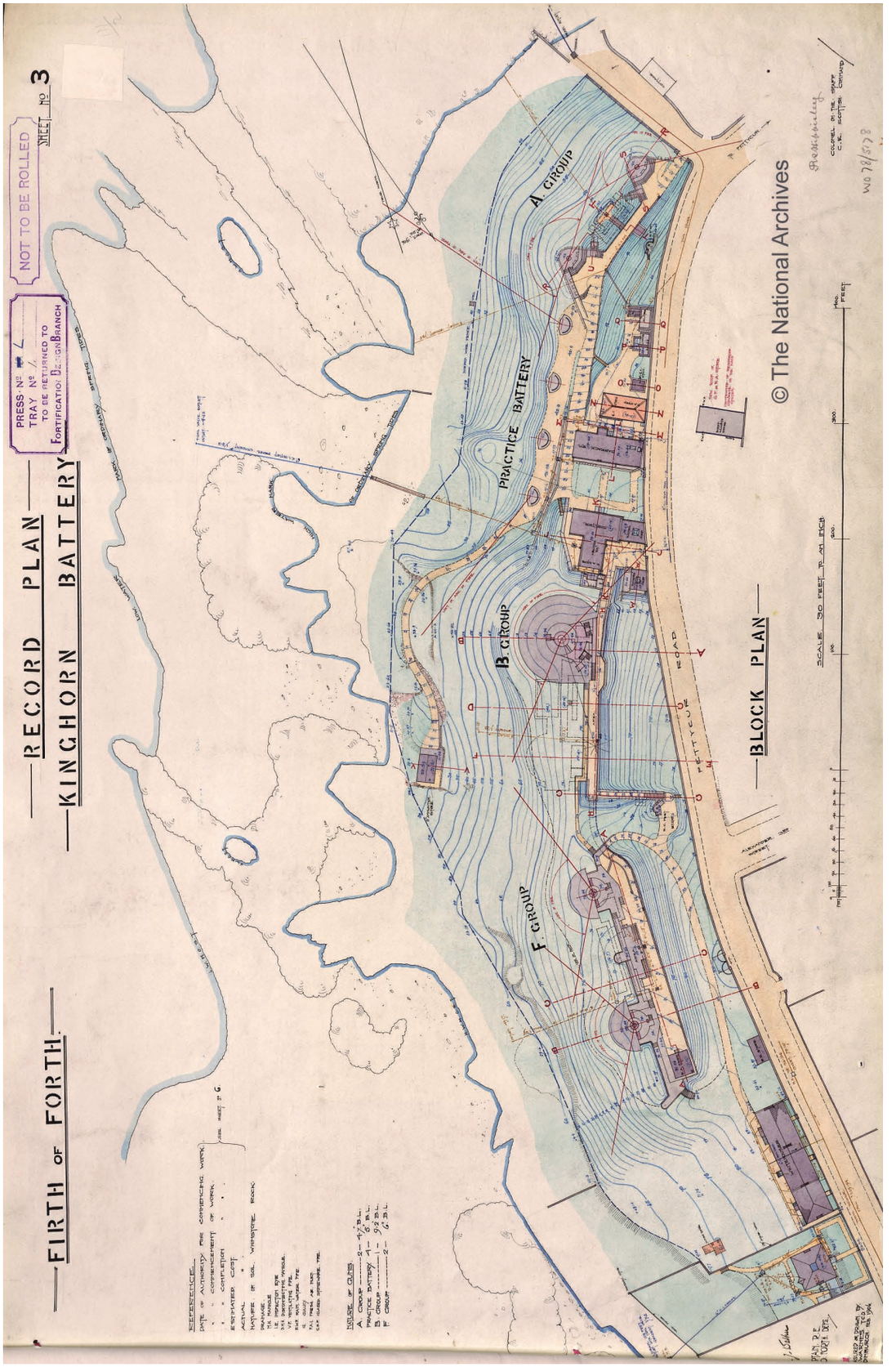

Figure 11.77
Royal Engineer plan of the whole extent of the Kinghorn battery in 1906 (© The National Archives (WO 78/5178))

as the old 10-inch RML gun.[173] Despite this sanguine report, the following collective letter from residents of Kinghorn appeared in the *Fife Free Press*:

> Two years ago … very much heavier guns were mounted, and every summer big gun practice is carried on, causing damage, for which no reparation is made. Our windows and our doors are smashed, the plaster of our ceilings is thrown down, our walls are cracked, our cisterns are shaken from their fixtures, the paving of our lobbies and the slates on our roofs are displaced and broken, but we can obtain no redress. We are told we must bear it, and pay for it, all for the good of the nation …[174]

The results of the 1905 Owen Committee on coast defence have been described in Chapter 4; at Kinghorn, by September 1907, the two 6-inch and two 4.7-inch guns had been removed from the 'approved armament' (although left in situ and listed for 'drill and practice' in 1913), leaving only the 9.2-inch gun. The 5-inch practice battery at Kinghorn (referred to as 'H' and 'L' Groups in the 1909 armament chart) was removed in 1908, at about the same time as that on Inchkeith. The Fort Record Book records that a Depression Range Finder for the 9.2-inch gun was delivered from the Ordnance Depot in Stirling in September 1913.

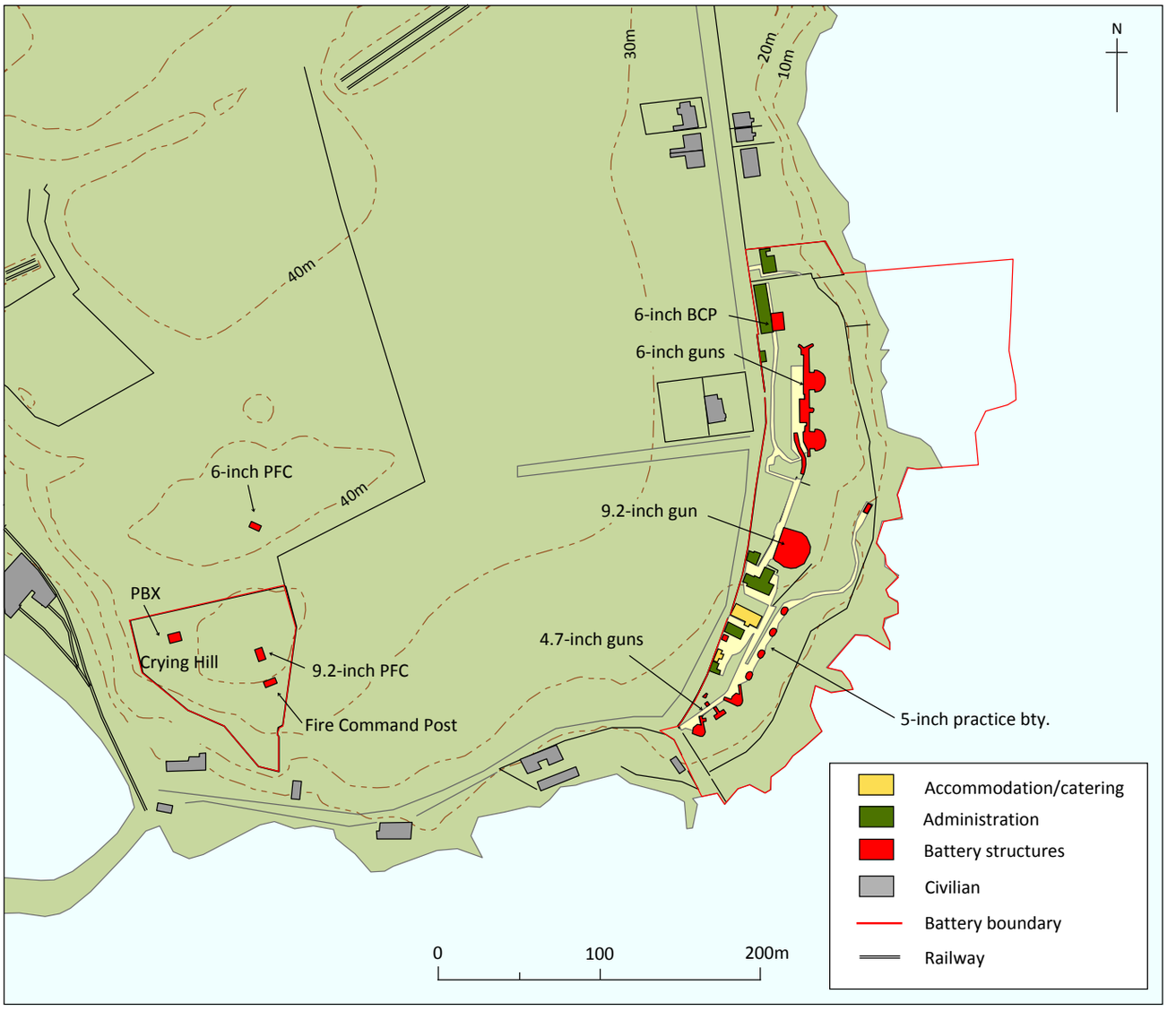

Figure 11.78
The layout of the Kinghorn battery in 1906, with the newly built Crying Hill structures. Oddly, the Position Finding Cell for the 6-inch guns is recorded as lying outside the War Department boundary (© Gordon Barclay)

Close defence: 1900–9

In 1900, provision was made in the Scottish Defence Scheme for the landward defence of the Kinghorn Battery and the adjacent shore, to prevent an enemy capturing it and pressing on to the Forth Bridge. The planned defences were to run in a line west-south-west to east-north-east from the north edge of the town to the high ground to the north-west. An infantry force of 240 was detailed to defend the Kinghorn Battery.[175] The Fort Record Book contains detailed plans (dated May 1907) for the close defence of the battery, showing that the Crying Hill site was to be surrounded by a barbed wire entanglement, and another would cover the entire front of the Kinghorn Battery at High Water Mark. Firing trenches were to be established on the boundaries of the battery and within and to the north of the Crying Hill site. Interestingly, the three houses at that date built in Alexander the Third Street were marked as to be put into a state of defence. In 1916, these three buildings were in War Department use, one as an officers' mess.

First World War

On the outbreak of war, the approved armament of Kinghorn comprised only the 9.2-inch BL Mk X on Mk V barbette mounting and two .303-inch machine guns on parapet carriages. The two 6-inch BL Mk VII on CP Mk II mountings were brought back into the approved armament on 8 August 1914, and were ready for action, with ammunition delivered from Woolwich, on the 13th.[176] On 5 September 1914, instructions were issued for the removal of the two 4.7-inch QF guns to Downing Point; they were sent in November.[177] The 9.2-inch gun was at that time known as 'R' Group while the 6-inch battery was 'S' Group.

The 1906 Record Plan was annotated to show that the original Battery Command Post (a simple platform for the Depression Range Finder) had been replaced by a more substantial structure, the change being annotated with the date of approval, '10-2-15'. The BCP and Electric Light Director Post for the 6-inch guns ('S' Group) was still situated adjacent to the 'Whitehouses' buildings in a plan of January 1918. The northern DEL was directed from this BCP. The former Fire Command Post on the Crying Hill was, by 1918, a Position Finding Cell for 'R' Group (the 9.2-inch gun).

Work was completed in 1916 on the installation of two DELs to the left and right of the batteries, and an engine room built behind a house, then owned by the Gibson family, in a bite dug into the cliff face at the south end of the Pettycur site. A second building, in front of the engine house, was built as a RA store. It is possible that this building adapted the earlier house. The Gibsons seem to have retained ownership, as the current owner's family bought it from them after the closure of the battery.[178] On the plans dated 27 January 1918, 'S' Group (the Kinghorn 6-inch battery) is shown as having its own BCP and ELD post just next to 'Whitehouses'. The north-east searchlight emplacement survives in very good condition, albeit with its roof now failing. Uniquely in the Forth, the sliding arced steel shutters survive, in the closed position (Fig 11.79).

The military were inconsistent in their recording of naval buildings on the battery sites, and, as far as we knew, the Naval Signal Station built near the southern edge of the Kinghorn Battery was not marked on any of their maps. The two-storey building, resembling an enlarged DEL emplacement, survives and has been incorporated into a modern house (Fig 11.80).

Figure 11.81 shows the layout of the battery in 1916–18; the three houses then standing in Alexander the Third Street and a further house on Pettycur Road were in War Department occupation, serving as the officers' mess, as men's quarters, and a dressing station; the fourth, the large house on the corner of Alexander the Third Street and Pettycur Road, was 'occupied by O[officer] C[commanding]

Figure 11.79
The northern DEL housing, with its steel shutters surviving
(© Gordon Barclay)

Figure 11.80
The two-storey naval signal station incorporated into a modern house
(© Gordon Barclay)

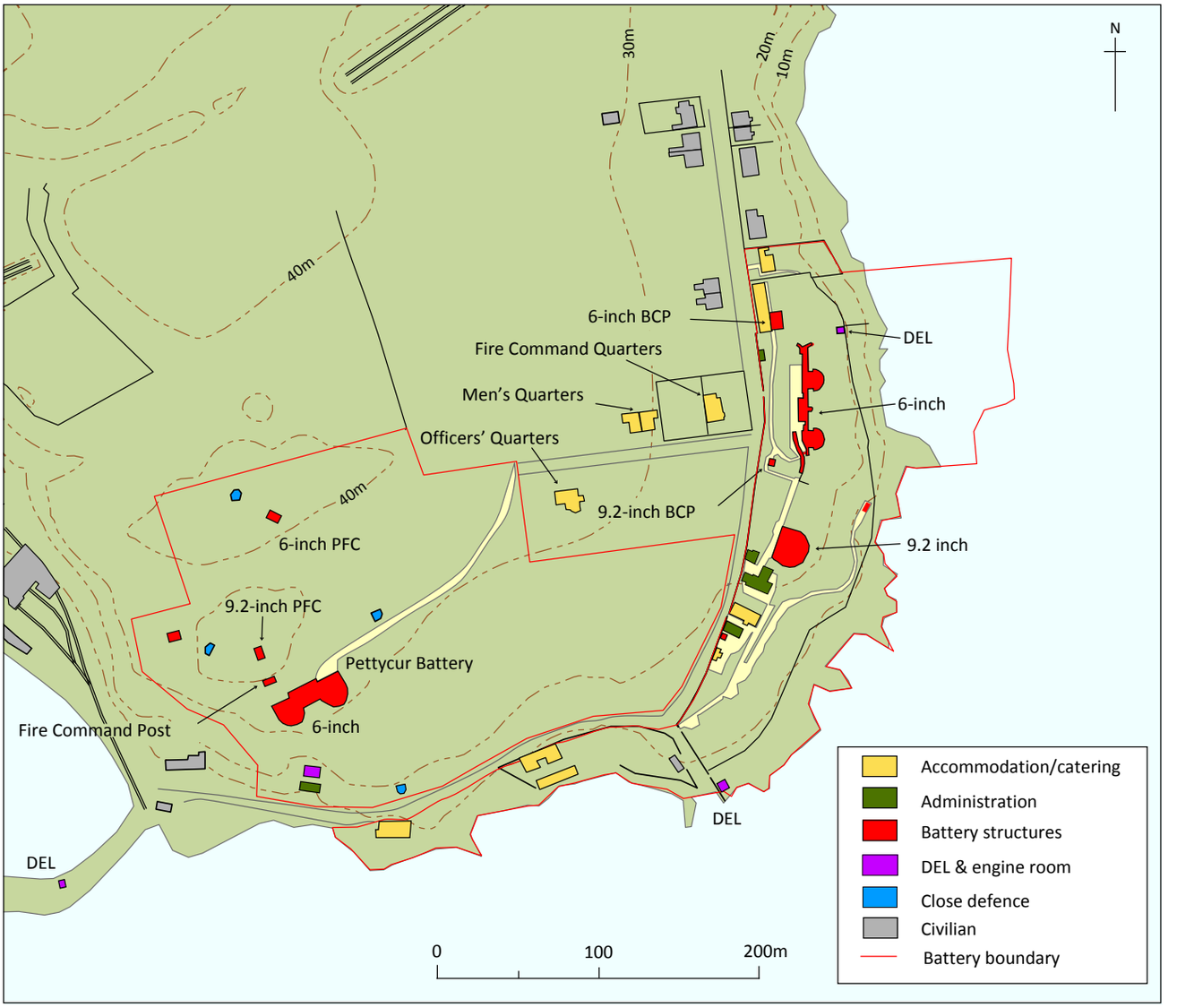

Figure 11.81
The Kinghorn/Pettycur complex in the second half of the First World War (© Gordon Barclay)

No. 3 Dist. Forth defences (Kinghorn) and staff'– that is, the Fire Commander.

In July 1916, before the revision of the Forth's defences, the 9.2-inch gun had two officers (a Battery Commander and Gun Group Commander) and 36 other ranks (the DRF and DPF both had three-man details; four telephonists; gun detachment of 13 men; ammunition detachment of eight men; storeman; lamp-man; two officers' servants). The 6-inch guns were manned by three officers (Battery Commander, Gun Group Commander and relief) and 55 other ranks (including a three-man DRF detachment; 22 man gun detachment with 11 reliefs; eight-man ammunition detachment; a Master Gunner; Artificer; storeman; lamp-man).[179]

The general revision

In the general revision of the defences, a new battery was added on the headland, incorporating the existing Crying Hill site and to be known as Pettycur. It was armed with two 6-inch guns transferred from the battery at Carlingnose. The land for the battery seems to have been bought as early as May 1914.[180] The guns were ready for action on 7 January 1917. An additional DEL was provided for the Pettycur Battery in 1917, on the corner of Pettycur pier; it survives in good condition (Fig 11.82).[181] The three Kinghorn/Pettycur DELs were recorded in February 1917 as having three RE officers and 45 sappers to operate them and the engine room, with an additional officer and sapper for maintenance work.

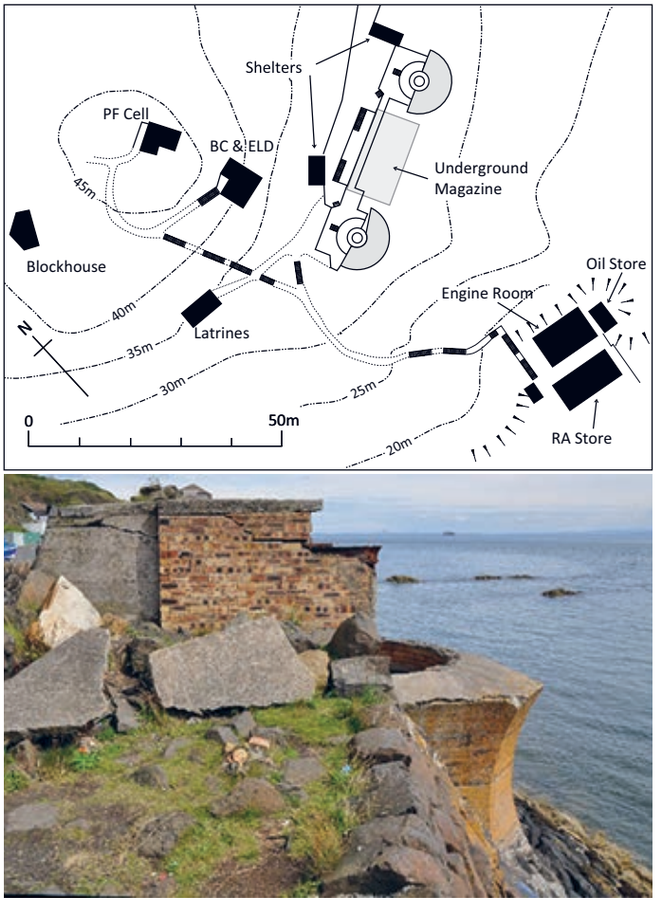

Figure 11.82
The Pettycur battery in 1922, based on a plan on the Fort Record Book (WO 192/250), showing the guns ('Q' Group), the BCP and the PFC for 'R' Group (the Kinghorn 9.2-inch), shelters, latrines, engine house and RA Store. Below is a modern photograph of the DEL housing on Pettycur Pier (© Gordon Barclay)

There are no detailed drawings of the Pettycur structures, but the layout seems to have been of a fairly standard design: the two 6-inch guns ('Q' Group) in circular emplacements with, between them, a buried magazine accessed by two stairways into an open area. There were also two shelters and a latrine. The Battery Command Post lay just behind the guns, converted from a pre-existing Position Finding Cell. The PFC for 'R' Group, the 9.2-inch gun, was in the former Fire Command Post immediately behind this, and a new PFC for 'S' Group (the Kinghorn 6-inch guns) was added. Part of the gun pit for gun 'Q1' (the southern gun) survives in the garden of the care home now occupying the site; the latrine building survives just outside the garden, apparently in good structural condition; the Battery Command Post also survives, albeit in an inaccessible position on an unstable slope visible from the gun pit.

The Fort Record Book records that one of the Mk VII 6-inch guns at Kinghorn was dismounted and sent to Calais on 11 July 1917; the battery was left only partly armed until 11 May 1918, when a replacement gun was sent up from Woolwich.

Landward defences

Elaborate landward defences were built during the First World War.[182] The coastal approach from Kirkcaldy was blocked by a series of barbed wire entanglements in front of firing trenches and more substantial 'redoubts'. The northern and north-western inland approaches to the town were also blocked.

A map on the Fort Record Book, dated 27 January 1918, shows the location of five machine gun posts round the battery site; three were distributed to the north-east and west of 'Q' Group at Pettycur; one was positioned on the clifftop below Whitehouses; the third was on the clifftop in front of 'S' Group (the Kinghorn 6-inch guns). The 1922 map of Pettycur shows the location of three blockhouses, one of which (see below) had been built in 1914. One of these survived in good condition until 2016, but by then had been unroofed and partly demolished, with two walls being incorporated into a new building (Fig 11.83).

In the General Mobilization Scheme, the 7th (Territorial Force) Battalion the Black Watch was detailed for coast defence and was allocated to War Stations at Kinghorn and Burntisland. 'Preparatory Movement' was ordered on the evening of 31 July 1914 and a 'Special Service Section' of three officers and 117 other ranks arrived in Kinghorn on 2 August. The Special Service Section had conducted a test mobilisation earlier in the year and occupied Kinghorn Fort for two days, when, together with the Regular artillery, it took part in firing practice and night manoeuvres in conjunction with the fleet. The main body of the battalion arrived at its War Stations during the evening of 7 August.[183]

The General Officer Commanding Scottish Coast Defences visited Kinghorn soon after the battalion's arrival

Figure 11.83
One of the Crying Hill blockhouses, in course of transformation, 2016 (© Gordon Barclay)

and announced that an attack in force by the Germans might take place at any moment; it was possible that a landing might be effected somewhere on the east coast of Fife, with the object of taking Kinghorn Fort, the defences at Rosyth and the Forth Bridge in rear. It was to foil such an attack that the landward defences were built; the construction of these works was completed in an intensive period of 36 hours of almost continuous digging by the 7th Battalion, 60 per cent of the men being connected with the mining industry.

For the first three months after mobilisation, the line was occupied in force under conditions closely approximating to those of active service, although it was not until into 1915 that the battalion could appear, fully equipped, in the full Black Watch kilted uniform.

The supposed danger of invasion was not entirely removed, nor were the trenches completely evacuated till early 1915, but by degrees the garrison was reduced and, at the end of December, consisted only of detached sentry posts.

Between the Wars

On 17 April 1918, approval was given to move the Depression Range Finder from the disarmed battery at Braefoot to the Crying Hill at Kinghorn, for the 6-inch guns ('S' Group). This work was completed on 14 November 1919. In May 1920, Pettycur was put into care and maintenance, while the 9.2 and 6-inch guns at Kinghorn were to be retained for drill and practice. However, a map of 1919, amended in 1922, marks the Pettycur Battery as for training only. A new battery telephone exchange was built at that time in the north-west corner of the Pettycur site; this seems to have been part of a wholesale upgrading of telephone communications between the coast defence and signal stations in the first half of the 1920s.[184] On 9 July 1920, the 9.2-inch gun was condemned, and could in future only be used for a 'half series' of firing. Later that month, the two .303-inch Maxims issued in 1917 for close defence were returned to the Stirling Ordnance Depot. Two Vickers .303-inch machine guns were issued in March 1930 and withdrawn again on 10 July 1933. Lewis guns were issued in April 1937.

The 'History of the Work' on the Fort Record Book[185] tells a rather confusing story of the replacement of the old Mk II shields on the 6-inch guns with the larger Mk IV. There is an undated photograph, sadly too blurred for publication, which shows the Pettycur Battery with the eastern gun mounting a Mk II shield, with the other in a Mk IV, as part of the Interim Defence Scheme. This pattern of replacement is the same as on Inchkeith in 1931. The Fort Record Book also records the withdrawal and reallocation of all the sighting equipment in the battery in April 1931. As the international situation deteriorated, 'Q' Section (the Pettycur guns) was brought into the Approved Armament of the Forth in March 1938. 'R' Section (the 9.2-inch) was included in the reserve armament of the Forth in the same month. 'S' Section (the Kinghorn 6-inch guns) was nominated as Examination Battery in January 1939.[186]

Complaints from the residents of Kinghorn about the noise continued to be a regular thing over the years. In 1929, Kinghorn Town Council requested their local MP, Mr Tom Kennedy, to take the matter up with the Government. The response from the War Office was that practice was only carried out once a year and that it was essential that the guns should be kept in a serviceable condition. They went further, however; hitherto, the Territorial Army had practised on Kinghorn Battery, but they would henceforth use only Pettycur, in conjunction with Inchkeith, and there would be no full-charge firing. The resumption of heavy gun practice in 1938 prompted more complaints, and Mr Kennedy again raised the matter in the House of Commons on 21 June.[187]

Second World War

In October 1939, a War Office file recorded a proposal to provide a second DEL and a third generator at Pettycur. Given that there were three surviving DEL housings on-site from the First World War, it is not clear which of these might have been in use, and what was to be added.[188]

A high-resolution aerial photograph dated 6 April 1941 shows the layout of the battery, clearly in a state of transition (Fig 11.84). 'S' Group (the two 6-inch guns of Kinghorn Battery) are shown as having their overhead protection in place. The 9.2-inch emplacement is shown as without overhead protection, and apparently empty.[189] Of the two 6-inch guns of 'Q' Group (Pettycur), the western ('Q/1') appears to have its overhead protection in place, while the other looks very much as though it has had only its rear protection built, not its overhead cover. In the south-east part of the Pettycur site, the photograph shows a dog-legged line of 14 Nissen huts, with a water tank at the angle change. Behind the Pettycur guns, the photograph shows the walls, or more probably the brick bases, of over a dozen incomplete buildings. A close-defence plan on the Fort Record Book, dated August 1942, shows that only eight of the completed Nissen huts were then in place, although it also marked which private houses were in military occupation. It is recorded that, like the batteries of the Inner Line, Kinghorn was provided with a 4.5-inch howitzer, and practice firing was noted in the War Diary from May 1943 onwards.[190]

By June 1942, Home Guard personnel from the 5th and 8th Fife Battalions were involved in crewing the guns, and the numbers of trained men increased, by September, to one officer and 81 other ranks.[191] In January 1944, Kinghorn was recorded as being in care and maintenance, while Pettycur was manned by Home Guard (apart from Regular manning on the DELs).[192]

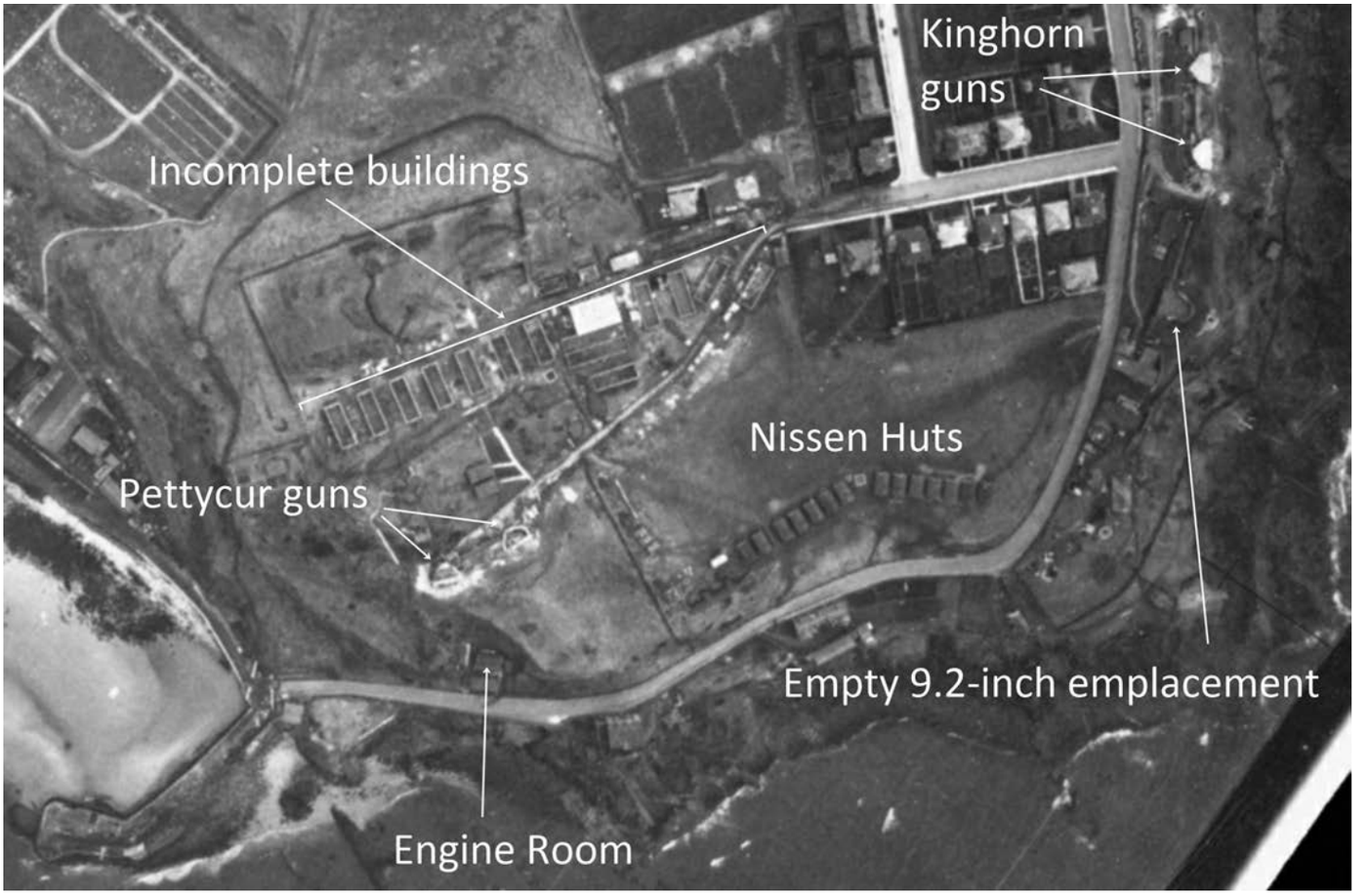

Figure 11.84
Aerial photograph taken on 7 April 1941 (© National Collection of Aerial Photographs www.ncap.org.uk)

Post-war

The 'History of the Work' on the Fort Record Book was written up to March 1949, with a single manuscript addition for the following month noting that the 120cm searchlights had been removed and replaced by 90cm Mk 5 lights. Notice was given in the *Fife Free Press* issue of 3 October 1953 that the naval authorities advised that a Bofors gun would be fired from Kinghorn Battery point, between 9 a.m. and 4.30 p.m. from Monday to Friday of the following week. We have no further information.

Survival

Very little remains from the original fort: the loop-holed boundary facing Pettycur Road; the original vehicle gate with its pedestrian gate; and a brick-built shed near the north end. All three searchlight emplacements remain in good condition. The northern still has its steel shutters; the middle is now a summer house; and that on the pier has been made safe by the removal of its overhanging roof. Retaining walls within the battery and most of the concrete uprights of the security fence survive. The latrine and PFC on Crying Hill survive. Of the guns, only the gun pit of gun 'Q1' at Pettycur and the front glacis of the 9.2-inch survive. However, it is reported that underground parts of the battery survive under (or incorporated within) later structures.[193]

11.3 Leith Docks

First World War

Batteries on the southern shore were planned to the west of Leith, at Granton, between 1888 and 1898.[194] In 1888, 1889 and 1894, batteries were proposed at Leith,[195] but nothing was built there until the 1916 revision of the defences. The battery was established on the north-eastern flank of Leith Docks, on reclaimed land at a corner of the sea-wall, giving an arc of fire of almost 180° (Fig 11.85). The relative height of the ground

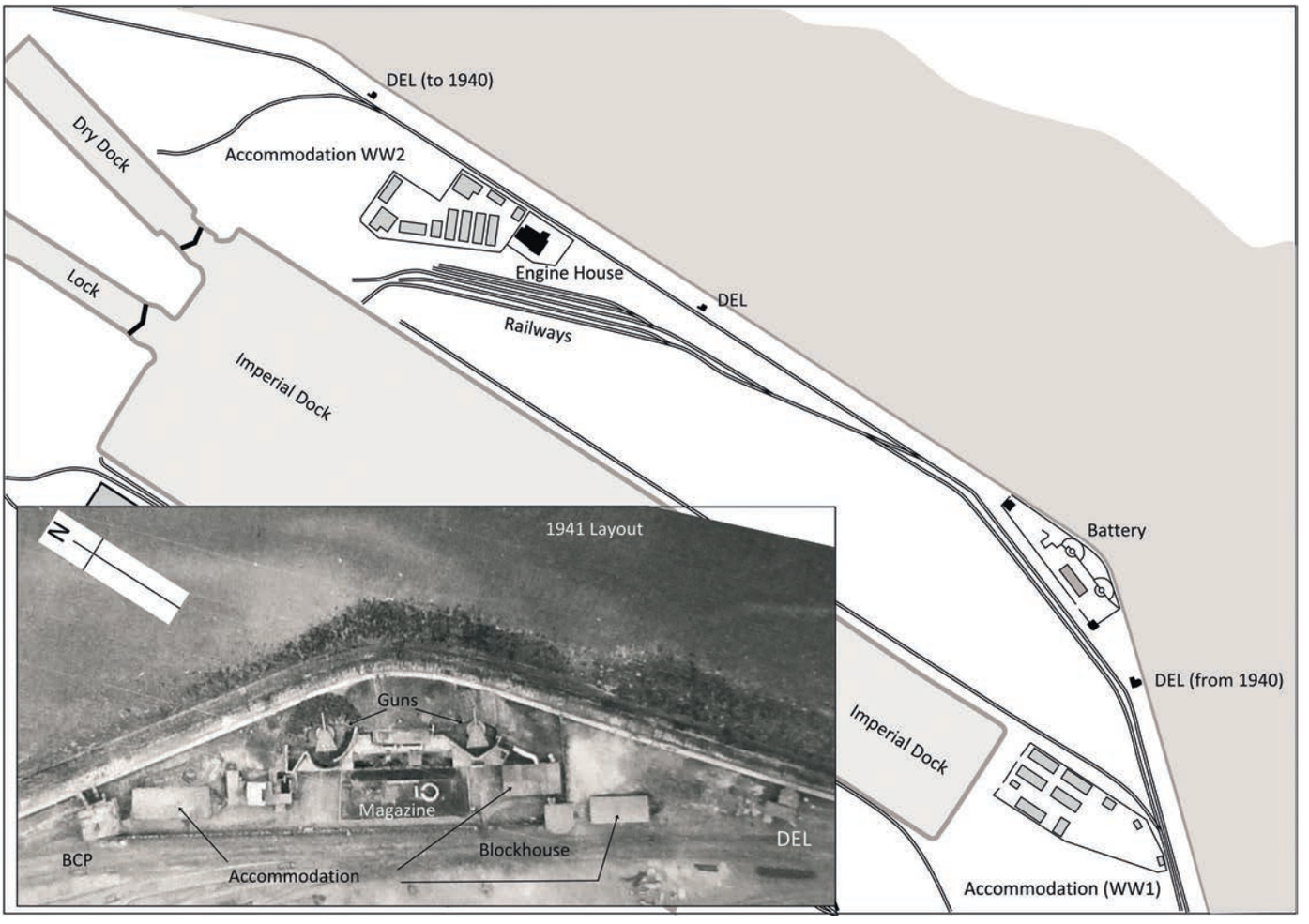

Figure 11.85
Leith Docks. The location of the First and Second World War features and, inset, an annotated aerial photograph from 1941, before the overhead protection was provided (RAF. Out of copyright)

level to the sea level beyond the wall meant that the depth to which structures could be buried before hitting the water table was limited.

Many of the papers on the Leith Docks Fort Record Book, even though the book was in use until the 1950s, date from the inter-war period. Two very useful plans of Leith Battery for the Second World War were unexpectedly found in the Fort Record Book for Coastguard Battery.[196] A set of drawings dated 27 June 1916 shows the location and design of the proposed battery, the Defence Electric Lights, the engine room and the encampment for the men.[197] A combined Battery Command and Electric Light Director Post was built just to the west of the guns.[198]

The gun platforms were built on deeply set drums of concrete, under which pilings had been necessary in the made-up land. The guns were fronted on the seaward side by a sloping glacis rising from the top of the sea wall. The magazine was built behind and below the gun platforms, excavated partly into the made-up ground behind the wall. All ammunition had to be manhandled. There were shell and cartridge recesses built into both gun emplacements.[199]

The guns for the battery, two 6-inch BL Mk VII, on Central Pedestal mountings, were transferred from Hound Point and were mounted and 'in action' by 5 December 1916. Two .303-inch Maxim machine guns were approved as an addition to the armament and arrived in October 1917.[200]

The emplacements for the moveable fighting lights both lay along the sea-wall to the north-west, 230m and 485m from the battery. The engine room was built between the lights, 350m from the battery and 30m behind the sea-wall, dug in to half its height, the upper part of the building being protected by an earthen embankment.[201] The lights and engine room were manned by two RE officers and 30 other ranks.[202]

An 'unclimbable fence' was built around the site, and a blockhouse was built in the southern corner. A separate fence was built around the engine house compound, with a machine gun emplacement on the west corner.[203] The encampment for the garrison of the battery lay due south of the guns, tucked into space left amongst the railway lines.[204]

Between the wars

Between the wars, there were plans to reclaim more land at the docks, which necessitated planning a new battery on the line of the new sea-wall.[205] However, the land was not reclaimed until after the battery was dismantled in the 1950s.

A proposal in 1930 to build a new Battery Command Post to a similar design to that on the West Fort at Inchkeith was not carried through.[206] The two Mk II shields were replaced by Mk IV shields in 1931, as part of the work undertaken to implement the Intermediate Defence Scheme and, as elsewhere in the Forth, more modern HE Mk XXb shells were issued. With a full charge, the guns (recorded on 7 May 1935) could achieve effective ranges of 3,425 yards (*c* 3,130m) (against a battleship), 3,075 yards (*c* 2,810m) against blocking ships, 2,100 yards (*c* 1,920m) against destroyers and 1,775 yards (*c* 1,620m) against motor boats.[207]

An aerial photograph of the docks dated 3 September 1935 shows the battery in its cramped and insalubrious situation, between the sea-wall and a dense pattern of railway sidings for the adjacent coal loading port, with the two DELs, the engine room and the Battery Command Post. It cannot have been a pleasant posting.[208] A photograph taken by a German spy in the 1930s shows the guns and BCP from nearby (Fig 11.86).

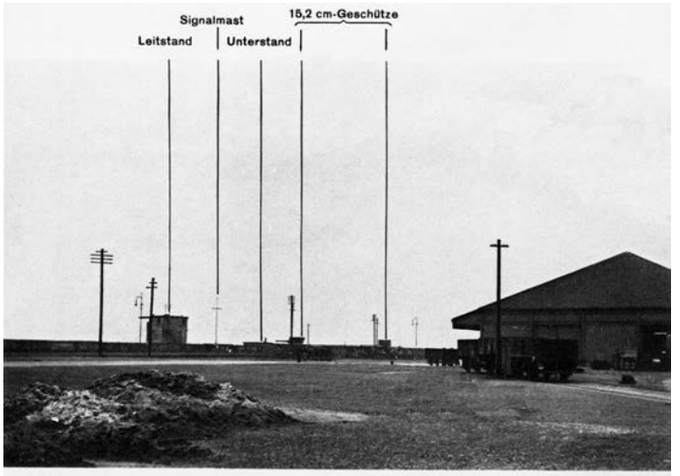

Figure 11.86
A photograph of the Leith Docks battery taken in the 1930s, by a German sailor or agent (Oberkommando der Kriegsmarine, via A Liebold)

An undated sketch plan on the Fort Record Book of the main part of the battery shows the locations of two Lewis guns mounted for anti-aircraft defence, one on top of the Battery Command Post, the other on the roof of the defensive blockhouse at the south corner of the enclosure. The Fort Record Book of Kinghorn records the installation of Lewis guns in April 1937, and this may be the same time as Leith.[209] The ground floor of the BCP building also had a loop-hole facing north-west along the sea wall.

The Second World War

Two very clear RAF aerial photographs, dated April 1941, show the two guns in their enveloping Mk IV shields (Fig 11.85); the emplacements had no overhead protection at this stage.[210] In January 1940, it was decided that one of the two DELs at Leith (the western one, farthest from the battery) would be shifted to a new position east of the battery, as the former position had been found 'for some time past to be unsatisfactory, owing to the fact that both lights are on the same flank of the battery …'.[211]

In the Second World War, the battery accommodation was split between a main camp, with messes and so on, just west of the engine room, and a few huts within and just adjacent to the battery.[212] By early 1942, 60 Home Guard volunteers were receiving training at the Leith Battery, and it was believed that they would form a valuable resource, as the men had agreed to give full-time service.[213]

In June 1943, as part of the 'Flood Tide' reduction in coast artillery, the Leith Battery was listed as part of 505 Coast Artillery Regiment, RA, as a 'Close Defence' battery, to be reduced to 'cadre'.[214] A list of January 1944 shows the battery as manned by Home Guard, with Regulars manning the DELs.[215]

Post-war

In 1952, instructions were issued for the dismantling and disposal of the two 6-inch guns and their mountings. The work was undertaken between 21 September and 2 October and they were removed by road to Woolwich. The DELs were dismantled in October and sent off by road to storage at Donnington. In November, further instructions were received at the battery to place all remaining equipment under 'heavy care and protection', as the battery had been listed as surplus to the 'Basic or the Reserve Scale of Defence' for the Forth. This had been completed by April 1953.[216]

The battery, including the engine room and DEL emplacements, were 'finally handed over to Commanding Royal Engineer Lowland District' on 31 August 1955. Work began immediately on dismantling the works and no trace is believed to remain.[217]

Notes

1 WO 33/873.
2 WO 78/5162; WO 78/5160; WO 192/251. The surveys of 1911 and 1918 survive in their entirety, each of seven sheets, in the collections of the National Library of Scotland (C18:13(4)) and the British Library (X.4961) respectively. The 1893 edition survives only in sheets used to mark up later proposals and as preserved on War Office files; the southernmost sheet has not yet been located. The maps are very detailed, with most structures labelled as to their purpose; many redundant structures were also marked and identified.
3 Copies of the 1:2,500 maps of 1893 ('Photozincographed at the Ordnance Survey Office, Southampton, 1893') survive on four War Office files: WO 78/5159, WO 78/5160, WO 78/5180, WO 78/5158. The 1911 map ('Surveyed in 1891. Revised in 1909–10') survives in its original form on WO 78/5157 and in an edition revised to 1914 on WO 78/5156. Also in the National Library of Scotland. We did not locate a 1918 1:2,500 map.
4 WO 192/251.
5 Aspects of the fortifications of Inchkeith itself have been the subject of four articles: the water supply, by Ruckley (1984); the record of a short visit by members of the UK Fortifications Club, in 2004 (UK Fortifications Club 2005); the record of survey and excavation on the island in 2001 (Pollard and Banks 2008); and an account of the Inchkeith batteries that had their origins prior to 1914 (Stevenson 2014).
6 A number of modern writers state that the whole island was sold to the War Department in 1879. The Registers of Scotland, however, record the sale in 1891; RHP2704; RHP48586; RHP93657.
7 *Fife Free Press*, 11 July 1891.
8 *The Scotsman*, 23 August 1878.
9 Grant 1884: 292.
10 *The Scotsman*, 23 August 1878 and 4 July 1881.
11 *The Scotsman*, 1 July 1884.
12 *The Scotsman*, 18 October 1879.
13 *The Scotsman*, 30 July 1884.
14 *The Scotsman*, 14 October 1880; Grant 1884: 293–4.
15 Smith 1985: 92.
16 UK Fortifications Club 2005.
17 WO 78/4751.
18 WO 396/2; WO 78/5180.
19 Pollard and Banks (2008: 123–4) report a door in the southern rock-ditch of the South Fort, 'which had clearly come from inside the *caponier*'. We believe that the differentiated fabric is too irregular to have formed any sort of formal entry and that it is more likely that the undoubted hole may represent an access made for the introduction of a piece of equipment; two holes have been made in the lower parts of the walls of the *caponier* to route cables, we believe, from the engine house to the defence searchlights. They also reported the presence of a doorway through the wall of the fort into the northern rock-cut ditch. We could not find such a door, which could only have been accessed through a tunnel cut through the rock, and no such tunnel has been located.
20 Grant 1884: 294.
21 WO 192/251.
22 Grant 1884:293.
23 Smith 1985: 93.
24 *The Scotsman*, 4 July 1881.
25 *The Scotsman*, 19 July 1881.
26 Bill Clements, pers comm.
27 *The Scotsman*, 19 July 1883.
28 Smith 1985: 95.
29 WO 32/5528.
30 *Evening Telegraph*, 19 July 1884.
31 *The Scotsman,* 24 Aug 1885.
32 *The Scotsman*, 16 April 1885.
33 WO 33/5.
34 *The Scotsman,* 25 July 1888.
35 *The Scotsman,* 27 July 1889.
36 *Edinburgh Evening News*, 11 November 1889.
37 *Fife Free Press*, 1 Feb 1890.
38 *Edinburgh Evening News*, 25 March 1890.
39 *Fife Free Press*, 1 August 1891.
40 CAB 18/22A.
41 WO 78/4328; WO 78/5180.
42 *The Scotsman*, 9 June 1892.
43 WO 78/5157.
44 *The Scotsman*, 24 December 1892.
45 WO 78/5157.
46 The West Battery also has a vertical ladder down into the lamp passage of the 1880 magazine.
47 WO 78/5157; Ordnance Survey 1911 *War Office. Fifeshire, Inchkeith 1:500* 1911.
48 *The Scotsman*, 25 September 1893.
49 The guns were still recorded as mounted on 1 January 1898 (CAB 18/19).
50 CAB 7/6.
51 Pollard and Banks's (2008: 114) mention of the ladder lifts, in a paragraph dealing with the 1880 fort, can be read as implying that the lifts were part of the original design; however, they run directly to, and are integral with, the 1899–1900 6-inch gun platforms.
52 WO 78/5159.
53 WO 78/4751; WO 192/251.
54 WO 78/4328.
55 WO 192/251.
56 WO 192/251.
57 Stevenson (2014: 81) suggests that four of the practice guns were muzzle-loaders. The armament chart attached to the Scottish Defence Scheme of 1909 (WO 33/491), however, lists the practice guns as four 5-inch, two 6-pdr QF and two 3-pdr QF guns, all breech-loaders.
58 Ordnance Survey 1911 *War Office. Fifeshire, Inchkeith 1:500.*
59 Pollard and Banks 2008: 130–1. Some confusion has arisen about the earliest date that the practice batteries were mapped. Pollard and Banks (2008: 130) suggest that they were marked on the 1891/1893 1:2,500 map. It is, however, only shown on the edition of this map revised to 1909–10 (which is reproduced as fig 2 in their report). Both editions of the map are on the same War Office file (WO 78/5158).
60 CAB 18/19; WO 33/381.
61 WO 78/4328.
62 WO 33/766.
64 Pollard and Banks 2008: 124.
65 Ordnance Survey 1911 *War Office. Fifeshire, Inchkeith 1:500.*
66 WO 78/5159.

67 'BLC' – breech-loading converted – guns were Mk IV and Mk VI 6-inch guns whose breech mechanisms had been modernised to the Mk VII standard and extended to take a more powerful charge. It has been suggested (UK Fortifications Club 2005; Stevenson 2014: 81) that the BLC practice guns were mounted on the 5-inch practice emplacements. The Armament Table attached to the Scottish Defence Scheme of 1909, however, explicitly states that the four 6-inch BLC guns were mounted in 'A' and 'M' Groups (the North and South Batteries); Ordnance Survey 1909 *War Office. Maps to Accompany the Scottish Coast Defence Scheme*; WO 33/491.
68 WO 78/5157; WO 78/4328.
69 WO 78/3856.
70 Ordnance Survey 1911 *War Office. Fifeshire, Inchkeith 1:500.*
71 WO 78/5158.
72 WO 78/5158.
73 WO 78/5157.
74 WO 192/251.
75 WO 192/251.
76 *The Scotsman*, 26 February 1907.
77 Ordnance Survey 1911 *War Office. Fifeshire, Inchkeith 1:500.*
78 *The Scotsman*, 28 October 1911; Ordnance Survey 1911 *War Office. Fifeshire, Inchkeith 1:500*; Morrison-Low 2010: xxiv.
79 *The Scotsman*, 29 July 1913.
80 *The Scotsman*, 28 November 1913.
81 Unfortunately, the 'History of the Fort' on the Fort Record Book does not mention any of the DELs.
82 WO 78/5162.
83 WO 78/5162.
84 WO 78/5180.
85 WO 78/5180.
86 WO 78/5180.
87 Morrison-Low 2010: xiv.
88 WO 33/766.
89 WO 78/5179.
90 WO 33/810.
91 By the time of the 1918 map of Inchkeith, the DELs at the South Battery were numbered Nos 1 and 2; those on the West Stell, Nos 4 and 5.
92 Ordnance Survey 1911–18 *War Office. Inchkeith, Fifeshire. 1:500.*
93 Pollard and Banks 2008: 126–9.
94 WO 78/4417
95 Ordnance Survey 1911–18 *War Office. Inchkeith, Fifeshire. 1:500.*
96 WO 78/5156.
97 LP/WNC/31/4/56–76 1914–1915 (Labour History Archive and Study Centre, University of Central Lancashire).
98 Light ND.
99 Baker ND. A 'reception hospital' was for the 'temporary reception and detention of lighter cases pending their distribution to hospitals throughout the country, or their discharge to duty' (Macpherson and Mitchell 1921: 180).
100 WO 78/5156.
101 2nd Lt Archibald Hugh Houston Ross (later CBE, 1896–1969) served with the Royal Garrison Artillery on Inchkeith. It is possible that he also served with the Royal Engineers. He later served with the Indian Forest Service and the Forestry Commission, rising to become the Director of the Forestry Commission in Scotland. We are grateful to Lt Ross's daughter, Mrs Fiona Buchanan, for permission to reproduce his beautiful and informative drawings.
102 *The Scotsman*, 31 August 1931.
103 *The Scotsman*, 14 December 1914.
104 *The Scotsman*, 17 December 1914.
105 *The Scotsman*, 31 August 1920.
106 In correspondence, Department of Transport.
107 WO 192/251.
108 ADM 116/2493.
109 WO 192/252.
110 The UK Fortifications Club account suggests the 'A' Group guns went to Inchcolm, not the other way round. We know, however, that Inchcolm was disarmed in 1930–1 (WO 192/108).
111 WO 192/251.
112 Hogg 2002: 116.
113 CAB 13/8.
114 The southern 12-pdr holdfast takes the form of a steel plate 1.22m in diameter with, concentric to it, an outer ring of six bolts 97cm in diameter, and an inner one of 18 bolts 70cm in diameter. The two holdfasts are at NT 29565 82380 and NT 29570 82362. The northern holdfast is largely concealed by turf; it was discovered only by a remarkable piece of field observation by RM.
115 The closure of the Royal Artillery Museum in 2016 meant that we were unable to check Ordnance records for the Forth.
116 *The Scotsman*, 25 May 1936.
117 ADM 1/9848.
118 WO 78/5179.
119 WO 192/251.
120 Bruce Stenhouse, pers comm.
121 *The Scotsman*, 13 November 1939.
122 Finlayson 1983: 46–8.
123 Charles Grant, pers comm.
124 Finlayson 1983: 46–8.
125 *Edinburgh Evening News*, 26 December 1974.
126 *Fife Free Press*, 24 February 1940. There are two versions of a story about what happened next: first, that on the following morning the Master Gunner travelled round to Salamander Street, not to apologise, but to collect the dummy shell (J A Potter, pers comm); second, that the shell was returned to Inchkeith with a note 'We believe this belongs to you' (Jeffrey 1992: 137). What is certain is that the shell did return to the island, and Charles Grant kept a piece of its driving band.
127 No women were stationed permanently on Inchkeith in the Second World War, but a detachment of about a dozen ATS was sent out daily by boat to the island from Leith (*The Scotsman*, 15 November 1940).
128 WO 166/2296.
129 Fold 3/Admiralty War Diaries.
130 WO 166/2128.
131 WO 199/1171.
132 Taylor 2010: 130.
133 Bruce Stenhouse, pers comm.
134 WO 166/2362.
135 UK Fortifications Club 2005.
136 WO 199/2818.
137 We were able to locate six in 2017: NT 29568 82375 (beside practice battery); NT 29139 82822 (Cawcans Ridge); NT 29285 82910 (by Fire Command North); NT 29385 82699 and NT 29390 82715 (both beside AA guns on ridge of island); NT 29540 82282 (South Fort). RM believes that he saw others many years ago, when the island was less vegetated.

138 WO 166/11408.
139 WO 199/1171.
140 WO 166/2362; WO 166/11210; WO 199/1137.
141 War Office 1942.
142 WO 166/11408.
143 WO 199/954B.
144 WO 199/1171.
145 WO 287/78.
146 *The Scotsman*, 15 November 1940.
147 WO 166/15002.
148 *The Scotsman*, 15 November 1940.
149 *The Scotsman*, 15 November 1940.
150 *The Scotsman*, 15 November 1940.
151 We believe that the 'Mk VII+' may be the Mk VII^{v} described in 1913, being differentiated by a thicker tube and a 'Single Motion Breech Mechanism' (Royal Regiment of Artillery 1913a).
152 *Edinburgh Evening News*, 17 July 1953.
153 WO 192/250.
154 WO 78/4173; WO 78/4250; WO 78/5178.
155 The battery structures were omitted from publicly available Ordnance Survey maps published in 1920 and 1947 (both surveyed immediately before the respective wars) and, in a post-war Ordnance Survey photo-mosaic published in 1950, the battery complex was 'painted out' with false fields and buildings.
156 WO 192/250. The map of land purchases has been built up from information in the Registers of Scotland (Search Sheet 9669; SS 0620; SS 14771; SS 0121), files in the National Records of Scotland (E886/98), and a Treasury file in the National Archives, Kew T 1/15865.
157 *The Scotsman*, 23 August 1878.
158 WO 78/4173.
159 WO 192/250.
160 WO 192/251; CAB 7/6; CAB 18/19.
161 Unlike smaller-calibre QF guns, which had propellant and shell in a single piece, the 4.7-inch shell and propellant were stored separately and loaded sequentially.
162 WO 78/5178.
163 David Wilson, pers comm.
164 *Fife Free Press* 18 August 1894.
165 WO 192/250.
166 CAB 18/19; CAB 7/6.
167 *Fife Free Press*, 26 July 1902.
168 WO 78/5156.
169 David Wilson, pers comm.
170 Registers of Scotland. Fife, Search Sheet 14771.
171 WO 78/4173.
172 WO 33/381.
173 *Fife Free Press* 11 March 1905.
174 *Fife Free Press* 25 August 1906.
175 WO 33/173; WO 33/381; WO 33/444; Barclay and Morris forthcoming.
176 WO 192/108.
177 WO 192/108.
178 Owner, pers comm.
179 WO 33/766.
180 Registers of Scotland Fife Search Sheet 14771.
181 WO 192/250.
182 WO 78/4417; WO 78/4396.
183 Wauchope 1925: 239–40.
184 ADM 1/8667/164.
185 WO 192/250.
186 WO 192/250.
187 *Fife Free Press* 13 April 1929 and 25 June 1938.
188 WO 199/1171.
189 The Fort Record Book notes that the 9.2-inch gun of 'R' Group, and its Position Finder, had been dismantled between February 1939 and the date of the entry, in March 1949. The 1941 aerial photograph seems to show the gun emplacement empty.
190 WO 166/11409.
191 Osborne 2009: 197–8.
192 WO 199/954B.
193 David Wilson, pers comm.
194 CAB 7/6; CAB 18/19
195 *Fife Free Press*, 30 June 1888; *The Scotsman*, 10 December 1889; CAB 18/22A.
196 WO 192/104.
197 WO 78/5176.
198 WO 78/5176.
199 WO 192/252.
200 WO 192/252.
201 WO 78/5176.
202 WO 78/5179.
203 WO 78/5176.
204 WO 78/5177.
205 WO 78/5176; CAB 13/3; CAB 12/5.
206 WO 192/104.
207 WO 192/252.
208 NCAP-000-000-083-156 1935 *Leith Docks*. National Collection of Aerial Photography, Historic Environment Scotland: Aerofilms.
209 WO 192/250.
210 WO 192/252.
211 WO 199/1171.
212 WO 192/104.
213 Osborne 2009: 196.
214 WO 199/527.
215 WO 199/954B.
216 WO 192/252.
217 WO 192/252.

Chapter 12

THE OUTERMOST DEFENCES

Between the Kincraig and Fidra batteries, the Forth Estuary is 14.3km wide, most of which is navigable. The history of the consideration of the armament of an outer line, either on the Elie–Fidra line or the May Island line, is summarised in Part II. To the west of the line lay the important port of Methil, at the west end of Largo Bay, which from 1924 had been identified as the major convoy mustering point for the east coast.[1] In the First World War, there were no gun defences east of Inchkeith.

In the inter-war period, the main seaborne threat to the Forth was considered to be an attack by light cruisers, destroyers, submarines and fast motor torpedo boats, on vessels moored in Largo Bay, Leith Roads, and naval vessels at anchor between Inchkeith and the Forth Rail Bridge. Recommendations were made to move the outer line of coast batteries eastwards and mount 6-inch gun batteries at Caiplie on the Fife shore, on the May Island and at Gin Head on the East Lothian coast, which would have effectively closed the estuary to any hostile shipping. Despite the obvious logic of these proposals, they failed to materialise, in part for financial reasons, and in part because of uncertainties caused by the 'gun v aeroplane' debate (see Chapter 6 above). In July 1939, the Joint Defence Committee recommended that counter-bombardment batteries, to engage warships standing off and firing into the Forth at long range, should be established on the north and south shores of the Forth, in the vicinity of Fife Ness and Gin Head. The siting of a further battery of two 6-inch BL guns on Mk V (45°) mountings near Gullane was proposed to cover the narrower portion of the Forth in conjunction with the battery at Kincraig (Elie). The precise relationship between this discussion and the establishment of the Fidra 'emergency' Battery at some point early in 1940 is not clear. In August 1941, the Home Forces Coast Defence Committee recommended the installation of two 9.2-inch batteries to north and south of the Forth, but again these proposals came to nothing.[2]

12.1 Kincraig, Elie

Kincraig was the final permanent battery to be sited in the Forth. It was hurriedly constructed during the early days of the Second World War, but later modifications provided it with the most modern guns in the estuary, and the only gun-laying radar. The site's height (60m above sea level) and location made it an obvious choice. Its main objectives were to: protect merchant shipping in the convoy anchorage; act as advance look-out station for the Forth defences as a whole; prevent the entry of any enemy vessel; prevent beach landings; and engage at long-range, enemy vessels approaching or attempting to bombard shipping in harbour.

For the coast battery proper, there are two main sources of information: the Fort Record Book[3] and a file of correspondence relating to the defences of the Forth.[4] While the Fort Record Book has useful maps and photographs, its documents are sparse and often undated. The 'History of the Work' on the Fort Record Book is explicitly based on the memories of men who had served at the battery for four years, rather than on documents, and is consequently perhaps not wholly reliable. RM has collected reminiscences of the battery, both from personnel who served there and from local people, which informed his book about the area, written with Mike Ramage.[5]

In late September 1939, four 25-pdr field guns (from 109 Battery, 78 Field Regiment, RA) were sent to Kincraig to provide temporary cover while the more permanent battery was built.[6] The field guns were provided with a temporary wooden Battery Observation Post, *c* 2.5m higher than the guns.

Two 6-inch BL Mark VII guns were mounted on CP MK II 15° mountings in October by Major R Shrive, RA, of the Armament Withdrawal Party. They were on simple holdfasts set at ground level, without any form of cover or protection, which at least had the advantage of allowing them a large arc of fire, including inland (Fig 12.1; Fig 12.2).[8] It was only in January 1940 that the War Department bought the battery site.[9]

A two-storey Battery Observation Post (BOP), designed to look like an abandoned domestic building, was built a short distance behind the guns, where it had the best all-round view of the battery's field of fire. The upper level contained the Battery Command Post and the telephone exchange. The lower

level contained the watch-room and stores. Two Royal Marine signallers were stationed to communicate with shipping using semaphore and Morse code.[7] After about a year, three RN signallers were sent to assist.

Behind the summit of the hill on which the guns were positioned, and therefore out of the line of fire, six underground magazines were completed in June 1940 by unit labour and civilian contractors. These magazines were used to store high explosive, armour piercing, solid shot, practice shells and cartridges (Fig 12.1).

During the early construction of the battery, the camp's main supply of water came from a single tap, which says much about the conditions on the emergency batteries.

At first, there was only a single barbed wire perimeter fence, extending down the cliffs on both sides onto the beach. A small armoury near the battery office contained a stock of Lee Enfield .303-inch rifles for use by the camp's garrison. There were no anti-aircraft defences. In the early days, between 20 and 30 National Defence Corps members were stationed at the camp to act as sentries and man the searchlights. A map

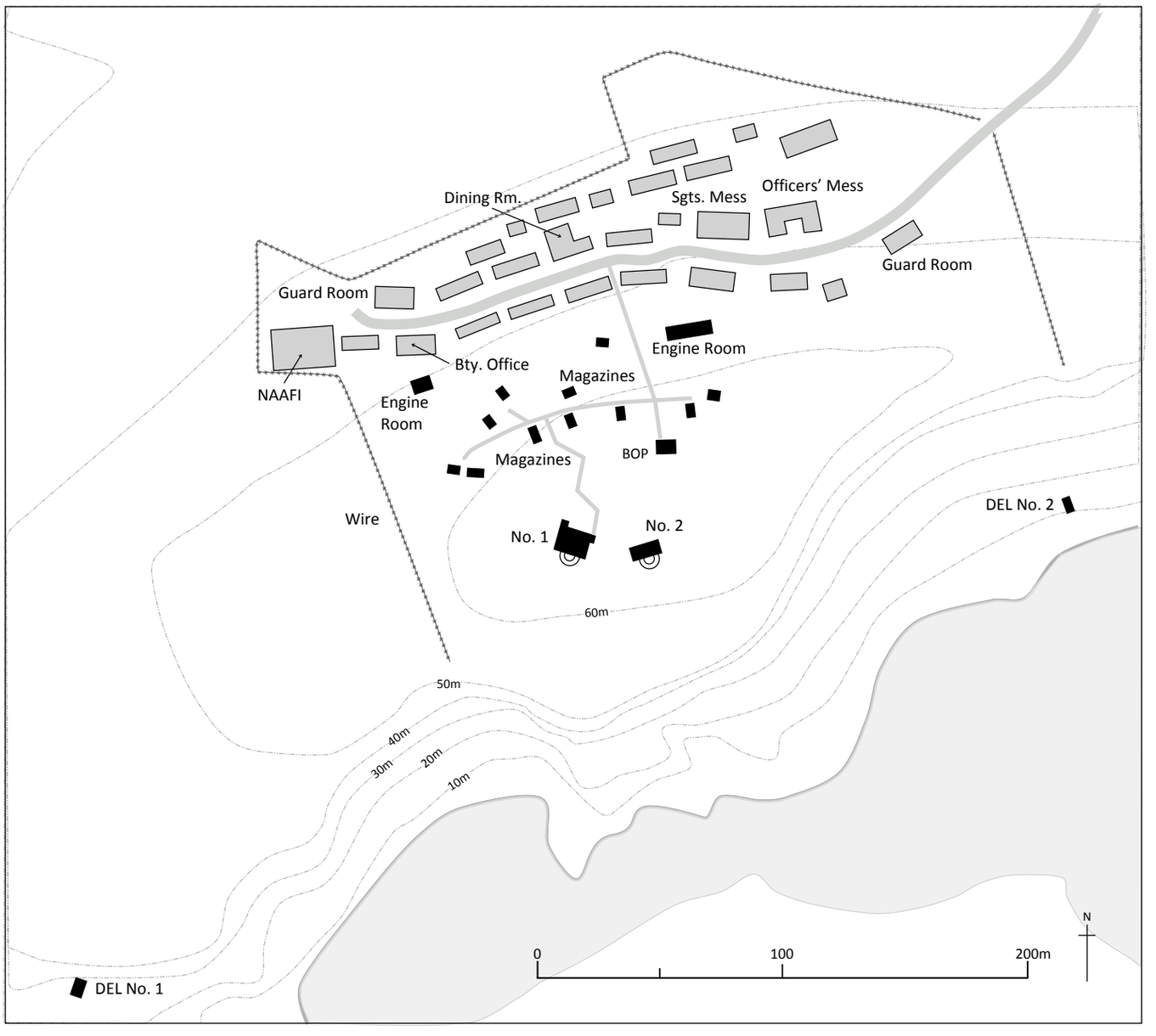

Figure 12.1
Plan of the first Mk VII 6-inch guns and battery accommodation at Kincraig, in 1940 (© Gordon Barclay)

of Polish Army dispositions between October 1940 and March 1941 shows that a company of Polish infantry of the 4th Cadre Brigade was positioned just north of the battery, with defences facing landward as well as machine-gun positions on the cliffs. The coast of Largo Bay, just to the west, was heavily defended by the Poles.[10]

In April 1941, Brigadier A G Rolliston, RA, the Commander Royal Artillery at Scottish Command, reported his concerns to GHQ Home Forces about the lack of overhead protection of the coast defence gun crews from aerial attack. He dismissed arguments that such shelters would unnecessarily restrict the arc of fire of the guns because it was 'of no use having guns which [could] cover wide expanses of sea if they can't shoot into those areas owing to the disablement of the detachments'. He noted, consequently, that 'it has been decided to ignore the landward arc of Kincraig battery and instructions have been given for gun houses to be built . . .'.[11]

He also reported that the duty shelters at Kincraig were 'terrible places, dark, dirty and gloomy', while recognising that they had been built as an emergency: 'new ones are to be built when a decision on the gun-houses is arrived at'.

The 6-inch guns were each provided with a fighting light in the form of a coast defence 90cm Mk III moveable searchlight. The battery was also to be provided with an emergency 'beach light', an aircraft homing light and a spare 90 cm Mk III lamp and reflector.

DEL emplacement No. 2 was built above the shoreline at the bottom of the cliffs, south-east from No. 2 gun, while DEL No. 1 was sited half-way down the cliff slope to the south-west of the battery and was accessed by a flight of steep concrete steps. Although the searchlights could be operated automatically from the Close Defence Battery Observation Post (see below for a description of this structure) using a 'Magslip' system, they were usually operated manually by an attendant, who received instructions by telephone from the BOP.

As part of the discussion about strengthening the outermost line, in July 1941, GHQ Home Forces decided to replace the existing guns at Kincraig with modern Mk XXIV 6-inch guns on Mark V 45° mountings (Fig 12.3). The principle had been established that coast artillery would be more effective firing in salvoes of three shots, and so three gun houses were built at Kincraig; however, only two guns were mounted. The combination of the improved gun, with a higher muzzle velocity, and the increase in elevation allowed a significantly longer range of 24,500 yards (almost 22,000m) instead of 14,000 yards (just over 13,000m).[12] It was estimated that gun production schedules would allow the new guns to be supplied in October 1941. The new emplacements would be sited further apart and dug into the ground, to lower the height of the gun houses.[13]

The primary role of the newly equipped battery was the close defence of the Largo Bay convoy mustering area, although it was also expected to act as a counter-bombardment battery until such time as the proposed heavier counter-bombardment guns were mounted nearer the mouth of the Firth.

The existing BOP was retained as the Close Defence (CD) BOP, and was provided with a Depression Range Finder with a range of 1,500–14,400 yards (*c* 1,370–13,170m).

A separate counter-bombardment (CB) BOP was sited on the ridge at Craig Heugh, *c* 370m to the east of the original BOP, just inside the camp's eastern boundary. It was equipped with a simplified Fire Direction Table (FDT) and a Depression Position Finder. The DPF had an operational range of 5,000–27,000 yards (*c* 4,570–24,700m). The rectangular structure was provided with embrasures for musketry defence and lay within its own barbed-wire enclosure (Fig 12.3). It appears to have been rarely used.[14]

The Battery Plotting Room (BPR) and Command Post (CP) layout was completed in June 1942. The CP was a small underground bunker located a short distance north of No. 2 gun, on the south side of the magazine trench from where it was accessed, and the BPR (Control Room) was a large room sunk into the ground a short distance north-east of the CP on the north side of the service road leading into the camp. The BPR contained a large plotting table and was the control room for the battery. A Lieutenant and nine gunners manned this room. Nine separate lines of communication cables connected the BPR to the guns, CP, OPs and other main places throughout the camp by separate underground routes.

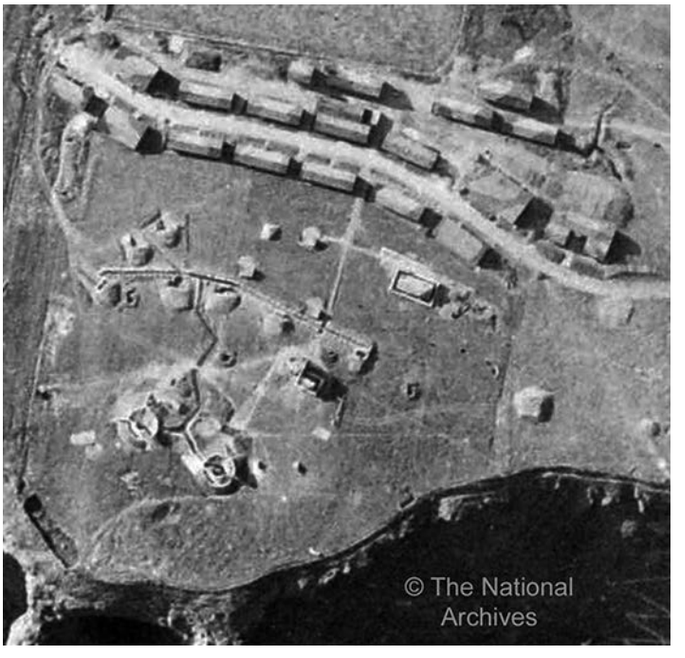

Figure 12.2
Aerial photograph of the original layout of 6-inch guns, 1 August 1940
(© The National Archives, WO 192/255)

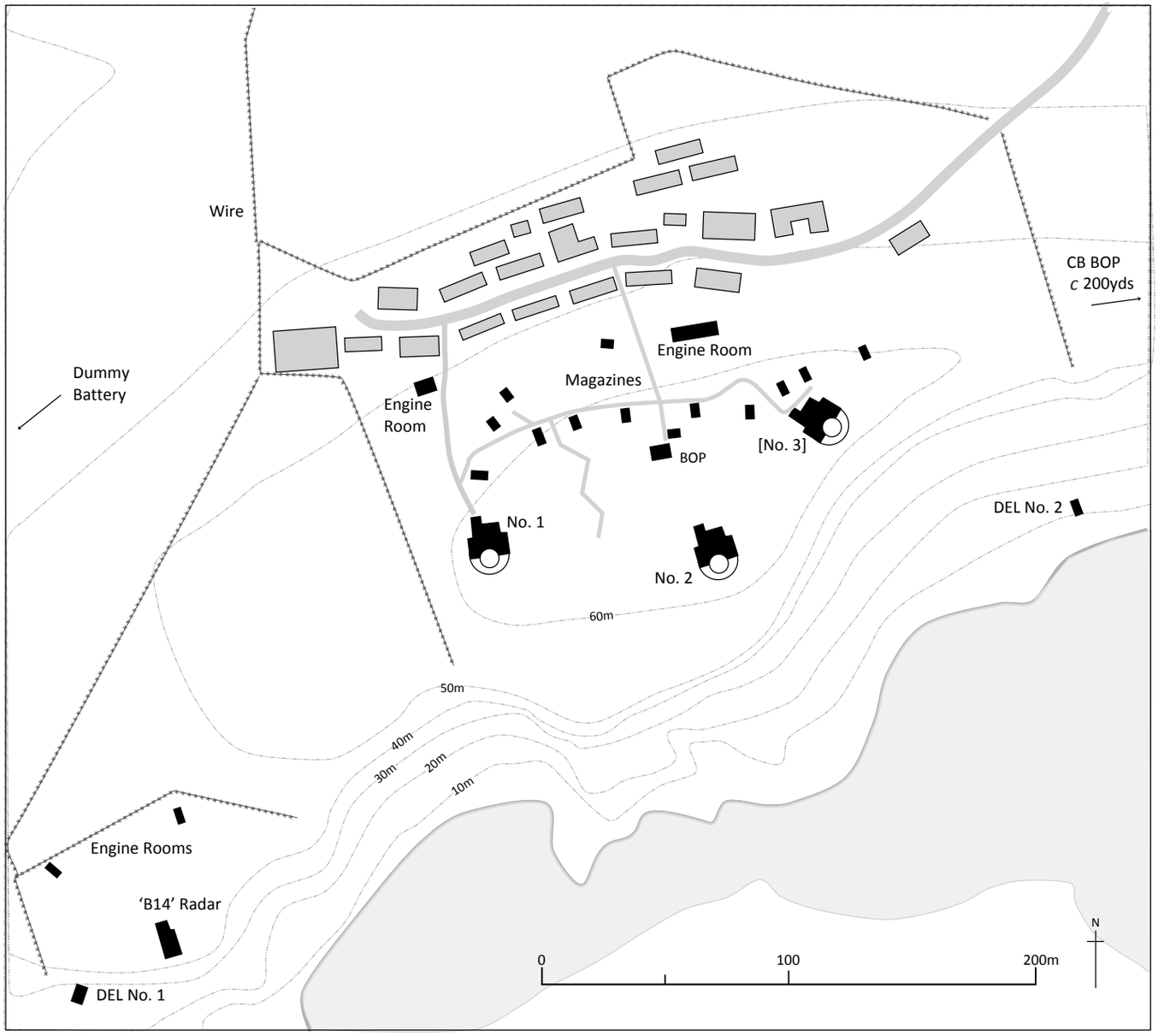

Figure 12.3
Plan of the reconstructed Kincraig battery, including the radar installation, in *c* 1943 (© Gordon Barclay)

Because the new Mk XXIV guns were not available for Kincraig by the time the 45° mounts and the new gun houses were complete (February 1942), two Mk VII guns were temporarily mounted in May 1942. The Mk XXIV guns were finally issued in April 1943.[15]

The sunken roadway linking the magazines was extended at this time to service additional magazines for the third gun position. As it transpired, the third gun position, although built, was never armed.

Although Kincraig's new guns had a maximum effective range of 24,300 yards (*c* 22.2km) by day, by night the effective range was limited by the range of the searchlights to *c* 4,000 yards (*c* 3.6km). This meant that during the hours of darkness there was a gap of *c* 7,000 yards (*c* 6.4km) in the centre of the channel in which enemy vessels would be immune from the guns at both Kincraig and Fidra, an unsatisfactory state of affairs that continued until the Kincraig Battery was equipped with radar.

In November 1941, the decision was made to site a coast artillery radar set at Kincraig. Hitherto, the battery had been able to call upon the services of the radar station sited between Crail and Caiplie on the Fife coast. Radar designed for use with coast artillery had been developed earlier that year and could detect a surface vessel at a range of 35,000 yards (32km) or more and follow its course, giving accurate ranges and bearings as well as recording shell splashes from which corrections could be calculated. Smaller vessels could be picked up at 12,000 yards (*c* 11km) and the equipment could also detect low-flying aircraft. The radar equipment was to form part of a coast-watching cordon around the coast of Britain, but it was only in September 1942 that a Coast Artillery (CA) No. 1 Mark II radar set was installed at Kincraig within a purpose-built blockhouse, designated building 'B14'. This emplacement was located 275m south-west of No. 1 gun. Two 7ft (2.15m) parabolic dishes were mounted on its roof (Fig 12.4). The B14 emplacement comprised a visual Radar Observation Post at its front overlooking the cliff edge and the mouth of the estuary, a radar transmitting and receiving room directly behind the OP and a small engine room at the rear of the building. The Radar OP was provided with a director instrument for taking bearings of potential targets. Once established, the range and bearings would then be communicated by telephone to the Battery Plotting Room and used to aim the 6-inch guns.

The arrival of radar meant that it was now possible to engage hostile vessels at any time and in any weather across the whole width of the estuary and out to sea. Working together, all three Observation Posts (CD, CB and Radar) would have given the battery complete cover over all the areas of sea within range of its guns. In principle, all three OPs would send bearings and ranges of targets to the FPR, where the Fortress Plotter would convert these into map co-ordinates as he received them and chart the course of the targets. These co-ordinates would then be communicated to the battery, where they were converted into battery bearings and ranges by a co-ordinate converter. A Fire Direction Table mechanically calculated the necessary travel, ballistic and spotting corrections. The required elevations and direction were then passed to the guns by means of dials. Fall of shots reports would be passed from the OPs to the BPR, where the necessary adjustments could be made. Whenever the May Island's indicator loops detected an unidentified crossing, Kincraig Battery was informed by telephone and the guns were made ready for action.

In 1943, the fort was manned by two Regular RA officers and 138 other ranks (although the full complement was *c* 188 men). Documents associated with the 'Flood Tide' reduction in Coast Artillery personnel noted, in September and November 1944, that Kincraig was still manned by Regulars.[16] It proved difficult to recruit Home Guardsmen for service at the relatively isolated battery.[17]

Dummy batteries were built early in the war at a number of places in the UK, to draw enemy gunfire away from the real battery.[18] Kincraig was the only battery in Scotland for which we have evidence of a dummy battery.[19] It lay *c* 300m west-south-west of the real one (the three 'guns' lying between NGR NT 46186 99801 and NT 46356 99799) and appears to have been built between April 1941 (when it is not visible on an aerial photograph) and 2 July 1942 (when it was recorded on a plan on the Fort Record Book). There are very clear but undated aerial photographs of the dummy battery on the Fort Record Book (Fig 12.5). Advice on the scale and cost of dummy batteries (*c* 10% of the cost of a real one) had been provided by the War Office in the form of a pamphlet titled 'The Concealment of Coast Defence Works' in 1938;[20] early in the war, some units had clearly been going too far, even employing film-set construction companies.[21] In December 1940, it was reported that 'Scottish Command are having much trouble over their dummy batteries' and had not received a War Office specification of how they were to be built.[22] Interestingly, the

Figure 12.4
The roof of the radar building with the parabolic antenna
(© John Handscomb Collection, reproduced by kind permission of the Handscomb family)

Figure 12.5
Undated aerial photograph showing the three dummy guns, positioned about 500m to the west-south-west of the real guns (© The National Archives, WO 192/255)

Kincraig dummy was much more likely to have been more than a mere Royal Artillery 'wheeze' to confuse the enemy. In September 1941, the fields around Kincraig were the site of a major exercise by Polish paratroopers simulating an attack on the real battery at Kincraig in the presence not only of many senior British officers, but also the Polish Prime Minister, General Sikorski. As the Poles would not have been able to use the operational battery as the target of their exercise, the dummy battery is more likely to have been built to serve that purpose.[23]

In references to the land defence of the battery from late 1942 or early 1943, it was noted that 'Polish Forces at Elie may be available to assist in defence of Kincraig'.[24] Kincraig was also issued with two field guns, a 75mm and a 4.5-inch howitzer (practice-firing being referred to from the spring of 1943).[25]

During 1942, an Unrotated Projectile anti-aircraft projector was issued to Kincraig. As already noted above (Section 10.2), a man had to sit inside the device to operate it. The test-firing, however, only succeeded in blowing the door open. Fortunately, the operator was uninjured. The results were unimpressive; when the men did finally get the device to launch the rockets, some landed only a few yards away. Further efforts to master the weapon were soon abandoned. Reference is made to 40mm Bofors AA gun practice at Kincraig in July 1944.[26] As noted above, the field guns, and perhaps also this Bofors gun, may have been intended to familiarise men on the sort of weapons they might use when transferred out of shrinking Coast Defence units.

The battery camp lay on the northern, reverse side of the hill, protected from direct fire. It comprised a guard house, officers' and sergeants' messes and accommodation at the east; a street of seven living huts for the men, with a large dining hut in the middle and ablutions to the north (Fig 12.6). At the western end of the street were the guard room and battery office, with the large NAAFI at the end, with a separate hut for the accommodation of its staff. Three further living huts lay to the north. Between the camp and magazines were two engine houses and stores.[27]

The life of the battery

From Thursday 8 December 1939, weekly concert parties were organised in the NAAFI at the camp by the Reverend R L Kilgour. The frequency of the concert parties soon diminished to two or three a year. Dances, well frequented by local people, were also held in the NAAFI.

During 1940 or 1941, Captain Douglas Grant, who was stationed at Charles Hill Battery, near Aberdour, was detailed to lead a night-time practice attack on Kincraig Battery, to test the defences of the camp. Twenty to 30 men set off crawling across the open moors from Kilconquhar railway station towards the battery. Eventually, the raiding party arrived at their objective and successfully surprised the garrison, who, after recovering from the ignominy of 'capture,' reluctantly opened the canteen and treated Captain Grant's men to a cup of coffee before they returned to their base.[28]

In January 1940, George Tofts was one of two signallers with the Royal Marines who were sent to Kincraig to communicate using an Aldis Lamp to signal Morse Code to the two armed trawlers stationed at the mouth of the Forth and occasionally to other vessels, and to carry out vessel recognition.

On 10 June 1940, the day that Italy declared war on Great Britain and France, Tofts was duty signaller. Two Italian merchant ships were anchored off Methil and were to be boarded by Royal Naval personnel and their crews interned, but one of the vessels tried to make a run for the estuary mouth. The naval authorities alerted Kincraig Battery and when the vessel was *c* 4.8km off Chapel Ness, the crew at No. 2

Figure 12.6
The main street of the Kincraig camp, looking west. On the right are a living hut, the dining hut/cookhouse, and two further living huts (© John Handscomb Collection)

gun fired a single solid bring-to round a short distance ahead of the vessel's bow, sending up a huge spout of water. The Italian crew then capitulated.

The examination trawlers would signal the BOP at Kincraig if they discovered any mines in the Firth of Forth, whereupon the duty signaller would telephone this information to the Chief Examination Officer at Leith or to the Extended Defence Officer at Inchkeith.

The camp's NAAFI received its supplies from the depot at Balgowan in Perthshire, sent by rail to Cupar and uplifted by camp transport. Bread was supplied by the Leven Reform Co-operative Store, sent by train to Kilconquhar railway station. Meals were served in the mess room, which was located about mid-way along the lower tier of the camp.

On most days, a baker from Elie would arrive after 4 p.m. with his van to sell cakes to the men through the camp fence. Sometimes these cakes were given on credit, because the soldiers were so poorly paid.

The Irish Nazi William Joyce ('Lord Haw-Haw') included Kincraig in his propaganda radio programme *Germany Calling,* boasting to British listeners that the Germans were going to bomb 'Kincraig Battery'. Despite this, Kincraig had a fairly quiet war and its guns were never called upon to engage enemy vessels.

At the end of the war in Europe in May 1945, when the battery sentries on the beach and cliffs were withdrawn, four local boys decided to 'do' the Chain Walk, something which had not been possible during the war years.[29] After finding a gap in the barbed wire fence, they scrambled up the steep slopes, which brought them out under Kincraig's guns. On discovering no one was about, the boys climbed on top of the guns and gun houses where they played for a short while before they continued their adventure in the direction of Shell Bay. As they neared Kincraig Point, the boys saw what appeared to be another large gun battery, constructed near the point, close to the shore. Up until this time they had been unaware of any other large guns in the area apart from those mounted above Kincraig cliffs. However, when they arrived at this gun battery they were amazed to find the gun positions were in fact the dummies, having wooden poles for gun barrels and timber turrets covered with roofing felt.

Major Johnstone, RA, OBE, took over command of Kincraig round about this time. He had the reputation for being a strict disciplinarian and, according to some accounts, he ran the camp like his own private army, with the personnel having no recourse to anyone else but himself. In fairness, some found the discipline was not as strict as at some other camps and felt it quite an enjoyable posting.

During his National Service, Gunner Roy Lewis from No. 3 Battery was stationed at the camp from August 1947 until July 1949. Lewis estimates there were *c* 150 men at Kincraig during his time. The Master Gunner (Warrant Officer) and two or three others, who had formerly been prisoners of the Japanese during the war, had been sent to Kincraig to train the National Servicemen on the guns and other equipment. These men were permitted to wear shoes instead of boots due to the condition of their feet as a result of their brutal treatment as POWs. In the mess, these men would complain when others left food on their plates and one of them even had the habit of storing food under his bed.[30]

Figure 12.7
Photograph of the crew in front of their gun, at a TA camp in 1949, with the roof of the BCP (disguised to look like a derelict building) visible in the background. The gun is the southern of the guns, after the battery was reconstructed (© Bruce Stenhouse Collection)

After being called up for National Service and on completing his basic training, 18-year-old Gunner David Winmill from South Wales was sent to Kincraig in May 1949. He was initially detailed to train on No. 1 gun, but afterwards worked mainly in the Battery Plotting Room as a range recorder and wireless operator. The battery was below strength at that time, with the complement being 130–140 officers and other ranks, including one Major (the CO), one Captain (Adjutant), three Lieutenants, two 2nd Lieutenants, one Battery Sergeant Major, NCOs and gunners and tradesmen. In addition, there were four or five cooks. Most of the personnel were billeted in the huts, each of which held 15–20 men.[31]

On 18 May, the *Revenge* class battleship HMS *Royal Sovereign* sailed into the Forth to be decommissioned, after having spent about seven months on loan to the USSR Navy, as the *Arkhangelsk*. Although the battleship had been returned to the Royal Navy on 4 February, the slightly eccentric Major Johnstone suspected she might still have a Russian crew on board, and he ordered the gun positions and other buildings at the top of Kincraig to be camouflaged with nets and foliage from trees.[32]

During 1950, the battery received two mobile 3.7-inch QF HAA guns fitted with steel cruciform platforms with folding sides, which could be lowered into position at a chosen site and

the wheels then removed. At Kincraig, they were sited *c* 180m apart, one on either side of the 6-inch gun positions, but were occasionally repositioned.

Target shooting

Practice shoots with the 6-inch guns occurred regularly, using moving targets, which took the form of a bow-shaped log raft *c* 6m long with upright, white-painted, corrugated sheeting fixed along its deck. It was first towed to a rendezvous area outside the target range until orders were given to proceed with the exercise. The target range was a large area of sea at the mouth of the Firth of Forth, *c* 16–19km from the battery, north-east of North Berwick. Once the order was given to proceed, the target was towed through the range area at a set speed. For manual sighting of the guns, the target was towed (*c* 450m behind the launch and, for radar sighting, the distance was *c* 730m. The targets were towed by fast Royal Army Service Corps launches, fitted with three 500hp Rolls-Royce Merlin aeroplane engines, capable of 40 knots (*c* 74kmh).

On one occasion, after being picked up at Burntisland, Gunner Winmill and two other servicemen were taken in the launch to the rendezvous area to await orders to tow the target. The gun crews at Kincraig were on that occasion members of a visiting regiment who had come to do a day's training. The unit was practising using the telescopic sights, for direct firing at a fast-moving target. These sights were located on either side of the gun and, when the two telescopes were lined up on the bow wave of the target, the left sight gave the target's range and the right sight gave its direction.

Once the order was given to begin the shoot, 450m of towline was run out from the winch and the launch proceeded over a calm sea at a speed of *c* 30 knots (55kph), to replicate the speed of a destroyer. After a few minutes, Gunner Winmill heard No. 1 gun firing. It took several seconds for the projectile to travel from the gun to the target, and on scanning the skyline for the shell, the men in the launch suddenly became aware that it was travelling in their direction: it landed in the sea no more than 30m behind them, sending up a mighty spout of water. The now terror-stricken radio operator began to scream into the radio microphone to stop the shoot, as it was clear the battery was sighting on the launch and not the target.

It would only be a matter of seconds before the next shot, and at this point the Captain of the launch opened the throttle to escape the barrage. As the launch was carrying some 1,200 gallons of high octane fuel, being hit even by a solid shot shell could still have caused a massive explosion.

The wireless operator at Kincraig had difficulty understanding the frantic messages from the launch, but the shoot was brought to a sudden halt by one of Kincraig's own NCOs, who had looked through the gun's sights and realised the gun crew had been aiming at the launch and not the target.

There was no mains electricity and power was supplied by three diesel generators, which had to be started up at 6 a.m. every morning. They were switched off at midnight, leaving the camp without power until the following morning. The guardhouse was provided with a stove for heating and, during the black-out hours, an electric torch for light.

In October 1950, the troops were withdrawn from Kincraig and the battery went into care and maintenance, although the 6-inch guns continued to be used for training/practice shoots until 1956.[33] During the 1950s, units from 414 Coast Artillery (Forth) TA based at Easter Road in Leith visited Kincraig to train on the 3.7-inch guns, radar, range-finders, predictor and searchlights during their annual summer camp at Pettycur, Kinghorn. Finally, in October 1956, the site was closed and the equipment dismantled.[34] All stores were removed, apart from the guns, mountings, projectors, radar and searchlight generators, which were sold as scrap. One of the guard huts was sold to Elie Golf Club and was used as the Starter's Hut until 2015.

Surviving remains

Much of the battery survives. Efforts to reduce or remove the three gun emplacements, the CD BOP, main engine room and No. 2 searchlight have left these sites filled with the rubble from their superstructures. Radar building B14, with its two engine rooms, remains relatively intact, although the Nissen hut has long since disappeared. The CD BOP at Craig Heugh is now roofless but its walls still stand prominently on the ridge. All the magazines remain in good condition, without their steel doors, although some are in-filled with rubbish and earth. Two of the magazines were, until recently, used in connection with a modern radio mast erected at the gun positions. The Command Post, west engine room and underground water tank on the south side of No. 3 gun position remain relatively intact.

A gun holdfast lies on the Fife Coastal Path a short distance east from No. 3 gun position. This mounting may have been the site for the anti-aircraft rocket launcher which was unsuccessfully tested in 1942. A larger holdfast for the original No. 1 gun is also still visible a short distance east of the later house for that gun's replacement.

12.2 Fidra, Dirleton

Fidra was one of a series of emergency batteries erected in the first 18 months of the Second World War (Fig 12.8); in Scottish Command, the sequence ran from 301 Battery at Sullom Voe in Shetland, through Fidra at 309, and ending at Berwick-upon-Tweed at 310 (Berwick was in Scottish Command until October 1940). The role of the emergency batteries was recorded as: (a) to prevent the capture of the gun site; (b) to prevent troopships, transports, landing craft etc

from approaching the beaches; (c) to engage troops in boats or landing craft or tanks attempting to gain footing on the beach; (d) in the last event to engage landwards targets, and then only if there were no ships or landing craft to engage.[35]

The battery at Fidra is perhaps the least well-documented battery in the Forth defences. It lay not on the island of Fidra[36] but on the adjacent mainland, on a site now occupied by a modern house. There is a story that the adoption of the name 'Fidra' was intended to mislead German intelligence as to the exact location of the gun positions; certainly, considerable lengths were undertaken to camouflage the site. On 30 May 1940, two 6-inch BL MK XII guns on P VI 15° mountings were sent to Archerfield Point near Dirleton on the Lothian coast opposite Elie. They were erected on-site in June and originally named 'Dirleton Battery'. Tom Porteous, a forestry worker at Archerfield Estate, was given 24 hours' notice in which to vacate his cottage, such was the hurry to construct the defences. Oral history suggests that Major Douglas Grant was given the job of designing the layout for Fidra Battery.

The two guns were mounted on concrete platforms set at ground level. They were provided with two anti-aircraft-type searchlights which were mounted in the open on concrete plinths sited to either side of the guns, to illuminate their targets at sea.

No contemporary plan of the Fidra Battery has been located but a series of official photographs was taken in November 1940. Both this battery and its fellow at Berwick-upon-Tweed were at first concealed inside shelters of heavy canvas painted to resemble small single-storey cottages (Fig 12.8). The sparse Fortress Record Book for Berwick has a sketch plan of that battery, which probably had similar arrangements as Fidra – the very minimum was provided in the way of offices, stores and accommodation.[37]

In December 1940, an inspection revealed that conditions at Fidra Battery were very poor for the 52 men who were stationed there. The battery had to 'cart all its water and the men have to go seven miles in an open lorry if they want a bath'. It was considered essential that a piped supply and a greater storage capacity be provided, if only because the battery lay in a pine wood and had no water for fire-fighting. The cost of £800 was approved in January 1941. Conditions at the camp were assessed as satisfactory in April 1941, although a good deal of work was still to be completed by civilian contractors.[38]

Fidra received concrete gun houses at much the same time as the other batteries in the Forth. A report dated 23 March 1941 mentions that only one of the gun houses had a roof by that date, and that the second gun would have to be out of action for a week or two while the concrete of its shelter set.[39]

The BOP was erected at the top of a short, steep slope behind the guns and was given a tiled, ridged roof so as to resemble a domestic building (Fig 12.9). A single DEL emplacement has been recorded by RCAHMS, presumably superseding the earlier open AA searchlight installed in 1940. This structure has also, however, been identified as an observation post.

Figure 12.8
One of the 6-inch guns at Fidra battery, disguised as a cottage using painted canvas (© Imperial War Museum H 5557)

A reinforced concrete magazine (still surviving) was located behind the guns and to the south-east lay the hutted encampment and an engine room, apparently concealed in trees. RCAHMS has also reported a sighting of what may be the accommodation site, comprising eight buildings at NT 5039 8595 on aerial photographs taken in 1962. A second engine room was located in a depression to the west of the guns.

In October 1940, it is recorded that Fidra was to be incorporated, for command purposes, into the Forth Defences group, titled at this point 'Leith Port'.[40] Although Fidra Battery saw no action during the Second World War, a German bomber did offload its bombs nearby on 3 September

Figure 12.9
The Battery Command Post for Fidra battery, disguised as a domestic building, now demolished (© Ron Morris)

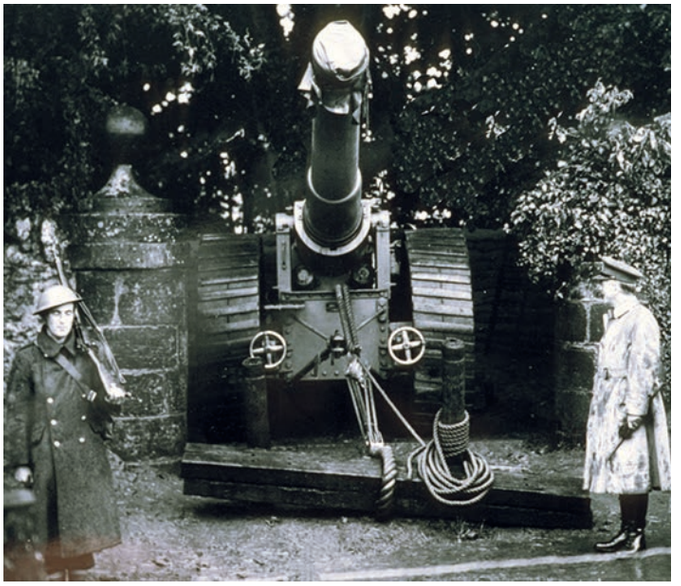

Figure 12.10
One of the two 6-inch naval guns on field carriages. These field versions were of First World War vintage (© Bruce Stenhouse Collection)

1940. Unlike Kincraig, Fidra was never developed into a permanent battery. In June 1943, Fidra was recorded as being a 'Close Defence' battery manned by the Home Guard;[41] by September, there were three HG officers and 105 other ranks.[42] By January 1944, Fidra had been reduced to care and maintenance.[43] Fidra's guns were removed in October 1945. Practice firing of a 4.5-inch howitzer at the battery is recorded in July 1943.[44]

Survival

What survives from the site is a magazine currently used as a store, the westerly engine room hidden in a dense thicket of sea buckthorn, the close defence OP overlooking the beach and the concrete plinths for the searchlights. The gun positions have been consumed by the more recent extensions of Marine Villa, formerly a cottage adjoining the battery.[45]

12.3 Dunbar

Two further guns were stationed in East Lothian, at Bowerhouse, near Dunbar (NT 66604 76696), as part of the anti-invasion defences, to tackle ships and boats carrying invading forces.[46] These were two First World War vintage 6-inch guns mounted on field carriages, originally used as heavy artillery on the Western Front (Fig 12.10). In November 1940, 155 (Lanarkshire Yeomanry) Field Regiment, RA, was responsible for artillery support for aerodrome and beach defence between Dunbar and Prestonpans. The regiment was at that time, after Dunkirk, equipped with a mixed bag of old guns – 4.5-inch howitzers and French 75mm guns – and two batteries did not even have guns at this stage. The two troops of 'C' Battery were equipped with four 4.5-inch howitzers and two 6-inch guns respectively. The battery's observation post was at St Baldred's Cradle, between Peffer Sands and the mouth of the Tyne, just west of Dunbar.[47] An inspection in April 1941 reported that 'Detachment, 8th Defence Regt RA. [illegible] two 6" guns on wheels in the DUNBAR area. Good and [?]clean commanded by a smart Regular acting captain of three years' service ….'[48]

12.4 The May Island

With the development of the Rosyth Naval Base and the build-up of naval infrastructure, a series of War Signal Stations was planned for the islands (including the May) and both coastlines of the Forth Estuary to provide continuous lines of communications with Royal Naval vessels in peacetime and all seafaring vessels in wartime. Some of these War Signal Stations were to be manned continuously while others, like May Island, were only to be manned on mobilisation.

In November 1910, the Admiralty leased from the Northern Lighthouse Board a small area of land on the high ground east of the main lighthouse on the May to build a WSS with flagstaff and semaphore. When finally completed, it had the appearance of a bungalow with east-facing bay windows and an open observation platform at the east end (Fig 12.11).

First World War

Before Britain joined the war, but with the international situation deteriorating, a detachment of Coastguards was sent

Figure 12.11
The War Signal Station on the Isle of May in its first form (© Isle of May Bird Observatory archive www.isleofmaybirdobs.org)

to the May in July 1914 to man the WSS. At that time, the Coastguard service acted as a reserve for the Royal Navy and carried out a number of duties on its behalf, such as signalling and wireless telegraphy.

In the spring of 1914, communication cables were laid to the island and at that time the *Edinburgh Dispatch* reported the May was to be fortified, and that 'the island was admirably adapted for gun batteries on the rock gallery system from which the weapons could be fired without much chance of being destroyed by opposing fire'. We have found no trace of any official planning for this.

At the outbreak of war, a flotilla of torpedo boats was employed on anti-submarine patrol duties within the Firth of Forth and surrounding North Sea. Two of these torpedo boats operated from the May Island to provide a rapid response to any sightings of enemy submarines.

As all navigation lights in the Forth were extinguished, the work of the torpedo boats was much hindered and some craft ran aground as a result. To aid navigation, three 'secret' lights were erected in the Firth; one at the May Island, one on the balcony of Elie Ness lighthouse tower and one at Eyebroughy Point on the south shore of the Forth.[49] The three lights were to be visible only to a distance of *c* 8km, and the May light was to be visible only to the west.

By the end of November, it was found necessary to relight the lighthouse on the May whenever any Royal Naval ships larger than a torpedo boat entered the Firth during hours of darkness. Ships passing within *c* 5km of the May Island were clearly illuminated by the light operating at full power, thus exposing them to the danger of a torpedo attack, and arrangements were made with the Northern Lighthouse Board to light, when requested, an oil light of lesser brilliancy.[50]

The May Island was also the pilot station for the Forth from November 1914 to March 1915; there was so much warlike activity in the estuary that compulsory pilotage was needed from the May westward and accommodation for 50 pilots was established on the island, in Thistle Field. The Forth Pilots were withdrawn from the May in March 1915, pilots subsequently being taken on board closer to Inchkeith.[51]

During the first half of the war, the May Island was not provided with any heavy armament but, according to a lightkeeper who was stationed on the island in the inter-war years, a gun of some description was mounted in the upper part of Chapel Field, in a spot still known as Battery Park. It is possible that a mobile 6-pdr was placed on the island, in part as an anti-aircraft measure against Zeppelins, which often made landfalls in the vicinity of May Island, St Abb's Head or Fife Ness. Admiral Lowry had asked, in May 1916, that surplus 6-pdrs from Rosyth be deployed in this role, but his scheme was turned down.[52]

Inter-War years

In 1919, the Admiralty obtained two more pieces of ground on the island to construct a Wireless Telegraphy Station and a small oil store. This lease and that for the site of the WSS were terminated at Martinmas in 1924, following large cuts in Admiralty expenditure.

In September 1934, the Northern Lighthouse Board granted the Midlothian Ornithological Club permission to use the now redundant War Signal Station to start the first co-operatively manned bird migration study centre in Great Britain. The building was by then the only ex-Admiralty building on the island not to have been demolished. When a party of Club members landed on the island on 2 September 1937, however, they found Royal Naval personnel in residence in the building and were obliged to camp near the south end of the island. A Royal Naval cable ship arrived off the island to

Figure 12.12
The armoured tail cables of the indicator loops, as they come ashore on the May Island (© Ron Morris)

lay communication cables and indicator loops on the seabed as part of the defence arrangements planned for the Forth.

A concrete base was also laid about that time opposite the lightkeepers' quarters in Fluke Street in preparation for the possible future erection of a portable control station for the loops. This control station took the form of a long corrugated hut which was stored at Rosyth and which could be erected on-site within 24 hours.[53] Tail cables of the indicator loops were laid on the island between two huts erected at the north side of the WSS, a gully (later called 'Cable Cleft') and a hut near Altarstanes landing at the north-west of the island (Fig 12.12).[54] The Navy left the island on 21 September, allowing the Club to return to their 'bungalow' for the time being.[55]

In June 1938, a hut and the control instruments for the indicator loops were put in place on the island.[56] Although the Navy was steadily building up its presence on the island, it was still being visited by excursionists during the summer months. The naval authorities thought it undesirable to stop this traffic in case the rumour that the island was being 'fortified' spread.

In the autumn, further buildings associated with the loops, wireless and their infrastructure were erected. The Admiralty also took over the WSS building and planned an octagonal glass observation room on top of the open observation platform and erected a *c* 21m-high signal mast alongside it.[57] The island was closed to visitors in September 1938 under the terms of the Defence Regulations. The station was still not permanently manned and the lighthouse keepers agreed to undertake the duties of caretakers.[58]

Second World War

There are few official documents recording the May Island's role in both wars. However, in the early 1990s, a number of ex-naval servicemen who had served there during the Second World War were traced and interviewed by one of us (RM).

Figure 12.13
The War Signal Station as it was reconstructed in the Second World War
(© Ron Morris)

In late August 1939, with the prospect of imminent war, the fixed anti-submarine defences were brought into an immediate state of readiness. The May Island received a garrison of Royal Naval Volunteer Reserve and Royal Naval pensioner personnel which, at its peak numbered *c* 70 men, and the island effectively became the 'stone frigate', HMS *May Island*. The May Island's role was to detect, contact and identify all vessels, surface or submerged, approaching or leaving the Forth estuary, and to act as a point of communication between these vessels and the naval authorities upriver. All Allied submarines were to enter or leave the estuary on the surface.

During the restoration of the WSS, the Navy built a wooden roof over the observation platform on the top of its flat roof to offer protection from the elements (Fig 12.13). At first, the platform was open on all sides, but windows were added later in the war. The WSS contained a Signals Distribution Office (SDO) on the ground floor, which housed the island's telephone exchange and quarters for the Signal Officer who was in charge of the station. There were also direct telephone lines to Royal Naval offices at Leith, HMS *Cochrane* II, Naval HQ *Pitreavie*, the Extended Defence Officer at Inchkeith, Royal Naval Air Station, Dunino, and a civilian line to Anstruther exchange.

Besides the Signal Officer, the WSS was staffed by a Chief Yeoman, three Yeomen, and 12 Signalmen, who were divided into four watches. Normally one Yeoman, or the Chief Yeoman, and one Signalman, manned the SDO, while two other Signalmen manned the tower.

Initially, a fleet of five armed anti-submarine trawlers operating from Granton was assigned to the island's defences. These were augmented for a time by five requisitioned drifters from Buckie (based at Anstruther) to act as look-out vessels during times of poor visibility. At any one time, two or three of the A/S trawlers patrolled the estuary mouth inside the loop system. The examination vessel patrolled further upriver (nearer to Kincraig Examination Battery) so as not to interfere with A/S trawlers. Use of the island's lighthouse was restricted during the Second World War, but incoming convoys would occasionally request that it be illuminated for their safe passage.[59]

Indicator Loop Control Station

Whenever a steel-built vessel passed over an indicator loop, the vessel's magnetic field induced a small electric current in the cable, which was recorded in the control station. All convoys were carefully checked in and out of the Forth, as their presence could provide cover for an enterprising U-boat attempting to enter the estuary undetected.

There seem to have been six Harbour Defence ASDICs (HDA) anchored to the seabed west of the guard loop system

Figure 12.14
The Loop building on the Isle of May, now demolished (© Ron Morris)

at the May Island; four of them ('C' to 'F') are shown on a chart relating to an anti-submarine exercise in June 1943, and we believe that 'A' and 'B' continued the line to the south (Fig 7.1). As with the loops, they were connected by cables to the control station on the May from where they were operated. The ASDICs could determine the bearing of a submarine. Proposals in 1943 to relocate the May HDAs upriver may have resulted in one being moved to protect Inchkeith.[60]

The Control Station was also known as the HDA Hut or the Loop Room (Fig 12.14). It consisted of three apartments: an engine room containing two diesel generators; a central monitoring room housing the instruments for operating the indicator loop and ASDIC devices; and a radio room, from where radio contact was made with the anti-submarine trawlers on patrol. Whenever there was an unexplained crossing of the loops, the ASDICs were turned on and the A/S trawlers were alerted.

During late summer 1940 a small Royal Naval station under the command of May Island was set up at Canty Bay on the Lothian coast, with a look-out on Gin Head, forming part of the 'May Island-Canty Bay Indicator Loop Early Warning System'. It was linked to May Island by telephone.[61] Although it was originally planned to operate all the indicator loops south of May Island from Canty Bay, in June 1943 all the instruments for operating the loops were located within the Control Station on May Island.[62] We believe that the Canty Bay station most probably operated only as a look-out post over the southern loops, alerting the May Island to any observed movements.

A small detachment of the Royal Observer Corps (ROC) was installed on the May in December 1941, in a small corrugated field post located on a hillock south of the Old Beacon.[63] There were usually eight observers on the island at a time, working in pairs, covering each 24-hour period. Their primary function was to identify and report the movements of all aircraft sighted from the post. The ROC observers wore RAF uniforms and carried revolvers. Their normal spells of duty on the May were three weeks on, followed by three weeks off. However, prolonged spells of inclement weather often resulted in protracted periods spent on the island.[64]

Approval was granted on 4 April 1940 for the establishment of a radar station on May Island, 'to assist, but not to replace the visual control of the indicator loop system'. However, production limitations at the time made it impossible to provide a special station for the May. At the end of November 1940, the RAF had recommended the installation of a Chain Home Low (CHL) radar station on the island. The CHL stations were designed to detect aircraft flying as low as 150m. This was strongly supported by the naval authorities at Rosyth, but nothing was done. An entry in the Admiralty War Diaries for 30 January 1941 records the concern of the Commander-in-Chief Rosyth about the lack of a CHL radar station on the island: on three occasions, during the afternoons of 24, 25 and 27 January, enemy aircraft had approached the Firth of Forth from the east and had carried out extensive reconnaissance of the Forth and Rosyth Dockyard without having been intercepted by fighters. On each occasion, the first indication of their presence was received from a ship, and this suggested that there was a line of approach by which aircraft could arrive undetected off the May Island. The Commander-in-Chief Rosyth strongly recommended that, in view of the growing importance of Rosyth Dockyard, such a station should be set up on the island.

Nothing more was done about a radar station until the spring of 1942, when a Type 31 low-power, coast defence, surface-watching radar set, housed in a transportable wooden cabin (known as a Gibson box) with its dish mounted on top, was delivered to the island. It arrived on a landing craft supply boat, and had to be manhandled up the island to its site, a concrete base situated a short distance east of the WSS. Sometime afterwards, a second radar set, believed to be a Type 41, which was a medium powered version of the Type 31, was sent to the May. At some point, this was housed in a small brick building known as the Radar Operations Room, which was constructed at the west side of the concrete platform where the Type 31 set remained.

Although these radar sets were not generally used for the detection of aircraft, a number of secret calibration exercises took place to check the accuracy of the sets, which involved low-flying Walrus seaplanes from Donibristle.

The May was supplied with food, fresh water and other supplies by two contracted vessels from Anstruther, which also transported personnel. In one year alone, one vessel made 527 trips to the island. Fresh water could only be landed at Kirk Haven Harbour during periods of calm weather, as it was pumped ashore into two lime-washed storage tanks.

The length of service on the May varied from a few months to several years. Leave normally consisted of two periods of ten days each year. Although weekend leave was also available every six weeks or so, few of the crew made use of it as it did not allow them sufficient time to travel to and from more distant homes.

The Commanding Officer, Lieutenant Commander Griffiths, did not take shore leave as he was on call 24 hours a day. Naval discipline was rarely, if ever, enforced, because there was little occasion for it, rather than through any laxity. Uniform was seldom worn, except for church parade, taken by the Commanding Officer, or on other ceremonial occasions. The normal day-to-day dress of the crew was either jerseys and trousers or boiler suits.

Commander Griffiths had to overcome the restrictions on women serving on ships, as he recalled:

> When my radar [Petty Officer] was hurt by a fall and hospitalised ashore, I had to make an urgent secret signal to the Commander-in-Chief, Rosyth, for a relief, who arrived the next morning; a gorgeous blonde who reported to me as my new PO Radar. When I could get my breath I enquired about her experience, to be told that she was reading for her mathematical tripos at Girton, when the Admiralty put its finger on her, gave her a three months' crash course in radar, and there she was. Having a sex-starved ship's company and no wrennery, I had to make her a guest of the wardroom mess, with my wife as chaperone, to the great satisfaction of my junior officers.[65]

The island was largely undefended, as Commander Griffiths remarked, 'I had sufficient semi-automatic weapons to arm an infantry platoon, and an adequate supply of ammunition; but I am sure that an enterprising U-boat commander could have landed and cut our throats like so many sheep …'. There was a single Lewis gun for anti-aircraft defence, mounted outside the north-east corner of the WSS. In May 1946, the Extended Defence Officer, Captain George Holbson Laing, RN, in a report on the defences in the Forth, stated that 'the very valuable and delicate instruments in connection with the Loop and HDA systems were most vulnerable to air attack, and this should have been provided against by housing the engines, and instruments, in caves excavated in the rocks. The personnel could also have been protected in this way. A single direct hit from a medium-sized bomb could have put all the underwater defences and communications out of action.' Holbson identified only Inchkeith and May Island as the locations for the delicate instruments.

U-boats were frequently suspected of lurking in the vicinity of the estuary mouth, but there was only one occasion when the crewmen of the May were convinced that a U-boat was actually attempting to enter the Firth of Forth. This occurred one afternoon during the very last days of the European conflict and was probably the consequence of a determined U-boat commander hoping to make a final strike before the war ended. Ratings in the loop room detected a crossing of the outer loops close to the southern end of the island. At first this was routinely reported to the SDO, but when no surface vessel was seen over the loops, the ASDICs were manned and the A/S trawlers alerted. Sometime afterwards a second crossing was detected by the inner loop system, and it was then suspected that a U-boat was floating in on the incoming tide. Destroyers soon arrived at the scene to assist the armed trawlers, and depth charges were dropped in the area. However, further contact with the 'crossing' was lost, although the destroyers and A/S trawlers maintained the search throughout the night. Early next morning, when the tide was going out, similar loop crossings in reverse order were detected, suggesting the U-boat, if that is what it was, had not tried to carry through its attack and was now attempting to leave the Forth. This led to a repeat of the previous day's excitement, but a further search by the destroyers and A/S trawlers proved fruitless.

Post War

At the end of the war, the May's naval complement was considerably reduced, although a presence was maintained on the island until early 1946. On 12 May 1945, the ROC Post was stood down and the personnel left the island. However, as with all other ROC Posts, the Air Ministry retained possession of the Low Light (which had been used for accommodation) and the field station for a time in case they were required for reoccupation in the event of an emergency, or for training.

The rest of the Admiralty personnel were withdrawn in early 1946, but the hutted encampment was maintained until about 1960, and Naval Lieutenants regularly visited the island for short periods with parties of adventurous cadets.

In July 1952, all the wartime communication cables laid across the island were torn up.[66]

The Korean War crisis and the increase in international tension led to proposals for a new ROC post to replace the wartime post, which had been dismantled. The Air Ministry erected an Observer's Post on a 5.5m square site leased from the Northern Lighthouse Board, close to the former site. In the end, it was never manned. At about the same time, the cable ship *Iris* arrived off the May and laid more cables on behalf of the Air Ministry, which increased the number of telephones on the island from six to twelve.

The dismantling of the large naval huts in Thistle Field began in 1961. In August 1980, the Head Lightkeeper, in a misguided attempt to tidy up the island, set fire to the WSS and the corrugated hut which had housed its generator. All the woodwork was reduced to a pile of ashes, but the brickwork remained standing. On 14 April 1981, the lightkeepers used explosives to remove the brickwork.

Now all that remains from the First World War period is a stone-built toilet near Holyman's Road and the concrete plinth for the War Signal Station. There is also a wooden grave marker in the old graveyard on the south plateau bearing the inscription 'WUFFY', of HMTB 28, Drowned, 25.X.14, presumably marking the grave of a pet dog belonging to a crewman from one of His Majesty's Torpedo Boats, which were stationed at the May.

From the Second World War period, there still remain the radar operations room and radar engine room buildings, as well as the concrete foundations for the ASDIC/Loop Control Station, hutted encampment and Signalmen's quarters. Sections of loop cable, in its protective armour, survive on the shore at NT 658988.

Notes

1 CAB 36/17.
2 WO 199/1110.
3 WO 192/255.
4 WO 199/1171.
5 Morris and Ramage 2009. The description of the battery here is adapted from their description.
6 Forbes 2009.
7 ADM 1/9849; Forbes 2009.
8 WO 199/1171.
9 Registers of Scotland, search sheet 9669, Volume 99, page 108.
10 A.VI.1/77 (PISM); Barclay 2013: 257–60.
11 WO 199/1171.
12 Hogg 1978: 191–2.
13 WO 199/1171.
14 WO 199/1171; Tofts, pers comm.
15 WO 192/255.
16 WO 199/528 WO 199/1171.
17 Osborne 2009: 196.
18 Dobinson 2000: 63.
19 A set of structures at NT 2060 7690 near Cramond, visible on a 1946 aerial photograph (RAF sortie M/105/NLA/104 frame 0620), adjacent to an Army accommodation camp, has been identified by HES as a dummy AA site (Canmore NT27NW 51); one of our informants suggested that this was a coast defence dummy, but we agree with the HES interpretation.
20 WO 287/78.
21 WO 199/940.
22 WO 199/940.
23 King 2005: 137–8.
24 WO 192/255.
25 WO 166/11409; WO 166/15002.
26 WO 166/15002.
27 There is a persistent local story that local members of a strict Brethren sect, who were conscientious objectors, were held at Kincraig at some time during the war. It is unlikely in the extreme that these men would be imprisoned in a military camp, but it is possible that they were held there temporarily while their cases were being considered. There were few British military installations in Fife in which they might have been held, as Fife was garrisoned by the Polish Army for much of the war.
28 Morris and Ramage 2009: 40–4.
29 The Chain Walk is a scrambling route *c* 1km east of Earlsferry along the cliff, a little above high water. Eight chains provide hand-holds on the route, which can take two to three hours to complete.
30 Roy Lewis, pers comm.
31 David Winmill, pers comm.
32 Morris and Ramage 2009: 61.
33 Morris and Ramage 2009: 69.
34 WO 199/1171.
35 WO 166/1742.
36 *contra* Saunders 1985.
37 WO 192/98.
38 WO 199/940; WO 199/942.
39 Morris and Ramage 2009: 70.
40 WO 166/1742.
41 WO 199/527.
42 Osborne 2009: 197–8.
43 WO 199/954B.
44 WO 166/11408.
45 WO 199/528.
46 WO 166/1567; Barclay 2013: 252–5; Allan Kilpatrick, pers comm.
47 WO 166/1567.
48 WO 199/942.
49 Morris 2004: 9.
50 ADM 137/1170; Morris 2004: 10.
51 Morris 2004: 5–13.
52 ADM 137/1170; Morris 2004: 12–13.
53 Morris 2004: 38.
54 NLC10/3/80.
55 Morris 2004: 21.
56 NCL 10/3/80.
57 NCL 10/3/80.
58 NCL 10/3/80.
59 Morris 2004: 40–5.
60 ADM 1/13135; Bruce Stenhouse, pers comm.
61 Evans 1950; Morris 2004: 41. ADM 1/13135.
62 ADM 1/13135.
63 NLC 10/3/80.
64 Morris 2004: 47–9.
65 Morris 2004: 31.
66 Morris 2004: 65; *Isle of May Bird Observatory and Field Station Daily Logs, 25 and 30 July 1952* (now stored at Scottish Ornithologists' Club (SOC) HQ, Waterston House, Aberlady, East Lothian EH32 0PY).

CONCLUSION

For around a century, the Firth of Forth was defended, first, as an increasingly important commercial port, then as a naval anchorage, and finally as the site of an important Royal Naval Base. In contrast to the anchorage in Scapa Flow, it was continuously used and provision made for its defence from 1880 until 1977. It played a vital role in two World Wars, as a repairing and commissioning base, as the base of the Grand Fleet and other naval formations and as the home of the convoy mustering area in Largo Bay. For all its prominence in the past, when the estuary was full of ships, the memory of the Forth's naval history is fading.

The most enduring markers of that history are the remains of the great naval fortress built to defend the commercial and naval port. These fortifications reflected the most up-to-date contemporary thinking on defence and their extensive surviving remains provide not only a major resource for understanding this aspect of Britain's naval history, but also for telling that story to a wider public. We hope our research provides the basis for future understanding, interpretation and conservation.

ANNEX: LIST OF CANMORE NUMBERS

Below, the main sites are listed along with the central National Grid References and site numbers allocated by Historic Environment Scotland in their *Canmore* database. Additional information may be available in local Historic Environment Records. The HES and local HER records for Stirling and east Lothian are available on the Pastmap.org website. Fife and Edinburgh did not make their information available online at the time the table was created.

Site Name	Central NGR	Canmore Site Numbers
Throsk	NS 850 928	NS89SE 76 + many sub-records
Rosyth	NY 0986 8267	NT08SE 41 + many sub-records. Other numbers relate to individual buildings
Crombie	NT 04796 84102	NT08SW 104 + sub-records
Castlandhill Radio Station	NT 1202 8261	NT18SW 222
Dalmeny	NT 13866 78245	NT17NW 177
Inchgarvie	NT 1370 7950	NT17NW 192
Forth Bridge Boom Defences (WW1)	NT 13474 79547	NT17NW 318
Coastguard	NT 13468 80254	NT18SW 119 NT18SW 120.01 (naval signal station)
Carlingnose	NT 13381 80718	NT18SW 105
Submarine Mining Station	NT 1346 8078	NT18SW 124
Hound Point	NT 15825 79322	NT17NE 70
Downing Point	NT 15765 82463	NT18SE 24
Braefoot	NT 17888 83433	NT18SE 25 + many sub-records
Charles Hill	NT 18635 83806	NT18SE 27 NT18SE 50 (anti-boat barrier)
Inchcolm	NT 1880 8250	NT18SE 22 + many sub-records
Inchmickery	NT 20674 80579	NT28SW 1
Cramond Island	NT 19763 78728	NT17NE 71 NT17NE 100 (75mm emplacement etc) NT17NE 118 (pylons)
Leith Docks Battery	NT 2785 7710	NT27NE 162
Inchkeith	NT 2944 8245	NT28SE 5 + many sub-records NT28SE 12 (jetty)
Kinghorn/Pettycur	NT 2699 8630	NT28NE 47 (Kinghorn) NT28NE 48 (Pettycur)
Kincraig	NT 4673 9991	NT49NE 44
Fidra Battery, Dirleton	NT 5029 8696	NT58NW 45
May Island	NT 65900 99090	NT69NE 16 (radar) NT69NE 19 (loop room) NT69NE 20 (signal station) NT69NE 21 (ROC post)
Fife Ness Radio Station	NO 63695 09674	NO60NW 384

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Archival Sources

The minutes and memoranda of the Committee of Imperial Defence, in the CAB 12 and CAB 13 series, were consulted in the National Records of Scotland. Duplicate copies are also held in the National Archives, Kew. Individual items from the Stenhouse Collection in the University of Edinburgh (https://archives.collections.ed.ac.uk/repositories/2/resources/204) have been used as illustrations and are referenced in their captions.

The National Archives, Kew

ADM 1/8667/164 1924 Personnel required at War Signal Stations on mobilisation.

ADM 1/8879 1904–5 Submarine mine defence: Naval aspects.

ADM 1/9505 1938 Defences United Kingdom: Seaward defences of home ports and bases: report of Admiralty Committee.

ADM 1/9848 1938–9 Defences United Kingdom: Indicator loop systems and harbour defence ASDICS for ports at home and abroad.

ADM 1/9849 1939 Defences United Kingdom: Defence of Home Ports.

ADM 1/9855 1939 Defences United Kingdom): Firth of Forth Anti-submarine fixed defences: Measures to increase efficiency consequent upon torpedoing of HMS Belfast.

ADM 1/9856 1939 Defences United Kingdom: Coastal Defences of UK Atlantic and Eastern Ports.

ADM 1/10392 1939–40 Defences United Kingdom: May Island, Firth of Forth, proposed indicator loops system: requisition of five Trawlers as look-out vessels.

ADM 1/12930 1941–3 Defences United Kingdom: Port defences in Rosyth Command: statement and amendments and removal of warhead minefield from Rosyth Channel.

ADM 1/13135 1943 Defences United Kingdom: Anti-submarine defences in Firth of Forth: trials, reports and revision.

ADM 1/15298 1943 Defences United Kingdom: Reductions in coast artillery defences in United Kingdom.

ADM 1/16723 1941–4 Defences United Kingdom: Future policy regarding coast artillery: viewpoints of services.

ADM 1/22932 1951–5 Naval Stations: Loch Ewe, Firth of Forth and Clyde: consideration of seaward defences; decision not to establish booms in peacetime; arrangements for laying heavy indicator nets in emergency.

ADM 1/25641 1954–7 Port plan for Granton and Leith in time of war.

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