CONSTRUCTION LOGISTICS & MANAGEMENT PLAN

NEWHAM COLLEGE, STRATFORD CAMPUS, WELFARE ROAD, LONDON E15 4HT

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CONTENTS

Appendices

In accordance with CDM 2015 Regulations, 777 Demolition & Haulage Co. Ltd will fulfil the role of Principal Contractor.

All works undertaken on this project will be conducted observing the current Government, Public Health England (PHE) & The Construction Leadership Council (CLC) guidelines on safe working practices.

Important note – This document 'Construction Logistics and Management Plan' has been generated to assist the client discharge their planning conditions and satisfy all GLA requirements.

At this point, buildings to be demolished have not yet undergone any structural or engineering demolition assessments, so final methodology and sequencing may change subsequent to this issue.

Overview

The following document outlines how 777 Demolition & Haulage Co. Ltd intends to manage the logistics and execute the demolition of the redundant commercial and residential buildings at the following location.

Site Location

The site is located at: Newham College Block Y Welfare Road, London, E15 4HT

Surrounding Area

The site is located within the Newham College Stratford Campus, on Welfare Road in Stratford, East London. Site access will be from the B164 (Vicarage Lane) and via Shirley Road.

The surrounding area mainly consists of residential areas including local shops.

2. Scope of Works

Scope of Works

The Scope of Works consists of the following main items:

- Installation of vehicle gates.
- Service isolation works.
- Pre-Demolition soft strip all areas.
- Removal of asbestos containing materials.
- Demolition of the buildings down to slab level.
- Removal of all slabs and foundations.
- Removal of all arising from site.
- Backfilling voids with crushed materials.

Site Constraints

Site constraints include:

- Nearby Live College Buildings and Residential Areas
- Local roads and traffic controls.

Buildings Scheduled for Demolition

The buildings within the site boundary line (in red) are to be demolished.

Protection of the Public and other workers

Demolition processes give rise to conditions that, unless carefully controlled, can have an adverse and direct effect on the General Public, other site workers, and the surrounding environment. In this document, 777 will detail measures that will be taken to reduce the impact of demolition but retain effective and efficient methods.

Communication

The 777 Demolition Site Manager will have overall control of the site of our works, while communication with any additional contractors will be maintained throughout the works.

In the event of a complaint from a neighbour or a member of the public in relation to any site activity, it will be recorded in a designated logbook, stating the nature of the complaint, the cause and, where appropriate, the remedial action taken. Should complaints about odour, noise, dust or vibration be received, they will be addressed directly by 777 to enable results at the time of the complaint to be reviewed, and where appropriate immediate actions employed to rectify the problem.

All complainants will be contacted by 777 for further discussion and identification of a mutually acceptable resolution if the problem persists. Where a valid grievance is raised measures will be put in place where practicable to avoid recurrence of the complaint. 777 will notify the Client as soon as practicable once a complaint has been received.

777 will co-ordinate a letter drop/information leaflet to the surrounding community informing them of progress and upcoming works, and they will be available on this project.

Community Engagement

It is confirmed that Newham College London in conjunction with 777 Demolition shall:

- Issue regular newsletters to local residents;
- Keeping the local community up to date with the progress of the development;
- Acting as a point of contact and to seek to resolve any issues connected to the construction of the development that may be raised;
- Attending and participate in any construction logistics forums which may operate within the vicinity to the site;
- Exploring ways of coordinating development activities across the site and in the wider area for the duration of the construction programme.

Install signage on the site hoarding which will clearly show the Community Liaison Officers contact details and include;

- Name
- Contact telephone number
- Email address
- Emergency contact telephone number

Considerate Constructor Scheme

777 Demolition will register this site with the Considerate Contractors Scheme with a copy of their certification made available on request. All relevant information/signage relating to the Considerate Constructors Scheme will be displayed in a prominent position on the site hoarding. CLOCS (Construction Logistics and Community Safety and FORS (Fleet Operator Recognition Scheme) compliance will be a mandatory requirement for all construction vehicles accessing and being used on this site.

Working hours

8.00am – 6.00pm Monday to Friday, 9.00am – 1.00pm Saturday are the permitted working hours.

No work will be carried out on Sundays or Public/Bank Holidays without written consent, except for emergency response should such a situation occur.

Duration: 16 weeks of main works.

Temporary Works

All temporary works (If required) will be handled by the Site Team in conjunction with our engineering sub-contractor, and appointed temporary works coordinator- STAP Ltd.

3. Site Logistics

Site Access
(Please see the Traffic Management Plan section included in this document)

The following control measures will be adhered to:

- All vehicle movements on and off 777's site will be controlled by traffic marshals.
- All demolition operatives shall use the established site pedestrian routes.
- Vehicles will not be allowed to queue on the highway.
- At no time will 777 vehicles exceed 5mph within site.

Site Boundary (Fencing / Hoarding)

The existing perimeter railings will be utilized to segregate our works areas from the live areas of the college, and public external areas. These railings will be fitted with a combination of 777 branded monarflex and debris netting.

In addition, new vehicle gates will be installed on Welfare Road, and internally, a combination of heras, solid heras fencing, and crowd barriers will be used to segregate operatives from moving plant.

Relevant warning signs will be attached to the perimeter with additional signage by the vehicle and pedestrian access gates detailing our on-going works and contact information.

Please refer to our Appendix A - Logistics Plan

Vehicle Movements

The total number of H.G.V vehicle movements estimated for this site is 240 across a period of 16 weeks.

These 240 movements will not be equally spread across the 16-week period with 70% of the movements required to clear hard rubble waste material taking place in the last 7-weeks of our works.

- 4 X Low-Loader Movements (Plant & Welfare Delivery / Collections)
- 15 X 40 Cu Yard RORO Skips (Soft-Strip Removal)
- 4 X Sealed Container RORO Delivered / Collected (Asbestos Removal)
- 202 8-Wheel Tipper Lorries (Hard Rubble Clearance)
- >15 Loads of 6F2 Import (Estimated Basement Backfill)

Please note that all vehicle movements will be undertaken outside of peak times (whenever possible) including the general rush hour periods of 08:00 – 09.30Hrs and 16:00 – 18:00Hrs Monday to Friday.

This will ensure that no HGV vehicle movements will take place as students enter and leave the campus.

Traffic Management (Step-By-Step Process) Vehicles Entering or Leaving Site

Vehicles / lorries for waste clearance will be scheduled at least 24-hours in advance.

STEP 1: Ahead of the lorry / vehicle's arrival, the driver will, when parked and stationary, make a 30-minute pre-warning courtesy call to site so that they are aware and ready for the vehicle's arrival.
STEP 2: The 777 Gateman will alert the site traffic marshals of the lorry / vehicles arrival and open the gate.
STEP 3: 2 X Advanced Training Traffic Marshals wearing orange hi-visibility jackets will then proceed outside of the site to safely supervise the reversal of the lorry / vehicle into site, and to keep any pedestrians at a safe distance.
STEP 4: The lorry / vehicle will only reverse once all pedestrians have been diverted safely away or are held at a safe distance away from the site entrance and maneuvering vehicle.
STEP 5: Once the vehicle has been safely reversed into site and to its loading location, the site gates will be closed.
STEP 6: Once loaded, the lorry / vehicle will (Once loaded) leave the site via the same gates turning right only while supervised again by traffic marshals.
STEP 6 ALTERNATIVE: The lorry / vehicle will leave site via the secondary set of gates following the installation of a site one way system. All external vehicle movements beyond the site gates will be supervised by multiple traffic marshals at all times. Pedestrians will again be kept at a safe distance and/or safely diverted to the opposite side of the road.

Safety of the Public

Construction traffic poses a potential risk to pedestrian and cyclist safety. As such, vulnerable road users' safety will be paramount. The use of Traffic Marshals during all periods of operation at the site will assist with pedestrian and cyclist safety. A pedestrian route will always be maintained in front of the site along Welfare Road.

777 Demolition will use silver accreditation of FORS (Fleet Operator Recognition Scheme) where applicable and to be signatories of CLOCS (Standard for Construction Logistics: Managing Work Related Road Risk).

Highway Maintenance – Damage Record / Control of Mud

Demolition vehicles will load/unload whist positioned within either the on-site loading area, or the on-street loading area. Both of which will be constructed of a solid substrate which will be kept free of mud and dirt in order to avoid potential track-out onto the public highway. Any mud or dirt unexpectedly tracked out onto the highway will be cleaned up immediately. Construction vehicles entering site will travel through site via a haul road which will be constructed of a solid substrate which will be kept free of mud and dirt in order to avoid potential track-out onto the public highway.

There will also be a wheel wash facility adjacent to the vehicle site exit point. It is also confirmed that appropriate measures will be taken to protect the public highway from damage arising from construction related activity and to prevent concrete and other detritus from being washed into the public highway drainage system. In addition, it is confirmed that the Local Authority will be informed promptly should any such damage to the highway occur.

777 Demolition will undertake regular inspections of the highway within the vicinity of the site and any damage caused by vehicles associated with the construction of the development will be recorded and the council notified as soon as reasonably practicable.

Temporary Road Closures

No road closures are anticipated for the demolition phase of the project, but parking bay suspensions will be required.

Site Security

Site security during working hours will be provided by 777's gatemen & other operatives.

A rapid deployment CCTV Tower or similar system may be installed which is a wireless alarm system for first aid and fire emergencies which has remote satellite stations linked to a central unit in the Site Manager's office, and any activation of the remote units informs the Site Manager where and what type of emergency has occurred.

This would then provide 24/7 security cover and prevent unauthorized persons accessing the site.

Welfare

Welfare facilities are to be available on site throughout the project duration and facilities will be of a standard in accordance with the requirements of the Construction (Design and Management) Regulations 2015 and incorporate the Smoke-Free (Premises and Enforcement) Regulations 2006.

The welfare area will have Heras fencing erected around the front access to segregate it from our area of works. A pedestrian route will also be erected to give operatives safe access from the cabins to their area of works - these routes will be created by erecting Heras fencing as and when needed.

In general, the site welfare will consist of the following facilities:

- Suitable numbers of sanitary conveniences which reflect the number of people working on the site and which are adequately ventilated and lit.
- Washing facilities, which provide basins large enough to allow people to wash their faces hands and forearms and a supply of clean hot and cold, or warm, water.
- A suitable means of drying will also be provided. Rooms containing washing facilities will be adequately ventilated and lit.
- A suitable supply of drinking water and drinking vessels, and an area for taking meals and breaks.
- Canteen facilities including a kettle or urn for boiling water, and a means of preparing food - microwaves, ovens etc.
- Project offices for 777 staff (desks / chairs / filing cabinets).
- Meeting Room / Site Induction Room (these may be incorporated into multi-purpose units).
- Extra hand sanitiser pumps and anti-bacterial sprays or wipes for use in communal areas.

Temporary Services

The term 'Service' means all pipes, cables and other equipment associated with electric, gas, water, and telecommunications industries.

Installation of the temporary electrics for the welfare area will be carried out by our temporary electrics sub-contractor and will be under 777's direct supervision. All electricians will have a minimum JIB Electricians Card (ECSCS).

All electrical installations shall be installed to BS7671 (formally the IEE Wiring Regulations) by experienced electricians holding relevant City & Guilds qualifications.

First Aid

First Aid provision will be in accordance with the requirements of the Health and Safety (First-Aid) Regulations 1981.

This will include:

- Adequate amount of first-aiders / appointed persons onsite (777's Site Manager and Supervisor will both have the First Aid At Work qualification.
- Fully stocked first aid box.
- Eye wash station.
- First aiders training certificates up to date.
- An Accident report book.

Fire

The 777 Site Manager or his/her Site Supervisor will apply the measures detailed in the Fire Plan and Fire Risk Assessment contained within our Construction Phase Plan within 48 hours of site possession, and he/she will assess the site and complete the plan accordingly.

The following control measures will be adhered to:

- No intentional fires on site.
- Air horns to be provided at fire points to raise alarm.
- A permit to work system to be in place to cover any hot works (none planned in the current scope of works).
- If undertaken, hot works to cease a minimum of 1 hour before end of shift for fire watch to take place.
- Observation of the HSG168 "Fire Safety In Construction" guidelines.

Fire extinguishers suitable for the possible types of fire will be available on site.

COSHH (Hazardous Waste solids, gases or liquids)

All substances covered under COSHH regulations will be stored in a designated outside area, and COSHH assessments will be completed for each individual item.

The following control measures will be adhered to:

- Control entry to storage area.
- Define a specific area for storage and put-up clear signage.
- Ensure the area is spacious, organised, well lit, ventilated and locked (when not in use).
- Provide enough space to easily deal with spills.
- Provide spill kits.
- Label all containers, including partly used ones.
- Floors should be impervious, resistant to liquids and easy to clean.
- Keep easily ignitable materials, such as empty packaging, in a separate store-room and oxidising chemicals in dedicated buildings.

Plant Storage

Items of plant and equipment will be stored overnight in a secure location to prevent unauthorized removal, and the keys to machinery will be kept locked in the Site Manager's cabin.

Skips and Bins

Our standard method of waste collection is 40 yd^3 skips which would be delivered to and collected from site using roll-on/roll-off lorries.

As the buildings are in the process of being cleared of rubbish and soft stripped, all arisings generated from the works will be vertically transferred to ground level where all materials will be separated into their specific waste groups, loaded into bins, or skips and transported to a licensed waste processing facility. A Waste Disposal Log will be generated by 777 as an active document.

As the slab remains intact, it is our intention to use this slab as available space for temporary safe storage of demolition arisings to keep it contained within the remaining structure. This also ensures that waste lorries are only called to site when waste bins are full and avoids unnecessary trips.

Waste tickets are scanned and recorded onto our project document system and comprise part of the final Health & Safety File.

4. Utilities & Existing Services

Prior to demolition work commencing, any disconnections and/or diversions will have been undertaken by the client and completed by the relevant utility provider.

The term 'Service' means all pipes, cables and other equipment associated with electric, gas, water, and telecommunications industries.

Before commencing works 777 will ensure that all the services have been tested, isolated, removed, and re-routed (where applicable). All services will be assumed to be LIVE until a Certificate of Isolation for disconnection has been provided to 777 from the service providers or client. Copies of these certificates will be kept on site and can be viewed at any time upon request made to the Site Manager.

Any services which are to remain LIVE throughout the site for any period of our work are to be clearly marked prior to demolition commencing. This will be achieved by using appropriate tape and/or spray paint in accordance with National Joint Utilities Group 'Guidelines on the positioning and colour coding of underground utilities', as well as any additional protection as required. In addition, any services that have been identified to remain LIVE throughout our works will be raised by the Site Manager in the daily morning Pre-Job Brief so that all operatives are made aware of the location of the services.

If LIVE services are still present within the site, the following control protocols will be implemented prior to breaking ground in any location:

- Service drawings *will be referenced for the presence of known services*
- *Excavation area (if relevant) is to be fully CAT / GENNY scanned for the presence of services (even if drawing indicates no services present)*
- *If any services are identified in the excavation zone (if relevant) these will be marked above ground by a timber peg line – no excavation works will be allowed within 1-metre of this location*
  NOTE: Where the presence of services effects the progress of work, the client will be informed so they can arrange for services disconnections to be completed before further works commence
- *Only once the above has been completed will a permit to dig be issued – the permit will clearly state any services present*
- *The daily permit to dig MUST be held by the relevant machine operator*.

If water supplies are disconnected prior to site possession, our requirements for dust suppression during demolition will be gained from a metered hydrant.

Foul and surface water drains will be identified on site and protected or permanently sealed where required.

5. Plant and Equipment

Excavators (Demolition Specification)

The demolition and waste processing activities will be facilitated by demolition specification 360˚ excavators. All 777's plant fleet are fitted with an automatic "Oil Quick ® coupler system, which allows hydraulic work tools to be connected and disconnected from the driver's cab. The operator can change between various work tools within a few seconds, such as a shear, plate shear, concrete cracker, concrete pulveriser, concrete pincer, hydraulic breaker, tine grab, crusher bucket, standard bucket, sorting grab, clam shell bucket, hydraulic magnet, and rotary screener.

Plant inspections will be carried out and recorded in the daily inspection booklets and weekly on the LOLER 1998 or PUWER 1998 registers accordingly. Applicable 12 monthly statutory certificates for all plant will be available on site.

NRMM (Non-Road Mobile Machinery)

777 Demolition will ensure that all NRMM equipment (37kW and 650kW) shall be registered on the NRMN register and meets the standards as stipulated by the Mayor of London to follow best construction practice.

777 Demolition will ensure that all NRMM plant meets the emissions standards for the NRMM low emission zone. Non-Road Mobile Machinery (NRMM), particularly from the construction sector, is a significant contributor to London's air pollution. The Mayor of London implements standards for machinery used on construction and demolition sites to combat this major source of pollution across London. The NRMM Low Emission Zone (LEZ) utilises the Mayor and London Borough's planning powers to control emissions from NRMM used on construction sites. It must be ensured that all NRMM comply with London's current and future NRMM policy. The current London Policy for NRMM5 states the following: *"NRMM on all sites within Greater London is required to meet Emission Stage IIIB as a minimum; and NRMM on all sites within either the Central Activities Zone (CAZ) or Opportunity Areas (OAs) is required to meet Emission Stage IV as a minimum."* It is important to note that the emission standards for the NRMM LEZ progressively become more stringent over time. From 1st January 2025, all NRMM operating across Greater London will be required to meet Emissions Stage IV. The standards tighten once more on 1st January 2030, with all NRMM operating across Greater London being required to meet Stage V.

777 Demolition will ensure that where reasonably practicable to do so the vehicles and machinery used is carrying out the demolition works are hybrid or electric.

777 Demolition will ensure that we use vehicles which meet relevant safety standards, including construction logistics and community safety, fleet operator recognition scheme and Euro 6/V1 vehicle emission standards.

777 Demolition will ensure that all H.G.V. vehicles used will meet relevant safety standards, including construction logistics and community safety (CLOCS), fleet operator recognition scheme (FORS), and Euro6/VI vehicle emissions standards (and at least direct vision standard one.

6. Personnel and Qualifications

All 777 demolition Site Managers hold a CCDO (*) Demolition Manager Card, SMSTS (Site Managers Safety Training Scheme) certificate, a First Aid training certificate, plus other site-specific training.

All demolition Site Supervisors hold a CCDO Demolition Supervisor Card, SSSTS (Site Supervisor Safety Training Scheme) certificate, a First Aid training certificate, plus other site specific and technical training.

All demolition operatives hold CITB, CCDO, or CPCS competency cards. Further to this all operatives are given NDTG task specific training such as demolition, asbestos awareness, hot works cutting, abrasive wheel, working at height and other specific training such as PASMA and IPAF.

All 777 Contractors Limited operatives and sub-contractors will be given area specific induction along with a Toolbox Talk on the safe system of work they are working under. Further to this all staff and sub-contractors undertake 777's Seven Steps to Safety which is part of our Safety 24:7 Behavioral Safety Scheme.

All 777 Contractors Limited operatives have been trained to recognise Asbestos Containing Materials - if any ACMs are located in the structure during demolition, work will cease, and the Site Manager will be notified. An asbestos surveyor will then be called to site and a sample taken for testing.

777 Contractors Limited policy has always been to try and gain additional work force from the local communities (if required) - this is achieved by contacting local employment offices and job centres.

The following personal protective equipment will be provided as a minimum requirement:

- Hard Hat (BS EN 397)
- Gloves (BS EN 420)
- Eye Protection (BS EN 166)
- Safety Footwear (BS EN 345)
- Hi-Vis Clothing (BS EN 471)

The following personal protective equipment will be issued and will be worn when deemed necessary by the site manager:

- Face/Nose Mask with appropriate filter (BS EN 140)
- Ear Defenders (BS EN 352-1/2)
- Wet Weather Clothing (BS EN 343)
- Additional Eye Protection (PR EN 175)
- Full Body Harness (BS EN 361)
- Leather Gauntlets (PR EN 12477)
- Flame Retardant Coveralls (BS EN 470-1)

(*) CCDO = Certification of Competence for Demolition Operatives (an affiliated scheme to the CSCS).

Health and Safety Officer

One of 777's Health & Safety Team will be allocated full time to the work and give a portion of their time to the administration and guidance on health & safety matters relating to the site works.

As a minimum, the H&S Officer shall hold an NVQ Level 4 Occupational Health & Safety qualification, NEBOSH, or similar approved.

Plant Drivers

All of 777's plant drivers undergo extensive training and testing, resulting in either a CPCS Trained Operator Red Card (2-year validity), or a CPCS Competent Operator Blue Card (5-year validity).

Drivers with a CPCS Red Card are then enrolled onto a NVQ qualification, and upon passing, are upgraded to the CPCS Blue Card, which is renewable every 5 years with a simple technical refresher test.

Qualifications from other certification bodies (e.g. NPORS, National Plant Operators Recognition Scheme) are also available to plant drivers for equipment which may not be covered under the CPCS scheme.

Demolition or Site Operatives

All of 777's site operatives hold a minimum of either the CSCS Construction Site Operative card, or a CCDO Demolition Labourer (D1) Card. Many operatives hold higher CSCS/CCDO qualifications than this, ranging from CPCS Skilled Worker, up to CCDO Topman and CCDO Supervisors cards.

All operatives undertake both Asbestos Awareness and Demolition Awareness courses as required, which are held frequently on site or at 777's head office. Many site operatives also hold job-specific qualifications, such as Traffic Marshall, Fire Marshall, MEWP and PASMA training, which are recorded on 777's training matrix records.

Frequent refresher and update courses are held to ensure qualifications are kept up to date with the latest legislation requirements.

HGV Drivers

Under 777's commitment to training and on-going development all HGV drivers have undertaken NVQ Level 2 qualifications. This specific HGV NVQ qualification ensures 777 have one of the most competent trained fleet of drivers within the industry sector. This qualification is on top of our current CPC training. The NVQ qualification will see all drivers assessed on the job, from the beginning of the day undertaking the pre-use checks to observation of loading and driving techniques and including the completion of waste transfer and consignment notes.

Hauliers used to supply lorries for the clearance of waste materials and for the delivery and collection of welfare and plant will be required to provide evidence of cycle awareness and anti-idle training.

Specialist Sub-Contractors

All specialist sub-contractors will pre-qualify to work on the project by successfully completing our sub-contractor questionnaire which demonstrate:

- Relevant experience
- Excellent health and safety track record
- Adequate insurances
- Financial stability
- Reference from the last 3 years
- Industrial accreditations
- Environmental and sustainable credentials / procedure

7. Outline Methodology

Removal / Disposal of Hazardous Substances

All unidentified cylinders / drums / containers will be collected and stored in a fenced off area in the site. All COSHH substances will then be catalogued and appropriately disposed of offsite by one of our specialist subcontractors. Hazardous waste consignment notes will be provided documenting the type, quantity, and disposal address of the COSHH items removed offsite.

Scaffolding

777's approved sub-contractor will be Aerial Scaffolding Ltd and will supply their method statement to 777 before installation for it to be checked. The scaffold will be erected in 2m high lifts, at 1.8m centres, and will be encapsulated within Monarflex sheeting. Monarflex sheeting used at higher levels will take into account of wind loadings.

During demolition of the buildings, the scaffolding will be taken down in conjunction with the progressive demolition always keeping a 2m height above the working floor to contain any demolition materials within the site.

Scaffolding on the southern elevation and the scaffold fan will use a maximum of 16-ft scaffold tubes, compared to the usual 20-ft tubes. These are used to limit the potential topple distance in the highly unlikely circumstances of any tubes being dropped during erection or dismantling or coming loose during very severe weather.

All scaffolding will be inspected by a competent/trained person before it is used for the first time and then every 7 days, until it is removed, or prior to this if it is exposed to conditions likely to cause deterioration (e.g. following adverse weather conditions) or following substantial alteration. All scaffolding inspections will be carried out by a competent person whose combination of knowledge, training and experience is appropriate for the type and complexity of the scaffold they are inspecting.

777's own operatives and the out-of-hours security personnel will also intermittently check the Monarflex sheeting, and report any defects to the 777 Site Manager.

Emergency out-of-hours contacts for scaffold attendance (i.e. for wind/storm damage) will be displayed on the scaffold base and also in 777's site office.

Removal of Asbestos Containing Materials (ACMs)

There are three categorizes of asbestos work - notifiable licensed, notifiable non-licensed and non-licensed.

All 777 operatives have received training to recognize ACMs. Should any additional ACMs (other than those in the asbestos survey) be located within the buildings during demolition, work will cease, and the Site Manager notified, and an asbestos surveyor will be called to site, and a sample taken for testing to confirm, prior to works in that area continuing.

Non-Licensed Asbestos Work

Examples of such material are asbestos cement, floor tiles, bitumen felt, sink pads, and small areas of textured decorative coatings, which are likely to be non-friable and in good condition. Types of work involved in this category include removal of non-deteriorated asbestos sheets, encapsulation of asbestos materials and short-duration maintenance of AIB in good condition.

Low risk work involving the above materials will be undertaken with suitable PPE & RPE equipment, relevant control measures and method sheets.

The number of persons present will be minimized to those carrying out the work.

Specific methodology will be issued in a numbered SSOW (Safe Systems Of Work) before work commences.

Disposal of Asbestos Containing Materials (ACMs)

Asbestos waste needs to be disposed of carefully and safely.
ACMs will be securely double-bagged, sealed and placed in secure and lockable asbestos waste skips before the material leaves site.

The material will be sent to a licensed asbestos-waste receiving facility using secure, lockable skips.

Records of all consignments are kept and logged onto 777's waste reporting system.

Pre-Demolition Soft-Strip

In accordance with the demolition phasing all building will require soft stripping prior to demolition to remove rubbish, fixtures and fittings and non-load bearing walls, soft stripping of the building will enable the concrete/hard-core to be processed more efficiently and the contamination of the recycled hard-core is minimized. When all known hazardous materials have been removed and live services terminated the soft stripping of the building can commence.

Working progressively through the building the items below will be removed using a combination of hand tools, mattocks, crowbars and alike in a general soft stripping exercise.

- ✓ Removal of all floor coverings and carpets etc
- ✓ Removal of all rubbish, furniture, equipment and stockpiled materials
- ✓ Removal of non-load bearing walls, plasterboard and partitions, cills, light fittings and shelving
- ✓ Removal pf paneling and sheet finishes to the walls
- ✓ Removal of any suspended ceiling tiles, of plasterboard ceilings
- ✓ Removal of all toilet fixtures and fittings, including toilet pans, sinks and cubicles
- ✓ Removal of all kitchen equipment, sinks and cupboard units electrical and mechanical services
- ✓ Removal of all surface mounted electrical and mechanical cabling and pipe work

If suitable, buildings may be soft-stripped using small plant, such as Bobcat skidsteer dumpers and small excavators. This is dependent on access, ground bearing slabs and general suitability with all works carried out within plant only fenced off exclusion zones.

All waste materials will be segregated by waste type, stockpiled and then cleared either by hand or using a suitable sized excavator equipped with a grab attachment, All waste will be cleared in 40 Cubic Yard skips.

Demolition of Structures

All building structures will be demolished using a range of demolition excavator plant, including high reach the boom of this machine is fitted with water spray jets.

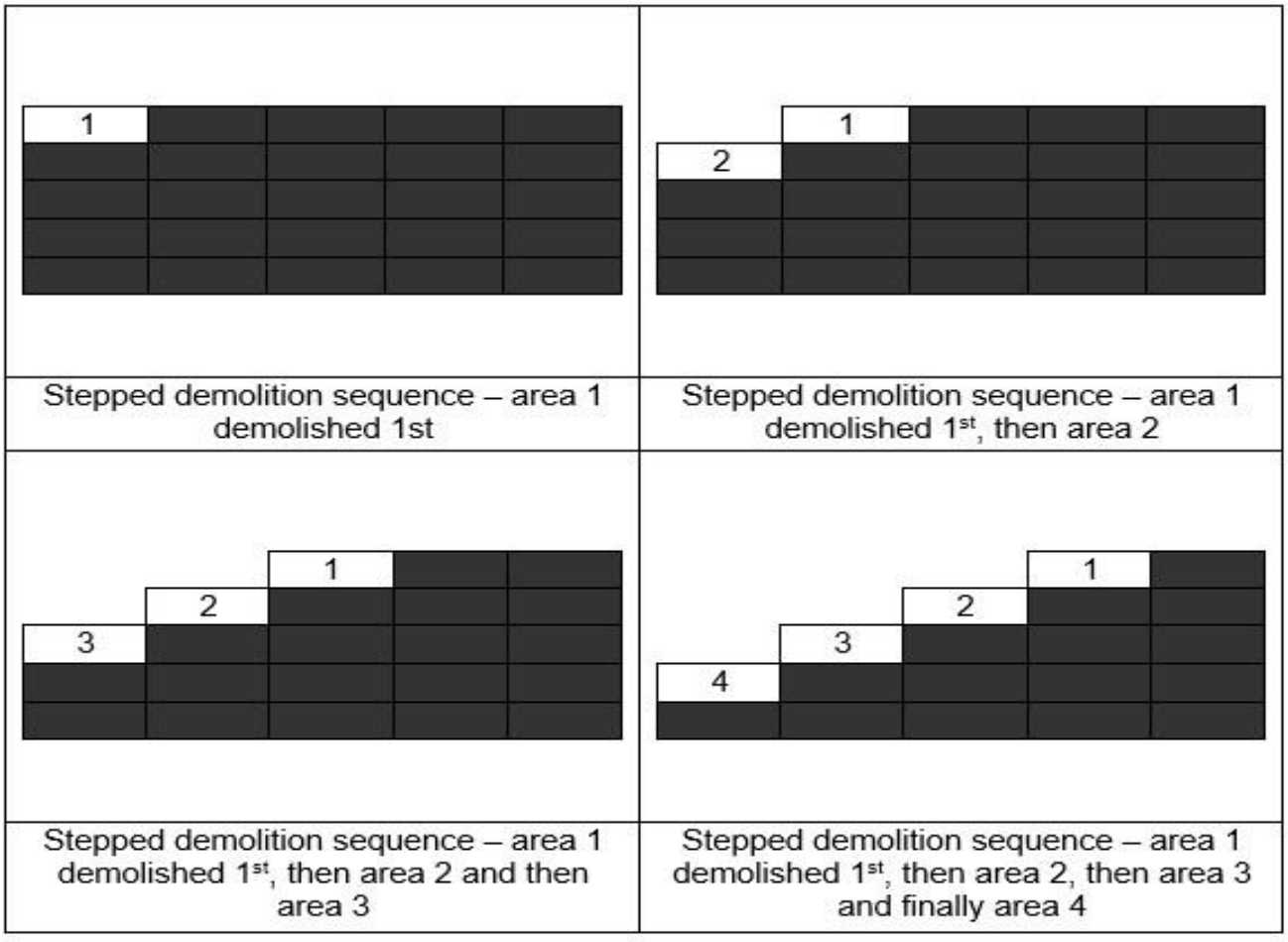
No works will take place, until any required protection or demolition scaffolding has been handed over, all utility services have been terminated back to the site boundaries and asbestos materials have been removed.

The structure will be demolished down on a floor-by-floor basis within fenced off exclusion zones in accordance with the *'Demolition Code of Practice BS:6187:2011'* and NFDC best recommended practice.

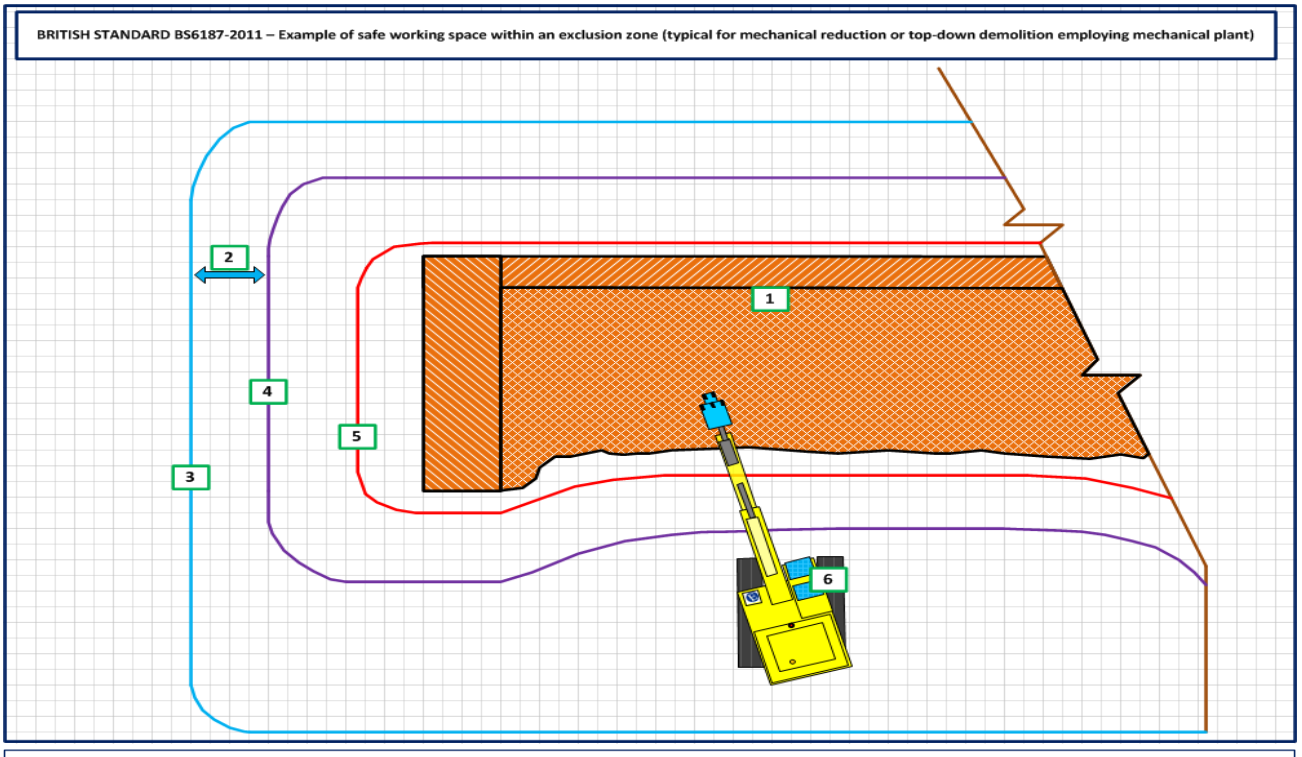
Access to all plant only exclusion zones for operatives will only take place when plant has been shut down and at the discretion of our Site Manager. Two-way radio communication will be used.

Where a spray jet has not been fitted to the arm of the machine, a water cannon such as a Dust Boss, Motofog or other similar unit will be used to atomise the eject fine water droplets across the area of works therefore suppressing dust released from the demolition processes.

The demolition sequence of the building will be stepped at each floor level so as not to create a totally vertical face, as shown below; this will also maintain the stability of the building. Methodology will be the same process as above with any scaffold required being struck down in sequence with the demolition.



EXAMPLE - Stepped Demolition Sequence Using High-Reach Excavator (4-Storey Building)



Removal of Slab & Foundations

Prior to commencement, areas will be CAT scanned, with a drawing marked-up and attached to the permit to dig, along with any notes from the analysis of the UXO Survey (Unexploded Ordinance) for the site.

The demolition excavator on hammer attachment will track onto the slab of building, starting at the back edge of the slab and working backwards onto the slab of building.

The demolition excavator using its bucket will load the concrete slab arising's into our Moxy Dumper ready for transportation to the recycling zone.

As the slab is removed the banksman will also check the underside of the slab and the ground exposed for any asbestos debris, change in colour or noticeable odour.

The machine will use the teeth of the bucket to drag the broken slab arising's back into the site casting them out of the working area.

The excavator's operator will, in a controlled and careful manner working from the agreed start point, dig down to expose the depth and size of the wall's foundations, using the teeth of the bucket to pry them from the ground chasing them over the length and width.

The excavator will then dig down the inside of the foundation to expose the depth of the foundations.

The excavator will repeat the process across the site staying 500mm away from the site boundary line.

A secondary excavator equipped with a breaker attachment will reduce any large lumps of the slab to allow for easier loading of the Moxy Dumper.

As each section of foundation is removed, the spoil will be placed back into the void using the back of the bucket to compact the material; once the ground level is reached, the machine will level off the area.

8. Environmental Controls

Environmental Controls include an assessment of flood risks, ground, flora, fauna, and the effects of demolition on the local environment.

All works will be undertaken with regard to LBN/GLA Construction Code of Practice – Please Refer to Link Below:

https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-guidance-and-spgs/control-dust-and

Detailed below are our general procedures and control methods:

General

- 777 Group's Environmental and Sustainability Policies shall be followed and applied to the commitments to environmental governance generated directly or indirectly for the project as a matter of priority for 777 Group. Copies can be provided on request.
- Our sub-contractors and suppliers are highly encouraged to make the same considerations and sign up to environmental protection mitigation measures on the project.
- Safe Systems of Work (SSoW), work instructions, risk assessments and method statements will be reviewed and implemented to minimise risk to the environment whilst on the project.
- Segregation of waste and materials on project will be implemented where there is sufficient risk mitigation to the environment (see *Site Waste Management section*).

Regulations

Work on this project will include the implementation of*:

- Best Practical Means in accordance with BS 5228: Part 1
- BS6187 2011 code of practice for demolition and refurbishment
- London Councils – "The control of dust and emissions from construction and demolition"
- GLA/ALG procedures as set out in ''the control of dust emissions from construction and demolition'' Supplemental Planning Guidance July 2014.
- ICE Demolition Protocol 2008
- London Plan 2011 Implementation Framework – "The control of dust and emissions during construction and demolition" July 2014
- Mayor of London – "The control of dust and emissions from construction and demolition Guidance" November 2006
- Department of Markets and Consumer Protection COP for Deconstruction and Construction Sites 2013.

(*= Not exhaustive)

As standard on all projects, the Environmental Team will assess all aspects and risks that may have an effect on the environment, eco-systems, flora and fauna and human interaction. To achieve this, checks are made on the nature of works and surrounding areas to pinpoint, categorise and identify all areas including natural features that may be at risk or have need of any special requirements, protection or considerations.

Detailed below are mitigation measures implemented in line with current legislation to minimise environmental impact on surrounding areas, including that of considerations to the remaining residents in close proximity to the development and general compliance.

Waste Management

777 are experienced in the compilation of Site Waste Management Plans (SWMP) and the NFDC Demolition & Refurbishment Information Data Sheet Programme (DRIDS), which ensures high standards of material handling, re-use, recycling, remanufacture, reduction and disposal on a project by project basis.

Control of Possible Ground Contamination

- 777 implement controls to contain any spillages or possible fuel/ hydraulic oil leaks from plant and equipment. These include placing spill kits on site and training in the transfer of fuel and the positioning of drip trays beneath static machinery. Training is provided to project teams and tested for effectiveness.
- In order to reduce the risk of ground contamination, plant, machinery and vehicles are to be well maintained to prevent leakage, purchase of the most modern plant and machinery
- To mitigate any ground contamination from any potential leakages, 777 will ensure that substances are stored in a secured bunded areas with spill kits made available with effective management systems in place.

Control of Air Pollution

- 777 use the most innovative plant with the most environmentally friendly specifications. Any plant, machinery and vehicles will be switched off when not in use, as this minimises unnecessary air pollution.
- Regular physical observation by key members of staff and the Environmental Team audit process is carried out.
- Pre- and Post-Task Briefings taking into account risk of dust emissions, adjustment of working assessment to mitigate or reduce where possible.
- Toolbox talks with all project staff to ensure all understand the impact of dust on the locality.
- De-construction methodology implemented taking into account de-construction drop distances, areas of exposure and dust control effectiveness.
- Local engagement to keep residents informed on progress and if works producing excess dust are due to commence.
- We will ensure that all Lorries are sheeted before leaving site and that damping down measures as detailed above are also deployed at the processing stage - this will ensure that dust emissions are minimised during the process.
- Demolition method as detailed previously – we will mitigate dropping from height as far as reasonably practicable. Demolition will be gradual and accompanied by suitable dust suppression as detailed above.
- Dust monitoring will be carried out at site perimeters on a weekly basis. A specific Environmental Management Plan (EMP) will be put in place prior to project commencement to denote monitoring points at the site boundary, monitoring will be carried out periodically via hand-held devices with readings logged, reported and maintained on site for reference.
- Should monitored levels of dust be read above that of Workplace Exposure Limit (WEL) 0.3 mg/m^3 Time Weighted Average (TWA) over an 8hr period, then works will stop while an alternative method or further mitigation measures will be implemented.

Control of Dust Pollution

Activities with the potential to generate dust will be visually monitored throughout the day by the site supervisor and site manager. The site team will dampen down with water during the works and post demolition.

Where dust is observed this will be managed with a review of the work methods and the implementation of dust suppression such as screening, covering over or dampening down. Emissions will be monitored and recorded at various positions along the boundary of the site using static dust monitoring devises e.g. frisbees, this will allow us to assess the potential impacts from our activities beyond the site boundary.

Where dust suppression is required this will be implemented immediately. In dry weather the works will be dampened to ensure there is no dust emitted from site. Motofogs and dust buster water misting plant will be utilised as required.

Key activities for dust suppression include:

- Demolition works to all the buildings have a significant potential to emit dust. 777 will employ various control measures to ensure we prevent any dust from leaving our PC area. These include pre-soaking the area, damping down during demolition activities and damping down post demolition. Motofog/Dust Boss ® equipment will also be used along with additionally localised screening as appropriate. All vehicles will be sheeted on arrival and departure from site, and access routes will be dampened down during periods of dry and warm weather.
- The movement of plant and vehicles into and out of the site can cause dust and deposit material from the site. To prevent this traffic marshals will check vehicles before they leave site - wheel washing facilities, typically a jet wash, will be used to clean the wheels of vehicles before they leave site (this is typically an issue during winter and on projects with areas of groundworks). Surfaces will be swept back towards the site to ensure that no dust or mud leaves site with vehicle movements.
- The exhaust fumes from plant and vehicle movements may contribute to the project emissions. To minimise these, vehicle movements on site will be restricted to prevent any additional exhaust fumes along with the implementation of a Traffic Management Plan to prevent unnecessary movement of plant or vehicles. We already operate a 'no idling' policy whereby static vehicles turn off their engines.
- To minimise any dust leaving the site boundary there will be minimal stockpiling on site where practicable - stockpiles and demolition activities will be dampened down to minimise windborne emissions. The project team are mindful that this is a highly residential area and dust management will be a priority.
- Any stockpiles will be dampened down using hoses to prevent any dust leaving site. Stock piling will be kept to a minimum as materials will be removed from the site or re-used as quickly as possible.

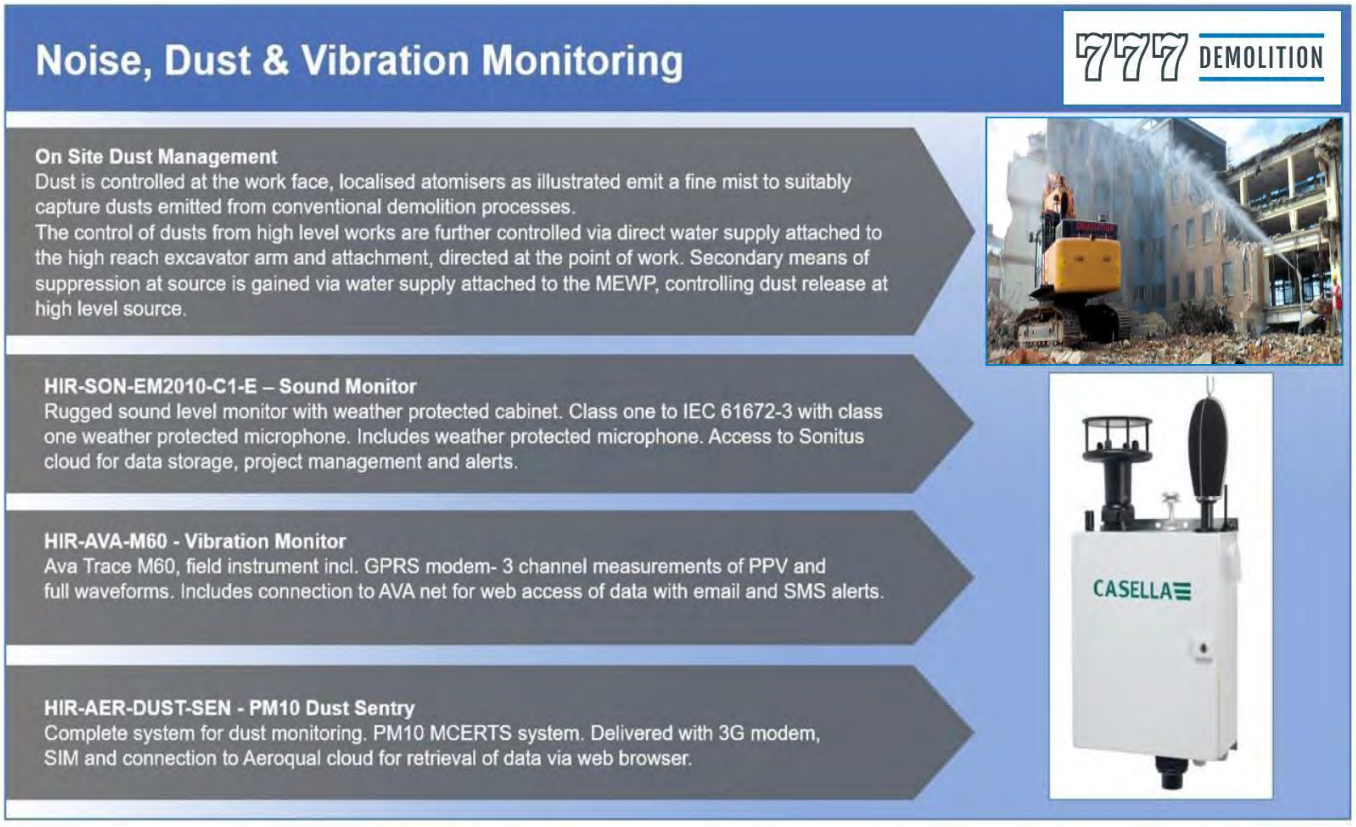
Control of Noise Pollution

- Pre-task and post-task reviews of working practices and ensuring noise risk is addressed and reduced to acceptable levels.
- Toolbox talks with trained project staff to update operations on potential and current noise level impacts.
- Pre-project and weekly project monitoring to ensure minimal impact to baseline noise levels.

- Self-imposed “quiet times” on site to coincide with local residential activities. Noisy works, unless agreed otherwise, will be limited to the approved working hours as detailed above, this being between 8.00am and 6.00pm Monday – Friday, this will include the collection/delivery of equipment.
- Physical barriers - for example, hoarding, Monarflex © covering on scaffold to reduce noise emission.
- Engagement with local residents at regular intervals especially during noisy task specific works to explain progress.
- The use of the most modern silenced plant available in the industry for the task will be used to reduce the level of noise emissions from machinery as far as reasonably practicable. The use of hydraulic breaker attachment will be minimised and used only where absolutely necessary.
- Techniques will be used to minimise the dropping from height. All demolition activities will be carried out in accordance with ‘BS6187 2011: Demolition Code of practice for demolition and partial demolition’.

Control of Vibration

- If suitable, drop mats and machine pads can be positioned to reduce plant, vehicle and process vibration.
- Regular resident liaison to confirm that vibration levels are acceptable and not impacting on the environs.
- Use of modern intrinsically compliant plant and equipment ensuring vibration levels are minimised.
- Utilisation of the right machine for the right job ensuring that plant is not under-powered to carry out the task and hence, generating more vibration than necessary. Also maintaining modern equipment with intrinsic vibration reduction designed in.



Sample of typical equipment used by 777 Demolition & Haulage Co. Ltd

Onsite Safety Measures & Signage

777 Contractors Ltd are aware of the constraints of the site and will install and adhere to the described logistics regime to cope with them in a manner that ensures that the safety of our neighbours and the general public remains paramount and that the effects on their day-to-day activities are minimal.

All vehicles entering or leaving the site will be in accordance with HSG144 and INDG199, and be directed under the guidance of a dedicated traffic marshal who will be suitably competent, trained and experienced, and identifiable from an orange hi-vis jacket.

All deliveries and collections from site will be recorded in the site log, and waste movements recorded for use in the Site Waste Management Plan. The use of mobile phones may be utilised (when it is safe and legal to do so) to ensure communication is maintained between 777 drivers and the site so that the arrival of vehicles can be suitably planned if this is required at any point.

One traffic marshal will be in attendance to supervise lorry movements on and off-site site to control internal traffic flow.

Segregation of public and vehicles/personnel will be achieved by a clearly defined site boundary, and a banksman positioned preventing personnel and vehicles coming into contact with each other, site operatives and members of the public using the footpaths outside the site during site entry/exit.

777 Contractors Limited prides itself on having HGV vehicles at the pinnacle of the safety industry.

All 777's HGV's are fitted with a variety of safety systems and alarm equipment (see '777's HGV Safety Features' drawing below). 777 have also installed Driver Behaviour Tracking Systems which allow the monitoring of acceleration, braking and speed - this ensures drivers are working safely and complying with current laws and legislations. This system allows reports to be generated along to management which detail fuel consumption and carbon dioxide emissions. This highlights any vehicle irregularities ensuring that our fleet are running at maximum efficiency.

Every vehicle has a tracker fitted, which enables the 777 Transport Manager to plan routes taking into account the type of vehicle, specific loads, and the following constraints:

- Abnormal loads routing
- Congestion charging
- Construction Logistics Plans
- Dangerous goods routing and parking conditions
- Delivery curfews and permit requirements - for example, the London Lorry Control Scheme
- Delivery and Servicing Plans
- Loading and unloading restrictions

- Low Emission Zone
- Parking controls
- Tunnel restrictions
- Satellite navigation larger vehicle routing
- Tunnel/motorway tolls
- Vehicle weight and dimension restrictions

Working Practices

- All vehicle movements will be controlled by qualified Traffic Marshals.
- Traffic Marshals dressed orange hi-visibility jackets will escort all lorries into and out of the site, particular care will be taken during reversing operations.
- Vehicles will not be allowed to queue on the adjacent highways.
- All people entering and leaving the site will be required to log in and out. All staff and visitors shall use the established site pedestrian routes.
- Segregation of personnel and vehicles/plant within the site area will be achieved by clearly defined routes and traffic marshal preventing personnel and vehicles/plant coming into contact.
- Warning signs will be displayed in prominent positions around the site and work area indicating "CAUTION CONSTRUCTION SITE TRAFFIC".
- Prior to works starting all personnel will be given a site-specific induction and orientation to the site. This will be conducted by the Site Manager who will advise personnel on any specific safety requirement that are required during the course of the project.
- All vehicles will be unloaded/loaded and turned within the confines of the site hoardings, and no loading/un-loading will be allowed on public roads.
- Routes outside of site will be kept clear for emergency service vehicles at all times.
- All drivers will be given a site-specific induction on first arrival on site - this is to ensure that everyone understands the site traffic requirements and precaution to prevent injury.
- All vehicular traffic will take due regard to all other road users and pedestrians.
- A 5mph speed restrictions will be used while vehicles are on site.
- Plant equipment will be offloaded within site area only.

- Site plant i.e. excavators, diggers etc, will only be driven by persons that are trained and competent with the appropriate qualifications.
- All flat back lorries will have edge protection for operatives' safety should they have to mount the rear.
- Audible reversing warning devices will be fitted to all vehicles and be directed by a Banksman when reversing.
- All vehicles loaded with arisings will be fully sheeted before leaving site.
- All walkways/ pavements will be kept clear of debris and/or material to prevent slips, trips and fall hazards.
- A wheel-wash facility will be installed to clean the wheels of vehicles exiting the site onto surrounding roads.
- Should there be a requirement for Emergency vehicle access, they will be given priority right of way.
- A logistics co-ordinator will plan daily traffic movements both on and off site and will be tasked with ensuring this plan is monitored and correctly administered.
- Any complaints should initially be directed to the Site Manager, whose number will be detailed at the site access point, with points raised considered and alterations made where possible. Any further complaints should be directed to the head office to be dealt with, the number being detailed at the site entrance.

Safety signs (detailed below) will be used in conjunction with the site's Traffic Marshals and will be positioned to ensure the public, site personnel, and works traffic are aware of nearby dangers.

- *"Entry for construction traffic only"*
- *"Caution construction traffic"*
- *"Beware cyclists"*
- *"Pedestrian Routes"*
- *"5mph speed limit"*
- *"Cyclist Routes"*

Drivers' Rules

Drivers of our vehicles and Plant will also adhere to the following rules set out below.

- Daily check of water, oil, fuel, lights, tyre pressures, brakes, steering and hydraulics.
- Report any defects immediately - do not use the vehicle if considered unsafe.
- Be aware of the dimensions of the vehicle and the load/potential load it will be carrying.
- Set the gear to neutral before starting the machine.
- Ensure the vehicle is not overloaded.
- Ensure that starting handle shafts, drive shafts, belts, worm drives and flywheels are guarded.
- Keep vehicle tidy.
- Do not carry passengers, other than in the seats provided.
- Do not attempt to mount or leave a moving vehicle, or permit passengers to do so.
- Do not make adjustments with the engine running.
- Never leave the machine with the engine running.
- Never reverse without the supervision of a banksmen.
- Keep to the speed limits onsite and on public roads.
- Keep the machine in low gear when travelling downhill.
- Do not smoke during refueling.
- Do not use petrol for cleaning purposes.
- Before tipping loads into excavations ensure that there is an adequate stop and that no one is working in the vicinity of the tip area.

A review of our TMP will be carried out in the event of any major changes to our working procedure or required level of access. Regardless of the aforementioned, this document will be reviewed regularly to ensure it is fit for purpose. If changes are made, then the Client will be sent a copy of the new revision for comment

9. Risk Assessments

RISK ASSESSMENT		
Site Location	Date of Assessment	Assessed by
Newham College Block Y Welfare Road, London, E15 4HT	15/11/2023	Alex Fisher
Description of Work Assessed	Traffic Management	

Risk is assessed in accordance with the HSE's Guidance Note INDG16 "Five Steps to Risk Assessment" plus our Professional Health and Safety Adviser's document "Risk Assessment Made Easy" as:

a. Look for the hazards.
b. Decide who might be harmed and how.
c. Evaluate the risks and decide what control measures are required.
d. Record the findings.
e. Review the assessment and revise it if necessary.

Ref №	Risk Assessments
RA 020	Loading/Unloading of Roll On/Off Skips
RA 027	Risk to Public and Third Parties from site activities
RA 037	Traffic Management
RA 056	Vehicle Access & Egress
RA 061	Working Adjacent to Live Traffic

Activity	RA 020 - Loading/unloading roll on/off skips		
Hazards		**At Risk Groups**	
Vehicle overturning		777 Employees	Contractors
Contact with overhead services	Debris falling onto the public highway during transit.	Visitors	Members of the public
Falling objects		Young Persons	~~Vulnerable groups~~
Lifting equipment failure		Migrant workers	

Risk Rating (Before controls)	Likelihood	Severity	Risk Level
	4	5	High

Control Measures

- A clear work area which is the total length of the vehicle and skip, plus a further 3 metres shall be provided.
- The loading/unloading area, where ever possible and as far as reasonable practicable be flat. However, if this cannot be achieved the horizontal gradient shall not exceed 5 degrees.
- Skips should be positioned away from any over-head services
- All loads shall be levelled prior to recovery.
- All loads are to be sheeted/netted prior to recovery unless the recovery vehicle is fitted with a self-sheeting/netting system in which case it must be covered prior to leaving site and entering a public highway.
- All operatives involved to wear appropriate PPE
- Trained and competent banksman to be present throughout the operation.
- If the vehicle is required to reverse to deposit or remove the skip in the designated area then a banksman will control the vehicle movements at all times whilst on site.
- Prior and during loading and unloading of the skip, an exclusion zone is to be set up to avoid entrapment, crush and entanglement injuries with any of the equipment.
- Vehicles to be fitted with reversing cameras
- Vehicles to be fitted with audible warnings when reversing
- Vehicles to use designated traffic routes at all times.
- Lifting equipment to be checked regularly and as required to comply with LOLER regulations
- Faulty or damaged equipment to be repaired or retired and not used to perform any lifting or unloading.
- If a skip has an access ladder on the side, this is not to be used by operatives unless absolutely necessary.
- Operatives are not permitted to the access the rear of the lorry at any time. This includes climbing onto the back of it to assist in removal or replacement of sheeting.

Additional Site Specific Controls / Information

Risk Rating (with controls)	Likelihood	Severity	Risk Level
	1	4	Low

Further Guidance

- http://www.hse.gov.uk/pubns/waste06.pdf
- http://www.hse.gov.uk/foi/internalops/ocs/200-299/234_11.htm
- http://www.hse.gov.uk/food/roll-cages-wheeled-racks.htm

Reviewed on site by:		Review Date:	

Activity	RA 027 - Risks to the public and third parties from site activities		
Hazards		**At Risk Groups**	
Collision with persons	Mud and dirt onto the public highway.	777 Employees	Contractors
Falling Objects	Unauthorised access	Visitors	Members of the public
Footpath/Public Highway obstructions	Vehicle movements	Young Persons	Vulnerable groups
Noise, Dust and Vibration		Migrant workers	

Risk Rating (Before controls)	Likelihood	Severity	Risk Level
	2	4	Medium

Control Measures

- Site perimeter to be protected/guarded using a timber hoarding or metal palisade fencing, in the event that these methods are found not to be reasonably practicable then the use of Heras fencing shall be considered.
- In the case of a timber hoarding it is worth considering the inclusion of viewing panels.
- Screens & debris netting shall be used where required.
- All visitors to site shall receive a site induction where they shall be made aware of the inherent site hazards & appropriate PPE shall be issued to them.
- SSOW shall be adhered to at all times
- Banksmen shall be employed to control traffic manoeuvres & to marshal pedestrian traffic past exclusion zones.
- Where necessary plant/machinery will pause to allow pedestrian traffic to pass by.
- There shall be constant interface between the site management team & local residents.
- Where it is necessary to close footpaths or the public highway permission shall be obtained from the local authority & the New Roads & Street Works Act shall be complied with at all times.
- Noise and vibration shall be supressed using new technologies and equipment to ensure low vibrations and reduction of noise.
- Where required local restrictions shall be adhered to with regards to breaking. (Section 60/61)
- Dust suppression shall be used to keep dust to a minimum.
- Wheel wash stations, jet wash and road sweepers shall be used to limit the amount of mud/dirt/debris reaching the public highway.
- Newsletters, progress reports and other relevant information shall be displayed where possible informing the public and local residents of site activities.
- Lifts, loading and unloading shall only be carried out in designated areas and when safe to do so.
- Any near misses shall be reported and recorded, then reviewed to ensure no reoccurrence.
- Weekly monitoring of noise, dust and vibration shall be carried out with the results submitted to the project manager for review.
- Security guards shall be employed where required to ensure that no out of hours unauthorised access takes place.
- Door locks, coded key pads, biometric system and other security measures will be in operation during working hours to prevent unauthorised access.
- Any complaints received shall follow the company's complaints procedure and followed up accordingly.
- Staff are not permitted to use foul or abusive language
- Site working hours to be adhered to
- Smoking/Eating outside of site is to be discouraged

Additional Site Specific Controls / Information

Risk Rating (with controls)	Likelihood	Severity	Risk Level
	1	4	Low

Further Guidance

• http://www.hse.gov.uk/foi/internalops/ocs/700-799/789_5.htm • http://news.hse.gov.uk/2008/09/17/public-health-and-safety-risks-from-work-activities/	Section 60/61 http://www.hse.gov.uk/toolbox/managing/managingtherisks.htm

Reviewed on site by:		Review Date:	

Activity	RA 037 - Traffic Management		
Hazards		**At Risk Groups**	
Collision–Pedestrians/Vehicles	Cyclists	777 Employees	Contractors
Faulty vehicles	Diversions	Visitors	Members of the public
Route changes due to site requirements	Road Traffic Incidents	Young Persons	Vulnerable groups
Excavations & uneven ground	Exhaust fumes	Migrant workers	
Lack of segregation	Debris on the road		
Collision with fixed objects	Obstructions/obstacles on walkways, forcing pedestrians into traffic routes		

Risk Rating (Before controls)	Likelihood	Severity	Risk Level
	3	5	High

Control Measures

- Gates/Barriers shall be erected to control entry onto site and the procedure for obtaining entry shall be displayed.
- An appropriate speed limit of a maximum of 5mph shall be set for the site and adhered to at all times.
- Where ever possible, the need for reversing shall be eliminated by the provision of a turning circle or the introduction of a trained and competent banksman.
- Designated areas for loading and unloading shall be provided.
- Blind spots should be eliminated by the provision of convex and concave mirrors.
- Routes for pedestrians and traffic shall be segregated.
- Signage shall be erected to warn and instruct users of traffic routes.
- All persons shall be provided with information regarding traffic routes at the point of induction.
- All vehicles shall be fitted with flashing amber warning beacons and reverse warning systems
- All vehicle and plant checks shall be carried out and maintenance schedules adhered to.
- The site traffic management plan shall be displayed throughout site.
- Any changes or activities which will effect which will affect traffic routes shall be covered in the daily, pre work briefing.
- Edge protection, including stop blocks shall be provided alongside any excavation, bodies of water or close to pedestrian routes.
- An exclusion zone shall be provided around any work area in which plant/equipment slews.
- All temporary structures shall be protected from collision
- Where necessary, a wheel wash system and/or road sweeper shall be employed to prevent contamination of the public highways.
- Traffic marshals shall be employed to control vehicle access/egress
- Traffic routes should be clearly identifiable and areas where cross over between vehicles and pedestrians is likely, gates/barriers should be set up with warning signs alerting users to the hazards.
- PPE is to be worn at all times whilst on site so that they can be clearly identified by drivers and plant/equipment operators
- If operatives need to pass plant or machinery, they should make themselves known to the operator who will inform them when it is safe to pass.
- Vehicles should be fitted with a 'Deadman' switch.
- A traffic management plan is required and is also required to be briefed out to the operatives.
- Site working house should be strictly adhered to
- No parking in residents bays is permitted at any time
- Sufficient lighting shall be used at all times, either natural or task specific
- Good road conditions to be maintained where possible, drains and pot holes to be avoided.

Additional Site Specific Controls / Information

Risk Rating (with controls)	Likelihood	Severity	Risk Level
	1	5	Low

Further Guidance

Hse.gov.uk/workplacetransport/trafficmanagement.htm Hse.gov.uk/construction/safetytopics/ Hse.gov.uk/workplacetransport/separating.htm	Hse.gov.uk/workplacetransport/checklist/section2.htm Hse.gov.uk/workplacetransport/trafficroutes.htm Traffic management plan

Reviewed on site by:		Review Date:	

Activity	RA 056 - Vehicle Access/Egress		
Hazards		**At Risk Groups**	
Collision with persons	Excavations	777 Employees	Contractors
Collision with vehicle/plant	Fumes	Visitors	Members of the public
Collision with stationary object	Interface with Public	Young Persons	Vulnerable groups
Collision with structure	Reversing vehicles	Migrant workers	
Working on public highway	Cyclists		

Risk Rating (Before controls)	Likelihood	Severity	Risk Level
	4	5	High

Control Measures

- A suitable and sufficient traffic management plan shall be developed which shall include provision for cyclists
- All vehicles shall be FORS Silver compliant
- Suitable and sufficient access/egress points to and from the public highway for vehicles shall be provided.
- Vehicle access/egress points shall be under control of traffic marshals at all times.
- CCTV shall be provided at vehicle access/egress points.
- Vehicles shall not be allowed to queue on site and shall be kept at an offsite holding point prior to entry
- Waiting vehicles will switch off their engines and under no circumstances will idling be allowed
- Vehicles shall be booked in with site management prior to arriving at site and under no circumstances will vehicles be allowed access if they turn up without giving prior notice. Access times to site will take into account Arnhem Primary School restrictions (see earlier main document).
- Traffic marshals shall be trained/competent in their duties.
- Traffic marshals shall be provided with orange high visibility clothing
- Traffic marshals shall be issued with whistles and torches
- The need to reverse vehicles shall be minimised
- Physical barriers and hold points shall be established to prevent pedestrian access
- Signage shall be put in place to warn pedestrians/road users of works and any traffic controls ahead
- The local authority shall be consulted with regard to minimising vehicle movements during times of high volumes of traffic being on the public highway.
- In the event that a road closure is found to be necessary to facilitate safe vehicle access/egress the local authority shall be consulted and the required permits obtained
- In the event that the site is in close vicinity to a school, vehicle movements shall be minimised/prohibited during school drop off times.
- Where necessary a wheel wash system or road sweeper shall be employed to prevent contamination of the public highway.
- All loads shall be secured and tippers sheeted prior to leaving site
- Vehicles emerging from site onto the public highway shall obey the designated speed limit at all times.

Additional Site Specific Controls / Information

Risk Rating (with controls)	Likelihood	Severity	Risk Level
	2	5	Medium

Further Guidance

HSG144 – The Safe Use of Vehicles on Construction Sites	New Roads and Street works Act 1991 Safety at Street works and Road Works

Reviewed on site by:		Review Date:	

Activity	RA 061 - Working adjacent to live traffic		
Hazards		**At Risk Groups**	
Collision with moving traffic	Cyclists	777 Employees	Contractors
Excavations	Obstructing the public	~~Visitors~~	Members of the public
Moving plant	Noise/Dust	~~Young Persons~~	Vulnerable groups
Slips, trips and falls	Contact with services	Migrant workers	

Risk Rating (Before controls)	Likelihood	Severity	Risk Level
	5	5	High

Control Measures

- Any existing areas to be retained shall be protected and a dilapidation survey shall be undertaken prior to works commencing.
- Only trained and competent operatives, supervisors and managers shall be involved in undertaking this type of work.
- A suitable and sufficient site specific risk assessment of the work area shall be undertaken and from this a SSoW developed by a competent person, following the guidelines set out in the Safety at Street Works and Road Works Accredited Code of Practice (ACOP), prior to the setting up of the work area or any works commencing.
- Any restrictions placed upon the works by the local enforcing authority shall be adhered to at all times
- All works shall be compliant with the Safety at Street Works and Road Works ACOP as required by the New Roads and Street Works Act 1991.
- The appropriate licences/permits shall be obtained from the local authority.
- Any diversions to traffic on the public highway shall be suitably controlled and signed.
- Operatives shall wear the appropriate PPE and high visibility clothing at all times.
- All work areas shall be signed and lit as appropriate, in some circumstances this will require provision for measures which exceed those stated in the ACOP
- Suitable and sufficient segregation shall be provided as set out in the Safety at Street Works and Road Works ACOP
- So far as is reasonably practicable buffer zones/safe areas shall be provided.
- The work area shall be segregated from vehicular traffic and pedestrians
- The appropriate licences/permits shall be obtained from the local authority.
- All areas shall be kept clear of obstruction, suitable storage for rubbish shall be provided and under no circumstances shall debris be allowed to obstruct public areas.
- Suitable and sufficient warning signage for pedestrians and road users shall be in place prior to works commencing.
- Works shall be planned, so far as is reasonably practicable, to minimise disruption to public transport i.e. bus routes
- All vehicle movements shall be under the control of a competent banksman.
- All plant being used to undertake the works shall be suitable for use on the road i.e. having pneumatic tyres or rubber tracks.
- All plant shall be parked safely and securely with the keys removed to prevent unauthorised use.
- Consideration shall be given to members of the public/passers-by at all times.
- All personnel shall refrain from using foul or abusive language.
- Acoustic shielding shall be employed as required.

Additional Site Specific Controls / Information

Risk Rating (with controls)	Likelihood	Severity	Risk Level
	2	5	Medium

Further Guidance

New Roads and Street Works Act 1991
Safety at Street works and Road Works 2014
Traffic Management Act 2004

Reviewed on site by:		Review Date:	

RISK ASSESSMENT – PART B

On each site and each location, the generic assessments must be reviewed to ensure that all significant hazards and their risks are identified and controlled. Completion of this section will ensure that the assessment is both appropriate and complete.

Location		Date		Maximum number of people involved in activity:	

Assessment №	Any additional specific hazards identified	Additional control measures required

Assessment of remaining risks: *Based on Risk Matrix*	Minor ☐	Moderate ☐	Serious ☐	Major ☐	Catastrophic ☐

Is residual risk level acceptable	Yes ☐ No ☐	Any serious and imminent danger risks identified	Yes ☐ No ☐

Is there any emergency action required to be taken	Name(s) of competent person(s) appointed to take the appropriate action	
	Principal Contractor	
	Sub-Contractor	
	Other	

Are there any foreseeable circumstances which will require an additional assessment

Review – The assessment will be reviewed as the work progresses and if there are any changes to working processes

Signed	Print Name	Date

Circulation of Risk Assessment
Contractor ☐ Site Copy ☐ Employees ☐ Subcontractor ☐ Other ☐ Client ☐

Risk Matrix – To be used to determine the degree of risk for each hazard i.e. 'how bad and how likely'					
	Severity of Harm				
Probability of Harm	1 = Minor	2 = Moderate	3 = Serious	4 = Major	5 = Catastrophic
1 = Improbable	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk
2 = Remote	Low Risk	Low Risk	Medium Risk	Medium Risk	Medium Risk
3 = Possible	Low Risk	Medium Risk	Medium Risk	Medium Risk	High Risk
4 = Probable	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5 = Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

Probability Classification (P)	Severity Classification (S)	Degree of Risk (PxS)
0 = Impossible	0 = No injury / affect	0 = No risk
1 = Improbable – Very low probability of such an event occurring.	1 = Minor – Minor accident, resulting in no injuries or lost time, little or no damage to property or the environment.	1 to 5 = Low Risk – ensures controls are adhered to and activity need not alter
2 = Remote – Would rarely occur.	2 = Moderate – Potential injury necessitating less than 3 days off work, damage to property or the environment requiring remedial work.	6 to 12 = Medium Risk – tolerable, but efforts should be made to reduce the risk where cost effective and reasonably practicable.
3 = Possible – May occur on occasions.	3 = Serious – Accident reportable under RIDDOR 95, serious damage to property or the environment.	
4 = Probable – Could occur frequently.	4 = Major – Accident resulting in serious or permanent injury, major or permanent damage to property or the environment.	13 -25 = High Risk – Unacceptable except in extraordinary circumstances, all control measures must be taken regardless of cost.
5 = Likely – Very likely to happen unless activity prevented.	5 = Catastrophic – Accident resulting in death or severe disablement, destruction of property, irreversible damage to the environment.	

When the detailed control measures in place are adhered to, the risks above should be reduced to an acceptable level.

The risk assessments adhere to the current British Standards as follows:

HEAD PROTECTION

BS EN 397: Specification for industrial safety helmets.

EYE PROTECTION

BS EN 166: Specification for personal eye protection.
BS EN 169: Specification for filters used in eye protection for welding etc.
prEN 175: Equipment for eye & face protection during welding/allied processes.

EAR PROTECTION

BS EN 352-1: Specification for earmuffs.
BS EN 352-2: Specification for earplugs.
prEN 352-3: Specification for earmuffs attached to safety helmets.
prEN 352-4: Specification for level-dependent earmuffs.
BS EN 458: Selection, use, care & maintenance of hearing protectors.

RESPIRATORY PROTECTION

BS EN 136: Full face masks.
BS EN 137: Self-contained open-circuit compressed air.
BS EN 140: Half masks & quarter masks.
BS EN 149: Filtering half-masks against particles.

HAND PROTECTION

BS EN 420: General requirements for gloves.
BS EN 374: Protective gloves against chemicals/ micro-organisms.
BS EN 388: Protective gloves against mechanical risks (abrasion, cutting, etc).
BS EN 407: Protective gloves against thermal risk (heat &/or fire).
prEN 12477: Protective gloves for welders.

GENERAL PROTECTION

BS ENV 343: Protection against foul weather.

HEAT & FLAME PROTECTION

BS EN 470-1: Protection clothing for use in welding, grinding and cutting.

CHEMICAL PROTECTION

BS EN 7184: Selection, use and maintenance of chemical protective clothing.

FOOT PROTECTION

BS EN 345: Specification for safety footwear for professional use

10. UXO Site Safety and Emergency Procedures Plan

No sub-ground excavation work are proposed as part of this demolition phase, but will operate in line with the mitigation measures identified in the UXO Risk Assessment (Appendix D).

UXO Safety Induction Training/Site Safety Awareness Briefings will be provided to everyone working at or visiting the site. The training will be commensurate with the individual's responsibilities and duties on the site. The training will be provided by a qualified Explosive Ordnance Disposal Engineer and delivered as a separate module of the Site Safety Induction Course.

No work will be undertaken on site without awareness briefing training from the specialist UXO Consultancy overseeing this work. In the event that a suspicious object is discovered, all works will be ceased and a competent EOD engineer will be instructed to inspect and/or emergency services called.

Please refer to Appendix D (Safelane Global – Detailed Unexploded Ordanance Risk Assessment REF 9357 RA)

The above risk assessment has determined that this site's risk level is Medium.

11. Further information

Following the TFL CLP Guidance document, the following information is supplied as brief supplementary notes:

a) Waste minimisation forms an integral part of 777's corporate responsibility, and details of measures to be implemented on this project are contained within "Site Waste Management Plan" part of this document.

b) Alternative modes of transport are encouraged, as detailed earlier in this document.

c) 777's vehicle renewal policy follows an established 777 Group policy of running an up-to-date, modern and fuel-efficient fleet of vehicles at all times. This policy results in 777 having vehicles on the road which are virtually all less than three years old. The same policy applies for 777's demolition plant purchases.

d) As the main activity on site will be demolition, the need for off-site fabrication and collaboration between suppliers is not applicable but should be considered if such a need arises.

e) This document will need to be revised if there are any major changes to the size and type of machinery working on site or if there are any changes to any processes that may incur a significant rise of the level of risk from traffic and or traffic management.

f) Regardless of the above this document will be revised/reviewed quarterly to ensure it is fit for purpose.

Sign Off Sheet for Site Personnel

Acknowledgement Sign Off Sheet			
Construction & Logistics Management Plan Newham College Block Y Welfare Road, London, E15 4HT			
Record No:		Instructor:	
Attendees			
	Name	Signature (I have been briefed and understand this Traffic Management Plan and will not deviate from it)	Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Operative Feedback and Suggestions If you have any comments or ideas on safer methods of working, then write them here and discuss them with the instructor			

APPENDIX A
(SITE LOGISTICS PLAN)

777 DEMOLITION

BLOCK W

BLOCK A

YPA

BLOCK Y

Reception Area
(Early Demolition Commencing 17/11/23)

W Block Entrance Secured Before Works Commence

Early Demolition of COSHH Stores 10/11

Covered Walkway Demolish Prior to Scaffold Erection

Dying Room

Canteen

Toilet Block

Scaffold Staircase 2

Scaffold Staircase 1

SKIP LOADING & UNLOADING AREA

Contractors Car Park (Early Stage Works Only)

Site Office

UKPN Sub-Station

GM

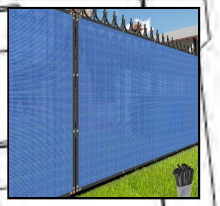
Utilise Existing Gates

WELFARE ROAD

Railings to Welfare Road Elevation Fitted with 777 Monarflex

Existing Railings, Gate & Vehicle Barrier Removed

Fencing / Railings Fitted with Blue Debris Netting



KEY:

- = 777 Branded Monarflex (Fitted to Railings)
- = Blue Debris Netting (Fitted to Fencing)
- = PHASE 1 Scaffolding
- = PHASE 2 Scaffolding
- = Crowd Barriers
- = Mesh Heras Fencing
- = Solid Heras Fencing
- = Pedestrian Gate
- = Personnel Entrance Door (Includes Digi-lock)
- = 5-Meter Vehicle Gates (Installed On Blocks)
- GM = Gate Man / Traffic Marshall Station

Following Early November Demolition Works
Site Layout 04/12/23 >

BLOCK W

Following Demolition of COSHH Store
10/11/23 to 16/11/23

Installation of FIRE EMERGENCY WALKWAY

Dying Room

Canteen

Toilet Block

BLOCK A

YPA

BLOCK Y

SKIP LOADING & UNLOADING AREA

Scaffold Staircase 2

Scaffold Staircase 1

Double Door Opening(s) Blocked-Up

Newly Installed Insulated Partition + Fire Protection

Site Office

UKPN Sub-Station

GM

2.4M Timber Hoarding On Blocks

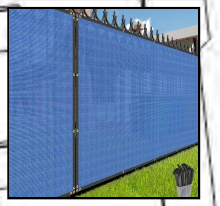
Utilise Existing Gates

WELFARE ROAD

Railings to Welfare Road Elevation Fitted with 777 Monarflex

Existing Railings, Gate & Vehicle Barrier Removed

Fencing / Railings Fitted with Blue Debris Netting



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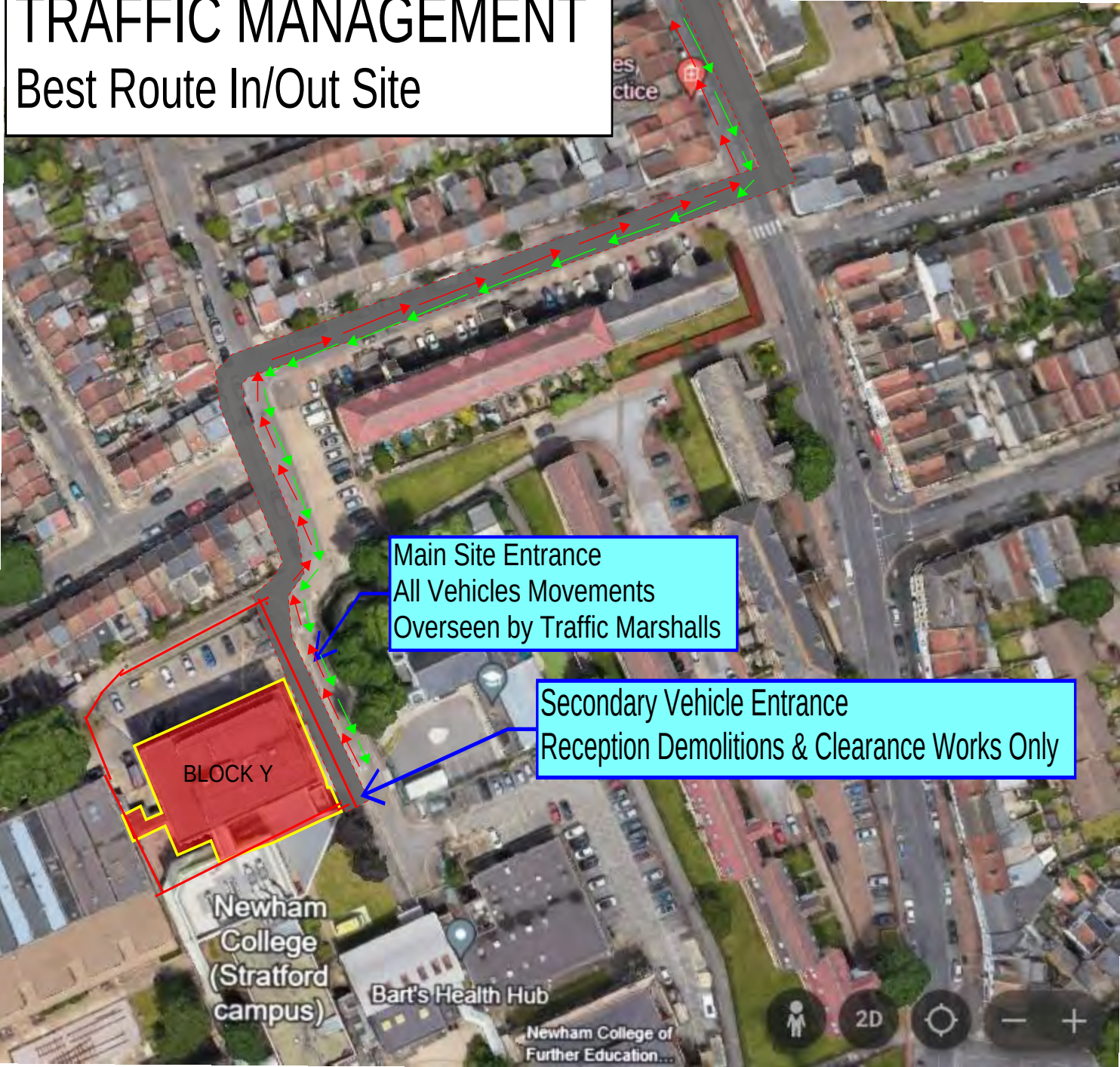
= Pedestrian Gate

= Personnel Entrance Door (Includes Digi-lock)

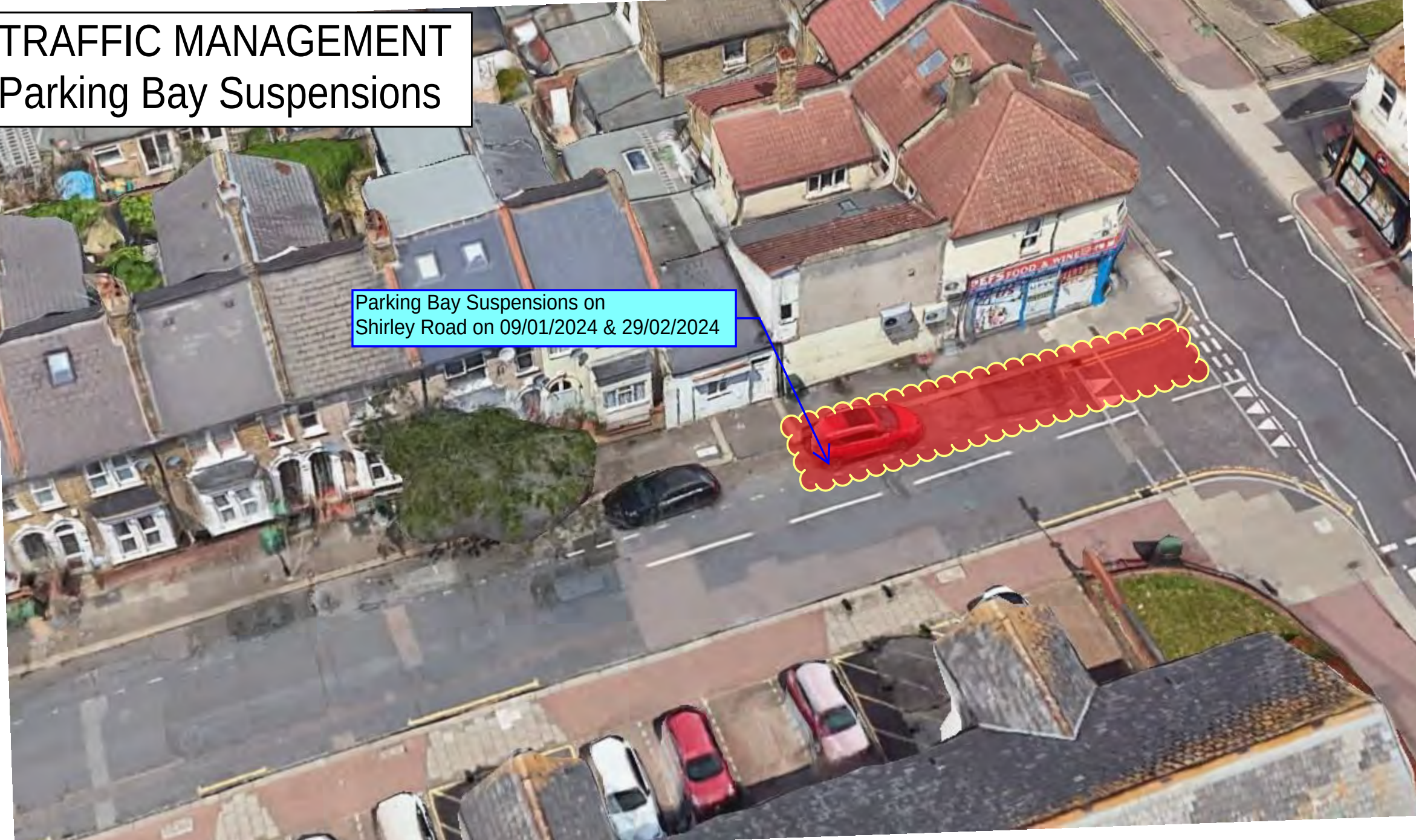
= 5-Meter Vehicle Gates (Installed On Blocks)

GM = Gate Man / Traffic Marshall Station

TRAFFIC MANAGEMENT
Best Route In/Out Site



TRAFFIC MANAGEMENT
Parking Bay Suspensions



APPENDIX B
(SITE CONDITION SURVEY)


PHOTO DATE: 06/10/2023
Welcome to
NEWHAM COLLEGE LONDON


PHOTO DATE: 06/10/2023

PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023
NO SMOKING


PHOTO DATE: 06/10/2023
ZONE Y YPA
EXIT


PHOTO DATE: 06/10/2023
makita


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023


PHOTO DATE: 06/10/2023

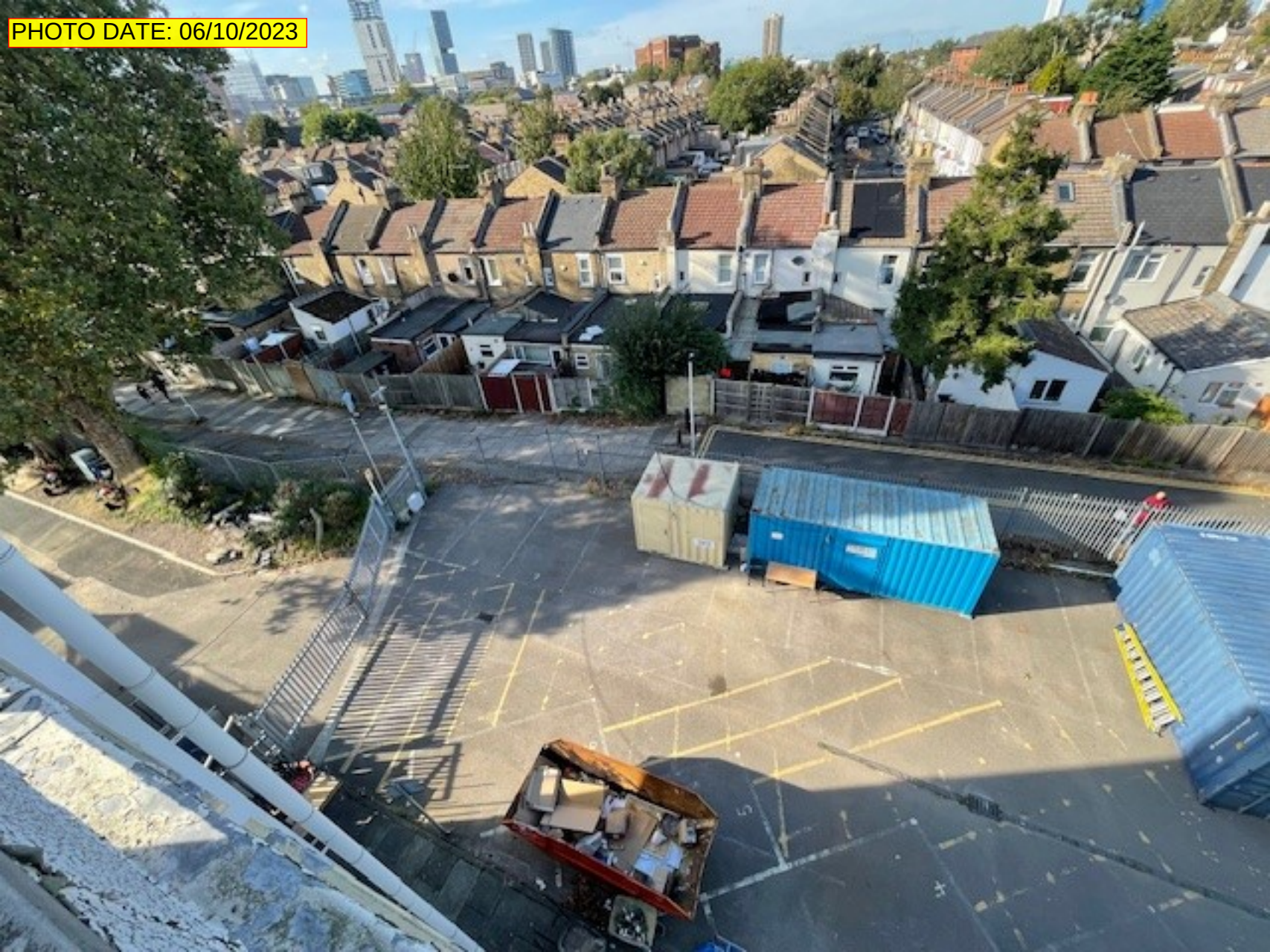


PHOTO DATE: 06/10/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023
ARE RD


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023

PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023


PHOTO DATE: 16/11/2023
WELFARE RD

APPENDIX C

(AIR QUALITY & DUST MANAGEMENT PLAN)

Air Quality Assessment:
Block Y, Newham College, Stratford Campus

March 2023

Experts in air quality management & assessment

AIR QUALITY CONSULTANTS - CELEBRATING 25 YEARS -

Document Control

Client	Newham College of Further Education	**Principal Contact**	Peter West (AA Projects)

Job Number	J10/14199A/10

Report Prepared By:	Paul Outen

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
J10/14199A/10/1/F1	7 March 2023	Final	Dr Denise Evans (Associate Director)

Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
24 Greville Street, Farringdon, London, EC1N 8SS Tel: 020 3873 4780
aqc@aqconsultants.co.uk

Registered Office: 23 Coldharbour Road, Bristol BS6 7JT
Companies House Registration No: 2814570

Executive Summary

The air quality impacts associated with the proposed replacement of Block Y at Newham College's Stratford Campus in the London Borough of Newham have been assessed. The development will consist of a single, three-storey building to replace the existing Block Y at the site.

The proposed development is not located near to any busy roads, and the assessment has demonstrated that future users of the replacement Block Y will experience acceptable air quality, with pollutant concentrations below the air quality objectives.

The proposed development will be provided heat and hot water by Air Source Heat Pumps and thus will not introduce any new combustion plant. Furthermore, it will not lead to an increase in staff or pupil numbers, nor will it provide additional car parking spaces, and will therefore not generate any additional vehicle movements; thus, the proposed development will not have an adverse effect on local air quality.

During the construction works a range of best practice mitigation measures will be implemented to reduce dust emissions and the overall effect will be 'not significant'; appropriate measures have been set out in this report, to be included in the Dust Management Plan for the works.

Overall, the construction and operational air quality effects of the proposed development are judged to be 'not significant'.

The proposed development has also been shown to meet the London Plan's requirement that new developments are at least 'air quality neutral'.

Contents

1 Introduction

1.1 This report describes the potential air quality impacts associated with the proposed replacement of a building at Newham College in the London Borough (LB) of Newham. The proposed development will involve the demolition of Block Y, which will then be rebuilt in the same location. Block YPA, located adjacent to Block Y, will also be internally refurbished as part of the works.

1.2 The proposed development lies within a borough-wide Air Quality Management Area (AQMA) declared by Newham Council for exceedances of the annual mean nitrogen dioxide (NO_2) and 24-hour mean PM_{10} objectives. The proposed development will introduce exposure into this area of potentially poor air quality; thus, an assessment is required to determine the air quality conditions that future occupants will experience. The main air pollutants of concern related to road traffic emissions (the main source of air pollution at the development) are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$).

1.3 The location and setting of the proposed development are shown in Figure 1, along with the nearby Focus Areas and monitoring sites.

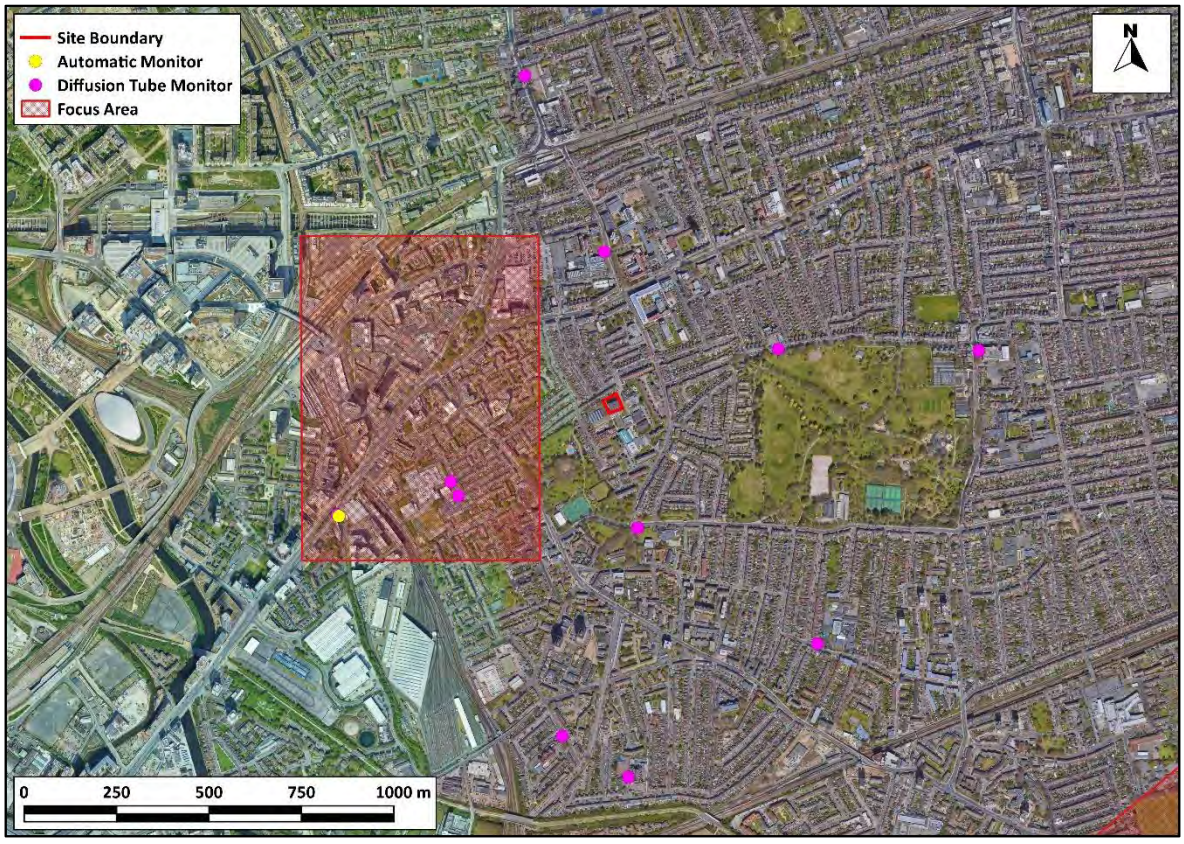


Figure 1: Proposed Development Setting in the Context of Air Quality

Imagery ©2023 Google.

1.4 The new Block Y will be provided with heat and hot water by Air Source Heat Pumps (ASHPs); there will be no new combustion plant and thus no significant point sources of emissions within the proposed development.

1.5 The Greater London Authority's (GLA's) London Plan (GLA, 2021a) requires new developments to be air quality neutral. The air quality neutrality of the proposed development has been assessed following the methodology provided in the latest GLA's London Plan Guidance (Air Quality Neutral) (GLA, 2023).

1.6 The GLA has also released Supplementary Planning Guidance on the Control of Dust and Emissions from Construction and Demolition (GLA, 2014b). The SPG outlines a risk assessment approach for construction dust assessment and helps determine the mitigation measures that will need to be applied. A construction dust assessment has been undertaken and the appropriate mitigation has been set out.

1.7 This report describes existing local air quality conditions (base year 2019; 2020 and 2021 were not used due to the impacts of the Covid-19 pandemic), and the predicted air quality in the future assuming that the proposed development proceeds. The assessment of traffic-related impacts focuses on 2024, which is the anticipated year of opening. The assessment of construction dust impacts focuses on the anticipated duration of the works.

1.8 This report has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with Newham Council.

2 Policy Context

2.1 All European legislation referred to in this report is written into UK law and remains in place.

Air Quality Strategy

2.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an AQMA, and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

2.3 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

2.4 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

2.5 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has since announced that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe

from 2035. If these ambitions are realised then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades.

Environment Act 2021

2.6 The UK's new legal framework for protection of the natural environment, the Environment Act (2021) passed into UK law in November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.

2.7 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96) sets two new targets for future concentrations of $PM_{2.5}$. These targets are described in Paragraph 3.5.

Environmental Improvement Plan 2023

2.8 Defra published its 25 Year Environment Plan in 2018 (Defra, 2018b). The Environment Act (2021) requires Defra to review this Plan at least every five years. The Environmental Improvement Plan 2023 (Defra, 2023a) is the first revision. This outlines the progress made since 2018 and adds detail to the goals defined in the 2018 Plan, including that of achieving clean air.

2.9 The Environmental Improvement Plan 2023 sets out the new air quality targets which have been set for concentrations of $PM_{2.5}$. These targets, which are described in more detail in Paragraph 3.5, include the long-term targets in the Statutory Instrument described in Paragraph 2.7, and interim targets to be achieved by 2028.

2.10 The 2023 Plan outlines the role of local authorities in helping it meet both its targets and existing commitments. It notes that an Air Quality Strategy will be published to provide guidance on how local authorities should assist. The Plan makes clear that this will focus on reducing emissions from sources within a local authority's control, including through traffic management and planning powers. This focus on emissions, as opposed to directly requiring local authorities to assess $PM_{2.5}$ concentrations against the new targets, recognises that $PM_{2.5}$ is a cross-boundary issue; most $PM_{2.5}$ within a local authority's area is not, by and large, emitted within that local authority. The 2023 Plan also outlines the respective roles of industry, agricultural sectors, and the Department for Transport in providing the coordinated action required to meet both its new, and pre-existing targets and commitments.

Planning Policy

National Policies

2.11 The National Planning Policy Framework (NPPF) (2021) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective:

"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

2.12 To prevent unacceptable risks from air pollution, Paragraph 174 of the NPPF states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality".

2.13 Paragraph 185 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".

2.14 More specifically on air quality, Paragraph 186 makes clear that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan".

2.15 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified".

2.16 Regarding plan-making, the PPG states:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

2.17 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan "*identifies measures that will be introduced in pursuit of the objectives and can have implications for planning*". In addition, the PPG makes clear that *"Odour and dust can also be a planning concern, for example, because of the effect on local amenity"*.

2.18 Regarding the need for an air quality assessment, the PPG states that:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity".

2.19 The PPG sets out the information that may be required in an air quality assessment, making clear that:

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".

2.20 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".

London-Specific Policies

2.21 The key London-specific policies are summarised below, with more detail provided, where required, in Appendix A1.

The London Plan

2.22 The London Plan (GLA, 2021a) sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The key policy relating to air quality is Policy SI 1 on *Improving air quality*, Part B1 of which sets out three key requirements for developments:

"Development proposals should not:

a) lead to further deterioration of existing poor air quality

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

c) create unacceptable risk of high levels of exposure to poor air quality".

2.23 The Policy then details how developments should meet these requirements, stating:

"In order to meet the requirements in Part 1, as a minimum:

a) development proposals must be at least Air Quality Neutral

b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures

c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1

d) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure".

2.24 Part C of the Policy introduces the concept of Air Quality Positive for large-scale development, stating:

"Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

1) how proposals have considered ways to maximise benefits to local air quality, and

2) what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this."

2.25 The proposed development is not large-scale development, thus an Air Quality Positive statement is not required.

2.26 Regarding construction and demolition impacts, Part D of Policy SI 1 of the London Plan states:

"In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance".

2.27 Part E of Policy SI 1 states the following regarding mitigation and offsetting of emissions:

"Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development".

2.28 The explanatory text around Policy SI 1 of the London Plan states the following with regard to assessment criteria:

"The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter.

The aim of this policy is to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits. Where limit values are already met, or are predicted to be met at the time of completion, new developments must endeavour to maintain the best ambient air quality compatible with sustainable development principles.

Where this policy refers to 'existing poor air quality' this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits"[1].

2.29 The London Plan includes a number of other relevant policies, which are detailed in Appendix A1.

[1] The London Plan was developed based on a World Health Organisation guideline for $PM_{2.5}$ of 10 $\mu g/m^3$ (see Paragraph 2.30).

London Environment Strategy

2.30 The London Environment Strategy was published in May 2018 (GLA, 2018a). The strategy considers air quality in Chapter 4; the Mayor's main objective is to create a *"zero emission London by 2050".* Policy 4.2.1 aims to *"reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport".* The strategy sets a target to achieve, by 2030, the guideline value for $PM_{2.5}$ which was set by the World Health Organisation (WHO) in 2005. An implementation plan for the strategy has also been published which sets out what the Mayor will do between 2018 and 2023 to help achieve the ambitions in the strategy.

Mayor's Transport Strategy

2.31 The Mayor's Transport Strategy (GLA, 2018b) sets out the Mayor's policies and proposals to reshape transport in London over the next two decades. The Strategy focuses on reducing car dependency and increasing active sustainable travel, with the aim of improving air quality and creating healthier streets. It notes that development proposals should *"be designed so that walking and cycling are the most appealing choices for getting around locally".*

GLA SPG: Sustainable Design and Construction

2.32 The GLA's SPG on Sustainable Design and Construction (GLA, 2014a) was revoked upon publication of the new London Plan, but it is understood that GLA still expects the emission standards set within it for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant to be met.

GLA SPG: The Control of Dust and Emissions During Construction and Demolition

2.33 The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b) outlines a risk assessment based approach to considering the potential for dust generation from a construction site, and sets out what mitigation measures should be implemented to minimise the risk of construction dust impacts, dependent on the outcomes of the risk assessment. This guidance is largely based on the Institute of Air Quality Management's (IAQM's[2]) guidance (IAQM, 2016), and it states that "*the latest version of the IAQM Guidance should be used*".

Air Quality Focus Areas

2.34 The GLA has identified 160 air quality Focus Areas in London. These are locations that not only exceed the annual mean limit value for nitrogen dioxide, but also have high levels of human exposure. They do not represent an exhaustive list of London's air quality hotspot locations, but locations where the GLA believes the problem to be most acute. They are also areas where the GLA considers there to be the most potential for air quality improvements and are, therefore, where the GLA and Transport for London (TfL) will focus actions to improve air quality. The proposed

[2] The IAQM is the professional body for air quality practitioners in the UK.

development is located 170 m east of the Stratford Town Centre and Romford Road air quality Focus Area.

Local Policies

2.35 The Newham Local Plan (Newham Council, 2018) was adopted in 2018. Within the Plan, Policy SC5 refers specifically to Air Quality and states:

"Proposals that address the following strategic principles, spatial strategy and design and technical criteria will be supported:

1. *Strategic Principles:*
    a. *All development should be at least Air Quality Neutral, supporting a net decrease in specified pollutants and making design, access, energy, and management decisions that minimise air pollution generation and exposure at demolition, construction and operation stage; and*
    b. *Development will support implementation of Newham's Air Quality Action Plan, ensuring identified actions and mitigation are incorporated where relevant.*
2. *Spatial Strategy:*
    a. *Development along major roads or in other locations that experience air quality exceedances should be configured to improve the dispersal of identified pollutants and reduce exposure without compromising SP7 objectives; and*
    b. *Development close to navigable waterways should maximise use of waterborne freight and waste movement during construction and operation.*
3. *Design and technical criteria:*
    a. *Air quality neutrality should be demonstrated using methodologies set out by the London Plan and related guidance;*
    b. *All Major development should detail how it aligns with the Mayor of London's Control of Dust & Emissions during Construction & Demolition SPG or subsequent updates;*
    c. *Waste facilities and other dust and emissions-generating uses should be fully enclosed or provide an equivalent level of environmental protection with respect to air emissions;*
    d. *Development should only deploy combustion-based energy sources (including CHP, biomass boilers, and wood-burning stoves) as a last resort; those that do should demonstrate use of low-emission plant and post process mitigation/treatment where necessary to avoid an increase in controlled pollutants; and*

e. *Developments likely to generate any significant traffic, and hence air quality impacts, on the A12 and A406 (whether alone or in combination with other development) which pass within 200 m of the Epping Forest SAC will need to undertake an assessment of impact on the SAC as part of the HRA."*

Building Standards

2.36 Part F(1) of Schedule 1 of the Building Regulations 2010 as amended June 2022 (Ministry of Housing, Communities & Local Government, 2022) places a duty on building owners, or those responsible for relevant building work[3], to ensure adequate ventilation is provided to building occupants.

2.37 Approved Document F (HM Government, 2021a), which accompanies the Building Regulations, explains that care should be taken to minimise entry of external air pollutants. Specific steps should be taken to manage ventilation intakes where the building is near to a significant source of emissions, or if local ambient concentrations exceed values set in the Air Quality Standards Regulations 2010 (see Paragraph 3.10, later). These steps include maximising the distance between emission source and air intake, considering likely dispersion patterns, and considering the timing of pollution releases when designing the ventilation system.

2.38 Building Bulletin 101 (Education and Skills Funding Agency, 2018) states that *"achieving good indoor air quality in schools depends on minimising the impact of indoor sources of pollutants, as well as reducing outdoor pollutant ingress by effective design of the building and operation of the ventilation systems"*. It advises that performance levels in line with the 2010 World Health Organisation indoor air quality guidelines (WHO, 2010) should be achieved.

2.39 Part S(1) of Schedule 1, and Regulation 44D, of the Building Regulations 2010 (Ministry of Housing, Communities & Local Government, 2022) define a requirement for the provision of infrastructure for charging electric vehicles. Precise requirements are explained further within Approved Document S (HM Government, 2021b) and depend on the overall number of parking spaces provided and the average financial cost of installation.

2.40 Compliance with the Building Regulations is not required for planning approval, but it is assumed that the Regulations will be complied with in the completed building.

[3] Building work is a legal term for work covered by the Building Regulations. With limited exemptions, the Regulations apply to all significant building work, including erecting or extending a building.

Air Quality Action Plans

National Air Quality Plan

2.41 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018a) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a Clean Air Zone (CAZ). There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

2.42 Newham Council's Air Quality Action Plan (Newham Council, 2019) sets out a series of initiatives by which the Council will seek to achieve the air quality objectives in the AQMA. None of the policies are considered relevant to this assessment, being general measures including updating procurement policies to reduce pollution from logistics and servicing, switching the Council fleet to zero emission vehicles, implementing Low-Emission Neighbourhoods (LENs) and traffic management schemes, and ensuring integration of air quality into transport project planning.

3 Assessment Criteria

3.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).

3.2 The UK-wide objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m^3 (Defra, 2022). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level. Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m^3 (Defra, 2022).

3.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. The GLA explains where these objectives will apply in London (GLA, 2019). The annual mean objectives for nitrogen dioxide and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals and care homes etc., the gardens of residential properties, school playgrounds and the grounds of hospitals and care homes. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

3.4 For $PM_{2.5}$, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see Paragraph 3.10), originally set at 25 µg/m^3 and currently set at 20 µg/m^3.

3.5 Defra has also recently set two new targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by the end of 2040, with the interim target being a value of 12 µg/m^3 by the start of 2028[4]. The second set of targets relate to reducing overall

[4] Meaning that it will be assessed using measurements from 2027. The 2040 target will be assessed using measurements from 2040. National targets are assessed against concentrations expressed to the nearest whole number, for example a concentration of 10.4 µg/m^3 would not exceed the 10 µg/m^3 target.

population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.

3.6 Defra will assess compliance with the population exposure targets by averaging concentrations measured at its own background monitoring stations. This will not consider small changes over time to precisely where people are exposed (such as would relate to exposure introduced by a new development). Furthermore, as explained in Paragraph 2.10, all four new targets provide metrics against which central Government can assess its own progress. While local authorities have an important role delivering the required improvements, the actions required of local authorities, which will be clarified within a future Air Quality Strategy, relate to controlling emissions and not to directly assessing $PM_{2.5}$ concentrations against the targets.

3.7 Development control decisions can most effectively support Defra to achieve all four targets by optimising new developments to reduce their total emissions. The ambient concentrations to which occupants of new developments are exposed will have no effect on the ability to meet these targets. Similarly, where a new development causes an increase in local concentrations, this must be viewed in the context that all four targets relate to concentrations across England as a whole; there will be very few locations where a localised impact could alter the date by which the target is achieved in England.

3.8 The new $PM_{2.5}$ targets have been considered within this assessment principally by working with the developer to ensure that all practical measures will be taken to reduce emissions. However, it is recognised that there is often interest in investigating how local air quality within a development's study area will relate to the new concentration targets.

3.9 As explained in Paragraph 2.30, the GLA has set a target to achieve an annual mean $PM_{2.5}$ concentration of 10 $\mu g/m^3$ by 2030. This target was derived from an air quality guideline set by WHO in 2005. In 2021, WHO updated its guidelines, but the London Environment Strategy (GLA, 2018a) considers the 2005 guideline of 10 $\mu g/m^3$. While there is no explicit requirement to assess against the GLA target of 10 $\mu g/m^3$, it has nevertheless been included within this assessment.

3.10 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010)[5]. The limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$ are the same numerical concentrations as the UK objectives, but achievement of the limit values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when

[5] As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

3.11 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for Nitrogen Dioxide, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Value
Nitrogen Dioxide	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3
PM_{10}	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m^3
$PM_{2.5}$	Annual Mean	20 µg/m^3 [a]
	Annual Mean	10 µg/m^3 by 2030
	Annual Mean	12 µg/m^3 before 2028 [b]
	Annual Mean	10 µg/m^3 by 2040 [b]

[a] There is no numerical $PM_{2.5}$ objective for local authorities (see Paragraph 3.4). Convention is to assess against the UK limit value which is currently 20 µg/m^3.

[b] Expressed to the nearest whole number. Defra has explained in the 2023 Environmental Improvement Plan (Defra, 2023a) that local authority responsibilities in relation to these targets relate to controlling emissions and not determining concentrations.

Construction Dust Criteria

3.12 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the IAQM (2016) has been used (the GLA's SPG (GLA, 2014b) recommends that the assessment be based on the latest version of the IAQM guidance). Full details of this approach are provided in Appendix A2.

Road Traffic Screening Criteria

3.13 Environmental Protection UK (EPUK) and the IAQM recommend a two-stage screening approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in Appendix A3, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m^2 of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a detailed assessment.

3.14 The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. The screening thresholds (described in full in Appendix A3) inside an AQMA are a change in flows of more than 25 heavy duty vehicles or 100

light duty vehicles per day; outside of an AQMA the thresholds are 100 heavy duty vehicles or 500 light duty vehicles. Where these criteria are exceeded, a detailed assessment is likely to be required, although the guidance advises that *"the criteria provided are precautionary and should be treated as indicative"*, and *"it may be appropriate to amend them on the basis of professional judgement"*.

4 Assessment Approach

Consultation

4.1 The assessment follows a methodology agreed with Newham Council via email correspondence between Tim Baker (Environmental Control Officer at Newham Council) and Paul Outen (Air Quality Consultants) during January 2023. Specifically, the following key points were agreed:

- a construction dust risk assessment should be provided;
- the air quality neutrality of the development should be assessed;
- traffic generated by the proposed development can be screened out of the assessment;
- no assessment of energy plant is required due to the proposed development not introducing any new combustion plant; and
- the impacts of existing sources of pollution on the proposed development can be assessed qualitatively.

Existing Conditions

4.2 Existing sources of emissions and baseline air quality conditions within the study area have been defined using a number of approaches:

- industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2023b);
- local sources have been identified through examination of the Council's Air Quality Review and Assessment reports;
- information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority, and through examination of the London Atmospheric Emissions Inventory (LAEI) database produced by the GLA (GLA, 2021b). These predicted concentrations cover the whole of the GLA area at 20 m grid resolution; and
- whether or not there are any exceedances of the annual mean limit value for nitrogen dioxide in the study area has been identified using the maps of roadside concentrations published by Defra (2020) (2023c). These are the maps used by the UK Government, together with the results from national Automatic Urban and Rural Network (AURN) monitoring sites that operate to the required data quality standards, to identify and report exceedances of the limit value. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations (Defra, 2023c), which are available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Construction Impacts

4.3 The construction dust assessment considers the potential for impacts within 350 m of the site boundary, or within 50 m of roads used by construction vehicles. The assessment methodology follows the GLA's SPG on the Control of Dust and Emissions During Construction and Demolition (GLA, 2014b), which is based on that provided by IAQM (2016). This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts. Appendix A2 explains the approach in more detail.

Road Traffic Impacts

4.4 The first step in considering the road traffic impacts of the proposed development has been to screen the development and its traffic generation against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as described in Paragraph 3.13 and detailed further in Appendix A3. Where impacts can be screened out, as for this development, there is no need to progress to a more detailed assessment.

Impacts of Existing Sources on Future Occupants of the Development

4.5 The impacts of nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations on users of the proposed development have been assessed qualitatively, taking account of local air quality monitoring data, proximity to local road traffic emissions and the GLA's LAEI predicted concentrations.

4.6 The assessment examines air quality conditions in 2019 and assumes these are representative of air quality conditions at the time the development is occupied; this assumption is considered to be worst-case as it is generally expected that nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations will decline in future years.

Assessment of Significance

Construction Dust Significance

4.7 Guidance from IAQM (2016) is that, with appropriate mitigation in place, the effects of construction dust will be 'not significant'. This is the latest version of the guidance upon which the assessment methodology set out in the GLA guidance (GLA, 2014b) is based (the GLA guidance advises that the latest version of the IAQM guidance should always be used). The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that effects will normally be 'not significant'.

Operational Significance

4.8 There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors; the experience of the consultants preparing the report is set out in Appendix A4. Full details of the EPUK/IAQM approach are provided in Appendix A3.

'Air Quality Neutral'

4.9 The GLA's London Plan Guidance (Air Quality Neutral) (GLA, 2023) sets out guidance on how an 'air quality neutral' assessment should be undertaken. It also provides a methodology for calculating an offsetting payment if a development is not 'air quality neutral' and it is not possible to identify or agree appropriate and adequate mitigation.

5 Baseline Conditions

Relevant Features

5.1 The proposed development is located within Newham College. The site is bounded by the college itself to the west, east and south, and residential properties on Faringford Road to the north. It currently consists of the existing Block Y, which will be demolished to make way for the new building.

5.2 The proposed development is located within an AQMA.

Industrial Sources

5.3 No significant industrial or waste management sources have been identified that are likely to affect the proposed development, in terms of air quality or odour.

Local Air Quality Monitoring

5.4 Newham Council operates four automatic monitoring stations within its area, one of which is located within 1 km of the proposed development. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Gradko International Ltd (using the 50% TEA in acetone method). These include 11 sites within 1 km of the proposed development. Annual mean results for the years 2016 to 2021, where available, are summarised in Table 2, while results relating to the 1-hour mean objective are summarised in Table 3. Exceedances of the objectives are shown in bold. The monitoring locations are shown in Figure 2. The monitoring data have been taken from Newham Council's 2021 Annual Status Report (Newham Council, 2022).

Table 2: Summary of Annual Mean NO_2 Monitoring (2016-2021) ($\mu g/m^3$)

Site No.	Site Type	Location	2016	2017	2018	2019	2020	2021
NM2	Roadside	Cam Rd	**42**	**38**	29	29	24	23
NHM-16	Kerbside	Opposite 99 Leytonstone Rd	**54**	**60**	**51**	**43**	37	32
NHM-21	Kerbside	Cam Rd	37	39	34	**41**	25	23
NHM-S 34	-[a]	Stratford School Academy	-	-	-	30	24	22
NHM-S 38	-[a]	Park Primary School	-	-	-	26	21	20
NHM-S 53	-[a]	John F Kennedy Special School	-	-	-	27	22	21
NHM-S 54	-[a]	School 21	-	-	-	29	21	20
NHM-S 55	-[a]	Sarah Bonnell School	-	-	-	31	26	25
NHM-S 56	-[a]	West Ham Church Primary School	-	-	-	34	30	31
NHM-S 57	-[a]	Portway Primary School	-	-	-	27	19	20
NHM-S 58	-[a]	Ranelagh Primary School	-	-	-	27	20	18

Site No.	Site Type	Location	2016	2017	2018	2019	2020	2021
NHM-S 59	-[a]	Manor Primary School	-	-	-	27	20	21
Objective			40					

[a] No information is provided for the site type in the 2021 ASR (Newham Council, 2022).

Table 3: Number of Hours with NO_2 Concentrations Above 200 µg/m³

Site No.	Site Type	Location	2016	2017	2018	2019	2020	2021
NM2	Roadside	Cam Rd	0	0	0	0	0	0
Objective			18					

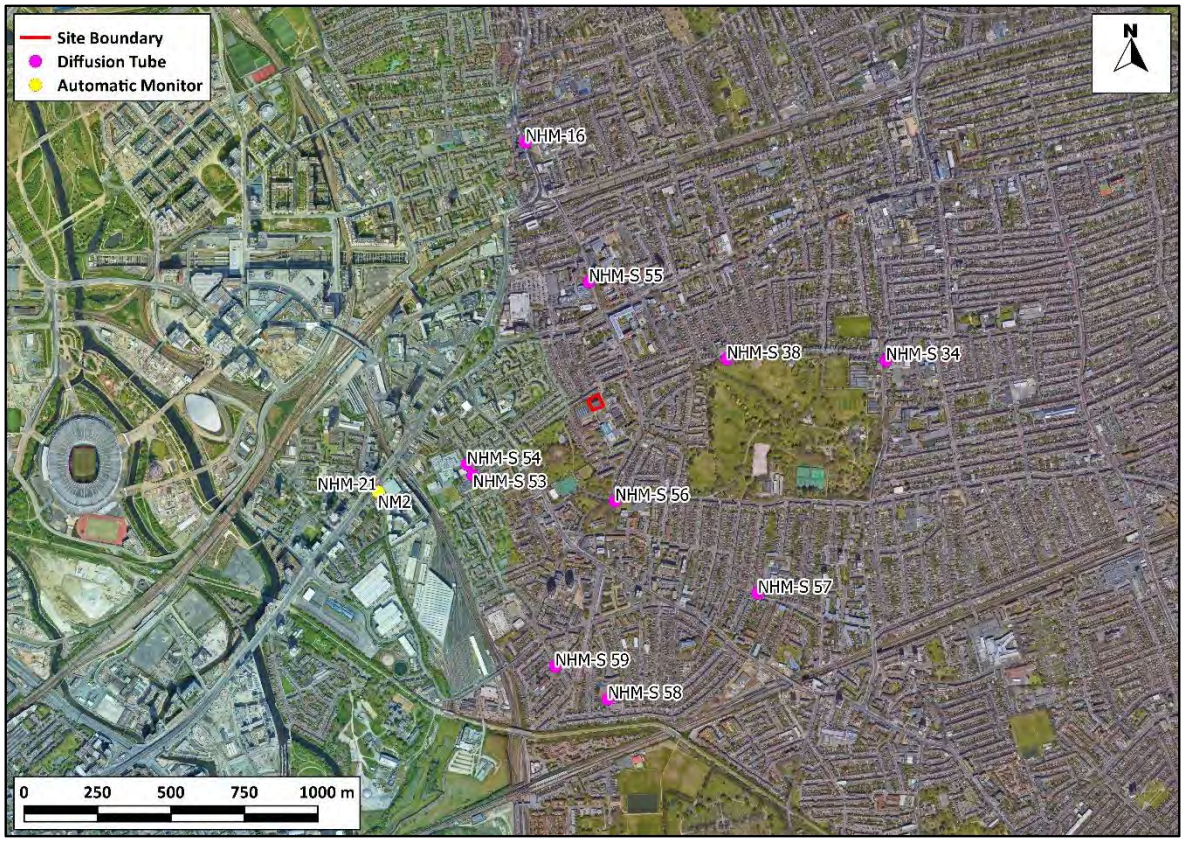


Figure 2: Monitoring Locations

Imagery ©2023 Google.

5.5 There have been no measured exceedances of the annual mean objective at the Cam Road automatic monitor since 2017; concentrations since 2018 have remained well below the objective. Furthermore, there have been no exceedances of the 1-hour mean objective at this monitoring station in the six years of data presented. At the NHM-21 diffusion tube monitoring site, only one

exceedance has been measured in recent years, in 2019. For all other diffusion tube monitoring sites within 1 km of the proposed development, there have been no measured exceedances of the annual mean objective since monitoring began in 2019.

5.6 While 2020 and 2021 results have been presented in this Section for completeness, they are not relied upon in any way as they will not be representative of 'typical' air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations.

5.7 The NM2 automatic monitoring station also measures PM_{10} and $PM_{2.5}$ concentrations. Annual mean results for the years 2016 to 2021, where available, are summarised in Table 4, while results relating to the daily mean PM_{10} objective are summarised in Table 5. Exceedances of the objectives are shown in bold. Whilst there have been no exceedances of the objectives, the GLA target for annual mean $PM_{2.5}$ was exceeded in both years of monitoring.

Table 4: Summary of Annual Mean PM_{10} and $PM_{2.5}$ Monitoring (2016-2021) (µg/m^3)

Site No.	Site Type	Location	2016	2017	2018	2019	2020	2021
PM_{10}								
NM2	Roadside	Cam Rd	19	17	18	18	18	17
Objective			**40**					
$PM_{2.5}$								
NM2	Roadside	Cam Rd	-	-	-	-	11	13
Objective/GLA target			**20/10 [a]**					

[a] The 20 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it. 10 µg/m^3 is the GLA target for annual mean $PM_{2.5}$; again, there is no requirement for local authorities to meet this.

Table 5: Number of Days with PM_{10} Concentrations Above 50 µg/m^3

Site No.	Site Type	Location	2016	2017	2018	2019	2020	2021
NM2	Roadside	Cam Rd	9	0	1	3	6	0
Objective			**35**					

Exceedances of Limit Value

5.8 There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedances of the annual mean nitrogen dioxide limit value (Defra, 2023d). Furthermore, Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2023c), which are used to identify and report exceedances of the limit value, identify exceedances of this limit value in 2019 along many roads in London, including a section of the A118 located approximately 500 m northwest proposed development. The Greater London Urban Area has thus been reported as exceeding the limit value

for annual mean nitrogen dioxide concentrations. Defra's predicted concentrations for 2024 (Defra, 2020) do not identify any exceedances within 1 km of the application site. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the proposed development by the time that it is operational.

5.9 Defra's Air Quality Plan requires the GLA to prepare an action plan that will *"deliver compliance in the shortest time possible"*, and the 2015 Plan assumed that a CAZ was required. The GLA has already implemented an LEZ and a ULEZ, thus the authority has effectively already implemented the required CAZ. These have been implemented as part of a package of measures including 12 Low Emission Bus Zones, Low Emission Neighbourhoods, the phasing out of diesel buses and taxis and other measures within the Mayor's Transport Strategy.

6 Construction Phase Impact Assessment

Construction Traffic

6.1 It is anticipated that no more than ten heavy vehicles will access the site on any given day, thus the additional heavy vehicle movements on local roads will be below the 25 AADT screening criterion recommended by EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017). It is, therefore, not considered necessary to assess the impacts of traffic emissions during the construction phase and it can be concluded that the proposed development will not have a significant impact on local roadside air quality as a result of construction traffic emissions.

On-Site Exhaust Emissions

6.2 The IAQM guidance (IAQM, 2016) states:

"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur".

6.3 The proposed development is relatively small, thus the number of NRMM able to operate at any one time will be limited. In line with the GLA's Control of Dust and Emissions During Construction and Demolition SPG, and as describe in Appendix A6, NRMM are expected to comply with emissions standards. Additionally, there will be no idling when vehicles are not in use, and machinery will be located away from sensitive receptors as far as possible. It is judged that there no risk of significant effects at existing receptors as a result of on-site machinery emissions.

Construction Dust and Particulate Matter Emissions

6.4 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. Step 1 of the assessment procedure is to screen the need for a detailed assessment. There are receptors within the distances set out in the guidance (see Appendix A2), thus a detailed assessment is required. The following section sets out Step 2 of the assessment procedure.

Potential Dust Emission Magnitude

Demolition

6.5 There will be the requirement to demolish the existing Y Block, the volume of which is estimated to be approximately 7,500 m^3 based upon aerial and Streetview imagery. It is assumed to be constructed of brick/concrete, steel, exterior cladding and glass. Demolition is expected to take two months (September and October 2023). The method of demolition has not yet been decided. Based

on the example definitions set out in Table A2.1 in Appendix A2, and using elements of professional judgement, the dust emission class for demolition is considered to be *small.*

Earthworks

6.6 The characteristics of the soil at the site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2023), as set out in Table 6. Overall, it is considered that, when dry, this soil has the potential to be moderately dusty.

Table 6: Summary of Soil Characteristics

Category	Record
Soil Layer Thickness	Deep
Soil Parent Material Grain Size	Mixed (Arenaceous [a] – Rudaceous [b])
European Soil Bureau Description	River Terrace Sand/Gravel
Soil Group	Light (Sandy) to Medium (Sandy)
Soil Texture	Sand to Sandy Loam [c]

[a] grain size 0.06 – 2.0 mm.

[b] grain size > 2.0 mm.

[c] a loam is composed mostly of sand and silt.

6.7 The site covers approximately 1,600 m^2 and most of this will be subject to earthworks, involving removal of the foundations of the demolished buildings and landscaping. It is assumed that dust will arise mainly from the handling of dusty materials (such as dry soil). Based on the example definitions set out in Table A2.1 in Appendix A2, and using elements of professional judgement, the dust emission class for earthworks is considered to be *small*.

Construction

6.8 The development includes the construction of a single, three-storey building with a total volume of approximately 6,000 m^3. The construction will take 54 weeks and will involve piling. It is assumed that dust will arise from the handling and storage of dusty materials. Based on the example definitions set out in Table A2.1 in Appendix A2, and using elements of professional judgement, the dust emission class for construction is considered to be *small*.

Trackout

6.9 It is anticipated that there will be a maximum of 10 outward heavy vehicle movements per day. It is understood that vehicles will not travel over unpaved ground before leaving the site. Based on the example definitions set out in Table A2.1 in Appendix A2, the dust emission class for trackout is considered to be *small*.

6.10 Table 7 summarises the dust emission magnitude for the proposed development.

Table 7: Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Demolition	Small
Earthworks	Small
Construction	Small
Trackout	Small

Sensitivity of the Area

6.11 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

6.12 The IAQM guidance, upon which the GLA's guidance is based, explains that residential properties and the college are 'high' sensitivity receptors to dust soiling (Table A2.2 in Appendix A2). Residential properties and the college are also classified as being of 'high' sensitivity to human health effects. There are more than 10 residential properties and existing college buildings within 20 m of the site (see Figure 3).

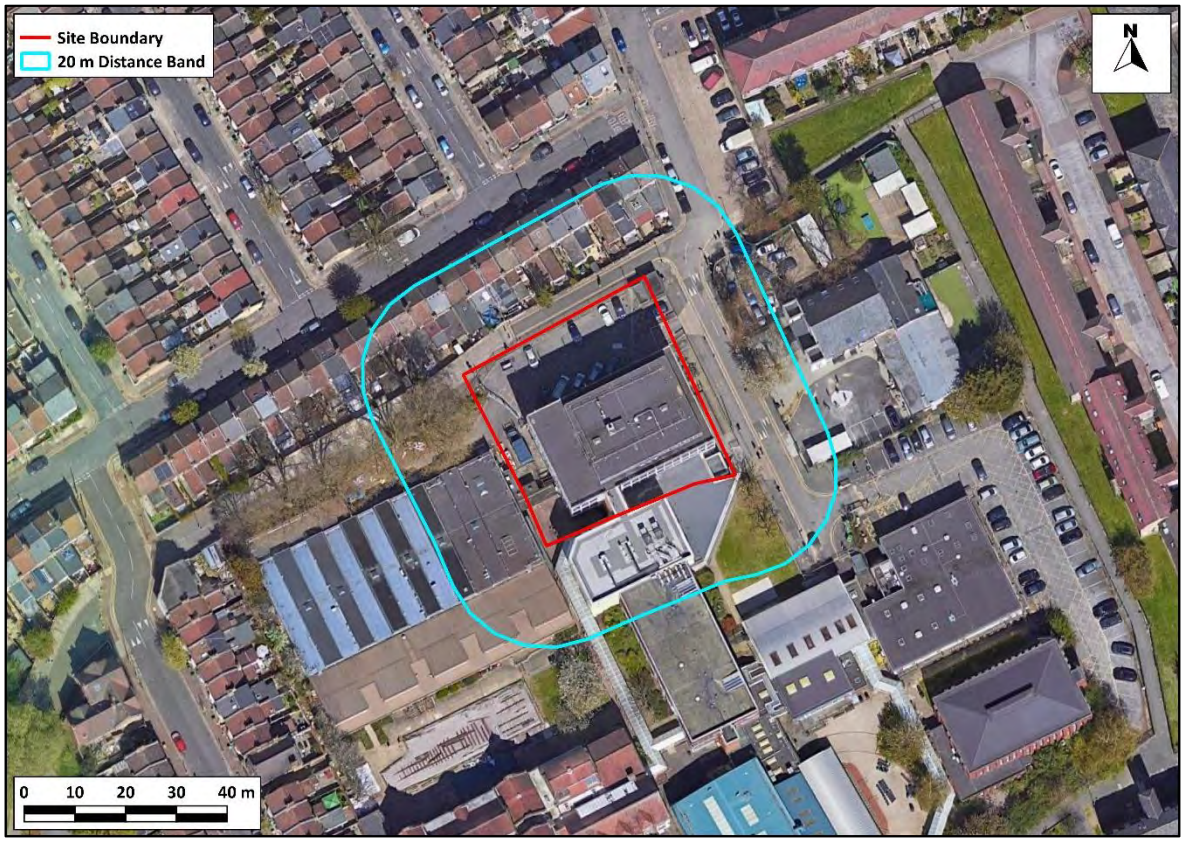


Figure 3: 20 m Distance Band around Site Boundary

Imagery ©2023 Google.

6.13 Table 7 shows that the dust emission magnitude for trackout is *small* and Table A2.3 in Appendix A2 thus explains that there is a risk of material being tracked 50 m from the site exit. It is understood that current proposals for the construction works will involve vehicles leaving the site via Welfare Road. There are more than 10 residential properties within 20 m of the roads along which material could be tracked (see Figure 4).

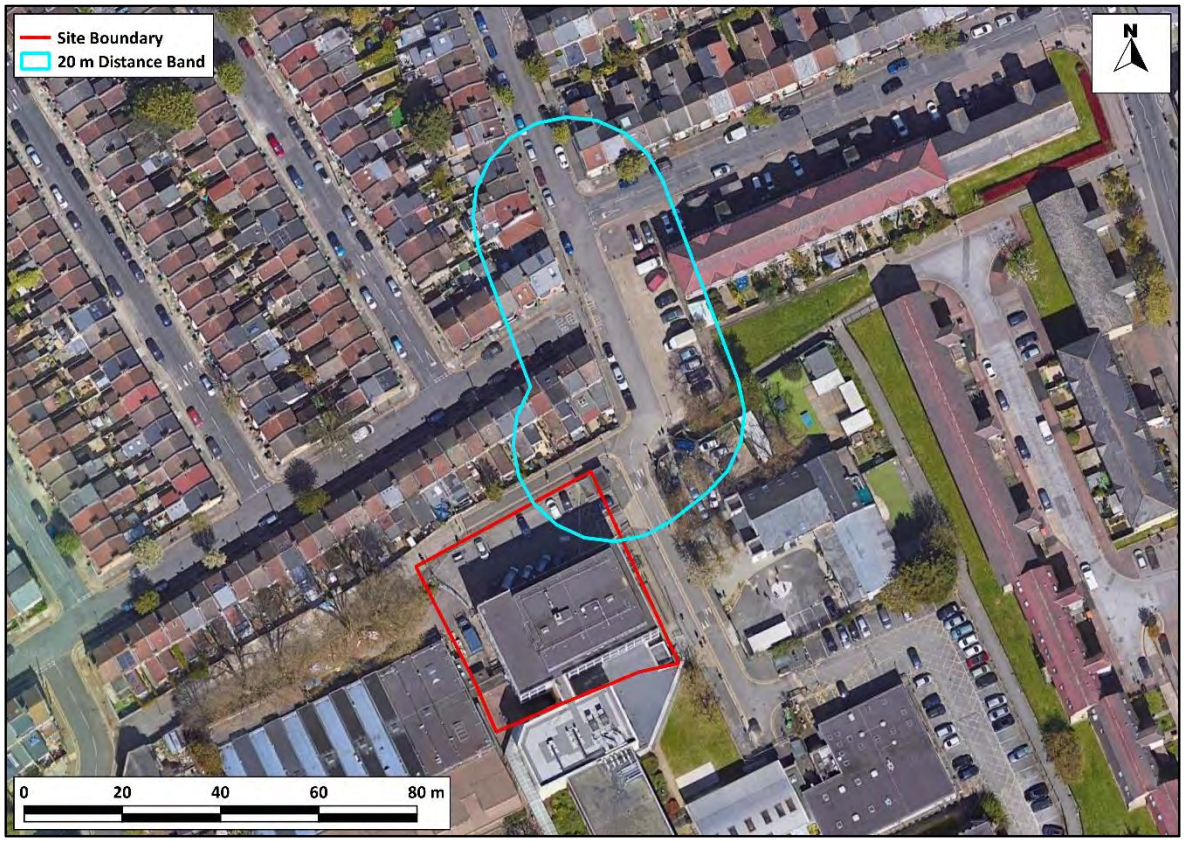


Figure 4: 20 m Distance Bands around Roads Used by Construction Traffic Within 50 m of the Site Exit

Imagery ©2023 Google.

Sensitivity of the Area to Effects from Dust Soiling

6.14 Using the information set out in Paragraph 6.12 and Figure 3 alongside the matrix set out in Table A2.3 in Appendix A2, the area surrounding the onsite works is of 'high' sensitivity to dust soiling. Using the information set out in Paragraph 6.13 and Figure 4 alongside the same matrix, the area is also of 'high' sensitivity to dust soiling due to trackout.

Sensitivity of the Area to any Human Health Effects

6.15 The matrix in Table A2.4 in Appendix A2 requires information on the baseline annual mean PM_{10} concentration in the area. The properties nearest the site are well away from major roads; however to provide a conservative assessment, the existing annual mean PM_{10} concentration at these properties has been assumed to be 18 $\mu g/m^3$, as measured in 2019 at the NM2 (Cam Road) automatic monitoring station (see Table 4). Using the information set out in Paragraphs 6.12 and Figure 3 alongside the matrix in Table A2.4 in Appendix A2, the area surrounding the onsite works is of 'low' sensitivity to human health effects. Using the information set out in Paragraph 6.13 and Figure 4 alongside the same matrix, the area surrounding roads along which material may be tracked from the site is also of 'low' sensitivity.

Sensitivity of the Area to any Ecological Effects

6.16 The guidance only considers designated ecological sites within 50 m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50 m of the site boundary or those roads along which material may be tracked, thus ecological impacts will not be considered further.

Summary of the Area Sensitivity

6.17 Table 8 summarises the sensitivity of the area around the proposed construction works.

Table 8: Summary of the Area Sensitivity

Effects Associated With:	Sensitivity of the Surrounding Area	
	On-site Works	Trackout
Dust Soiling	High Sensitivity	High Sensitivity
Human Health	Low Sensitivity	Low Sensitivity

Risk and Significance

6.18 The dust emission magnitudes in Table 7 have been combined with the sensitivities of the area in Table 8 using the matrix in Table A2.6 in Appendix A2, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 9. These risk categories have been used to determine the appropriate level of mitigation as set out in Section 9 (step 3 of the assessment procedure).

Table 9: Summary of Risk of Impacts Without Mitigation

Source	Dust Soiling	Human Health
Demolition	Medium	Negligible
Earthworks	Low	Negligible
Construction	Low	Negligible
Trackout	Low	Negligible

6.19 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (IAQM, 2016).

7 Operational Phase Impact Assessment

Impacts at Existing Receptors

7.1 The proposed development will not result in any changes to staff or pupil numbers at the college, nor will it result in any changes to the number of car parking spaces. As such, the number of vehicle trips generated by the college will not change from the existing design. The relevant screening thresholds will therefore not be exceeded and there is no requirement for a detailed assessment of road traffic impacts at existing receptors; it can be concluded that the proposed development will not have a significant impact on local roadside air quality.

7.2 Furthermore, the proposed development will not employ any additional combustion plant at the site; energy will be provided via ASHPs.

Impacts of Existing Sources on Future Occupants of the Development

7.3 The maximum modelled annual mean concentrations within the site have been determined from the LAEI database (GLA, 2021b); the maximum annual mean concentrations in 2019 at the proposed development are:

- NO_2: 29.0 µg/m^3
- PM_{10}: 17.5 µg/m^3; and
- $PM_{2.5}$: 11.1 µg/m^3.

7.4 These concentrations are well below their respective statutory objectives in 2019.

7.5 The predicted $PM_{2.5}$ annual mean concentration marginally exceeds the GLA target of 10 µg/m^3 in 2019. This is widespread across both Newham and much of Greater London. It is reasonable to expect the $PM_{2.5}$ concentrations within the site to be approaching the target value by the time the proposed development is operational (2024), as a result of wider improvements in air quality, including through the implementation of the London Environment Strategy (GLA, 2018a).

7.6 Monitoring undertaken within 1 km of the proposed development confirms the above; measured concentrations of nitrogen dioxide were below the annual mean objective in 2019 (Table 2) at all locations apart from those classified as kerbside sites adjacent to busy roads.

7.7 PM_{10} and $PM_{2.5}$ concentrations (Table 4) measured at the NM2 automatic monitor at Cam Road have been well below the relevant objectives in the years of data available. In terms of $PM_{2.5}$, however, exceedances of the GLA target were measured in the two years of available data; however, this monitoring site is located adjacent to the busy A118 where concentrations are expected to be considerably higher than at the development site which is in a background location.

7.8 Based on the information set out above, future users will experience acceptable air quality with all pollutant concentrations below the respective objectives, and there is no need for more detailed assessment.

Significance of Operational Air Quality Effects

7.9 The operational air quality effects without mitigation are judged to be 'not significant'. This professional judgement is made in accordance with the methodology set out in Appendix A3, and takes account of the assessment that:

- pollutant concentrations at worst-case locations within the proposed development will all be below the objectives, thus future occupants will experience acceptable air quality; and
- the redevelopment of Block Y will not result in an increase of vehicle trips on the local road network, nor will it introduce any new combustion plant at the college.

8 'Air Quality Neutral'

8.1 The purpose of the London Plan's requirement that development proposals be 'air quality neutral' is to prevent the gradual deterioration of air quality throughout Greater London. The 'air quality neutrality' of a proposed development, as assessed in this section, does not directly indicate the potential of the proposed development to have significant impacts on human health (this has been assessed separately in the previous section). The air quality assessment has been undertaken using the latest GLA's London Plan Guidance (Air Quality Neutral) (GLA, 2023).

Building Emissions

8.2 The proposed development does not include any combustion plant for the routine provision of electricity, heating or hot water and will thus have no direct building emissions. The proposed development is, therefore, better than air quality neutral in terms of building emissions.

Road Transport Emissions

8.3 TPP Ltd has advised that the proposed development is expected to generate a total of 5,234 car trips per year. Appendix A5 provides the Benchmark Trip Rates for each land use category based on the Gross Internal Area (GIA) for the land use. The GIA has been provided by 10architect. Table 10 shows calculation of the TEB for this development.

8.4 The total development trip rate is less than the TEB. The proposed development is thus air quality neutral in terms of transport emissions.

Table 10: Calculation of Transport Benchmarks for the Development

Use Class	GIA (m^2)	Benchmark		Annual Trips from Development
		trips/m^2/yr	Trips/yr	
Schools, nurseries, doctors' surgeries, other non-residential institutions	1,689	30.3	51,178	5,234

Summary

8.5 The building and transport related emissions associated with the proposed development are both below the relevant benchmarks. The proposed development therefore complies with the requirement that all new developments in London should be at least air quality neutral.

9 Mitigation

Good Design and Best Practice

9.1 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required.

9.2 The EPUK/IAQM guidance predates the recent publication by Defra of long-term air quality targets for $PM_{2.5}$. As explained in Paragraph 3.5, meeting the new target will require positive action from many different sectors. While it is not appropriate to determine individual planning applications based on whether future $PM_{2.5}$ concentrations in an area will be above or below the concentration target, it is nevertheless appropriate that new development contributes to meeting the national targets by ensuring that air quality is taken into account in development design.

9.3 The proposed development incorporates the following good design and best practice measures, which have been accounted for in the assessment as far as is possible:

- A Travel Plan will be provided, which will also encompass the wider campus;
- 34 cycle parking spaces will be provided for Block Y;
- the redevelopment of Block Y will reduce the overall car parking spaces at the college, which can reasonably be expected to reduce overall car trips to and from the college;
- provision of 14 electric vehicle charging bays within the car park adjacent to Block Y;
- use of ASHPs to avoid the need for on-site combustion; and
- the new Block Y will cover a smaller footprint than the existing building, and thus will not introduce any sensitive exposure closer to nearby roads.
-

Recommended Mitigation

Construction Impacts

9.4 Measures to mitigate dust emissions will be required during the construction phase of the development in order to minimise effects upon nearby sensitive receptors.

9.5 The site has been identified as a *Medium* Risk site during demolition and *Low* Risk during earthworks, construction and for trackout, as set out in Table 9. The GLA's SPG on *The Control of Dust and Emissions During Construction and Demolition* (GLA, 2014b) describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on what monitoring should be undertaken during the construction phase. This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust

impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in Appendix A6.

9.6 The mitigation measures should be written into a dust management plan (DMP). The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan, and may require monitoring. The GLA's guidance suggests that, for a Medium Risk site, automatic monitoring of particulate matter (as PM_{10}) will be required. It also states that, on certain sites, it may be appropriate to determine the existing (baseline) pollution levels before work begins. However, the guidance is clear that the Local Authority should advise as to the appropriate air quality monitoring procedure and timescale on a case-by-case basis.

9.7 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Road Traffic Impacts

9.8 The assessment has demonstrated that the overall air quality effect of the proposed development will be 'not significant; it will not introduce any new exposure into areas of unacceptable air quality, nor will the development-generated traffic emissions have a significant impact on local air quality. It is, therefore, not considered appropriate to propose further mitigation measures for this development.

9.9 Measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which is written into UK law).

10 Residual Impacts

Construction

10.1 The IAQM guidance, on which the GLA's guidance is based, is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in Section 9 and Appendix A6 are based on the GLA guidance. With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.

10.2 The IAQM guidance does, however, recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however, the scale of this would not normally be considered sufficient to change the conclusion that overall the effects will be 'not significant'.

Road Traffic Impacts

10.3 The residual impacts will be the same as those identified in Section 7. The overall effects of the proposed development will be 'not significant'.

11 Conclusions

11.1 The assessment has considered the impacts of the proposed development on local air quality in terms of dust and particulate matter emissions during construction and identified the air quality conditions that future users will experience and whether the proposed development is air quality neutral (as required by the London Plan). The assessment has been based on measurements made during 2019, to ensure a worst-case assessment that does not take into account temporary reductions in pollutant concentrations as a result of reduced activity levels during the Covid-19 pandemic.

Construction Impacts

11.2 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emissions. Appropriate measures have been recommended and, with these measures in place, it is expected that any residual effects will be 'not significant'.

Operational Impacts

11.3 Air quality conditions for future occupants of the proposed development have been shown to be acceptable, with concentrations well below the air quality objectives throughout the site.

11.4 The proposed development will not result in an increase in staff or pupil numbers at the college, nor will it introduce any additional car parking or combustion plant; as such, it will not generate any additional emissions.

11.5 The overall operational air quality effects of the proposed development are judged to be 'not significant'.

Air Quality Neutral

11.6 The building and transport related emissions associated with the proposed development are both below the relevant benchmarks. The proposed development therefore complies with the requirement that all new developments in London should be at least air quality neutral.

Policy Implications

11.7 Taking into account these conclusions, it is judged that the proposed development is consistent with Paragraph 185 of the NPPF, being appropriate for its location both in terms of its effects on the local air quality environment and the air quality conditions for future residents. It is also consistent with Paragraph 186, as it will not affect compliance with relevant limit values or national objectives. The proposed development is also consistent with Policy SC5 of the Newham Local Plan, as it is Air

Quality Neutral, will not employ combustion plant and not generate additional road traffic when compared to the existing use. Furthermore, the proposed development is compliant with Policy SI 1 of the London Plan in the following ways:

- it will not lead to further deterioration of existing poor air quality;
- it will not cause or extend any exceedances of legal air quality limits;
- it will not create new exposure to poor air quality; and
- it is better than air quality neutral.

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13 Glossary

AADT	Annual Average Daily Traffic
AQAL	Air Quality Assessment Level
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
Focus Area	Location that not only exceeds the annual mean limit value for NO_2 but also has a high level of human exposure
GIA	Gross Internal Floor Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LB	London Borough

LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
µg/m^3	Microgrammes per cubic metre
NO_2	Nitrogen dioxide
NPPF	National Planning Policy Framework
NRMM	Non-road Mobile Machinery
OEP	Office for Environmental Protection
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
OLEV	Office for Low Emission Vehicles
PHV	Private Hire Vehicle
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
RDE	Real Driving Emissions
SCR	Selective Catalytic Reduction
SPG	Supplementary Planning Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TEA	Triethanolamine – used to absorb nitrogen dioxide
TEB	Transport Emissions Benchmark
TfL	Transport for London
TRAVL	Trip Rate Assessment Valid for London
ULEZ	Ultra Low Emission Zone
ZEC	Zero Emission Capable

14 Appendices

A1 London-Specific Policies and Measures

London Plan

Electric Vehicle Charging

A1.1 To support the uptake of zero tailpipe emission vehicles, Policy T6.1 of the London Plan states:

"All residential car parking spaces must provide infrastructure for electric or Ultra-Low Emission vehicles. At least 20 per cent of spaces should have active charging facilities, with passive provision for all remaining spaces".

London Environment Strategy

A1.2 The air quality chapter of the London Environment Strategy sets out three main objectives, each of which is supported by sub-policies and proposals. The Objectives and their sub-policies are set out below:

"Objective 4.1: Support and empower London and its communities, particularly the most disadvantaged and those in priority locations, to reduce their exposure to poor air quality.

- *Policy 4.1.1 Make sure that London and its communities, particularly the most disadvantaged and those in priority locations, are empowered to reduce their exposure to poor air quality*
- *Policy 4.1.2 Improve the understanding of air quality health impacts to better target policies and action*

Objective 4.2: Achieve legal compliance with UK and EU limits as soon as possible, including by mobilising action from London Boroughs, government and other partners

- *Policy 4.2.1 Reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport*
- *Policy 4.2.2 Reduce emissions from non-road transport sources, including by phasing out fossil fuels*
- *Policy 4.2.3 Reduce emissions from non-transport sources, including by phasing out fossil fuels*
- *Policy 4.2.4 The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality*

- *Policy 4.2.5 The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice, lead action and support evidence based steps to improve air quality*

Objective 4.3: Establish and achieve new, tighter air quality targets for a cleaner London by transitioning to a zero emission London by 2050, meeting world health organization health-based guidelines for air quality

- *Policy 4.3.1 The Mayor will establish new targets for $PM_{2.5}$ and other pollutants where needed. The Mayor will seek to meet these targets as soon as possible, working with government and other partners*
- *Policy 4.3.2 The Mayor will encourage the take up of ultra low and zero emission technologies to make sure London's entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines*
- *Policy 4.3.3 Phase out the use of fossil fuels to heat, cool and maintain London's buildings, homes and urban spaces, and reduce the impact of building emissions on air quality*
- *Policy 4.3.4 Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces"*

A1.3 While the policies targeting transport sources are significant, there are less obvious ones that will also require significant change. In particular, the aim to phase out fossil-fuels from building heating and cooling and from NRMM will demand a dramatic transition.

Low Emission Zone (LEZ)

A1.4 The LEZ was implemented as a key measure to improve air quality in Greater London. It entails charges for vehicles entering Greater London not meeting certain emissions criteria, and affects diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. Since 1 March 2021, a standard of Euro VI has applied for HGVs, buses and coaches, while a standard of Euro 3 has applied for large vans, minibuses and other specialist diesel vehicles since 2012.

Ultra Low Emission Zone (ULEZ)

A1.5 London's ULEZ was introduced on 8 April 2019. The ULEZ currently operates 24 hours a day, 7 days a week in the same area as the current Congestion Charging zone. All cars, motorcycles, vans and minibuses are required to meet exhaust emission standards (ULEZ standards) or pay an additional daily charge to travel within the zone. The ULEZ standards are Euro 3 for motorcycles, Euro 4 for petrol cars, vans and minibuses and Euro 6 for diesel cars, vans and minibuses. The ULEZ does not include any requirements relating to heavy vehicle (HGV, coach and bus) emissions, as these are addressed by the amendments to the LEZ described in Paragraph A1.4.

A1.6 The ULEZ currently covers the entire area within the North and South Circular roads, applying the emissions standards set out in Paragraph A1.5. The ULEZ is to be expanded across all London boroughs in August 2023.

Other Measures

A1.7 Since 2018, all taxis presented for licencing for the first time had to be zero emission capable (ZEC). This means they must be able to travel a certain distance in a mode which produces no air pollutants, and all private hire vehicles (PHVs) presented for licensing for the first time had to meet Euro 6 emissions standards. Since January 2020, all newly manufactured PHVs presented for licensing for the first time had to be ZEC (with a minimum zero emission range of 10 miles). The Mayor's aim is that the entire taxi and PHV fleet will be made up of ZEC vehicles by 2033.

A1.8 The Mayor has also proposed to make sure that TfL leads by example by cleaning up its bus fleet, implementing the following measures:

- TfL will procure only hybrid or zero emission double-decker buses from 2018;
- a commitment to providing 3,100 double decker hybrid buses by 2019 and 300 zero emission single-deck buses in central London by 2020;
- introducing 12 Low Emission Bus Zones by 2020;
- investing £50m in Bus Priority Schemes across London to reduce engine idling; and
- retrofitting older buses to reduce emissions (selective catalytic reduction (SCR) technology has already been fitted to 1,800 buses, cutting their NOx emissions by around 88%).

A2 Construction Dust Assessment Procedure

A2.1 The criteria developed by IAQM (2016), upon which the GLA's guidance is based, divide the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

A2.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A2.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A2.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A2.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A2.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Step 2A – Define the Potential Dust Emission Magnitude

A2.7 Dust emission magnitude is defined as either 'Small', 'Medium', or 'Large'. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A2.1.

Table A2.1: Examples of How the Dust Emission Magnitude Class May be Defined

Class	Examples
Demolition	
Large	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
Earthworks	
Large	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months
Construction	
Large	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout [a]	
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

[a] These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

A2.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A2.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A2.2. These receptor sensitivities are then used in the matrices set out in Table A2.3, Table A2.4 and Table A2.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

A2.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A2.6 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

A2.11 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A6.

STEP 4: Determine Significant Effects

A2.12 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

A2.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

Table A2.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium	users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM_{10}		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

Table A2.3: Sensitivity of the Area to Dust Soiling Effects on People and Property [6]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

[6] For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a *large* dust emission magnitude for trackout, 200 m from sites with a *medium* dust emission magnitude and 50 m from sites with a *small* dust emission magnitude, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A2.4: Sensitivity of the Area to Human Health Effects [6]

Receptor Sensitivity	Annual Mean PM_{10}	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A2.5: Sensitivity of the Area to Ecological Effects [6]

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table A2.6: Defining the Risk of Dust Impacts

Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

A3 EPUK & IAQM Planning for Air Quality Guidance

A3.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

"Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations".*

Recommended Best Practice

A3.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

"The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions".

A3.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m^2 of commercial floorspace;
- are carried out on land of 1 ha or more.

A3.4 The good practice principles are that:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new "street canyon", as this inhibits pollution dispersion;

- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1000 m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNOx/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
    - Spark ignition engine: 250 mgNOx/Nm^3;
    - Compression ignition engine: 400 mgNOx/Nm^3;
    - Gas turbine: 50 mgNOx/Nm^3.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNOx/Nm^3 and 25 mgPM/Nm^3.

A3.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

"It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the "damage cost approach" used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential".

A3.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

"There may be a requirement to carry out an air quality assessment for the impacts of the local area's emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development".*

Impacts of the Development on the Local Area

A3.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m^2 of floor space for all other uses or a site area greater than 1 ha.

A3.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A3.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A3.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A3.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

"Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30kW CHP unit operating at <95mg/Nm^3.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable".

A3.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

"The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive 'trigger' for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality".

A3.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

"The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer".

A3.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

Assessment of Significance

A3.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

A3.16 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A3.17 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A3.18 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A4.

A4 Professional Experience

Dr Denise Evans, BSc (Hons) PhD MIEnvSc MIAQM

Dr Evans is an Associate Director with AQC, with more than 23 years' relevant experience. She has prepared air quality review and assessment reports for local authorities, and has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has extensive modelling experience, completing air quality and odour assessments to support applications for a variety of development sectors including residential, mixed use, urban regeneration, energy, commercial, industrial, and road schemes, assessing the effects of a range of pollutants against relevant standards for human and ecological receptors. Denise has acted as an Expert Witness and is a Member of the Institute of Air Quality Management.

Paul Outen, BSc (Hons) MIEnvSc MIAQM

Mr Outen is a Principal Consultant with AQC, with over eleven years' experience in the assessment of air quality and odours. He undertakes air quality and odour assessments covering residential and commercial developments, industrial installations, road schemes, energy centres and mineral and waste facilities. These involve qualitative assessments, and quantitative modelling assessments using the ADMS dispersion models, for both planning and permitting purposes. He has also presented evidence at public hearings. Mr Outen has a particular interest in odour assessment, and has extensive experience in the assessment of odours across a wide range of industries throughout the UK, Europe and Asia. He also has experience in pollutant monitoring techniques. He regularly undertakes site audits for various installations to advise on pollution control and mitigation strategies. He is a Member of both the Institution of Environmental Sciences and Institute of Air Quality Management.

A5 'Air Quality Neutral'

A5.1 The GLA's consultation draft of London Plan Guidance; Air Quality Neutral (GLA, 2023) provides an approach to assessing whether a development is air quality neutral. The approach is to compare the expected emissions from the building's energy use and vehicle trips against defined benchmarks for buildings and transport in London.

A5.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A5.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A5.2.

A5.3 The average trip length and average emission per vehicle are required if there is a need to calculate offset payments. The values given by GLA are set out in Table A5.3 and Table A5.4 respectively.

Table A5.1: Building Emissions Benchmark NO_x Emission Rates ($gNO_x/m^2/annum$) [a]

Land Use [b]	Individual Gas Boilers	Gas Boiler Network	CHP + Gas Boiler Network	Heat Pumps + Gas Boiler Network
Residential (including student accommodation and large-scale purpose-built shared living development)	3.5	5.7	7.8	5.7
Retail	0.53	0.97	4.31	0.97
Restaurants and bars	1.76	3.23	14.34	3.23
Offices	1.43	2.62	11.68	2.62
Industrial	1.07	1.95	8.73	1.95
Storage and distribution	0.55	1.01	4.5	1.01
Hotel	9.47	15.42	38.16	15.42
Care homes and hospitals	9.15	14.9	36.86	14.9
Schools, nurseries, doctors' surgeries, other non-residential institutions	0.9	1.66	7.39	1.66
Assembly and leisure	2.62	4.84	21.53	4.84

[a] Solid and liquid biomass appliances also emit fine particulate matter in addition to NO_x. The benchmark emission rate for particulate matter is zero.

[b] Separate use classes for commercial uses, including retail and offices, have now been replaced by use class E. If these separate uses are specified in the development proposal, they should be used for this assessment. Where the intended use is not specified, or where use class E has been specified, the benchmark for retail should be used.

Table A5.2: Benchmark Trip Rates

Land Use	Annual trips per	Benchmark Trip Rates		
		Central Activities Zone (CAZ)	Inner London (excluding CAZ)	Outer London
Residential (including student accommodation and large-scale purpose-built shared living development)	dwelling	68	114	447
Office / Light Industrial	m^2 (GIA)	2	1	16
Retail (Superstore)	m^2 (GIA)	39	73	216
Retail (Convenience)	m^2 (GIA)	18	139	274
Restaurant / Café	m^2 (GIA)	64	137	170
Drinking establishments	m^2 (GIA)	0.8	8	N/A
Hot food takeaway	m^2 (GIA)	N/A	32.4	590
Industrial	m^2 (GIA)	N/A	5.6	6.5
Storage and distribution	m^2 (GIA)	N/A	5.5	6.5
Hotels	m^2 (GIA)	1	1.4	6.9
Care homes and hospitals	m^2 (GIA)	N/A	1.1	19.5
Schools, nurseries, doctors' surgeries, other non-residential institutions	m^2 (GIA)	0.1	30.3	44.4
Assembly and leisure	m^2 (GIA)	3.6	10.5	47.2

Table A5.3: Emission factors per vehicle-km

Pollutant	Emission factors (g/veh-km)		
	Central Activities Zone (CAZ)	Inner London [a] (excluding CAZ)	Outer London [a]
NOx	0.48	0.39	0.35
$PM_{2.5}$	0.036	0.032	0.028

[a] Inner London and Outer London as defined in the London Plan (GLA, 2021a).

Table A5.4: Average Distance Travelled by Car per Trip

Land use	Distance (km)		
	Central Activity Zone	Inner	Outer
Residential	4.2	3.4	11.4
Office	3.0	7.2	10.8
Retail	9.2	5.5	5.4

A6 Construction Mitigation

A6.1 Table A6.1 presents a set of best-practice measures from the GLA guidance (GLA, 2014b) that should be incorporated into the specification for the works. These measures should be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Table A6.1: Best-Practice Mitigation Measures Recommended for the Works

Measure	Desirable	Highly Recommended
Site Management		
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site		✓
Develop a Dust Management Plan (DMP)		✓
Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary		✓
Display the head or regional office contact information		✓
Record and respond to all dust and air quality pollutant emissions complaints		✓
Make a complaints log available to the local authority when asked		✓
Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the Local Authority when asked		✓
Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions are being carried out and during prolonged dry or windy conditions		✓
Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and ensure that the action taken to resolve the situation is recorded in the log book		✓
Preparing and Maintaining the Site		
Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible		✓
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site		✓
Avoid site runoff of water or mud		✓
Keep site fencing, barriers and scaffolding clean using wet methods	✓	
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below		✓
Carry out regular dust soiling checks of buildings within 100 m of site boundary and provide cleaning if necessary	✓	

Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly		✓
Agree monitoring locations with the Local Authority		✓
Where possible, commence baseline monitoring at least three months before work begins		✓
Operating Vehicle/Machinery and Sustainable Travel		
Ensure all on-road vehicles comply with the requirements of the London LEZ (and ULEZ)		✓
Ensure all Non-road Mobile Machinery (NRMM) comply with London's NRMM emission standards. Currently, NRMM used on any site within Greater London are required to meet Stage IIIB of EU Directive 97/68/EC (The European Parliament and the Council of the European Union, 1997) and its subsequent amendments as a minimum, while NRMM used on any site within the Central Activity Zone, Canary Wharf or one of London's Opportunity Areas are required to meet Stage IV of the Directive as a minimum. The proposed development is within an area where this stricter requirement applies. From January 2025, NRMM used anywhere in London will be required to meet stage IV, while from January 2030 the stage V standard will apply. From January 2040 only zero emission machinery will be allowed.		✓
Ensure all vehicles switch off engines when stationary – no idling vehicles		✓
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable		✓
Implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing)		✓
Operations		
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems		✓
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate		✓
Use enclosed chutes, conveyors and covered skips		✓
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate		✓
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods		✓
Waste Management		
Reuse and recycle waste to reduce dust from waste materials		✓
Avoid bonfires and burning of waste materials		✓
Measures Specific to Demolition		
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust)	✓	
Ensure water suppression is used during demolition operations.		✓

Avoid explosive blasting, using appropriate manual or mechanical alternatives		✓
Bag and remove any biological debris or damp down such material before demolition		✓
Measures Specific to Construction		
Avoid scabbling (roughening of concrete surfaces), if possible	✓	
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place	✓	
Measures Specific to Trackout		
Avoid dry sweeping of large areas	✓	
Avoid dry sweeping of large areas	✓	
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport	✓	

APPENDIX D
(UXO SURVEY / RISK ASSESSMENT)

SAFELANE
GLOBAL

Detailed Unexploded Ordnance Risk Assessment

In Respect Of:
Newham College Site

For:
HSP Consulting Engineers Ltd

Report Reference:
9357 RA

safelaneglobal.com

2020
Awarded to
SafeLane Global Limited

Distribution

Version	Format	Recipient	Author	Review	Authorisation	Date
1	PDF Copy	HSP Consutling Engineers Ltd	OA	ED	NB	29/07/2022

This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry. This report has been compiled using all due diligence and expertise and having made all proper but reasonable enquiries within given time limitations. However, in accepting and implementing the recommendations contained in this report, the client does so strictly at his own risk.

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Executive Summary

The Site	
Address:	Welfare Road, London, Greater London, E15 4HT
OS National Grid Reference:	TQ 39424 84234
Site Description:	The site is predominately occupied by Newham College campus buildings, alongside associated ancillary structures. In addition, hardstanding in the form of parking facilities is present at the site's periphery. There are small areas of soft vegetation present towards the south and central areas of the site. The study area has access to Whalebone Lane in the north and Govier Close in the south.
Proposed Works	
No information provided.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating	**MEDIUM from the following UXO types:** • German Air-Delivered HE bombs • Anti-Aircraft Projectiles
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	
Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between **10-12m** below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

Recommended Risk Mitigation		
Risk Level	**Planned Site Activity**	**Recommendations**
Medium	**Shallow Intrusive Works eg excavations**	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI)

		• Explosive Ordnance Disposal (EOD) Engineer Watching Brief (for brownfield areas unsuitable for NI magnetometer survey)
	Deep intrusive works (eg piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions
In making this assessment and recommending these risk mitigation measures, the proposed 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, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.		

Table of Contents

List of Annexes

Appendices

Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LCC	London County Council
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Newham College Site

1 Introduction

HSP Consulting Engineers Ltd has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of Newham College Site.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC - Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- Newham Archives.
- Layers of London.
- Landmark Maps.
- RAF Aerial Photography Collection.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	Welfare Road, London, Greater London, E15 4HT	
OS National Grid Reference	TQ 39424 84234	
Site Description	The site is predominately occupied by Newham College campus buildings, alongside associated ancillary structures. In addition, hardstanding in the form of parking facilities is present at the site's periphery. There are small areas of soft vegetation present towards the south and central areas of the site. The study area has access to Whalebone Lane in the north and Govier Close in the south.	
Proposed Works	No information provided.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Borehole	Borehole Reference	TQ38SE1936
	Location	Abbey Lane – Plaistow Lane Junction (approximately 300m south-west).
	Date	1916
	Recorded Shallow Geology	• 2.43m of Made Ground. • 5.18m of black (river) Gravel. • 10.06m of Peaty Clay.
British Geological Survey Mapping	Superficial Deposits	Taplow Gravel Member – Sand and Gravel.
	Bedrock	Lambeth Group – Clay, Silt, and Sand.

7 Pre and Post-WWII OS Mapping

	Date	Observations	Reference	Source
Pre-WWII	1920	• The site is located in a dense urban area, comprised of predominately residential properties. • There several buildings demarcated *Schools* are located in the western extent of the site. • The site is crossed by two roads, *Reynolds Road* and *Union Road,* with another road, *Whalebone Lane* to adjacent to the site's northern boundary. • The southern extent of the site is occupied by open ground.	Annex C-1	Landmark Maps
Post-WWII	1948	• The site appears to have seen significant changes in the post-war period; prefabricated structures, redevelopment, and clearance are all highlighted within the site boundary. • Ruins are present adjacent to the sites southern and eastern boundaries. • Within the immediate vicinity of the site, especially towards the south, houses shown on pre-war OS mapping have been replaced by prefabricated housing. • Evidence of ruins, clearance, and redevelopment is often indicative of bomb damage on early post-WWII OS mapping. • Prefabricated houses were often constructed in areas previously cleared by bombing and used to house those displaced by severe damage to their homes.	Annex C-2	Landmark Maps

8 The Threat from Aerial Bombing

8.1 General Bombing History of London

8.1.1 First World War

During WWI, London was targeted and bombed by Zeppelin Airships and by Gotha and Giant fixed-wing aircraft. An estimated 250 tons of ordnance (high explosive and incendiary bombs) was dropped on Greater London, more than half of which fell on the City of London.

A WWI bomb census map for the London area (not annexed) does not record any bomb strikes in close proximity to the site.

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting 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. 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.

8.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

As the war progressed, the strategy changed to one of attempting to destroy the morale of the civilian population by the "carpet bombing" of London. The Blitz on London began on 7th September 1940 with concentrated attacks coming to an end in May 1941 as the Luftwaffe was diverted east to prepare for 'Operation Barbarossa'; the invasion of the Soviet Union.

During 1942 and 1943, there were a number of minor raids carried out by small formations of fighter bombers and then between January and May 1944 the Luftwaffe returned to London en masse, for Operation Steinbock. These raids were executed by inexperienced Luftwaffe crews and were less frequent when compared to the original Blitz of 1940/41. Poor navigation and improved defences resulted in unsustainable Luftwaffe losses and many raids were unsuccessful.

Between 1940 and 1945 there were a total of 71 'major' air raids on London. In this period, it is estimated that a total of 190,000 bombs (equivalent to 18,000 tons) were dropped, resulting in the deaths of 29,000 people.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe. Totals of 2,419 V1s and 517 V2s were recorded in the London Civil Defence region.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

8.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.
- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.
- Anti-personnel (AP) Bomblets: AP bombs 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.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

8.3 Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the London Borough of West Ham between 1940 and 1945.

Record of German Ordnance Dropped on the London Borough of West Ham	
Area Acreage	4,689
High Explosive Bombs (all types)	1,498
Parachute Mines	45
Oil Bombs	23
Phosphorus Bombs	21
Fire Pots	3
Pilotless Missile (V1)	59
Long Range Rocket (V2)	26
Total	1,675
Items Per 1,000 Acres	**357**

Source: Home Office Statistics

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 incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

8.4 WWII London Bomb Density Map

The bombing density map depicts the concentration of bombs that fell on Greater London throughout WWII. The highest densities were recorded around Central and East London along the River Thames.

Site location	London Borough of West Ham
Bombing density	High
Bombs per 1000 acres	300-399
The bombing density map is presented in **Annex D.**	

8.5 Site Specific WWII Bombing Records

8.5.1 London ARP Bomb Census Maps

A review was conducted of The London ARP Bomb Census Maps. Two consolidated maps covering the majority of the Blitz period were produced, in addition to weekly maps dating from the 7th September 1940 up to 18th June 1944. All of the available maps for the site were reviewed. Note that all distances given are approximations from the nearest site boundary.

	Date Range	Number of Local Incidents	Weapon	Closest Incident to the Site	Reference
Consolidated	**Night bombing up to 07/10/1940**	18	17 x HE bombs 1 x Parachute mine	On site (south)	**Annex E-1**
	Night bombing 07/10/1940 – 28/06/1941	39	35 x HE bombs 4 x Parachute mine	60m south-west	
Weekly	**07/10/1940 – 14/10/1940**	10	8 x HE bombs 2 x 1kg IB shower	145m north	**Annex E-2**
	02/12/1940 – 09/12/1940	3	1 x HE bomb 2 x 1kg IB shower	175m east	
	05/05/1941 – 12/05/1941	5	HE bombs	140m south-west	**Annex E-3**
	10/05/1943 – 17/05/1943	1	500kg HE bomb	60m west	

8.5.2 County Borough of West Ham Civil Defence Consolidated Bomb Plot Map 1939-45

A bomb census map for West Ham was obtained from Newham Archives. Note, the scale of this map is not entirely accurate, therefore all distances should be considered estimations.

Weapon	Closest Incident to the Site
~ 70 x HE bombs	On site
~36 x Incendiary bombs (that caused fires)	35m north-east
9 x Oil Bombs (including unexploded)	110m north-east
1 x Parachute Mine (including unexploded)	185m north-east
1 x V1 'Flying Bomb'	325m south-west
1 x V2 Long Range Rocket	375m south-west
Reference	**Annex F**

8.5.3 London V2 Bomb Census Map

Following the beginning of the V1 and V2 campaign in mid-1944, a series of maps showing where these weapons fell was produced for the London Civil Defence region and these were updated as the war progressed.

V2 Strike Recorded on Site (or in Vicinity)	✓
Date	1945 (exact date unspecified)
Distance from Site	<40m of the site (Tennyson Road)
Reference	**Annex G**

8.5.4 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records.

Written ARP records were reviewed for	The London Borough of West Ham
Source	The National Archives
Records of bombing on / near the site were found	✓

Date	Weapon	Details
18th September 1940	HE bomb UXB	HE bomb fell at the rear of Bristol Road, Bristol Road is located approximately <50m from the site.
28th September 1940	2 x HE bombs	Multiple HE bombs landed on Bristol Road, Bristol Road is located approximately <50m from the site.
	I.B	Incendiary landed on No. 125 Bristol Road, Bristol Road is located approximately <50m from the site.
16th October 1940	UXB	A UXB was discovered in Vicarage Lane, no exact location is specified, but it is possible that it is within <150m of the site.
15th November 1940	UX Land Mine	A UX Land Mine was discovered on Vicarage Lane, (removed) which is located approximately <150m from the site. Moreover, this ARP confirms that there was a barrage balloon site located on Vicarage Lane.
15th March 1941	I.B	An I.B. fell on Bristol Road, Bristol Road is located approximately <50m from the site.
	I.Bs UXAA	These incidents occurred around Vicarage Lane, which is located approximately <150m from the site. Due to the reference to a school, it is likely to have occurred 330m north of the site.
14th March 1944	184 x I.Bs	Multiple places were listed in this shower, including Reynolds Avenue, which encroaches onto the site's eastern extent. It is likely that buildings on site were affected by this incident.
16th June 1944	AA shell	Nos. 89, 90, 91 on Bristol Road (approximately, 50m away from the site) suffered bomb damage from an AA shell.

8.5.5 Home Office Intelligence Reports

The Home Office Intelligence reports document enemy action on British domestic soil and were prepared twice a day for the Home Security War Room. The summaries were prepared by intelligence staff, who compiled reports received from the twelve civil defence regions.

However, available records only document time and general location of attack and numbers of casualties. The intelligence officials generally only recorded locations on municipal level (town, village, or city), rarely providing specific addresses.

Home Office reports have recorded 141 individual air raids over the West Ham area.

8.5.6 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. The following references to incidents on site or in the surrounding area were found.

Date	Weapon	Details
1939-1945	UX 500lb bomb	*"I lived in Ham Park Road during WWII… it was very difficult to stay asleep, for with the Luftwaffe in their searchlights, the anti-aircraft battery across the street in West Ham Park made far more noise than the bombs."* *"…we had to climb the back fence and go live in a school for four days, whilst they defused an unexploded 500lb bomb a few yards along the road."*[1] Ham Park Road is located 900m east of the site.

[1] http://newhamphotos.com/blacksaturday.pdf

8.5.7 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	c.1945-1949
Source	RAF Aerial Photography Collection
Image Type	Aerial
Image quality	Moderate revolution, small scale
Observations	• The site appears largely consistent with the conditions shown on historical post-war mapping. • The western extent of the site, where redevelopment is shown on OS mapping, appears to have suffered bomb damage and been cleared before the structures were erected. • The row of houses on to the north of the site seemed to have suffered minor blast damage, highlighted by the colour of their roofs. • The imagery highlights the significant number of prefabricated structures within the site and surrounding area. It is clear that the majority of the site was affected by bombing, and extensive damage was caused across the area. •
Reference	**Annex H**

8.5.8 Bombing Decoy Sites

A national decoy authority headed by Colonel John Fisher Turner was set up in July 1940, and following earlier experiments in Glasgow and Sheffield, a system of urban lighting decoys was set up. These were known as "Civil" sites; Civil 'QL' for urban lighting simulation, and Civil 'QF' for dummy fires. "Q" – sites were equipped with assorted electrical and pyrotechnical apparatus to simulate the flare given from furnace doors, steel-making, railway marshalling yards, and light given off by inefficient blackout precautions.

Other sites simulated small fires started by incendiary bombs, with oil-storage area fire simulation being developed near large oil installations. A further variation on fire decoy sites was the "SF", or "Special Fires" sites. A larger, longer-burning type of fire was provided at these sites - known as "Starfish" sites - to draw incendiary bombs, and hopefully as a consequence the full enemy payload, from falling on the larger conurbations and defence installations during heavy air raids. Decoy sites had a good level of success – airfield decoy sites across Britain for example had received 359 attacks by the end of 1941. The real airfields were bombed 358 times.

A bombing decoy site was established in close proximity to the site	✘

8.5.9 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 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, nor 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.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✓
Additional Comments	Located approximately 860m to the west of the site, High Street Stratford (exact location unknown).

8.6 UXB Ground Penetration

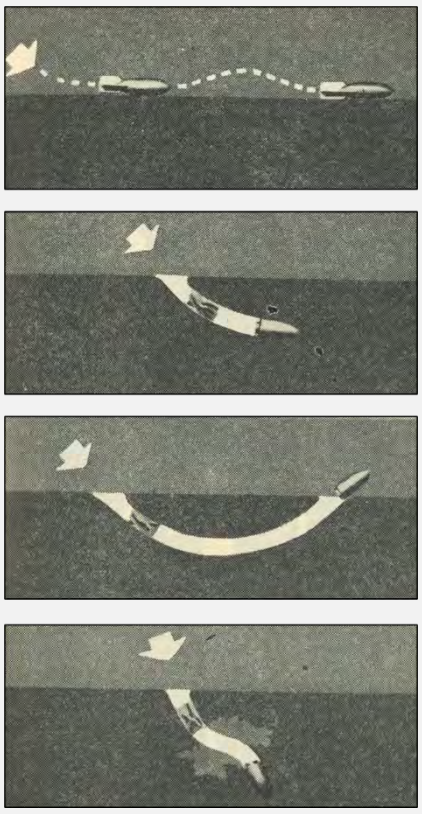
8.6.1 General Considerations

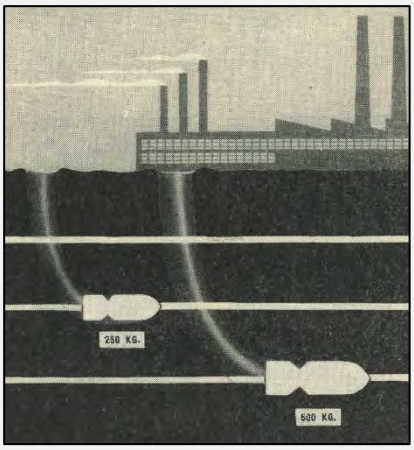
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

8.6.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

8.6.3 Second World War Bomb Penetration Studies

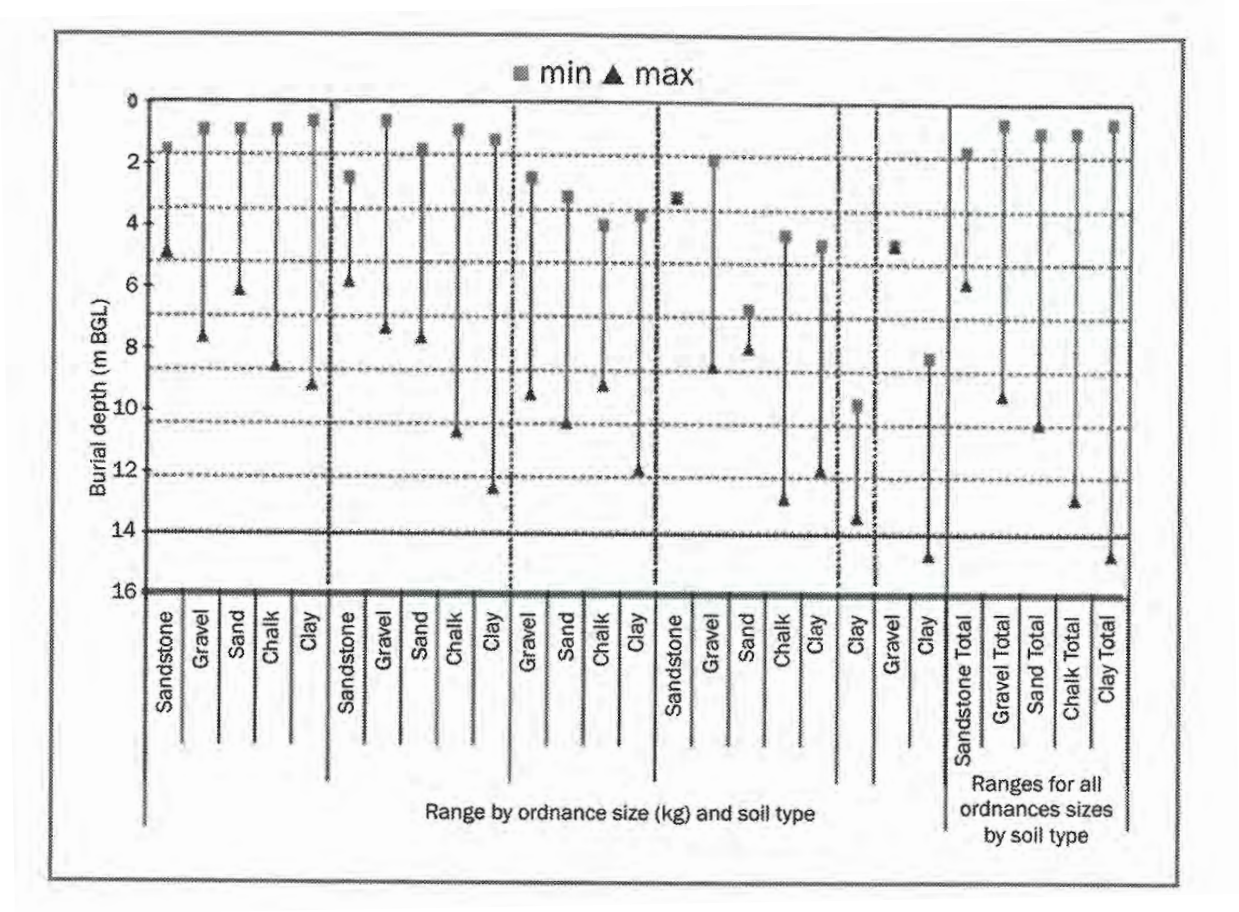
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

8.6.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



8.6.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – 2.43 of Made Ground, >5.18m of Gravel, >10.06m Clay.
- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

8.7 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 8.5, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

8.7.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

8.7.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

8.7.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

8.7.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

8.7.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.
- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

8.7.6 Site Specific Analysis

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			**Additional Comments**
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	High	West Ham's localised bombing density can be considered high, with 357 items per 1000 acres. Multiple bombs are plotted in and around the site boundary.
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✓	
	Were any HE bomb strikes recorded on site?	✓	
	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot bombs (large bombs) were recorded within a 300m radius of the site?	Approx. 60	
	Were any nearby sticks of large bombs recorded in line with the site?	✓	
	Were any 1kg incendiary bomb showers recorded over the site?	✘	ARP records highlight incendiaries landing around Bristol Road, approximately 50m from the site.
Bomb Damage Assessment	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✓	Residential properties in the eastern extent of the site were completely cleared.
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) has been found.	✘	
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	Possibly	

	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	✓	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✓	
	The site was exclusively or partially developed during WWII.	✓	
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	Possibly	The school on site seemed to have sustained little bomb damage, it is possible this remained in use during the war.
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	Welfare Road ran north to south through the eastern section of the site.
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✓	
	The site was occupied by a school during WWII.	✓	
	Part of the site is likely to have been subject to post-raid searches for UXO.	✓	
	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	✓	
	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	✘	
	The site was occupied by a graveyard which would have experienced limited access.	✘	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✘	

	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✖	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✖	
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	✓	It is likely that parts of the site were abandoned following severe bomb damage.
	The site was occupied by dense, inaccessible vegetation during WWII.	✖	
	The site may have been susceptible to waterlogged conditions during WWII.	✖	
	The site was occupied by (possibly) unmaintained grass field during WWII.	✖	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✖	
	The site was occupied by tidal mud or marshland during WWII.	✖	
	The site was occupied by railway tracks crossing soft ground during WWII.	✖	
	The site was occupied by stockpiled material during WWII.	✖	
	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	Possibly	It is possible that the school on site did not sustain any bomb damage or only sustained minor damage.
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	✓	
	The site was occupied by well-maintained, manicured lawn during WWII.	✖	
	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	

Bomb Failure Rate Assessment	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

9 he Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✗
Military Training Areas / Weapons Ranges	✗
Ordnance / Explosives Factories and Storage Depots	✗
Sites Requisitioned for Military Use	✓
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✗
Locations of Army Explosive Ordnance Clearance Tasks	✗
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✗

The risk of contamination from Allied UXO on site is discussed below.

9.1 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[2]

[2] Various News Sources

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019
	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015
	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

9.2 Anti-Aircraft Gun Batteries

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to new positions with relative ease when required. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today.

The maximum ceiling height of fire at that time was around 11,000m however, as the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, large 5.25-inch weapons were brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

When the supply of clockwork fuses from Switzerland was cut off, Britain was forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse. This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all and falling to the ground as UXBs. In January 1944, more people in London were killed by HAA shells than by German bombs.

9.3 Site-Specific Threat from Allied Military Ordnance

The following table identifies the potential threat to the site of contamination from British / Allied UXO.

Potential Source	Details
Nearest Home Guard (HG) Battalion to the site	13th City of London (West Ham) HG Battalion.
Home Guard Activity on site	• One HG battalion was stationed in the vicinity of West Ham during WWII; however, no record of its HQ location was found. • Although typically HG battalions would take part in training exercises in areas occupied by open countryside, there are several examples of Home Guard units carrying out invasion training in urban areas. • Despite this, no evidence has been found to suggest any HG activity took place on site. It is therefore highly unlikely that any HG training exercises, or activity would have taken place at this location.
Defensive features within the vicinity	• According to ARP records, a barrage balloon site was located on Vicarage Lane, approximately <150m from the site.
Threat to the site from unexploded AA shells	• 5 HAA Batteries were located within a 5km radius of the site. The closest was located approximately 2.2km north-east. • It is likely that additional, temporary AA guns were brought to the West Ham area during WWII due to its proximity to the London docks and other high value targets. This is particularly the case during the heaviest raids over London. • The site and adjacent structures were largely occupied by areas of hard-standing and buildings which sustained moderate to heavy damage during WWII. It is likely that many of these were abandoned, and that areas of rubble or debris would have been present on site for some time. • In addition, a large area of open ground lay adjacent to the sites north-western boundary, and it was likely to have only seen seasonal access. • Consequently, it is conceivable that in such conditions, the likelihood of a subsequent UX AA shell falling on site unnoticed and the resulting entry hole going unobserved would have been increased.

9.4 Generic Types of WWII British / Allied Unexploded Ordnance

9.4.1 Land Service Ammunition (LSA)

9.4.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars
b. Grenades
c. Projectiles
d. Rockets
e. Landmines

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.4.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

9.4.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

9.4.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.4.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

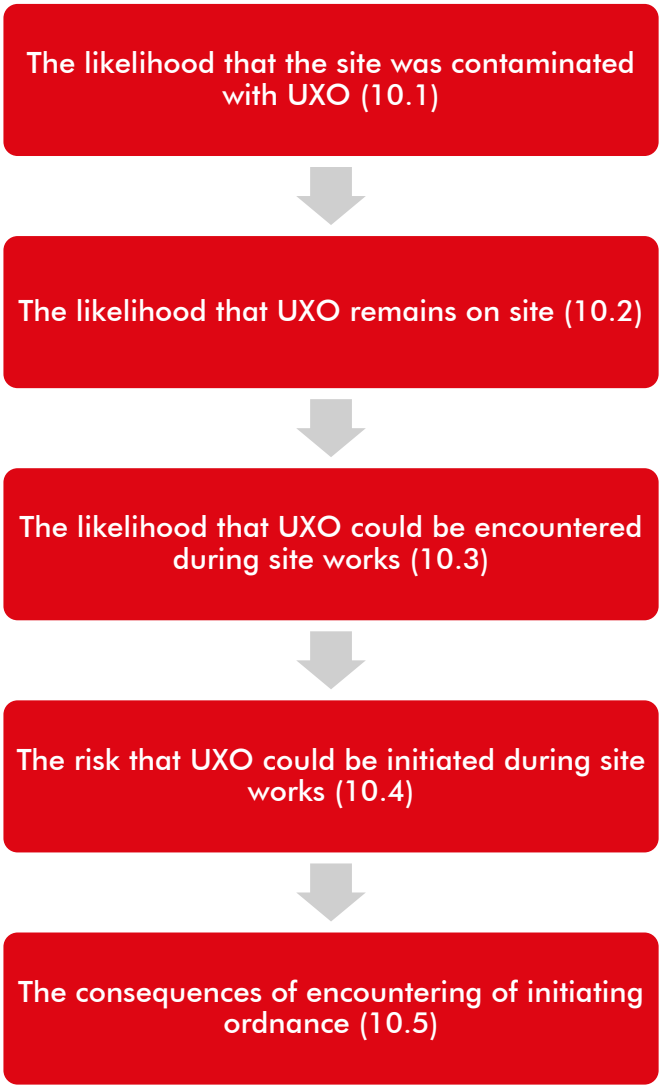
The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

10 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

10.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

10.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

10.1.2 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• West Ham's localised bombing density can be considered high, with 357 items per 1000 acres. • 2 x HE bombs plotted on site. • ARP records provide evidence of bombing on site. • 1 x 1kg IB showers identified on ARP bombing records, landing around Bristol Road.
Bomb Damage	• The eastern extent of the site was destroyed entirely • Several prefabricated buildings were subsequently constructed in the cleared areas. • The school building in the west likely sustained light blast damage from the nearby bomb strikes.
Ground Conditions	• Following severe bomb damage on site, it is likely that large sections of the site were occupied by ruins / rubble / debris for a time. • Soft vegetation in the southern extent. • In such ground conditions, evidence of a UXB entry hole could easily have gone unobserved.
Frequency of Access	• Parts of the site were likely abandoned following bomb damage, especially after the demolition of several buildings. • The school may have remained occupied / in use.
J-Curve Effect	• Had any UXB landed within unconsolidated material on site, such as rubble, debris, ruins, soft vegetation etc, it could have come to rest beneath the adjacent undamaged buildings, such as the school.
Other considerations	n/a
Overall Likelihood of Contamination	**Medium**

10.1.3 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition / Small Arms Ammunition	No evidence has been found to suggest that the site formerly had any British / Allied military occupation or usage that could have led to contamination with items of UXO.
Anti-Aircraft Projectiles	• 5 HAA Batteries were located within a 5km radius of the site. The closest was located approximately 2.2km north-east. • It is likely that additional, temporary AA guns were brought to the West Ham area during WWII due to its proximity to the London docks and other high value targets. This is particularly the case during the heaviest raids over London. • The site and adjacent structures were largely occupied by areas of hard-standing and buildings which sustained moderate to heavy damage during WWII. It is likely that many of these were abandoned, and that areas of rubble or debris would have been present on site for some time. • ARP records highlighted an AA shell landing on Bristol Road, <50m from the site, it is possible that more AA shells could have landed on site. • Consequently, it is conceivable that in such conditions, the likelihood of a subsequent UX AA shell falling on site unnoticed and the resulting entry hole going unobserved would have been increased.
Overall Likelihood of Contamination	**Medium**

10.2 The Likelihood that Unexploded Ordnance Remains on Site

10.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

10.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	None
Local ordnance finds	None
Local tasks undertaken by SafeLane Global	None

10.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✓
Further Details	Most of the site has seen some redevelopment following WWII. The prefabricated houses shown in the eastern extent will likely have been cleared around the 1960s. Newham College school was developed on the site, which incorporated the construction of new buildings and cleared the older structures.

10.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	Evidence shows that the site has been redeveloped on several occasions. Although the maximum depth to which these works were undertaken is unknown during the timeframe of this report, it is assumed to have required a range of intrusive methods.
Further comments	Within the footprints of the post-war redevelopment / ground works, the risk of shallow buried UXO (especially German 1kg incendiaries) remaining will have been partially mitigated since any such items could have been encountered and removed during soil stripping and levelling. Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations / boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. At any location on site where no bulk excavations have been carried out, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth.

10.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a 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. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	No details on proposed works have been provided. Any future intrusive works are considered at risk from encountering an item of UXO.

10.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed 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.

10.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.
Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-	This is the most likely scenario resulting in the bomb detonating.

sensitive) fuze explosive	

10.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions, particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

10.5 The Consequences of Encountering or Initiating Ordnance

Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

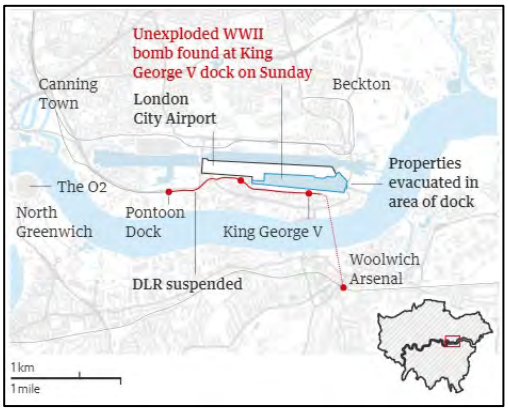
Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others. A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said. The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air. A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt." Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in. Radio reports claimed that the total number of injured stood at 14. **Blown up by history**	A WWII bomb killed 3 and injured 8 in Berlin - 1994
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII 1000kg HE bomb found in Exeter, causing a construction site and the surrounding area to be evacuated. The subsequent detonation caused substantial damage to nearby buildings.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

11 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

11.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be Medium.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Medium	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	Medium	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Low	Low	Low	Not Significant	**Low**
Land Service Ammunition	Low	Low	Low	Moderate	**Low**

12 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

12.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in **Section 12.2**.

Risk Level	Planned Site Activity	Recommendations
Medium	Shallow Intrusive Works eg. excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Explosive Ordnance Disposal (EOD) Engineer Watching Brief (for brownfield areas unsuitable for NI magnetometer survey) • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI)
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

12.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer. • Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required.

	• Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of

	an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).
Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	**Non-Intrusive Survey** This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required.

	The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. **Target Investigation** If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

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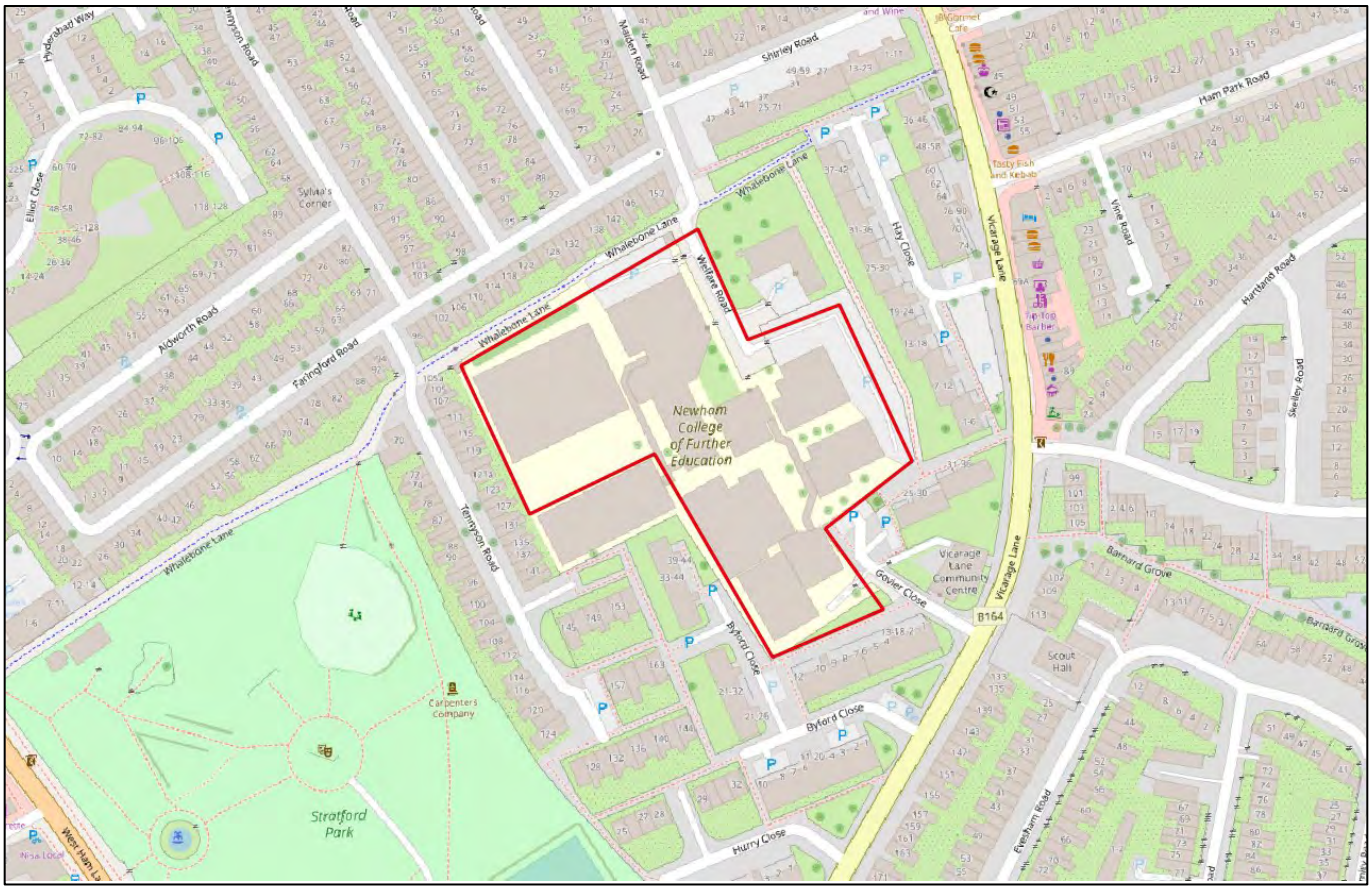

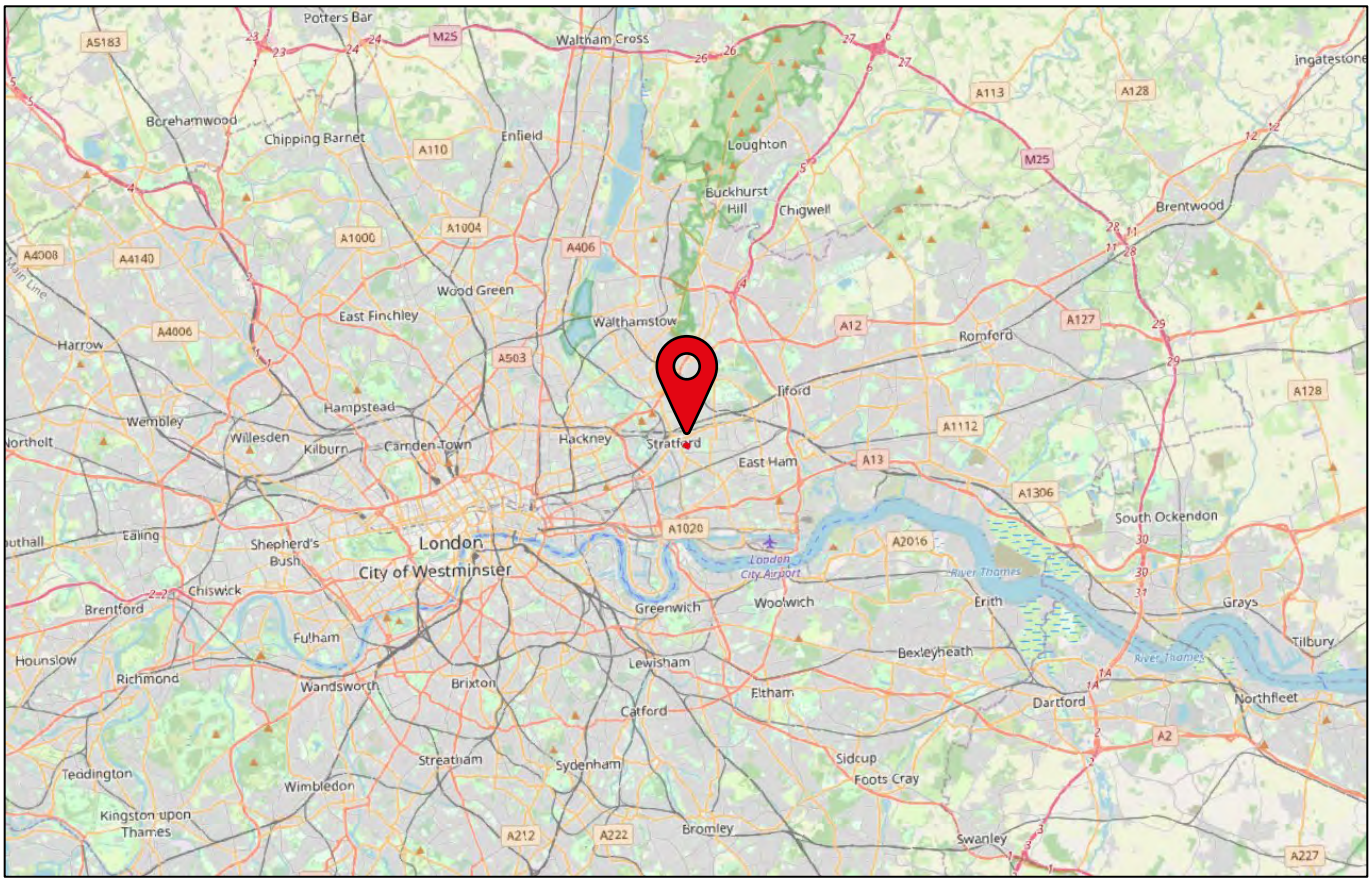

SAFELANE® GLOBAL

Recent Aerial Photograph / Site Plan

Annex B
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Approximate site boundary

Google Earth™ Mapping Services

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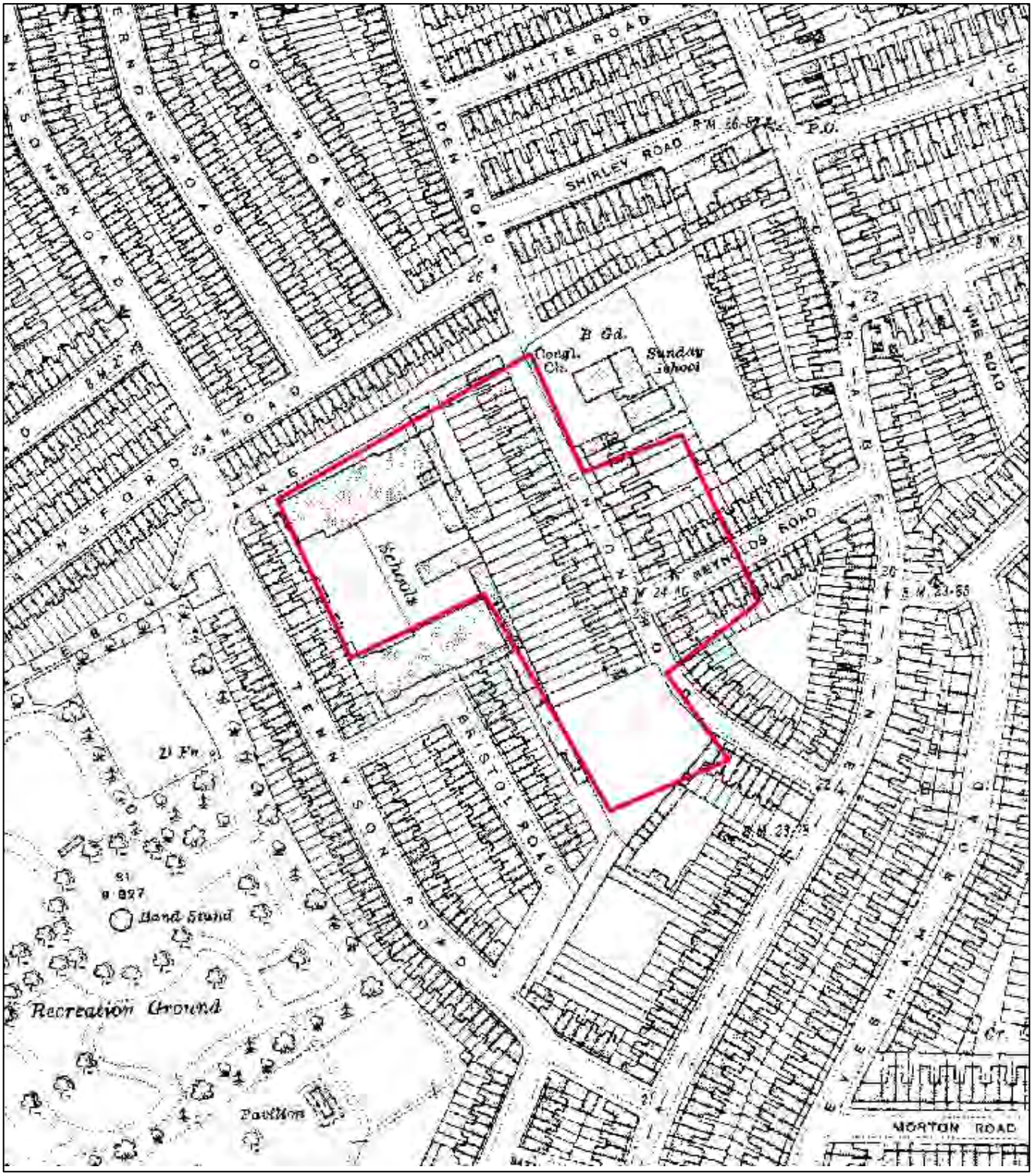

Approximate site boundary

SAFELANE® GLOBAL

1948 OS Map

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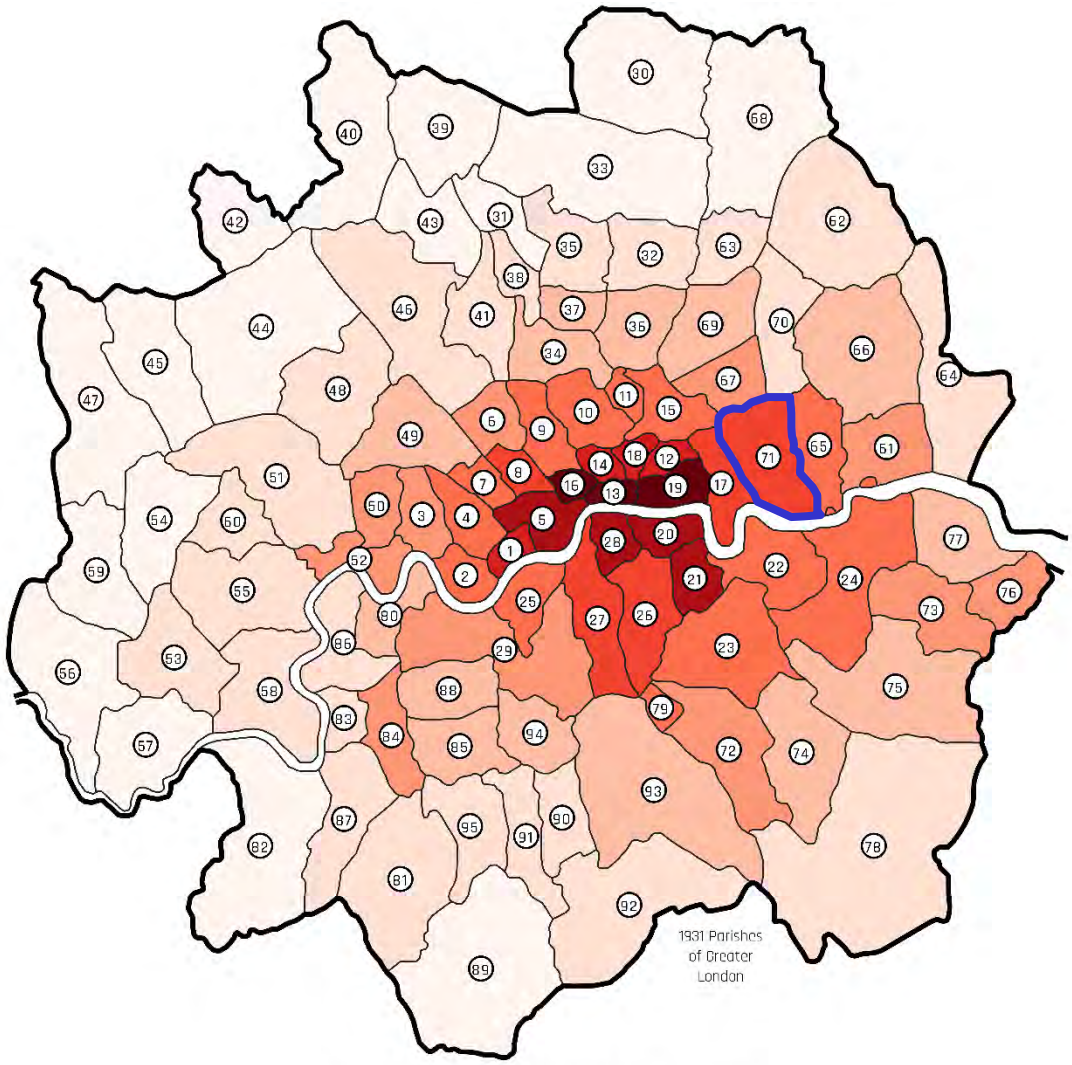
Approximate site boundary
Clearance
Redevelopment
Ruins
Prefabricated Buildings

SAFELANE® GLOBAL

WWII London Bomb Density Map

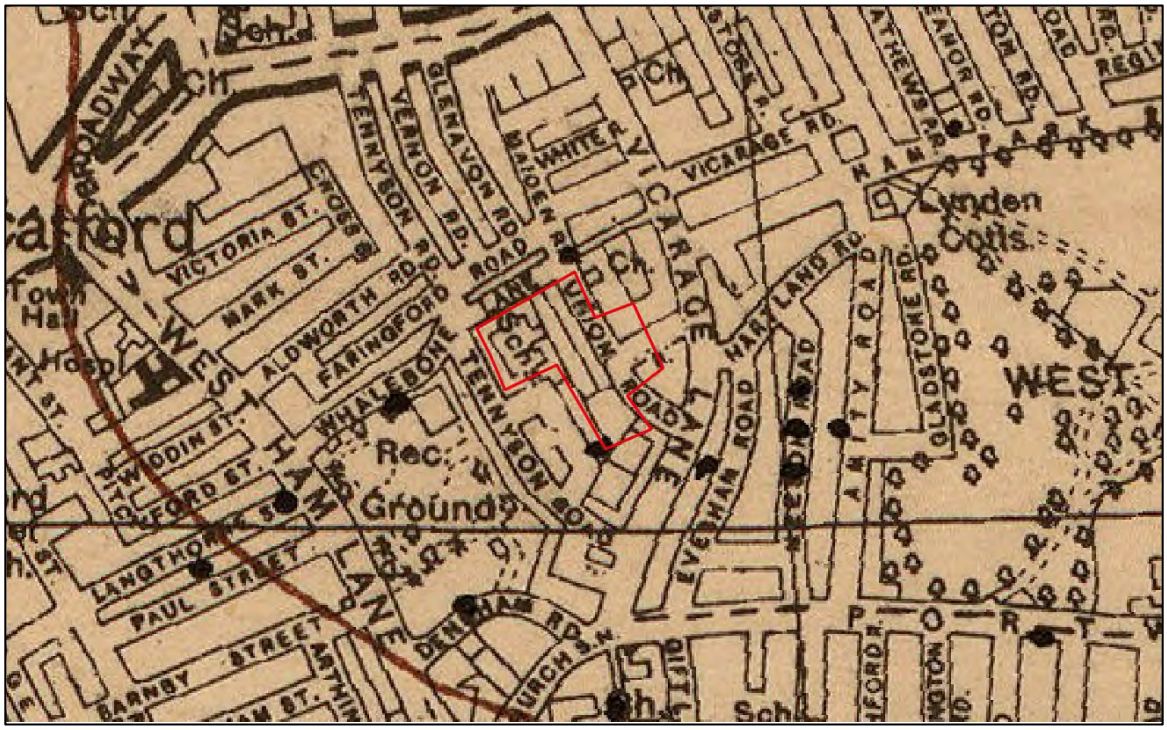
Annex D 9357 RA



No. of Bomb Strikes Per 1,000 Acres

Under 50 | 50-99 | 100-149 | 150-199 | 200-299 | 300-399 | 400-499 | 500-599 | Over 600

1	Chelsea	20	Bermondsey	39	Potters Bar	58	Twickenham	77	Erith
2	Fulham	21	Deptford	40	Elstree	59	Yiewsley and West Drayton	78	Orpington
3	Hammersmith	22	Greenwich	41	Finchley	60	Southall and Norwood	79	Penge
4	Kensington	23	Lewisham	42	Bushey	61	Barking	80	Barnes
5	Westminster	24	Woolwich	43	Barnet	62	Chigwell	81	Epsom and Ewell
6	Hampstead	25	Battersea	44	Harrow	63	Chingford	82	Esher
7	Paddington	26	Camberwell	45	Ruislip and Northwood	64	Dagenham	83	Kingston on Thames
8	St. Marylebone	27	Lambeth	46	Hendon	65	East Ham	84	Malden and Coombe
9	St. Pancras	28	Southwark	47	Uxbridge	66	Ilford	85	Merton and Morden
10	Islington	29	Wandsworth	48	Wembley	67	Leyton	86	Richmond
11	Stoke Newington	30	Cheshunt	49	Willesden	68	Waltham Holy Cross	87	Surbiton
12	Bethnal Green	31	East Barnet	50	Acton	69	Walthamstow	88	Wimbledon
13	City of London	32	Edmonton	51	Ealing	70	Wanstead and Woodford	89	Banstead
14	Finsbury	33	Enfield	52	Brentford and Chiswick	71	West Ham	90	Beddington and Wallington
15	Hackney	34	Hornsey	53	Feltham	72	Beckenham	91	Carshalton
16	Holborn	35	Southgate	54	Hayes and Harlington	73	Bexley	92	Coulsdon and Purley
17	Poplar	36	Tottenham	55	Heston and Isleworth	74	Bromley	93	Croydon
18	Shoreditch	37	Wood Green	56	Staines	75	Chislehurst and Sidcup	94	Mitcham
19	Stepney	38	Friern Barnet	57	Sunbury-on-Thames	76	Crayford	95	Sutton and Cheam



Night bombing up to 7th October 1940

Night bombing between 7th October 1940 and 28th July 1941

Approximate site boundary HE bomb strike

07/10/1940 – 14/10/1940

02/12/1940 – 09/12/1940

Approximate site boundary HE bomb strike

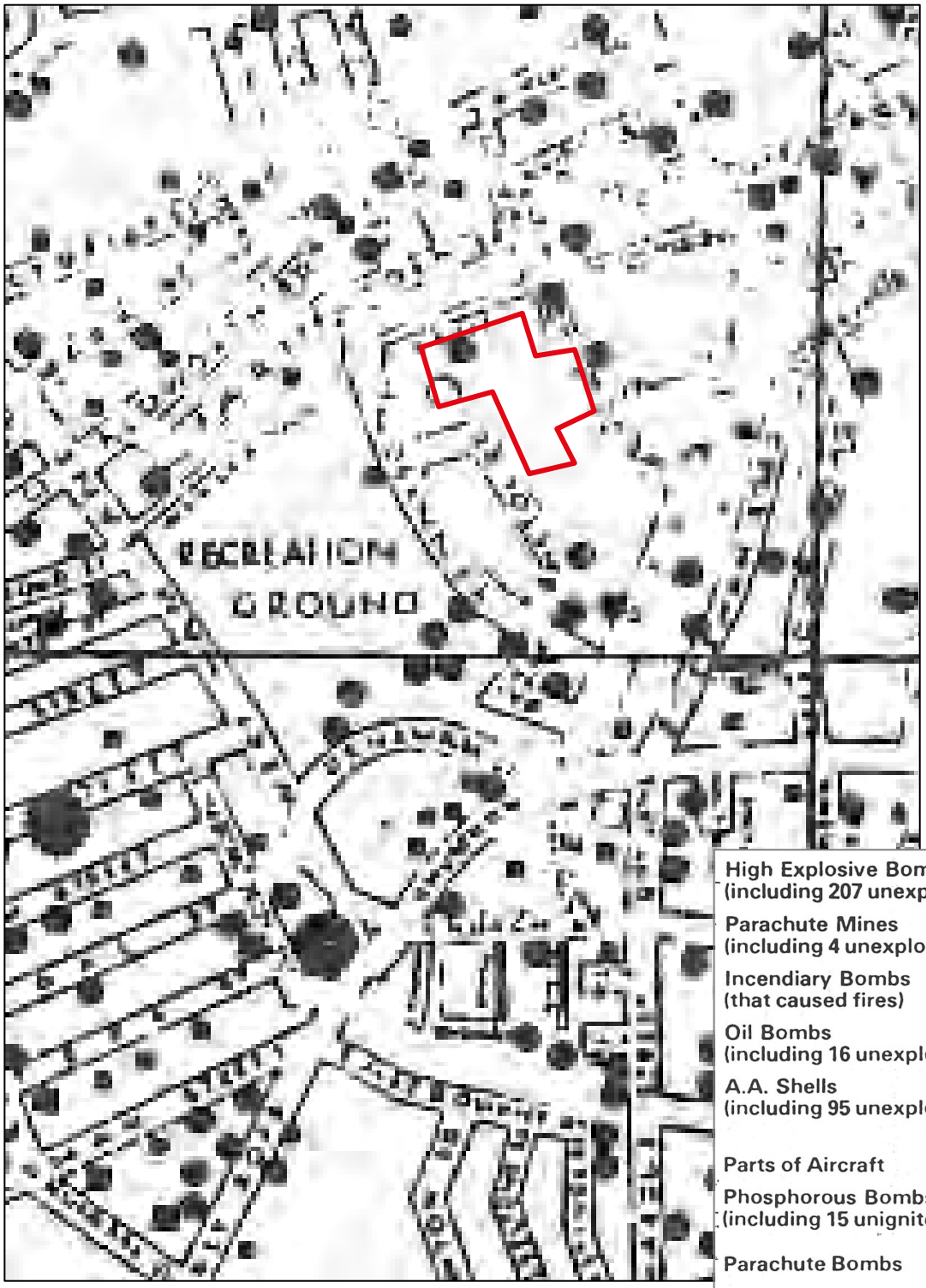
05/05/1941 – 12/05/1941

10/05/1943 – 17/05/1943

Approximate site boundary HE bomb strike 500kg HE bomb

West Ham Bomb Plot Map

N



High Explosive Bombs (including 207 unexploded)	1493
Parachute Mines (including 4 unexploded)	32
Incendiary Bombs (that caused fires)	1130
Oil Bombs (including 16 unexploded)	65
A.A. Shells (including 95 unexploded)	201
Parts of Aircraft	1
Phosphorous Bombs (including 15 unignited)	16
Parachute Bombs	1
Flying Bombs (V1's)	68
Long Range Rockets (V2's)	33

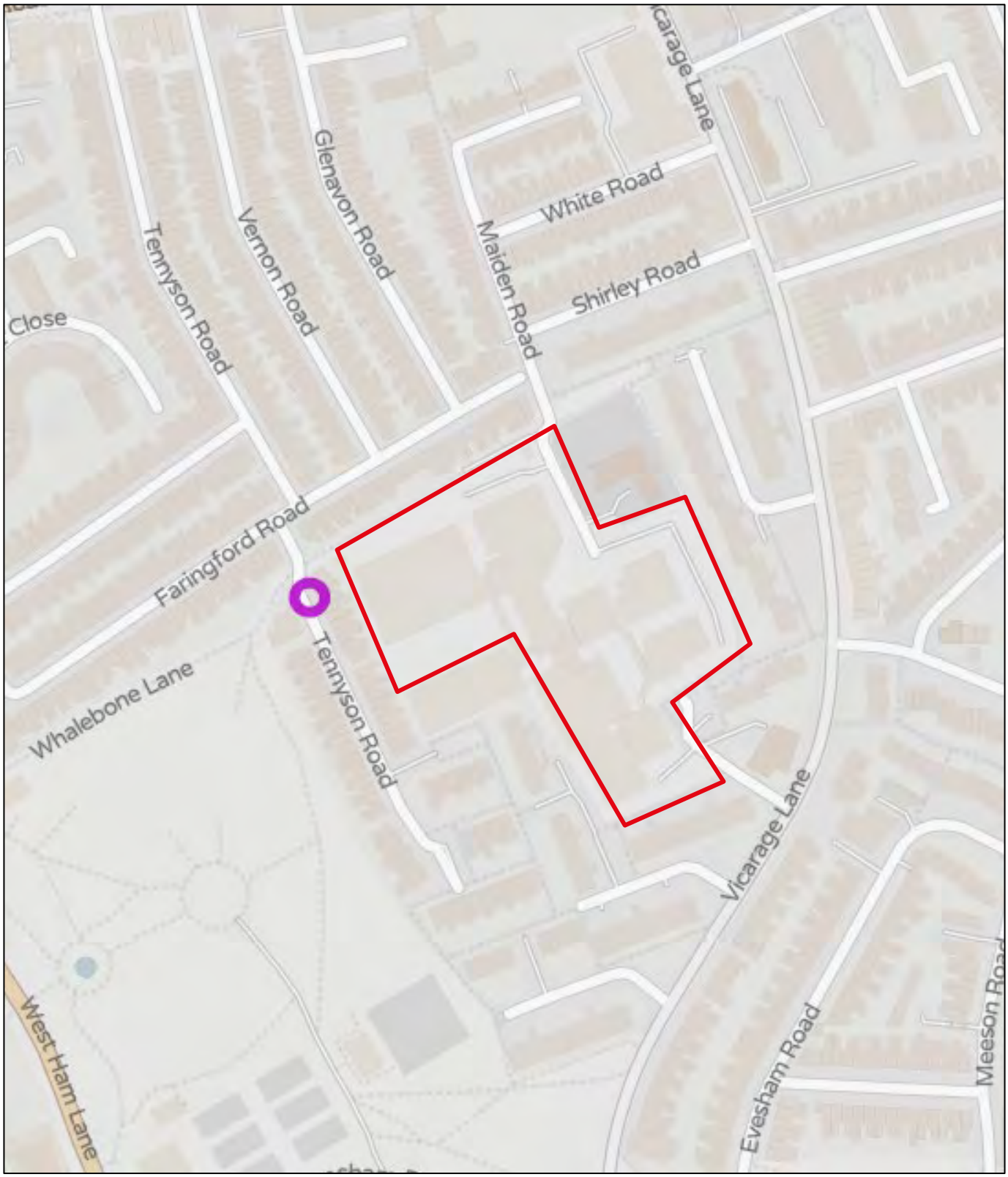
Approximate site boundary

Newham Archives

SAFELANE® GLOBAL

London V2 Bomb Census Map

Annex G
9357 RA



Approximate site boundary

V2 Rocket strike

Layers of London

SAFELANE® GLOBAL

WWII-era RAF Aerial Photography – c.1945-49

Annex H
9357 RA

N

Approximate site boundary Clearance Prefabricated Buildings

RAF Aerial Photography Collection

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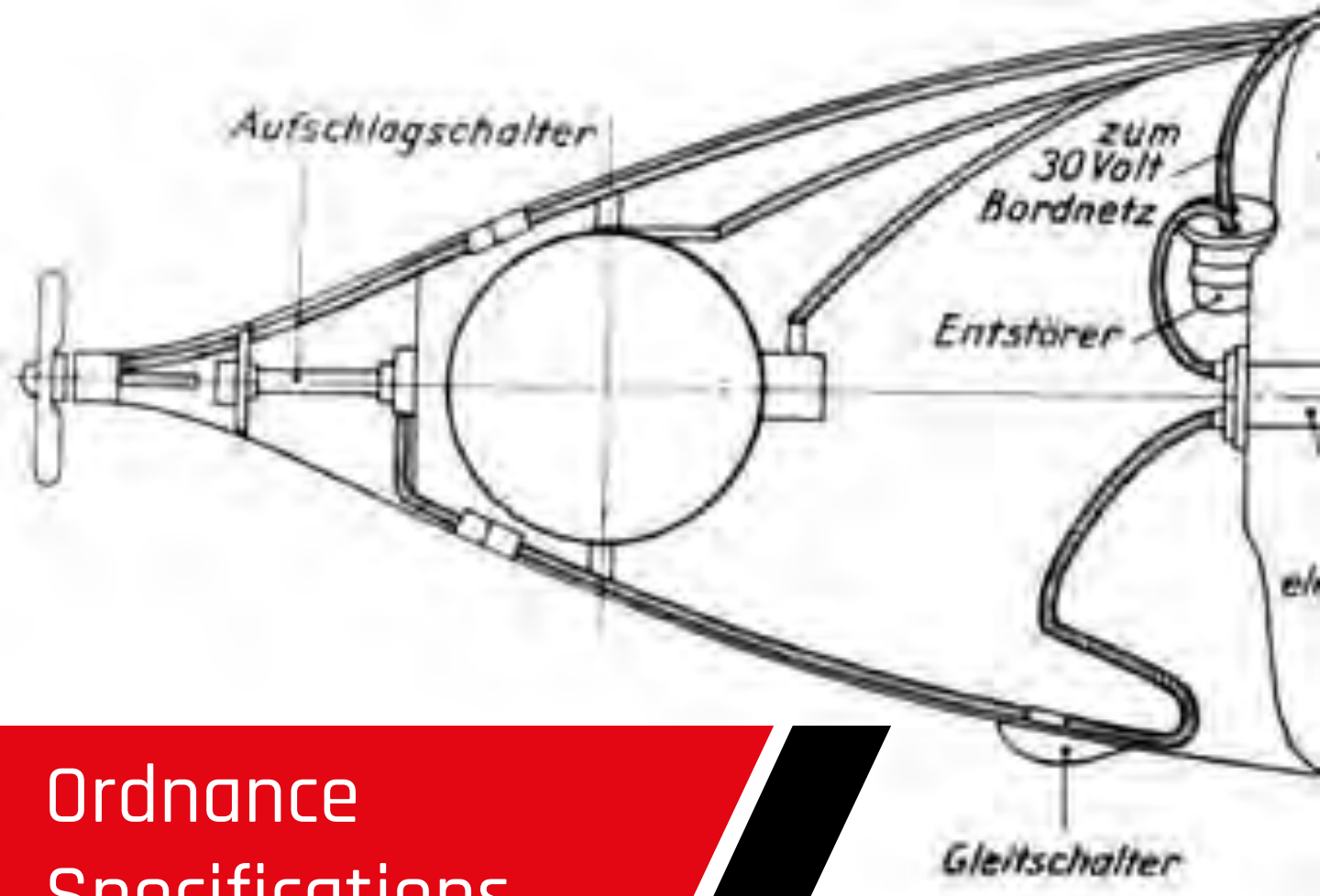
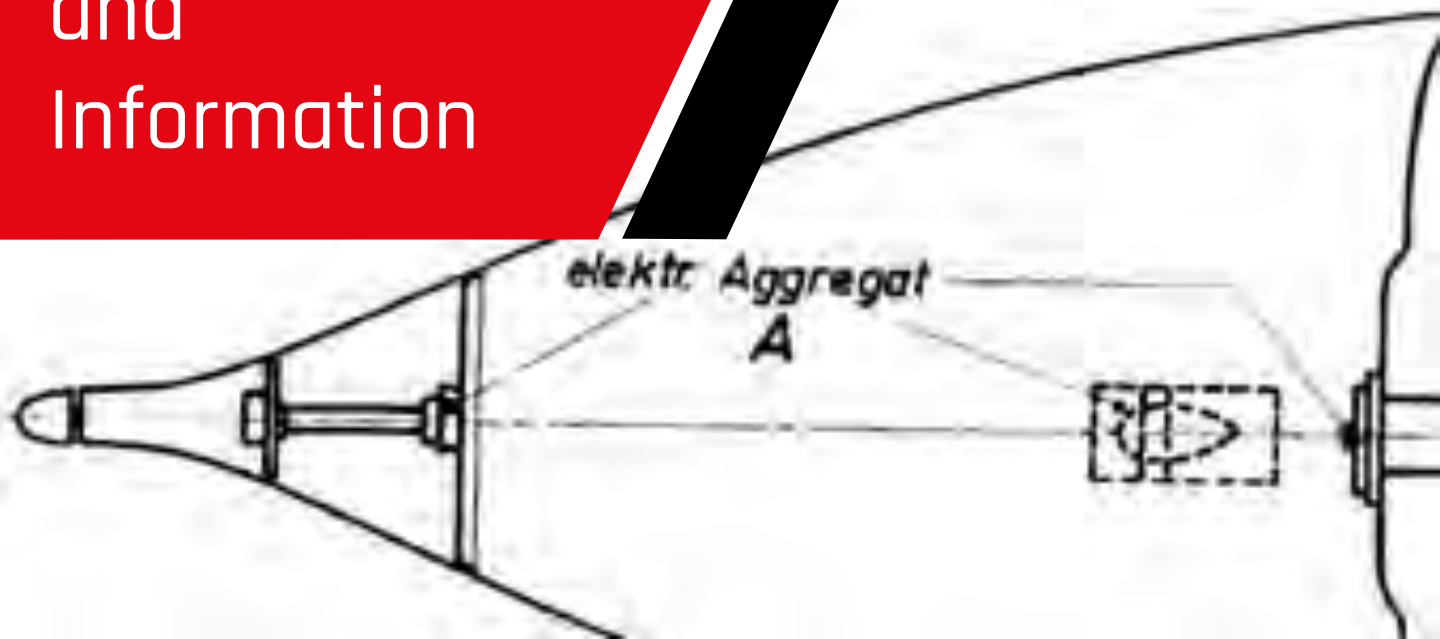
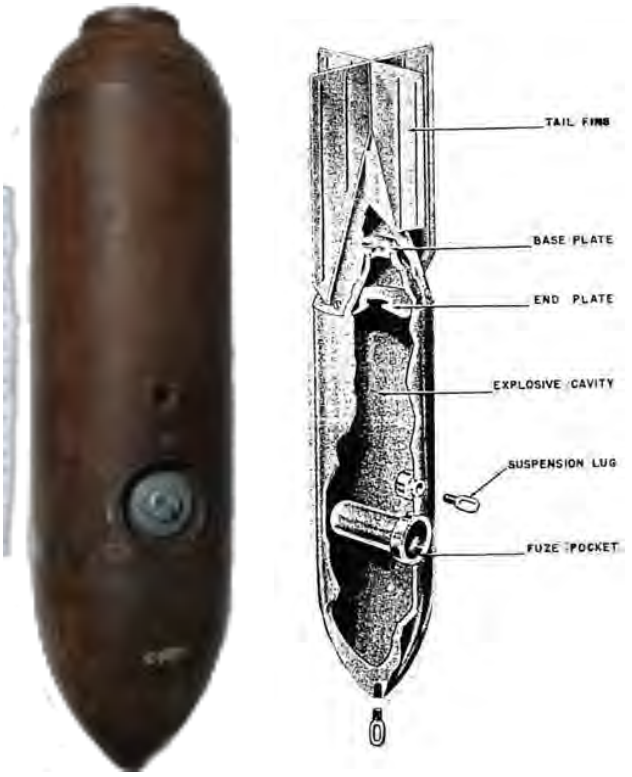
LEADING THE WAY



Ordnance Specifications and Information



German Ordnance

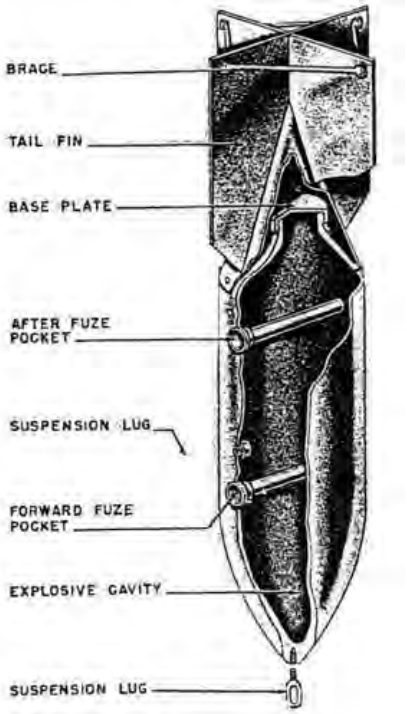


Sprengbombe Cylindrisch 50

Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)

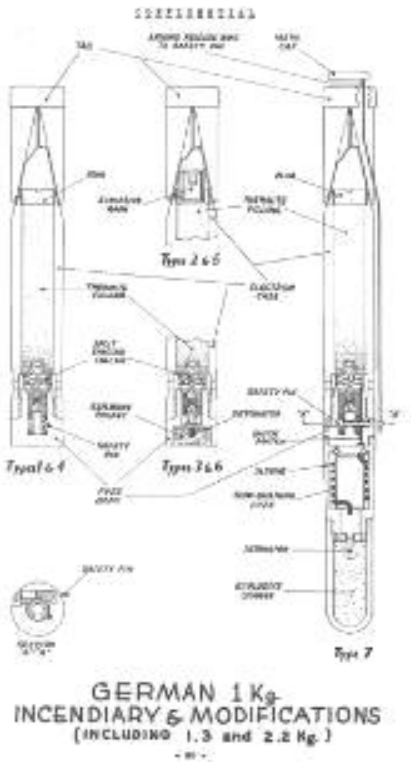


Sprengbombe Cylindrisch 250

Bomb weight: 245-256k
Explosive Weight: 125-130kg
Fuze Type: Electrical impact / mechanical time delay fuze
Bomb Dimensions: 1640x512mm
Body Diameter: 368mm
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

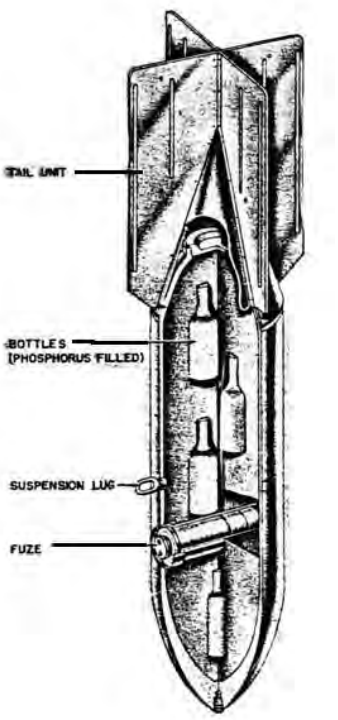
In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.

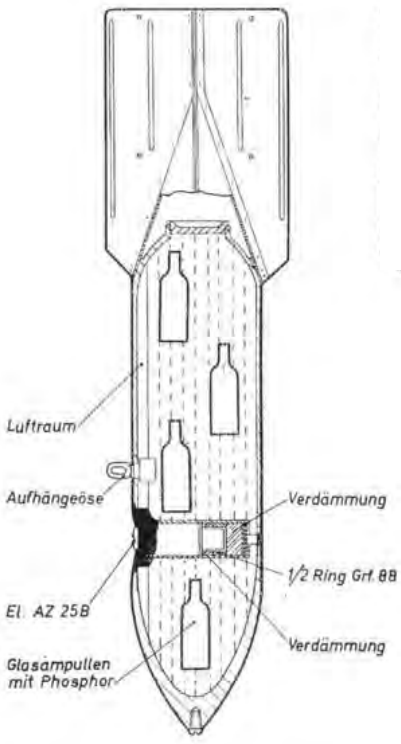


Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

1kg Incendiary Bomb (IB)

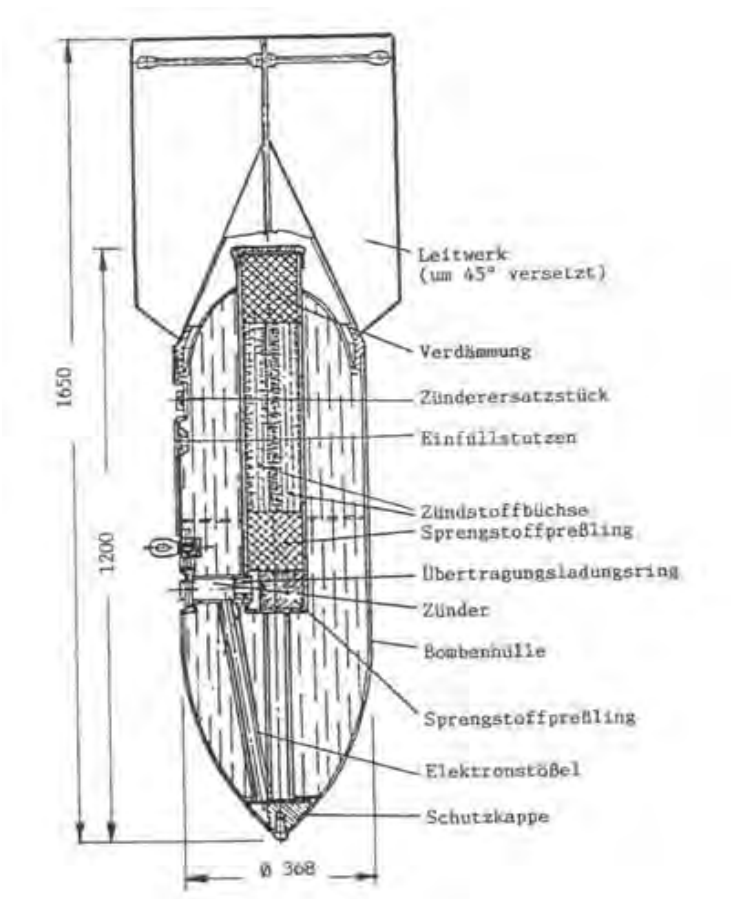
Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.





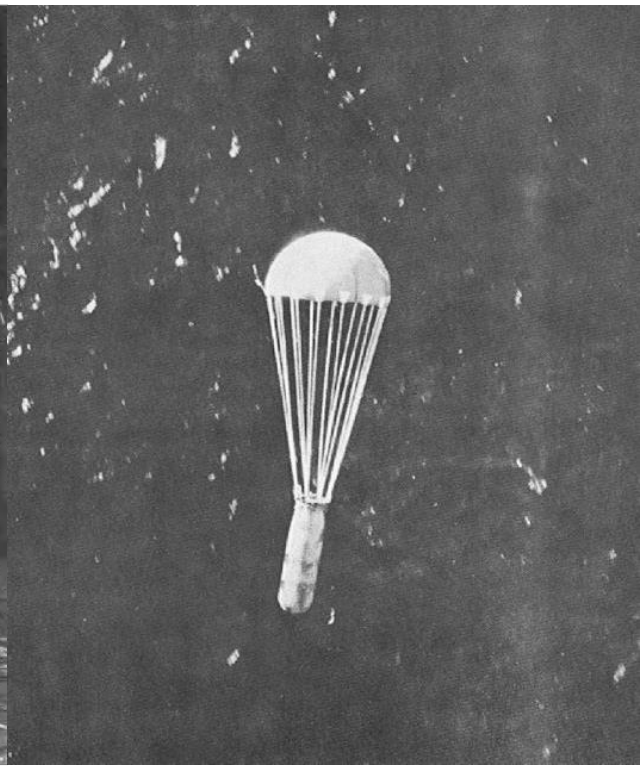
C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture



Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration



Luftmine A/B 'Parachute Mine'

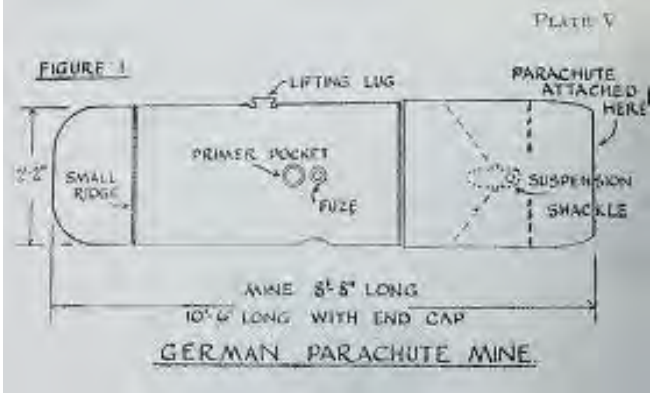
Bomb Weight: A- 500kg, B – 1000kg

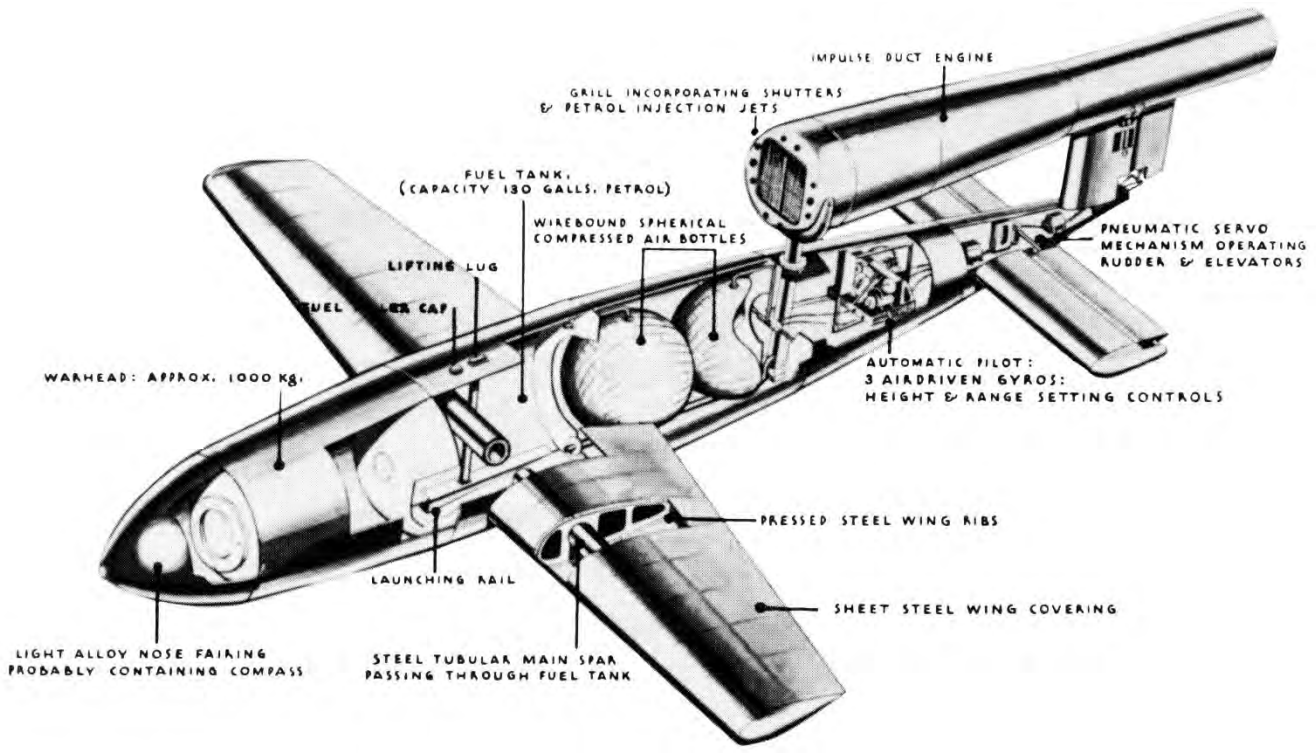
Fuze Type: Mechanical clockwork fuze

Bomb Dimensions: A – 1768mm, B – 2682mm

Use: Capable of creating severe blast damage in built-up areas.

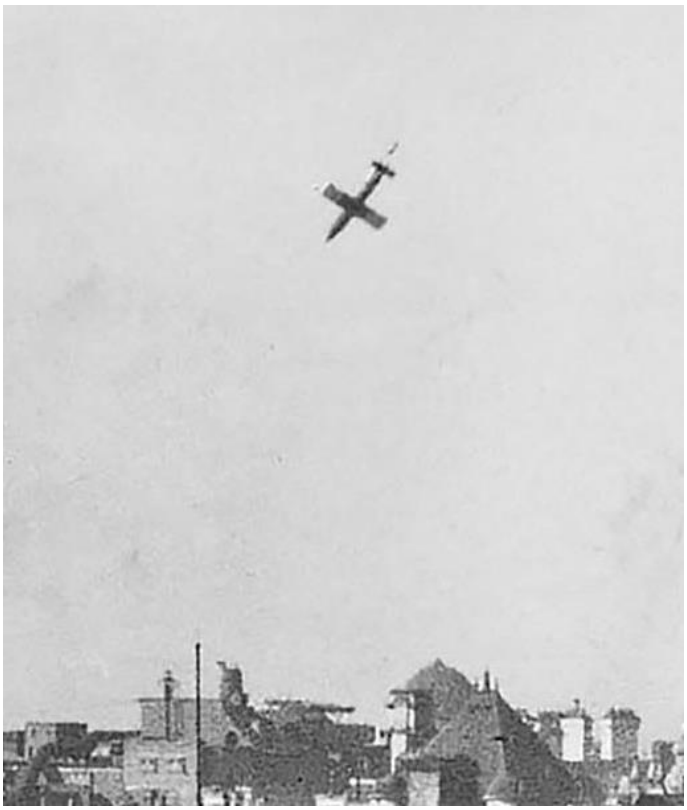
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.



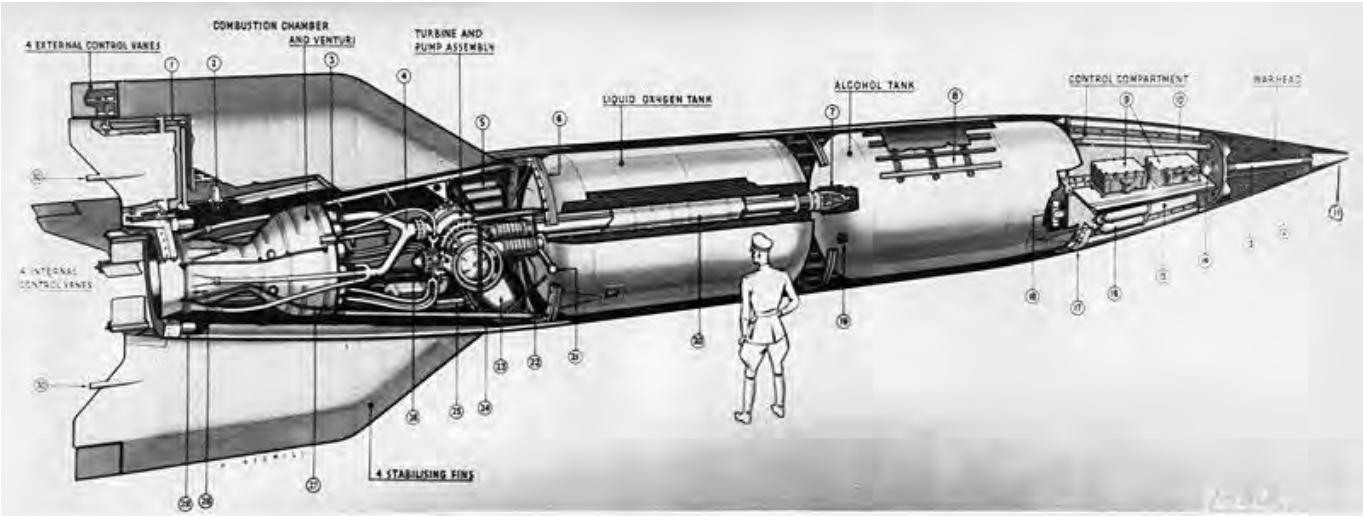


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting

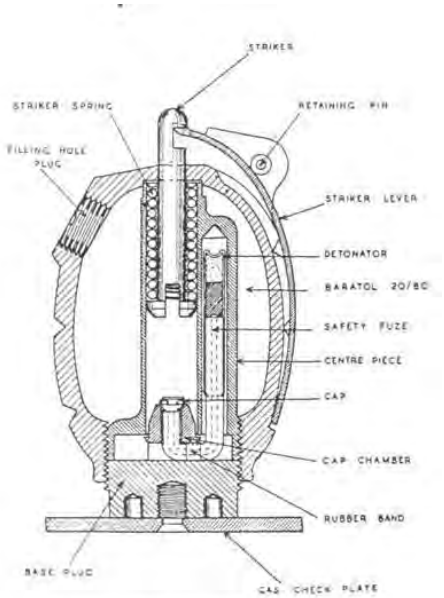


1 CHAIN DRIVE TO EXTERNAL CONTROL VALVE
2 ELECTRIC MOTOR
3 BURNER CUPS
4 ALCOHOL SUPPLY FROM PUMP
5 AIR BOTTLES
6 REAR JOINT RING AND STRONG POINT FOR TRANSPORT
7 SERVO-OPERATED ALCOHOL OUTLET VALVE
8 ROCKET SHELL
9 RADIO EQUIPMENT
10 PIPE LEADING FROM ALCOHOL TANK TO WARHEAD
11 NOSE PROBABLY FITTED WITH NOSE SWITCH, OR OTHER DEVICE FOR OPERATING WARHEAD FUZE
12 CONDUIT CARRYING WIRES TO NOSE OF WARHEAD
13 CENTRAL EXPLODER TUBE
14 ELECTRIC FUZE FOR WARHEAD
15 PLYWOOD FRAME
16 NITROGEN BOTTLES
17 FRONT JOINT RING AND STRONG POINT FOR TRANSPORT
18 PITCH AND AZIMUTH GYROS
19 ALCOHOL FILLING POINT
20 DOUBLE WALLED ALCOHOL DELIVERY PIPE TO PUMP
21 OXYGEN FILLING POINT
22 CONCERTINA CONNECTIONS
23 HYDROGEN PEROXIDE TANK
24 TUBULAR FRAME HOLDING TURBINE AND PUMP ASSEMBLY
25 PERMANGANATE TANK (GAS GENERATOR UNIT BEHIND THIS TANK)
26 OXYGEN DISTRIBUTOR FROM PUMP
27 ALCOHOL PIPES FOR SUBSIDIARY COOLING
28 ALCOHOL INLET TO DOUBLE WALL
29 ELECTRO-HYDRAULIC SERVO MOTORS
30 AERIAL LEADS

Vergeltungswaffe 2 (V-2) Rocket

Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.

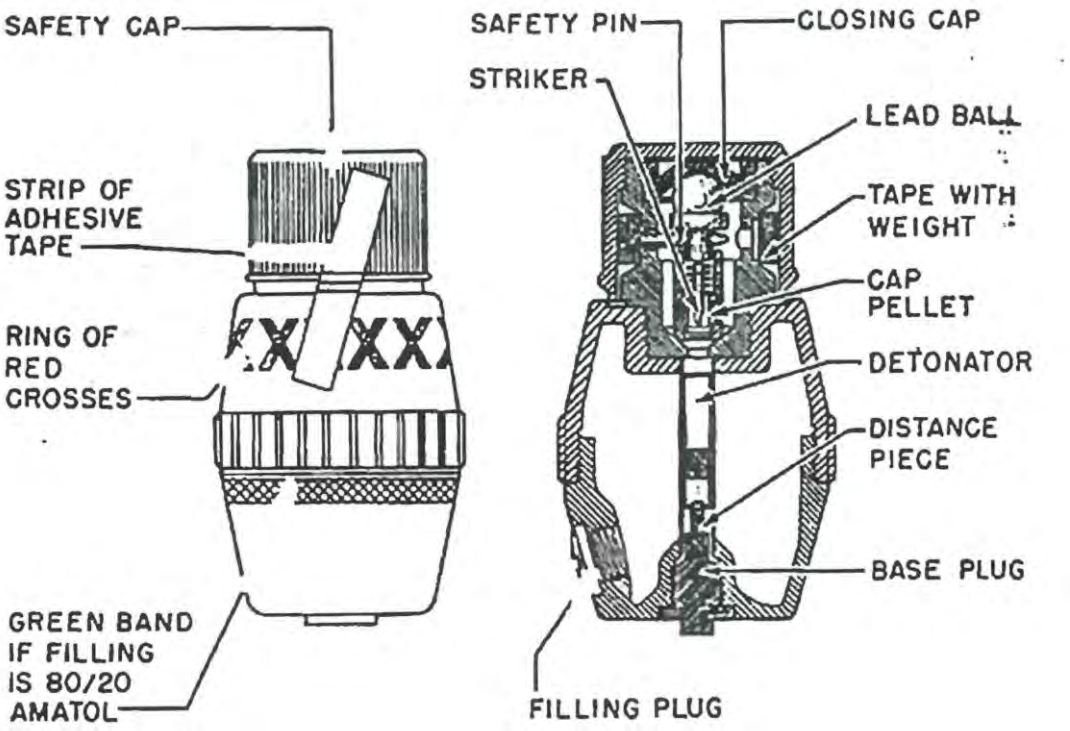
British & Allied Ordnance



Grenade, .303 inch rifle, No. 36M, Mark I.

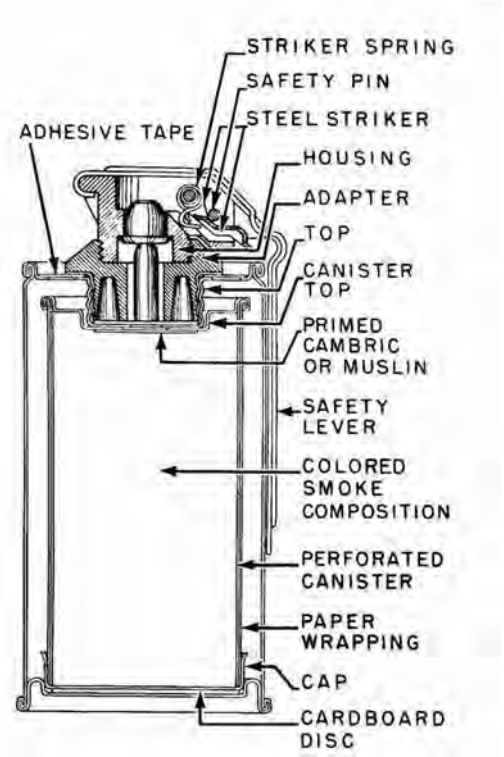
No. 36 "Mills" Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.



Typical Smoke Grenade

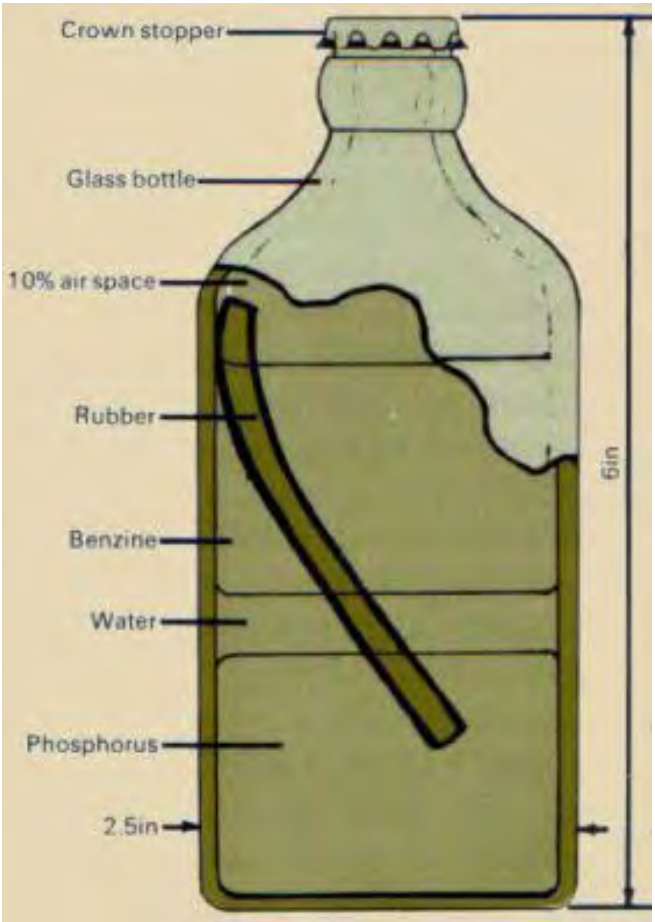
Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.

Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

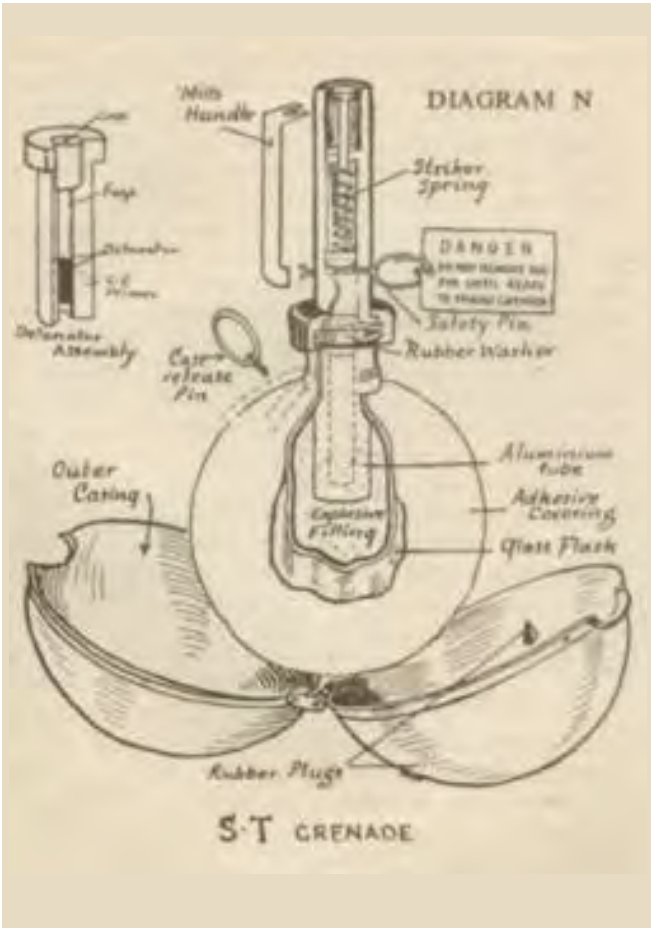
The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.



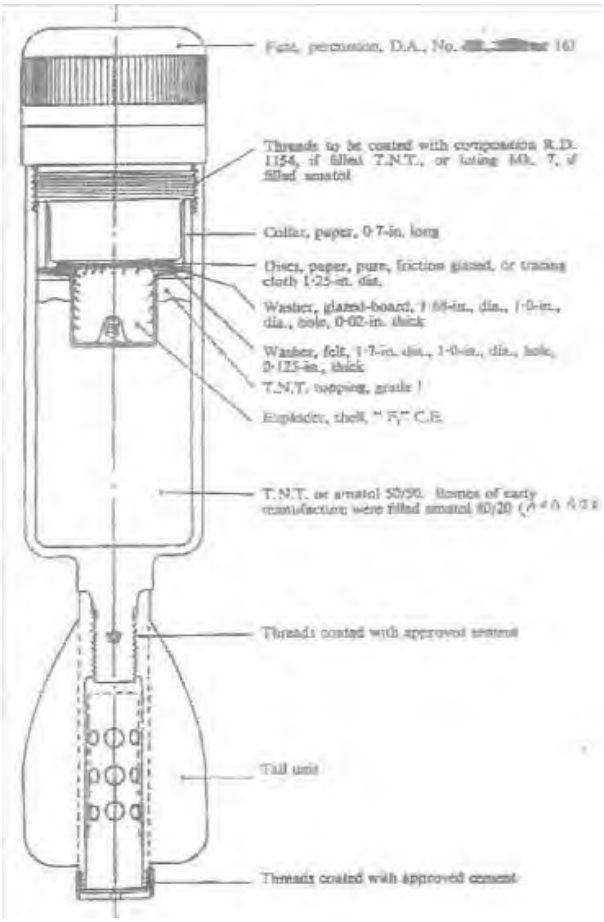
No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.



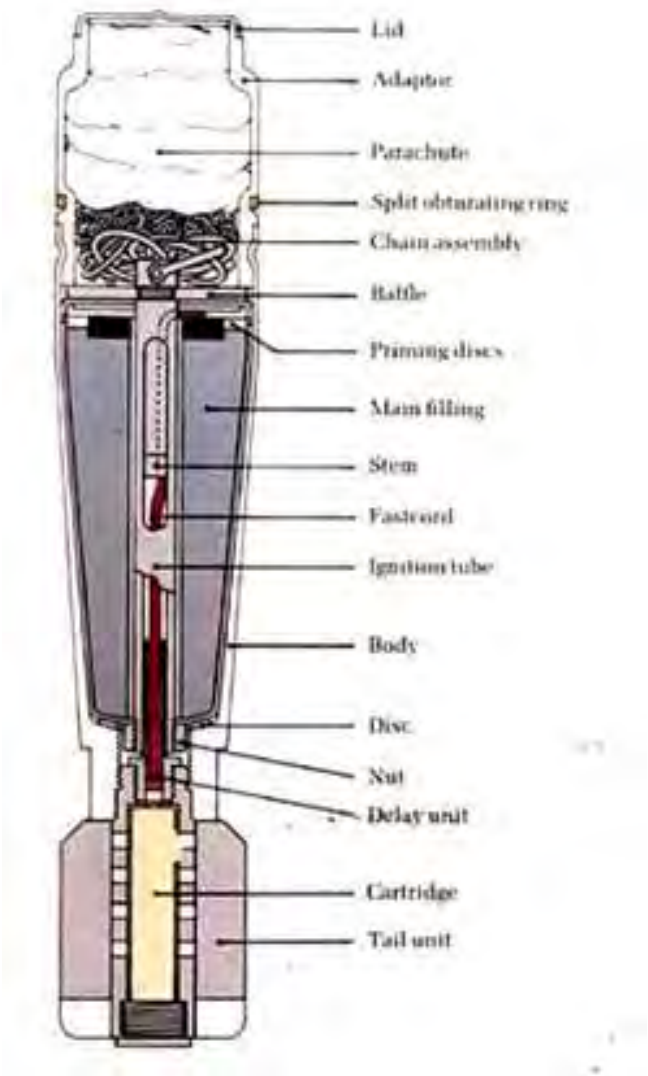
Typical 2" High Explosive Mortar

Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.



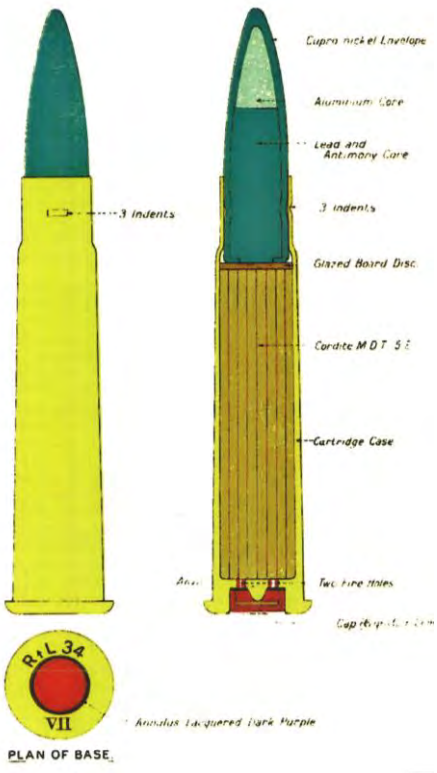
Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.



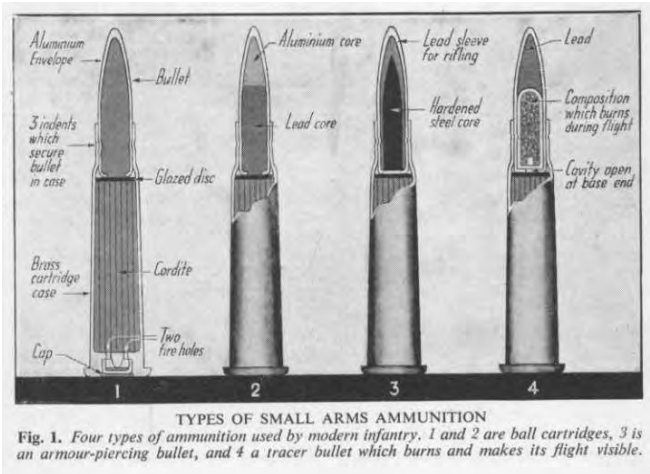
Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



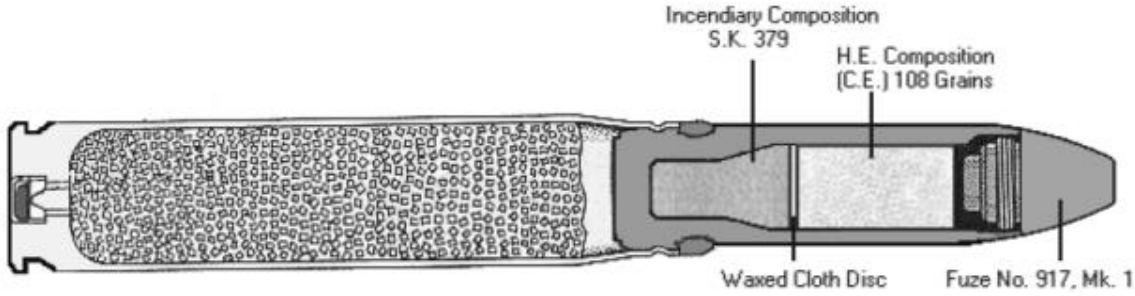
.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons



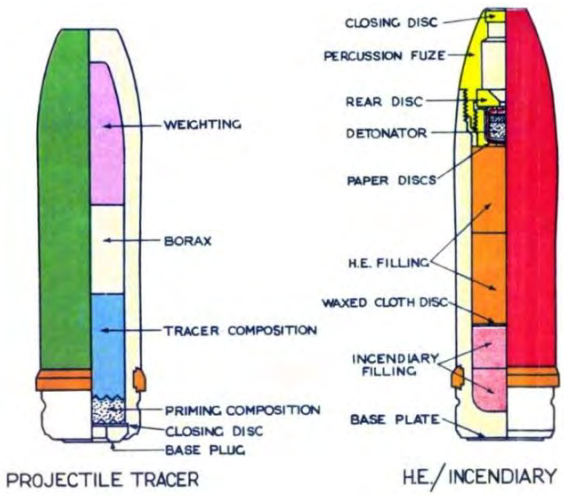
TYPES OF SMALL ARMS AMMUNITION

Fig. 1. *Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.*



20mm Hispano HEI Ammunition

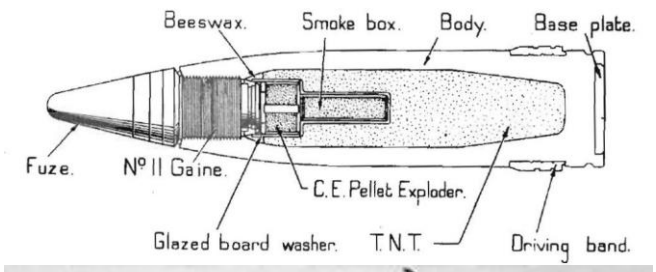
Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



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.	

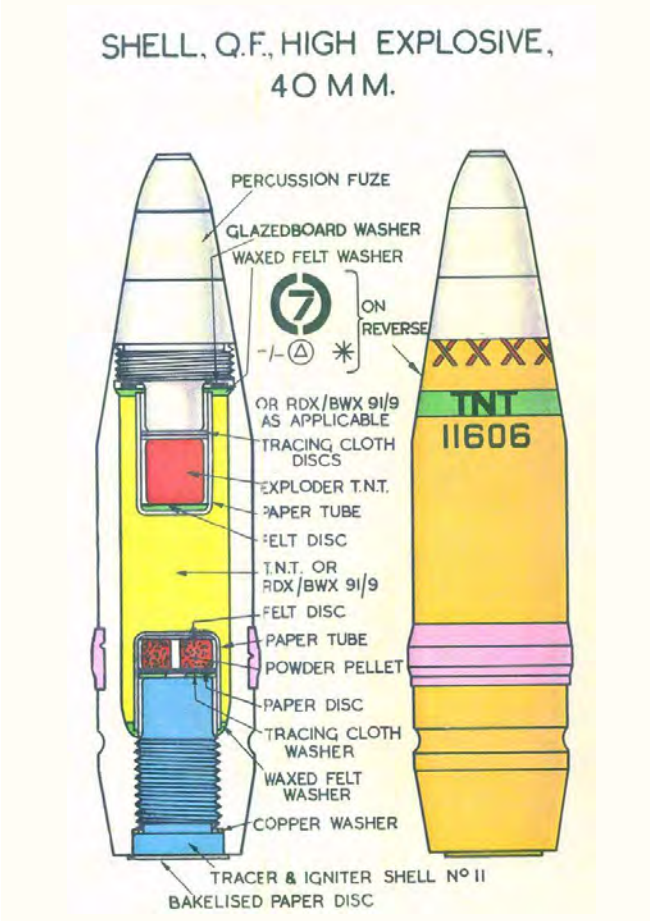
3.7" Anti-Aircraft Projectile

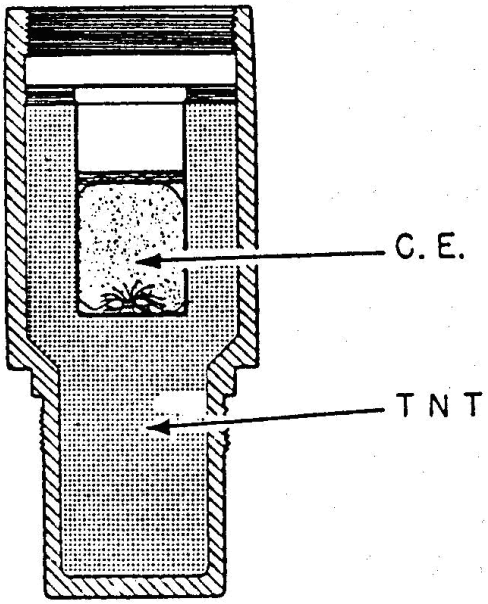
Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.



40mm Bofors Gun Projectile

Weight: 0.86kg
Bomb Dimensions: 40mm x 310mm
Rate of Fire: 120 rounds per minute
Ceiling: 7,000m
Muzzle Velocity: 881m/s
Remarks: Mobile batteries – normally few records of where these guns were located.





Rockets / Un-rotating Projectiles

Weight: 24.5kg
Bomb Dimensions: 94 x 360mm
Carriage: Typically, white phosphorus
Rate of Fire: 10-20 rounds per minute
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.
Top-left image: Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery