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UNEXPLODED ORDNANCE RISK MITIGATION PLAN

Crabtree Lane, Manchester

Introduction

Brimstone Site Investigation (Brimstone) manages and mitigates unexploded ordnance (UXO) risks using industry leading processes and technologies to ensure the safety of all construction, development, geological, and defence projects. Brimstone implements services depending on the UXO risk, the ground conditions, and the proposed ground intrusions, reducing the risk to a satisfactory and tolerable level in accordance with the ALARP 'as low as reasonably practicable' risk mitigation principle.

Following the conclusion of a Brimstone detailed risk assessment, reference: DRA-24-1690-KEEP06R-CrabtreeLane,Manchester and dated 30th April 2026, an elevated risk of encountering unexploded ordnance (UXO) has been identified. The elevated risk has been deemed as moderate across the entirety of the assessed parcel of land, meaning proactive on-site risk mitigation services must be employed to reduce the risk to a tolerable level, when considering the 'as low as reasonably practicable' risk mitigation principle.

Site Specific UXO Risk

When assessing UXO risk, all potential risk sources from German, British, and Allied activities must be considered before providing a risk level for each ordnance category. The intolerable risk for Crabtree Lane, Manchester is from German airdropped weapons, and specifically high explosives bombs and incendiary bombs, and British/Allied anti-aircraft projectiles. This ordnance risk stems predominantly because of the aerial bombardment by the Luftwaffe during the Blitz of World War II and the Allied forces response to attack.

Table 1: UXO risk table.

Risk Table					
Risk Zone	UXO Type (Hazard)	Likelihood of UXO Contamination	Likelihood of UXO Remaining	Likelihood of UXO Encounter	Overall Risk Rating
Moderate Risk	WWII German GP HE Bombs	Moderate	Moderate-High	Moderate	MODERATE
	HAA Shells	Moderate	Moderate	Moderate	
	LSA	Low	n/a		LOW
	German 2kg IBs	Low	n/a		
	German 1kg IBs	Low	n/a		
	LAA Shells	Low	n/a		
	SAA	Low	n/a		

Since the cessation of WWII and the scaling back of the Crabtree Forge, the site has witnessed redevelopment, and its present-day appearance is that of a semi-industrialised area, with a large set of buildings occupying the west of the site and with wooded areas to the south and disturbed ground to the east.



Figure 1: assessed site boundary

General Recommendations for Site Based Services

In conformance with industry guidelines Brimstone undertakes recognised and approved site-based services to continue the UXO risk mitigation process. These services are recommended based on three key indicators: UXO risk, ground conditions, and proposed ground intrusions.

Table 2: recommended risk mitigation measures.

Risk Mitigation Measure	Recommendation
UXO Safety Awareness Briefing	Prior to all intrusive works commencing.

EOD Engineer - On Site Supervision (Watching Brief)	During all open excavations within undisturbed WWII ground.
Intrusive Magnetometer Probe Survey	At all pile and borehole positions that will be installed into undisturbed WWII ground.

A brief explanation of each deliverable is as follows:

Safety awareness briefing

Delivered by a fully qualified and experienced explosives engineer, the duration of the session is around 60-minutes and includes a presentation and follow up question and answer for all attendees. The toolbox talk will briefly outline the features and characteristics of the type of ordnance posing a risk to the specific site before running through means of identification and response should any suspicious items be identified. As a bare minimum, it is recommended that a briefing is delivered to all site management for the principal contractor and all site operatives for the groundwork's contractor, though all site attendees will find the briefing informative. Following the session, all attendees will name and sign the attendance sheet, and the presentation will be issued to the project's primary point of contact.

Watching brief supervision

Whilst excavating in undisturbed wartime ground an explosives engineer will be deployed to site to supervise all groundworks. Initially, the engineer will deliver a safety brief followed by the overseeing of excavations within ground that carries the risk of UXO. Given the supervisory nature of this undertaking there will be no extension to proposed groundworks programmes because of our presence. It is recommended that an explosives engineer is present for all new intrusions but not follow on activities, such as backfilling or muck-away. The duration on site will largely depend on the groundworks duration but the UXO consultant will work proactively with the client to ensure that all deployments are necessary and fully justifiable.

Intrusive magnetometer probe survey

Deploying a cone penetrometer testing (CPT) rig equipped with a magnetometer sensor, each pile location, pile cap, pile/secant wall, or borehole will be methodically probed prior to piling and boring activities. The radius of each survey is two-metres from the probe tip omni-directionally, meaning it is often possible to capture multiple piles with a single survey. The duration on site ultimately depends on the number of probes required to survey all proposed pile and borehole locations to maximum bomb penetration depth of maximum depth of the installations, whichever is shallower. All Brimstone rigs are fully tracked so they can operate when the site is at formation level. If a piling mat is due to be installed prior to deployment, Brimstone can penetrate up to 500mm of compacted crushed stone with 95% assurance or 750mm with 60% assurance that the probe will break through.

Site Specific Considerations

A significant variable to consider when planning site based UXO risk mitigation is alterations to the site between the cessation of wartime activities and present day. During and immediately after WWII the site was recorded as being part of the Crabtree Forge and Acre Works, resulting in a series of buildings. To the south, there were gardens, a brook, and allotments recorded.

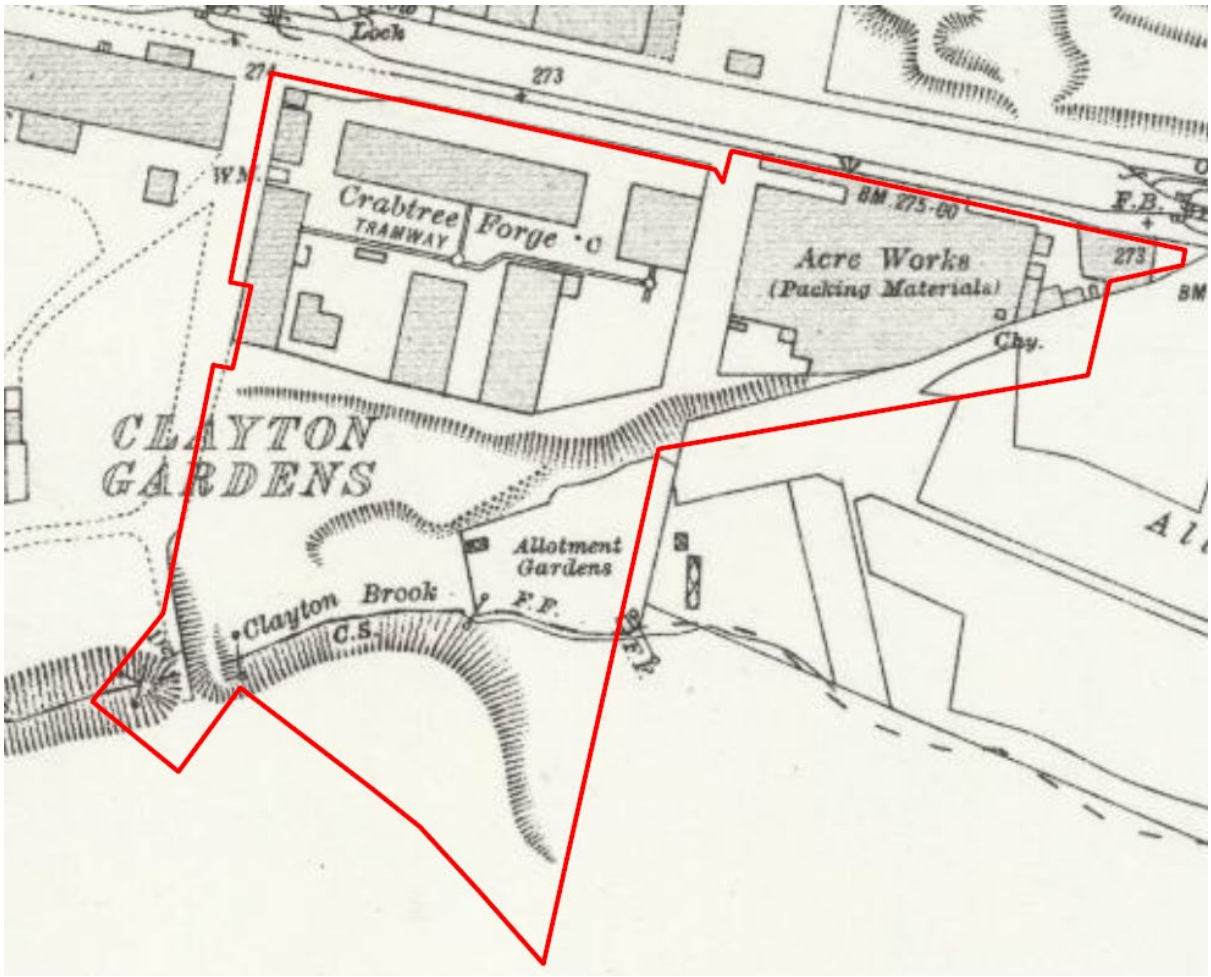


Figure 2: historical OS mapping from 1933

Since the 1950s and on multiple occasions thereafter, the site has witnessed developmental works, ranging from small structures, to large buildings, and hardstanding.

Considering that much of the shallow depths of soils has been significant worked since-WWII, Brimstone considers these top layers of ground to carry a low risk of encountering UXO. Any ground beneath these depths still carries a risk of UXO and there remains a moderate risk (medium as per DRA-24-1690-KEEP06R-CrabtreeLane,Manchester) for any significant and aggressive ground disturbance using high-powered machinery.

Proposed Development

It is understood that demolition of the existing structures, followed by the erection of a new mixed use residential development, which will comprise of 194 units that will utilise a piled foundation solution in areas deemed applicable. Excavations are planned for the plots, and for the infrastructure required to service the homes, including and not limited to,

Site Specific UXO Risk Mitigation Services

Since much of the top layers of ground have been installed or manipulated since WWII, Brimstone recommends that the most prudent way to mitigate the UXO risk is via the undertaking of one or multiple safety awareness briefings to the site management and groundworks teams and an intrusive survey prior to piling or boring activities.

If these recommended measures are completed, then the UXO risk will reduce to low.

Table 3: UXO risk following site-based mitigation

UXO TYPE (ASSOCIATED HAZARD)	CURRENT UXO RISK	UXO RISK FOLLOWING THE IMPLEMENTATION OF RECOMMENDED SERVICES
WWII German GP HE Bombs	Moderate	Low
HAA Shells	Moderate	Low
Land Service Ammunition	Low	Low
WWII German 2kg Incendiary / HE Bombs	Low	Low
WWII German 1kg Incendiary Bombs	Low	Low
WWII British Light Anti-Aircraft Shells	Low	Low
WWII British Small Arms Ammunition	Low	Low

CIRIA C681 states that any risk that is low-moderate or lower is deemed to be tolerable with no further site deployment required.

Conclusion

Following the delivery of two site-based mitigation services the UXO risk to the proposed development will have been reduced to a tolerable level, meaning no further proactive on-site mitigation parameters will need to be procured. Any alterations to the construction and groundworks programme must be communicated to Brimstone to determine whether these changes will alter the risk profile for the entirety of specific portions of the site.