ISSN 1478-7008

ENGLISH HERITAGE

COASTAL ARTILLERY FORTIFICATIONS ON THE ISLE OF GRAIN, KENT

Moraig Brown, Paul Pattison
and Andrew Williams

SURVEY REPORT

ARCHAEOLOGICAL INVESTIGATION SERIES

ISSN 1478-7008

COASTAL ARTILLERY FORTIFICATIONS ON THE ISLE OF GRAIN, KENT

Moraig Brown, Paul Pattison
and Andrew Williams

ARCHAEOLOGICAL INVESTIGATION SERIES

RCHM
ENGLAND

COASTAL ARTILLERY FORTIFICATIONS

ISLE OF GRAIN

KENT

NMR INDEX Nos: TQ 87 NE 7-10 & 115

NGR: TQ 892 760

Report by: P. Pattison, M. Brown & A. Williams
Survey by: M. Brown, P. Pattison, D. Garrow, A. Menuge, A. Williams & A. Donald
Drawings by: D. Garrow, P. Pattison, M. Brown & A. Cooper
Large-format photography by: S. Cole

Cambridge Office: Brooklands, 24 Brooklands Avenue, Cambridge. CB2 2BU
Tel: 01223 324010 ***Fax***: 01223 311203 ***e-mail***: cambridge@rchme.gov.uk

Headquarters: National Monuments Record Centre, Great Western Village, Kemble Drive, Swindon. SN2 2GZ
Tel: 01793 414700 ***Fax***: 01793 414707 ***e-mail***: info@rchme.gov.uk ***Internet***: http://www.rchme.gov.uk

Grain Fort during the First World War, with two 9.2-inch BL guns in place on the terreplein (reproduced courtesy of the Royal Engineers Library, Chatham: 779/940.3(42))

RCHM
ENGLAND

CONTENTS

1.	Introduction	1
2.	An Outline History of the Defences on the Isle of Grain	4
3.	Description and Interpretation:	8
	Grain Tower	11
	Grain Fort	35
	Dummy Battery (originally Grain Battery)	43
	Wing Battery	53
	Grain Battery	58
	Other Military Installations	62
4.	Management Implications for the Site	68
5.	Survey and Research Methods	71
6.	Glossary	72
7.	Bibliography and Sources	74
8.	Photographs taken during the survey	77
9.	Acknowledgements	81

ABBREVIATIONS USED IN THE TEXT

AA	anti-aircraft
CASL	coast artillery searchlight
BC	battery command
BL	breech-loading
BOP	battery observation post
DRF	depression range finder
QF	quick-firing
RML	rifled muzzle-loader
SB	smooth-bore

RCHM
ENGLAND

LIST OF FIGURES

Frontispiece: Grain Fort during the First World War

1.	Location map	1
2.	Aerial photograph showing the coastal artillery batteries at Grain	2
3.	RCHME 1:2500 plan showing the area covered by the survey and the individual features mentioned in the text	(in folder)
4.	Map dated 1864 showing the land acquired for the new fortifications at Grain	9

Grain Tower

5.	Grain Tower; view from the south-east across the mudflats	11
6.	The original entrance into the Tower with the date of construction incised into the lintel	12
7.	Sections through GrainTower, drawn in 1914	15
8.	The anchor chain for the Medway Boom and sockets for the wooden supports for the landing stage	16
9.	Plans dated 1914 of the ground floor and foundation level of Grain Tower	17
10.	Plans dated 1914 of the gun and upper floors of Grain Tower	19
11.	The interior of the Men's Shelter showing hammock hooks in the ceiling	21
12.	The stairs leading to the 4.7-inch QF gun positions	22
13.	Sketch plan of the gun floor and barrack block in 1941	24
14.	The lift mechanism for the Twin 6-pounder gun at magazine level	25
15.	Schematic plan of the conversion of the magazine store into a barrack room in 1941	26
16.	RCHME plan of the gun floor level (1:125 scale)	27
17.	Contemporary photograph showing the installation of the Twin 6-pounder gun in 1941	29
18.	The Battery Observation Post from the south	30
19.	The interior of the barrack room with the NCO's room in the far corner	32
20.	Schematic plan of the barrack room in 1941	33

Grain Fort

21.	Plan dated 1895 of Grain Fort	34
22.	Schematic comparison of profiles across the Fort in 1895 and 1998	35
23.	Block plan dated 1895 of the main underground components of Grain Fort	36

24. Plan dated 1895 of the ground floor of the keep 37

25. RCHME survey plan of Grain Fort (surveyed at 1:500 scale) 39

Dummy Battery

26. Plan dated 1906 of Dummy Battery 43

27. Plan dated 1906 of the new 4.7-inch QF battery 44

28. RCHME survey plan of Dummy Battery (surveyed at 1:500 scale) 45

29. Dummy Battery from the south-east, showing the exposed concrete of the 4.7-inch QF battery and the standing water in front 46

30. Dummy Battery from the rear showing the two 4.7-inch QF gun emplacements, the magazine between them and the BC post to the right 47

31. RCHME plan of the 4.7-inch QF battery and magazine 48

32. The southern 4.7-inch QF emplacement showing the holdfast bolts 49

33. Dummy Battery showing the magazine entrance, steps to the gun emplacements and the BC post to the right 50

Wing Battery

34. Plan dated 1896 of Wing Battery 52

35. Plan dated 1896 of one 4.7-inch QF and two 11-inch RML gun emplacements and their magazines 53

36. RCHME survey plan of Wing Battery (surveyed at 1:500 scale) 54

37. Photograph taken during the First World War showing the rear of Wing Battery and the buildings stationed there 56

Grain Battery

38. Plan dated 1902 of Grain Battery 58

39. Plans and elevations dated 1902 of one of the 6-inch BL gun emplacements and its magazine and troop shelter 59

40. RCHME survey plan of Grain Battery (surveyed at 1:500 scale) 60

41. First World War trenches north of Grain Fort, with the twin electric light emplacement for Grain Fort in the distance 62

42. Electric searchlight emplacement at Grain during the First World War, with part of an extensive trench system in the foreground 63

43. The electric searchlight emplacement east of Grain Fort 64

44. First World War photograph across Wing Battery, showing the building complex and the Medway Boom 65

45. Photograph of the Engine Room from the southwest 65

1. INTRODUCTION

In March 1998 the Royal Commission on the Historical Monuments of England (RCHME) surveyed earthworks and structures associated with the coastal batteries at Grain, on the Isle of Grain, Kent (NMR Numbers TQ 87 NE 7-10; SAM Number Kent 297). This survey was undertaken at the request of Kent County Council as part of an Interreg II programme relating to historic fortifications in Kent, Nord-Pas de Calais and West Flanders. The projects was coordinated for Kent partners by Kent County Council and part-funding was provided by the European Union. The project was the responsibility of staff of the RCHME's Field Office in Cambridge.

The Isle of Grain is an area of low-lying ground defined by the River Thames to the north, the River Medway to the east and south, and Yantlet Creek to the west. The mouth of the River Medway and the Isle of Grain occupy a strategically important location where the Thames Estuary, a wide open body of water, narrows into the River itself (Figure 1). The Thames is just 8km (5 miles) wide at this point, with extensive stretches of mudflats which make landing boats of any size difficult. The River Medway, therefore, as one of the few navigable rivers providing landing places in this area, occupied a vital link in the East Coast defences; the fortifications protecting it, including those at Sheerness and on the Isle of Grain, were of paramount importance.

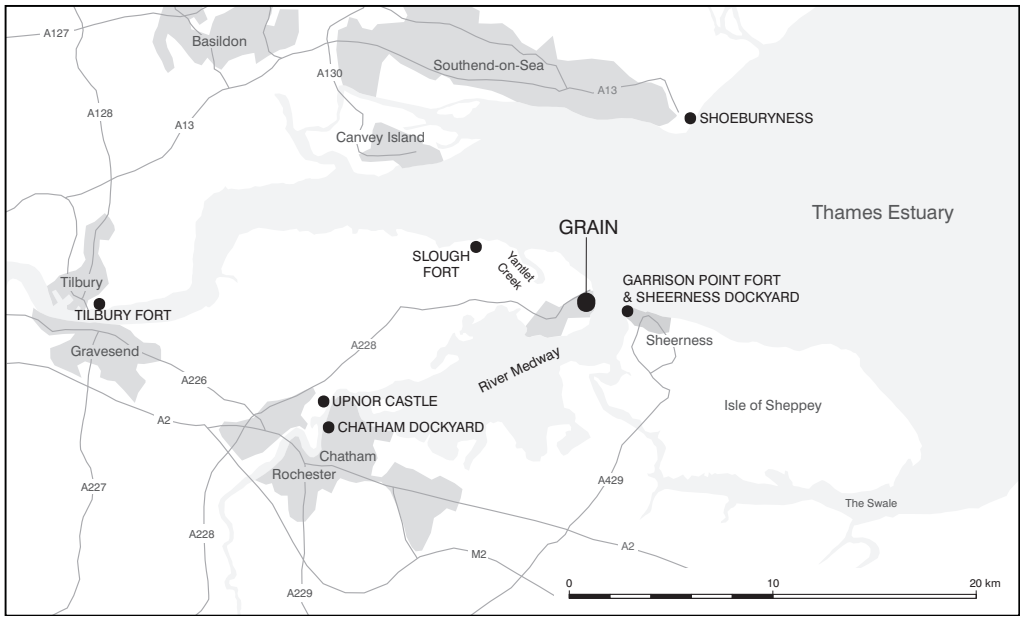

Figure 1
Location map

The visible remains of the Grain defences comprise five batteries of coastal artillery, one of which was once a powerful garrisoned fort, occupying the eastern tip of the Isle. Four of these cluster along the coast facing into the Medway, while the fifth, Grain Tower, lies in the estuary on a tidal mud flat called Grain Spit, between Grain and Sheerness (Figure 2). All are of the 19th or early 20th century in origin and formed part of a greater defensive scheme for the Thames and Medway.

Figure 2
Aerial photograph showing the coastal artillery batteries at Grain (NMR AP: 58/RAF/ 1779/298 (06/06/1955))

As well as these five batteries, numerous other fortifications and military installations were established on the Isle of Grain at various points in its history. For instance, during the First World War there was a seaplane base to the south of the batteries and a complex arrangement of trenches and communication lines extended along much of the coast. Many of these works, although obviously important in their time, have left little or no surface trace; they are briefly touched upon here if some slight trace survives within the survey area or where they are directly relevant to one of the main batteries.

The majority of the remains lie within an informal receration area maintained by St James Isle of Grain Parish Council, and are a popular destination for local residents.

Project aims

The survey of the artillery defences had three major aims:

1. To provide a better understanding of the surviving remains
2. To provide a general overview of the conservation and management needs of the area
3. To assess the educational and tourism potential of the site.

2. AN OUTLINE HISTORY OF THE DEFENCES ON THE ISLE OF GRAIN

Although little attention has been paid over the years to the defences on the Isle of Grain, Philip MacDougall compiled a short history in 1980. *The Isle of Grain Defences*, published by the Kent Defence Research Group, forms the basis of the short synthesis which follows.

The River Medway has long played an important rôle in England's coastal defences, not least due to the construction of the Royal Naval Dockyard at Chatham, 8 miles upriver, in 1570, though even before this the river was an important naval anchorage. Grain, Sheerness, Hoo, Gillingham, Upnor and Chatham all played important rôles in the defence of the Medway, though the focus was at Sheerness due to its proximity to the deep water channel; this focus was emphasised in the 17th century when another Naval Dockyard was built there. In 1802 it was proposed that the dockyard functions of Chatham and Sheerness be moved to a new site on the Isle of Grain. Although this proposal was never realised, Grain continued to play a vital part in defending the mouth of the river and the dockyard there.

The earliest reference to the Grain defences is in a document of 1532 which suggests that the entrance to the River Medway was subject to a permanent defence plan, with one Nicholas Arnolde governing Queenborough, the Isle of Grain and Sheerness. This document mentions numerous weapons for the defence of *'Sheppie'* and the *'Isle of Granie'*, ranging from bows and morris pikes to demi-canon and culverins. In 1545, £500 was spent on fortifying Queenborough Castle and the Isles of Sheppey and Grain, though what the money was spent on is not clear.

By the middle of the 17th century, the Medway defences were so poorly organised and equipped that in June 1667 the Dutch were able to enter the river and wreak havoc upon the ships anchored as far up as Chatham and Rochester. It was only after this penetrating and humiliating raid that three earthen batteries were constructed on the Grain side of the river. These appear to have been short-lived; by 1725 the Medway defences were concentrated solely on the fort at Sheerness, which had been completed after the Dutch raid of 1667: the rest apparently had been abandoned.

A temporary measure, in 1771, saw a guardship anchored in the Medway close to the Isle of Grain, and in a report of 1779 Lt Col Hugh Debbeig concluded that the area was substantially undergunned. In consequence, a number of floating batteries were brought into the estuary for the duration of the Napoleonic War. A temporary mortar battery was erected at Grain in 1797 to prevent rebellious sailors sailing towards London during the Nore Mutiny.

A small battery, some 600m WWS of Grain Fort, is visible on aerial photographs dating from the First World War (PRO: WO/192/83), though no other references to its existence have been

located. The battery constitutes a semi-circular work with an inner ditch surrounding a pentagonal open-topped structure; it is very similar to a number of batteries dating from the late 18th/early 19th centuries, several of which were located along the north Kent coast (Smith 1985, 17-8; Roger Thomas, pers comm). MacDougall mentions a temporary mortar battery, possibly this one, at Grain in 1797, but he fails to note its location (MacDougall 1980, 7).

Although it was recognised during the Napoleonic Wars that the Medway entrance was insufficiently protected, it was not until 1846 that specific plans were produced for defences on the Isle of Grain, resulting in borings being taken on a spit of land in the Medway estuary to ascertain its potential for supporting a Gun Tower. Work on the foundations of this tower, referred to in early documentation as Three Gun Tower and then Grain Tower, began late in 1848 (PRO: WO/44/614), and it was completed by 1855. It was equipped with three smooth-bore (SB) cannon: two 32-pounders and a 56-pounder (CREL a).

Grain Tower was a derivative of the Martello Towers which evolved from the design of a gun tower at Cape Mortella (subsequently corrupted to Martello) in Corsica that survived prolonged bombardment by the Royal Navy in 1794. As a result of this action, senior British officers recommended a tower of this design as the basis of a coastal defence system for southern England. Due to the cost involved the idea was not adopted until 1803, under the threat of imminent invasion, and construction on the first tower did not start until 1805. Between 1805 and 1812 a chain of 74 towers was built between Folkestone and Seaford with a further 24 of modified design, the East Coast Towers, built from 1808 onwards between St Osyth Stone and Aldeburgh. The distinguishing features of the Martello design are a roughly elliptical plan with the inner and outer walls arranged eccentrically so that the thickest part of the wall faces the most vulnerable side, usually to seaward. Access was by a ladder or drawbridge leading to the living accommodation on the first floor with water, stores, and ammunition on the ground floor. The armament of a single 24-pounder gun, or three 24-pounders in the case of the East Coast towers, was mounted on the roof. The usual garrison in the tower consisted of one officer and 24 men. The Martello Tower design became a favoured method of minor fortification and was built in various modified forms at British bases and possessions all over the world (Saunders 1989, 141).

The tower at Grain came towards the end of an evolutionary line but is not a solitary example as functionally similar gun towers were built at Stack Rock on the Mersey (1850) and in Pembroke Dock (1851) (Saunders 1989, 143). However, it was obsolete within a few years: its smooth-bore guns were intended for close defence of the deep water channel and became vulnerable to the threat from the new iron-hulled warships which, from 1855, carried a new generation of longer reaching and more powerful rifled artillery. Nevertheless, a 6-inch rifled muzzle loader (RML) was installed on the Tower *c* 1860 and remained until 1906 (PRO: WO/192/223).

Following the 1860 Royal Commission into England's coastal defences, there was a colossal effort put into the construction of new forts and batteries throughout England. Locally, it resulted in an overhaul of the Sheerness defences and the construction of the massive two-tier casemated battery at Garrison Point. The Commission also recommended that a large fort and an auxiliary battery be built at Grain, and that Grain Tower should be strengthened and re-armed. While lack of funds ensured that the Tower remained virtually unchanged, work began on Grain Fort in 1861 and was well advanced by 1868. It was designed as a garrisoned and defensible keep, surrounded by a polygonal earthwork of huge proportions, the embankment of which was to support a powerful battery. Initially there were to be 16 heavy artillery pieces, but alterations in the design and problems with supply meant that the completed work had emplacements for seven guns, initially RMLs, but later supplemented by two 10-inch breech-loaders (BLs) on disappearing carriages.

The auxiliary battery recommended by the Royal Commission was constructed on Smithfield Marshes, 1km south of Grain Fort, and was originally named Grain Battery (changed to Dummy Battery in 1901). Construction took place between 1867 and 1869 but it was probably not completed as originally designed, there being problems with subsidence on the site. The gun complement was meant to be 16 but only four RMLs were mounted some time in the 1870s.

By the late 1880s, new quick-firing (QF) guns of smaller calibre were being developed to counter a new threat: attack from fast-moving torpedo boats which had the potential to wreak havoc on anchored shipping in the estuary. These new guns were gradually installed in coastal artillery batteries throughout the British Isles, including Grain, where a new battery was built in 1895, on the southern flank of Grain Fort. Called Wing Battery, it was built to a new, low-visibility design and supported a combination of two heavy RMLs and two 4.7-inch QF guns (PRO: WO/78/5133/2).

By the beginning of this century, Grain and Sheerness formed the front line defence for the vitally important Thames and Medway estuaries, due to the long-range 9.2-inch BL guns recently installed at Grain Fort (Smith 1985, 37). In 1900, the estuary was given the additional protection of a floating boom, with separate 12-pounder batteries protecting each end of it, one at Hooks Flat, the other on Burntwick Island. This was still not enough and in 1901 another new battery - again of low profile - was built south-west of Grain Fort: Grain Battery was armed with four 6-inch BL guns. Only three years later the old Grain Battery - renamed Dummy Battery - was totally rebuilt for two 4.7-inch QF guns. Each of these new batteries had attendant magazines, shelters, command posts and direction range-finding equipment; searchlights to counter night attack were provided in the first decades of the 20th century.

By 1911 the two 4.7-inch QF guns had been moved from Wing Battery to new emplacements on Grain Tower. In the same year a new boom was laid between Grain Tower and Sheerness. Few

sources have come to light regarding the batteries during the First World War but there was considerable military activity: by 1918, the Fire Command Post for the Thames defences was sited at Grain (Smith 1985, 40). There were apparently anti aircraft (AA) guns on Dummy Battery. MacDougall states that there were two 3-inch AA guns, in part to defend the Royal Naval seaplane station just to the south (MacDougall 1980, 18), and the Approved Armament lists more AA guns close to the aircraft sheds: two 6-pounder Hotchkiss and two 1-pounders on naval carriages (PRO: WO/33/746 page 36). Moreover, the entire coastal strip from north of Grain Fort to south of Dummy Battery was protected by trenches, barbed-wire entanglements, machine-gun posts and at least one temporary redoubt (CREL b). Given the supremacy of the Royal Navy during the First World War it is unlikely that the guns at Grain were fired in anger, though they remained vigilant (see Frontispiece). After the war it is probable that the batteries, in common with the majority of other coastal defences, were kept in a 'care and maintenance' condition or were disarmed.

By 1935, Grain Battery was disarmed; Wing and Dummy Batteries had no weaponry after the First World War. The condition of Grain was probably reviewed in 1938 after the Munich Crisis of that year had made clear the likelihood of war with Nazi Germany. At the outbreak of the Second World War only Grain Fort mounted medium guns - two 6-inch BL. At Sheerness and on Grain Tower a new type of weapon was soon deployed. This was the Twin 6-pounder gun, a weapon capable of a very high rate of fire, specially designed to counter the fast-moving German 'E' and 'S' motor torpedo boats. Grain Tower was extensively altered to support this gun and a free-standing barrack block was built adjacent to it. There was other activity in the area, notably north of Grain Fort where there were two emergency gunhouses for 6-inch BL guns (at TQ 888770 and TQ 889770), a heavy AA battery (White Hall Farm Battery at TQ 883773) and extensive anti-tank defences along the foreshore (NMR APs: 82/RAF/713/0274-5; 540/458/3239-40).

A military presence was maintained over most of the site until the decision in 1956 to abandon all coastal artillery fortifications, after which many structures were pulled down or filled in to make them safe, and some of the earthworks slighted.

3. DESCRIPTION AND INTERPRETATION

For all letters and words in **bold** in the text please refer to the relevant figures; for an overview of the entire survey area see Figure 3.

Summary

The following text is primarily concerned with the five artillery batteries at Grain. They are described in chronological order as follows:

Grain Tower, built 1848-55

Grain Fort, built 1861-8

Dummy Battery, built 1867-9

Wing Battery, built 1895

Grain Battery, built 1900-1

The area of survey extended from Grain Fort in the north to Dummy Battery in the south; a narrow coastal strip, some 150-250m wide, along the west side of the Medway estuary; a total area of approximately 32 hectares (69 acres). Grain Tower was surveyed as a separate exercise. All the archaeological features within this area were recorded at a scale of 1:2500, with 1:500 or larger scale surveys of the batteries.

Grain Fort was the main fortification at Grain from its construction in the 1860s to its decommissioning in 1956. It was supported originally by an auxiliary battery, Dummy Battery, some 500m to the south, reached along a specially constructed road carried in a cutting and on a causeway. Wing Battery and Grain were built very close to Grain Fort at the turn of the 19th century: the proximity of the three is unusual but was probably the result of pragmatism; the need for batteries of new design overlooking the estuary with at least some elevation: the ground to the south was too low.

Several military features survive in the areas between the batteries. These include two searchlight emplacements of pre-First World War date and an engine room probably supplying power to Grain Tower during the Second World War.

Introduction

With the exception of Grain Tower in the estuary, the defences were established on enclosed farmland, common land and coastal marsh, acquired under the Defence Act of 1860, by purchases between 1861 and 1863 (Figure 4). The northern half of this area occupies slightly higher, dry ground immediately south-east of the village of Grain, while to the south of Smithfield Road the remainder is taken up by Smithfield Marshes. Smithfield Road provided access to the jetties and causeway serving Grain Tower.

Figure 4
Map dated 1864 showing the land acquired for the new fortifications at Grain (acquisitions shaded darker grey) (PRO: WORKS/43/373)

The construction of these batteries required alterations to the sea front, especially on Smithfield Marshes, and the existing meandering sea wall was either levelled or incorporated into a new one established a short distance to the east, roughly along the high water line of ordinary spring tides. A fragment of the earlier sea wall survives as a denuded earthwork south of Wing Battery. Considerable earth movement and drainage works were required in the areas around the batteries, most obviously in Smithfield Marshes where new drainage ditches were cut to augment those existing alongside the natural creek system. Also, there are two large, flat-bottomed depressions, up to 2.0m (6ft 6in) deep; probably borrow pits. Grain Fort and Dummy Battery were linked by a straight road which survives as an earthwork: south to Smithfield Road it is carried in a cutting, averaging 4.0m (13ft) wide and 1.5m (5ft) deep; it crosses the marshes as a prominent causeway, 4.0m (13ft) wide and 2.0m (6ft 6in) high. The larger borrow pit abuts the causeway and on its western margin there are several small mounds, probably soil dumps, which overlie the lower slope of the causeway. The smaller borrow pit also adjoins the causeway.

GRAIN TOWER

Grain Tower is located on the east side of the Isle of Grain at the extreme low-water mark of a tidal mud flat called the Grain Spit. The port of Sheerness is almost due east of the tower and is clearly visible from its top. The deep-water channel from the Nore into the Medway runs between the Tower and Sheerness.

Figure 5
Grain Tower; view from the south-east across the mudflats (NMR: AA98/07914)

The Tower (Figure 5) is reached at low tide by a causeway or hard, constructed from interlocking concrete blocks laid between timber edging. Large sections of the causeway, particularly at the exposed east end, have broken up under the action of the tides. In 1864, access to the tower was from a little further north via a track following an angled course, heading south-east from the shore: this is likely to have been the original arrangement (Figure 4). The causeway was moved to its present position sometime before 1889, though the structure which survives today may be a later rebuild, possibly dating to around 1915, the date of the boom to which the hard also provided access (PRO: WO/78/5115/2).

At high tide the tower can only be reached by boat and there was a jetty adjacent to the causeway by 1889 (PRO: WO/78/5115/2; Figure 4).

1) The original tower 1847 - 1910

Grain Tower has a plan similar to that of the east-coast Martello Towers of 1808-12: the exterior does not conform to any regular figure but resembles a circle which has been flattened on the east and north west. Internally, however, the plan is a true circle, placed eccentrically within the outer figure so that the thickest part of the wall faces the seaward or north-east side. In elevation the tower tapers from a broad base to the string course or cordon, the highest original point of the tower remaining.

Unlike the Martello Towers, which were constructed entirely from brick, Grain Tower has an outer skin of granite ashlar, though the interior walls and vaults are of brick. The granite blocks, 1.0m (3ft 4in) long by 0.4m (1ft 4in) high, are carefully coursed with the joints almost concealed. The mortar is a dense brown substance which may be a development of the lime, tallow and ash mortar used on Martello Towers (Saunders 1989, 141). Internally a central circular-section pier rises from ground level to an annular-vaulted ceiling above the first floor, an arrangement which parallels that found in earlier Martello Towers.

The exterior of the tower is very plain with a two-course stepped plinth at the base and a cordon of rounded section incorporating a drip mould running around the tower. The openings for a door and four first-floor windows are carefully formed with granite blocks forming both flush sills and lintels. Various ferrous shackles and loops are set in the stonework of the tower but their function is not clear; some may have been mooring points.

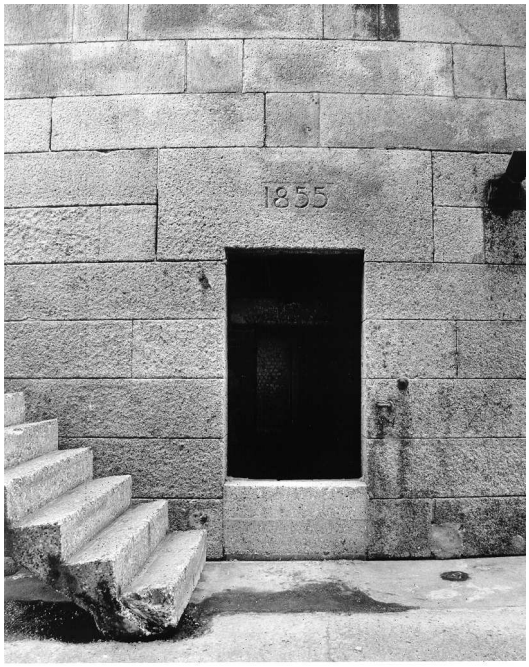

Figure 6
The original entrance into the Tower with the date of construction incised into the lintel (NMR: AA98/07903)

The entrance

Entry is at first-floor level via a doorway set midway up the north-west side of the tower. The projection of a section of the tower wall under the doorway forms a landing at low tide and a landing-stage at high tide, originally reached by stairs on the south-west. The doorway has the date *'1855'* incised in the lintel (Figure 6). As this courses with the surrounding stonework and the date agrees with the documentary sources for the date of the completion of the tower there is no reason to doubt that it is original. A rebate in the granite lintel and pintles on the east side of the door suggest that there was a flush-fitting outside door opening outwards on pintle hinges. On the inside of the doorway, pintles and a deep

rebate in the lintel (the sill has been destroyed by later work) show that there was also a door closed from inside the tower. Various holes in the surrounding masonry, many now blocked by mortar, suggest the positions of fittings such as bars and locks.

The entrance opens onto a small lobby, from which brick-vaulted stairs rise north-east and south-west in the thickness of the tower wall: originally there was no direct access from the entrance into the body of the tower. The north-east stair leads through a semicircular arched doorway for a door opening inwards, to a small chamber with a semi-circular vaulted ceiling. This chamber is lit by a single window underneath a two-course segmental arch with a sill made out of sandstone slabs gently sloped towards the interior. The window was intended for light only, rather than local defence of the doorway, as it is impossible to see the entrance or steps. The chamber contains a large slate water tank, mounted 2.0m (6ft 6in) off the floor, and supported by two courses of corbelled-out brickwork on the interior wall and by set-backs in the other two walls; this, along with the use of slate slabs for the body of the tank, suggests that it is an original feature. The brickwork of the chamber is undisturbed and courses through, confirming the impression that the chamber was constructed to contain the water tank. It is possible that there was a handpump, though no pipework is visible.

The south-west stair from the lobby contains granite steps leading up to a small landing lit by a window. The south-west jamb of this window has a smooth finish to the granite and utilises the same yellow-orange brick, suggesting that it is original, although the rest of the window is later work. It is likely that a window similar to that in the water tank chamber should have been in this position. A flight of stairs descends from the landing in a sharply downward-angled vaulted passage, entering the body of the tower through a semi-circular arch. On the south-west side, near the foot of the stair, there is a small vaulted room or recess, recorded as an *'old latrine'* on a drawing of 1914 (PRO: WO/78/5121/3).

These elaborate arrangements of entry are unusual compared to the Martello Towers, which have direct access from the entrance. The obvious explanation at Grain is for defence, perhaps to compensate for the relative vulnerability of the doorway from the outside: Martello entrances were usually defended by outworks or accessible only by a retractable ladder. In contrast, and at low tide, Grain is provided with granite steps and a landing which would have helped attackers reach the door and break it down. However, once inside they would have to contend with the narrow entrance passage and stairs, and in small numbers, making them easy targets for the defenders as they emerged into the body of the tower. The water tank chamber may have been included to provide false exits to confuse attackers. The only other advantage of this tortuous access would have been to keep draughts out of the living quarters, although the location of the door on the landward side of the tower would have made it quite sheltered.

The first floor

In earlier Martello Towers the first floor provided living accommodation for the garrison, and the evidence points to a similar arrangement here. The first floor is lit by three large windows each having deep internal splays, a shelving sill formed of sandstone flags, and a shallow segmental rear arch. The window frame is placed in the granite outer skin of the tower. The height of the sills from the floor of the tower and the slope of the sill makes it unlikely that these windows were intended as gun positions.

No evidence for original internal partitions remains and the fireplace is rather fragmentary. In the north wall between two windows there is an opening blocked with brickwork which has failed, revealing smoke-blackened bricks at the rear of the opening and, forming the base, a sandstone slab with a central hole, perhaps for a stove flue. The standard Martello plan provided a single fireplace in the living quarters (in the officer's room) with the stack rising in the thickness of the tower wall. The evidence at Grain is too fragmentary to confirm this arrangement, although it is the strongest hypothesis. West of the fireplace is an original cupboard.

The ground floor

This was not accessible at the time of survey as it was full of sea water and old pipes. The 1914 drawings show that the ground floor was unlit and reached down a ladder from the Barrack Room. Inverted arches form the base of the vaulted internal chamber in the tower, spreading the loads collected by the external walls and the central column. The ground-floor rooms are shown with solid floors made up level on the top of the inverted arches except the south-west room, labelled as *'very wet',* which has a suspended timber floor and what appears to be a vaulted ceiling, suggesting that it was a magazine. It is also clear that this room is the only partitioned space on the ground floor, suggesting that the rest of the ground floor was used as general storage. In 1914 the north-west room is labelled *'Old Magazines'* referring, in error, to the whole of the ground floor. Martello Towers generally used the ground floor as a magazine and food store (Figure 7).

The roof

The roof formed the fighting position of the tower. Access from the first floor is via a staircase leading from an arched doorway in the west side of the tower. The granite steps of this stair are contained in a brick vaulted passage, C-shaped in plan, running between the granite outside wall and the brick inside wall. The stair passage is located in the west side of the tower, facing the Isle of Grain, the side least vulnerable to shell fire. The lower of two 90-degree winder turns is lit by a window with a sandstone sill: the interior face of the granite has a rebate, probably for a shutter for a glazed window, matched by another cut into the sill. Square holes located about half-way up the sides of the window opening would have provided ventilation.

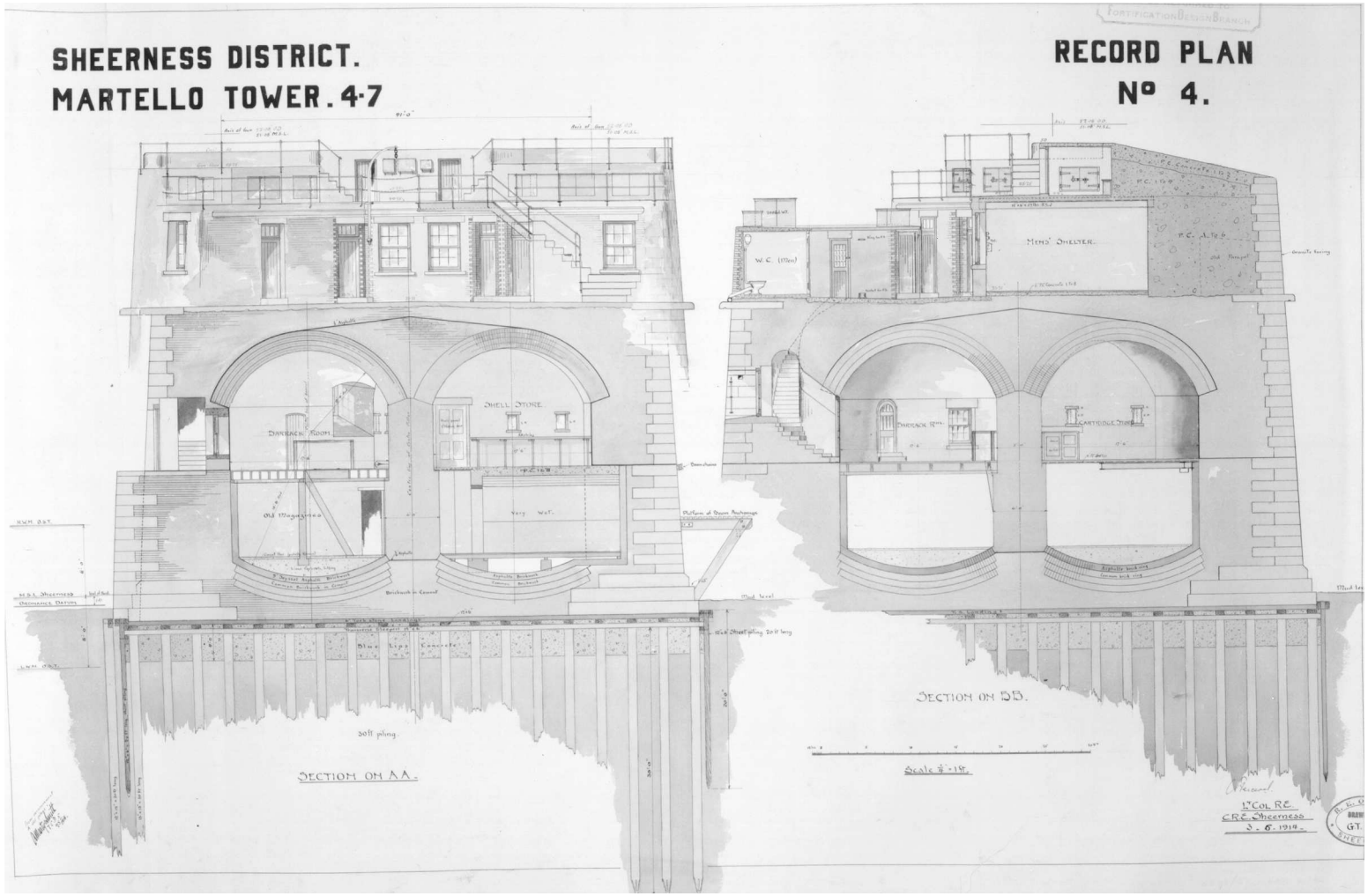

Figure 7 *Sections through Grain Tower, drawn in 1914* (PRO: WO/78/5121/4)

The stair passage appears to be largely unaltered and emerges onto the roof in virtually its original position.

Successive remodelling has removed all traces of the original form of the roof and its fighting arrangements. However, the original armament was one 56-pounder and two 32-pounder cannon and, by analogy with Martello plans, they would have been mounted on the roof behind a parapet. One of the 1914 section drawings shows the dotted elevation of the parapet, about 2.5m (7 ft) high, rising on the same batter as the rest of the tower (CREL c: Sheerness Letter Books 1855, p.115; Figure 7).

2) The 1910-12 remodelling

Grain Tower was remodelled for new armament between December 1910 and May 1912 (Figure 7). Two 4.7-inch QF guns were transferred from Wing Battery to counter the potential threat of high-speed torpedo boats attacking ships at anchor at Sheerness or Chatham. The guns, associated directing equipment and crew quarters were installed on the roof while the first floor was remodelled as barracks and magazines. The ground floor level was abandoned as *'very wet'*. The tower also acted as an anchor point for a boom stretching to Sheerness.

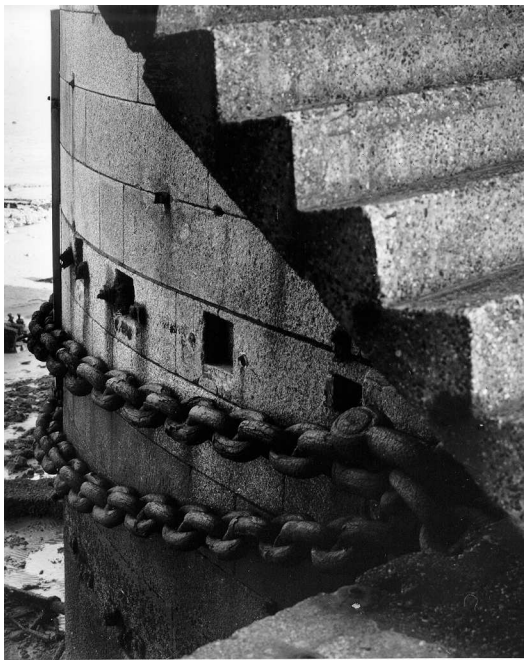

Figure 8
The anchor chain for the Medway Boom and sockets for the wooden supports for the landing stage (NMR: AA98/07892)

Apart from the removal of the old parapet to the level of the cordon, little alteration was carried out on the exterior. The only additions that can be identified as part of this phase are the remains of the Medway Boom: a large link chain wrapped around the tower (Figure 8) and the remains of wooden staging on the east and west sides of the tower. The staging was supported by posts lodged in sockets cut into the stonework of the tower at oblique angles; the east platform was a boat stage, the west platform used by the Admiralty for rigging the Boom (Figure 7).

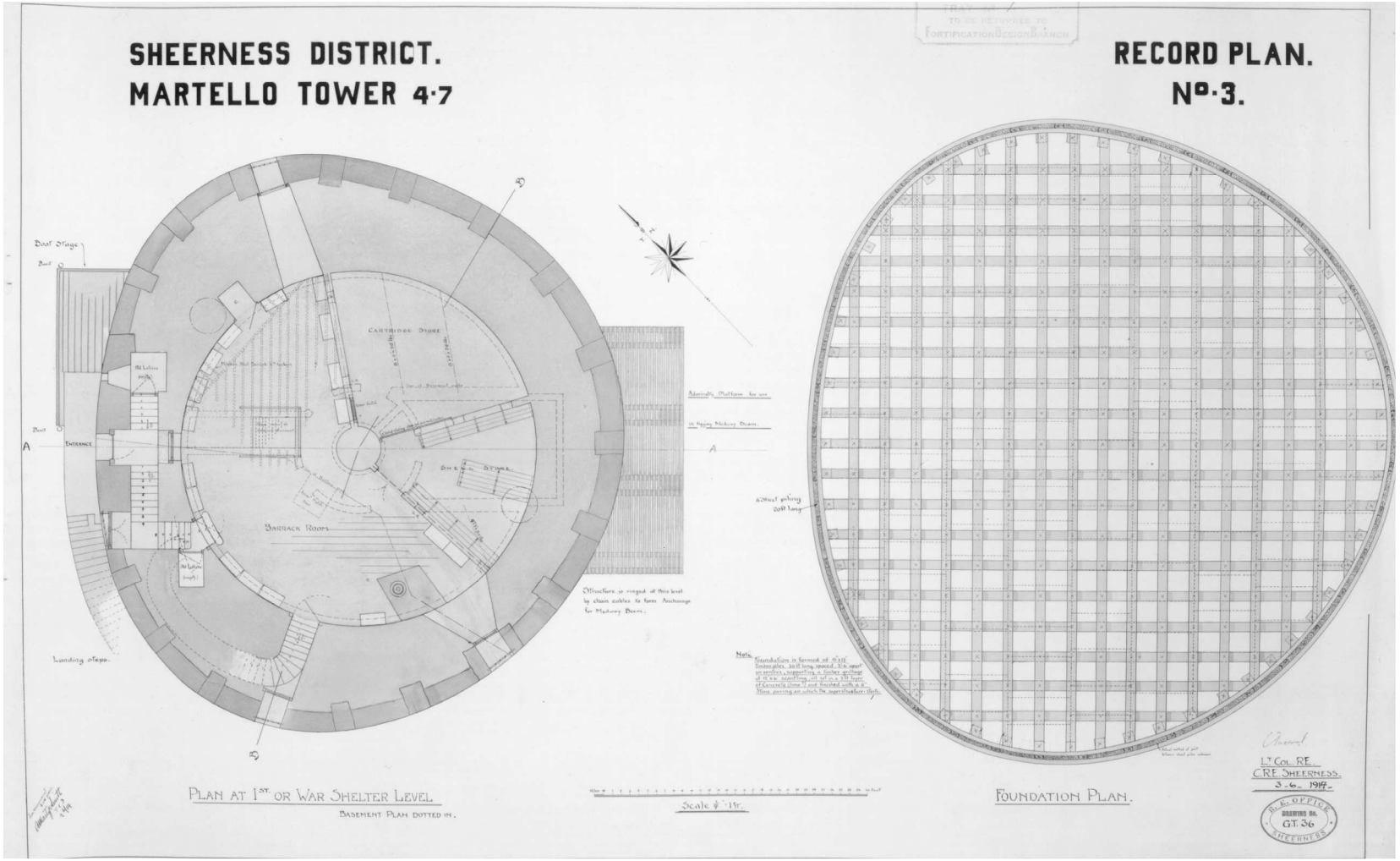

Figure 9 *Plans dated 1914 of the ground floor and foundation level of Grain Tower* (PRO: WO/78/5121/3)

The first floor: Barrack Room, Shell Store and Cartridge Store

The remodelling of the first floor involved the insertion of a series of brick partition walls, dividing the area into three rooms: the Shell Store and Cartridge Store were located in the south-east and south-west, the remaining space given over to the Barrack Room (Figure 9).

The creation of these rooms involved extensive work, with a new concrete floor being laid, possibly using the set-backs for the original timber floor. Each room was sector-shaped with 9-inch partition walls built in yellow brick laid to English bond, radiating from the central pier. Intercommunicating doors were provided against the central pier, leaving the majority of the floor space available for storage or living accommodation. The dividing walls were built to stop short of the vault and wooden louvred ventilators were set in their top courses, both measures to facilitate ventilation between rooms. All three walls have two small borrowed lights placed 1.5m (4ft 8in) off the floor; these have sandstone lintels and sills. Rebates formed in cement, screw holes and lead mounts for glass show that these lights were originally glazed flush from one side and would probably have acted as magazine lights.

Light for the Barrack Room was increased by cutting away the lintel and jambs of the window and replacing them with concrete sections supported on angle-iron brackets. Additional light in the Barrack Room was provided by inserting a sashed borrowed light in the wall directly opposite the entrance. In common with other doorways and windows in this phase it had a concrete lintel and blue bull-nosed Staffordshire brick jambs. As the original fireplace was now located in the Cartridge Store and was blocked up during the conversion, the Barrack Room had to be heated; there may have been a radiator against the central pier.

The Barrack Room was also used as part of the ammunition supply system: an ammunition hatch to the Upper Shelter Level (see below) pierced the vault in roughly the same location as the present ammunition hoist (Figure 9). When this hatch was in use the Barrack Room had to act as the shifting lobby, where cartridges and shells were handled before being supplied to the guns. The handling process had to be well organised: shells would have been passed into the east end of the Barrack Room via the twin-leaf doors from the Shell Store while cartridges entered at the west end. A depression, perhaps for a rail, in the floor of the present doorway and a straight joint in the west jamb reveal the position of a sliding issue hatch placed low in the wall between the Barrack Room and Cartridge Store (Figure 7). Shells and cartridges would have been passed to a handling crew in the centre of the room who would have passed the ammunition through the hatch in the roof to the gun crews. The large floor area of the Barrack Room would have allowed these three separate crews working room to hoist the ammunition through the hatch to the guns.

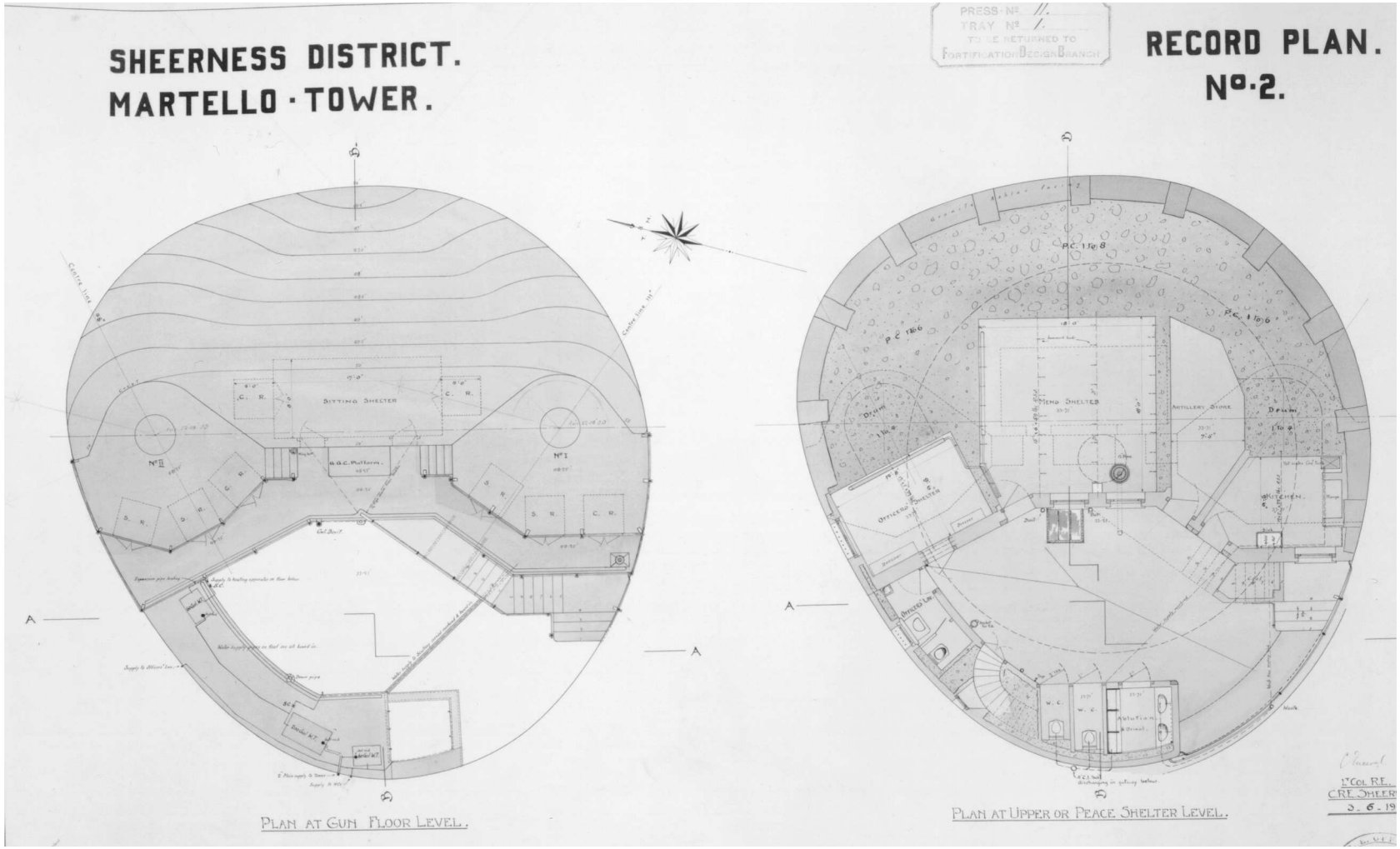

Figure 10 Plans dated 1914 of the gun and upper floors of Grain Tower (PRO: WO/78/5121/2)

The Upper Shelter Level

To provide two new emplacements for the 4.7-inch QF guns the parapet of the tower was replaced with gun positions and crew accommodation on two levels. These are labelled on one of the 1914 plans, at cordon level, as *'Upper or Peace Shelter Level'* and *'Gun Floor Level'* (Figure 10).

This area, which provided protected accommodation for the gun detachments and their stores, consisted of two blocks of rooms: an ablutions block on the west-south-west and a shelter, stores and kitchen block facing this to the east. Between them was an open area (now largely occupied by the later BOP: see below). This work is characterised by the use of yellow brick laid to English bond with the use of concrete lintels and bull-nosed blue Staffordshire brick for jambs in door and window openings.

The ablutions block is a single-storey brick building with a flat concrete roof, incorporating the top of the original stair passage which has resulted in the top six stairs being reset and the corresponding section of vault being partially rebuilt in yellow brick. A small window with yellow brick jambs and a concrete lintel and sill in the exterior wall of the ablutions block lights the top of the stair passage. The other surviving section of the block is to the east of the stair entrance and is a small room with a timber door at its east end. The room is lit by a single window with a cement sill and lintel, placed in the centre of the exterior wall. This was the *'Officers' Latrine'* and the 1914 plan shows a sink placed under the window and a lavatory stall at the west end; fittings for the sink and cistern are still present. There were also two WC stalls and an Ablutions block and Urinal on the west side of the stair. The only remains of these is a short stub of wall, now part of the parapet, and a concrete cap over the west wall of the stair passage and its concrete roof. Located on the north-west side of the door to the stair is a cast non-ferrous socket for the flag pole or signalling staff.

From the 1914 plan it is clear that, as protection against shell fire, the side and rear walls of the shelters, stores and kitchen block were incorporated into the cement and aggregate fill forming part of the foundations of the Gun Floor. The reinforced ceiling of these rooms formed the base of the walkway surrounding the gun positions on the Gun Floor and consists of ferrous joists and reinforcing rods that run from the rear (east) walls of the shelters and stores to the English-bond brick wall that forms the west (front) wall.

The north-west room of this block was an Officers' Shelter, entered by a doorway in the brick front wall and lit by a window in a short section of brick-built parapet wall abutting the rebuilt granite wall. All the other walls are of shuttered concrete with evidence for having had plaster and skirting boards as part of a higher standard of decoration for officers. The concrete floor has been laid around wooden battens which provided support for a boarded wooden floor. A section of metal pipe projecting from the wall to the right of the door may be the remains of a central heating system (Figure 10). Ferrous joists of a small cross-section are visible partially projecting from the plaster

ceiling. This form of joist is visible only in this room and may have been intended just to provide a grip for the ceiling plaster that would survive the recoil of the gun overhead.

The Men's Shelter is immediately adjacent and uses the same form of construction. It has two windows (the northern one now blocked) in the front wall, placed to the south of the door. The room was built between the supports for the guns which allows the rear wall to project further into the cement/aggregate fill than the Officers' Quarters. Correspondingly the front wall is set back forming an angle with the walls of the Officer's Quarters and Artillery Store, creating a circulating space at the top of the stairs and around the ammunition hatch. The ferrous joists/beams forming the ceiling are of a wider and heavier sectional form than those in the Officers' Quarters and have a plain finish. They hold a series of large metal hooks set at regular intervals in their soffits; these are hammock hooks and there were corresponding hooks let into both side walls, forming interleaved spaces for sixteen hammocks, half the war complement of NCOs and men for the battery as noted on one of the 1914 plans (Figure 11). Another of these plans shows what could be central heating radiators running along the north wall and indeed some pipe fittings survive at the bottom of this wall. A stove is also shown with its flue emerging through or above the south window (Figure 10); a section of pipe remains in this position and could be the remains of this flue but there is no visible evidence of the stove. There is no evidence of plaster or skirting boards.

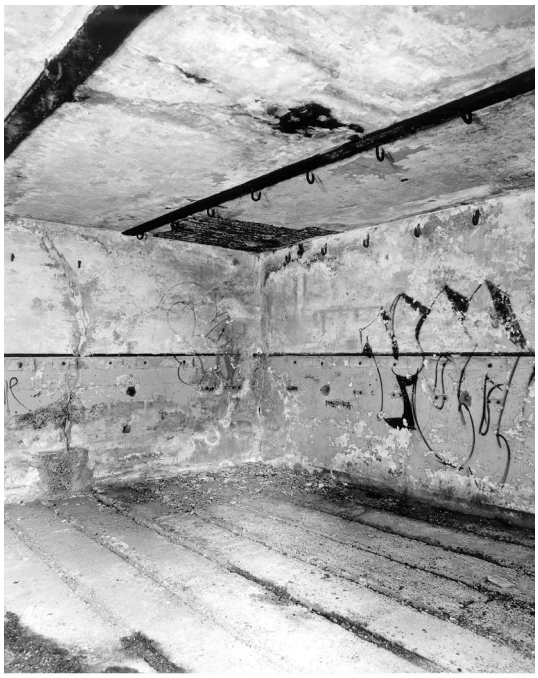

Figure 11
The interior of the Men's Shelter showing hammock hooks in the ceiling
(NMR: AA98/07906)

The room on the south side of the Men's Shelter was an Artillery Store, where equipment was kept for the operation, cleaning and maintenance of the guns. It employs the same constructional techniques as the shelters but without a boarded floor or any evidence for heating, confirming its status as a store. No joists are visible in the ceilings of this room or the adjacent Kitchen, but failure of the surrounding concrete reveals that they are constructed of reinforcing rods contained in troughs formed out of thin sheet steel. This technique may be the principal construction method for the Gun Floors in contrast to the living quarters where ferrous joists were provided just to support the ceiling plaster and hammock hooks. The irregular plan of the Artillery Store appears to be the result of having to fit in with the support for the south gun and the need for the front wall to change angle to accommodate the access stair to the Gun Floor.

The adjacent room was a Kitchen, divided from the Artillery Store by a brick wall. Access was from the circulating area via a doorway next to that of the Artillery Store. The Kitchen is lit by a window in the south-west wall. The only visible evidence for the use of this room is the remains of a brick stack in a mixture of yellow brick and softer orange-red brick (possibly reused from the original phase) in the position labelled *'Range'* on the 1914 plan (Figure 10). An insulated water cylinder and associated pipework on the rear wall suggests that the hot water supply for the central heating system was taken from the kitchen.

The Gun Floor Level

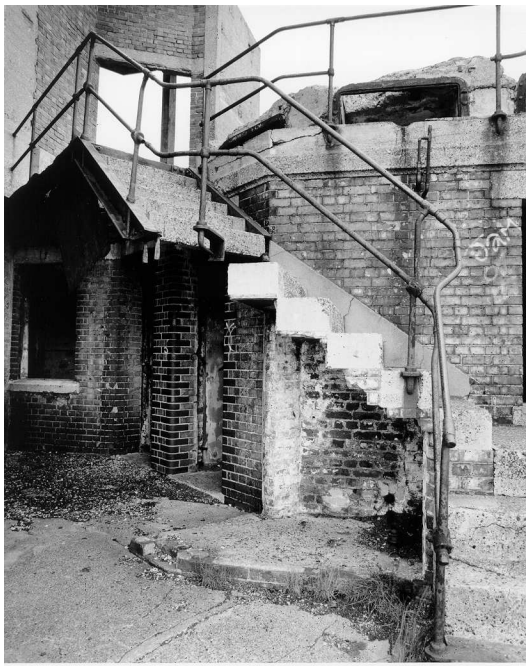

Figure 12
The stairs leading to the 4.7-inch QF gun positions
(NMR: AA98/07905)

Access to the Gun Floor is via a steel stair reached by a flight of cantilevered concrete steps placed parallel to the south-west wall of the Kitchen (Figure 12). The closed string stair is composed of concrete treads and 'I' section steel strings, with landings of steel chequer plate and tubular handrails linking substantial cast stanchions. The south-east side of the stair is secured to the corresponding wall of the Kitchen and Artillery Store and the stair follows the profile of the shelter front wall to emerge on the Gun Floor on a walkway between the two gun positions.

From this walkway the gun positions were reached via two sets of concrete steps of which only the south-west set remain. A *'Sitting Shelter'* is shown on the 1914 plan, located in the east wall of the walkway opposite the head of the stairs; this shelter was intended as a protected and sheltered area for the duty gun detachments (Figure 10). The two doorways to this shelter flanked a platform rising to gun position level; this is usually the Gun Commander's Platform although it is labelled on the 1914 plan as *'GGC Platform'*. Ammunition reached the gun positions via a davit on the north-west side of the stairs above the ammunition hatch from the magazine. Additional stores of cartridges also appear to have been kept in the Sitting Shelter as two recesses with doors, labelled *'C.S.'* (Cartridge Store) are shown.

Only the south gun position survives (No. I gun) and is a standard 4.7-inch gun emplacement adapted for Grain Tower (see Figure 16). The base of the gun mounting was a 10ft-diameter concrete drum rising from the cordon level of the tower. The gun was secured to the drum by a standard holdfast of six one-and-a-half-inch bolts equally spaced around a depressed centre to

accept the gun pedestal. Incorporated in the concrete base of the gun floor at walkway level are three lockers for ready-use ammunition, two for shells and the third for cartridges. The cartridge locker can still be identified by the use of non-ferrous fittings for the door hinges and jambs and is located under the south corner of the gun floor. The concrete apron forming the front of the gun emplacement is composed of a Portland cement/aggregate layer retained by a new section of granite ashlar wall with blocks possibly reused from the original parapet. That it is not a section of the original parapet is shown by the lighter mortar colour and the wider courses between the blocks. The mass concrete fill is carefully graded to a sloped profile or glacis rising up to the gun position so that only the barrel and shield of the gun would be visible, and any incoming shells would be deflected upwards. The second gun position, now removed, was of similar construction with minor differences to allow for its position on the tower.

Both 4.7-inch guns were removed in February 1929 (PRO: WO/192/223).

3) The Twin 6-pounder gun, 1940 - 1956

Grain Tower was re-armed with a Twin 6-pounder QF gun in July 1940; the general layout appears on a sketch plan dated 1943 (WO 192/223: Figure 13). This was a new weapon recently developed for coastal artillery as a specific counter-measure to the high-speed German 'E' and 'S' motor torpedo boats. It is possible that Grain's situation in the mouth of the Thames, a prime target for these torpedo boats, made it the site of one of the first applications of the gun.

The Twin 6-pounder was an integrated 'weapons system' rather than simply a gun, with a very high rate of fire (60-120 rounds per minute), electrically powered traverse and elevation, and vertical sliding breech loading. Because its intended target was most likely to operate at night and at high speed it had a dedicated searchlight mounting and each gun had its own director tower with positions for both the observation post, gun director detachments and searchlight director detachments. The gun was mounted in an armoured steel shield in a specially designed reinforced-concrete emplacement. The directors for the gun and searchlights were normally housed on two separate storeys in a reinforced-concrete tower placed behind the gun emplacement. On land the searchlights and generator house were in further separate reinforced-concrete emplacements placed some distance from the gun emplacement. For Grain Tower the generator house appears to have been located on the shore and connected to the tower by cables which emerged in the old latrine by the entrance (see Engine Room, below).

The Coast Artillery Searchlight Emplacement (CASL)

The searchlight emplacement (CASL) was reached along a new direct route on the first floor from the tower entrance (Figure 13). This avoided the need for the searchlight crew to go through the magazine to reach their positions. The entrance to the new passageway was formed by the removal of the frame and sill of the 1910-12 borrowed light facing the entrance. From here, the passage leads through the 1910-12 Barrack Room into the Cartridge Store. The 4½-inch walls of

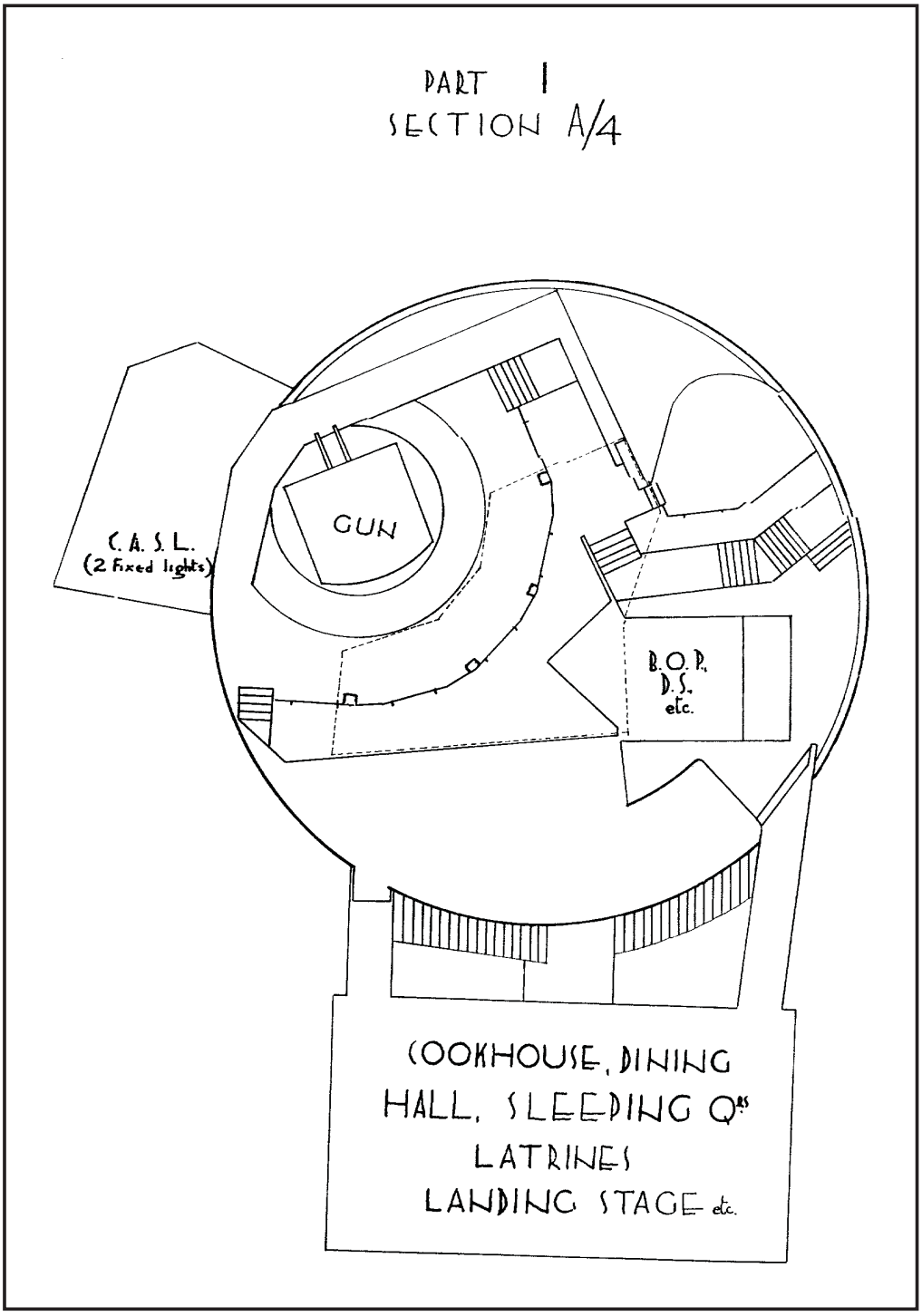

Figure 13
Sketch plan of the gun floor and barrack block in 1943 (PRO: WO/192/223)

this passage are built from Fletton brick with the east wall tied into the corresponding wall of the Cartridge Store using a 1910-12 borrowed light. Access to the Cartridge Store is by a doorway in the position of the Issue Hatch but with a new lintel and jambs. As the Twin 6-pounder used fixed ammunition, the Cartridge Store was no longer needed for its original role and was probably used as a store, perhaps for searchlight spares. The searchlight emplacement is reached from the former Cartridge Store via an original window opening converted into a doorway, effected simply by removing the sill and replacing it with concrete steps. A short length of wooden ladder probably reached the sill from the floor of the tower.

The searchlight emplacement was located on a platform constructed at first-floor level against the north side of the tower. There were two fixed lights in the emplacement (PRO: WO/192/223). The platform has a frame of reinforced-concrete with posts rising from the beach supporting a floor and a flat roof. Above floor level the space between the posts is filled with courses of Fletton bricks with a 1.5m-high (4ft 8in) opening for the lights extending across the north wall. This opening was closed with steel shutters and the rebates for the steel tracks of the shutters are still visible in the reinforced concrete lintel and sill of the opening; one of the shutters was found at the base of the tower. There are no obvious signs of the mountings for the lights but steel racks flanking the entrance to the position probably contained the switch gear for the lights and various grooves in the floor and ceiling show the positions of cable runs. A large opening in the floor suggests that the lights were winched into position and removed for maintenance using a block and tackle hung from a mount in the roof.

The Magazine

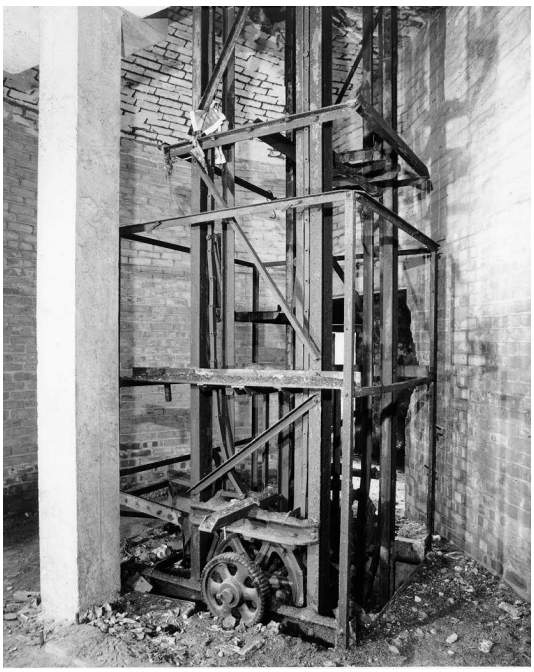

Figure 14
The lift mechanism for the Twin 6-pounder ammunition at magazine level (NMR: AA98/07900)

The Twin 6-pounder used different ammunition from the 4.7-inch guns: it was smaller and had the shell fixed into the neck of the cartridge. Consequently, the interior of the tower was remodelled for a new magazine system. The 1910-12 Shell Store became the Magazine with the majority of the Barrack Room converted into a handling area, apart from a small room at its west end. This room was formed by the construction of the east wall of the new searchlight position passage; it is not ascribed a function in any contemporary document and was probably used as a store.

The main requirement of the Twin 6-pounder was for a rapid, uninterrupted supply of ammunition. Accordingly, an electrically-powered lift, running in an open shaft, was installed in the Barrack Room close to the position of the 1910-12 ammunition hatch (Figures 14 and 15). Ammunition was passed from the 1910-12 Shell Store through a steel door to the lift which carried the ammunition to the rear of the gun position. A large reinforced-concrete pier was placed to the south-west of the lift shaft, probably to support the vault weakened by the large opening made for the lift and the weight of the gun mounting above. The area around the lift bottom was partially enclosed by two 4½-inch Fletton brick walls. One wall forms the west wall of the searchlight passage and has a doorway at its west end allowing access to the lift area. The other wall runs concentrically to the circumference of the tower and forms a passage from the bottom of the stairs leading to the both the original entrance passage and the searchlight passage. Along with the wall of the 1910-12 Shell Store these walls form a 'box' around the bottom of the lift shaft and this may

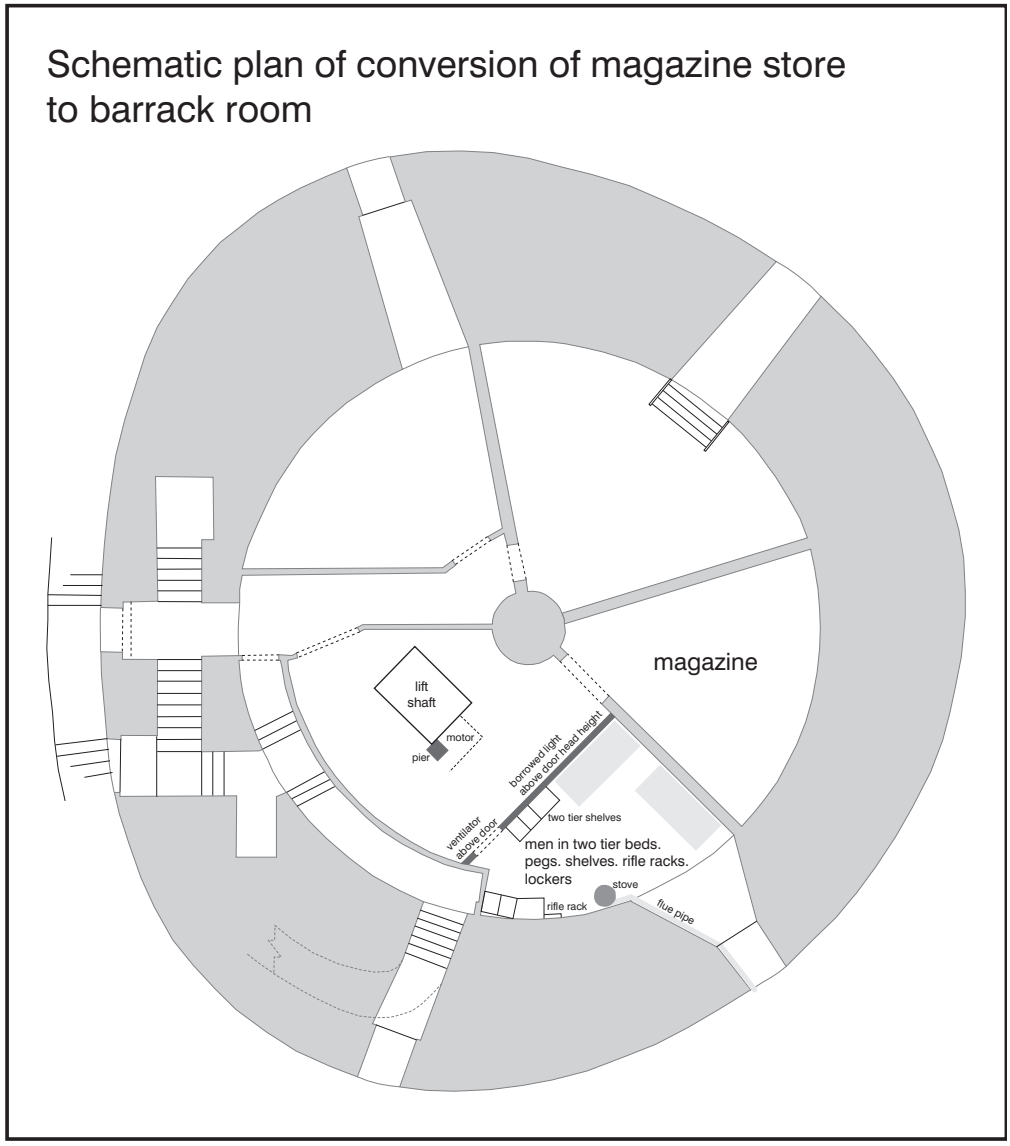

Figure 15
Schematic plan of the conversion of the magazine store into a barrack room in 1941 (after PRO: WO/192/223)

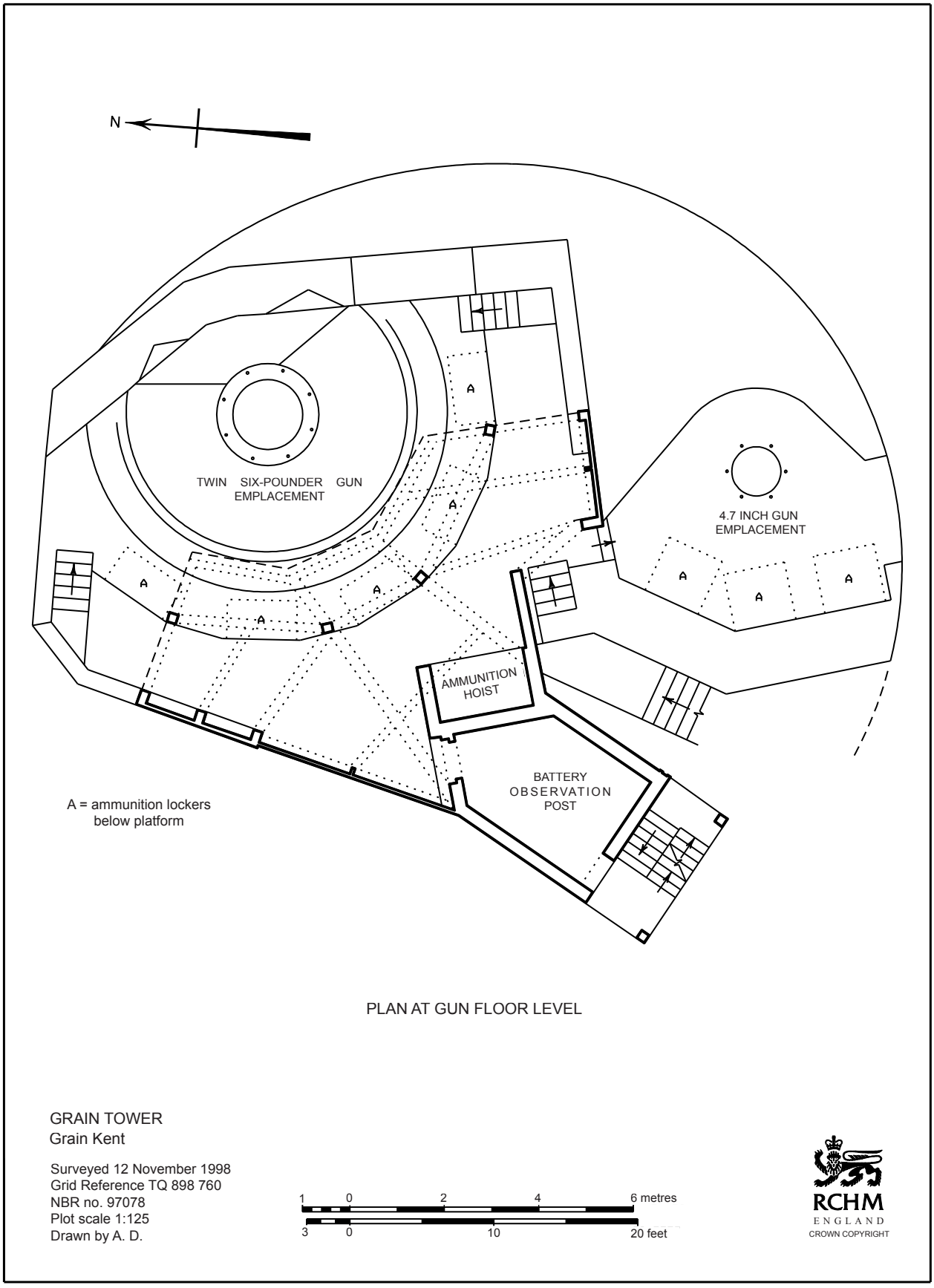

Figure 16 *RCHME plan of the gun floor level.*

have been intended to prevent any flash from an explosion on the gun above spreading back down the lift shaft and into the magazine. The walls also provide a segregated working area for the crew loading ammunition onto the lift.

A plan dated 1941 (Figure 15) plan shows that an additional 4½-inch Fletton wall was constructed to the west of the lift between 1940 and 1941, running from the concentric wall to the south-west wall of the 1910-12 Shell Store, to create a barrack room for four men. The room, entered by a doorway between the tower wall and the south end of the new wall, was lit by the original window in the tower wall supplemented by borrowed lights set high in the new wall. The 1941 plan shows that two bolts in the east jamb of the window were the mountings for a stove flue leading from a stove placed beneath the window.

The Twin 6-pounder Gun Pit and Shelter (Figure 16)

Extensive remodelling took place on the Gun Floor and Upper Shelter Level around the northern 4.7-inch emplacement (no. II). From contemporary photographs of the Twin 6-pounder's installation it seems that the 4.7-inch emplacement was demolished along with the shelter, director platform and corresponding sections of walkway (Figure 17). The tower also supported two Hotchkiss 2-pounder QF guns for anti-aircraft use, mounted in the summer of 1939 and removed in October 1941 (PRO: WO/192/223).

The Twin 6-pounder was housed in a reinforced-concrete gun emplacement with surrounding apron which occupies the entire area of the Gun Floor Level from the south-east side of the old No. I emplacement to the north side of the tower, projecting slightly beyond the tower on the east side. The gun pit is a standard example and consists of a pedestal mounting with a steel traverse ring and a set of holdfast bolts set in the pit. Behind the gun is a pair of small rails on the lip of the pit to carry the ammunition trollies. Set in the base of the gun pit are five lockers for ready-use ammunition with the remains of the door hinges and steel jambs still visible. The ammunition lift from the magazine rises at the rear of the emplacement in a walkway area below the level of the gun pit. The top of the lift is contained in a reinforced-concrete structure with access to the lift machinery and ammunition trays via steel doors, ensuring that any explosion at the gun would not reach the ammunition in the lift. In this case it is clear that the full shell trays had to be manhandled from the lift and carried about 1.5m (4ft 11in) to the level of the ammunition trollies at the rear of the gun

The ammunition handling and shelter area at the rear of the gun is protected by a reinforced-concrete structure consisting of a cantilevered roof supported on posts with the whole assembly standing on a floor projecting beyond the front wall of the 1910-12 Officers' and Men's Shelters. The rear wall of the shelter is of Fletton brick between the supporting posts for the roof. The roof does not project over the gun pit as the Twin 6-pounder had an armoured shield around the gun.

Figure 17 *Contemporary photograph showing the installation of the Twin 6-pounder gun in 1941* (PRO: WO/192/223)

Battery Observation Post (BOP)

This was contained in a reinforced-concrete tower (Figure 18), located in front of the doors to the 1910-12 Kitchen and Artillery Store and reached from the rear of the shelter area. The tower resembles the standard BOP with the gun-director and searchlight-director positions placed behind armoured shutters on two floors rising from the rear of the gun mounting. However this example has four floors, the extra floors provided to maintain the relationship of the director floors to the gun position because the tower has its base on the Upper Shelter Level rather than on the higher Gun Floor. The standard design dictated that the first floor above the gun position, in this case the third floor, contained the direction and control equipment for the searchlights.

The ground-floor room, on the Upper Shelter Level, is reached by a short flight of reinforced-concrete steps. The other floors are reached by an external stair, in reinforced-concrete with tubular steel handrails, which dog-legs up the south-west side of the BOP. A small landing is provided outside the doorway to each level.

Access to all rooms was through an armoured door. The door to the ground-floor room, in the south-west wall, is labelled *'Battery Office'*. The interior is bare and lit by a single window high in the west wall. In common with all the rooms in the BOP there is a hole in the ceiling in the south-west corner for telephone or power cables and various scars on the wall showing the position of other cable runs.

The first floor provides a through route from the external stair to the rear of the gun position via an armoured door. Scars on the walls show that hooks and racks were provided for the personal equipment of the gun detachment, suggesting that this floor was used as a shelter for the

Figure 18
The Battery Observation Post from the south
(NMR: AA98/07887)

detachment when they were not in action. As the two floors effectively form a separate structure on which the standard BOP stands, the roof of the first floor is formed from a reinforced-concrete slab, covered in bitumen or asphalt.

The armoured door to the searchlight-director room on the second floor has been removed and only the scars of removed cable runs show that equipment has been installed here. In common with the gun- director floor above, this room has the remains of a complex series of armoured shutters and windows. The viewing slit for the director position is formed by a 1m-high (3ft 3in) slit left between the wall and the ceiling. The slit extends across the entire front wall and about a quarter of the way along the east and west walls, giving a view through 180 degrees. Originally the viewing slit had armoured glass windows contained in steel window frames; when the gun was in action they would be removed from mounting frames set in the slit by releasing a series of catches; these catches and frames are still in position. Once these frames were removed protection was provided by two sets of sheet steel shutters on the exterior of the tower which simply hinged down to be supported in a horizontal position by steel stanchions projecting below the sill of the viewing slit. This position has nearly all its external shutters intact with sections on the north-west side and at the front missing. Further protection was provided internally by thicker sheet steel shutters running in guide rails stretching from the floor to the sill of the observation slit; these were hoisted up and down using steel wire running in pulleys attached to the guide rails. The shutters have been removed but the guide rails and pulleys remain. These heavier internal shutters provided protection for the director crews while the gun was in action, while the windows and external shutters provided protection against the weather and attack by aircraft when the Observation Post was manned by look-outs as part of the daily routine.

The gun-director position on the third-floor retains its armoured door and its internal armoured shutters. A reinforced-concrete pillar in the centre of the room supported the range-finder and director equipment for the gun.

Alterations to the Upper Shelter Level

Some of the 1910-12 buildings on the Upper Shelter Level received minor alterations and additions during the 1940 remodelling. The most noticeable was the provision of armoured doors for both shelters, the internal stair, the Kitchen and the Artillery Store. The BOP effectively blocked the north-west window of the Men's Shelter and divided the Upper Shelter Level in half. The south-west window in the Men's Shelter was made into a doorway to allow more convenient access. The Kitchen was subdivided internally to provide a latrine at its north-east end. The western end of the ablutions range was removed to provide access to the new Barrack Block built on the north-west side of the tower. As part of the construction of the Barrack Block landing stage, the landing stage at the tower entrance was extended in shuttered concrete.

The Barrack Block

This is a freestanding structure built on the north-west side of the tower (Figures 5 and 13). Although documentary sources do not provide a date for its construction, it must have accompanied the installation of the Twin 6-pounder to accommodate the increased complement of the battery for war service. A date of *c* 1940 is also suggested by a number of stylistic details mentioned below. Section A/4 in the Fort Record Book lists the following rooms or areas in the block: Cookhouse, Dining Hall, Sleeping Quarters, Latrines and Landing Stage (PRO: WO/192/223).

In common with the other major structures of the Twin 6-pounder phase, the major structural material in the barrack block is reinforced-concrete. The four-by-two bay basic structure consists of posts and beams and has three floors: living and sleeping accommodation occupied the top two floors with the open-sided bottom floor, at the level of the tower landing stage, used as a store and landing stage.

There are three points of access from the Tower: a reinforced-concrete cat-walk from the west end of the ablutions block to the top floor of the barracks, a set of steps rising from the north-east side of the tower landing stage to a landing entering the lower floor of the living accommodation and at the lower level a walkway from the tower landing stage to the barrack block landing stage. The provision of two routes from the Barrack Block accommodation to the Tower cut the time taken by the battery personnel to reach their combat positions: the gun and BOP detachments went out of the south-west end of the block on the top floor and the searchlight and magazine detachments went out of the north-east end and descended to the tower entrance, so avoiding crowding a single exit.

The two enclosed floors have brick cavity walls between the concrete posts. The 9-inch inner leaf is of Fletton brickwork while the 4½-inch outer leaf, unusually, is of rusticated Flettons, typically used as a better-quality facing brick on inter-war housing. The use of this brick probably indicates a construction date early in the war, when peacetime stocks of these bricks were being used up.

The flat roof is of reinforced concrete and the same material is used for the lintels of the doors and windows. The window sills are of brick outside the building and glazed tile inside. The remaining window frame is a steel casement.

The cat-walk from the Tower enters the top floor of the Barrack Block at its south end via a lobby. This gives access to the Cookhouse and the Dining Room and incorporates the ceiling hatch to the brick-built water-tank housing and small observation post on the roof. The Cookhouse, west of the lobby, is lit by windows in the south and west walls. A larder partitioned off in the south-east corner is lit by the remaining steel framed window and contains a concrete cold slab. The Cookhouse is tiled throughout and retains various pieces of pipework and supports showing the position of the sink and cooker. A serving hatch is placed between the Cookhouse and the Dining Hall.

The Dining Hall is a large room occupying the whole width of the Barrack Block, well-lit with four windows on the west side and two on the east, facing the tower (Figure 19). The interior walls are plastered and a gap has been left for skirting boards. Various pipe clips and brackets at skirting board level and underneath the windows suggest that it had central heating. The floor is bare concrete although there are fragments of what could be a floor covering like linoleum in the corners and doorways (almost universally used in structures of this type; Roger Thomas, pers comm).

A single bay at the north end of the Dining Hall contains the Latrines and the internal stair to the lower floor. The Latrines are on the north-west side of the landing and consist of two stalls, each with its own window and two urinals on the north wall. The stairs are constructed in reinforced concrete with the same type of welded steel handrails as are used in the BOP.

Figure 19
The interior of the barrack room with the NCO's room in the far corner
(NMR: AA98/07913)

The lower floor of the Barrack Block is entered through a lobby passing a shower room in the same position as the Latrines on the top floor. This was the Sleeping Quarters and the greater part is occupied by a single room out of which a small room is partitioned in the north-west corner (Figure 20). This accords with the usual layout of barracks, with the small room for an NCO, a corporal

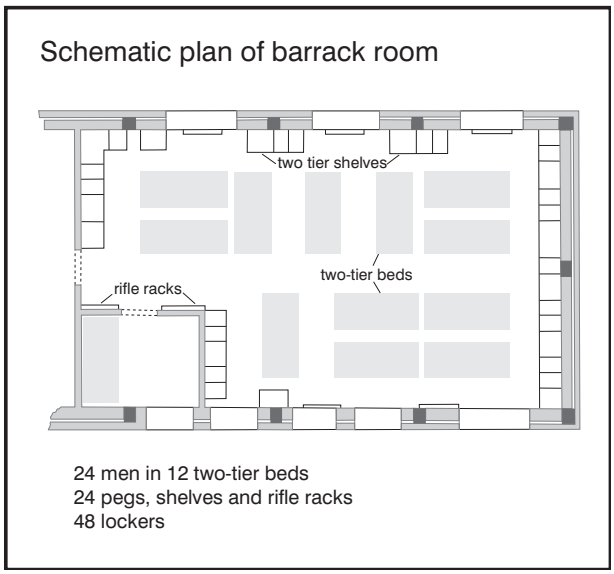

Figure 20
Schematic plan of the barrack room in 1941 (after PRO: WO/192/223)

or above, in charge of the barracks. Like the Dining Hall the room is plastered and had a skirting board along with the fittings for central heating radiators. Scars in the paintwork suggest the position of lockers and racks which are indicated, together with the other fixtures and furniture, on the wartime plan: twelve two-tier bunk beds arranged to flank a central walkway, lockers and racks arranged along the south and west walls of the room with the rifle racks against the east wall of the NCO's room.

The Barrack Block was intended for occupation as a permanent barracks. In 1954, the personnel required for the Grain Tower Battery were 56 men and two officers. Of this number 16 had jobs on shore (such as engine room staff) or jobs which did not require a permanent presence on the tower (such as cooks); this left 42 men to be accommodated on the tower. There were four beds available in the barrack room in the tower, 16 hammock spaces in the Men's Shelter and 25 beds in the Barrack Block making 45 bed spaces in all, not counting whatever provision may have been made in the Officers' Shelter (PRO: WO/192/223).

The landing stage

The landing stage is accessible only from the external north-west end stair or the bridge from the Tower landing stage. It is a flat area with mooring bollards and the remains of some concrete and brick partitions for storage areas. In all probability it was intended for the handling of bulky items - ammunition and food - that were delivered by Lighter rather than carried across the causeway.

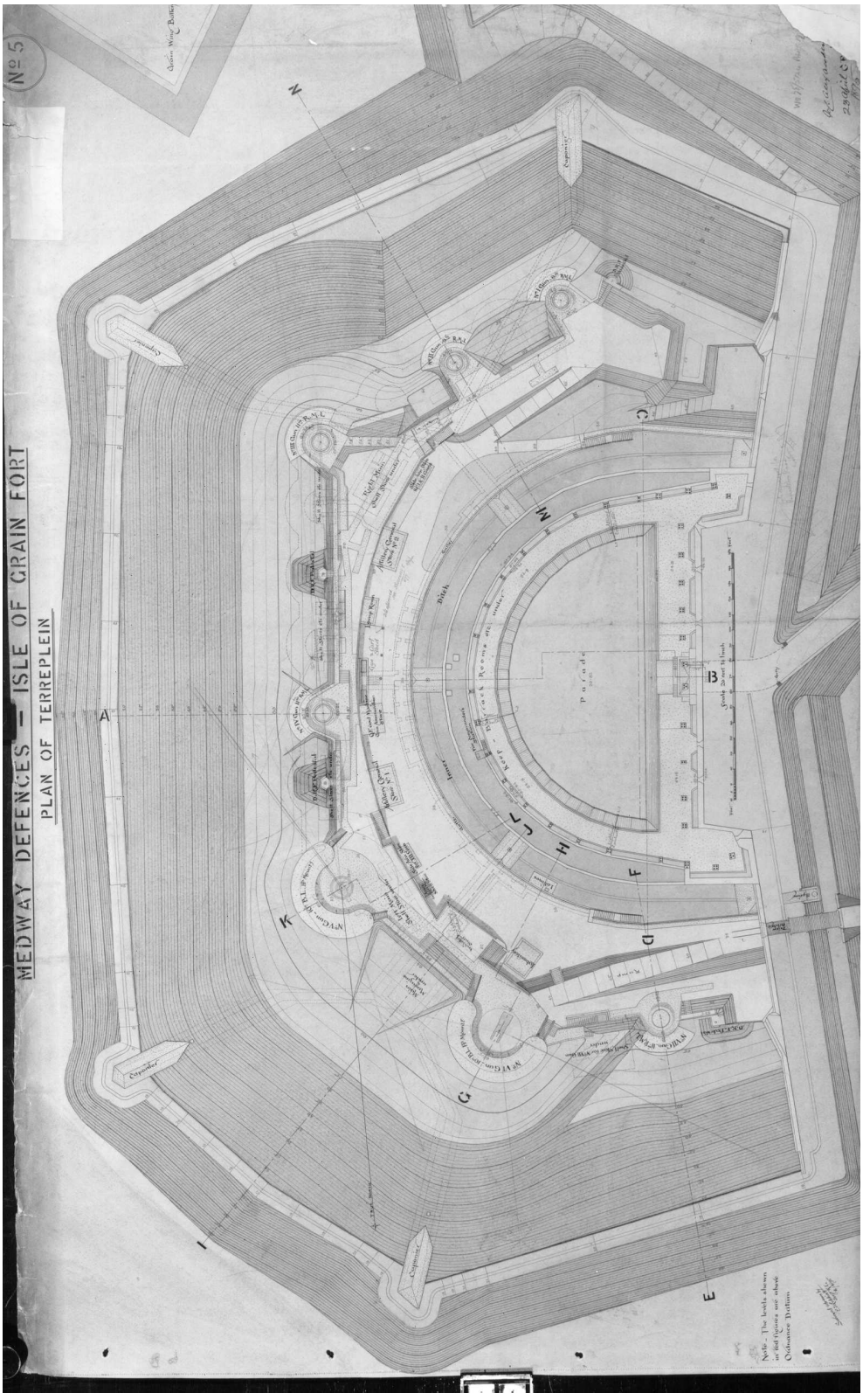

Figure 21 *Plan dated 1895 of Grain Fort* (PRO: WO/78/5124/19)

GRAIN FORT

Built between 1861 and 1868, Grain Fort was the most complex of the Grain fortifications, and performed a central rôle in the defences. It remained in use until 1956. The Fort comprised two main elements which are shown clearly on a plan of 1895; a massive polygonal earthwork surrounding a free-standing semi-circular keep. The earthwork was formed from a bank with an outer ditch containing four caponiers at the angles. On top of the bank the terreplein had emplacements for several heavy guns of varying type and calibre. The keep fitted neatly inside the polygonal earthwork but was defensible in its own right: between it and the polygonal earthwork was an inner ditch containing five caponiers (Figure 21).

Behind the rampart the terreplein provided access both to the guns as well as to the ammunition stores or magazines, which were built into the bank for protection from incoming fire, and to the detachment shelters. The bulk of the ammunition for the Fort as well as for the other fortifications at Grain was stored in the main magazine, built at ground floor level below the bank and reached through the keep. Behind the terreplein a second, lower platform or covered way housed a number of buildings including the laboratory, where shells and cartridges may have been filled, side arms stores and general artillery stores; access between the terreplein and the covered way was achieved through ramps and steps.

It is of vital importance to note that the appearance of the fort was substantially altered between 1961 and 1975 (NMR APs: 58/RAF/4646/332-3; OS/66/228/396-8; OS/75300/1-3). This involved the complete removal of the keep and infilling of the resulting cleared area with earth and rubble to create level ground, as shown on Figure 22. The polygonal bank was smoothed on the landward side, concealing but probably partially preserving the support buildings behind the emplacements. On the terreplein itself, above-ground structures were levelled and the gun emplacements infilled. The huge outer ditch had its southern and northern arms partially infilled and its caponiers removed, although the remainder has its original profile. As a whole then, Grain Fort now bears little resemblance to the original structure. Nevertheless, much lies buried beneath the polygonal earthwork.

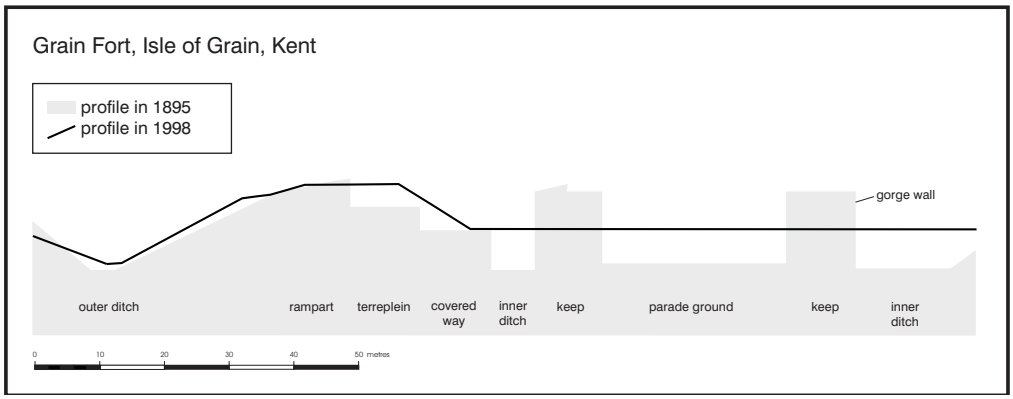

Figure 22
Schematic comparison of profiles across the Fort in 1895 and 1998

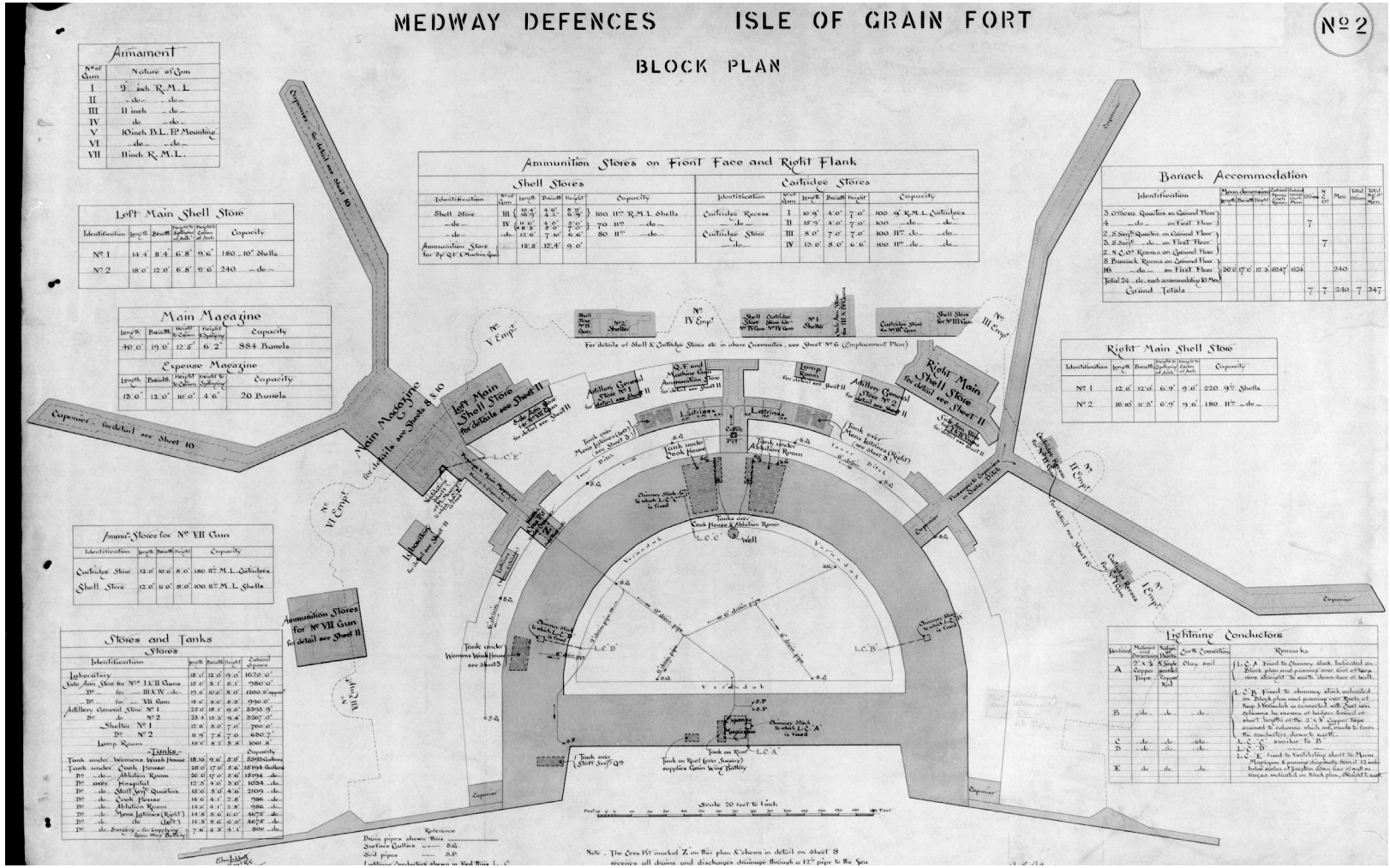

Figure 23 Block plan dated 1895 of the main underground components of Grain Fort, including the caponiers in both ditches (PRO: WO/78/5124/16)

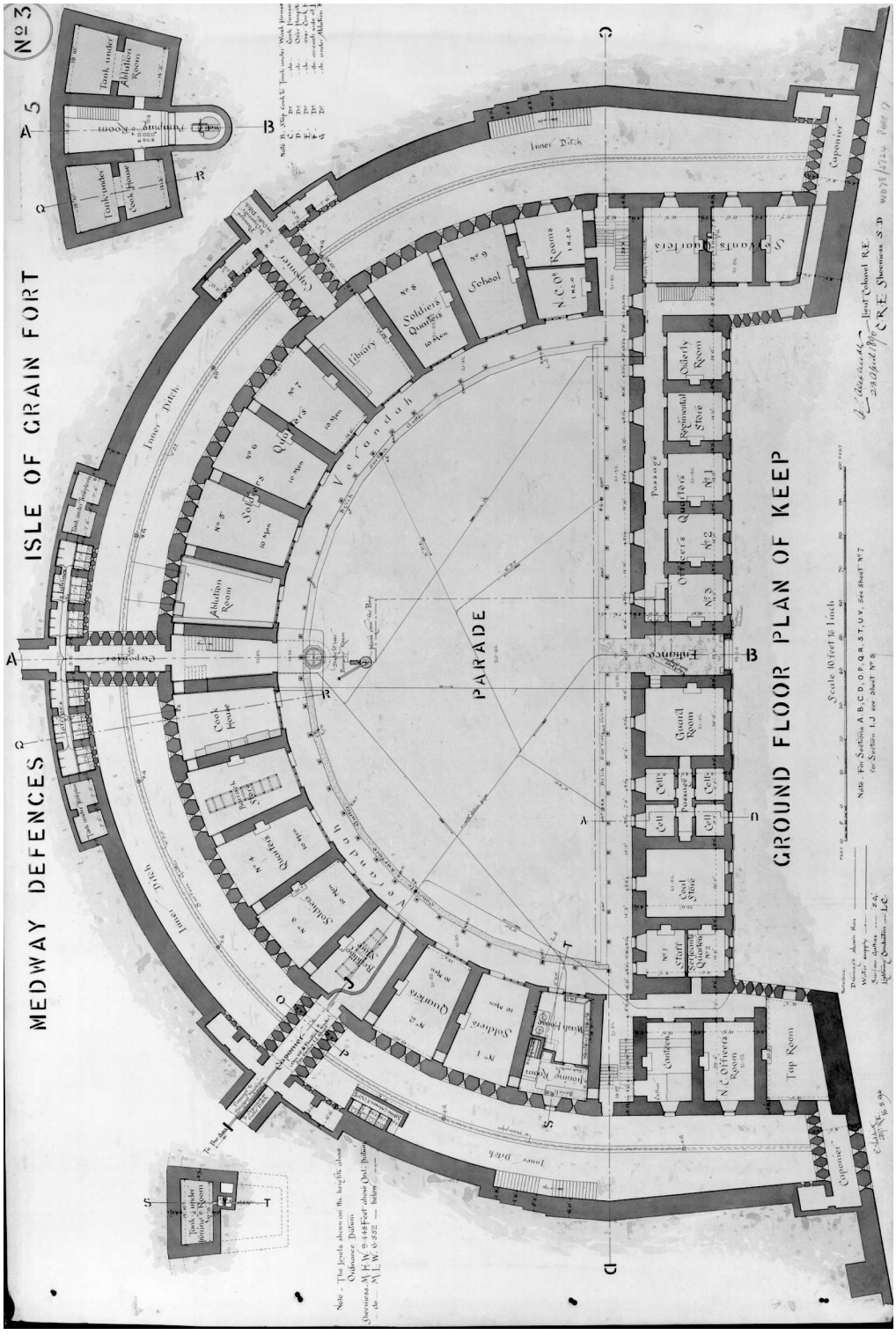

Figure 24 Plan dated 1895 of the ground floor of the keep (PRO: WO/78/5124/17)

The keep

This was designed to be self-defensible, and to co-operate with Slough Fort at Allhallows, 5km along the coast to the west; the basic design of the keep is very similar to those of South Hook and Hubberston Forts at Milford Haven (Roger Thomas, pers comm). Access to the keep was via a central gateway in the gorge wall which was flanked by musketry galleries in two projecting demi-bastions. It is an impressive two-storeyed D-shaped structure in brick, built around a parade ground, with a ditch separating it from the polygonal earthwork. There were five caponiers in this inner ditch, two of which led to four more caponiers in the main outer ditch. The inner caponiers were designed to provide flanking fire in the event of attackers gaining the ditch but also provided access to the main magazine (Figure 23). All other magazines were reached directly from the relevant gun position on the terreplein.

The keep contained the soldiers and officers quarters as well as all of the ancillary rooms including canteens, schoolrooms, guardrooms, hospital and cells (Figure 24). There was accommodation for 240 Soldiers, 2 Non-Commissioned Officers, 5 Staff Sergeants, 6 Officers and 1 Field Officer (PRO: WO/78/5124/17-8). There were several gun positions on the roof, probably for small-gauge artillery (PRO: WO/78/5124/22). Although not visible on the 1895 plan, aerial photographs show a narrow bridge connecting the roof of the keep with the terreplein (NMR APs: 106G/UK/1444/17-8).

The main magazine was of brick and concrete cavity-walled construction (PRO: WO/78/5124/24). It was situated beneath the north-east corner of the polygonal earthwork. Although no detailed plans survive, it appears to have been a single room with a shifting or outer lobby immediately inside the entrance. A single ammunition lift was positioned awkwardly distant from the door to the magazine, indicating that ammunition was moved between the two via an issue hatch not visible on the plan.

The polygonal earthwork

For letters and words in **bold** see Figure 25.

This is relatively complete; a 5-sided bank with outer ditch, now open to the landward side. The ends of the bank are revetted by 5.0m-high (16ft 4in) vertical brick walls, laid to English bond, which were formerly continuous with the keep. Much of the outer scarp is original and although the inner one was created mainly during demolition, it appears to be a cosmetic covering: beneath it lie remains of many support buildings. Something close to an original profile occurs at **a** on the north inner scarp, where a double slope reflects the long ramp which formerly led to the terreplein. On flat ground, 5.0m to 10.0m (16ft 4in to 32ft 8in) inside the foot of the bank, intermittent stone coping, **b**, defines the outer lip of the inner ditch.

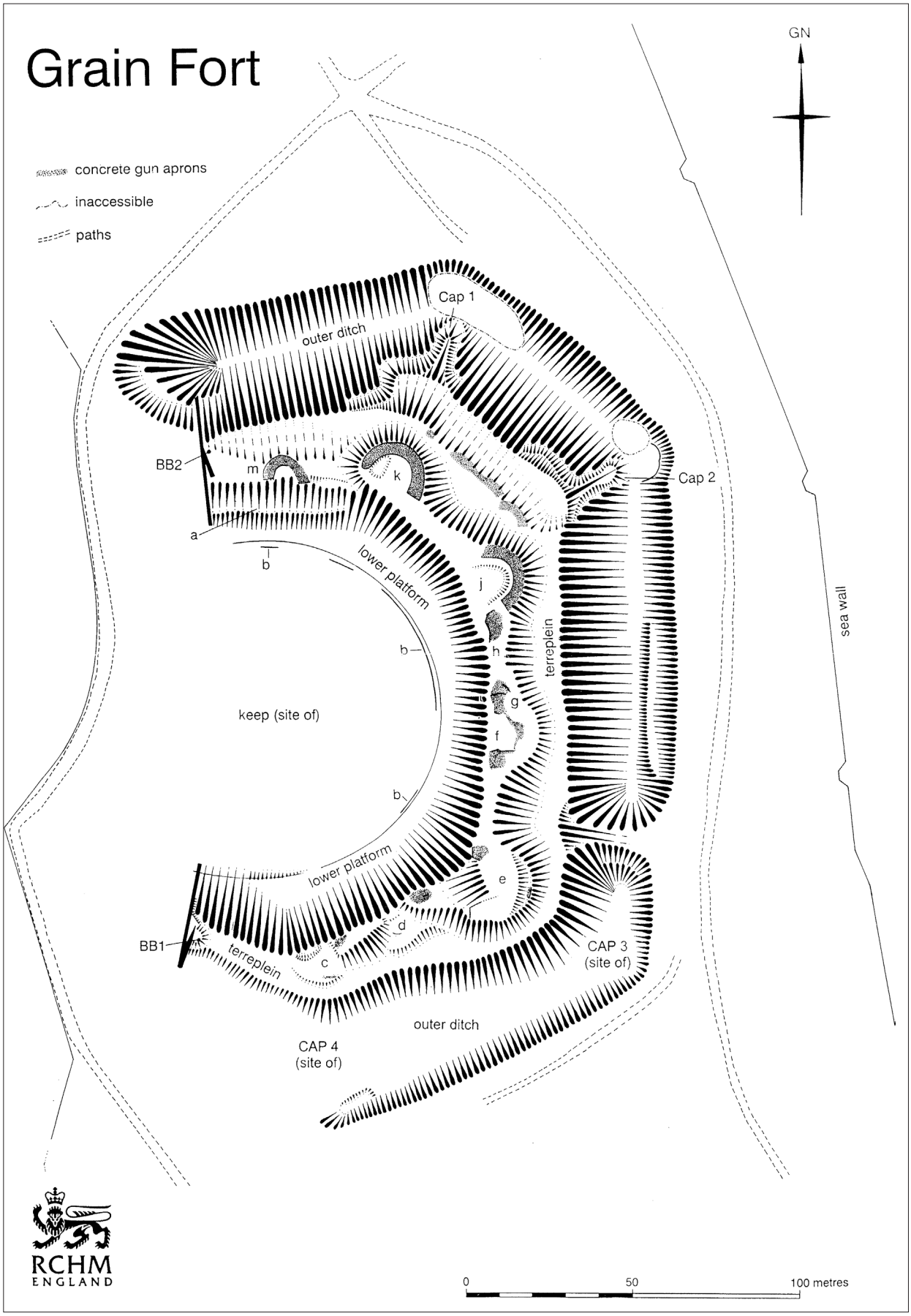

Figure 25 *RCHME survey plan of Grain Fort.*

The V-shaped **outer ditch** measures 34.8m (114ft 2in) wide at its top and 4.0m (13ft 2in) wide at its base by a maximum of *c* 5.2m (17ft) deep; it is fairly uniform in profile along the northern three sides. A causeway, created during the early 1960s, crosses the southern end of the eastern arm of the ditch, south of which the ditch has been substantially infilled creating a shallower profile, 3.4m (11ft 2in) deep, with a broad flat bottom (NMR APs: 58/RAF/4646/332-3; OS/66/228/396-8).

Two earthen projections into the ditch cover the truncated remains of two outer caponiers, the outer ends of which have been demolished. Caponier 1 (**Cap 1**) was not accessible, though a 0.3m-square (1ft) blocked air vent was noted roughly halfway down the side of the ditch. A small hole broken through the roof of caponier 2 (**Cap 2**) enabled a glimpse of its brick-vaulted passage, painted white. The caponiers originally stopped short of the outer face of the ditch, which was revetted vertically in concrete; the revetment to caponier 2 is visible as a 2.5m (8ft 3in) high and 0.9m (3ft) thick concrete wall arranged in a lobate pattern to provide anti-ricochet protection.

The third caponier, **Cap 3**, appears to have been thoroughly removed but two short sections of the concrete anti-ricochet wall are visible in the base of the ditch. All traces of caponier 4 (**Cap 4**) have been buried beneath rubble infill.

The terreplein and its gun emplacements

The rampart is 10.2m (33ft 4in) from the base of the ditch and 7.2m (23ft 7in) from the now level ground to the rear. A subsidiary glacis runs along its seaward edge to mask the emplacements and to absorb and deflect enemy fire. The 1895 plan shows seven gun emplacements. There seems little doubt that this represents the gun complement and fort design eventually agreed, even though the original proposal was for sixteen guns. Most of these emplacements remained until the fort was decommissioned in 1956: several, however, were altered for the insertion of new, more up-to-date weapons between the two dates, with a decrease in the numbers deployed. In 1942 there were only two guns in position, probably 6-inch BL's, their camouflage visible on air photographs. Both were still in place in 1946 and 1953, without camouflage but with their semi-circular gunhouses, turrets and barrels clearly visible, testifying to the Fort's continued manning. They had been removed by 1955 (NMR APs: 26/UK920/31-32; 106G/UK/1444/17-8; 82/RAF/713/274-5; 58/RAF/1779/0296-9).

All of the emplacements have been infilled, leaving visible only parts of the concrete aprons in front of the gun pits, and the earthwork scarps beyond. There are remains of nine emplacements visible as follows:

c, marked only by a small patch of concrete and two slight crescentic scarps defining the inner (0.3m (1ft) high) and outer (0.5m (1ft 7in) high) edges of the apron (no I gun, 9-inch RML in 1895).

d, a tiny fragment of the apron survives, including part of the rear edge defining the gun pit; to the front a curving scarp, 1.3m (4ft 3in) high, marks the outer edge of the apron (no. II gun, 9-inch RML in 1895).

e, the two inside corners of the apron survive and although the gun pit is infilled a slight scarp, 0.2m (7in) high, defines part of its southern side; the outer edge of the apron is defined by a prominent scarp, 2.9m (9ft 6in) high. Where the apron survives, patches of asphalt cover it and there are a number of holes, probably for the attachment of camouflage nets; the apron is partially damaged to the rear. The remains of a ready-use ammunition locker, 1.1m (3ft 6in) wide, is situated immediately north of the gun pit in the rear wall; full survey was not possible but a rebate for an externally opening door was noted (no. III gun, 11-inch RML in 1895; 9.2-inch BL gun by 1905).

f, part of the concrete apron and gun pit of a 6-inch BL gun, active in the Second World War (MacDougall 1980, 14; NMR APs: 106G/UK/1444/17-8). Much of the concrete for this emplacement has been repaired; no asphalt is visible, but small holes in the apron may be for the attachment of camouflage nets. Protruding from the slope behind it are two short stretches of concrete: to the north are the remains of what appears to be a ready-use ammunition locker, while to the south a set of steps, visible on the 1895 plan, is overlain with later, rougher concrete.

g, underlying emplacement **f**, part of the apron of to an earlier emplacement (no. IV gun, an 11-inch RML in 1895; 9.2-inch BL gun by 1905).

h, a fragment of the inner face of the apron survives, with sharp corners and a battered internal wall. This was for the second 6-inch BL gun active in the Second World War. It replaced and partially overlay:

j, a clear emplacement survives as a broad concrete apron with a rounded internal edge to a battered wall. A slight scarp, 0.4m (1ft 4in) high, marks the inside edge of the gun pit (no V gun, 10-inch BL in 1895).

k, appears to have escaped relatively unscathed; the concrete apron is complete, with a rounded edge and battered internal and external walls, and despite its depiction on the 1895 survey (where it is rounded, matching that to the north), the square south-eastern end appears to be original (no. VI gun, 10-inch BL in 1985). A series of small holes may have been for camouflage nets. Towards the north-western end of the apron, the concrete is very pitted and four shallow gouges define a roughly square area, perhaps the location of a small structure.

m, most of the concrete apron survives, with a rounded internal edge, and part of a broken wing wall heading south from its western end. In the southern side of the eastern end are the remains of a ready-use ammunition locker with a now-unreadable sign above (no. VII gun, 11-inch RML in 1895).

Two small patches of concrete (**n**) on the terreplein's north-eastern corner are of unknown origin and function. The concrete is very rough, full of pebbles and apparently not reinforced. The southern, larger patch defines a definite arc, though whether this is functional or merely the result of following the earthwork at that point is not clear. It may be part of the roof of the main magazine which is situated immediately below (Figure 21), or it may be a much later feature, possibly forming the base for a structure which has disappeared.

In the Second World War, both ends of the terreplein supported Blacker Bombard (Spigot Mortar) emplacements; the southern one (**BB1**) has a low semi-circular mound, 7.6m (24ft 11in) in diameter by 1.3m (4ft 3in) high, supporting the concrete column and steel pintle for the weapon. There is no obvious sign of a gun pit or surrounding lockers, but if the mound marks an episode of infilling, as seems likely, this has obscured them. The northern emplacement (**BB2**) has its central concrete column, steel pintle, and fragments of a brick gun pit. Aerial photographs show that both of the weapons were situated within square sunken gun pits (NMR APs: 82/RAF/713/274-5). The Home Guard manned these weapons: there was no regular infantry in the Fort at this time (PRO: WO/192/55).

DUMMY BATTERY (originally Grain Battery)

The original battery

No plans showing the design of the original battery, built between 1867 and 1869, have been located. However, examination of the re-design plans of 1904-5 (Figure 26) reveals that the original installation comprised two principal elements, both of which are also visible on aerial photographs. The first was a curving earthwork laid out in the shape of the letter J, on which the guns were to be mounted: a broad bank with a carefully sloped and facetted external face, a concrete core and a ditch on the seaward sides. Only two original emplacements appear on the plans and photographs, next to one other on the eastern side: each embrasure had wide splays for guns on traversing carriages, probably 11-inch RML's. The curve of the J shows no sign of ever having embrasures and the very tip appears to be unfinished. It is possible, however, that there were up to three more embrasures in the area occupied by later guns: this would mean five guns, at most, before 1904; all on the east side (NMR APs: 82/RAF/713/Part 3/545-6).

The curving earthwork protected the second part of the battery, a large rectangular bomb-proof mound which probably covered the support buildings, including a main magazine, artillery stores and detachment shelters. Aerial photographs dated 1953 show two entrances into what appear to be two separate structures within this mound; the southern one had a broad recessed entrance in the west side and six chimneys or ventilators protrude through its covering mound: this was probably the main magazine. The northern structure was entered from the east and it had two chimneys or ventilators: it may have been a detachment shelter (NMR APs: 82/RAF/713/Part 3/545-6).

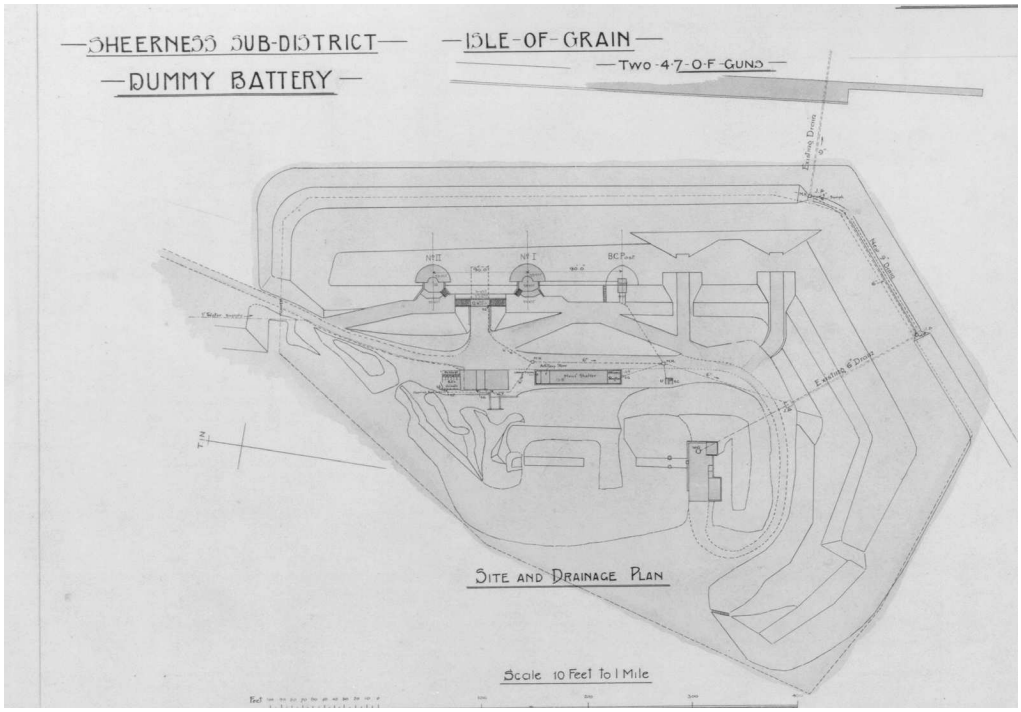

Figure 26
Plan dated 1906 of Dummy Battery (PRO: WO/78/5115/5)

The redesigned battery

The battery was completely redesigned in 1904-5 (Figure 26). Entry to the battery was originally from the north along the causeway from Grain Fort. At this time it was altered to approach obliquely from the north-north-east, probably under cover of the sea wall rather than along the exposed causeway. The new battery occupied only the northern half of the old earthwork and comprised two 4.7-inch QF emplacements with a magazine under and battery command (BC) post to the south (Figure 27). Sheltered behind the earthwork were three new buildings of light construction: two rectangular ranges comprising mens shelter/officer's shelter/artillery store/lamp room and mens urinals/ablution room/cook house/store respectively. The third was a small latrine and privy for the officer. The southern part of the old magazine mound remained in use.

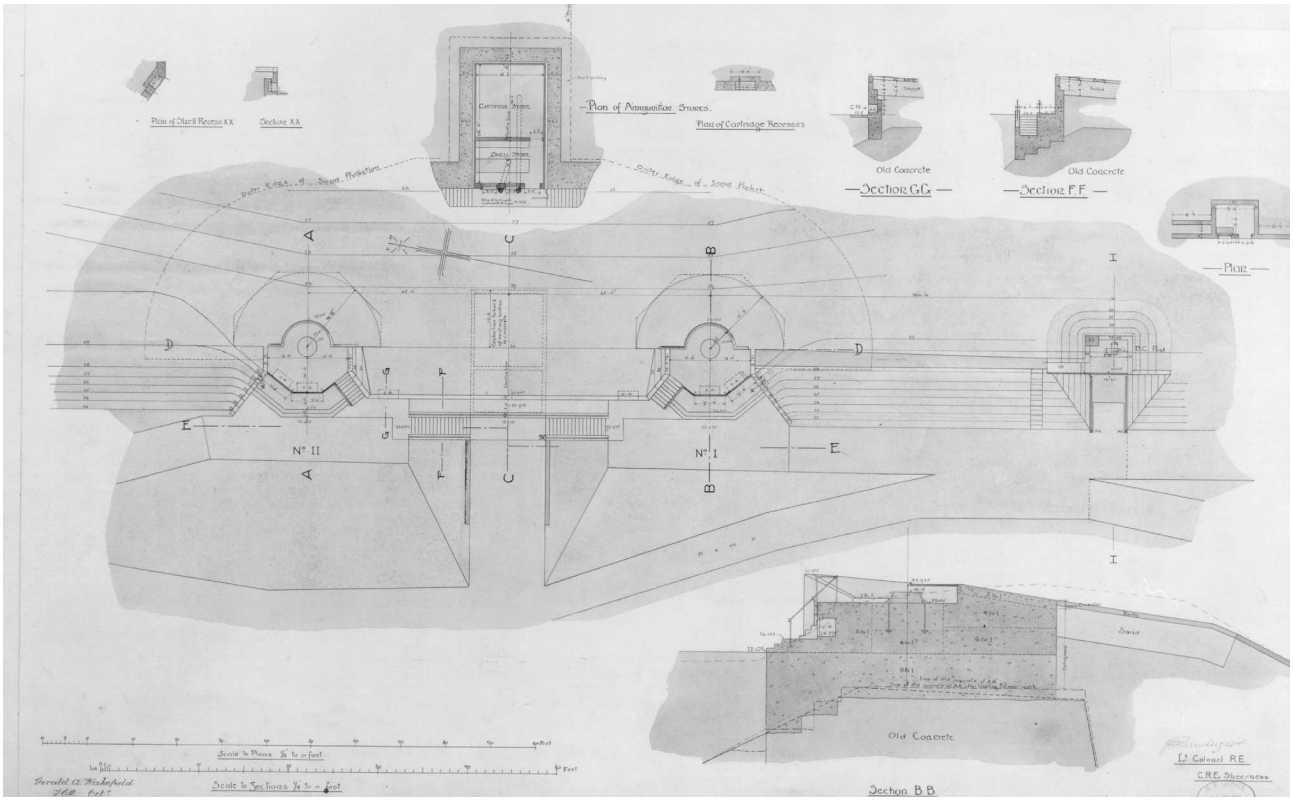

Figure 27
Plan dated 1906 of the new 4.7-inch QF battery (PRO: WO/78/5115/3)

The surviving remains

The letters in **bold** appear on Figure 28.

Dummy Battery was severely damaged by extensive demolition and excavation for materials, sometime between 1953 and 1955; its appearance today is totally misleading (Figure 29). A large trench was dug around the entire earthwork, cutting severely back into its sides, removing the tip of the J, and destroying its once carefully-graded profile to leave steep sharp sides of exposed concrete. The trench has become filled with water on the east side and with reed and marsh on the

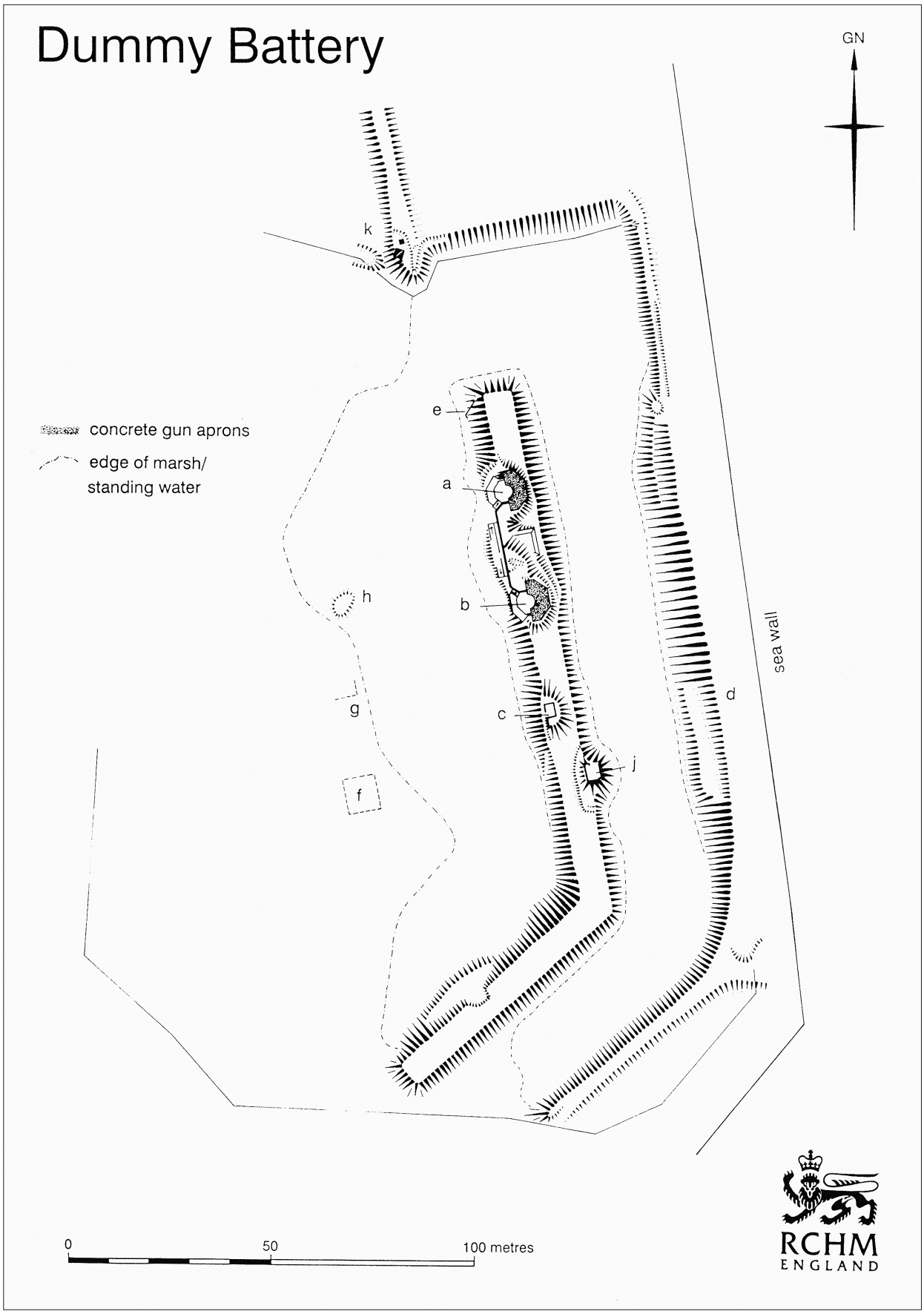

Figure 28 *RCHME survey plan of Dummy Battery.*

west, giving the impression of a moat: this is totally false and has nothing at all to do with the battery (NMR APs: 82/RAF/713/Part 3/545-6; 58/RAF/1779/Part 6/246-8). Furthermore, the top of the battery has had its earth and sand protective layers totally removed, such that the QF emplacements, **a** and **b**, and BC post, **c**, stand proud at the north end while the south end is featureless, scraped and flat: nothing of the earthworks remain here; just a concrete core. This mass concrete is made of local small beach pebble, gravel and flint, with some fragments of stock brick, tightly packed in a concrete matrix: this is probably from the original battery. Only along the southern part of the external ditch does part of the original profile, **d**, survive. Additionally, a short length of brick wall, **e**, just protrudes at the north end of the earthwork, possibly revetting the ramp up to the northernmost gun emplacement.

Figure 29
Dummy Battery from the south-east, showing the exposed concrete of the 4.7-inch QF battery and the standing water in front

The support buildings and bomb-proof magazine mound of both phases which formerly stood behind the earthwork have been almost entirely removed: only two patches of concrete and tiled floors, **f** and **g**, and a low brick foundation, **h**, can still be discerned.

The 4.7-inch QF battery

Figure 30
Dummy Battery from the rear showing the two 4.7-inch QF gun emplacements, the magazine between them, and the BC post to the right (NMR: AA98/07943)

a) The gun emplacements

The majority of the 1904-5 battery is constructed in mass concrete, though brick is used its magazine (Figure 30). The two gun emplacements were originally linked by a covered way with parapet for protection: this survives apart from short lengths at either end, such that it is no longer possible to walk between the two. The walkway is 0.92m (3ft) wide, its battered concrete parapet 2.43m (8ft) tall. Located centrally at eye level in the parapet face is an inserted concrete patch inscribed '1905', the battery's completion date. The edge of the walkway has a low plinth to the rear, formerly supporting a hand rail. From each end, a flight of 17 steps leads down to the magazine (Figure 31).

Attempts have been made to remove material from both gun emplacements, notably from the aprons where there are drill marks in the concrete, and earth and sand has been quarried out from the seaward face, destroying the earthwork profile, revealing the asphalted roof of the magazine and exposing the layered concrete core of the battery (Figure 29). Up to 2.45m (8ft) is visible, in seven layers averaging 0.30m (1ft) in thickness, and there is some variation in the concrete, reflecting successive batches of supply. Small to medium-sized pebble and flint or angular rock fragments are typical.

Each emplacement is a mirror image of the other, with wing walls, barbette and semi-circular apron defining the gun floors (Figures 31 and 32). The concrete surfaces are finished in a layer of finer concrete only 1cm thick, containing tiny fragments of a pinkish rock, probably granite. Flights of steps, one still with its hand rail, lead from the walkway directly onto each gun floor, the back of which was guarded by another hand rail for which the securing staples survive only in the

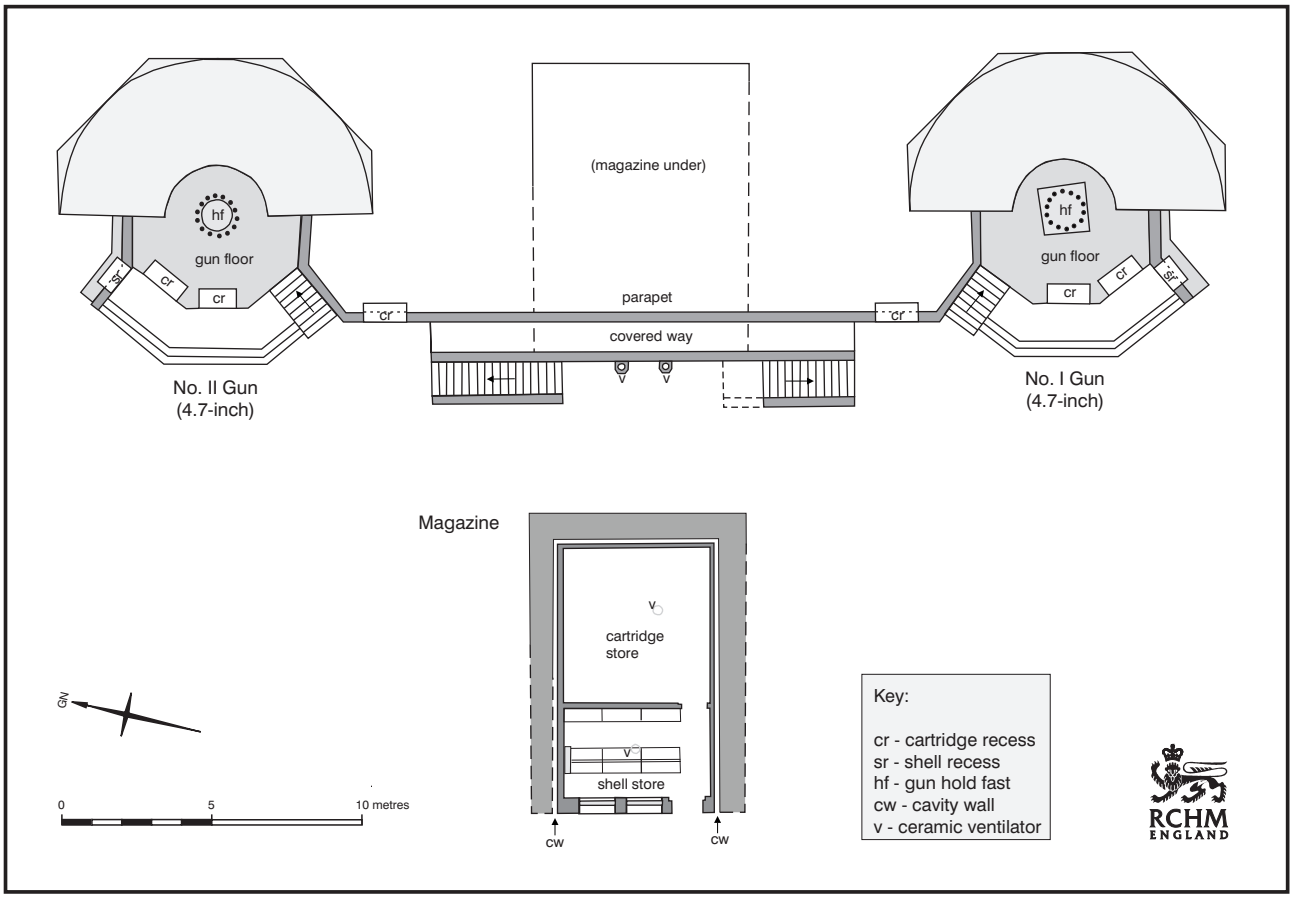

Figure 31
RCHME Plan of the 4.7-inch QF battery and magazine

southern emplacement. The gun holdfasts are identical in that there are 14 steel bolts defining a circle of 1.235m (4ft 0.5in) diameter. However, that for gun no. I appears to have been inserted, as it is set in an individual square patch of concrete. The holdfast for gun no. II has concrete built up inside the ring of bolts.

Behind the gun floors and 1.21m (4ft) lower, are secondary floors providing access to ammunition recesses. Each emplacement has three cartridge recesses and one shell recess; two cartridge recesses are located under the gun floor and one at either end of the walkway (each 1.38m (4ft 6in) wide, 0.62m (2ft) high and 0.62m (2ft) deep); the shell recesses are under the outer wing walls (each 0.92m (3ft) wide, 0.62m (2ft) high and 0.62m (2ft) deep). All have heavy steel frames for strong doors.

The barbettes stand 0.61m (2ft) above the gun floors and the aprons describe semi-circles, although the facetted and layered foundations are now exposed: in each the upper layer is laid in radiating segments 0.3m (1ft) thick.

Figure 32
The southern 4.7-inch QF gun emplacement showing the holdfast bolts
(NMR: AA98/07949)

b) The Battery Command (BC)/Depression Range-Finding (DRF) post

This is a concrete building of two floors. It appears to stand on a mound but originally only the upper floor projected above the earthwork of the battery. The layers of concrete are clearly visible and the east side appears to be on a brick plinth.

The lower room, the map and plotting room for the battery commander, measures 2.6m (8ft 6in) by 2.0m (6ft 6in) and is entered through a doorway 2.15m (7ft) high and 0.88m (2ft 10in) wide; the adjacent window is 1.36m (4ft 6in) high and 0.85m (2ft 8in) wide and has a concrete lintel. A map or plotting table under the window has been removed but a rebate in the northern wall and a mortice for an upright support in the floor can still be seen. The internal walls are rendered and the ceiling is whitewashed.

The upper 'room', always open to the sky, was an observation and range-finding platform. It is defined by parapet walls on the east and south: access was from the northern side, leading to a flight of steps (removed with the earthworks) down to the lower room. The west (rear) side was originally defined by a hand rail. The concrete floor and part of the walls are bitumen-painted. The floor has a square scar in the concrete marking the position of the DRF pillar, and the stubs of three metal rods. Additionally, there is a small hole, 0.08m square, through to the lower room, probably for a speaking tube.

c) The magazine

The external elevation is smooth rendered, with a single door and two windows. Above these are fittings on the walls for two davits to lift ammunition up to the covered way above and the exit holes for two ventilators (Figure 33).

Figure 33
Dummy Battery showing the magazine entrance, steps to the gun emplacements and the BC post to the right (NMR: AA98/07945)

The entrance is 2.06m (6ft 9in) high and 1.03 wide (3ft 4in), wooden framed for twin outward-opening doors. Each window is 0.95m (3ft 1in) wide and 1.07m high (3ft 6in) with heavy concrete lintels and wooden frames for twin inward-opening lights.

Inside are two rooms in series; these are built in yellow stock brick within a concrete shell with a ventilation cavity between them (Figure 31). The ceilings are flat, composed of axial steel girders with shallow brick vaults between them; ceramic pipes in the ceiling provided ventilation. The outer room is the smaller at 4.64m (15ft 3in) by 2.89m (9ft 6in): this was a shell store and it still contains a galvanised steel framework for shelving; two racks run along the central axis of the room and a third along the party wall. It is linked to the larger inner room, a cartridge store, by a doorway with a wooden frame hinged for inward-opening doors. The cartridge store measures 4.64m (15ft 3in) by 4.93m (16ft 3in).

There are no lamp recesses nor any electric light fittings in the magazine or anywhere else in the battery.

First World War AA emplacement

A fragmentary concrete structure, **j**, with walls surviving to a maximum height of 0.9m (3ft) and of varying thickness (0.28m (11in) to 0.62m (2ft)). The whole structure is approximately square, although there is a recess in the north wall. A single entrance in the west wall, 1.31m (4ft 4in) wide, is rebated for doors. The interior is filled with concrete debris including chunks of a

corrugated concrete roof. The purpose of this structure is unknown but it is one of two built into the two known embrasures of the original battery. Quite possibly, they are shelters or ammunition stores for the AA guns known to have been here in the First World War (MacDougall 1980, 18); the circular scar of a gun holdfast is visible on the earthwork between them on aerial photographs (NMR APs: 82/RAF/713/Part 3/545-6).

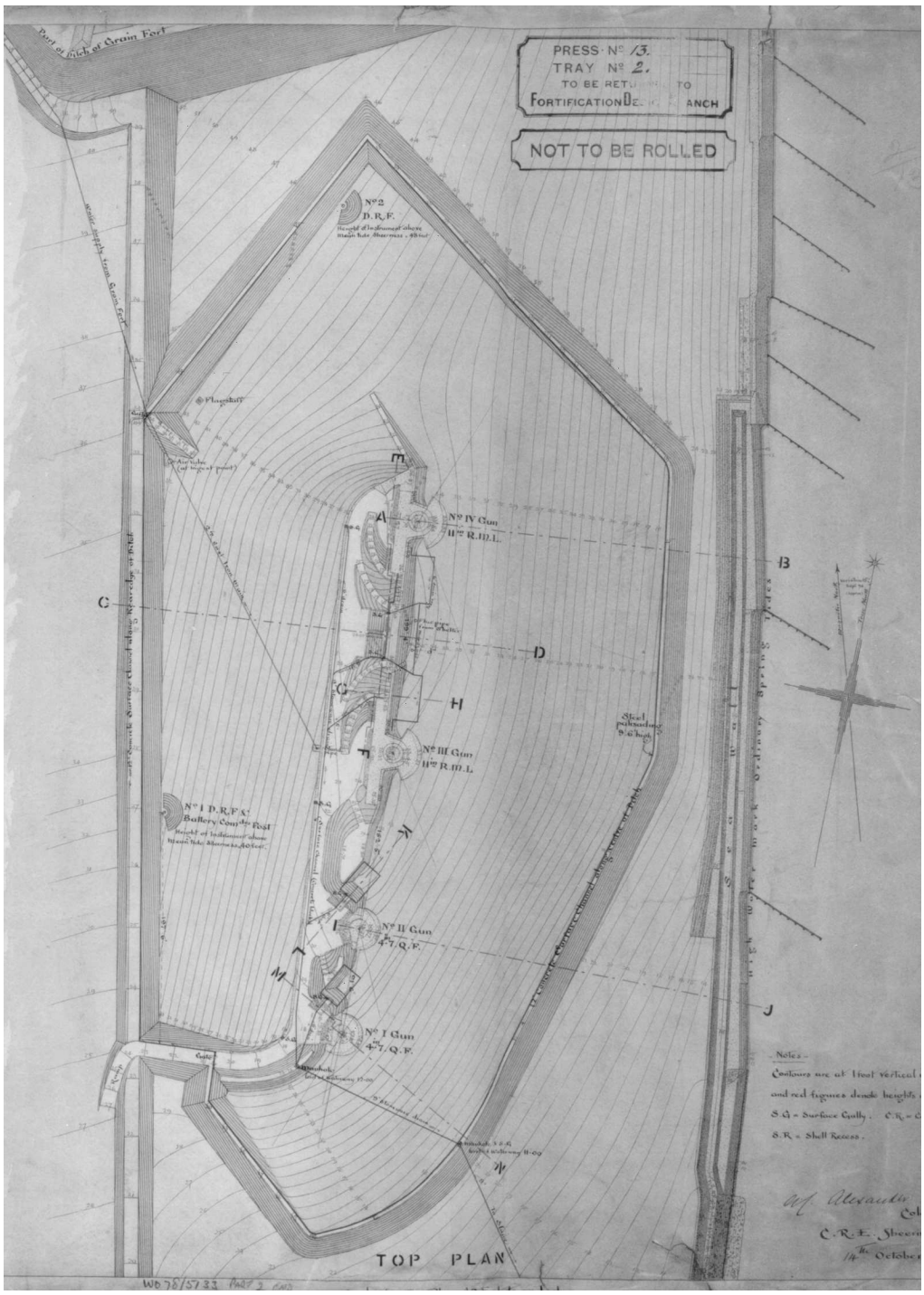

Figure 34 *Plan dated 1896 of Wing Battery* (PRO: WO/78/5133/2)

WING BATTERY

The letters and text in **bold** appear on Figure 36

Wing Battery is situated on a gradual slope towards the sea and was created in part by the careful scarping of this slope, such that the artificial and natural are not always clearly discernible. This low profile is typical of the time, a deliberate design feature to make the battery invisible from the sea. The battery was built in 1895, as a supplement to the coastal artillery at Grain: original plans of 1896 survive. It was equipped with four main weapons: two 4.7-inch QF guns to provide defence against fast-moving destroyers and torpedo boats; and a pair of 11-inch RMLs for heavier targets (Figures 34 and 35).

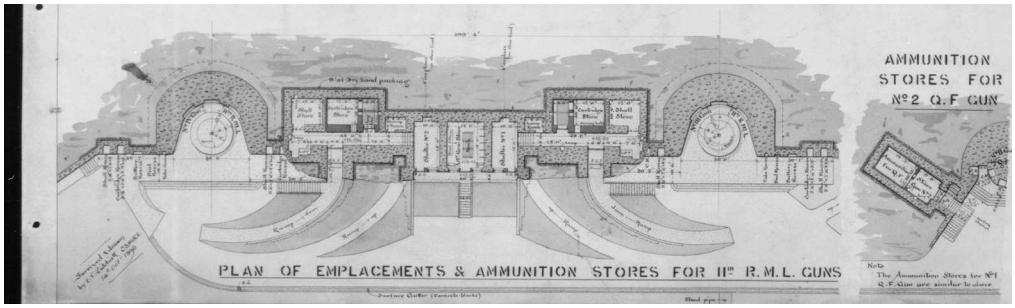

Figure 35
Plan dated 1896 of one 4.7-inch QF and both 11-inch RML gun emplacements (PRO: WO/78/5133/2)

Today, the greater part of the battery is densely overgrown with young trees, scrub and undergrowth. Despite this, many of its principal features can still be discerned and there is a striking correlation between the original plans of 1896 and the present-day survey plan. This is because the battery was active for only a very short time, rapidly becoming obsolete, and was not significantly altered. Although its 4.7-inch QF guns were removed and installed on Grain Tower in 1911-12, the battery was occupied during the First World War, probably by infantry in temporary accommodation (see below). Moreover, the parapet between the gun emplacements was converted into a series of infantry breastworks clearly recorded on contemporary photographs (Figure 37).

Although long since abandoned, the gun emplacements and magazines etc remained open and accessible in 1961 but by 1966 had been infilled or sealed. Consequently, although this has concealed features of the battery it has also preserved much that would otherwise have been subsequently vandalised (NMR APs: 58/4646/333; OS/66228/396).

The battery consists of an outer defensive *enceinte* and a central linear hollow, dug into the hillside, for the emplacements, magazines and detachment shelters. The outer defence is an elongated, irregular hexagonal earthwork defined by a ditch. This ditch, which originally contained an **unclimbable fence** (in parts still traceable), is extremely well defined along its west, north-west, north-east and south-west sides, averaging 4.8m wide by 1.8m deep (15ft 8in by 5ft 11in). The western side carries the original road linking Grain Fort and Dummy Battery; the main

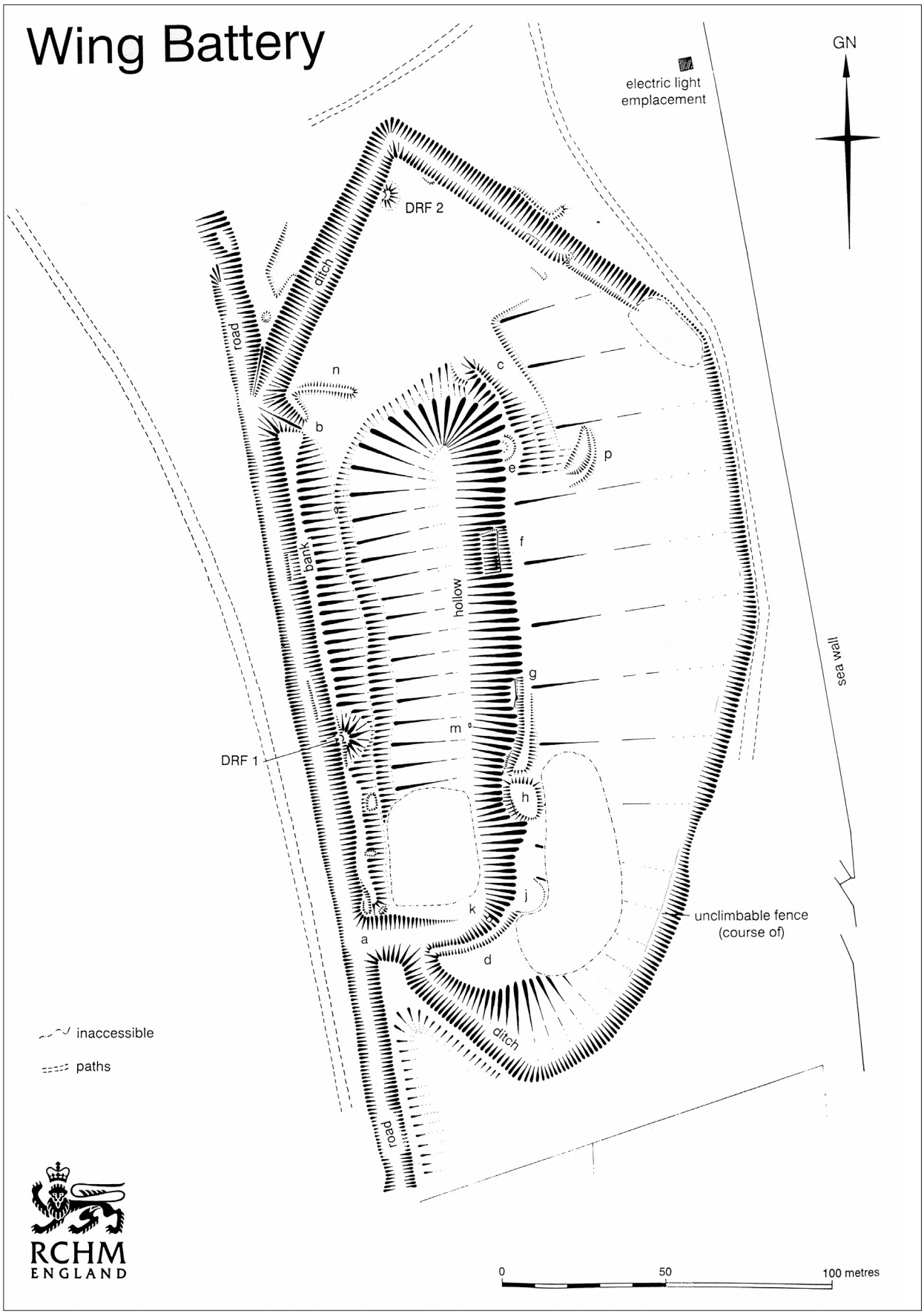

Figure 36 *RCHME survey plan of Wing Battery.*

entrance, **a**, lies to the south-west, while a second, minor entrance, **b**, is at the north-west angle. To the east and south-east the ditch effectively formed a counterscarp, 1.5m (4ft 11in) high, to the gently-graded natural slope.

The Battery Command (BC)/Depression Range-Finding (DRF) Posts

A continuous but very slight bank, averaging 12.9m (42ft 4in) wide and 0.3m (1ft) high, runs along the inside of the western ditch. Built onto it is the BC post, incorporating one of two DRF stations, which controlled the guns: **DRF 1** survives as a semi-circular mound, 16.3m (53ft 6in) north-south by 8.1m (26ft 6in) transversely and 1.0m (3ft 3in) high. Set into the rear of the mound, reached by a flight of steps from the main ditch, is the remains of a curving concrete wall, 1.2m (3ft 11in) high and 0.2m (6in) thick, which formed the parapet at the front of the position. Behind it, is the site of the DRF pillar and beyond that a rectangular pit, 1.1m by 0.5m (3ft 7in by 1ft 7in) and at least 0.4m (1ft 4in) deep, containing several power cables.

The second DRF station (**DRF 2**) is located close to the northern corner of the battery. It is of similar design, with an oval mound, 9.3m by 5.7m by 1.0m high (30ft 6in by 18ft 8in by 3ft 3in), supporting a curving concrete wall, 1.3m (4ft 3in) high.

The gun emplacements

The guns and ancillary structures were sited in a large, roughly rectangular **hollow** excavated into the hillside and measuring approximately 173m by 47m by 1.3m deep (567ft by 154ft by 4ft 3in). The emplacements were set in a line along the seaward face and were numbered I to IV from the south. The ends of the hollow were protected by infantry positions formed by short earthworks: that on the north, **c**, is a straight section of bank, while that on the south, **d**, has a curving line formed by a true infantry step or *banquette* cut into the slope, with an earthen parapet above it.

The seaward face of the hollow is currently a moderately steep scarp but originally was carefully stepped and ramped to accommodate the gun floors, the covered ways between them and the magazines underneath. The 11-inch RMLs were located in emplacements in the northern half and were separated by individual underground magazines and detachment shelters with a shared access and general artillery store. Each magazine comprised separate shell and cartridge stores; external ramps were used to bring ammunition into the magazines, while ammunition lifts, one for each gun, took it straight up to the emplacement, where there were ready use lockers (Figure 35).

In the southern half of the hollow, the 4.7-inch QF guns each had a separate magazine comprising a small lamp room and two further rooms for ammunition storage (Figure 34); these follow what appears to have been a standard pattern exhibited at contemporary sites elsewhere, for example at Beacon Hill Fort near Harwich, Essex (Brown & Pattison 1997, 26-8).

Today, although all the gun pits have been infilled, there are clear surface traces of three out of the four. The northern RML emplacement (no. IV gun), **e**, is defined by two concentric semi-circular scarps, the outer of which marks the edge of the gun pit - part of its concrete wall is visible. On the slope just to the south, a roughly rectangular area, **f**, measuring 12.5m by 5.0m (41ft by 15ft 5in), is revetted to front and sides with a concrete wall; this is the former observation platform situated between the two RML's (Figure 33). Further south, also set into the slope, is a length of concrete wall, **g**, with the remains of two ready-use ammunition lockers set into it. This wall exhibits a slight but definite bend, clearly identifiable on the 1896 plan between the RML and QF emplacements: the lockers were for the southern RML (no. III gun).

Slight traces of concrete and a sub-circular mound of infill, **h**, mark the position of the northern QF emplacement (no. II gun), while part of the concrete apron of the southern emplacement (no. I gun), **j,** survives along with a semicircular scarp defining the edge of the gun pit. Just to the south-west is a brick-lined manhole, **k**, with the remains of a concrete cover. The shaft measures 0.9m by 1.0m (3ft by 3ft 2in) and is at least 1.2m (4ft) deep; metal steps let into one side. It is an original feature providing access to the main site drainage system (Figure 34). Another pit, **m**, measuring 1.2m by 0.7m (4ft by 2ft 4in), is of concrete and brick construction but only 0.9m (3ft) deep: it is shown on the 1896 plan as a 'surface gulley' and was also connected with drainage; there is a drain pipe in its north-east corner.

Miscellaneous features

Several slit trenches, probably of First World War date, were noted across the site, with a particular concentration between the main entrance, **a**, and the **DRF1** position.

Figure 37 *Photograph taken during the First World War showing the rear of Wing Battery and the buildings stationed there* (reproduced courtesy of the Royal Engineers Library, Chatham: 779/940.3(42))

Just inside the northern entrance a slight bank, **n**, 21.0m (68ft 10in) long and 0.5m (1ft 5in) high, is of unknown origin: it does not appear on the 1896 plans. However, it may be connected with a later infantry position defending the entrance.

A crescentic pit with associated upcast, **p**, to the east of no. I gun is the result of later activity: it appears as an open digging in 1942 and may be a rubbish pit (NMR APs: 26/UK/920/31-2).

A series of four buildings formerly stood in a line along the base of the hollow at its southern end: they are visible on photographs of First World War date held at the Royal Engineers Library at Chatham (Figure 37) and on an air photograph of similar date, when the battery was active (Figure 37; PRO: WO/192/223). The southernmost still stood until 1961 but was demolished shortly thereafter (NMR AP: 58/4646/333). These buildings probably comprised accommodation, stores, latrines etc for troops manning the defence lines along the coast here.

GRAIN BATTERY

The letters in **bold** appear on Figure 40.

This was constructed as a practice battery between 1900 and 1901 and was armed with four 6-inch BL Mk VII guns. In 1918 one gun was permanently removed. It continued to function with three guns until 1935-6 when its was stripped of its armament; from this time it was out of use (PRO: WO/192/53).

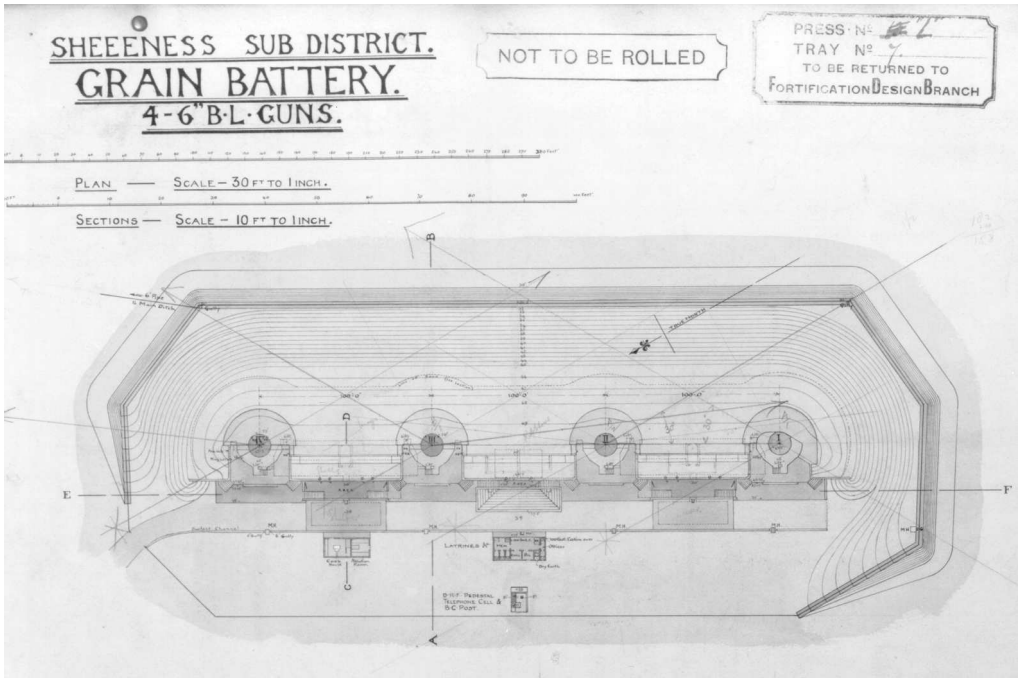

Figure 38
Plan dated 1902 of Grain Battery (PRO: WO/78/5122/3)

In morphological terms, Grain Battery was the simplest of the four land batteries at Grain (Figure 38). Built on flat ground facing south-west, it consisted of a long earthen mound with four gun emplacements arranged in a line on the terreplein. A ditch protecting the front and ends of the mound contained an unclimbable fence which continued around the rear of the battery. A service road entered from the north, running behind the mound and providing access to the guns and support buildings along its western side. The mound had a vertical rear facade which provided access to the emplacements, the underground magazines and artillery stores. The guns were arranged in two pairs linked by a continuous covered way at terreplein level: each pair shared cartridge and shell stores situated in the mound underneath the guns and there were lifts which took ammunition to ready-use lockers in the emplacements (Figures 38 & 39). The plan of each magazine and its relationship to the emplacement follows a fairly standard pattern; a single 6-inch BL gun installed at Beacon Hill Fort near Harwich, Essex, was almost identical (Brown & Pattison 1997, 35).

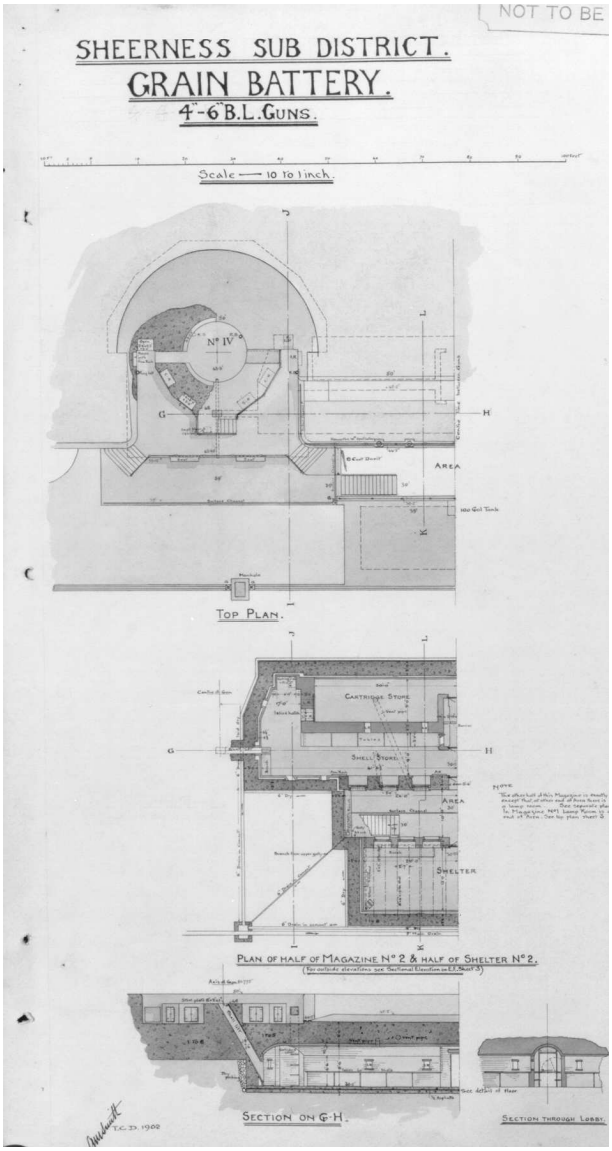

Figure 39
Plans and elevation dated 1902 of one of the 6-inch BL gun emplacements and its magazine and troop shelter (PRO: WO/78/5122/4)

Each pair of guns also had a detachment shelter: these were located underground, directly beneath the service road. To the east of the service road were three surface buildings: a latrine block, a cookhouse/ablution room and a combined BC Post/DRF/ Telephone cell.

The battery is accessible today, although there is thick scrub growth in several places, particularly in the ditch terminals and on the seaward scarp. As with Wing Battery, the empty gun emplacements were infilled and the magazines sealed between 1961 and 1966: the free-standing buildings to the rear were cleared leaving no surface trace, although the underground shelters might survive under the present allotments (NMR APs: 58/RAF/ 4646/332-3; OS/66/228/396-8).

The main mound is sub-rectangular and measures 115m (377ft) long on the seaward side, 140m (459ft) along the rear, and 45m (147ft) along the ends; it stands only 2.9m above the present ground surface. The front scarp is gently graded, the end scarps steeper. The steep scarp at the rear conceals the entrances to the magazines: originally there was a vertical facade.

The ditch is almost symmetrical in plan except that the north terminal ended short to allow entry of the service road while on the south it extended around the end and for a short distance to the rear, providing extra protection. Along the front of the battery the ditch is a consistent size - 4.9m (16ft 1in) wide and 1.5m (4ft 11in) deep - while at the ends it spreads to become significantly wider. No trace remains of the unclimbable fence but along the eastern and southern sides of the ditch there is

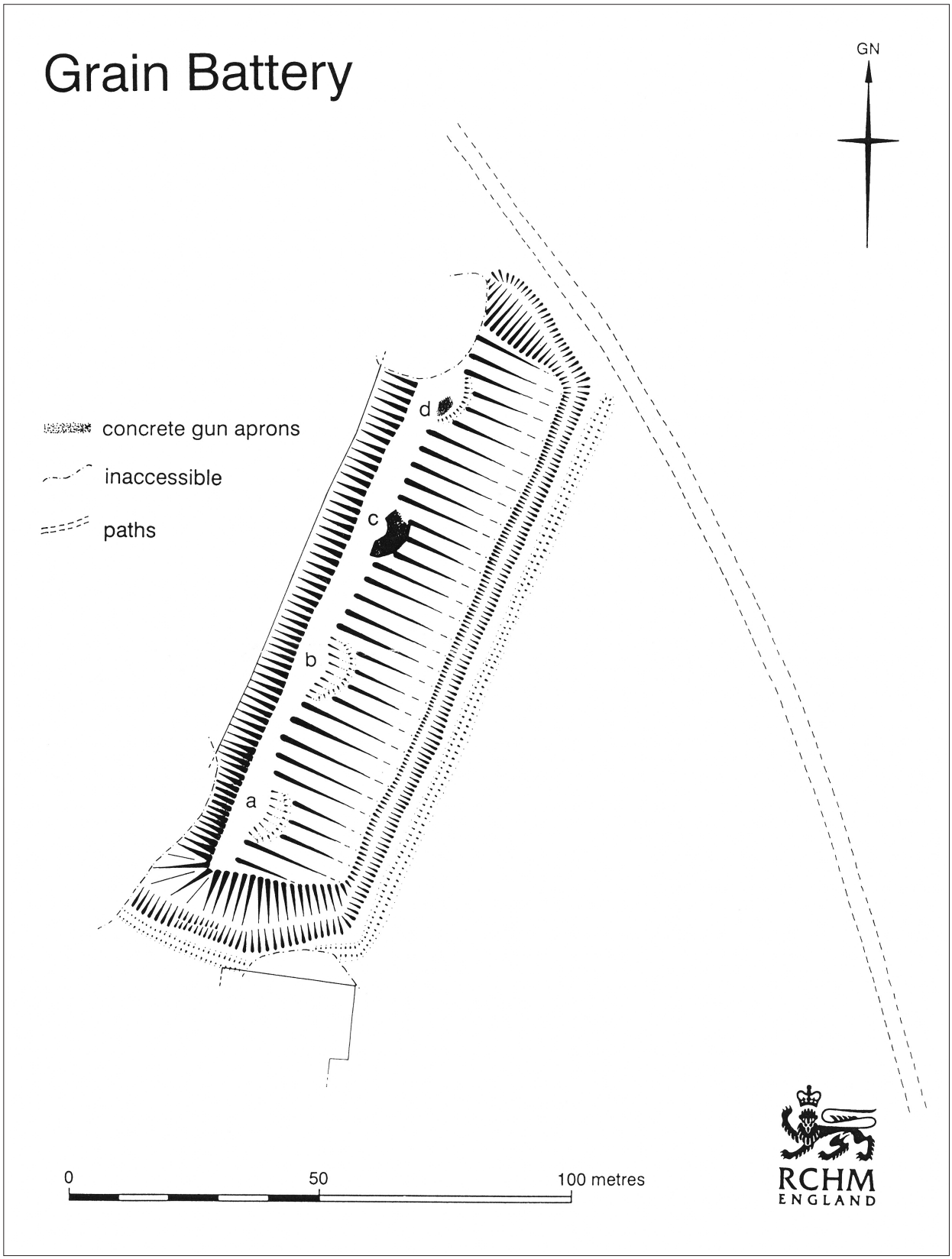

Figure 40 *RCHME survey plan of Grain Battery.*

a slight external bank, 3.5m wide by 0.2m (11ft 6in) 7in) high, a counterscarp designed to conceal the ditch and the fence when viewed from the seaward side.

The terreplein is 5.8m (19ft) wide and retains traces of all four gun emplacements: **a** (no. I gun) and **b** (no. II gun) are visible as double scarps which probably mark the inner and outer edges of the concrete aprons; most of another apron, **c**, (gun no. III) remains on the surface, and a single scarp and small patch of concrete, **d**, represent the apron of the fourth emplacement (gun no. IV).

OTHER MILITARY INSTALLATIONS

(Figure 3)

The areas between the batteries were used by the military for various purposes. During the First World War complex arrangements of trenches, barbed wire obstacles and machine gun emplacements were located along most of the foreshore. Surprisingly little remains of this activity, but contemporary photographs illustrate the sheer complexity of the activity (CREL b; Figure 41). Aerial photographs indicate considerable activity during the course of the Second World War. Most of this has been cleared away, leaving but small trace. A summary follows:

1) North of Grain Fort

The ground surface, which slopes away gradually from the fort to the north and east, has an undulating and disturbed appearance, with several shallow hollows and ditches. Most are of minor significance but of military origin, probably dating from the First World War. At **a** there is a rectangular platform, 18.0m (59ft) long, 10.0m (33ft) wide and terraced 0.6m (2ft) into the slope: this is probably the base for a temporary structure, possibly troop accommodation. Just north of the platform, there is a small oval mound, **b**, and large a oval hollow, **c**, 20.0m (66ft) long, 10.0m (33ft) 1.0m (3ft 3in) deep; these occur in an area which appears pitted and disturbed on air photographs, and are perhaps connected with small-scale extraction of sand, gravel or similar material (NMR APs: 106G/UK/1444/4107-8).

Figure 41
First World War trenches north of Grain Fort, with the twin electric light emplacement for Grain Fort in the distance (the edge of Grain Fort can just be made out in the top right hand corner) (reproduced courtesy of the Royal Engineers Library, Chatham: 779/940.3(42))

Electric Light Emplacement

A twin searchlight emplacement, serving artillery in Grain Fort, formerly stood at **d**: it appears on First World War photographs and on aerial photographs of 1946 and 1961; thereafter it was demolished and cleared. A slight platform, **e**, is the sole remnant of an associated shelter or bunker a few metres to the south (Figure 42; NMR APs: 106G/UK/1444/4107-8; RAF/58/4646/332-3; OS/75/300/001). This twin emplacement, designated electric light nos. 13 and 14, was constructed by 1914 and served the guns on Grain Fort (PRO: WO/78/5124/10).

Figure 42
Electric searchlight emplacement at Grain during the First World War, with part of the extensive trench system in the foreground. Note the apsidal end with its steel shutters gurading the lights (reproduced courtesy of the Royal Engineers Library, Chatham: 779/940.3(42))

2) East of Grain Fort

Electric Light Emplacement

An artillery searchlight, **f**, proposed in 1911 and probably built shortly afterwards, stands alone on the sea wall (Figure 43; PRO: WO/78/5124/12). It probably served the guns on both Wing and Grain batteries. It is set back into the slope which is revetted by a battered concrete wall up to 0.93m (3ft) high. The structure follows the standard pattern but is badly damaged so that the apsidal end, which formerly held the light cells, is largely broken out. Internally the rectangular room is just a concrete shell, approximately 3.32m by 2.87m (10ft 11in by 9ft 4in). The south wall contains a recess, 1.5m (5ft) long and 0.23m (9in) deep, and in the north-west corner the concrete has been chipped out for a stove; its flue pipe pierces the roof.

Figure 43
The electric searchlight emplacement east of Grain Fort (NMR: AA98/07927)

3) East of Grain Battery

Part of a military camp stood in the triangle of land between Grain and Wing batteries and Smithfield Road during the Second World War: it was a dispersed group of about a dozen buildings which had been largely cleared by 1946 (NMR APs: 26/UK/920/31-2; 106G/UK/1444/4107-8). Today the area, used for informal recreation, is flat and virtually featureless; no buildings remain. A few straight, shallow ditches, no deeper than 0.2m (7in), are possible remnants of the defensive perimeters associated with the camp.

4) South of Wing Battery

This area has been improved in recent years as a series of fenced paddocks. Also, a series of three rectangular ponds were established along the eastern edge of the area in the 1950's (NMR APs: 82/RAF/713/Part 3/402-3; 58/RAF/1779/Part 2/297-298). Despite this disturbance, there are several earthworks, foundations and two standing buildings.

There was a complex of buildings here in the First World War (Figure 44) and during the Second World War several structures stood within a roughly kite-shaped defended perimeter, probably defined by a fence, which is now gone. In its north-western corner aerial photographs record two square buildings in a small square enclosure: although the buildings have gone there is part of a concrete floor from one of them, and two sides of the enclosure are defined by **g**, a low scarp 0.4m (1ft 4in) high, incorporating irregular lumps of concrete which have metal inserts, presumably for uprights to support the perimeter fence. This enclosure and its two structures originally stood alone, approached via a track from Smithfield Road, and may date from the First World War: they appear on aerial photographs which, although undated, certainly pre-date 1931, and might be among the jumble of buildings on a ground photograph of definite First World War date (PRO: WO/192/83; OS 6-inch map Kent sheet 13NW; CREL b).

Figure 44
First World War photograph across Wing Battery, showing the building complex at extreme right , and the Medway Boom between the shore and Grain Tower (reproduced courtesy of the Royal Engineers Library, Chatham: 779/940.3(42))

Engine Room

In the Second World War, at the southern end of the kite-shaped enclosure was another building, **h**, which survives. This is a four-bayed rectangular structure in brick and concrete: the bays are of brick between concrete pillars; the flat concrete roof is asphalted. The southern elevation is the main one, with twin heavy steel doors, three windows, and ventilators at high level. The eastern end wall has a single steel door; the western end wall two windows, while the north elevation contains only ventilators. A large circular tank formerly stood just to the north of this building, possibly for fuel oil. Together with the ventilators, this suggests that the building was an engine or generator room, perhaps for the artillery searchlights on the shore and on Grain Tower during the Second World War: the present structure appears to be of this date. However, it appears to be a re-build because another, smaller building is recorded on the earlier, pre-1931 photographs, in its own square enclosure, together

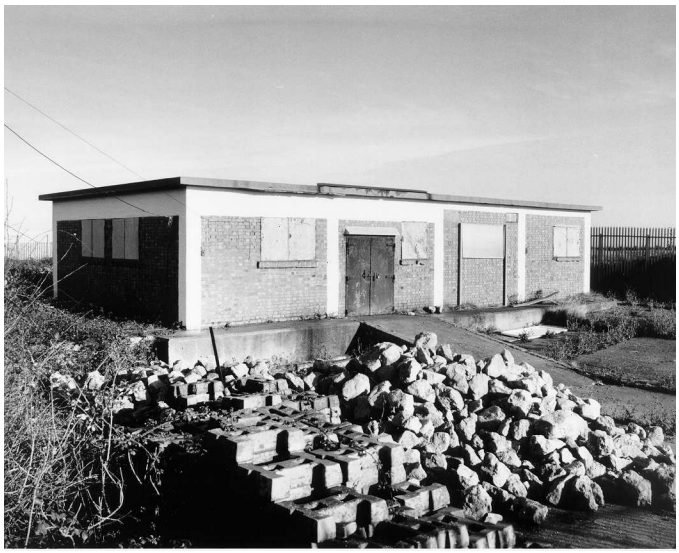

Figure 45
Photograph of the Engine Room from the southwest (AA98/07926)

with the circular tank. This building was positioned exactly in line with the Medway Boom and possibly housed a winch for tensioning and adjusting the boom cables according to tidal conditions (PRO: WO/192/83; NMR APs: AC1/RAF/F26/5; OS 6-inch map Kent sheet 13NW).

Electric Light Emplacement

North of the tank there was an observation tower of Second World War date, removed after 1975 (NMR APs: OS/75/300/001-3). Close by is another artillery searchlight, **j**, which illuminated the area on the seaward side of the Medway boom. It was already in existence by 1911 (PRO: WO/78/5124/12) and is built to a standard pattern comprising a rectangular room with apsidal end for the light cells. A small rectangular room has been added on the west. The construction is of rendered concrete except the south wall of the added room which is in yellow stock brick. The flat roof is asphalted and the roof is supported on cross-axial steel girders; it overhangs the walls by 0.17m (6.5in). The main room is 2.9m (9ft 6in) wide by 2.22m (7ft 3in) long. The circular end is 2.5m (8ft 3in) to 2.9m (9ft 6in) diameter while the added room is rectangular at 1.9m (6ft 3in) by 1.52m (5ft), originally reached through double doors; the interior walls are painted cream over the top third, brown the remainder.

Just to the south of the terminus of Smithfield Road is a small concrete building, **k**, connected with the supply and control of electric power. It is only 1.83m (6ft) square internally with walls 0.30m (1ft) thick, recessed into and protected by the sea wall. The flat roof has a slight overhang to the front where there is a heavy steel door and frame. The interior has a recessed floor reached by five steps; at floor level a round aperture in the east wall has a bundle of power cables; the south wall has four vents covered with a mesh screen, each vent 0.21m (7in) tall and 0.12m (4in) wide; there are scars from shelving and circuit boards. The building is visible on aerial photographs (NMR APs: 26/UK/920/31-32; 106G/UK/1444/4025-6).

5) North of Dummy Battery

At the very end of the causeway to Dummy Battery, and cut into it, are two small buildings, **m**: both appear to have been concerned with power supply and telephone communications to the battery and at least one is visible on the First World War air photographs. The smaller structure is little more than cupboard size at 0.88m (2ft 10.5in) by 0.61m (2ft) internally with concrete walls 0.16m (6in) thick. A doorway in the north wall has a steel frame for a heavy door. Inside, there is a plinth with joist holes for a wooden floor; in the rear wall are three vertical grooves for battens - probably to mount a board. There are small square apertures in the front and rear walls, partially filled with secondary concrete, and a secondary metal pipe entering at high level.

The larger building, placed on a concrete plinth, is itself only 2.11m (6ft 11in) square internally, with walls 0.29m (11.5in) thick in rendered stock brick laid to stretcher bond. The concrete roof appears to be secondary, and has a very slight slope to the rear. The entrance in the west wall has a heavy duty steel door, steel frame and concrete step and lintel; there is a scar from a large sign on

the wall to the left of it. Inside, there is a large rectangular pit in the north-west corner, 1.05m (3ft 5in) by 0.70m (2ft 3.5in) and at least 0.60m (2ft) deep, where a large bundle of power cables enter the building. There are timber slats and battens to the walls, possibly connected with shelving or lining.

Either or both of these buildings may have been a test hut, serving as both telephone junctions points and telephone system testing stations.

4. MANAGEMENT IMPLICATIONS FOR THE SITE

The importance of the Grain artillery defences

Abandoned military sites are now recognised as a vital and tangible element in our heritage. As as island nation with World-wide imperial interests, the defence of the realm from foreign invasion was of great importance, particularly in the 19th and early 20th centuries. From the later part of the 19th century, the development of land-based artillery fortifications in the British Isles was fast and furious, part of the arms race among the great powers of the day. The Grain artillery fortifications, in many ways, illustrate that development in a single location - from the Martello Tower to the low-profile Wing and Grain Batteries. Moreover, their context - the defence of the Medway dockyards - is immediately apparent, providing excellent educational and tourist potential.

As far as individual elemnts of the site are concerned, it would be too easy to dismiss Grain Fort because of the loss of the great keep. However, its surviving earthwork covers a maze of underground passages and magazines which may be in excellent condition. In addition, Wing and Grain Batteries are virtually complete examples of short-lived artillery fortifications, and the form of Wing Battery itself, with the polygonal perimeter, is particularly rare.

Finally, it should be noted that the present survey encompassed only a part of the former military area. In Grain village itself there are surviving buildings and structures of First and Second World War date - and perhaps earlier - which have yet to be examined. Outside the village there were more military installations, parts of which may survive; elements of a late 17th/early 18th century battery which was located to the west of the village may survive below ground (PRO 192/83). Only by a wider survey will the full educational and tourist potential of the Grain defences be realised.

Condition of the remains

The state of preservation varies. There has been serious damage, such as the partial removal of Dummy Battery in the 1950's and the demolition of the keep of Grain Fort in the 1970's. Surviving buildings, for instance the Electric Light Emplacements, serve as convenient subjects for graffiti, vandalism and rubbish dumping. The Engine Room has fared better and is maintained as a working building.

Thankfully, the earthwork remains are prominent and well-preserved with virtually no erosion due to human or animal interference. Nevertheless, the area occupied by the batteries is in a state of semi-neglect. The military had a grazing regime over the area and it remained an open landscape without trees or scrub, where clear lines of sight were of prime importance. This is

clearly seen on First World War ground photographs in the Royal Engineers Library at Chatham (779/940.3(42)).

Today the landscape is in various ownership with differing land-use patterns. Those areas immediately north and south of Smithfield Road are used for low-intensity grazing. Elsewhere, including all the batteries, there is no clear land use other than informal access for local people who walk, exercise their dogs and play: the young woodland along the western edge of Wing Battery is popular with local children; there is also a field nearby maintained for sporting activities.

The major threat to these areas is scrub and tree growth. There had been minor pockets before the departure of the military in 1956, especially on those batteries which were not active artillery units after the First World War. Air photographs taken between the Second World War and the present day record the progressive spread of scrub and young woodland. It is particularly thick, often impenetrable, in the following locations:

1) The ditch of Grain Fort: mainly briar, thorn and young trees.
2) The ditches and southern half of Wing Battery: thick thorn scrub, briar and, along the western edge, young woodland.
3) The ditch ends and seaward scarp of Grain Battery: briar and thorn scrub.
4) The southern bank of Dummy Battery: thick gorse.

Access

Most of the site, including all of the batteries, can be approached easily. There are small local car parks at the northern end opposite St James' Church and in the centre off Port Victoria Road. Visitors can walk on all of the batteries and the allied structures: the Electric Light Emplacements and Engine Room are adjacent to the sea wall, where many people walk. It is possible to get onto the batteries and view their particular features. The areas immediately north and south of Smithfield Road are in private ownership but their features can be viewed from the sea wall or Port Victoria Road. However, there is no controlled or directed access to any of the batteries.

At low tide, Grain Tower can be reached along the causeway but the building itself is in private ownership. Access is not allowed and it is dangerous. A good view of its structure and features can be had from the end of the causeway.

There is some local concern about access to the underground parts of Grain Fort, which are extensive. These can be reached via the outer ditch, through small holes made in the broken ends of the caponiers. This is potentially a serious safety issue which needs to be addressed.

Facilities and information

At the present time there are no on-site facilities, and no information, for visitors to the batteries. There are, however, local shop and pub services in Grain village.

The lack of information is exacerbated by the infilling of many of the gun emplacements, so that now even the outer aprons are only partially visible. At Grain Fort, Wing and Grain Batteries, there is not enough visible of any one emplacement to enable understanding of its function and operation.

There is some potential to provided basic information for visitors but it would need to be tied into a clear management plan. At present, it is impossible to appreciate the nature, extent and former function of the batteries because of scrub growth: it will also progressively hinder access. A programme of selective scrub clearance and felling, perhaps tied to tree planting in 'safe' areas, would be required to more clearly define the earthworks (there has been some planting south of Grain Fort recently).

Information could be provided by the use of weather-proof display boards on site, supported by leaflets or booklets available locally and regionally, giving plans of the batteries and historical background. This is needed especially where features have been entirley removed and the ground evidence is incomplete: for example, the keep of Grain Fort.

The individual batteries and their support structures could be linked by an informal trail, proceeding from point to point. The huge earthen bank of Grain Fort, for instance, provides panoramic views to Grain Tower and Garrison Point, Sheerness, linking the Grain defences into the wider context of defending the dockyard and preventing enemy access to the Medway. If access to private land could be negotiated, Dummy Battery could be approached as originally intended, along the causeway over Smithfield Marshes. The battery itself has a well-preserved magazine with its original shell racks and, once the top of the battery is reached, via a short steep climb, the two 4.7-inch QF gun emplacements are clearly laid out, with gun holdfast and ready-use lockers etc. still in place. Safe access would have to be provided, perhaps in the form of a short walkway across the marshy area and steps up to the emplacements.

5. SURVEY AND RESEARCH METHODS

The archaeological survey was carried out by Moraig Brown, Paul Pattison and Duncan Garrow of the RCHME. Control and some hard detail was supplied using a Wild TC1610 Electronic Theodolite with integral EDM. Data was captured on a Wild GRM 10 Rec Module and plotted via computer using Trimmap software on a Designjet 750C plotter. Archaeological detail was supplied at 1:100, 1:500 and 1:2500 scales using conventional graphical methods.

The architectural survey of Grain Tower was carried out by Adam Menuge, Andrew Williams and Andy Donald.

Site photography was carried out by Steve Cole.

This report was written by:

Historical background: Moraig Brown and Paul Pattison

Grain Tower: Andrew Williams and Adam Menuge

Grain Fort: Moraig Brown and Paul Pattison

Dummy Battery: Paul Pattison

Wing Battery: Paul Pattison and Duncan Garrow

Grain Battery: Paul Pattison and Duncan Garrow

The various contributions were edited by Paul Pattison and synthesised into a single report by Paul Pattison and Moraig Brown.

The site archive (NMR Numbers TQ 87 NE 7-10) and a copy of this report have been deposited in the archive of the RCHME at the National Monuments Record Centre, Kemble Drive, Swindon SN2 2GZ, to where further enquiries should be directed.

6. GLOSSARY

Banquette	A low parapet over which infantry fire
Barbette	Breastwork of a battery over which guns fire
Batter	The slope of a wall face
Battery	A work, either temporary or permanent, where guns or mortars are mounted
Berm	Level space between the edge of a ditch and the foot of a rampart.
Breech-loader	A gun which is loaded from the rear of the barrel
Caponier	A sheltered passage across or projecting into a ditch; usually loopholed to provide flanking fire.
Carronade	A short heavy cannon with a large bore of varying calibres
Casemate	A bombproof vaulted chamber providing emplacements or loops for guns and/or troop accommodation
Cordon	A stone string course at the junction of a sloping wall and the vertical wall above it
Counterscarp	Exterior slope of a ditch
Covered way	A continuous walkway, protected from enemy fire by an earthwork parapet
Culverin	A large, long cannon, with a bore of approximately 5 inches (127mm)
Demi-culverin	A large, long cannon, with a bore of approximately 4 inches (100mm)
Depression range finder	An instrument used to work out the position of an enemy ship in order to set the angles and distances for guns to fire
Embrasure	An opening in a parapet or wall through which a gun can be fired
Enfilade	Fire coming from a flank which sweeps the length of the fortification
Fort	Position or building designed primarily for defence
Gorge	Rear of a work; usually the neck of a bastion or a detached work
Keep	Principal and strongest tower or a castle or fortification; usually a place of last resort
Loop	An opening in a wall through which a gun can be fired
Martello Tower	A British coastal tower, its design inspired by a coast defence work in Corsica
Muzzle-loader	A gun which is loaded from the front of the barrel
Parade Ground	A protected open area on which regular musters and exercises take place

Parapet	A low wall or earthen bank protecting the front edge of a rampart
Platform	Hard surface on which guns can be placed
Ramp	Inclined track on the rear slope of a rampart to allow the movement of troops and guns on to the terreplein
Rampart	Mass of excavated earth on which the trrops and guns of the garrison are raised, and forming the main defence of the fort
Revetment	Retaining wall of a rampart or the side of ditch
Rifled muzzle-loader	A muzzle-loading gun which has had grooves cut into the inside of the barrel which caused the shell to spin thus ensuring greater speed and accuracy
Terreplein	Level surface behind the parapet providing a platform for guns
Trace	The plan of a fortification
Work	General term for any work of defence

7. BIBLIOGRAPHY AND SOURCES

Brown ,M, & Pattison, P, 1997 *Beacon Hill Fort, Harwich, Essex* (unpublished RCHME survey report; NMR Number TQ 23 SE 32)

Colvin, HM (ed), 1982 *The History of the King's Works Volume IV 1485-1660 (Part II)* (London, HMSO)

Dobinson, CS, 1996 *Twentieth Century Fortifications in England* **Volume 1.2** *Anti-aircraft artillery*; site gazetteer, WWI (CBA)

Gulvin, KR, 1976 *The Medway Forts; a short guide* (The Medway Military Research Group)

Hogg, IV, 1974 *Coast Defences of England and Wales 1856-1956* (London, David & Charles)

Kent, P, 1988 *Fortifications of East Anglia* (Lavenham, Suffolk, Terence Dalton)

MacDougall, P, 1980 *The Isle of Grain Defences* (The Kent Defence Research Group)

Saunders, A, 1989 *Fortress Britain: Artillery fortification in the British Isles and Ireland* (Liphook, Beaufort Publishing)

Saunders, A, 1997 *Channel Defences* (London, Batsford/English Heritage)

Smith, VTC, 1985 *Defending London's River: The Story of the Thames Forts 1540-1945* (Rochester, North Kent Books)

Unpublished sources:

Chatham Royal Engineers (RE) Library

779/940.3(42) Field Defences, Thames and Medway Garrison, Sheppey Section (22/4/1919)

CREL a Sheerness. Fort Barracks. Garrison Point and Grain (18/4/1950)

CREL b Sheerness Letter Books: Letters issued commencing August 1855; ending December 1856 (SHE/0/3/32)

Public Record Office

WO/5115/2 Isle of Grain: location of two 4.7-inch QF guns on Dummy Battery (25/01/1906)

WO/78/5115/3 Dummy Battery: plans and sections of emplacements and magazine (25/01/1906)

WO/78/5115/4 Dummy Battery: sections and elevations of emplacements and magazine (25/01/1906)

WO/78/5115/5 Dummy Battery: plan of terreplein and troop shelter (25/01/1906)

WO/78/5122/2 Grain Battery: plan of emplacements (14/08/1902)

WO/78/5122/3 Grain Battery: plan of terreplein; sections and elevations of emplacement and magazine (14/08/1902)

WO/78/5122/4 Grain Battery: plans and sections of emplacement and magazine (14/08/1902)

WO/78/5124/4 Sheerness Sub-District, Grain Fort: two 9.2-inch BL guns (14/03/1905)

WO/78/5124/5 Grain Fort: plans of emplacements and shell and cartridge stores (17/12/1904)

WO/78/5124/6 Grain Fort: sections and elevations of magazine (19/12/1904)

WO/78/5124/10 Plans and sections of electric light emplacements (05/05/1914)

WO/78/5124/16 Grain Fort: block plan (23/04/1895)

WO/78/5124/17 Grain Fort: ground floor plan of keep (23/04/1895)

WO/78/5124/18 Grain Fort: first floor plan of keep (23/04/1895)

WO/78/5124/19 Grain Fort: plan of terreplein (23/04/1895)

WO/78/5124/20 Grain Fort: plan of emplacements, shell and cartridge stores (23/04/1895)

WO/78/5124/21 Grain Fort: sections and elevations of keep and emplacements (23/04/1895)

WO/78/5124/22 Grain Fort: sections and elevations of keep, main magazine and emplacements (23/04/1895)

WO/78/5124/23 Grain Fort: sections of emplacements (23/04/1895)

WO/78/5124/24 Grain Fort: plan of main magazine and two outer caponiers (23/04/1895)

WO/78/5124/25 Grain Fort: plans, sections and elevations of magazines (23/04/1895)

WO/78/5133/2 Wing Battery: plan of terreplein; plans and sections of emplacements and magazines (14/10/1896)

WO/192/53 Grain Battery: fort record book

WO/192/55 Isle of Grain, Grain Fort: fort record book

WO/192/83 Grain Fort: fort record book; early 20th century aerial photographs in wallet (undated)

WORKS/43/372 Isle of Grain defences (undated)

WORKS/43/373 Isle of Grain Fort and Battery: record plan of lands acquired under the Defence Act 1860 (16/01/1864)

WORK/45/1387 Grain Fort: plans, sections and elevations of staircase to terreplein (undated)

National Monuments Record Aerial Photographs

26/UK/920/30-2 (23/03/1942)

106G/UK/1444/17-8 (01/05/1946)

106G/UK/1444/25-6 (01/05/1946)

82/RAF/713/274-5 (06/02/1953)

82/RAF/713/402-3 (06/02/1953)

82/RAF/713/545-6 (06/02/1953)

58/RAF/1779/296-8 (06/06/1955)

58/RAF/1779/246-9 (06/06/1955)

58/RAF/4646/332-3 (28/08/1961)

OS/66228/396-8 (20/08/1966)

MAL/73047/12-4 (05-09-1973)

OS/75300/1-3 (01-07-1975)

8. PHOTOGRAPHS TAKEN DURING THE SURVEY

AA98/07886 Exterior. Grain Tower from south (B&W)

AA98/07887 Exterior. Battery observation tower from sout-west(B&W)

AA98/07888 Exterior. Wooden supports for Medway boom landing stage from south-west (B&W)

AA98/07889 Exterior. Grain Tower from south-east (B&W)

AA98/07890 Exterior. Supports to 1940 Barrack Block from north-east (B&W)

AA98/07891 Exterior. Causeway to Grain seen from landing stage beneath1940 Barrack Block (B&W)

AA98/07892 Exterior. Grain Tower west side, showing support sockets and mooring chain for Medway boom (B&W)

AA98/07893 Interior. Watertank/Latrine room, showing slate water tank (B&W)

AA98/07894 Interior. Foot of internal stair and doorway to 1855 Latrine from north-west (B&W)

AA98/07895 Interior. Cupboard recess and surviving original window(B&W)

AA98/07896 Interior. Blocked 1855 fireplace and window modified to become entrance to searchlight position (B&W)

AA98/07997 Interior. Landing of internal stair and south facing window (B&W)

AA98/07898 Interior. Magazine wall with magazine lights from south (B&W)

AA98/07899 Interior. Window south side with modified head for 1910 Barrack Room (B&W)

AA98/07900 Interior. First floor showing lift mechanism (B&W)

AA98/07901 Interior. First floor, view looking up showing lift mechanism and supporting concrete pier to vault (B&W)

AA98/07902 Interior. 1940 passage from original doorway to searchlight position (B&W)

AA98/07903 Exterior. West side, original doorway with dated lintel (B&W)

AA98/07904 Exterior. South side, 1910 Ablution Block and doorway to internal stair, flagpole mount and south west corner of B.O.P. tower (B&W)

AA98/07905 Exterior. 1910 stair to 4.7” gun position and doorway to kitchen (B&W)

AA98/07906 Interior. Men's shelter showing hammocks hooks (B&W)

AA98/07907 Exterior. South side, showing remaining 4.7" gun mounting and concrete apron (B&W)

AA98/07908 Exterior. Top of ammunition lift at Gun Floor level (B&W)

AA98/07909 Exterior. Twin six pounder gun pit with ammunition track and roof section (B&W)

AA98/07910 Exterior. Roof of twin six pounder gun placement and B.O.P. tower above from south-east (B&W)

AA98/07911 Interior. Gun director floor (top level) of B.O.P. showing remains of armoured shutters and gun director plinth (B&W)

AA98/07912 Exterior. 1940 Barrack Block, showing water/observation tower from east (B&W)

AA98/07913 Interior. 1940 Barrack Block. Barrack Room floor from south east (B&W)

AA98/07920 Exterior. Grain Tower from west (B&W)

AA98/07921 Exterior. Grain Tower from west (Colour)

AA98/07922 Exterior. Grain Tower and causeway from west (B&W)

AA98/07923 Exterior. Grain Tower and causeway from west (Colour)

AA98/07924 Exterior. Grain Tower and causeway from west (B&W)

AA98/07925 Exterior. Grain Tower and causeway from west (Colour)

AA98/07926 Exterior. ? Engine room from south-west (B&W)

AA98/07927 Exterior. Searchlight emplacement from south-east (B&W)

AA98/07928 Exterior. Searchlight emplacement from east (B&W)

AA98/07929 Exterior. Searchlight emplacement from east (Colour)

AA98/07930 Exterior. Searchlight emplacement from north-east (B&W)

AA98/07931 Exterior. Searchlight emplacement from south-east (B&W)

AA98/07932 Exterior. Searchlight emplacement from north-east (B&W)

AA98/07933 Exterior. Small structure built into sea wall from south-east (B&W)

AA98/07934 Exterior. Two small structures at south end of causeway on Smithfield Marshes from east (B&W)

AA98/07935 Exterior. Dummy Battery from north-east (B&W)

AA98/07936 Exterior. Dummy Battery from east north-east (B&W)

AA98/07937 Exterior. Dummy Battery from east north-east (B&W)

AA98/07938 Exterior. Dummy Battery from south-east (B&W)

AA98/07939 Exterior. Dummy Bsttery from south-east (Colour)

AA98/07940 Exterior. Dummy Battery from south-east, detail (B&W)

AA98/07941 Exterior. Dummy Battery from south-east, detail (Colour)

AA98/07942 Exterior. Dummy Battery from west-north west (B&W)

AA98/07943 Exterior. Dummy Battery from north-west (B&W)

AA98/07945 Exterior. Dummy Battery from north-west, detail (B&W)

AA98/07946 Exterior. Dummy Battery from north north-west, detail (B&W)

AA98/07947 Exterior. Dummy Battery from north north-west, detail (Colour)

AA98/07948 Exterior. Dummy Battery, south gun floor showing holdfast bolts from north (B&W)

AA98/07949 Exterior. Dummy Battery. South gun floor showing holdfast bolts and tower beyond from west (B&W)

AA98/07950 Exterior. Dummy Battery. North gun floor and causeway over Smithfield Marshes beyond from south (B&W)

AA98/07951 Exterior. Dummy Battery. North gun floor and causeway over Smithfield Marshes beyond from south (B&W)

AA98/07952 Exterior. Causeway over Smithfield Marshes from south on Dummy Battery (B&W)

AA98/07953 Exterior. Old Guard House from south-west (B&W)

AA98/07954 Exterior. Old Guard House from south-east (B&W)

AA98/07955 Exterior. Coastguard Cottages Nos. 1-10 from north-west (B&W)

AA98/07956 Exterior. Gate and gateposts and Coastguard Cottages beyond from north-east (B&W)

AA98/07957 Exterior. Coastguard Cottages Nos. 1-10 from north-east (B&W)

AA98/07958 Exterior. Coastguard Cottaes Nos. 1-6, south-east elevation (B&W)

AA98/07957 Exterior. Former military building, now Catholic Church, to south of Coastguard Cottages from south (B&W)

AA98/07960 Exterior. Former military buildings, now Catholic Church and Scout Hut to south of Coastguard Cottages from west (B&W)

AA98/07961 Exterior. `Medtha', former military building, from south-east (B&W)

AA98/07962 Exterior. `Medtha', former military building, from east (B&W)

AA98/07963 Exterior. Grain Tower from west on causeway (Colour)

AA98/07964 Exterior. Grain Tower from west on causeway (Colour)

AA98/07965 Exterior. Garrison Point Fort (Sheerness) from west on causeway to Grain Tower (B&W)

9. ACKNOWLEDGEMENTS

Thanks to the following people who assisted with the survey:

Ms Maggie Magnusson, The Royal Engineers Library, Chatham

Ms Alison Owens, Cluttons Daniel Smith Chartered Surveyors

Mrs Christine Gurr, St James Isle of Grain Parish Council

Paul Johnson, The Public Record Office

Mr & Mrs PW Royce, Grain

Mr R McGaughey, Beatle Line Ltd, Grain

Mr T Yaxley, Powergen

Roger Thomas, RCHME

Coastal Artillery Fortifications, Grain, Kent (NGR TQ 890 762)

Interpretation Plan

RCHM ENGLAND

Key:

- Ditch or scarp
- Bank
- Flat earthwork
- Miscellaneous earthwork
- Building or wall
- Concrete apron, floor or other structure
- Borrow pit
- Drainage ditch
- Slit trench (ST)
- DRF Depression Range Finder
- BB Blacker Bombard (Spigot Mortar) pedestal
- Sea wall earthwork
- Fence
- Roads, tracks and paths
- Ponds
- Creek
- Marsh
- Inaccessible area