

Detailed Unexploded Ordnance (UXO) Risk Assessment

Project Name	Land at Beck Lane, Sutton-in-Ashfield
Client	Griffiths Services & Developments Ltd
Site Address	Land at Beck Lane, Sutton-in-Ashfield
Report Reference	DA21211-00
Date	27/1/2025
Author	AL
Quality Assurance	PB
Final Check	AL

1st Line Defence

3 Maple Park, Essex Road, Hoddesdon. EN11 0EX

Tel +44 (0) 1992 245 020 Email info@1stlinedefence.co.uk

Web www.1stlinedefence.co.uk Company Reg No. 07717863



1ST LINE DEFENCE



Executive Summary

Site Location and Description

The site is located in Sutton-in-Ashfield, Nottinghamshire.

Recent aerial imagery indicates that the site was primarily occupied by open vegetation, with several structures and associated driveways within its central and eastern sections.

It is bound to the north by open vegetated land, to the east by Beck Lane, to the south by residential properties and their associated gardens, and to the west by further open vegetated land.

The site is approximately centred on the OS grid reference: **SK 50642 60705**.

Proposed Works

The scope of the proposed works was not available at the time of writing.

Geology and Bomb Penetration Depth

The British Geological Survey (BGS) map shows the site was underlain by the Lenton Sandstone Formation, comprising sandstone from the Permian and Triassic periods.

Site-specific geotechnical information was not available to 1st Line Defence at the time of the production of this report. An assessment of maximum bomb penetration depth can be made once such data becomes available, or by a UXO specialist during on-site support. It should be noted that the maximum depth that a bomb could reach may vary across a site and will be largely dependent on the specific underlying geological strata and its density.

UXO Risk Assessment

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 **Low Risk** from Allied unexploded ordnance.

The Risk from German Air-Delivered UXO

- During WWII, the site was situated within the Urban District of Sutton-in-Ashfield. According to official Home Office bombing statistics, this district was subject to an overall very low bombing density, with an average of 0.6 items of ordnance recorded per 1,000 acres. This comprised of only six high explosive bombs. This can largely be attributed to the lack of identifiable targets within the borough. Any incidents are believed to have been largely sporadic, caused by Sutton-in-Ashfield's proximity to Derby, Nottingham and along the flight path to northern England. Such attacks were called 'tip and run' raids; they were opportunistic, indiscriminate attacks to areas near confirmed targets.
- According to historic OS mapping, during WWII, the site was occupied by open vegetated land adjacent to Cock Lane to the east and residential properties to the south.
- No positive evidence of bombing was recorded on or bordering the site boundary within available records. While several incidents were recorded within Sutton-in-Ashfield (see **Annexes H, I and J**), none had any indicators that positively identified them with the site area. While one IB bomb was discovered in a rubbish pile near the site, this was thought likely to have been a by-product of the nearby Home Guard ammunition store and not due to bombing (see **Section 11.8** for more details).
- No evidence of bomb damage was visible in or along the site boundary within WWII-era and post-war aerial photography. Given the site's largely open composition, any damage would have typically taken the form of cratering, scattered earth, or indentations to the ground. However, none of these were visible on-site.
- It is likely the ground cover present on-site would have been largely un conducive towards the detection of UXO indicators due to the site's primarily soft, vegetated composition. It is also anticipated that the vegetated areas did not experience frequent access during WWII. However, the proximity of nearby residential properties and a roadway to the east may have provided the site and its immediate surroundings with a degree of observation.
- In summary, no positive evidence of bombing in or around the site boundary could be found within available record sets, and no damage indicators are observable in post-war aerial imagery. Although the possibility of UXO falling unnoticed within the site area cannot be entirely dismissed (due to the site's open nature and the limited locational descriptions provided concerning some of the bombing incidents within Sutton-in-Ashfield), no positive evidence could be found to suggest that the site area is at an elevated risk of encountering German UXBs. For this reason, the risk of UXO remaining on-site has been assessed as **Low**.

The Risk from Allied UXO

- Information provided in the Notts Free Press indicates that a Home Guard 'ammunition store' was located at the back of 9a Omberley Avenue, approximately 130m to the south-west of the site. The store was first reported when Horace Challenor (former member of the Home Guard) informed the police that the land behind 9a Omberley Avenue had been used as an ammunition store, with a potential 240 'molotov cocktails' still remaining. The police opened an investigation to find the exact location of these bombs, but considering there was a 21-year time gap between 1966 and the end of WWII, they found it difficult. The grenades were said to have been buried in a trench some 8ft from the hedge at the rear of the plot. If the location described is accurate, this would put the plot of land and trench some 135m from the proposed development site.
- A phosphorous grenade/'Molotov cocktail' (a self-igniting phosphorous or 'SIPS' grenade) was found during the search of the land amongst a pile of rubbish. Given that during the 1940s and 1950s, No 9 Omberley Avenue was an open plot of land – and two Nissen huts are noted to the rear of the land – it is thought probable that this was the area used by the Home Guard. The main reported cache of 240 grenades could not be found despite an extensive search – and the area was declared 'free from danger'.
- It was common for local Home Guard units to base ammunition depots in discreet locations to ensure quick access in the event of a German invasion. These depots were typically managed by the Home Guard squadrons themselves because they were regularly familiar with the affected area. No evidence, anecdotal or otherwise, could be found to indicate that the proposed development site itself was utilised by the Home Guard.
- King's Mill Military Hospital was situated approximately 550m southeast of the site. As such, there was a recorded American military presence within the surrounding area, often taking the form of personnel and tanks/other vehicles. Nonetheless, little information regarding their specific activities was available in accessible records. However, it is expected that its location (approximately 550m to the southeast) was too far from the site to be of immediate concern.
- In summary, a local news reference was found to a Home Guard ammunition store at the rear of 9a Omberley Avenue, and that SIP grenades had been disposed of here in a trench. No evidence of such disposal at the plot of land could be found during investigations in 1966. If the location described is accurate, the burial area should be some 130m south-west of the site.
- No official record of this depot – or of any Home Guard use of the area – could be found in local or national archive searches. It is not uncommon that official records of areas used by the Home Guard are hard to find, with most references coming from first hand/anecdotal sources. Nevertheless, no references, anecdotal or otherwise, could be found of the Home Guard using the site of the proposed development. The site has therefore been assessed at **Low Risk** of contamination from items of Allied unexploded ordnance. However, because of the nearby finds, the possibility of encountering UXO cannot be absolutely discounted, and it is recommended that ground personnel working on the site receive a UXO Safety and Awareness Briefing to make them aware of what to look out for, and what to do in the event that a suspect item is encountered. A UXO Risk Management Plan should also be compiled for the site.

Post-WWII Redevelopment

- There appears to have been some development on-site since WWII. Most notably, numerous structures are now within its central section, and a lone property is within its southeastern corner. There is also a hard-sounding driveway across the site's southern section.
- 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.

Recommended Risk Mitigation Measures

The following risk mitigation measures are recommended to support the proposed works at the Land at Beck Lane, Sutton-in-Ashfield site:

Activity	Recommended Risk Mitigation Measure
All Works	<ul style="list-style-type: none"> UXO Risk Management Plan Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

Note – proactive on-site UXO support/survey should not be necessary for any works taking place at the location of and down to the depths of significantly worked post-war made ground/post-war fill.

Glossary

Abbreviation	Definition
AA	Anti-Aircraft
AFS	Auxiliary Fire Service
AP	Anti-Personnel
ARP	Air Raid Precautions
DA	Delay-action
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
FP	Fire Pot
GM	G Mine (Parachute mine)
HAA	Heavy Anti-Aircraft
HE	High Explosive
IB	Incendiary Bomb
JSEODOC	Joint Services Explosive Ordnance Disposal Operation Centre
LAA	Light Anti-Aircraft
LCC	London County Council
LRRB	Long Range Rocket Bomb (V-2)
LSA	Land Service Ammunition
NFF	National Filling Factory
OB	Oil Bomb
PAC	Pilotless Aircraft (V-1)
PB	Phosphorous Bomb
PM	Parachute Mine
POW	Prisoner Of War
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RFC	Royal Flying Corps
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SA	Small Arms
SAA	Small Arms Ammunition
SD2	Anti-personnel "Butterfly Bomb"
SIP	Self-Igniting Phosphorous
U/C	Unclassified bomb
UP	Unrotated Projectile (rocket)
USAAF	United States Army Air Force
UX	Unexploded
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	Flying Bomb (Doodlebug)
V-2	Long Range Rocket
WAAF	Women's Auxiliary Air Force
X	Exploded

Contents

Executive Summary.....	ii
Glossary.....	iv
Contents.....	v
Annexes.....	viii
Appendices.....	viii
1. Introduction.....	1
1.1. Background.....	1
2. Method Statement.....	2
2.1. Report Objectives.....	2
2.2. Risk Assessment Process.....	2
2.3. Sources of Information.....	2
3. Background to Bombing Records.....	3
3.1. General Considerations of Historical Research.....	3
3.2. German Bombing Records.....	3
3.3. Allied Records.....	3
4. UK Regulatory Environment and Guidelines.....	4
4.1. General.....	4
4.2. CDM Regulations 2015.....	4
4.3. The 1974 Health and Safety at Work etc. Act.....	4
4.4. CIRIA C681.....	4
4.5. Additional Legislation.....	4
5. The Role of Commercial UXO Contractors and The Authorities.....	5
5.1. Commercial UXO Specialists.....	5
5.2. The Authorities.....	5
6. The Site.....	6
6.1. Site Location.....	6
6.2. Site Description.....	6
7. Scope of the Proposed Works.....	6
7.1. General.....	6
8. Ground Conditions.....	6
8.1. General Geology.....	6
8.2. Site-Specific Geology.....	6
9. Site History.....	7
9.1. Introduction.....	7
9.2. Ordnance Survey Historical Maps.....	7
10. Introduction to German Air Delivered Ordnance.....	8
10.1. General.....	8
10.2. Generic Types of WWII German Air Delivered Ordnance.....	8
10.3. Failure Rate of German Air Delivered Ordnance.....	9
10.4. UXB Ground Penetration.....	9
10.4.1. The J-Curve Principle.....	9
10.4.2. WWII UXB Ground Penetration Studies.....	9
10.4.3. Site Specific Bomb Penetration Considerations.....	10

10.5.	V-Weapons	10
11.	The Likelihood of Contamination from German Air Delivered UXBs.....	11
11.1.	World War I	11
11.2.	World War II Bombing of Urban District of Sutton-in-Ashfield.....	11
11.3.	WWII Home Office Bombing Statistics.....	12
11.4.	Nottinghamshire Incident Sheets and Reports.....	13
11.5.	Operations Reports to the County Emergency Committee.....	14
11.6.	Nottinghamshire War Diary	14
11.7.	Home Intelligence Summary Files.....	14
11.8.	Notts Free Press (May 20 th , 1966) Anecdotal Information.....	14
11.9.	WWII-Era Aerial Photography	15
11.10.	Abandoned Bombs.....	15
11.11.	Bomb Disposal Tasks.....	15
11.12.	Evaluation of German Air Delivered UXO Records	16
12.	Introduction to Allied Ordnance	17
12.1.	General.....	17
12.2.	Defending the UK From Aerial Attack.....	17
12.3.	Anti-Aircraft Artillery (AAA).....	18
12.4.	Land Service Ammunition.....	19
12.5.	Small Arms Ammunition.....	19
13.	The Likelihood of Contamination from Allied Ordnance.....	20
13.1.	Introduction	20
13.2.	9a Omberley Avenue Ammunition Store.....	20
13.3.	Nottinghamshire Home Guard.....	21
13.4.	King's Mill Military Hospital.....	21
13.5.	Evaluation of Contamination Risk from Allied UXO.....	22
14.	The Likelihood of UXO Contamination Summary.....	24
15.	The Likelihood that UXO Remains.....	26
15.1.	Introduction	26
15.2.	UXO Clearance.....	26
15.3.	Post-War Redevelopment.....	26
16.	The Likelihood of UXO Encounter.....	27
16.1.	Introduction	27
16.2.	Encountering Air Delivered Ordnance.....	27
16.3.	Land Service/Small Arms Ammunition Encounter	27
17.	The Likelihood of UXO Initiation.....	28
17.1.	Introduction	28
17.2.	Initiating Air Delivered Ordnance	28
17.3.	Land Service/Small Arms Ammunition Initiation.....	28
18.	Consequences of Initiation/Encounter.....	29
18.1.	Introduction	29
18.2.	Consequences of Detonation.....	29
19.	1st Line Defence Risk Assessment	30
19.1.	Risk Assessment Stages.....	30
19.2.	Assessed Risk Level.....	30

20. Proposed Risk Mitigation Methodology	31
20.1. General.....	31
Bibliography	32

Annexes

List of Report Annexes	
Annex A	Site Location Maps
Annex B	Recent Aerial Photography
Annex C	Client Provided Site Plan
Annex D	Pre and Post-WWII Historical Maps
Annex E	Example of UXO Entry Hole / The 'J-curve' Effect Principle
Annex F	Examples of UXO Incidents
Annex G	WWI Map of Air Raids and Naval Bombardments
Annex H	Nottinghamshire Incident Sheets and Reports
Annex I	Operations Report to the County Emergency Committee
Annex J	Nottinghamshire War Diary
Annex K	WWII-era RAF Aerial Photography of the Site
Annex L	Skegby Gardens Bomb Find, May 20 th , 1966
Annex M	Sutton-in-Ashfield Home Guard Photography
Annex N	Visual Overlay of Allied Landmarks – Recent Aerial Photography

Appendices

List of Report Appendices	
Appendix i-iii	Examples of German Air-Delivered Ordnance
Appendix iv	Examples of Anti-Aircraft Projectiles
Appendix v-vii	Examples of Land Service Ammunition
Appendix viii	Examples of Small Arms Ammunition

1st Line Defence Limited[®]

Detailed Unexploded Ordnance (UXO) Risk Assessment

Site: Land at Beck Lane, Sutton-in-Ashfield
Client: Griffiths Services & Developments Ltd

1. Introduction

1.1. Background

1st Line Defence has been commissioned by Griffiths Services & Developments Ltd to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for the works proposed at Land at Beck Lane, Sutton-in-Ashfield.

Buried UXO can present a significant risk to construction works and development projects. The discovery of a suspect device during works can cause considerable disruption to operations as well as cause unwanted delays and expense.

UXO in the UK can originate from three principal sources:

1. Munitions resulting from wartime activities including German bombing in WWI and WWII, long range shelling, and defensive activities.
2. Munitions deposited as a result of military training and exercises.
3. Munitions lost, burnt, buried or otherwise discarded either deliberately, accidentally, or ineffectively.

This report will assess the potential factors that may contribute to the risk of UXO contamination. If an elevated risk is identified at the site, this report will recommend appropriate mitigation measures, in order to reduce the risk to as low as is reasonably practicable. Detailed analysis and evidence will be provided to ensure an understanding of the basis for the assessed risk level and any recommendations.

This report complies with the guidelines outlined in CIRIA C681, 'Unexploded Ordnance (UXO) A Guide for the Construction Industry.'

2. Method Statement

2.1. Report Objectives

The aim of this report is to conduct a comprehensive assessment of the potential risk from UXO at Land at Beck Lane, Sutton-in-Ashfield. The report will also recommend appropriate site and work-specific risk mitigation measures to reduce the risk from explosive ordnance during the envisaged works to a level that is as low as reasonably practicable.

2.2. Risk Assessment Process

1st Line Defence has undertaken a five-step process for assessing the risk of UXO contamination:

1. The likelihood that the site was contaminated with UXO.
2. The likelihood that UXO remains on the site.
3. The likelihood that UXO may be encountered during the proposed works.
4. The likelihood that UXO may be initiated.
5. The consequences of initiating or encountering UXO.

In order to address the above, 1st Line Defence has taken into consideration the following factors:

- Evidence of WWI and WWII German air delivered bombing as well as the legacy of Allied occupation.
- The nature and conditions of the site during WWII.
- The extent of post-war development and UXO clearance operations on site.
- The scope and nature of the proposed works and the maximum assessed bomb penetration depth.
- The nature of ordnance that may have contaminated the proposed site area.

2.3. Sources of Information

Every reasonable effort has been made to ensure that relevant evidence has been consulted and presented in order to produce a thorough and comprehensible report for the client. To achieve this the following, which includes military records and archive material held in the public domain, have been accessed:

- The National Archives and Nottinghamshire Archives.
- Historical mapping datasets.
- Historic England National Monuments Record.
- Relevant information supplied by Griffiths Services & Developments Ltd.
- Available material from 33 Engineer Regiment (EOD) Archive (part of 29 Explosive Ordnance and Disposal and Search Group).
- 1st Line Defence's extensive historical archives, library and UXO geo-datasets.
- Open sources such as published books and internet resources.

3. Background to Bombing Records

3.1. General Considerations of Historical Research

This desktop assessment is based largely upon analysis of historical evidence. Every reasonable effort has been made to locate and present significant and pertinent information. 1st Line Defence cannot be held accountable for any changes to the assessed risk level or risk mitigation measures, based on documentation or other data that may come to light at a later date, or which was not available to 1st Line Defence during the production of this report.

It is often problematic and sometimes impossible to verify the completeness and accuracy of WWII-era records. As a consequence, conclusions as to the exact location and nature of a UXO risk can rarely be quantified and are, to a degree, subjective. To counter this, a range of sources have been consulted, presented and analysed. The same methodology is applied to each report during the risk assessment process. 1st Line Defence cannot be held responsible for any inaccuracies or the incompleteness in available historical information.

3.2. German Bombing Records

During WWII, bombing records were generally gathered locally by the police, Air Raid Precaution (ARP) wardens and military personnel. These records typically contained information such as the date, the location, the amount of damage caused and the types of bombs that had fallen during an air raid. This information was made either through direct observation or post-raid surveys. The Ministry of Home Security Bomb Census Organisation would then receive this information, which was plotted onto maps, charts, and tracing sheets by regional technical officers. The collective record set (regional bomb census mapping and locally gathered incidents records) would then be processed and summarised into reports by the Ministry of Home Security Research and Experiments Branch. The latter were tasked with providing the government 'a complete picture of air raid patterns, types of weapons used and damage caused- in particular to strategic services and installations such as railways, shipyards, factories and public utilities.'

The quality, detail and nature of record keeping could vary considerably between provincial towns, boroughs and cities. No two areas identically collated or recorded data. While some local authorities maintained records with a methodical approach, sources in certain areas can be considerably more vague, dispersed, and narrower in scope. In addition, the immediate priority was mostly focused on assisting casualties and minimising damage at the time. As a result, some records can be incomplete and contradictory. Furthermore, many records were even damaged or destroyed in subsequent air raids. Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are therefore not always reliable. Whereas records of attacks on military or strategic targets were often maintained separately and have not always survived.

3.3. Allied Records

During WWII, considerable areas of land were requisitioned by the War Office for the purpose of defence, training, munitions production and the construction of airfields. Records relating to military features vary and some may remain censored. Within urban environments datasets will be consulted detailing the location of munition production as well as wartime air and land defences. In rural locations it may be possible to obtain plans of military establishments, such as airfields, as well as training logs, record books, plans and personal memoirs. As with bombing records, every reasonable effort will be made to access records of, and ascertain any evidence of, military land use. However, there are occasions where such evidence is not available, as records may not be accessible, have been lost/destroyed, or simply were not kept in the first place.

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 Sutton-in-Ashfield, Nottinghamshire. It is bound to the north by open vegetated land, to the east by Beck Lane, to the south by residential properties and their associated gardens, and to the west by further open vegetated land.

The site is approximately centred on the OS grid reference: **SK 50642 60705**.

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

6.2. Site Description

Recent aerial imagery indicates that the site was primarily occupied by open vegetation, with several structures and associated driveways within its central and eastern sections.

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

The scope of the proposed works was not available at the time of writing.

8. Ground Conditions

8.1. General Geology

The British Geological Survey (BGS) map shows the site was underlain by the Lenton Sandstone Formation, comprising sandstone from the Permian and Triassic periods.

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
1918-1919	1:2,500	Pre-war OS mapping, dated 1918-1919, shows the site to comprise open vegetated land. It was bound to the north, south and west by open vegetated land and to the east by Cock Lane (modern-day Beck Lane).

Post-WWII		
Date	Scale	Description
1958-1959	1:2,500	Post-war OS mapping, dated 1958-1959, depicts changes/differences since the previous mapping edition. Most notably, several structures and a driveway associated with a nursery were now located on-site.

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 E). 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 F**.

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 E**).

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 – Lenton Sandstone 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 Sutton-in-Ashfield 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 G**. This source shows no discernible evidence of bombing in or around the site area.

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 Urban District of Sutton-in-Ashfield

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 the Urban District of Sutton-in-Ashfield, which sustained an overall very-low density of bombing, as represented by bomb density data figures, see [Section 11.3](#). Although Sutton-in-Ashfield itself was not a target for bombing, any incidents recorded can likely be attributed to the presence of Nottingham to the southeast and Derby to the southwest. This part of Nottinghamshire was often used by the Luftwaffe while they travelled to and from targets across northern England. As such, some incidents were likely dropped via opportunistic 'tip and run' raids. These were indiscriminate attacks on infrastructure near confirmed targets.

Records of bombing incidents in the civilian areas of the district 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 the Urban District of Sutton-in-Ashfield between 1940 and 1945.

Record of German Ordnance Dropped on the Urban District of Sutton-in-Ashfield		
Area Acreage		10,507
Weapons	High Explosive bombs (all types)	6
	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		6
Number of Items per 1,000 acres		0.6
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. Nottinghamshire Incident Sheets and Reports

Written incident sheets and reports were obtained from Nottinghamshire Archives. A transcript of the relevant written records is presented in the table below. Example imagery of these entries are presented in **Annex H**.

Nottinghamshire Incident Sheets and Reports – Annex H			
Date	Size of bomb/incident number	Record Transcription	Comments
4 th December, 1940	UXB AA Shell No.212.	Occurred in Sutton-in-Ashfield. Examination proved that the reported UXB was an AA Shell and had been removed.	<i>The site was located within Sutton-in-Ashfield. However, no information could be found to place this incident specifically on-site.</i>
11 th April, 1941	6 x HE 337	The bomb struck the corner of the LNE Railway sidings of the New Hucknall & Winter Bank Collieries Huthwaite. Sidings from the main line are blown up and are impassable to traffic. The main line is unaffected. A request was received from North Midland Regional control at 03:18 hours for 5 rescue parties to rendezvous at Mount Pleasant, Walsgrave, Coventry, to arrive at 0700 hours.	<i>The New Hucknall Colliery was located approximately 3.9km to the southwest. The Winter Bank Colliery was located approximately 7.7km to the southwest. These were too far from the site to be of concern.</i>
11 th May, 1941	1 x IB 356	IB impacted Columbia Avenue and Huthwaite Road within Sutton-in-Ashfield.	<i>Columbia Avenue was located approximately 3.1km to the southwest. Huthwaite Road was located approximately 2.85km to the southwest. While the site was located within Sutton-in-Ashfield, these roadways were too far from the site to be of concern.</i>
11 th May, 1941	1 x IB	1 Incendiary bomb fell at 27 Columbia Avenue, Nuthwaite Road, Sutton-in-Ashfield. There was no damage or casualties recorded.	<i>Columbia Avenue was located approximately 3.1km to the southwest. Huthwaite Road was located approximately 2.85km to the southwest. While the site was located within Sutton-in-Ashfield, these roadways were too far from the site to be of concern.</i>



11.5. Operations Reports to the County Emergency Committee

Written records from the County Emergency Committee were obtained from Nottinghamshire Archives. A transcript of the relevant written records is presented in the table below. Example imagery of these entries are presented in **Annex I**.

Operations Reports to the County Emergency Committee– Annex I			
Date	Size of bomb	Record Transcription	Comments
21 st April, 1941	6 x HE	6 HE bombs fell on the 11th of April at the corner of the LNE Railway sidings of New Hucknall and Winter Bank Collieries, Huthwaite. Sidings from the main line were blown up and made impassable to traffic. No casualties were sustained.	<i>The New Hucknall Colliery was located approximately 3.9km to the southwest. The Winter Bank Colliery was located approximately 7.7km to the southwest. These were too far from the site to be of concern.</i>

11.6. Nottinghamshire War Diary

Written records were obtained from Nottinghamshire Archives. A transcript of the relevant written records is presented in the table below. Example imagery of these entries are presented in **Annex J**.

Nottinghamshire War Diary – Annex J			
Date	Size of bomb	Record Transcription	Comments
19 th November, 1940	1 x UX HE No.212	Unexploded HE recorded at Wrightware Ltd, Kirkby Folly Road, Sutton-in-Ashfield.	<i>Kirkby Folly Road was located approximately 2.3km to the southeast.</i>

11.7. Home Intelligence Summary Files

Written Home Security Intelligence Summaries & Air Raid Files were obtained from the National Archives. The record was compiled by local Air Raid Precaution (ARP) personnel and volunteers during the war, and records the location, date and time of bombing raids, as well as the types of bomb used, and the damage caused.

This record set was checked, and an incident within 'Sutton-in-Ashfield' was found. The site was located on the outskirts of Sutton-in-Ashfield.

11.8. Notts Free Press (May 20th, 1966) Anecdotal Information

According to anecdotal evidence, a 1kg German incendiary bomb was discovered amongst a pile of garbage in the general Skegby Area. The Notts Free Press suggests this bomb had been dropped on Skegby during the winter of 1940, but considering the lack of bombing sustained in this part of Sutton-in-Ashfield, that is unlikely.¹ As a Home Guard ammunition store at the back of 9a Omberley Avenue, any found incendiaries were likely a by-product of transporting these products to Omberley Avenue.

See **Annex L** and Section 13.2 for more details.

¹ Notts Free Press, 20th May 1966



11.9. WWII-Era Aerial Photography

WWII-era aerial photography for the site area was obtained from the National Monuments Record Office (Historic England) / the Aerofilms Collection available from Britain from Above. This photography provides a record of the potential composition of the site during the war, as well as its condition immediately following the war (see **Annex K**).

WWII-Era Aerial Photography	
Date/Title	Description
11 th of August, 1945	This post-war aerial image, dated 1945, shows the site was occupied by open vegetated land. There was no clear evidence of bomb damage in or around the general site area.
13 th April, 1950	This oblique 1950 image shows the site was occupied by open vegetated land, with residential structures to the south. From this distance, it is hard to be sure, but there appeared to be no clear signs of damage in or around the site boundary.
2 nd May, 1953	This post-war aerial image, dated 1953, conveys the site to be occupied by open vegetated land, with several structures and a driveway within its central section. Despite the low quality of the image, no visible evidence of bomb damage was in or around the general site area.
2 nd May, 1953	This low-quality aerial image, dated 1953, similarly shows no discernible evidence of damage in or around the site boundary.

11.10. 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.

11.11. 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, Griffiths Services & Developments Ltd will be advised.

11.12. Evaluation of German Air Delivered UXO Records

German Air Delivered UXO Records Summary	
Factors	Conclusion
<p>Density of Bombing</p> <p><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></p>	<p>During WWII, the site was situated within the Urban District of Sutton-in-Ashfield. According to official Home Office bombing statistics, this district was subject to an overall very low bombing density, with an average of 0.6 items of ordnance recorded per 1,000 acres. Any incidents were likely sporadic, caused by Sutton-in-Ashfield's proximity to cities such as Nottingham and Derby. Such attacks were called 'tip and run' raids; they were opportunistic, indiscriminate attacks to areas near confirmed targets.</p> <p>Local bomb incident records were checked. There was no positive evidence found of bombing within the immediate site locality. Whilst several incidents occurred within Sutton-in-Ashfield, none appeared to have impacted the site itself. A 1kg incendiary bomb was referenced being found in a pile of rubbish at the rear of No. 9a Omberley Avenue (to the south-west of the site). The area was referenced as being used by the Home Guard – so it is probable that the item of disposed of there, rather than fell there, as no official record of IBs being dropped could be found.</p>
<p>Damage</p> <p><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></p>	<p>As the site primarily comprised open, vegetated land, any major bomb damage would have likely taken the form of cratering, circular depressions, scattered earth, or indentations to the ground. None of these indicators were visible on-site within 1945 or 1953 aerial photography.</p>
<p>Ground Cover</p> <p><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></p>	<p>According to OS mapping and post-war aerial imagery, the site was primarily occupied by open vegetated land. As such, it is expected that the nature of the ground cover present during the war was uncondusive to the detection of UXO indicators. This is because features such as disturbed ground and bomb entry holes (which could be as small as 20cm in diameter) could have been easily overlooked or obscured in such conditions.</p>
<p>Access Frequency</p> <p><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></p>	<p>It is anticipated that the majority of the site area did not experience a frequent and regular level of access during WWII, access was likely caused by the site's proximity to Beck Lane to the east and residential structures to the south (see Annexes D and K). However, given the proximity of these structures and Beck Lane to the site, the site was likely still subject to some degree of monitor.</p>
<p>Bomb Failure Rate</p>	<p>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.</p>
<p>Abandoned Bombs</p>	<p>1st Line Defence holds no records of abandoned bombs at or within the site vicinity.</p>



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.

This section of the report discusses the generic types of Allied ordnance typically encountered on areas associated with former military activity.

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
<ul style="list-style-type: none"> • Anti-aircraft gun emplacements to engage enemy aircraft. • Fighter aircraft to act as interceptors. • Rockets and missiles were used later during WWII. 	<ul style="list-style-type: none"> • 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**.

12.4. Land Service Ammunition

Due to the historical evidence of incendiaries being recorded within Omberley Avenue during WWII, items of LSA are being considered for this report.

The term LSA covers items of ordnance that are propelled, placed, or thrown during land warfare. These items may be filled or charged with explosives, smoke, incendiary, or pyrotechnics and can be divided into five main groups:

Land Service Ammunition (LSA)	
Item	Description
Mortar Rounds	A mortar round is normally nosed-fused and fitted with its own propelling charge. Its flight is stabilised by the use of a fin. They are usually tear-drop shaped (though older variants are parallel sided), with a finned 'spigot tube' screwed or welded to the rear end of the body which houses the propellant charge. Mortars are either High Explosive or Carrier (i.e. smoke, incendiary, or pyrotechnic).
Grenades	A grenade is a short range weapon designed to kill or injure people. It can be hand thrown or fired from a rifle or a grenade launcher. Grenades either contain high explosive or smoke producing pyrotechnic compounds. The common variants have a classic 'pineapple' shape.
Projectiles	A projectile (or shell) is propelled by force, normally from a gun, and continues in motion using its kinetic energy. The gun a projectile is fired from usually determines its size. A projectile contains a fuzing mechanism and a filling. Projectiles can be high explosive, carrier or Shot (a solid projectile).
Rockets	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.
Landmines	A landmine is designed to be laid on or just below the ground to be exploded by the proximity or contact of a person or vehicle. Landmines were often placed in defensive areas of the UK to obstruct potential invading adversaries.

In the UK unexploded or partially exploded mortars and grenades are the most common items of LSA encountered, as they could be transported and utilised anywhere. They are mostly encountered in areas used for military training and are often found discarded on or near historical military bases.

Images of the most commonly found items of LSA are presented in **Appendices v - vii**.

12.5. Small Arms Ammunition

Due to the historical evidence of incendiaries being recorded within Omberley Avenue during WWII, items of SAA are being considered for this report.

The most common type of ordnance encountered on land used by the military are items of Small Arms Ammunition (SAA). SAA refers to the complete round or cartridge designed to be discharged from varying sized hand-held weapons such as rifles, machine guns and pistols. SAA can include bullets, cartridge cases and primers/caps. Example images of the most SAA are presented in **Appendix viii**.

13. The Likelihood of Contamination from Allied Ordnance

13.1. Introduction

When undertaking construction work within or immediately adjacent to a site with previous and/or current military use, it is often considered likely to contain an elevated risk of contamination from Allied UXO. This assumption of risk is based on the following reasoning:

- The clearance of ordnance from military camps, depots, storage facilities, ranges and training areas were not always effectively managed, or undertaken to equivalent degrees of certainty. In addition, search and detection equipment used over seventy years ago following WWII has proved ineffective both for certain types of UXO and at depths beyond capability.
- In the vast majority of cases, explosive ordnance would have been stored and available for use at military installations. Ordnance ranged from small arms and land service ammunition to weapons components and larger, air delivered items. During periods of heightened activity, ordnance was also frequently lost in transit, particularly between stores and assigned training locations.
- The military generally did not anticipate that their land would be later sold for civilian development, and consequently appropriate ordnance disposal procedure was not always adhered to. It was not uncommon for excess or unwanted ordnance to be buried or burnt within the perimeters of a military establishment as a means of disposal. Records of such practice were rarely kept.

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. 9a Omberley Avenue Ammunition Store

Information provided in the Notts Free Press indicates that a Home Guard 'ammunition store' was located at the back of 9a Omberley Avenue, approximately 130m to the south-west.

The store was first reported when Horace Challenor (former member of the Home Guard) informed the police that the land behind 9a Omberley Avenue had been used as an ammunition store, with a potential 240 'molotov cocktails' still remaining. The police opened an investigation to find the exact location of these bombs, but considering there was a 21-year time gap between 1966 and the end of WWII, they found it difficult.² The grenades were said to have been buried in a trench some 8ft from the hedge at the rear of the plot.

Nevertheless, a phosphorous and 'Molotov cocktail' (the latter believed to be a SIPS grenade) was found on wasteland at Omberley Avenue by BDS. However, it is unknown whether these were found at 9a Omberley Avenue specifically or at one of the neighbouring houses. Given that during the 1940s and 1950s, No 9 Omberley Avenue was an open plot of land – and two Nissen huts are noted to the rear of the land – it is thought probable that this was the only area used by the Home Guard.

It was common for local Home Guard units to base ammunition depots in discreet locations to ensure quick access in the event of a German invasion. These depots were typically managed by the Home Guard squadrons themselves because they were regularly familiar with the affected area. No evidence, anecdotal or otherwise, could be found to indicate that the proposed development site itself was utilised by the Home Guard.

For more information about the Sutton-in-Ashfield Home Guard, see **Annex M** and [Section 13.3](#).

² Notts Free Press, 20th May 1966

13.3. Nottinghamshire Home Guard

The 7th (Sutton-in-Ashfield) Battalion was formed in May 1940 following the redesignation of the Local Defence Volunteer Company (see **Annex M**). However, little specific information was available regarding this unit. As they wore the Sherwood Foresters camp badge, it is expected they were affiliated with them in some capacity.³

Nonetheless, it is known that the Sutton-in-Ashfield units used the area around Huthwaite as a training ground along with other Home Guard units. In these areas, they performed military exercises (including shooting practice) but used wooden or makeshift weapons until they had completed their training. At this point, they were issued either a Lee-Enfield or a 'Tommy Gun', which they would regularly handle whilst on duty.⁴

As expressed in [Section 13.3](#) it was common for local Home Guard units to base ammunition depots in discreet locations to ensure swift access to such items in an emergency. These depots were often known personally by the units themselves and kept confidential for secrecy purposes.⁵ The Sutton-in-Ashfield regiment reportedly had a small store of over 200 items at the back of 9a Omberley Avenue, approximately 130m southwest of the site. As such, it is considered likely that there was at least some level of Small Arms Ammunition (SAA) handling, storage and usage across this part of Nottinghamshire.

See **Annex M** for more details.

13.4. King's Mill Military Hospital

Land associated with the King's Mill Hospital dates back to 1834 when it was the Mansfield Union Workhouse. Over this period, it provided accommodation and labour for those in destitution. Over time, it became a great location to house the sick and elderly, with more medical services being introduced to meet local needs.

After the war broke out in 1939, King's Mill experienced numerous changes. Designated as an Emergency Medical Service (EMS) hospital, they provided medical care for military and civilian casualties. Over the next few years, King's Mill specialised in treating the injured in Nottinghamshire. However, from 1943, sections of King's Mill were requisitioned/used by the United States Army as a military hospital - and was referred to as the 30th General Hospital of the University of California. They notably treated injured soldiers, including those evacuated from the frontlines in Europe. As such, there was increased American presence in the surrounding area, with military vehicles, equipment and personnel spotted in greater Mansfield.⁶

King's Mill served as a military hospital until the end of the war and is reported to have treated as many as 400 injured American servicepeople. It was also known to have housed German and Italian POWs. Later, as the war ended, POWs were seen in Sutton-in-Ashfield in brown uniforms with either a yellow diamond or circular path on the seam.⁷

³ Nanrah, G. (2020, July 19). *The Notts Hospital that treated injured American troops in WWII*. Nottinghamshire Live. <https://www.nottinghampost.com/news/nottingham-news/nottinghamshire-hospital-first-run-military-4336891>

⁴ (Nanrah, 2020)

⁵ (Nanrah, 2020)

⁶ Raynor, M. (n.d.). *Tanks and American soldiers*. Our Mansfield & Area. <https://www.ourmansfieldandarea.org.uk/content/place/mansfield/mansfield-military/tanks-and-american-soldiers>

⁷ (Raynor, *Tanks and American soldiers*)

13.5. 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
<p>Military Camps</p> <p><i>Military camps present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training.</i></p>	<p>1st Line Defence could find no evidence of a military camp within the site.</p>
<p>Anti-Aircraft Defences</p> <p><i>Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.</i></p>	<p>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 10.5km northwest of the site, in the vicinity of Lings Pond. Despite this distance the maximum effective range of an AA projectile can be up to 15km.</p> <p>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.</p>
<p>Home Guard Activity</p> <p><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></p>	<p>According to anecdotal information, the 7th (Sutton-in-Ashfield) Battalion was formed in May 1940 and operated until 1945. They reportedly used the area around Huthwaite as a training ground along with other Home Guard Units. As part of this training, they performed military exercises (including shooting practice) but used wooden or makeshift weapons until they had finished their training. At this point, they were issued either a Lee-Enfield or a 'Tommy Gun', which they would use whilst on duty.⁸</p> <p>Anecdotal information similarly recorded that a Sutton-in-Ashfield Home Guard regiment had a small store of over 200 items at the back of 9a Omberley Avenue, approximately 70m to the southwest. It was common for local Home Guard units to base ammunition depots in discreet locations to ensure swift access to such items in an emergency. These depots were often personally known to the units and were kept confidential for secrecy purposes.</p>
<p>Defensive Positions</p> <p><i>Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.</i></p>	<p>There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.</p>
<p>Training or firing ranges</p> <p><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></p>	<p>No evidence of training or firing ranges could be found within the site or surrounding area.</p>

⁸ (Nanrah, 2020)



<p>Defensive Minefields</p> <p><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></p>	<p>There is no evidence of defensive minefields affecting the site.</p>
<p>Ordnance Storage/Manufacture</p> <p><i>Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.</i></p>	<p>As expressed above, a home Guard regiment reportedly had a small store of over 200 items at the back of 9a Omberley Avenue, approximately 70m to the southwest. It was common for Home Guard units to base ammunition depots in discreet locations to ensure swift access to such items in an emergency. The items were recorded as a potential 240 'molotov cocktails', but in 1966 an IB and SIPS grenade was found, and no Molotov cocktails (see Annex L and <u>Section 13.2</u> for more details). No references could be found to the site being used by the Home Guard.</p>
<p>Military Related Airfields</p> <p><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></p>	<p>The site was not situated within the perimeters or vicinity of a military airfield.</p>

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	<p>The research has evaluated pre- and post-WWII Ordnance Survey maps, Luftwaffe reconnaissance imagery, Incident Sheets and Reports, Operational Reports to the County Emergency Committee, Nottinghamshire War Diary, Home Intelligence Summary Files, WWII-era Aerial Photography, Skegby Gardens Bomb Finds, May 20th 1966, Home Guard Photography, King's Mill Photography, Visual Overlay of Allied Landmarks and available anecdotal information.</p> <p>While the National Archives, Nottinghamshire Archives and anecdotal records were consulted during the production of this report, the record set is generally considered to be of mixed quality. However, all consulted record sets indicated that there was no positive evidence of bombing on site.</p>
German Air-Delivered Ordnance	<ul style="list-style-type: none"> During WWII, the site was situated within the Urban District of Sutton-in-Ashfield. According to official Home Office bombing statistics, this district was subject to an overall very low bombing density, with an average of 0.6 items of ordnance recorded per 1,000 acres. This comprised of only six high explosive bombs. This can largely be attributed to the lack of identifiable targets within the borough. Any incidents are believed to have been largely sporadic, caused by Sutton-in-Ashfield's proximity to Derby, Nottingham and along the flight path to northern England. Such attacks were called 'tip and run' raids; they were opportunistic, indiscriminate attacks to areas near confirmed targets. According to historic OS mapping, during WWII, the site was occupied by open vegetated land adjacent to Cock Lane to the east and residential properties to the south. No positive evidence of bombing was recorded on or bordering the site boundary within available records. While several incidents were recorded within Sutton-in-Ashfield (see Annexes H, I and J), none had any indicators that positively identified them with the site area. While one IB bomb was discovered in a rubbish pile near the site, this was thought likely to have been a by-product of the nearby Home Guard ammunition store and not due to bombing (see Section 11.8 for more details). No evidence of bomb damage was visible in or along the site boundary within WWII-era and post-war aerial photography. Given the site's largely open composition, any damage would have typically taken the form of cratering, scattered earth, or indentations to the ground. However, none of these were visible on-site. It is likely the ground cover present on-site would have been largely uncondusive towards the detection of UXO indicators due to the site's primarily soft, vegetated composition. It is also anticipated that the vegetated areas did not experience frequent access during WWII. However, the proximity of nearby residential properties and a roadway to the east may have provided the site and its immediate surroundings with a degree of observation. In summary, no positive evidence of bombing in or around the site boundary could be found within available record sets, and no damage indicators are observable in post-war aerial imagery. Although the possibility of UXO falling unnoticed within the site area cannot be entirely dismissed (due to the site's open nature and the limited locational descriptions provided concerning some of the bombing incidents within Sutton-in-Ashfield), no positive evidence could be found to suggest that the site area is at an elevated risk of encountering German UXBs. For this reason, the risk of UXO remaining on-site has been assessed as Low.
Allied Ordnance	<ul style="list-style-type: none"> Information provided in the Notts Free Press indicates that a Home Guard 'ammunition store' was located at the back of 9a Omberley Avenue, approximately 130m to the south-west of the site. The store was first reported when Horace Challenor (former member of the Home Guard) informed the police that the land behind 9a Omberley Avenue had been used as an ammunition store, with a potential 240 'molotov cocktails' still remaining. The police opened an investigation to find the exact location of these bombs, but considering



	<p>there was a 21-year time gap between 1966 and the end of WWII, they found it difficult. The grenades were said to have been buried in a trench some 8ft from the hedge at the rear of the plot. If the location described is accurate, this would put the plot of land and trench some 135m from the proposed development site.</p> <ul style="list-style-type: none">• A phosphorous grenade/'Molotov cocktail' (a self-igniting phosphorous or 'SIPS' grenade) was found during the search of the land amongst a pile of rubbish. Given that during the 1940s and 1950s, No 9 Omberley Avenue was an open plot of land – and two Nissen huts are noted to the rear of the land – it is thought probable that this was the area used by the Home Guard. The main reported cache of 240 grenades could not be found despite an extensive search – and the area was declared 'free from danger'.• It was common for local Home Guard units to base ammunition depots in discreet locations to ensure quick access in the event of a German invasion. These depots were typically managed by the Home Guard squadrons themselves because they were regularly familiar with the affected area. No evidence, anecdotal or otherwise, could be found to indicate that the proposed development site itself was utilised by the Home Guard.• King's Mill Military Hospital was situated approximately 550m southeast of the site. As such, there was a recorded American military presence within the surrounding area, often taking the form of personnel and tanks/other vehicles. Nonetheless, little information regarding their specific activities was available in accessible records. However, it is expected that its location (approximately 550m to the southeast) was too far from the site to be of immediate concern.• In summary, a local news reference was found to a Home Guard ammunition store at the rear of 9a Omberley Avenue, and that SIP grenades had been disposed of here in a trench. No evidence of such disposal at the plot of land could be found during investigations in 1966. If the location described is accurate, the burial area should be some 130m south-west of the site.• No official record of this depot – or of any Home Guard use of the area – could be found in local or national archive searches. It is not uncommon that official records of areas used by the Home Guard are hard to find, with most references coming from first hand/anecdotal sources. Nevertheless, no references, anecdotal or otherwise, could be found of the Home Guard using the site of the proposed development. The site has therefore been assessed at Low Risk of contamination from items of Allied unexploded ordnance. However, because of the nearby finds, the possibility of encountering UXO cannot be absolutely discounted, and it is recommended that ground personnel working on the site receive a UXO Safety and Awareness Briefing to make them aware of what to look out for, and what to do in the event that a suspect item is encountered. A UXO Risk Management Plan should also be compiled for the site.
--	---

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

Former military sites (or at least certain areas within their footprint) are often subject to clearance before they are returned to civilian use by the MoD. If a site is retained by the military, it is possible that no clearance operations have ever been undertaken. However, UXO is sometimes still discovered even on sites where clearance operations are known to have been undertaken. The detail and level of survey and targeted investigation undertaken by the military will depend on the former use of the site and purpose of the clearance (i.e. disposal, redevelopment, return to agriculture, etc.). The level of clearance will also depend on the available technology, resources and practices of the day.

It therefore cannot be assumed that the risk of UXO remaining has been completely mitigated, even though EOC tasks have been undertaken at a former military site.

15.3. Post-War Redevelopment

There appears to have been some development on-site since WWII. Most notably, numerous structures are now within its central section, and a lone property is within its southeastern corner. There is also a hard-sounding driveway across the site's southern section.

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.

16.3. Land Service/Small Arms Ammunition Encounter

Items of LSA and SAA are mostly encountered in areas previously used for military training. Such items could have been lost, burnt, buried or discarded during being in use by the military. Due to this, LSA are most likely to be encountered at relatively shallow depths – generally in the top 1m below ground level. Therefore, such items are most likely to be encountered during open excavation works. In some cases, there is the potential that LSA or SAA may be present on the surface of the ground – especially in areas with active military use or were recently in use by the MoD.

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.

17.3. Land Service/Small Arms Ammunition Initiation

Items of LSA generally do not become inert or lose their effectiveness with age. Time can cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays, or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

If left alone, an item of LSA will pose little/no risk of initiation. Therefore, if it is not planned to undertake construction/intrusive works at the site, the risk of initiation of any LSA that may be present would be negligible. Similarly, those accessing a contaminated area would be at minimal risk if they do not interfere with any UXO present on the ground. Clearly for many end uses, however, the presence of UXO anywhere on a site would not be acceptable as it could not be guaranteed that the items will not be handled, struck or otherwise affected, increasing the likelihood of initiation.

Items of SAA are much less likely to detonate than LSA or UXBs, but can be accidentally initiated by striking the casing, coming into contact with fire, or being tampered with/dismantled. It is likely that the detonation of an item of SAA would result in a small explosion, as the pressure would not be contained within a barrel. Detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

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 **Low 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 Land at Beck Lane, Sutton-in-Ashfield:

Recommended Risk Mitigation Measures	
Activity	Recommended Risk Mitigation Measure
All Works	<ul style="list-style-type: none"> 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

27/1/2025

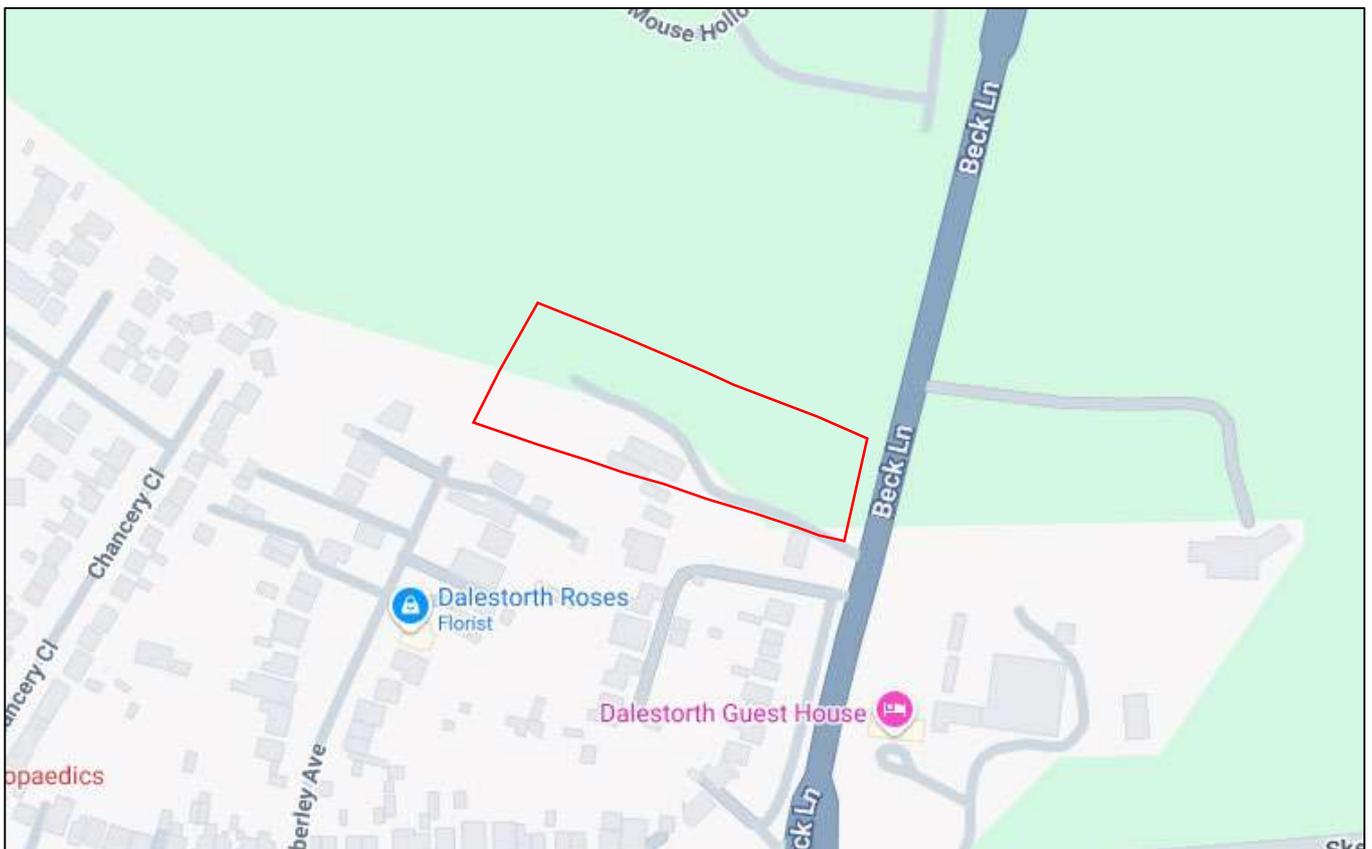
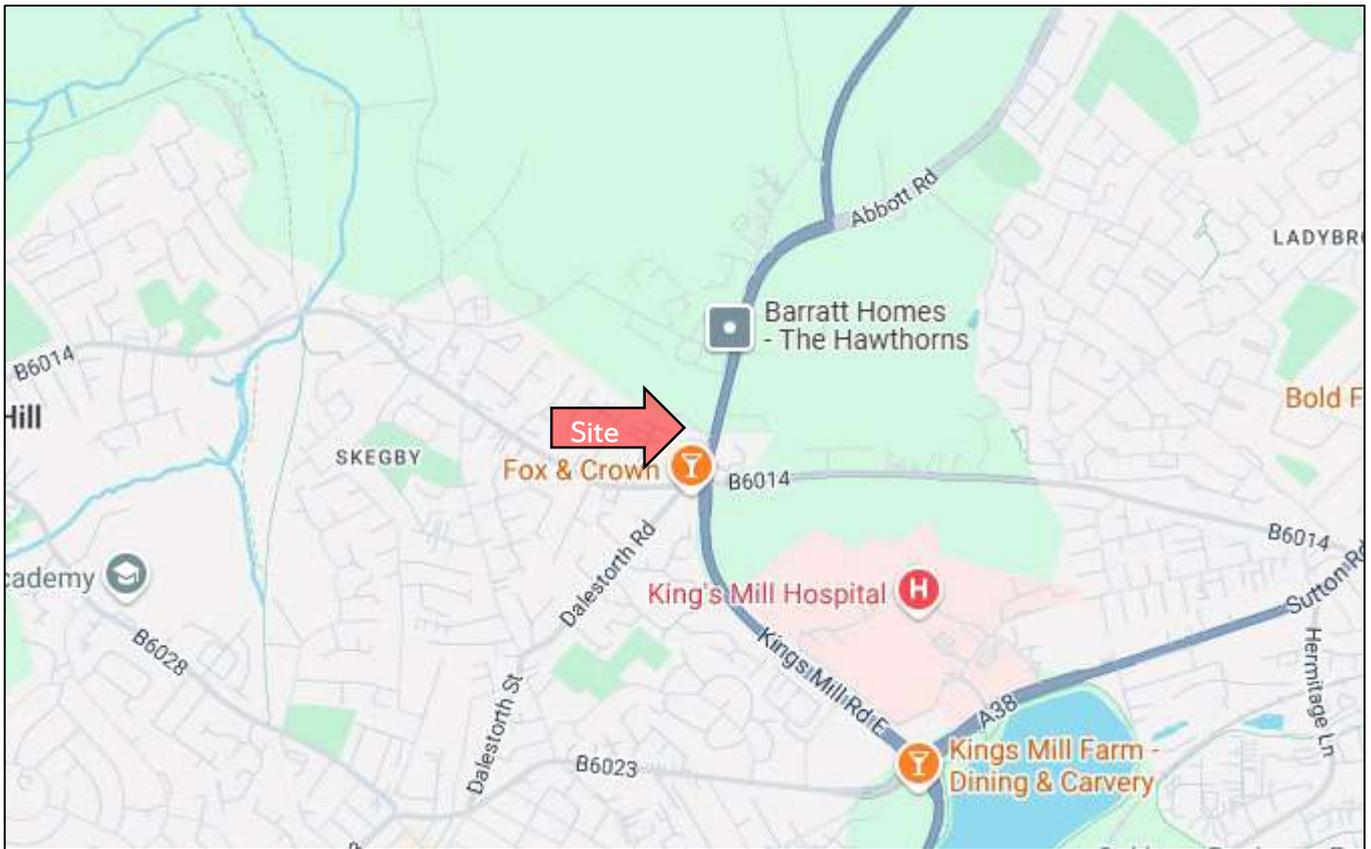
This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

Bibliography

- Bates, H. E., *Flying Bombs over England*, Frogletts Publications Ltd., 1994
- Castle, I., *London 1914-17: The Zeppelin Menace*, Osprey Publications Ltd., 2008
- Castle, I., *London 1917-18: The Bomber Blitz*, Osprey Publications Ltd., 2010
- Clarke, N. J., *Adolf Hitler's Holiday Snaps: German Aerial Reconnaissance Photography of London and the Home Counties 1939 – 1943*, N. J. Clarke Publications., 1996
- Clarke, N. J., *Adolf Hitler's Holiday Snaps: German Aerial Reconnaissance Photography of Southern England 1939 – 1943*, N. J. Clarke Publications., 1995
- Clarke, N. J., *Adolf's British Holiday Snaps: Luftwaffe Aerial Reconnaissance Photographs of England, Scotland and Wales*, Fonthill Media Ltd., 2012
- Dobinson, C., *AA Command: Britain's Anti-Aircraft Defences of the Second World War*, Methuen., 2001
- Fegan, T., *The 'Baby Killers': German Air raids on Britain in the First World War*, Leo Cooper Ltd., 2002
- Fleischer, W., *German Air-Dropped Weapons to 1945*, Midland Publishing., 2004
- Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, Channel 4 Books., 2001
- Morris, J., *German Air Raids on Britain: 1914 – 1918*, The Naval & Military Press., 1993
- Nanrah, G. (2020, July 19). *The Notts Hospital that treated injured American troops in WWII*. Nottinghamshire Live. <https://www.nottinghampost.com/news/nottingham-news/nottinghamshire-hospital-first-run-military-4336891>
- Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, Purnell Book Services Ltd., 1977
- Ramsey, W., *The Blitz Then and Now, Volumes 1,2 & 3*, Battle of Britain Prints International Ltd., 1987, 1988 & 1990
- Raynor, M. (n.d.). *Tanks and American soldiers. Our Mansfield & Area*. <https://www.ourmansfieldandarea.org.uk/content/place/mansfield/mansfield-military/tanks-and-american-soldiers>
- Scofield, J., *Modern Military Matters.*, Council for British Archaeology., 2004
- Stone, K., et al., *Unexploded Ordnance (UXO) A Guide For The Construction Industry (C681)*, CIRIA, 2009
- Whiting, C., *Britain Under Fire: The Bombing of Britain's Cities 1940-1945*, Pen & Sword Books Ltd., 1999

This report has been prepared by 1st Line Defence Limited with all reasonable care and skill. The report contains historical data and information from third party sources. 1st Line Defence Limited has sought to verify the accuracy and comprehensiveness of this information where possible but cannot be held accountable for any inherent errors. Furthermore, whilst every reasonable effort has been made to locate and access all relevant historical information, 1st Line Defence cannot be held responsible for any changes to risk level or mitigation recommendations resulting from documentation or other information which may come to light at a later date.

This report was written by, is owned by and is copyrighted to 1st Line Defence Limited. It contains important 1st Line Defence information which is disclosed only for the purposes of the client's evaluation and assessment of the project to which the report is about. The contents of this report shall not, in whole or in part be used for any other purpose apart from the assessment and evaluation of the project; be relied upon in any way by the person other than the client, be disclosed to any affiliate of the client's company who is not required to know such information, nor to any third party person, organisation or government, be copied or stored in any retrieval system, be reproduced or transmitted in any form by photocopying or any optical, electronic, mechanical or other means, without prior written consent of the Managing Director, 1st Line Defence Limited, Unit 3, Maple Park, Essex Road, Hoddesdon EN11 0EX. Accordingly, no responsibility or liability is accepted by 1st Line Defence towards any other person in respect of the use of this report or reliance on the information contained within it, except as may be designated by law for any matter outside the scope of this report.



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

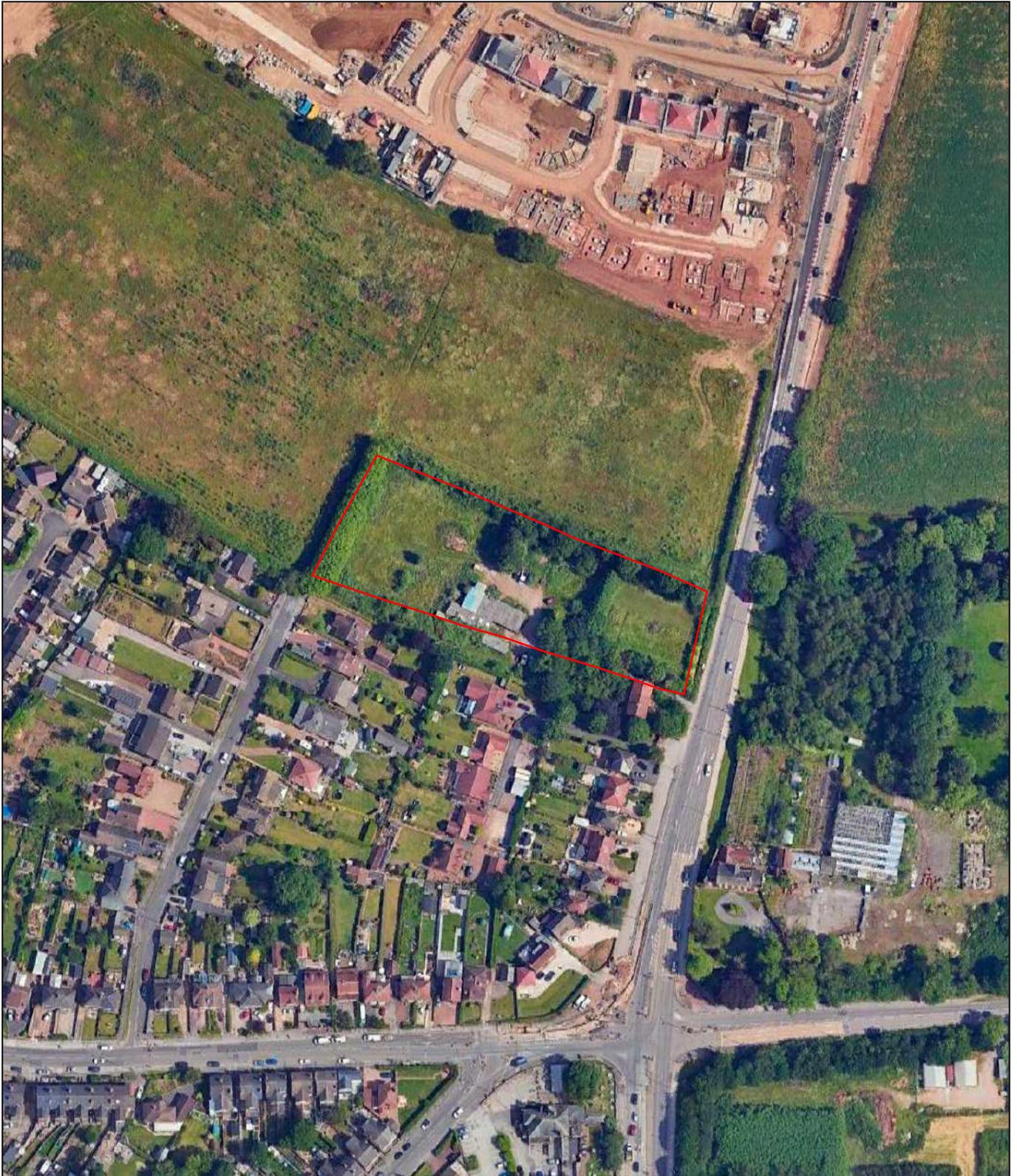
Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Google Maps

Approximate site boundary





1ST LINE DEFENCE

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

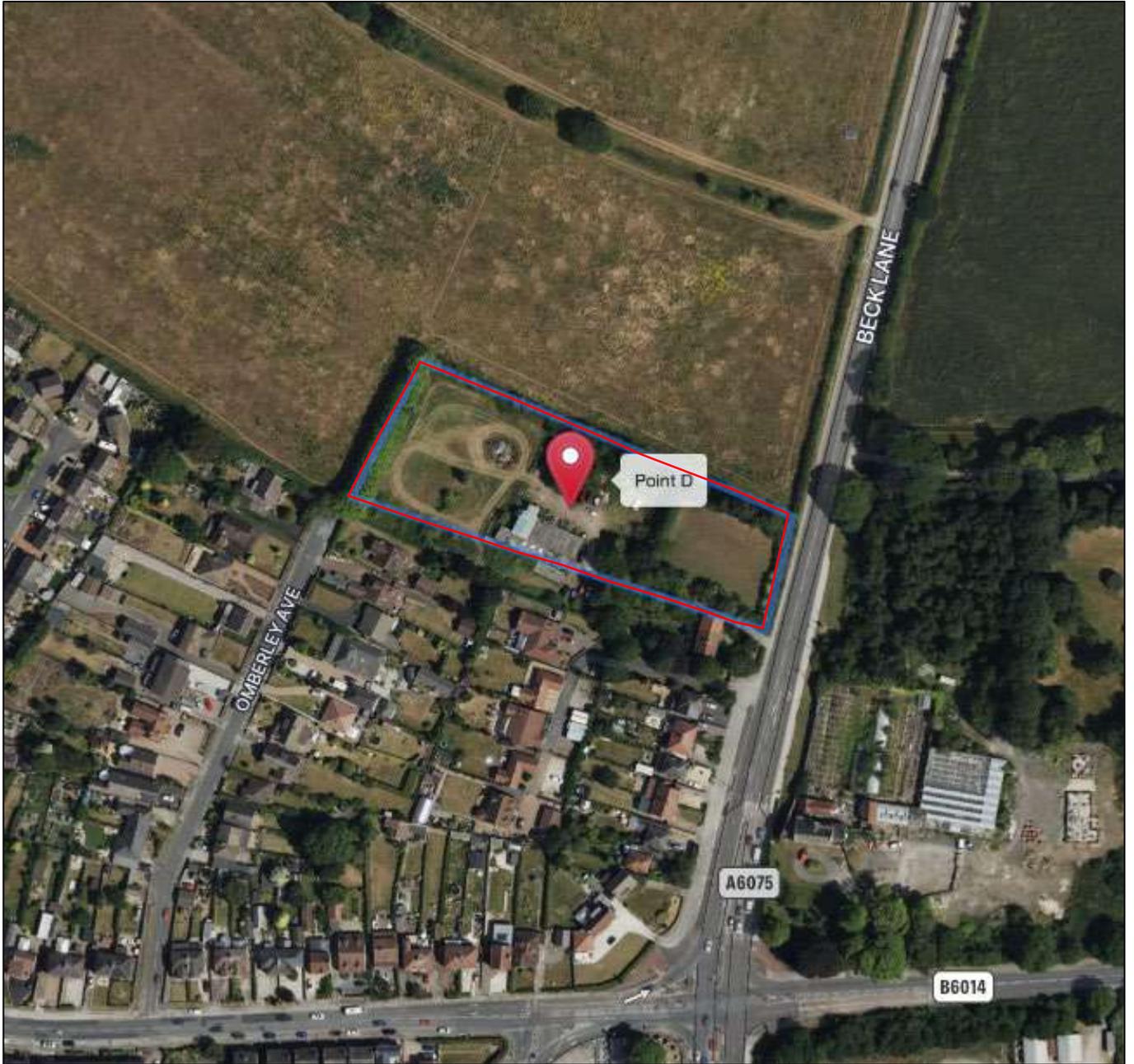
Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Google Earth

 Approximate site boundary





Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

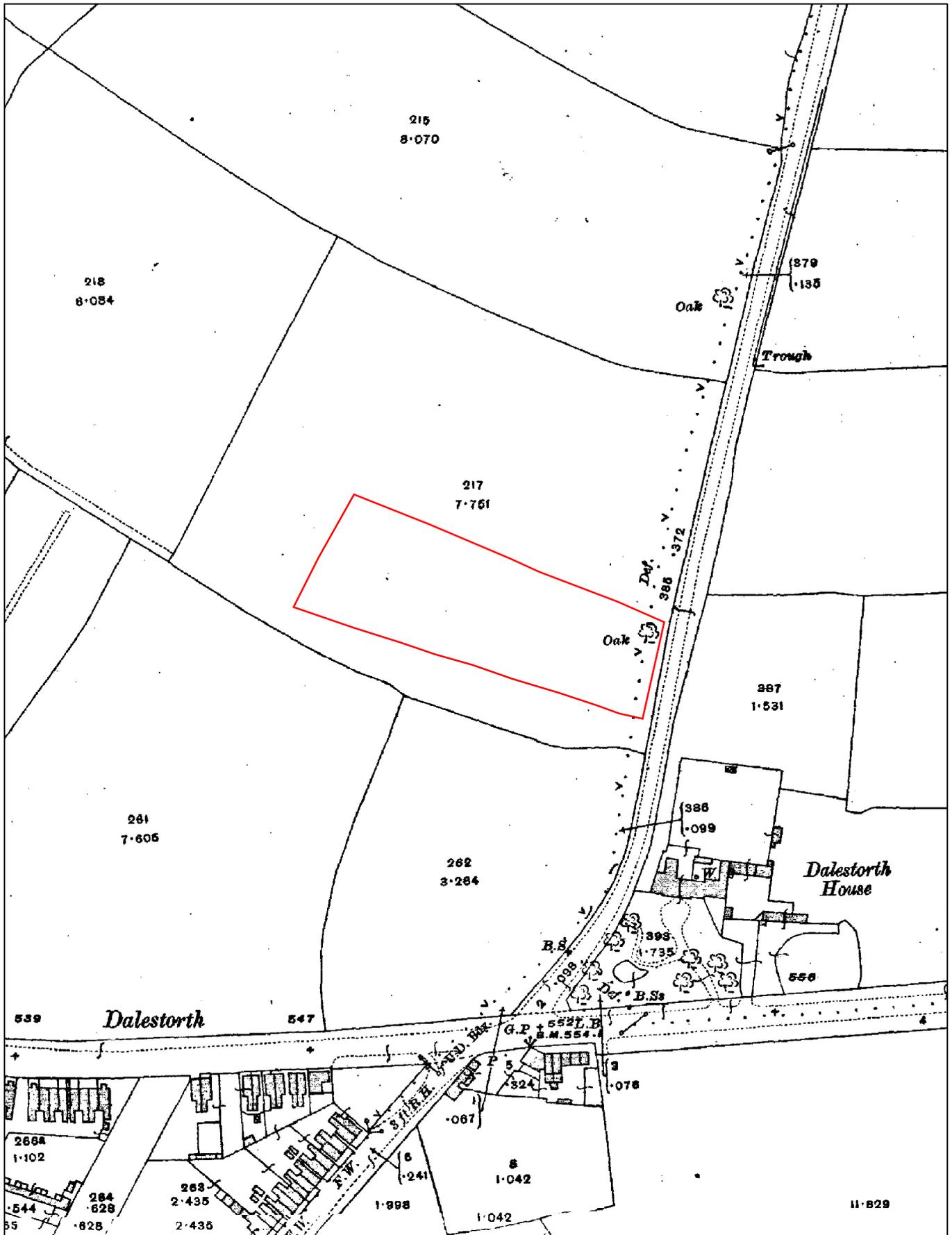
Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Griffiths Services & Developments Ltd

 Approximate site boundary





1ST LINE DEFENCE

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Landmark Maps

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

— Approximate site boundary






1ST LINE DEFENCE

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

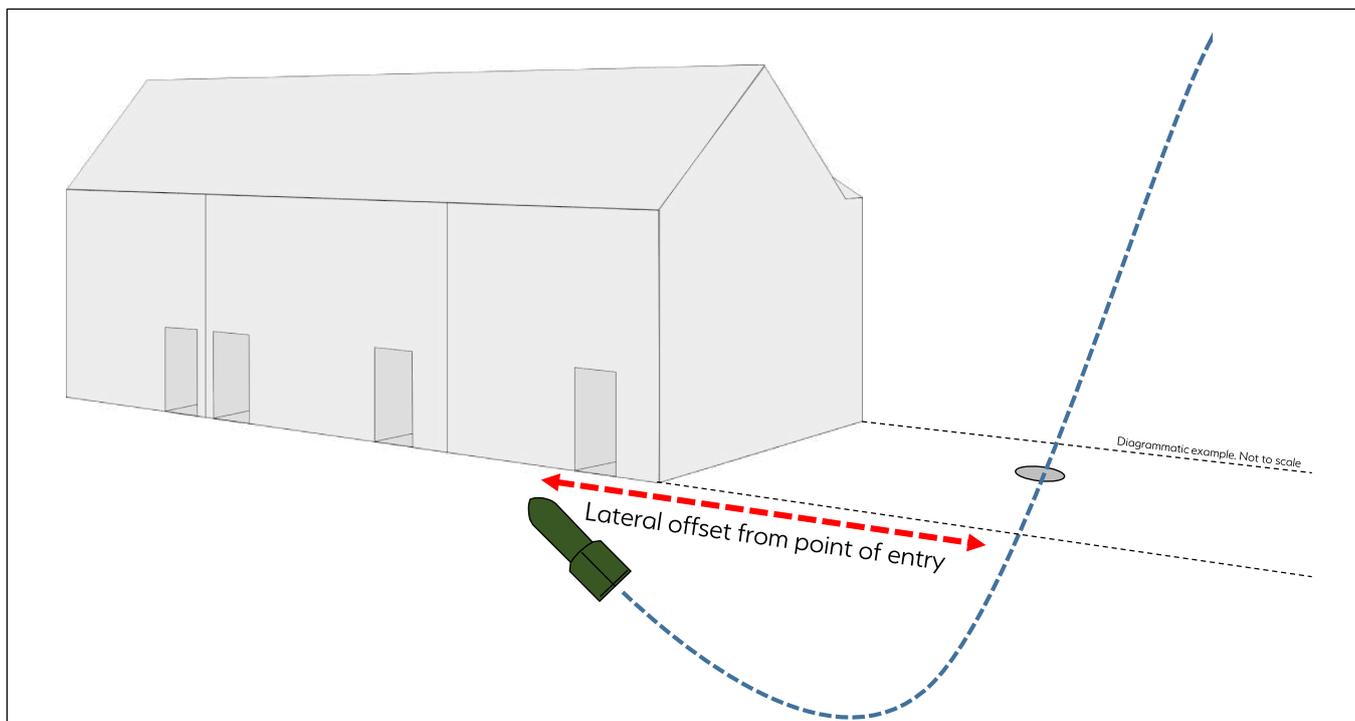
 **Approximate site boundary**



Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Landmark Maps



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**).

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

BBC NEWS



Plymouth unexploded WW2 bomb: Thousands of people displaced

A 500kg (1,102lb) German World War Two bomb that forced the evacuation of thousands of people in Plymouth has been detonated at sea.

The unexploded device was found in a garden on St Michael Avenue on Tuesday, sparking four days of disruption.

On Friday police closed roads and rail and bus services were stopped as the bomb was transported 1.4 miles (2.3km) through the city's streets.

The device was taken by boat beyond the breakwater and detonated at 21:51 GMT.



500kg German HE Bomb, February 2024



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: BBC News

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk

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

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



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

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 southwestern 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



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: BBC News

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk

BBC NEWS

Home Cost of Living War in Ukraine Climate UK World Business Politics Culture Tech

Unexploded WW1 artillery shell found in Newark

12th November 2020



The bomb was found when a machine operator was dredging the water.

An unexploded World War One artillery shell has been found in a river by a marina worker.

James Wilkinson, who works at Fleetisk Marina in Flettingham, was dragging the water at about 11:00 GMT when he uncovered the device.

A specialist bomb disposal unit carried out a controlled explosion to detonate the 18lb and 6in long "highly explosive" device.

Kirby residents react after grenade is detonated on housing estate

12th November 2020



Residents react after wartime grenade 'with pin still in it' is detonated on housing estate

By George King
Digital Audience and Content Editor
@Gorgrhenryking

Essex Police officers were called to the Taylor Wimpey housing development in Thorpe Road, Kirby Cross, after the 70 plus-year-old hand grenade was discovered.

YORKSHIRE POST

Army called after unexploded WW2 shell found in village near Ilkley

Police have released photos of an old wartime mortar shell that was found in a rural Yorkshire village.

By Grace Newton
Published 2nd Apr 2020, 12:04 BST
Updated 2nd Apr 2020, 12:06 BST

Army bomb disposal experts from the Royal Logistics Corps were called to Addingham, near Ilkley, yesterday to make the device safe.



Evening News

Police warning after discovery of unexploded mortar shell in Glossop moorland

Derbyshire Police described the find as 'very dangerous and unusual'



This unexploded mortar shell was found on moorland above Glossop (Image: Facebook/Glossop Postcard SMT)

The force said officers were alerted to the large metal shell on Saturday (February 20) by a member of the public.

It was identified by experts as an unexploded mortar shell, which the force described as 'very dangerous and unusual'.

Express & Star

Dozens more mortar shells found during work on Burntwood housing estate

By Luke Bartlett | Burntwood | Published: May 24, 2018 | 1 Comment

A large number of mortar shells have been discovered on a building site in Burntwood forcing businesses to evacuate.



The shells were found by Staffordshire Police on the site near Milestone Way, in Chasetown, and a 200m (656ft) cordon was soon after put in place.

Members of the public are being advised to stay away from the area near Morrisons supermarket while police deal with the shells.

Developers Taylor Wimpey and Baratt Homes were behind the plans to build 150 homes at Milestone Way.

Unexploded WW2 bomb found at Kenfig Pool, Bridgend

29 August 2014



Dean Smith believes the shell was made in Germany.

Bomb experts have been called to a south Wales nature reserve after an unexploded World War Two shell was discovered by a walker in Bridgend.

Dean Smith, 38, of Pyle, was walking near Kenfig Pool on Saturday when he saw a fin sticking out of the sand.

He reached down to pick it up, but ending up falling and landed with the 2ft-long (0.6m) bomb on top of him.

The site has been cordoned off by police and the Royal Logistics Corps will carry out a controlled explosion.

Swindon Advertiser

Worker on old school site in Swindon finds buried explosives

20th November 2020



At around 9.30am, the digger rubbed against the lid of something which was approximately 600mm below ground - and would have blown up instantly if broken.

AW Bombs are yellow phosphorus hand grenades in half pint clear glass bottles weighing 1.5lbs each, which ignite instantly once their liquid contents react with the outside air.

deadline.

December 14, 2020 | 1983

Locals on Isle of Wight find 1ft long unexploded WW2 bomb



AN UNEXPLoded World War Two bomb has been discovered by locals on the Isle of Wight.

Bomb disposal experts were deployed to the B3323 in Shorwell, after police arrived and identified the dangerous device.

Suffolk News

Icklingham mortar bomb is blown up by Army

Published: 16:46, 25 February 2015



Police had to guard an unexploded WW2 4in calibre mortar bomb overnight in a field near Icklingham until Army bomb disposal could blow it up on Tuesday.

The bomb had been found by farmworkers using a digger at about 2.50pm on Monday but by the time the Regiment Royal Logistic Corps' 621 Squadron, 11 Explosive Ordnance Disposal, from Colchester, had examined it it was too dark to carry out a controlled explosion.



Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Various news outlets

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

100 hand grenades found in Nottinghamshire woodland



Police said the weapons were found in woods off Clipstone Drive.

Bomb disposal experts were called to woodland in Nottinghamshire after 100 hand grenades were discovered.

The explosives were found in an area off Clipstone Drive, Forest Town, at about 11:45 BST on Monday.

Nottinghamshire Police said it was believed the Army had used the area for wartime weapons practice.

A "successful controlled explosion" was carried out by Joint Services Explosive Ordnance Disposal Engineers at 17:00 BST, a force spokesman said.

"No evacuations were necessary due to the rural location," he added.

A spokesperson for the Ministry of Defence (MoD) said: "We can confirm an Army Explosive Ordnance Disposal team was called out to Forest Town at the request of local police.

"A team from 11 EOD&S Regiment responded to the call-out in question. A number of items were safely destroyed in situ."



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

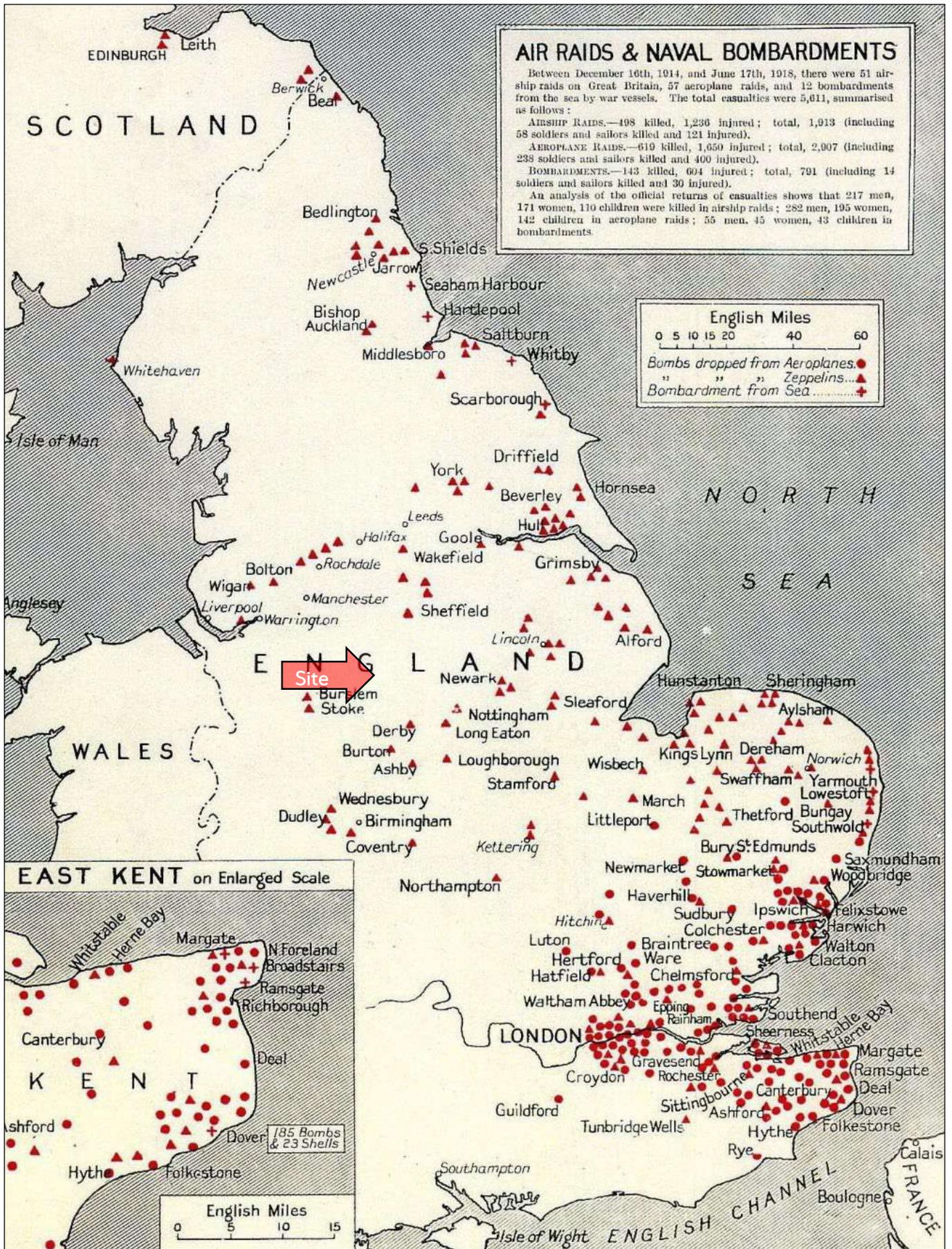
Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Various news outlets

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk



County District	Inci- dent No.	Place	INCIDENT SHEET. No. 41. 09.00 hours 4th December, 1940 to 09.00 hours 5th December.	Time and date	Type and No. of bombs	Casualties	Damage	Remarks
Sutton-in-Ashfield	Ref. 219							Examination proved that reported S.K.B. to be an A.A. Shell and has now been removed.
Bingham Rural	Ref. 219							

Sutton-in-Ashfield.	337	At corner of L.N.E. Railway Sidings of the New Hucknall & Winter Bank Collieries, Ruthorwaite.	09.25 hours 11.4.41.	H.E.	6	none	Sidings from the Main line are blown up and impassable to traffic. Main Line unaffected.	<p>A request was received from North Midland Regional Control at 03.18 hours for 5 Rescue Parties to proceed to Rendezvous at Mount Pleasant, Walsgrave, Coventry to arrive at 07.00 hours. The following parties were detailed :-</p> <ul style="list-style-type: none"> 1 from Mansfield Borough 1 " Mansfield Woodhouse 1 " Sutton-in-Ashfield 1 " Carlton Urban 1 " West Bridgford. <p><i>Quinn</i> for County Controller.</p>
---------------------	-----	--	-------------------------	------	---	------	--	---

Sutton in Ashfield Urban	356	Columbie Avenue Ruthorwaite Road Sutton in Ashfield	23.50 hours 11-5-41	I.B.	1	None	No damage.	All incidents reported on the 9th and 10th of May 1941 are quoted in my report to the Emergency Committee Meeting on the 19th May 1941.
--------------------------	-----	---	------------------------	------	---	------	------------	---

INTERIM OPERATIONAL REPORT.

Night: 11th/12th May 1941.

Bingham Rural District.

Number of incendiary bombs fell at 00.50 hours followed by 13 incendiary bombs at 01.10 hours. 3 women killed and 3 men injured. Serious damage caused to Grange Farm. Windows and ceilings of houses in vicinity damaged.

Small number of incendiary bombs fell at 00.58 hours in fields between Barnstone Cement Works and Langer-Barnstone Road in Parish of Barnstone. All fires extinguished. No damage or casualties.

Sutton-in-Ashfield Urban District.

1 incendiary bomb fell at 27 Columbie Avenue, Ruthorwaite Road, Sutton-in-Ashfield. No damage or casualties.



1ST LINE DEFENCE

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX

Email: info@1stlinedefence.co.uk

Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Nottinghamshire Archives

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk

COUNTY EMERGENCY COMMITTEE.
Monday 31st April 1941 at 8.15 p.m.
Operational Report for period 7th to 30th April 1941.

3 H.E. bombs
of Moorhouse-Ossington Road on
Sutton-in-Ashfield Urban District.
6 H.E. bombs fell on 11th April at corner of L.N.E. Railway Sidings
of New Hucknall and Winter Bank Collieries, Ruthwaite. Sidings
from the Main Line blown up and impassable to traffic.
No casualties.

INCIDENT SHEET, NO. 37. 02.00 hours 19th November 1940 to 02.00 hours 20th November 1940.							
County District	Ine-ident No.	Place	Time and date	Type and No. of bombs	Casualties	Damage	Remarks
Sutton-in-Ashfield Urban	518	Wrightware Ltd., Kirkby Polly Road, Sutton-in-Ashfield.	02.00 hours 19.11.40	Unexploded H.E.	none	no damage	



1ST LINE DEFENCE

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd	
Project: Land at Beck Lane, Sutton in Ashfield	
Ref: DA21211-00	Source: Nottinghamshire Archives
Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.	
www.1stlinedefence.co.uk	





Plot of land currently occupied by 9 Ormerley Avenue. Note two possible Nissen huts to rear – and open, undeveloped nature of the plot.



THE bitter memory of the black days of the Second World War flooded back to the people of Skegby on Monday when a Royal Army Ordnance Corps Bomb Disposal Unit were called to Omberley Avenue to unearth and destroy 240 "Molotov cocktails."

Although none of the phosphorous and benzine "bottle" bombs were discovered, Sapper J. Robertson found a German incendiary bomb amongst a pile of rubbish. The missile was of a one-kilogramme size thought to have been dropped by a bomber during the winter of 1940.

The possible presence of these anti-tank and infantry hand-bombs was brought to light when Mr. Horace Challenor, of 307, Mansfield Road, a member of the Home Guard, informed the police that during the days of conflict, the land now behind 9a, Omberley Avenue, had been used as an ammunition store.

The police then started enquiries to find the exact location of the bombs, but most of the members had died or moved away, thus making the task more difficult.

When the bomb disposal unit arrived, Capt. G. Gerdes told the *Notts. Free Press* that locating the "cocktails" would be a tricky and long job. It was thought that

Capt. G. Gerdes was not holding a bottle of milk for the dog, but a phosphorous and benzine Molotov cocktail and a partially live German incendiary bomb. They were found on waste land at Omberley Avenue, Skegby, by the Bomb Disposal Unit of the Royal Army Ordnance Corps during a search for a reputed 240 Molotov cocktails, or home-made anti-personnel bombs.

area being announced, it is too late to ascertain the exact location and depth.

Capt. Gerdes was told by a nearby resident that the bombs had been buried in a trench roughly eight feet from a hedge that grew at the rear of the land. The Captain said that to search this area could take days.

The unit's labours however, were given a boost when a local contractor, Mr. R. J. Ross, offered to bring up his bulldozer and take off the top 12 inches of the surface.

Once Mr. Ross had done his job, it was but a short task for the unit to check the area and declare it free from any danger.

With their efforts completed, the unit returned to its base at Selby in Yorkshire, stopping off at Doncaster

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Local Archives



1ST LINE DEFENCE

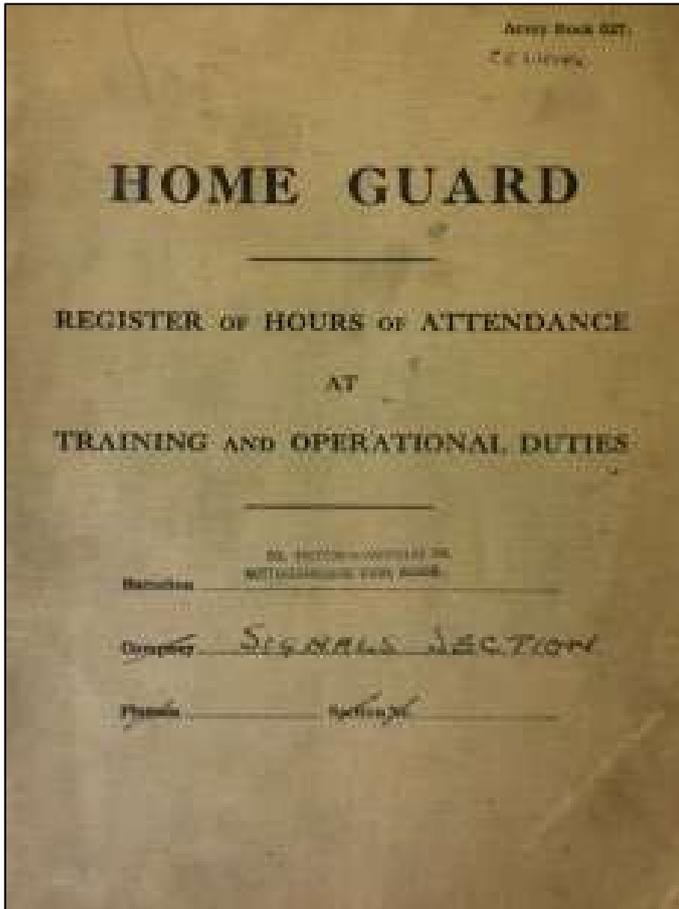
Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX

Email: info@1stlinedefence.co.uk

Tel: +44 (0)1992 245 020

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk



A Register of units was present at the foundation of the Home Guard (Local Defence Volunteers) in May 1940. The 7th Sutton-in-Ashfield Battalion was in attendance.

Source: Inspire Culture



The 7th Sutton-in-Ashfield Home Guard Battalion following a shooting competition, c.1943.

Source: Huthwaite Online



Officers of 'B' Company, 7th Sutton-in-Ashfield Battalion, November 1944.

Source: Huthwaite Online



1ST LINE DEFENCE

Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

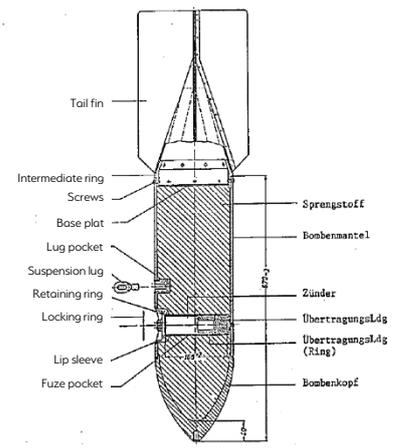
Source: Various



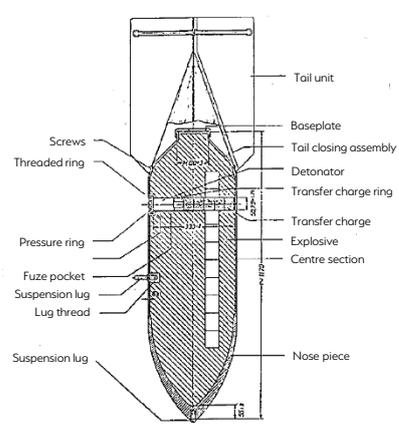
9a Omberley Avenue
Home Guard
'Ammunition Store'.

Kings Mill Military
Hospital

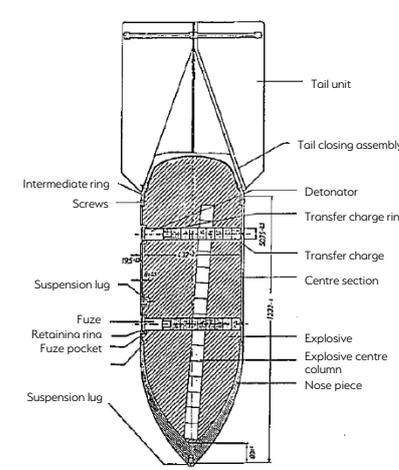
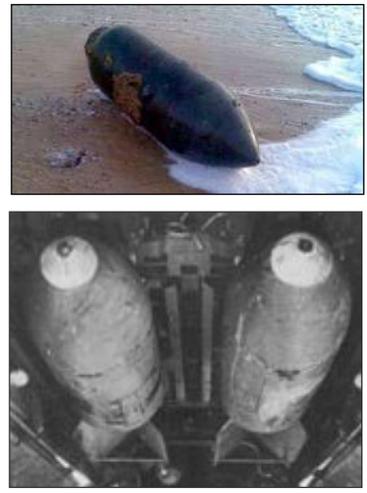
SC 50kg High Explosive Bomb	
Bomb Weight	40-54kg (88-119lb)
Explosive Weight	25kg (55lb)
Fuze Type	Impact fuze/electro-mechanical time delay fuze
Bomb Dimensions	1,090 x 280mm (42.9 x 11.0in)
Body Diameter	200mm (7.87in)
Use	Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.




SC 250kg High Explosive Bomb	
Bomb Weight	245-256kg (540-564lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.
Remarks	It could be carried by almost all German bomber aircraft and was used to notable effect by the Junkers Ju-87 Stuka (<i>Sturzkampfflugzeug</i> , or dive-bomber).




SC 500kg High Explosive Bomb	
Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, Trialene. Bombs recovered with Trialene filling have cylindrical paper-wrapped pellets, 1-15/16in. in length and diameter.



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

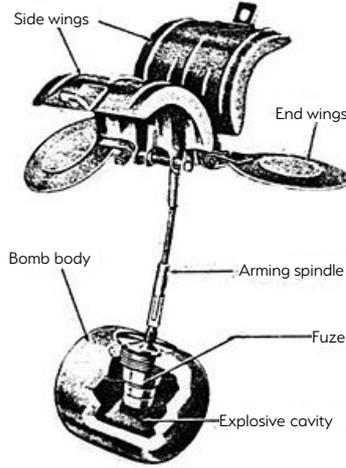
Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Various sources

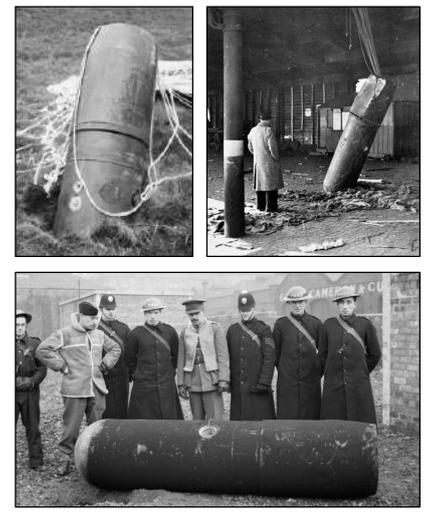
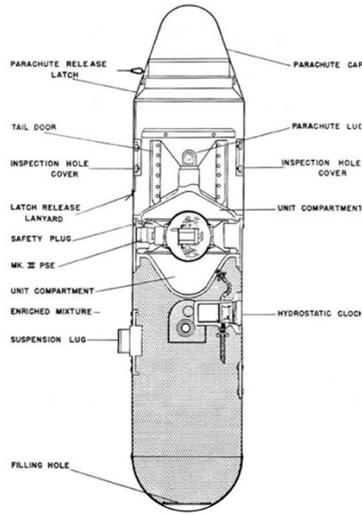
SD2 Anti-Personnel 'Butterfly Bomb'

Bomb Weight	Approx. 2kg (4.41lb)
Explosive Weight	Approx. 7.5oz (225 grams) of Amatol surrounded by a layer of bituminous composition.
Fuze Type	41 fuze (time) , 67 fuze (clockwork time delay) or 70 fuze (anti-handling device)
Body Diameter	3in (7.62 cm) diameter, 3.1in (7.874) long
Use	Designed as an anti-personnel/fragmentation weapon. They were delivered by air, being dropped in containers of 23-144 sub-munitions that opened at a predetermined height, thus scattering the bombs.
Remarks	Quite rare. First used against Ipswich in 1940, but were also dropped on Kingston upon Hull, Grimsby and Cleethorpes in June 1943, amongst various other targets in UK. As the bombs fell the outer case flicked open via springs which caused four light metal drogues with a protruding 5 inch steel cable to deploy in the form of a parachute & wind vane, which armed the device as it span.



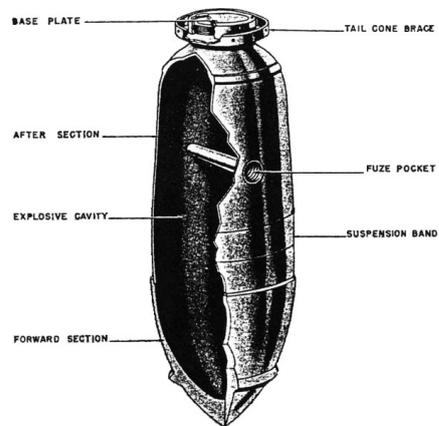
Parachute Mine (Luftmine B / LMB)

Bomb Weight	Approx. 990kg (2176lb)
Explosive Weight	Approx. 705kg (1,554lb)
Fuze Type	Impact/time delay/hydrostatic pressure fuze
Dimensions	2.64m x 0.64m (3.04m with parachute housing)
Use	Against civilian, military and industrial targets. Used as blast bombs and designed to detonate above ground level to maximise damage to a wider area.
Remarks	Deployed a parachute when dropped in order to control its descent. Had the potential to cause extensive damage within a 100m radius.



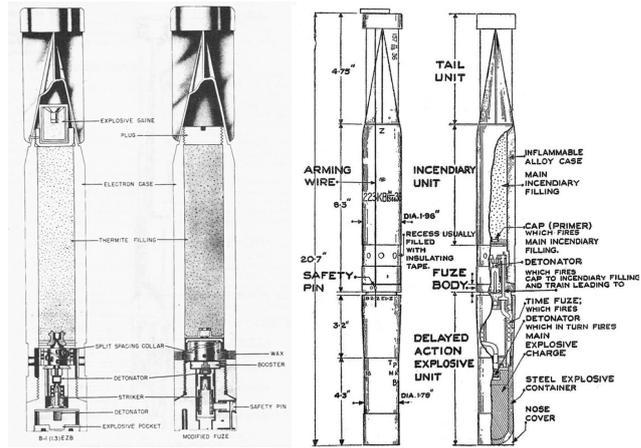
SC 1000kg High Explosive Bomb

Bomb Weight	Approx. 993-1027kg (2,189-2,264lb)
Explosive Weight	Approx. 530-620kg (1168-1367lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Filling	Mixture of 40% amatol and 60% TNT, but when used as an anti-shipping bomb it was filled with Triolen 105, a mixture of 15% RDX, 70% TNT and 15% aluminium powder.
Bomb Dimensions	2800 x 654mm (110 x 25.8in)
Body Diameter	654mm (18.5in)
Use	SC-type bombs were General Purpose Bombs used primarily for general demolition work. Constructed of parallel walls with comparatively heavy noses, they are usually of three-piece welded construction.



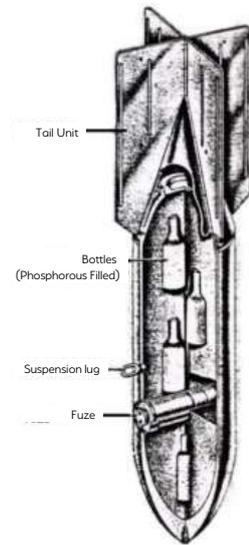
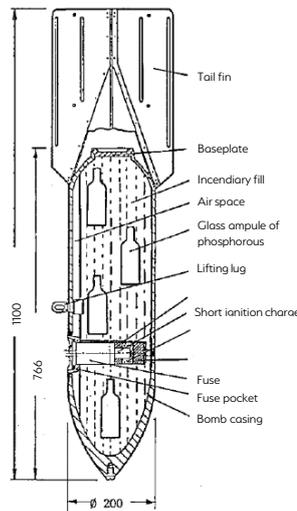
1kg Incendiary Bomb

Bomb Weight	Approx. 1.0 - 1.3kg (2.2 and 2.9lb)
Explosive Weight	Approx. 680g (1.5lb) Thermit 8-15gm Explosive Nitropenta
Fuze Type	Impact fuze
Bomb Dimensions	350 x 50mm (13.8 x 1.97in)
Body Diameter	50mm (1.97in)
Use	As incendiary – dropped in clusters on towns and industrial complexes.
Remarks	Magnesium alloy case. Sometimes fitted with high explosive charge. The body is a cylindrical alloy casting threaded internally at the nose to receive the fuze holder and fuze.



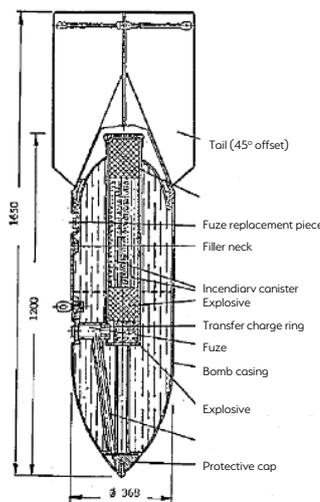
C50 A Incendiary Bomb

Bomb Weight	Approx. 41kg (90.4lb)
Explosive Weight	Approx. 0.03kg (0.066lb)
Incendiary Filling	12kg (25.5lb) liquid filling with phosphor igniters in glass phials. Benzine 85%; Phosphorus 4%; Pure Rubber 10%
Fuze Type	Electrical impact fuze
Bomb Dimensions	1,100 x 280mm (43.2 x 8in)
Use	Against any targets where an incendiary effect is required.
Remarks	Early fill was a phosphorous/carbon disulphide incendiary mixture.



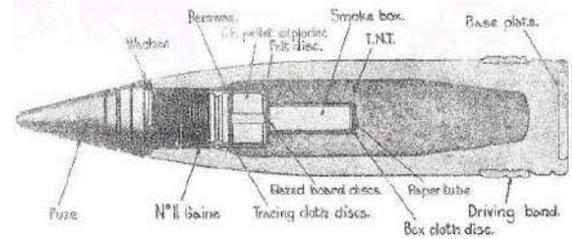
Flam C-250 Oil Bomb

Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, Trialene. Bombs recovered with Trialene filling have cylindrical paper-wrapped pellets, 1-15/16in. in length and diameter.



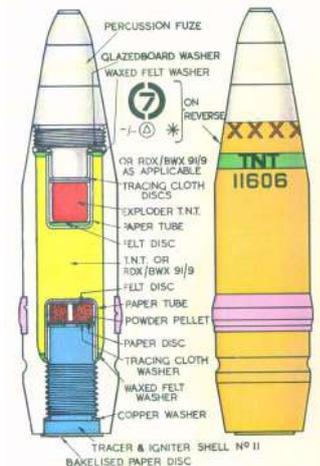
3.7 Inch QF Anti-Aircraft Projectile

Projectile Weight	28lb (12.6 kg)
Explosive Weight	2.52lbs
Fuze Type	Mechanical Time Fuze
Dimensions	3.7in x 14.7in (94mm x 360mm)
Rate of Fire	10 to 20 rounds per minute
Use	The 3.7in AA Mks 1-3 were the standard Heavy Anti-Aircraft guns of the British Army and were commonly used on the Home Front.
Ceiling	30,000ft to 59,000ft



40mm Bofors Projectile

Projectile Weight	1.96lb (0.86kg)
Explosive Weight	300g (0.6lb)
Fuze Type	Impact Fuze
Rate of Fire	120 rounds per minute
Projectile Dimensions	40 x 180mm
Ceiling	23,000ft (7000m)
Remarks	Light quick fire high explosive anti-aircraft projectile. Each projectile fitted with small tracer element. If no target hit, shell would explode when tracer burnt out. Designed to engage aircraft flying below 2,000ft.



3in Unrotated Projectile (UP) Anti-Aircraft Rocket ("Z" Battery)

HE Projectile Weight	3.4kg (7.6lb)
Explosive Weight	0.96kg (2.13lb)
Filling	High Explosive – TNT. Fitted with aerial burst fuzing
Dimensions of projectile	236 x 83mm (9.29 x 3.25in)
Remarks	As a short range rocket-firing anti-aircraft weapon developed for the Royal Navy. It was used extensively by British ships during the early days of World War II. The UP was also used in ground-based single and 128-round launchers known as Z Batteries. Shell consists of a steel cylinder reduced in diameter at the base and threaded externally to screw into the shell ring of the rocket motor.

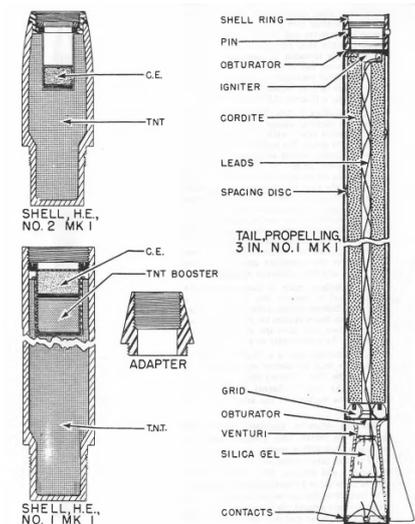


Figure 185—3-in. U.P. Antiaircraft Rocket Components



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

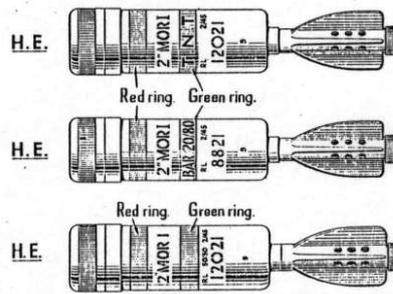
Ref: DA21211-00

Source: Various sources

2 inch Mortar High Explosive

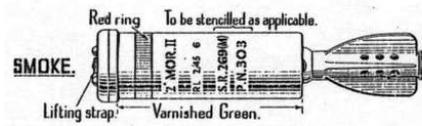
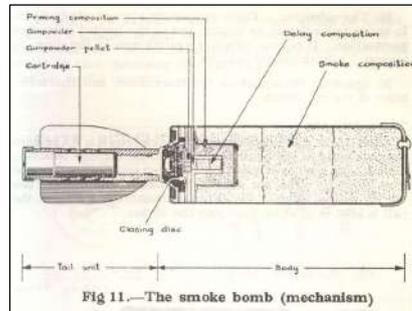
Weight	Approx. 1.02kg (2.25lb)
Maximum Range	460m (500yards)
Filling	200g RDX/TNT
Dimensions	51 x 290mm (2in x 11.4 in)
Fuze Type	An impact fuze which detonates the fuze booster charge and in turn the high explosive charge.
Use	It had greater range and firepower over hand and rifle grenades, and was used to attack targets behind cover with high explosive rounds.
Identification	HE has a rounded edge to a flat back. Can either be a black body colour with red and yellow band or dark green with yellow band. Brass cap on top. Practice will have hole all the way through the top.

MARKINGS, BOMB, M.L. 2 INCH. MORTAR.



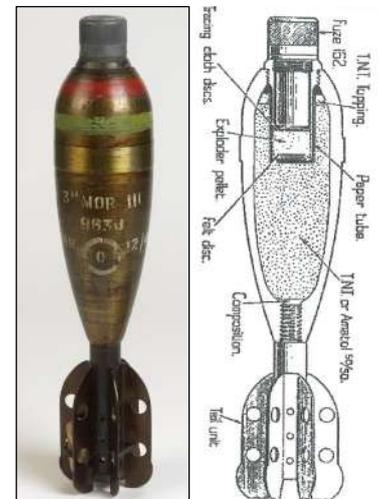
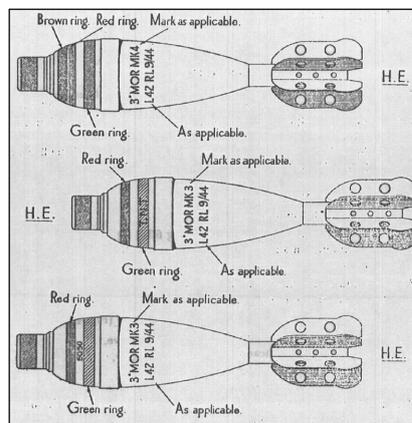
2 inch Mortar Smoke

Weight	Approx. 910g (2lb)
Maximum Range	460m (500yards)
Filling	White phosphorus and smoke fill
Dimensions	51 x 290mm (2in x 11.4 in)
Fuze Type	An impact fuze which initiates a bursting charge. This ruptures the mortar bomb's body and disperses the phosphorus filler.
Identification	Smoke mortars have a recess and emission holes. May still see light green body point. Look for stained ground around munition.
Use	As a screening device for unit movement or to impair enemy field of vision.

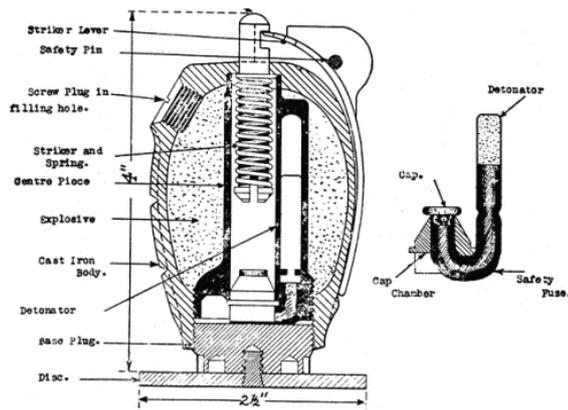


3 inch Mortar High Explosive

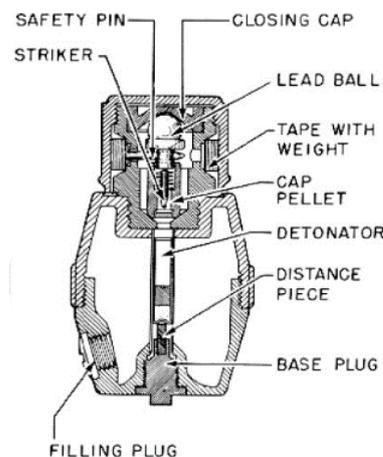
Weight	Approx. 4.5kg (10lb)
Maximum Range	1,460 (Mk1) – 2,560m (Mk2) (1,600 – 2,800yds)
Dimensions	81mm (3in)
Filling	Amatol
Firing Mechanism	Drop, fixed striker
Remarks	Fin-stabilised bomb fired by means of a charge consisting of a primary cartridge in the tail and four secondary cartridges.
Identification	An old style mortar. Often no way of telling if HE or practice, so treat as HE.



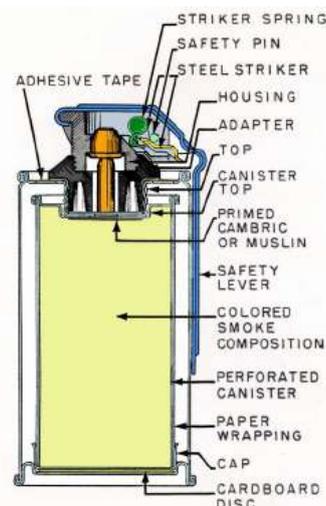
No. 36 'Mills' Grenade	
Weight	Approx. 765g filled (1lb 11.25oz)
Explosive Weight	71g (2oz) filling.
Fuze Type	4-7 second delay hand-throwing fuze. No. 6 Detonator
Dimensions	95 x 61mm (4 x 2.4in)
Use	Fragmentation explosive at approx. 30m range 100m range of damage.
Remarks	First introduced in 1915, its classic grooved, cast-iron 'pineapple' design was designed to provide uniform fragmentation. The detonator is inserted before use after removing the base plug.



No. 69 Grenade	
Weight	Approx. 383g (13.5oz)
Fill Weight	93g (3.25 oz) of either Amatol, Baratol or Lyddite
Fuze Type	'All-ways' fuze. Comprised of a safety cap, a weighted streamer attached to a steel ball bearing and a safety bolt designed to detonate from any point of impact.
Dimensions	115 x 60mm (4.5 x 2.4 in)
Use	A blast grenade for use as an offensive weapon. Detonator was inserted before use.
Remarks	Introduced December 1940 and made from the plastic Bakelite as opposed to conventional metals. Detection is difficult due to this low metal content.



No. 83 Smoke Grenade	
Weight	Approx. 680g (1.5lb)
Explosive Weight	Approx. 170-200g. (6-7 oz)
Fuze Type	Originally used a friction system using a match head composition. Later developed to a striker lever ignition system.
Dimensions	Approx. 62 x 140mm (2.44 x 5.5 in)
Use	Use as a target or landing zone marking device and as a screening method for troop / unit movement.
Remarks	This basic design stayed relatively unchanged up to the 1980's. The letters CCC were often etched into the body of the grenade in the colour of the smoke.



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

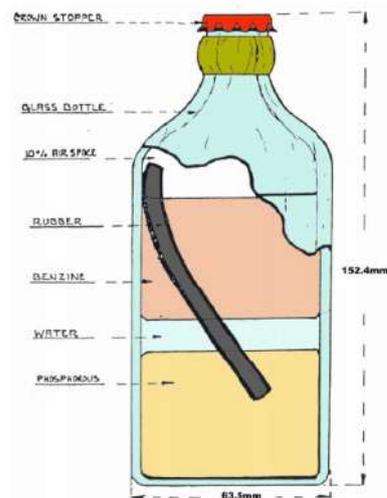
Source: Various sources

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk

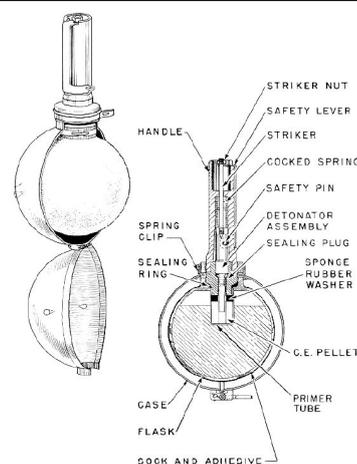
No. 76 Self Igniting Phosphorous (SIP) Grenade

Weight	Approx. 1lb 3oz
Filling	White Phosphorous and Benzene
Design	The filling was contained in a ½ pint sized glass bottle with water and a strip of rubber. Over time the rubber dissolved to create a sticky which would self ignite when the bottle broke.
Use	Originally intended as an anti-tank incendiary weapon deployed by hand. Designed to be produced cheaply without consuming materials needed to produce armaments on the front line.
Remarks	The Home Guard hid caches of these grenades during the war. Not all locations were officially recorded and some caches were lost and encountered post-war. In all cases, the grenades are still found to be dangerous.



No. 74 Grenade ("Sticky Bomb") Mk1

Weight	Approx. 1.1kg (2.25lb)
Filling	Approx. 600g Nobel's No.283 (Nitro-glycerine) (1.33lb)
Design	A glass ball on the end of a Bakelite (plastic) handle. The inside of the ball would contain the explosive filling and the outside a very sticky adhesive coating.
Use	An anti-tank grenade primarily issued to the home guard. It required the user to come in very close proximity of the target and smash the glass explosive container against it.
Remarks	Timer fuze was located in the handle. This would explode after 3-6 secs.



Flame Fougasse Bomb

Weight	Various
Filling	Initially a mixture of 40% petrol and 60% gas. Ammonal provided the propellant charge.
Design	Usually constructed from a 40-gallon drum dug into a roadside and camouflaged.
Use	As an improvised anti-tank bomb. When triggered the Fougasse could project a beam of burning sticky fuel in a fixed direction from up to 3m (10ft) wide and 27m (30yards) long.
Remarks	A highly unorthodox weapon designed by the Petroleum Warfare Department to address a critical lack of weapons in 1940. 50,000 are estimated to have been distributed around the UK.

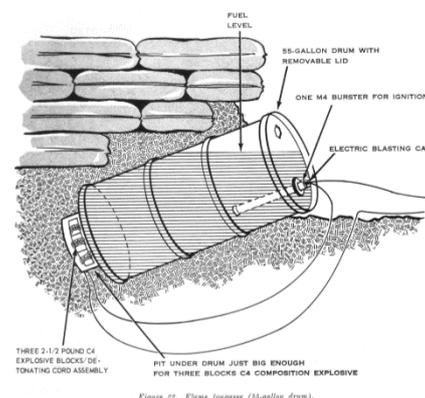


Figure 21. Flame fougasse (55-gallon drum).



Unit 3, Maple Park,
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Various sources

Produced by and Copyright to 1st Line Defence® Ltd. Registered in England and Wales with CRN: 7717863. VAT No: 128 8833 79.

www.1stlinedefence.co.uk

Common WWII-era Aircraft Mounted Gun Ammunition

7.7x56R 7.92x57 13x64B 12.7x38 TSR 12.7x99 12.7x108 15x90 20x12RB 20x80RB 20x82 20x94 20x99R 20x101RB 20x110RB 20x110 20x125 23x152B 30x90RB

7,7mm spitfire MK1 Hurricane MK1 others
 13mm MG 131 Bf109K FW190A8 MG 7,92mm Bf109E,F Bf110C Ju87
 15mm MG 151 Bf109F
 20mm Type 99-1 cannon 20mm MGFF cannon Bf109E Bf110C Ju87
 20mm Mg 151 cannon FW190
 20mm ShYAK Il2, yak3 others
 20mm Ho-5 cannon 20mm jap.
 20mm Hispano 20mm cannon spitfire mkl1B
 20mm Ho-3 cannon 20mm Jap.
 23mm VYa cannon yak il2
 30mm MK 108 cannr Bf109G6,Me: others MK FW1

OERLIKON HISPANO
 NOTE:- SHOULDER
 NOTE:- SHAPE OF BASE
 BASE OF CARTRIDGE
 * CONTRACTORS' INITIALS OR TRADE MARK
 + YEAR OF MANUFACTURE

.303 British Rifle Ammunition

Bullet Diameter	7.92mm
Case length	56.44mm
Overall length	78.11mm
Type	Rifle Ammunition
Propellant	Originally black powder. Later Cordite followed by Nitrocellulose
Remarks	First produced in 1889 and still in use today, the .303inch cartridge has progressed through ten 'marks' which eventually extended to a total of around 26 variations.



20mm Oerlikon Cannon Rounds

CLOSING DISC
 PERCUSSION FUZE
 REAR DISC
 DETONATOR
 PAPER DISCS
 H.E. FILLING
 WAXED CLOTH DISC
 INCENDIARY FILLING
 TRACER COMPOSITION
 PRIMING COMPOSITION
 CLOSING DISC
 BASE PLUG

COLOUR IDENTIFICATION

BRITISH	
NATURE OF SHELL	H.E. FILLING COLOUR
H.E. TRACER	T.N.T.
H.E.	T.N.T.
PROJ. PRACTICE	
PROJ. TRACER	
H.E. INCENDIARY	T.N.T.
H.E. INCENDIARY TRACER	T.N.T.

MILLIMETRES
 9 10 20

WEIGHTING
 BORAX
 TRACER COMPOSITION
 PRIMING COMPOSITION
 CLOSING DISC
 BASE PLUG

CLOSING DISC
 PERCUSSION FUZE
 REAR DISC
 DETONATOR
 PAPER DISCS
 H.E. FILLING
 WAXED CLOTH DISC
 INCENDIARY FILLING
 BASE PLATE

H.E./INCENDIARY/TRACER
 PROJECTILE TRACER
 H.E./INCENDIARY

20-mm Oerlikon Cannon
 Magazine
 Mark 14 gunsight
 Shield
 Column-raising handwheel
 Shoulder rest
 Back strap



Unit 3, Maple Park,
 Essex Road, Hoddesdon,
 Hertfordshire. EN11 0EX
 Email: info@1stlinedefence.co.uk
 Tel: +44 (0)1992 245 020

Client: Griffiths Services & Developments Ltd

Project: Land at Beck Lane, Sutton in Ashfield

Ref: DA21211-00

Source: Various sources

1st Line Defence

Unit 3, Maple Park
Essex Road, Hoddesdon
Hertfordshire EN11 0EX

Call +44 (0) 1992 245 020

Email info@1stlinedefence.co.uk

Web www.1stlinedefence.co.uk



1ST LINE DEFENCE