

# When the War came to Stratford: archaeological and built heritage recording of Second World War structures in the Lower Lea Valley

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As the centre of political and military power in Britain and the Empire, London represented the primary target for enemy aerial attack throughout the Second World War. Starting in the mid-1930s, a network of defences was established to protect the capital against attack from the air. Although these defences were far from complete at the outbreak of hostilities, the changing tactics of the Luftwaffe drove a number of rapid technological developments in anti-aircraft defence, evidence of which was preserved in the fabric of an Anti-Aircraft gun-site that is the subject of this article.

## The defence of London against aerial attack

Until the mid-1930s the prevailing attitude within British government circles towards the defence of major cities against aerial attack was summarised by Stanley Baldwin's observation that the bomber would 'always get through'.<sup>1</sup> However as the threat from Germany became increasingly apparent after 1933 and the government began belatedly to rebuild and re-equip the armed forces, attention also turned to the Anti-Aircraft (AA) defence of London. Indecision and bureaucratic inertia meant that little progress had been made by the autumn of 1937, when a committee headed by Sir Thomas Inskip decided to concentrate upon the production of fixed Heavy Anti-Aircraft (HAA) emplacements at the expense of mobile units.<sup>2</sup> The new strategy called for the capital to be defended by an Inner Artillery Zone (IAZ) comprising 65 HAA batteries, each equipped with a complement of four or more 3.7" or 4.5" static AA guns. Mobile Light Anti-

Aircraft (LAA) units equipped with smaller calibre weapons would provide close defence where necessary. The IAZ itself was subdivided into eastern (ZE), southern (ZS) and western zones (ZW).

The first blueprints for the design and layout of fixed HAA emplacements were issued by the War Office

Department of Fortification and Works (DFW) in March 1938, and work on the first sites began later that year.<sup>3</sup> Most HAA sites built to these early designs accommodated a half battery of four guns, comprising four emplacements (known as gun-pits) arranged around a central command post and fire-control

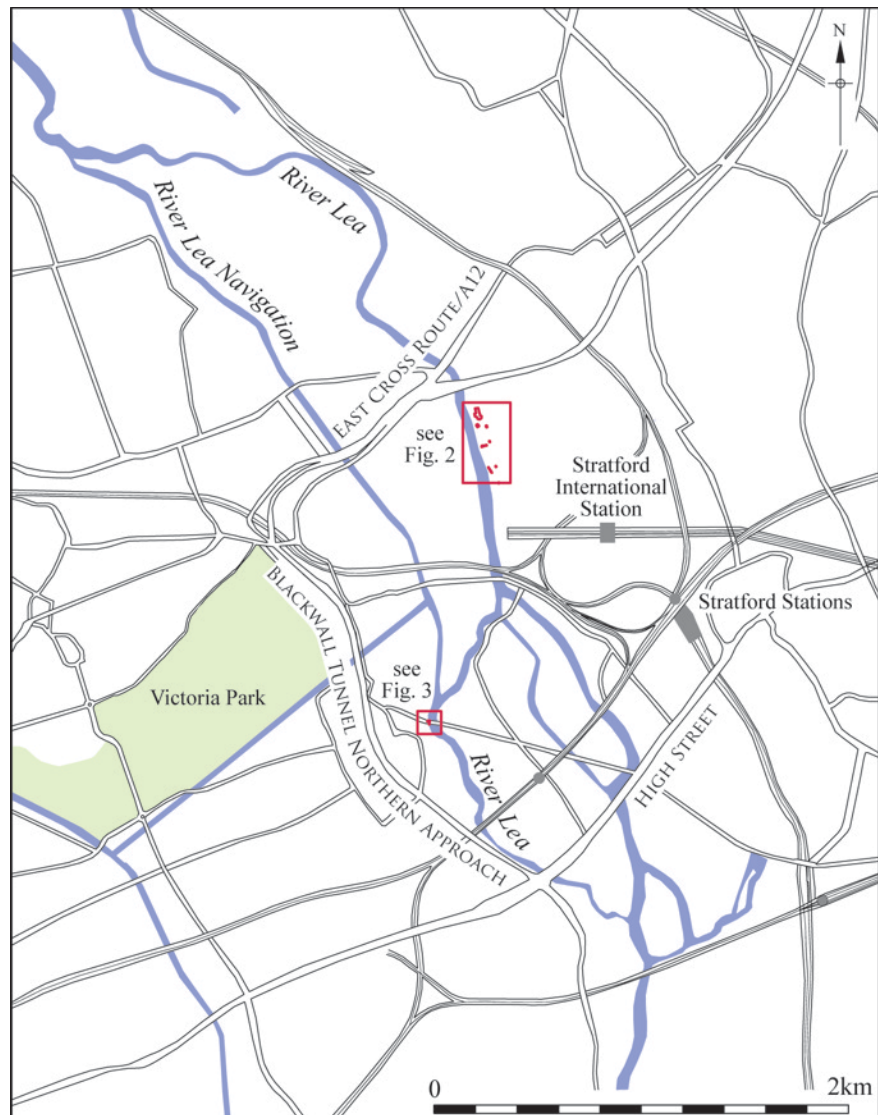


Fig. 1: site location



Fig. 2: detailed location plan of HAA gun emplacement and radar station ZE9/21

instruments intended to lay gunfire in the path of incoming enemy aircraft. This instrumentation comprised a heightfinder and a predictor, the latter of which established the aircraft's flight path and transmitted the necessary elevation settings to the guns electrically.<sup>4</sup> While the instrumentation was usually protected by earthworks and sandbagged enclosures, the gun-pits were octagonal, concrete-walled structures, banked externally with earth

and fitted with steel gates on two sides to allow access for the guns.<sup>5</sup> The guns were mounted on holdfasts at the centre of the gun-pits and ammunition was stored in concrete lockers around the perimeter of the platform. Shells were stored and put through the final stages of assembly in the cordite store and magazine, which were located nearby.

At the outbreak of the Second World War in September 1939, the air defence of the IAZ was the

responsibility of 26th AA Brigade, although this was subsequently reduced to cover just the north and east zones.<sup>6</sup> Under 26th AA Brigade were a number of Heavy and Light AA Regiments, which were periodically rotated between Brigade areas. At the start of the war 52nd HAA Regiment was based in the Brigade area, where it remained until August 1941.<sup>7</sup> 52nd HAA Regiment itself comprised four HAA batteries: 154, 155, 271 and 313 HAA Battery RA, although several other batteries were rotated through the Brigade area during this period. Designated ZE9 (Hackney Marshes) at the start of the war, and subsequently redesignated ZE21 in December 1939, the HAA gun-site that forms the subject of the present article was initially manned by troops of 155 HAA Battery RA and equipped with four 4.5" static guns.<sup>8</sup> Less than a month after the start of hostilities, two sections of 271 HAA Battery RA took over the site and its guns, where they remained throughout much of the Blitz until February of the following year, when they were replaced by men of 154 Battery HAA RA.<sup>9</sup>

### The defence of Britain against invasion, 1940

In contrast to the evolution of Britain's AA defences over several years, the nation's defences against ground invasion were conceived and constructed in a space of months following the fall of France in May 1940. In response to the threat of imminent invasion, Winston Churchill appointed General Sir Edmund Ironside Commander-in-Chief Home Forces, with responsibility for establishing defences capable of containing any German attack. Having left behind much of the army's mechanized transport, armour and artillery in France, British forces had little option other than to fight from fixed positions located behind the invasion beaches. Consequently Ironside devised a system of defence-in-depth, comprising an outermost layer of beach defences known as the 'Coastal Crust', behind which lay a network of fortified static 'Stop Lines', which encircled the major cities and industrial areas with hardened fortifications and anti-tank defences. London was defended by

three defence lines (Lines A–C), the innermost of which followed the River Lea northward from the Thames to South Tottenham.<sup>10</sup> The top tier of Ironside's hierarchy of defences was the General Headquarters (GHQ) Line, which extended from the Bristol Channel to the Wash.<sup>11</sup> When complete, Ironside's defensive network was designed to ensure that invasion areas were defended by a series of interlocking defended boxes, into which enemy units 'might be channelled, contained and ultimately destroyed'.<sup>12</sup> Pillboxes and anti-tank obstacles were also sited at strategic 'vulnerable points', such as factories, transport interchanges, airfields and radar stations.

In May 1940 a department of the DFW dedicated to the design of fixed anti-invasion defences (DFW3) was established under the command of Major-General Taylor. Over the months that followed DFW3 published a series of designs for hardened defensive structures, which included at least nine pillbox designs (named Types DFW3/22–28a). Blueprints were issued to Royal Engineers units responsible for the construction of defensive works, which in turn supervised the civilian contractors who built them. The decision to construct a particular type of pillbox depended upon local tactical considerations, which in turn determined the weapons best suited for defensive use. Most pillboxes were designed for the use of automatic weapons such as Bren and Vickers machine guns, although a number of the largest were designed to accommodate anti-tank artillery. Local commanders used the official designs as a guide, and many variations upon the basic DFW 3 types appeared, often in close proximity to one another.

Despite the considerable achievement of devising and initiating a home defence strategy within the space of less than two months, Ironside's scheme received a lukewarm reception when it was presented to Churchill and the Chiefs of Staff at the end of June 1940, and he was replaced the following month as Commander-in-Chief by General Sir Alan Brooke, who had recently gained first-hand experience of modern mechanized warfare in France.<sup>13</sup> Like Churchill,

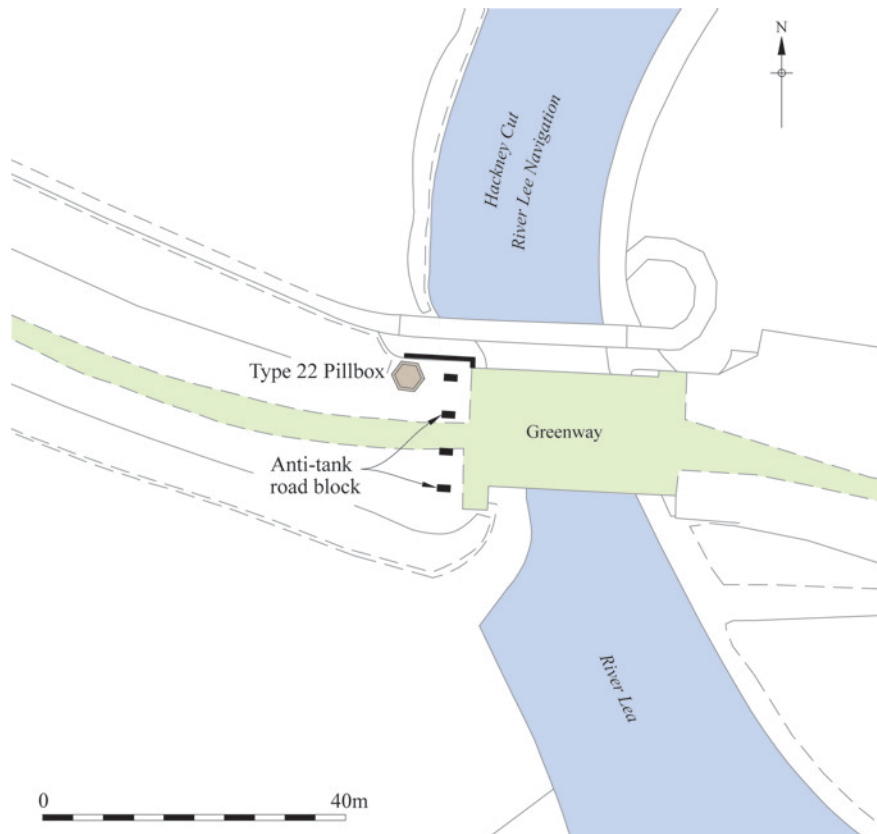


Fig. 3: detailed location plan of Greenway anti-tank roadblock

Brooke doubted the military value of static inland defences and set about establishing a mobile reserve force to engage invaders close to the coast. The introduction of Brooke's new defence scheme brought a halt to work on the GHQ Line and slowed the previously breakneck pace of pillbox construction. Despite the change in strategic direction, by mid-1941 as many as 28,000 pillboxes had been built in Britain.<sup>14</sup>

#### Site work

In advance of the redevelopment of a large tract of the Lea valley near Stratford, east London (Fig. 1), the site was subject to detailed heritage recording by archaeologists from the Museum of London Archaeology Service and Pre-Construct Archaeology. This study was intended to analyse and record the surviving built structures and buried remains associated with Second World War defence sites.<sup>15</sup> The sites investigated were arranged in two groups, the first located immediately to the south of the Eastway and to the north of the Manor Garden Allotments, and the second on the Northern Outfall bridge over the River Lea by Old Ford Lock.

The most northerly structure recorded was the site of HAA battery ZE21. In addition to two of the battery's gun-pits, the site also included a probable emplacement for a 40mm Bofors LAA gun, located a short distance to the south of the HAA emplacements. To the south of this was located the remains of the battery's Gun-Laying (GL) radar station, which was built during the autumn of 1941.<sup>16</sup> The station comprised the GL radar platform, the remains of a storage compound and three structures of uncertain function that may have served as pillboxes or machine gun posts (Fig. 2).

The group located on the Northern Outfall Sewer bridge comprised a single pillbox and a concrete anti-tank roadblock; the latter designed to slow any enemy advance along the Greenway path into the capital (Fig. 3). The latter structures were probably constructed in 1940.

#### HAA gun emplacements

The location and layout of ZE9/ZE21 Hackney Marshes were first depicted on the London County Council (LCC) revised Ordnance Survey map of 1938. Both the LCC map and an RAF aerial





Fig. 4: gun-pits with cordite store and magazine, facing east (photo: MoLAS-PCA)

photograph of June 1941 indicated that the gun-site was considerably larger and more complex than the area excavated archaeologically, comprising a central command post, surrounded by four gun-pits, a cordite store, magazine and compound. Only the north and south gun-pits were excavated and recorded, having been buried under more than 3m of post-war fill (Fig. 4). As both were nearly identical, only the south gun-pit is described here.

The concrete base was hexagonal in plan and was c. 12.75m north-south and the same east-west (Fig. 5). Although comprehensively razed to the platform, a number of 'ghosts' or scars were evident on the surface, indicating the location of structures and fittings. A scar was traced around the perimeter of the platform, marking the wall line. The location of the steel doors on the east and west sides of the gun-pit, were marked by reinforced concrete aprons with embedded iron tracks, the latter being the runners for the steel doors.

Other scars, roughly square in plan and arranged close to the perimeter, marked the former positions of the ammunition lockers. At the centre of

the platform was a thin circular scar, c. 2.70m in diameter, which marked the position of the 'babbett', the holdfast that anchored the gun to the concrete base. This was achieved by means of ten metal sockets that were set into the concrete, six of which survived with the remaining four indicated by scars.

Located between the two gun platforms and accessed from them by a concrete ramp were the magazine and cordite store.

#### Magazine

The magazine comprised a five-bay rectangular room that measured 15.5m × 5.25m. The exterior and internal walls were constructed from reinforced concrete. A substantial blast wall had been erected around the north, east and south sides of the building. This feature was 0.5m thick and was separated from the main magazine wall by a gap measuring 800mm, at the base of which was a shallow drainage channel. Access to the magazine was gained via a (missing) door formerly located in the centre of the west wall which led off the concrete path shared with the cordite store.

#### Cordite store

The cordite store was located to the west of the magazine and was rectangular in plan, measuring 8m × 4m. It comprised a single rectangular room with 0.5m thick reinforced concrete walls, the exterior faces of which had been coated with a layer of tar. The walls were constructed using a reinforced concrete and iron mesh core surrounded by an outer layer of poured concrete, but were not keyed into the floor. The lower half of the walls had been painted light red, above which they were painted light grey, although it is not known whether this colour scheme was original. A central doorway in the east wall provided access into the store from the shared walkway, and elements of a three-hinged iron doorframe survived on the north side of the entranceway. Two windows, each with iron reinforced L-plate lintels, were recorded towards each end of the east wall. Curved blast walls abutted the cordite store's north and south walls and may have been a later addition. These walls were formed of a reinforced concrete core, surrounded by an outer layer of poured and shuttered concrete.

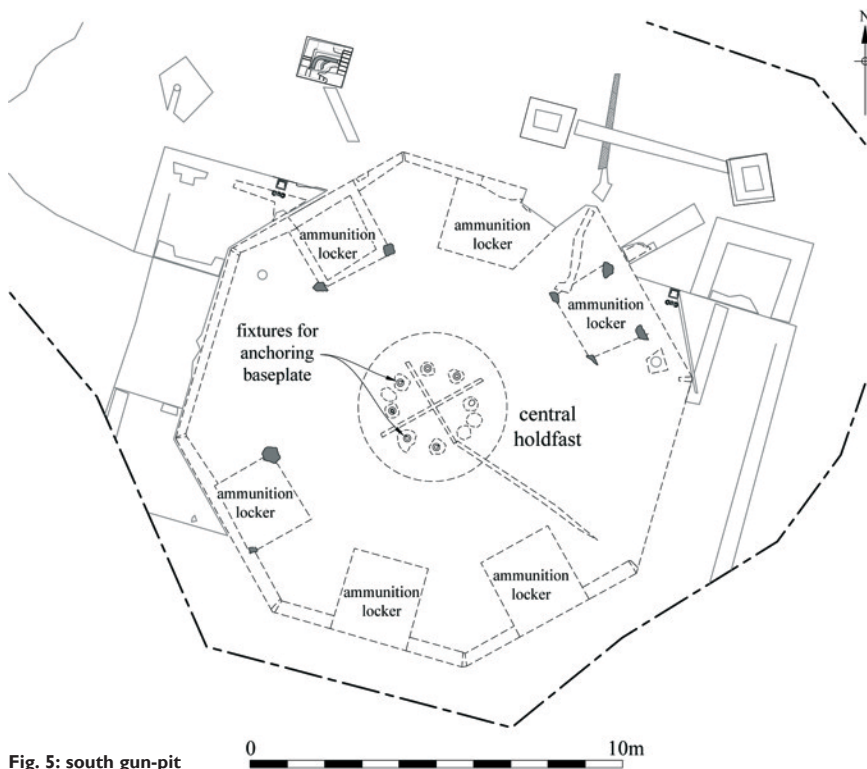


Fig. 5: south gun-pit

### Probable Light Anti-Aircraft (LAA) gun emplacement

The War Diary of 26th AA Brigade recorded that a single Bofors 40mm Mk III LAA gun was deployed at ZE21 towards the end of September 1940.<sup>17</sup> This gun, which was manned by men of 42 LAA Regiment, was recorded as having been 'in action' on 8th October.<sup>18</sup> Despite this, the gun was withdrawn only four days later, and it seems unlikely that it was accommodated in anything more permanent than a simple sandbagged emplacement.<sup>19</sup> Two-and-a-half years later however, it was decided to allocate single Bofors LAA guns to a number of HAA sites protecting the eastern approaches to the IAZ, including ZE21.<sup>20</sup> These guns, which were deployed in order to protect emplacements against opportunistic attacks by low-flying German aircraft, were used in the static role and it is probable that permanent emplacements were constructed to house them.

The probable LAA gun emplacement was located to the south of the HAA emplacement at ZE21. It was rectangular in plan (8.6m × 5.5m), formed of a floor surface that was sunk a little over 0.5m below ground level. The side walls along the long axes were constructed from sloping concrete, contained within narrow flanking bays

formed by low brick walls, and the short axes were of vertical brickwork and concrete. The floor, accessed by steps at the south-west and south-east corners, was constructed of concrete capped with ceramic tiles, some of which survived *in situ*.

### GL radar station

At the beginning of the war the fire control instrumentation deployed at ZE9/21 comprised a Vickers Predictor Mk VIII, a Spotter Mk III and a No. 10 Heightfinder.<sup>21</sup> Although this equipment was sufficient for directing AA fire during daylight hours, the Luftwaffe's tactic of bombing the capital at night stimulated the development of Gun-Laying (GL) radar sets, which used radio waves to detect enemy aircraft and directed AA fire accordingly. A handful of mobile GL Mk I sets were hurriedly deployed at HAA gun-sites within the IAZ in September 1940, although they proved to be of limited use as they were incapable of detecting the elevation of attacking aircraft.<sup>22</sup>

The introduction of the GL Mk II (Fig. 6) in early 1941 greatly enhanced the defenders' ability to concentrate accurate fire upon enemy formations. Comprising two trailer-mounted timber cabins for the receiver and transmitter units and a separate generator, the set was designed to be mobile, although

once deployed most became static installations.<sup>23</sup> In order to achieve the best results, the set was surrounded by a 'GL mat' of wire netting which gave an area of uniform electrical conductivity that neutralised irregularities in the radar's performance.<sup>24</sup> The radar receiver was placed at the centre of the mat, standing upon a fixed platform with a sloping ramp that allowed the transmitter to be towed into position. In October 1941 it was noted that a detachment of 148/6 'Z' AA Battery were 'carrying out construction work on command posts, gun positions and GL mats' at HAA sites in the brigade area; on the 24th of the month this detachment was transferred from ZE21 to ZE15, suggesting that it had completed its duties at the station.<sup>25</sup> The newly completed radar installation at ZE21 was subsequently designated GL Station no. 410.<sup>26</sup>

The GL station was located to the south of ZE21 (Fig. 7). The main structure, aligned on an east-west axis and measuring roughly 25.5m × 5.5m, comprised a single small, rectangular flat-roofed building, built of red stock brick set in English bond pattern. Extending eastwards from the east elevation of the building, from ground level to the roof were the two parallel shallow raked ramps constructed of concrete-capped brickwork. Built into the west wall, opposite the ramps, were

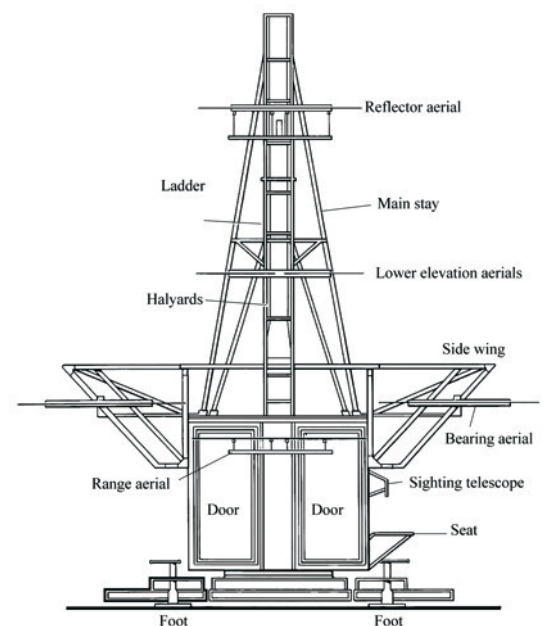


Fig. 6: GL Mark II radar receiver (after Dobinson (2001) 281, see fn. 1)





Fig. 7: GL radar receiver base (photo: MoLAS-PCA)

two large buttresses, presumably designed to brace the wall against outwards thrust from the weight of the roof and ramps. To the north-west of the main building was a small concrete base with a rectangular depression for the radar's generator.

Both the floor and roof were constructed of poured concrete and it is probable that the roof was reinforced so as to take the weight of the radar equipment. Set into the roof was a large, shallow, irregularly-shaped 'socket' or indent to accommodate the base and legs of the radar receiver.

The building contained two rooms, which were accessed through a single door in the north elevation. Supports in the north and south walls suggest that a bench or table extended across the width of the room at the east end of the room. Patches of paint suggested that the lower portion of the wall was green and the upper part was whitewashed. Room 2 was entered through a timber-framed doorway positioned in the centre of Room 1's south wall. The original door was still intact. The walls of this room had been rendered and painted white, and the ghosts of skirting boards were visible.

## Possible pillboxes/machine gun posts at GL Radar Station (Buildings 6–8)

Three structures of uncertain function were positioned along the western boundary of the GL radar station. Designated Buildings 6–8, these buildings may have fulfilled a defensive function as pillboxes or machine gun posts, although they were not built to any standard DFW pillbox design and all had large openings that may have left occupants vulnerable to incoming fire in the event of ground attack.

### Building 6

Building 6 was an irregularly-shaped hexagonal single-storey brick building aligned on a north-south axis, which measured roughly 5m × 2.7m, and which was the most 'pillbox-like' of the three structures (Fig. 8). Built of yellow stock brick in English garden wall bond, it was open plan with no internal walls. The walls were 0.35m thick with two embrasures in the east, south, and west walls and one in the north wall, which would have enabled defenders to fire light machine guns or rifles from cover. A short corridor entrance was located on the west side and the poured concrete floor was accessed *via* a short flight of stairs. The flat roof was constructed of poured concrete, which bore imprints of timber shuttering.

### Building 7

Building 7 was of similar shape and size as Building 6 but without a stairwell, with the poured concrete floor at a similar level to the exterior surface. It was constructed of 0.36m thick brick walls in English bond and was open plan. Two large openings were located high in the east, south and north walls and a single one in the west. The flat roof was made of poured shuttered

concrete, the underside of which retained imprints of the timber shuttering with patches of tar or bitumen on the exterior surface.

### Building 8

Building 8 was the most southerly of this group, located on the edge of the west bank of the Channelsea. In plan Building 8 was of similar dimensions to the other structures, with walls of comparable thickness constructed in red stock brick in English garden wall bond. The floor was of poured concrete. Single embrasures were recorded in the east and north walls; vegetation obscured possible embrasures in the other walls.

## Greenway pillbox and roadblock

The third group of structures was located some distance to the south of the radar station, and comprised part of Line C, the innermost anti-tank line defending the capital (Fig. 9).<sup>27</sup> The Greenway structures comprised a single pillbox and a concrete anti-tank roadblock that stood on the western side of the Northern Outfall Sewer bridge over the River Lea.

### Greenway pillbox

The Greenway pillbox was a Type 22, the most common infantry variant of the DFW family. It was an irregular hexagon in plan measuring 4.4m × 3.8m, and occupied a position on the north-west corner of the Greenway Bridge set back slightly from the River Lea, overlooking Old Ford Lock to the north. Each wall was 0.40m thick and formed of poured reinforced concrete contained embrasures; those located on the north and north-west walls were angled downwards to cover the River Lea. A concrete anti-ricochet (AR) wall remained *in situ* within the pillbox, located slightly off centre. Access to the



Fig. 8: Building 6: possible pillbox/machine-gun emplacement (photo: MoLAS-PCA)



Fig. 9: Greenway anti-tank roadblock and Type 22 pillbox (photo: MoLAS-PCA)

pillbox was gained by way of a low entranceway in the north-west wall, protected by a low L-shaped blast wall that abutted the pillbox.

#### Anti-tank roadblock

Four large rectangular concrete blocks, representing the remains of a simple anti-tank roadblock, were arranged north-south across the width of the Greenway. Each block measured 0.40m × 1.75m by 1.67m tall, and was vertical on all exposed faces except the west, which was sloped. On the interior faces of each block were four sockets of varying sizes into which RSJs were inserted to close the roadblock.<sup>28</sup>

#### Conclusion

Only a few HAA gun-sites have been professionally archaeologically recorded, and many have been lost to development without archaeological investigation. The present investigation of ZE21 has revealed the archaeological imprint of the dramatic changes in AA

technology and tactics that occurred over a remarkably short space of time, including such developments as the deployment of LAA guns to defend static HAA installations against attack by enemy aircraft, and the introduction of GL radar and the paraphernalia that helped that particular technology to function successfully. This paper has demonstrated how the integration of archaeological recording and documentary research can reveal a detailed and nuanced picture of the functions of and relationships between these structures, and the men and women who defended the country against aerial attack during the Second World War.

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*Kari Bower is a key member of the Pre-Construct Archaeology Built Heritage team and instrumental in recording and reporting on many of the post-1850 structures within the study area, and in particular the Second World War structures.*

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24. *Op cit fn 1*, 277–281; *op cit fn 4*, 32.

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