

4. UK Regulatory Environment and Guidelines

4.1. General

There is no formal obligation requiring a UXO risk assessment to be undertaken for construction projects in the UK, nor is there any specific legislation stipulating the management or mitigation of UXO risk. However, it is implicit in the legislation outlined below that those responsible for intrusive works (archaeology, site investigation, drilling, piling, excavation etc.) should undertake a comprehensive and robust assessment of the potential risks to employees and that mitigation measures are implemented to address any identified hazards.

4.2. CDM Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) define the responsibilities of parties involved in the construction of temporary or permanent structures.

The CDM 2015 establishes a duty of care extending from clients, principle designers, and contractors to those working on, or affected by, a project. Those responsible for construction projects may therefore be accountable for the personal or proprietary loss of third parties, if correct health and safety procedure has not been applied.

Although the CDM does not specifically reference UXO, the risk presented by such items is both within the scope and purpose of the legislation. It is therefore implied that there is an obligation for parties to:

- Provide an appropriate assessment of potential UXO risks at the site (or ensure such an assessment is completed by others).
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks presented by the project.
- Ensure the preparation of a suitably robust emergency response plan.

4.3. The 1974 Health and Safety at Work etc. Act

All employers have a responsibility under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, to ensure the health and safety of their employees and third parties, so far as is reasonably practicable and conduct suitable and sufficient risk assessments.

4.4. CIRIA C681

In 2009, the Construction Industry Research and Information Association (CIRIA) produced a guide to the risk posed by UXO to the UK construction industry (CIRIA C681). CIRIA is a neutral, independent and not-for-profit body, linking organisations with common interests and facilitating a range of collaborative activities that help improve the industry.

The publication provides the UK construction industry with a defined process for the management of risks associated with UXO from WWI and WWII air bombardment. It is also broadly applicable to the risks from other forms of UXO that might be encountered. It focuses on construction professionals' needs, particularly if there is a suspected item of UXO on site, and covers issues such as what to expect from a UXO specialist. The guidance also helps clients to fulfil their legal duty under CDM 2015 to provide designers and contractors with project specific health and safety information needed to identify hazards and risks associated with the design and construction work. This report conforms to this CIRIA guidance and to the various recommendations for good practice referenced therein. It is recommended that this document is acquired and studied where possible to allow a better understanding of the background to both the risk assessment process and the UXO issue in the UK in general.

4.5. Additional Legislation

In the event of a casualty resulting from the failure of an employer/client to address the risks relating to UXO, the organisation may be criminally liable under the Corporate Manslaughter and Corporate Homicide Act 2007.

5. The Role of Commercial UXO Contractors and The Authorities

5.1. Commercial UXO Specialists

The role of a UXO Specialist (often referred to as UXO Consultant or UXO Contractor) such as 1st Line Defence, is defined in CIRIA C681 as the provision of expert knowledge and guidance to the client on the most appropriate and cost-effective approach to UXO risk management at a site.

The principal role of UXO Specialists is to provide the client with an appropriate assessment of the risk posed by UXO for a specific project, and identify and carry out suitable methodology for the mitigation of any identified risks to reduce them to an acceptable level.

The requirement for a UXO Specialist should ideally be identified in the initial stages of a project, and it is recommended that this occur prior to the start of any detailed design. This will enable the client to budget for expenditure that may be required to address the risks from UXO, and may enable the project team to identify appropriate techniques to eliminate or reduce potential risks through considered design, without the need for UXO specific mitigation measures. The UXO Specialist should have suitable qualifications, levels of competency and insurances.

Please note 1st Line Defence has the capability to provide a complete range of required UXO risk mitigation services, in order to reduce a risk to as low as reasonably practicable. This can involve the provision of both ground investigation, and where appropriate, UXO clearance services.

5.2. The Authorities

The police have a responsibility to co-ordinate the emergency services in the event of an ordnance-related incident at a construction site. Upon inspection they may impose a safety cordon, order an evacuation, and call the military authorities Joint Services Explosive Ordnance Disposal Operation Centre (JSEODOC) to arrange for investigation and/or disposal. Within the Metropolitan Police Operational Area, SO15 EOD will be tasked to any discovery of suspected UXO. The request for Explosive Officer (Expo) support is well understood and practiced by all Metropolitan Boroughs. The requirement for any additional assets will then be coordinated by the Expo if required.

In the absence of a UXO specialist, police officers will usually employ such precautionary safety measures, thereby causing works to cease, and possibly requiring the evacuation of neighbouring businesses and properties.

The priority given to the police request will depend on the EOD teams' judgement of the nature of the UXO risk, the location, people and assets at risk, as well as the availability of resources. The speed of response varies; authorities may respond immediately or in some cases it may take several days for the item of ordnance to be dealt with. Depending on the on-site risk assessment the item of ordnance may be removed from the site and/or destroyed by a controlled explosion.

Following the removal of an item of UXO, the military authorities will only undertake further investigations or clearances in high-risk situations. If there are regular UXO finds on a site the JSEODOC may not treat each occurrence as an emergency and will recommend the construction company puts in place alternative procedures, such as the appointment of a commercial contractor to manage the situation.

6. The Site

6.1. Site Location

The site is located in Prestwich, within Greater Manchester, approximately 2km north of Salford City FC's stadium.

The site is bound by Highfield Place to the north, open land and hardstanding ground to the east, Rectory Lane to the south, and Bury New Road, Fairfax Road and Highfield Road to the west.

The site is approximately centred on the OS grid reference: **SD 81290 04118**.

Site location maps are presented in **Annex A**.

6.2. Site Description

Recent aerial imagery shows the site comprises multiple commercial structures, sections of Fairfax Road and Rectory Lane, and areas of hardstanding ground.

A recent aerial photograph and site plan are presented in **Annex B** and **Annex C** respectively.

7. Scope of the Proposed Works

7.1. General

Information provided by the client indicates that the proposed works on-site will include seven cable percussion boreholes to a maximum depth of 20m, ten open-drive boreholes to a maximum depth of 5m, removal and reinstatement of paving slabs, and four hand dug trial pits to a maximum depth of 1.5m. Works are to include the demolition of Longfield Shopping Centre as part of a regeneration project for the Prestwich area.

8. Ground Conditions

8.1. General Geology

The British Geological Survey (BGS) map shows that the majority of the site is underlain by Worsley Delf Rock - Sandstone, formed between 315.2 and 309.5 million years ago during the Carboniferous period. The south-western corner of the site is underlain by Pennine Upper Coal Measures Formation - mudstone, siltstone and sandstone, formed between 315.2 and 308 million years ago during the Carboniferous period.

Superficial deposits are shown to be underlain by Hummocky (moundy) Glacial Deposits, Devensian - Sand and gravel, formed between 116 and 11.8 thousand years ago during the Quaternary period.

8.2. Site-Specific Geology

Site-specific geotechnical data was not provided by the client during the production of this report.

9. Site History

9.1. Introduction

The purpose of this section is to identify the composition of the site pre and post-WWII. It is important to establish the historical use of the site, as this may indicate the site's relation to potential sources of UXO as well as help with determining factors such as the land use, groundcover, likely frequency of access and signs of bomb damage.

9.2. Ordnance Survey Historical Maps

Relevant historical maps were obtained for this report and are presented in **Annex D**. See below for a summary of the site history shown on acquired mapping.

Pre-WWII		
Date	Scale	Description
1938	10:10,560	Pre-war OS mapping indicates that the site was occupied by a mix of residential properties and their associated gardens, numerous roadways including <i>Fairfax Road</i> , <i>Barrow Street</i> , <i>Poppythorn Lane</i> , and <i>Longfield</i> , with hardstanding ground, a <i>Police Station</i> , and a small section of railway sidings within the south-east of the site. Open land borders to the north of the site, while further open land and railway sidings are to the east, with an <i>Infant School</i> , multiple structures, and unnamed roadways to the south, while an unnamed road and multiple structures including a Church are to the west.

Post-WWII		
Date	Scale	Description
1953-1954	1:2,500	Post-war OS mapping indicates that the site and its immediate environs have undergone no significant changes.

9.3. Pre-WWII Photography of the Site

Pre-WWII aerial photography has been obtained from the Aerofilms collection available from *Britain From Above*. This imagery provides a view of the site in 1935 (see **Annex E**). See below for a description:

Title of Photograph	Comments
Prestwich Railway Station, Bury New Road and environs, Prestwich, 1935	This pre-war oblique image shows the site and its immediate surroundings from a southern perspective. The site appears to contain multiple residential structures, roadways, associated gardens, hardstanding ground, and a small section of railway sidings within the east of the site that likely belong to Prestwich Railway Station.

10. Introduction to German Air Delivered Ordnance

10.1. General

During WWI and WWII, the UK was subjected to bombing which often resulted in extensive damage to city centres, docks, rail infrastructure and industrial areas. The poor accuracy of WWII targeting technology and the nature of bombing techniques often resulted in neighbouring areas to targets sustaining collateral damage.

In addition to raids which concentrated on specific targets, indiscriminate bombing of large areas also took place. This occurred most prominently in the London 'Blitz', though affected many other towns and cities. As discussed in the following sections, a proportion of the bombs dropped on the UK did not detonate as designed. Although extensive efforts were made to locate and deal with these UXBs at the time, many still remain buried and can present a potential risk to construction projects.

The main focus of research for this section of the report will concern German air delivered ordnance dropped during WWII, although WWI bombing will also be considered.

10.2. Generic Types of WWII German Air Delivered Ordnance

To provide an informed assessment of the hazards posed by any items of unexploded ordnance that may remain in situ on site, the table below provides information on the types of German air delivered ordnance most commonly used by the Luftwaffe during WWII. Images and brief summaries of the characteristics of these items of ordnance are listed in **Appendices i-iii**.

Generic Types of WWII German Air Delivered Ordnance		
Type	Frequency	Likelihood of Detection
High Explosive (HE) bombs	In terms of weight of ordnance dropped, HE bombs were the most frequently deployed by the Luftwaffe during WWII.	Although efforts were made to identify the presence of unexploded ordnance following an air raid, often the damage and destruction caused by detonated bombs made observation of UXB entry holes impossible. The entry hole of an unexploded bomb can be as little as 20cm in diameter and was easily overlooked in certain ground conditions (see Annex F). Furthermore, ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded smaller bomb. UXBs therefore present the greatest risk to present-day intrusive works.
1kg Incendiary bombs (IB)	In terms of the number of weapons dropped, small IBs were the most numerous. Millions of these were dropped throughout WWII.	IBs had very limited penetration capability and in urban areas would often have been located in post-raid surveys. If they failed to initiate and fell in water, on soft vegetated ground, or bombed rubble, they could easily go unnoticed.
Large Incendiary bombs (IB)	These were not as common as the 1kg IBs, although they were more frequently deployed than PMs and AP bomblets.	If large IBs did penetrate the ground, complete combustion did not always occur and in such cases they could remain a risk to intrusive works.
Aerial or Parachute mines (PM)	These were deployed less frequently than HE and IBs due to size, cost and the difficulty of deployment.	If functioning correctly, PMs would generally have had a slow rate of descent and were very unlikely to have penetrated the ground. Where the parachute failed, mines would have simply shattered on impact if the main charge failed to explode. There have been extreme cases when these items have been found unexploded. However, in these scenarios, the ground was either extremely soft or the munition fell into water.
Anti-personnel (AP) bomblets	These were not commonly used and are generally considered to pose a low risk to most works in the UK.	SD2 bomblets were packed into containers holding between 6 and 108 submunitions. They had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.

10.3. Failure Rate of German Air Delivered Ordnance

It has been estimated that 10% of WWII German air delivered HE bombs failed to explode as designed. Reasons for why such weapons might have failed to function as designed include:

- Malfunction of the fuze or gain mechanism (manufacturing fault, sabotage by forced labour or faulty installation).
- Many were fitted with a clockwork mechanism that could become immobilised on impact.
- Failure of the bomber aircraft to arm the bombs due to human error or an equipment defect.
- Jettisoning the bomb before it was armed or from a very low altitude. This most likely occurred if the bomber aircraft was under attack or crashing.

From 1940 to 1945, bomb disposal teams reportedly dealt with a total of 50,000 explosive items of 50kg, over 7,000 anti-aircraft projectiles and 300,000 beach mines. Unexploded ordnance is still regularly encountered across the UK, see press articles in **Annex G**.

10.4. UXB Ground Penetration

An important consideration when assessing the risk from a UXB is the likely maximum depth of burial. There are several factors which determine the depth that an unexploded bomb will penetrate:

- Mass and shape of bomb.
- Height of release.
- Velocity and angle of bomb.
- Nature of the ground cover.
- Underlying geology.

Geology is perhaps the most important variable. If the ground is soft, there is a greater potential of deeper penetration. For example, peat and alluvium are easier to penetrate than gravel and sand, whereas layers of hard strata will significantly retard and may stop the trajectory of a UXB.

10.4.1. The J-Curve Principle

J-curve is the term used to describe the characteristic curve commonly followed by an air delivered bomb dropped from height after it penetrates the ground. Typically, as the bomb is slowed by its passage through underlying soils, its trajectory curves towards the surface. Many UXBs are found with their nose cone pointing upwards as a result of this effect. More importantly, however, is the resulting horizontal offset from the point of entry. This is typically a distance of about one third of the bomb's penetration depth, but can be higher in certain conditions (see **Annex F**).

10.4.2. WWII UXB Ground Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by bomb disposal (BD) teams. Conclusions were drawn predicting the likely average and maximum depths of penetration of different sized bombs in different geological strata.

For example, the largest common German bomb (500kg) had a likely concluded penetration depth of 6m in sand or gravel but 11m in clay. The maximum observed depth for a 500kg bomb was 11.4m and for a 1,000kg bomb 12.8m. Theoretical calculations suggested that significantly greater penetration depths were probable.

10.4.3. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site of proposed works the following parameters should be used:

- WWII geology – Worsley Delf Rock Formation and Pennine Upper Coal Measures Formation.
- Impact angle and velocity – 10-15° from vertical and 270 metres per second.
- Bomb mass and configuration – The 500kg SC HE bomb, without retarder units or armour piercing nose (this was the largest of the common bombs used against Britain).

It has not been possible to determine maximum bomb penetration capabilities at this stage due to the limitations of site-specific geotechnical information provided for the purpose of this report. An assessment can be made once further information becomes available or by an UXO Specialist on-site.

10.5. V-Weapons

Hitler's 'V-weapon' campaign began from mid-1944. It used newly developed unmanned cruise missiles and rockets. The V-1, known as the flying bomb or pilotless aircraft, and the V-2, a long range rocket, were launched from bases in Germany and occupied Europe. A total of 9,251 V-1s and 1,115 V-2s were recorded in the United Kingdom.

Although these weapons caused considerable damage, their range was limited by their position of deployment across Europe and as a result the vast majority of V-weapon strikes were directed against targets in the south-east of England, predominantly in the London Boroughs and Home Counties. This limitation of capability meant targets in Prestwich were generally too far to be considered for V-weapon strikes by the Luftwaffe. The risk from V-weapons is therefore considered negligible and will not be further addressed in this report.

11. The Likelihood of Contamination from German Air Delivered UXBs

11.1. World War I

During WWI Britain was targeted and bombed by Zeppelin Airships as well as Gotha and Giant fixed-wing aircraft. The objective of these raids was to unnerve the British public, to destroy strategic targets and to ultimately attempt to coerce Britain's capitulation from the war. A WWI map of air raids and naval bombardments across the UK was consulted, see **Annex H**. This source does not record any WWI bombing incidents to have affected the site or the Manchester area generally.

WWI bombs were generally smaller and dropped from a lower altitude than those used in WWII. This resulted in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons there is a limited risk that UXBs passed undiscovered in the urban environment. When combined with the relative infrequency of attacks and an overall low bombing density, the risk from WWI UXBs is considered low and will not be further addressed in this report.

11.2. World War II Bombing of Prestwich Municipal Borough

The Luftwaffe's main objective for the attacks on Britain was to inhibit the country's economic and military capability. To achieve this they targeted airfields, depots, docks, warehouses, wharves, railway lines, factories, and power stations. As the war progressed the Luftwaffe bombing campaign expanded to include the indiscriminate bombing of civilian areas in an attempt to subvert public morale.

During WWII the site was located within Prestwich Municipal Borough, which sustained an overall very low density of bombing, as represented by bomb density data figures in [Section 11.3](#). Luftwaffe reconnaissance photography, as seen in **Annex I**, shows two Luftwaffe targets to the north of Manchester, within the vicinity of Heaton Park. The two targets on the reconnaissance photography marked 'A' and 'B' appear to be a reservoir and a water treatment plant during WWII. The site is located approximately 1.2km south-west of point 'A', and approximately 1km north-west of point 'B', but as wartime targeting systems tended to be inaccurate, neighbouring areas would often sustain collateral bombing.

Records of bombing incidents in the civilian areas of Prestwich Municipal Borough were typically collected by Air Raid Precautions wardens and collated by Civil Defence personnel. Some other organisations, such as port and railway authorities, maintained separate records. Records would be in the form of typed or hand written incident notes, maps and statistics. Bombing data was carefully analysed, not only due to the requirement to identify those parts of the country most needing assistance, but also in an attempt to find patterns in the Germans' bombing strategy in order to predict where future raids might take place.

Records of bombing incidents are presented in the following sections.

11.3. WWII Home Office Bombing Statistics

The following table summarises the quantity of German air delivered bombs (excluding 1kg incendiaries and anti-personnel bombs) dropped on Prestwich Municipal Borough between 1940 and 1945.

Record of German Ordnance Dropped on Prestwich Municipal Borough		
Area Acreage		2,421
Weapons	High Explosive bombs (all types)	16
	Parachute mines	0
	Oil bombs	0
	Phosphorus bombs	0
	Fire pots	0
	Pilotless aircraft (V-1)	0
	Long range rocket bombs (V-2)	0
Total		16
Number of Items per 1,000 acres		6.6
Source: Home Office Statistics		
This table does not include UXO found during or after WWII.		

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the risk relating to IBs is lesser than that relating to larger HE bombs, they were similarly designed to inflict damage and injury. Anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. Although Home Office statistics did not record these types of ordnance, both should not be overlooked when assessing the general risk to personnel and equipment.

11.4. Manchester Evening News 'Christmas Blitz' Bomb Map

A local bomb map compiled by the Manchester Evening News and utilising data from the Commonwealth and War Graves Commission, was consulted during the production of this report. This map shows the locations of civilian deaths in Greater Manchester between 22nd and 24th December 1940. As this map only records bombs which resulted in fatalities, and only covers a three day period, it is not considered a comprehensive account of bombing raids. Imagery of the map is presented in **Annex J** and discussed in the table below.

Manchester Evening News 'Christmas Blitz' Bomb Map	
Date Range	Comments
22nd– 24th December 1940	No bombs are recorded to have fallen within or in the immediate vicinity of the site.

11.5. Incident Report Book

Incident Report Book compiled by the Research and Experiments Branch of the Ministry of Home Security during WWII were consulted at Lancashire Archives. These reports recorded information such as the date, time, type and damage caused by bomb incidents for a selected time period in the region and are therefore not often comprehensive. A transcript of the associated written records of bomb incidents in the site's vicinity are presented in the table below. Imagery of these records are presented in **Annex K**.

Incident Report Book		
Location and Date	Type of bomb	Comments
Chandos Road 2 nd October 1940	2 HE Bombs	"2 slight casualties in partly demolished house, gas and water mains damaged." <i>This incident was recorded approximately 1.5km south-east of the site.</i>
Stobart Avenue 2 nd October 1940	1 U.X. Bomb	"In centre of lawn, rear of no.5" <i>This incident was recorded approximately 1.3km south-east of the site.</i>
Prestwich 3 rd October 1940	Oil Incendiary	"Dwelling house 492 Bury Old Road completely destroyed. 5 persons severely burned, all in hospital." <i>This incident was recorded approximately 600m north-east of the site.</i>
Bury Old Road 3 rd October 1940	Suspected UXB	"Bury Old Rd A665 closed to traffic." <i>This incident was recorded approximately 1.2km south-east of the site.</i>
Nazareth House 4 th October 1940	Suspected UXB	"The grounds @ Nazareth House were excavated but after digging for 4 1/2 foot nothing was found to suggest what had made the hole." <i>This incident was recorded approximately 1.2km south-east of the site.</i>
5 Stobart Avenue 4 th October 1940	Suspected UXB	"Military excavated the lawn @ Stobart Avenue and found a stone road sett identical with setts in Circular Road disturbed by an HE at a distance of 400 yards away." <i>This incident was recorded approximately 1.3km south-east of the site.</i>
9 West Meade 28 th October 1940	Delayed Action (JII)	"Bomb exploded at 08:55 hours. Gas and water mains damaged in pathway of house causing crater in roadway and damage to 8 houses, other minor damage." <i>This incident was recorded approximately 1.6km south-east of the site.</i>
Prestwich 1 st January 1941	UXAA Shell JIII	"On runway of Hilton Park Garage, Bury New Road." <i>This incident was recorded approximately 1.5km south-east of the site.</i>

11.6. Unexploded HE Bombs Record Bombs

A record file obtained from Lancashire Archives illustrating the records of UXBs present within the Manchester urban area. Many of the records are vague due to UXBs being noted within other record sets. A transcript of the associated written records of bomb incidents in the site's vicinity are presented in the table below. Imagery of these records are presented in **Annex L**.

Unexploded HE Bombs Record Bombs	
Location and Date	Comments
Nazareth House, Scholes Lane 3 rd October 1940	"Confirmed by police. 150 children removed to cellars... roads closed to traffic." <i>This incident was recorded approximately 1.2km south-east of the site.</i>
9 West Meade 27 th October 1940	"Confirmed by police 28/10/1940 @ 9:30 hours. Bomb exploded." <i>This incident was recorded approximately 1.6km south-east of the site.</i>

11.7. Bomb Damage Photographs

Bomb damage photographs were obtained from Lancashire Archives, illustrating damage to certain areas of Prestwich that were affected by WWII air raids. A transcript of the associated written records of bomb damage in the site's wider vicinity is presented in the table below. Imagery of these records and WWII photography are presented in **Annex M**.

Incident Report Book		
Location and Date	Type of bomb	Comments
Circular Road and Bland Road 1 st October 1940	HE Bomb	"During a raid on October 1 st 1940, a heavy bomb caused a deep crater in the centre of the road at the junction of Circular Road and Bland Road." <i>This incident was recorded approximately 1.6km south-east of the site.</i>

11.8. Abandoned Bombs

A post air-raid survey of buildings, facilities, and installations would have included a search for evidence of bomb entry holes. If evidence of an entry hole was encountered, Bomb Disposal Officer Teams would normally have been requested to attempt to locate, render safe, and dispose of the bomb. Occasionally, evidence of UXBs was discovered but due to a relatively benign position, access problems, or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an 'abandoned bomb'.

Given the inaccuracy of WWII records, and the fact that these bombs were 'abandoned', their locations cannot be considered definitive or the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

1st Line Defence holds no records of officially registered abandoned bombs at or near the site of the proposed works.

11.9. Bomb Disposal Tasks

The information service from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (now part of 29 EOD & Search Group) no longer processes commercial requests for information. It has therefore not been possible to include any updated official information regarding bomb disposal/clearance tasks with regards to this site. A database of known disposal/clearance tasks has been referred to which does not make reference to such instances occurring within the site of proposed works. If any relevant information is received at a later date, GEA Limited will be advised.

11.10. Evaluation of German Air Delivered UXO Records

German Air Delivered UXO Records Summary	
Factors	Conclusion
Density of Bombing <i>It is important to consider the bombing density when assessing the possibility that UXBs remain in an area. High bombing density could allow for error in record keeping due to extreme damage caused to the area.</i>	During WWII, the site was located within Prestwich Municipal Borough, which sustained an overall very low density of bombing according to official Home Office bomb statistics, with an average of 6.6 items of ordnance recorded per 1,000 acres. This low density of bombing can be attributed to Prestwich and its surrounding areas being much less of a target than other major cities in the north-west of England. However, Luftwaffe reconnaissance photography, as seen in Annex I, shows two German targets marked 'A' and 'B' at Heaton Park, located approximately 1km from the site. Incident Report Books and Unexploded HE Bombs Record Books both recorded air raids to have occurred throughout Prestwich. However no bombing was recorded within or in the immediate vicinity of the site, with the closest recorded incident being an oil incendiary shower approximately 600m north-east of the site at 492 Bury Old Road on 3rd October 1940. Likewise, no references to bombing at Prestwich Station or the surrounding area, which the site falls into, has been found in available online resources.
Damage <i>If buildings or structures on a site sustained bomb or fire damage, any resulting rubble and debris could have obscured the entry holes of unexploded bombs dropped during the same or later raids. Similarly, a high explosive bomb strike in an area of open agricultural land will have caused soil disturbance, increasing the risk that a UXB entry hole would be overlooked.</i>	When comparing pre- and post-war OS mapping there are no obvious indicators of damage observable, such as missing or 'ruin' buildings located within or bordering the site, or areas of clearance, all of which are often signs of bomb damage.
Ground Cover <i>The nature of the ground cover present during WWII would have a substantial influence on any visual indication that may indicate UXO being present.</i>	Given the site was occupied by various features, including multiple structures, roadways, a police station, and an adjacent train station, it is anticipated groundcover would have been conducive to the detection of evidence of unexploded ordnance. This is because had an item of UXO fallen on a roadway or structure, it would have resulted in an obvious crater or trail of rubble, potentially disrupting road traffic, and therefore would have been noticed and reported. Areas of the site occupied by undeveloped land and gardens may have possessed groundcover which is less conducive to UXO detection.



Access Frequency <i>UXO in locations where access was irregular would have a greater chance of passing unnoticed than at those that were regularly occupied. The importance of a site to the war effort is also an important consideration as such sites are likely to have been both frequently visited and subject to post-raid checks for evidence of UXO.</i>	Similarly to groundcover, it is expected access across the site would have been frequent. This is because the site was occupied by roadways and structures for the duration of WWII, and located within a relatively built up urban environment: conditions which are typically associated with frequent access. Given the lack of bombing and damage recorded on site, there is no reason to believe that access would not have remained frequent for the duration of the war. This would have increased the likelihood that evidence of UXO would have been spotted, reported and dealt with.
Bomb Failure Rate	There is no evidence to suggest that the bomb failure rate in the locality of the site would have been dissimilar to the 10% normally used.
Abandoned Bombs	1 st Line Defence holds no records of abandoned bombs at or within the site vicinity.
Bombing Decoy sites	1 st Line Defence could find no evidence of bombing decoy sites within the site vicinity.
Bomb Disposal Tasks	1 st Line Defence could find no evidence of bomb disposal tasks within the site boundary and immediate area.

12. Introduction to Allied Ordnance

12.1. General

Many areas across the UK may be at risk from Allied UXO because of both wartime and peacetime military use. Typical military activities and uses that may have led to a legacy of military UXO at a site include former minefields, home guard positions, anti-aircraft emplacements, training and firing ranges, military camps, as well as weapons manufacture and storage areas.

Although land formerly used by the military was usually subject to clearance before returned to civilian use, items of UXO are sometimes discovered and can present a potential risk to construction projects.

It should be highlighted that there is no evidence that the site formerly had any military occupation or usage that could have led to contamination with such items of Allied ordnance. Despite this, urban areas, such as the location of the site, can be at risk from buried unexploded anti-aircraft projectiles fired during WWII – as addressed below.

12.2. Defending the UK From Aerial Attack

During WWII the War Office employed a number of defence tactics against the Luftwaffe from bombing major towns, cities, manufacturing areas, ports and airfields. These can be divided into passive and active defences (examples are provided in the table below).

Active Defences	Passive Defences
• Anti-aircraft gun emplacements to engage enemy aircraft. • Fighter aircraft to act as interceptors. • Rockets and missiles were used later during WWII.	• Blackouts and camouflaging to hinder the identification of Luftwaffe targets. • Decoy sites were located away from targets and used dummy buildings and lighting to replicate urban, military, or industrial areas. • Barrage balloons forced enemy aircraft to greater altitudes. • Searchlights were often used to track and divert adversary bomber crews during night raids.

Active defences such as anti-aircraft artillery present a greater risk of UXO contamination than passive defences. Unexploded ordnance resulting from dogfights and fighter interceptors is rarely encountered and difficult to accurately qualify.

12.3. Anti-Aircraft Artillery (AAA)

During WWII three main types of gun sites existed: heavy anti-aircraft (HAA), light anti-aircraft (LAA) and 'Z' batteries (ZAA). If the projectiles and rockets fired from these guns failed to explode or strike an aircraft they would descend back to land. The table below provides further information on the operation and ordnance associated with these type of weapons.



Anti-Aircraft Artillery				
Item	Description			
HAA	These large calibre guns such as the 3.7" QF (Quick Firing) were used to engage high flying enemy bombers. They often fired large HE projectiles, which were usually initiated by integral fuzes, triggered by impact, area, time delay or a combination of aforementioned mechanisms.			
LAA	These mobile guns were intended to engage fast, low flying aircraft. They were typically rotated between locations on the perimeters of towns and strategically important industrial works. As they could be moved to new positions with relative ease when required, records of their locations are limited. The most numerous of these were the 40mm Bofors gun which could fire up to 120 x 40mm HE projectiles per minute to over 1,800m.			
Variations in HAA and LAA Ammunition	Gun type	Calibre	Shell Weight	Shell Dimensions
	3.0 Inch	76mm	7.3kg	76mm x 356mm
	3.7 Inch	94mm	12.7kg	94mm x 438mm
	4.5 Inch	114mm	24.7kg	114mm x 578mm
	40mm	40mm	0.9kg	40mm x 311mm
Z-AA	Rockets were commonly designed to destroy heavily armoured military vehicles (anti-tank weapon). The device contains an explosive head (warhead) that can be accelerated using internal propellants to an intended target. Anti-aircraft rocket batteries were also utilised as part of air defence measures.			

The conditions in which anti-aircraft projectiles may have fallen unnoticed within a site area are analogous to those regarding air delivered ordnance. Unexploded anti-aircraft projectiles could essentially have fallen indiscriminately anywhere within range of the guns. The chance of such items being observed, reported and removed during the war depends on factors such as land use, ground cover, damage and frequency of access – the same factors that govern whether evidence of a UXB is likely to have been noted. More information about these factors with regards to this particular site can be found in the German Air Delivered Ordnance section of this report.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at **Appendix iv**.

13. The Likelihood of Contamination from Allied Ordnance

13.1. Introduction

There are several factors that may serve to either affirm, increase, or decrease the level of risk within a site with a history of military usage. Such factors are typically dependent upon the proximity of the proposed area of works to training activities, munition productions and storage, as well as its function across the years.

This section will examine the history of the proposed site and assess to what degree, if any, the site could have become contaminated as a result of the military use of the surrounding area.

13.2. Evaluation of Contamination Risk from Allied UXO

1st Line Defence has considered the following potential sources of Allied ordnance contamination:

Allied UXO Records Summary	
Sources of Allied UXO Contamination	Conclusion
Military Camps <i>Military camps present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training.</i>	1st Line Defence could find no evidence of a military camp within the site.
Anti-Aircraft Defences <i>Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.</i>	1st Line Defence could find no evidence of Anti-Aircraft defences such as a HAA or LAA gun emplacement occupying or bordering the site. The closest HAA was located approximately 330m south-east of the site, in the vicinity of Hill Top Avenue. Despite this distance the maximum effective range of an AA projectile can be up to 15km. The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are generally analogous to those regarding German air delivered ordnance.
Home Guard Activity <i>The Home Guard regularly undertook training and ordnance practice in open areas, as well as burying ordnance as part of anti-invasion defences.</i>	Evidence of Home Guard activity is often difficult to locate, owing to the ad-hoc nature of Home Guard activity within each local area. Such training was often conducted on a small scale at the discretion of individual commanders and as such was seldom recorded officially. As such, no positive evidence could be found to confirm the presence of HG units within proximity to the site.
Defensive Positions <i>Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.</i>	There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.
Training or firing ranges <i>Areas of ordnance training saw historical ordnance usage in large numbers, often with inadequate disposal of expended and live items. The presence of these ranges significantly impact on the risk of encountering items of ordnance in their vicinity.</i>	No evidence of training or firing ranges could be found within the site or surrounding area.

Defensive Minefields <i>Minefields were placed in strategic areas to defend the country in the event of a German invasion. Minefields were not always cleared with an appropriate level of vigilance.</i>	There is no evidence of defensive minefields affecting the site.
Ordnance Manufacture <i>Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.</i>	No information of ordnance being stored, produced, or disposed of within the proposed site could be found.
Military Related Airfields <i>Military airfields present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training or bombing practice.</i>	The site was not situated within the perimeters or vicinity of a military airfield.

14. The Likelihood of UXO Contamination Summary

The following table assesses the likelihood that the site was contaminated by items of German air delivered and Allied ordnance. Factors such as the risk of UXO initiation, remaining, and encountering will be discussed later in the report.

UXO Contamination Summary	
Quality of the Historical Record	The research has evaluated pre- and post-WWII ordnance Survey maps, Luftwaffe reconnaissance imagery, press articles, online resources, WWI bomb maps, pre-WWII oblique aerial imagery, Manchester Evening News 'Christmas Blitz' Bomb Map, Incident Report Books, and Unexploded HE Bombs Records, bomb damage photographs, and online resources. The record set is of generally satisfactory quality, with numerous written records available in-house and online relating to air raids and damage in Prestwich and its surrounding area. However, no comprehensive bomb mapping exists, and no high-resolution WWII-era aerial imagery was available for the site and its immediate vicinity, with the only available records corroborating the composition of the site being pre- and post-war OS mapping and pre-war oblique aerial imagery.
German Air-Delivered Ordnance	- During WWII, the site was situated within Prestwich Municipal Borough which according to official Home Office bombing statistics sustained an overall very low density of bombing, with an average of 6.6 items of ordnance per 1,000 acres. Prestwich was not bombed as extensively as other areas within the north-west of England, such as Manchester, and according to Luftwaffe reconnaissance photography, as seen in Annex I, the nearest targets (marked 'A' and 'B') were located within Heaton Park and Prestwich, approximately 1km from the site. - During WWII, the site was occupied by a mix of terraced properties, associated gardens, roadways, hardstanding ground, and a small area of railway sidings belonging to Prestwich railway station. - No positive evidence of bombing has been found within available written records which do not note any bombing incidents on or within the vicinity of the site. The closest incident is recorded to have been an oil incendiary shower approximately 600m north-east of the site at 492 Bury Old Road on 3rd October 1940. - When comparing pre- and post-war OS mapping, no obvious signs of bomb damage are observable within the site boundary, such as areas of clearance, missing buildings, or structures labelled 'ruin'. Likewise, such indicators are not observable within the site vicinity. - Given that the site was occupied by roadways and structures throughout WWII, it is anticipated that ground conditions would have been conducive to the detection of evidence of UXO, as evidence of unexploded ordnance likely would have been obvious had such an item fallen on a hardstanding road or a building. Additionally, it is likely that the site would have been subject to regular access during the war, given that the site was occupied by structures, bound by roadways, and adjacent to a railway station. This would have increased the likelihood that evidence of UXO would have been spotted, reported and dealt with. Furthermore, given the lack of positive evidence of bombing on/around the site, it is likely that access and groundcover on site would have remained regular and conducive to UXO detection. - In summary, no positive evidence was found to indicate that the site was bombed or damaged during WWII, with the nearest bombing incident recorded approximately 600m north-east of the site boundary. Furthermore, no obvious indicators of bomb damage such as clearance or missing buildings are observable when comparing pre- and post-war OS mapping, which shows the site and its immediate surrounds to maintain its pre-war composition. - Given the site was occupied by roadways and structures, it is considered likely that the ground conditions on site would have been favourable to the detection of evidence of UXO, and that the site would have been subject to regular access – it is anticipated that ground conditions and access would have remained as such for the duration of the war, as no evidence of on-site bombing or damage could be found which may have affected this. As such, the risk from UXO contamination is not thought to be above the 'background risk' for this area of the UK, therefore the site has been assessed as Low Risk.

Allied Ordnance	• There is no evidence that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA. • The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding air delivered ordnance.
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15. The Likelihood that UXO Remains

15.1. Introduction

It is important to consider the extent to which any explosive ordnance clearance (EOC) activities or extensive ground works have occurred on site. This may indicate previous ordnance contamination or reduce the risk that ordnance remains undiscovered.

15.2. UXO Clearance

1st Line Defence has found no evidence in the public domain or within internal records that any official ordnance clearance operations have taken place on site. Note however that we have not received confirmation of this fact from the 33 EOD Regiment Archive (now part of 29 EOD & Search Group). It should also be noted that in addition to 29 EOD & Search Group archival information, 1st Line Defence also do not currently have access to data that may be relevant including 5131(BD)SQN Archive, SD Training Technical Advisory Section (TAS) and MACA Records (bomb disposal callouts).

If such information is available at a later date, it is recommended that it be reviewed as it will assist with understanding both levels and types of contamination likely to be present, and may indicate risk reduction in certain areas.

15.3. Post-War Redevelopment

Post-war the site has seen significant development, with Longfield Shopping Centre, which was built in the 1970s, now occupying the site. It is understood that a planning application was submitted in 2008 to redevelop the shopping centre.

The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.

16. The Likelihood of UXO Encounter

16.1. Introduction

For UXO to pose a risk at a site, there should be a means by which any potential UXO might be encountered on that site.

The likelihood of encountering UXO on the site of proposed works would depend on various factors, such as the type of UXO that might be present and the intrusive works planned on site. In most cases, UXO is more likely to be present below surface (buried) than on surface.

In general, the greater the extent and depth of intrusive works, the greater the risk of encountering. The most likely scenarios under which items of UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations.

Generally speaking, the risk of encountering any type of UXO will be minimal for any works planned within the footprint and down to the depth of post-war foundations and excavations.

16.2. Encountering Air Delivered Ordnance

Since an air delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth, there is a chance that such an item (if present) could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level as well as at depth.

17. The Likelihood of UXO Initiation

17.1. Introduction

UXO does not spontaneously explode. Older UXO devices will require an external event/energy to create the conditions for detonation to occur. The likelihood that a device will function can depend on a number of factors including the type of weaponry, its age and the amount of energy it is struck with.

17.2. Initiating Air Delivered Ordnance

Unexploded bombs do not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur.

In recent decades, there have been a number of incidents in Europe where Allied UXBs have detonated, and incidents where fatalities have resulted. There have been several hypotheses as to the reason why the issue is more prevalent in mainland Europe – reasons could include the significantly greater number of bombs dropped by the Allied forces on occupied Europe, the preferred use by the Allies of mechanical rather than electrical fuzes, and perhaps just good fortune. The risk from UXO in the UK is also being treated very seriously in many sectors of the construction industry, and proactive risk mitigation efforts will also have affected the lack of detonations in the UK.

There are certain construction activities which make initiation more likely, and several potential initiation mechanisms must be considered:

UXB Initiation	
Direct Impact	Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
Re- starting the Clock	A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.
Friction Impact	The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge.

18. Consequences of Initiation/Encounter

18.1. Introduction

The repercussions of the inadvertent detonation of UXO during intrusive ground works, or if an item or ordnance is interfered with or disturbed, are potentially profound, both in terms of human and financial cost. A serious risk to life and limb, damage to plant and total site shutdown during follow-up investigations are potential outcomes. However, if appropriate risk mitigation measures are put in place, the chances of initiating an item of UXO during ground works is comparatively low.

The consequences of encountering UXO can be particularly notable in the case of high-profile sites (such as airports and train stations) where it is necessary to evacuate the public from the surrounding area. A site may be closed for anything from a few hours to a week with potentially significant cost in lost time. It should be noted that even the discovery of suspected or possible item of UXO during intrusive works (if handled solely through the authorities), may also involve significant loss of production.

18.2. Consequences of Detonation

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

19. 1st Line Defence Risk Assessment

19.1. Risk Assessment Stages

Taking into account the quality of the historical evidence, the assessment of the overall risk from unexploded ordnance is based on the following five considerations:

1. That the site was contaminated with unexploded ordnance.
2. That unexploded ordnance remains on site.
3. That such items will be encountered during the proposed works.
4. That ordnance may be initiated by the works operations.
5. The consequences of encountering or initiating ordnance.

19.2. Assessed Risk Level

1st Line Defence has assessed that there is an overall **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. There is an assessed **Negligible Risk** from Allied unexploded ordnance.

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs		✓		
German 1kg Incendiary Bombs		✓		
Anti-Aircraft Artillery Projectiles		✓		
Allied Land Service and Small Arms Ammunition	✓			

Please note – although the risk from unexploded ordnance on this site has been assessed as 'Low', this does not mean there is 'no' risk of encountering UXO. This report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified throughout this report. Our reports take a common-sense and practical approach to the assessment of risk, and we strive to be reasonable and pragmatic in our conclusions.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk where necessary. The mitigation measures outlined in the next section are recommended as a minimum precaution to alert ground personnel to the history of the site, what to look out for, and what measures to take in the event that a suspect item is encountered. It should also be noted that the conclusions of this report are based on the scope of works outlined in the 'Proposed Works' section of this report. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.

20. Proposed Risk Mitigation Methodology

20.1. General

The following risk mitigation measures are recommended to support the proposed works at Longfield Shopping Centre:

Recommended Risk Mitigation Measures	
Activity	Recommended Risk Mitigation Measure
All Works	UXO Risk Management Plan It is recommended that a site-specific plan for the management of UXO risk be written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc. Contact 1st Line Defence for help/more information. Site Specific UXO Awareness Briefings to all personnel conducting intrusive works. As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.

In making this assessment and recommending these risk mitigation measures, if known, the works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified or additional intrusive engineering works be considered, 1st Line Defence should be consulted to see if a re-assessment of the risk or mitigation recommendations is necessary.

1st Line Defence Limited

13/10/2023

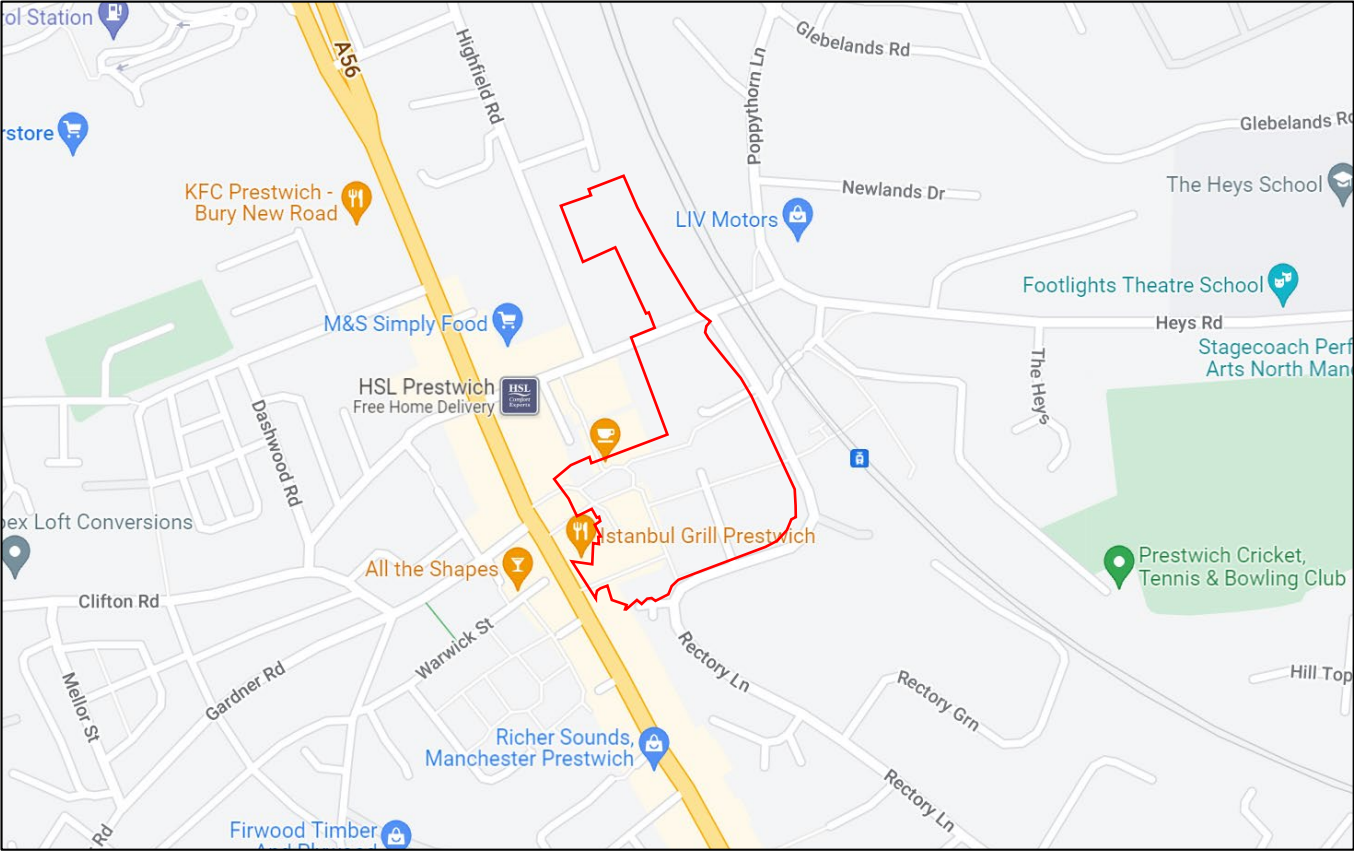
This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

Bibliography

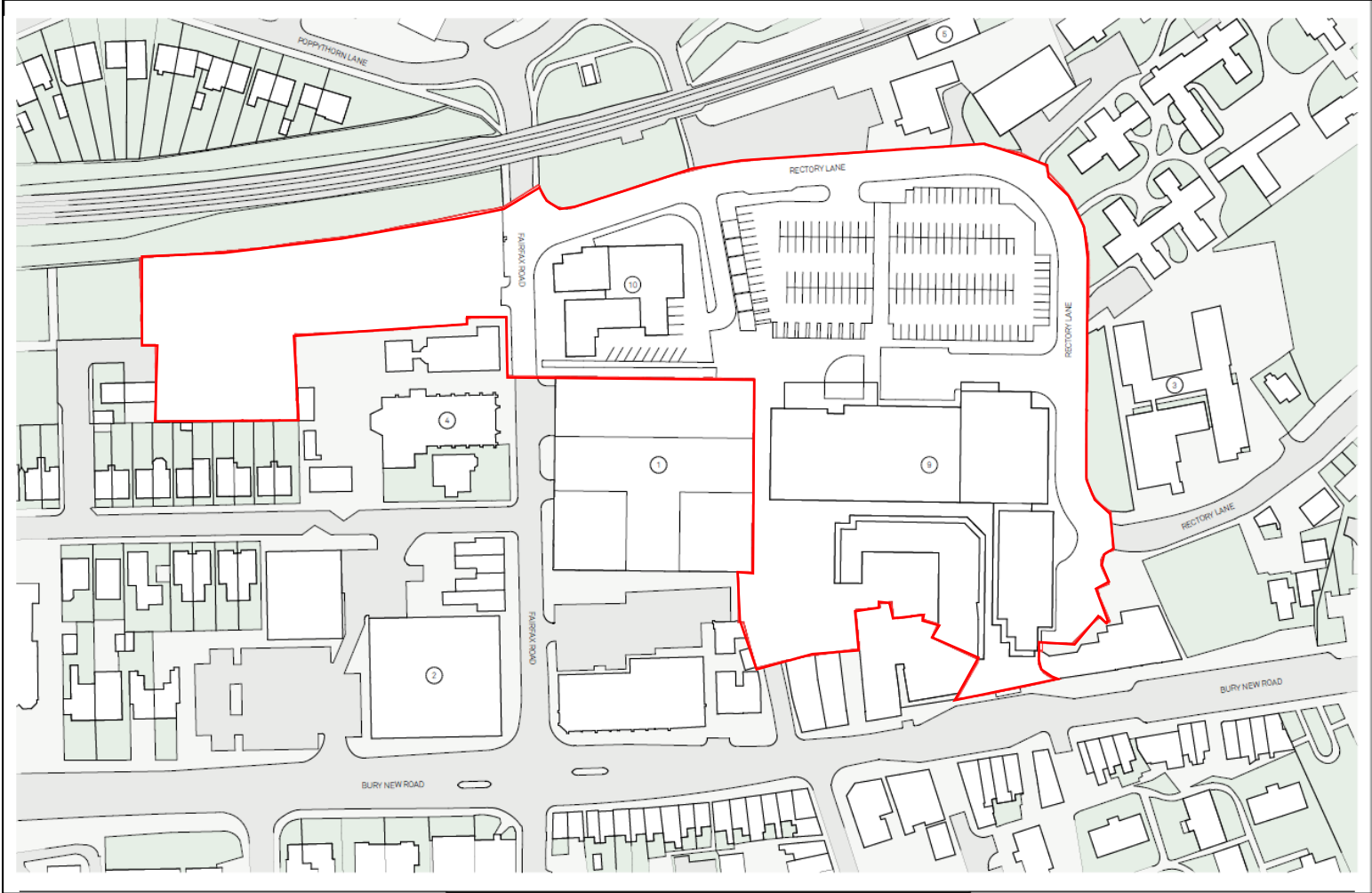
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Project: Longfield Shopping Centre

Ref: DA16882a-00

Source: Landmark Maps

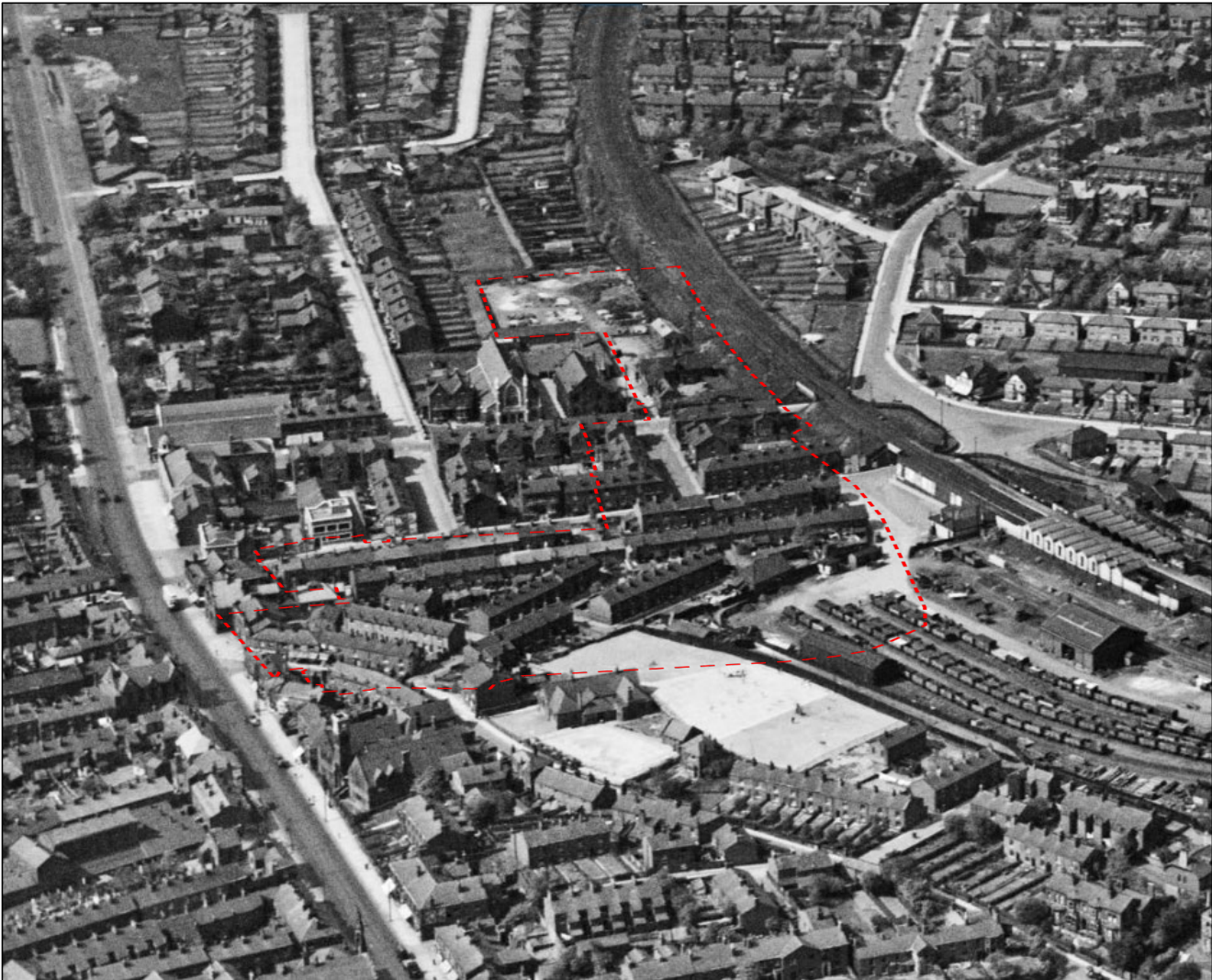
— Approximate site boundary





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Prestwich Railway Station, Bury New Road and environs, Prestwich, 1935



Top: J-curve Effect - Due to angle of entry, unexploded bombs would often end their trajectory at a lateral offset from point of entry, often ending up beneath adjacent extant structures/sites.

The photograph **above** shows a 250kg unexploded bomb found in Bermondsey in 2015, pointing upwards, demonstrating 'J-curve'.

One of the most common scenarios for UXO going unnoticed was when a UXB fell into a 'bomb site' (such as the area shown **Top Left**), the entry hole of the bomb obscured by any debris and rubble present. Note that the entry hole of a 50kg UXB could be as little as 20cm in diameter (**Left**).



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Source: Various sources

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BBC

NEWS

Bermondsey bomb: World War Two device safely removed



An unexploded World War Two bomb found in south London has been driven away safely under police and Army escort.

The 500lb (250kg) device was found on a building site in Grange Walk, Bermondsey on Monday.

Two primary schools were closed and hundreds of homes were evacuated as a precaution.

A cordon and 656ft (200m) exclusion zone was lifted at about 18:15 GMT as the bomb was removed to a quarry in Kent to be detonated, police said.

The Metropolitan Police force said the device was a 'SA' 250kg WWII German air-dropped bomb, known to the Army's Royal Logistic Corps bomb disposal experts.

250kg German HE Bomb, March 2015

BBC

NEWS

WW2 bomb found near London City Airport blown up



An unexploded World War Two bomb found near London City Airport has been detonated.

The 500kg device was discovered at the King George V Dock on Sunday during planned work at the airport.

It was closed and all flights were cancelled on Monday after an exclusion zone was put in place.

The detonation, which took place off Shoeburyness, Essex, was postponed on Tuesday because of high winds and dangerous conditions for divers.

The 1.5m-long German bomb - which was found in a bed of silt, 15m underwater - was carefully removed from the Thames and placed in a secure location a mile away from the coast of Essex.

500kg German HE Bomb, February 2018

BBC

NEWS



Exeter WW2 bomb is detonated after homes evacuated

More than 2,600 households and 12 university halls of residence were cleared before the 2,200lb (1,000kg) device was destroyed on Saturday.

Police said the blast left a crater about the size of a double-decker bus.

Police have reported large pieces of metal debris hitting buildings and said some properties in the 100m (330ft) exclusion zone had sustained "structural damage".



1000kg German HE bomb, February 2021

BBC

NEWS



Great Yarmouth: Huge blast after unplanned WW2 bomb detonation

A World War Two bomb found in Great Yarmouth has detonated while work was being done to defuse it, causing a huge blast that was heard for miles.

Army specialists were attempting to disarm it when there was an unplanned detonation at about 17:00 GMT.

People on social media said they heard a loud bang and felt buildings shake 15 miles (24km) away.

There have been no reports of injuries among the Army, emergency services or the public, Norfolk Police said.

Cordons were put in place when the bomb was first discovered close to two gas pipes on Tuesday, and work began to make it safe.

250kg German HE Bomb, February 2023

BASF has confirmed that an explosive device, most likely a World War II-era bomb, caused the blast that left one person injured Tuesday at a plant construction site in Germany.

The explosion was reported at BASF's Ludwigshafen toluene diisocyanate (TDI) plant, which recently broke ground for a 300,000 metric tons per year TDI production plant and other construction to expand its facilities.



BASF Provides Some Details

Responding to a request from *PaintSquare News* for more information on Wednesday (Feb. 27), BASF's manager of media relations and corporate communications Europe, Ursula von Stetten, wrote in an email, "So here [are] the facts: The detonation took place at 10:00 a.m. One person was injured; the injury is not serious. He will be kept in the hospital for some days.

"Cause of the detonation was an explosive device, presumably a bomb deriving from the Second World War. The device detonated when grounding work was done. No details on [a] delay [are] available. At the moment, the exact circumstances of the incident are [being] evaluated."

1st March 2013

SPIEGEL ONLINE

Blast Kills One

World War II Bomb Explodes on German Motorway

A highway construction worker in Germany accidentally struck an unexploded World War II bomb, causing an explosion which killed him and wrecked several passing cars.



A World War II bomb has exploded during construction work on a German highway, killing one worker and injuring several motorists who were driving past, police said.

The worker had been cutting through the road surface near the south-western town of Aschaffenburg when his machine struck the bomb and triggered it. Police said they weren't sure yet what type of bomb it was. "The explosion seems to have been too small for it to have been an aircraft bomb," a police spokesman said.

23rd October 2006

WWII bomb injures 17 at Hattingen construction site



Seventeen people were injured on Friday when a construction crew unwittingly detonated a buried World War II-era bomb in Hattingen.

An excavator apparently drove over a 250-kilogramme (550 pound) American bomb, damaging surrounding buildings. Most of the injured suffered auditory trauma from the blast, and the excavator operator suffered injuries to his hands, police in the German state of North Rhine-Westphalia said.

"The hole was astoundingly small for such a large bomb full of so many explosives," Armin Gebhard, head of the Arnsberg department for military ordnance removal, told The Local. "But of course it damaged all the surrounding buildings too. We are really happy it wasn't worse."

19th September 2013

BBC NEWS

World War II bomb kills three in Germany



A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

The blast happened an hour before the defusing operation was due to start.

Officials said the three men who died were experienced sappers, or combat engineers, who over 20 years had defused up to 700 bombs.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

2nd June 2010



June 2006



Salford WW2-era bomb find in garden prompts evacuation

🕒 31 October 2021

Residents have been moved out of their homes after an unexploded bomb believed to be from World War Two was found in a garden.

The device was discovered at the home on Moss Lane in Swinton, Salford, shortly before 11:30 GMT.

A cordon was put in place and nearby houses were evacuated, Greater Manchester Police said.

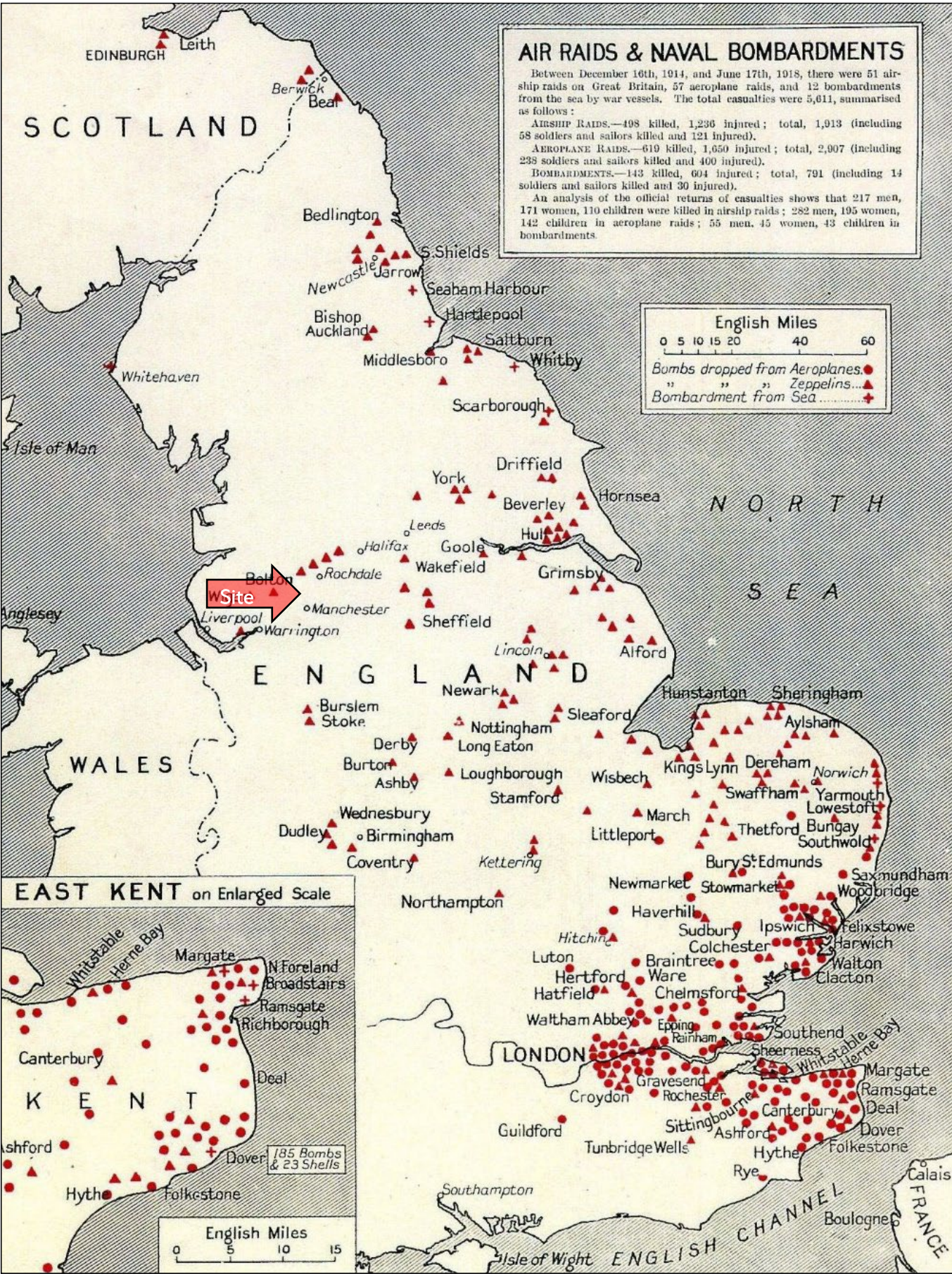
The force said an Explosive Ordnance Disposal team was brought in to assess the device before declaring it safe.

Greater Manchester Fire and Rescue Service said at about 16:00 GMT they were leaving the scene and people were returning home.

They said all previous advice for residents further from the device, who had been told stay inside and away from windows, was lifted.



People were told to leave their homes on Moss Lane in Swinton

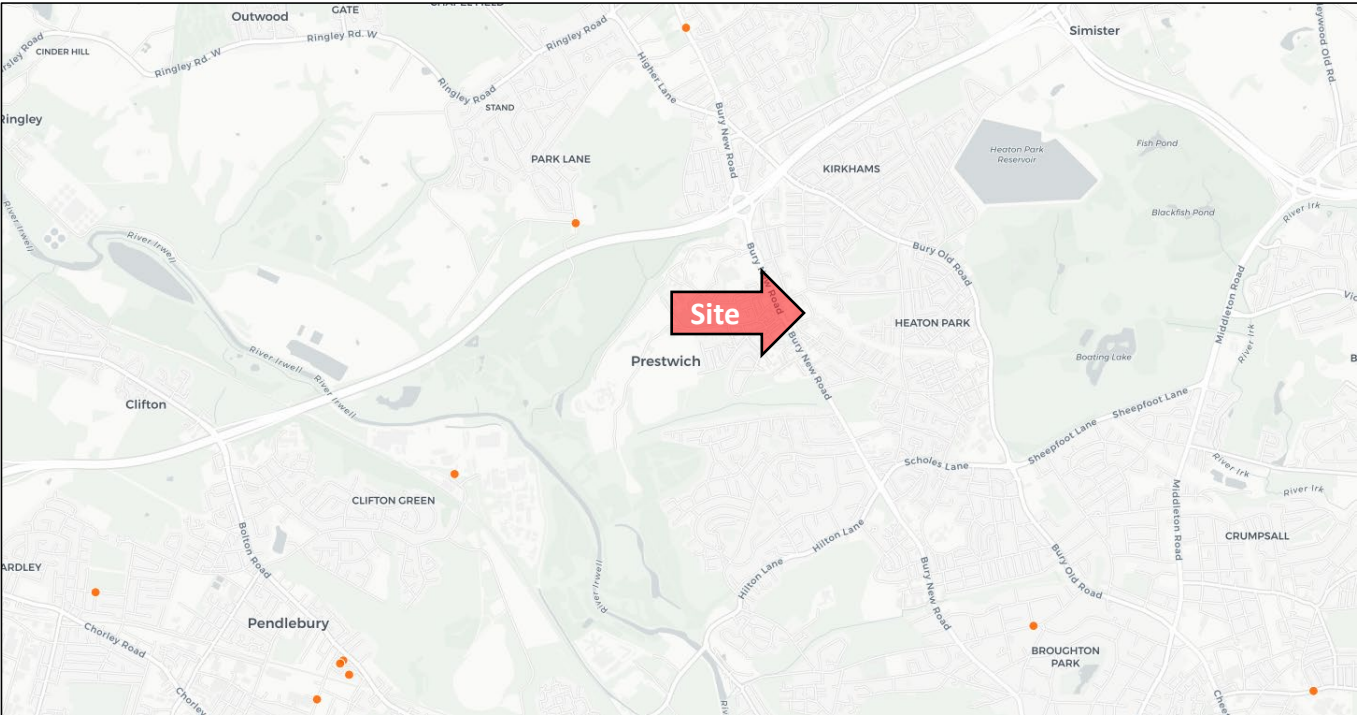


Heaton Park reservoir, Manchester 1940



Above: Heaton Park reservoir, Manchester 1940. The reservoir is marked by 'A' and to the south west in Prestwich is another target marked 'B', just to the left of Bury New Road. It is now covered by houses, but in 1940 appears to be a water treatment plant.





Recorded fatal bomb strike



2nd October 1940

297/1	2/10/40	08:33	PRESTWICH, Chandra Rd	2 H.E Bombs	2 slight casualties, on partly demolished house, gas & water mains damaged In centre of lawn rear of N°5
298/1	2/10/40	10:05	PRESTWICH, Slobart Avenue	1 U.X. Bomb	serious damage

3rd October 1940

302/1	3/10/40	08:45	PRESTWICH	Del Inconclary	Dwelling house 492 Bury Old Rd completely destroyed Five persons severely burned, all in hospital
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3rd October 1940

115/4	3/10/40	14:12	HALEWOOD, Wood Lane		BURY OLD RD A665 closed to traffic
303/2	3/10/40	18:25	PRESTWICH, Bury Old Rd	Suspected U.X.B 1 H.E.	Bomb dropped in sunny blough Wood Lane Aid of A.56, water mains expected damaged In Gun Hall. later believed that was H.E.

4th October 1940

303/3	4/10/40	12:35	PRESTWICH, Nazareth House	(L.2) Suspected U.X.B	In field
303/4	4/10/40	14:35	PRESTWICH,		ROAD A.665 NOW OPEN TO NORMAL TRAFFIC The grounds at Nazareth House were excavated but after digging for 4 1/2 ft nothing was found to suggest what had made the hole.
298/4	4/10/40	14:35	PRESTWICH, 5 Slobart Avenue	Suspected U.X.B	Military excavated the lawn at Slobart Avenue and found a stone road sett identical with setts in a circular road disturbed by an H.E. a distance of about 400 yds away.

28th October 1940

415/1-2	28/10/40	09:45	PRESTWICH, N°9 West Meade	Bombs 1 H.E	Conservatory Damaged, & windows of adjoining property
1/2	28/10/40	10:52	PRESTWICH,	Delayed Action (S.M.)	Bomb exploded at 08:50 hrs Gas & water mains damaged In pathway of house causing crater in roadway & damage to 8 houses, other minor damage
416/1	28/10/40	12:25	CROSBY, Seadale		

1st January 1941

1/1/41	✓	PRESTWICH	165/79 UXAA Shell J11	on Runway of Milton Park Garage, Bury New Rd.
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Ref: DA16882a-00

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