PADDINGTON GREEN
POLICE STATION

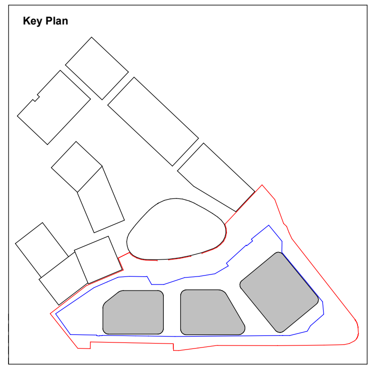
NOVEMBER 2022

Structural Method Statement (Part 3)

Structural Method Statement (Part 3) – November 2022 - GLA0711

Berkeley
Designed for life

Key Plan



Key

- Proposed Planning Boundary
- Site Ownership Boundary

Description	Date	Chk	Rev
Issued for Planning	18/11/22		P3
Planning Amendments	23/07/21		P2
Issued for Planning	26/03/21		P1

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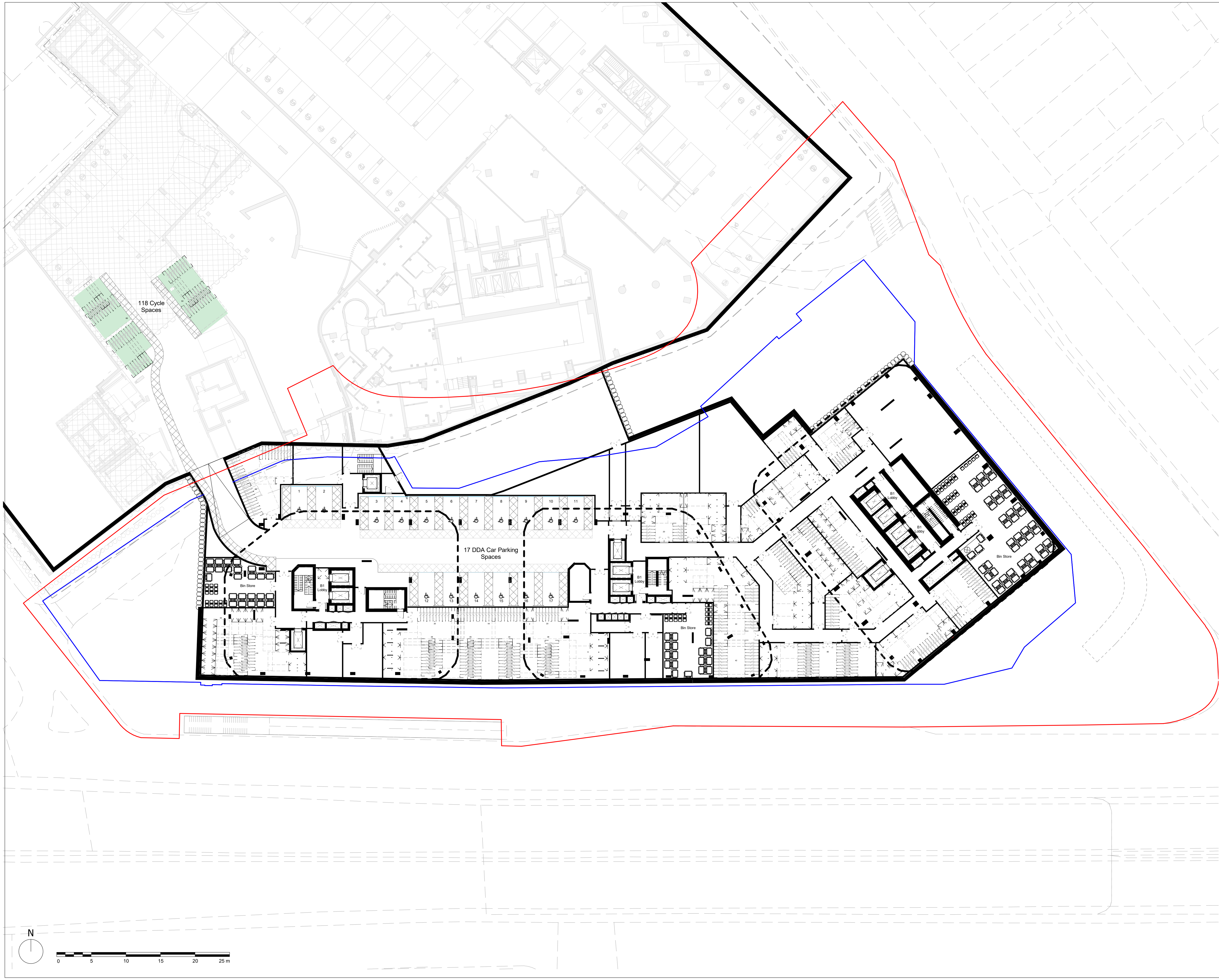
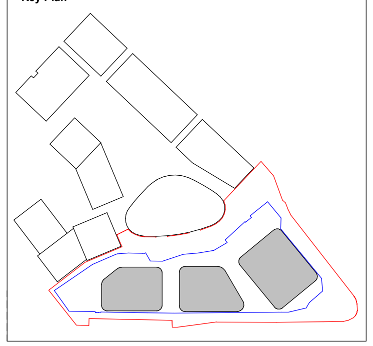
Project
Paddington Green Police Station
London, W2

Title
Proposed Ground Floor Plan

Suitability	Status		
S2	For Information		
Date	Scale @ ISO A1	Job Number	
08/12/21	1:250	15044	
Drawing Number		Revision	
15044-SQP-ZZ-00-DP-A-PL01104		P3	



Key Plan



Key

- Proposed Planning Boundary
- Site Ownership Boundary
- Cycle Shortfall Reallocation

Basement 1 Residential Cycle Provisions

Block I =
354 Josta + 34 Shef. Standard + 16 Shef. Oversized = 404

Block J =
212 Josta + 27 Shef. Standard + 18 Shef. Oversized = 257

Block K =
162 Josta + 46 Shef. Standard + 17 Shef. Oversized = 225

TOTAL = 886 Cycle Spaces
+ 118 shortfall Cycle Spaces in WEG

TOTAL = 1004 CYCLE SPACES

Description	Date	Chk	Rev
Issued for Planning	18/11/22		P2
Issued for Planning	26/03/21		P1

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Paddington Green Police Station
London, W2

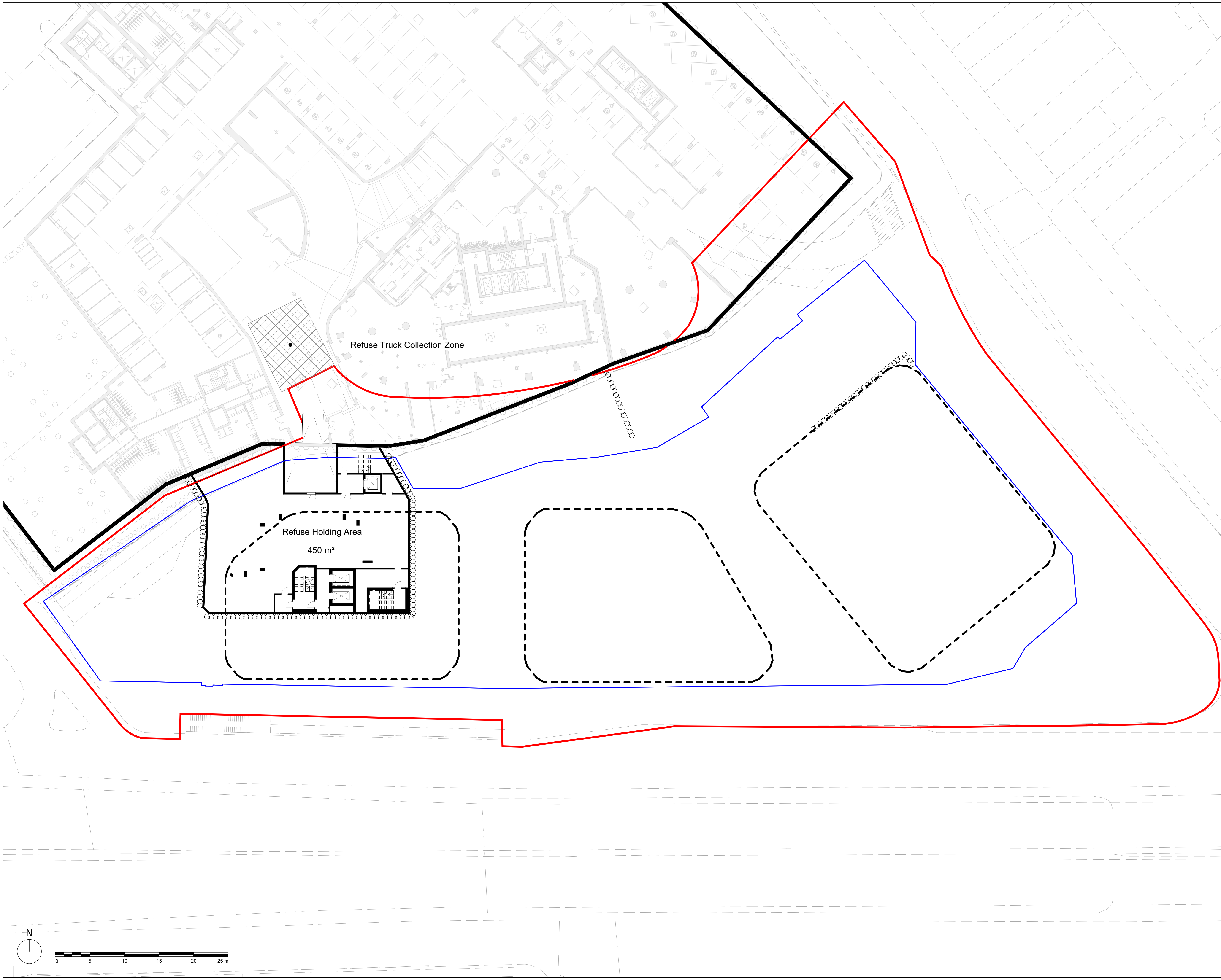
Title

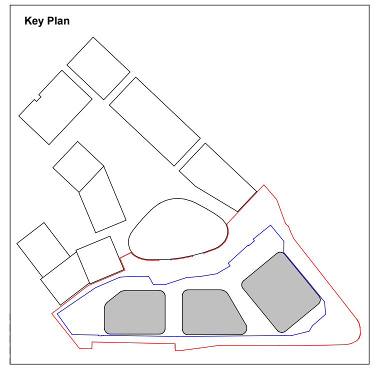
Proposed Basement Plan -1

Suitability	Status
S2	For Information

Date	Scale @ ISO A1	Job Number
26/03/21	1:250	15044

Drawing Number	Revision
15044-SQP-ZZ-B1-DP-A-PL01103	P2





Key

Proposed Planning Boundary

Site Ownership Boundary

Description	Date	Chk	Rev
Issued for Planning	18/11/22		P2
Issued for Planning	26/03/21		P1

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Project

Paddington Green Police Station
London, W2

Title

Proposed Basement Plan -2

Suitability	Status
S2	For Information

Date	Scale @ ISO A1	Job Number
26/03/21	1:250	15044

Drawing Number	Revision
15044-SQP-ZZ-B2-DP-A-PL01102	P2

Appendix C Ground Investigation Report

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GROUND INVESTIGATIONS REPORT

PADDINGTON GREEN POLICE STATION

LONDON W2

(Factual)

Report Reference No. C15340

On behalf of:-

Berkeley Homes Limited
380 Queenstown Road
London
SW8 4PE

August 2021

CONTENTS

	Page
INTRODUCTION	1
LOCATION, TOPOGRAPHY & GEOLOGY OF THE SITE	2
SITE WORK	4
LABORATORY TESTING	11

APPENDICES

EXPLORATORY HOLE LOCATION PLANS	APPENDIX 1
DETAILED UNEXPLODED ORDNANCE (UXO) THREAT ASSESSMENT	APPENDIX 2
EXPLORATORY HOLE RECORDS	APPENDIX 3
RETAINING WALL INVESTIGATION	APPENDIX 4
MONITORING RESULTS	APPENDIX 5
GEOTECHNICAL LABORATORY TEST RESULTS	APPENDIX 6
CHEMICAL LABORATORY TEST RESULTS SULPHATES	APPENDIX 7
CHEMICAL LABORATORY TEST RESULTS SOILS & LEACHATES	APPENDIX 8
CHEMICAL LABORATORY TEST RESULTS WAC TESTS	APPENDIX 9
CHEMICAL LABORATORY TEST RESULTS GROUNDWATER	APPENDIX 10

BERKELEY HOMES LIMITED

WSP
CONSULTING ENGINEERS

FACTUAL REPORT ON GROUND INVESTIGATIONS
AT
PADDINGTON GREEN POLICE STATION
LONDON W2

Report Reference No. C15340 **August 2021**

INTRODUCTION

Berkeley Homes Limited, the client, intend to redevelop the vacant Paddington Green Police Station, Newcastle Place, London W2. The existing buildings are to be entirely removed and replaced with a multi-storey development including a new basement.

Ground Engineering Limited was instructed by the client to carry out a ground investigation under the direction of Consulting Engineers, WSP, in order to determine the nature and characteristics of the soils beneath the site in relation to the proposed redevelopment and produce a factual report. In addition, geotechnical and chemical laboratory testing, and gas/groundwater monitoring was included within the scope of works, and a detailed UXO threat assessment report obtained.

In addition, further work was subsequently instructed including an investigation of part of the former police station's basement car park concrete retaining wall, and one of the access ramps to the basement car park.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

Paddington Green Police Station is situated immediately to the north-west of the junction of the A5 Edgware Road and the A40 Harrow Road, immediately to the north of the Marylebone flyover and south of Newcastle Place, within the City of Westminster, London W2. The approximately triangular site is centred at National Grid Reference TQ 26920 81740.

The site extends eastwards from Paddington Green to Edgware Road, 140m distant, and is between 22m and 55m wide, north to south, between Newcastle Place and Harrow Road.

The site is bounded by the above detailed roadways and contains the vacant, former Paddington Green Police Station and Section House. The latter comprises linked three to seven-storey buildings with a seventeen-storey tower at its eastern end, and an extensive basement car park with overlying podium deck car park. The car parks are accessed by concrete ramps at their western and north-eastern ends.

At the time of the investigation, the site was devoid of vegetation. Several small trees were present within the adjacent Harrow Road footpath. Newcastle Place separates the site from an adjacent large multi-storey residential development, which was under construction.

An underground railway tunnel of the Bakerloo Line runs approximately south-west to north-east immediately to the south-east of the site, and serves the nearby Edgware Road underground railway station, some 50m to the east.

The site stands on ground that gently falls from the north to south from 32.0mOD along Newcastle Place, to 31.5mOD on Harrow Road. The basement car park floor level lies at about 30.25mOD, and the overlying podium deck car park is at 33.80mOD.

The 1935 geological map for the district, which is based on the 1:10,560 scale 1920 O.S. map London IV.SE, shows the site to be covered by Taplow Gravel and underlain by the solid geology of the London Clay.

The 2006 geological map for the area at 1:50,000 scale, Sheet 256, shows the site to be covered by the Langley Silt Member (formerly Brickearth) and the underlying renamed Lynch Hill Gravel Member, and underlain by the solid geology strata of the London Clay Formation.

Previous investigations at this site have confirmed this sequence.

SITE WORK

Two cable percussive boreholes (BH 1 & BH 2) and eight window sample boreholes (WS 1 to WS 8) were scheduled to be undertaken at positions determined by the Engineer. At the request of the client, a small scale investigation of the composition/thickness of the basement car park retaining wall was added to the scope of works, and comprised two horizontal cores (HC 1 & HC 2) into the southern basement wall.

The works were completed between 26th April and 5th July 2021.

The exploratory hole positions are depicted on the ground level and basement level site plans at the rear of this report, whilst the holes/probes on the western ramp are marked on an extract of a topographical survey provided by the Engineer (Appendix 1).

The site work was undertaken under the supervision of Geo-environmental Engineers from Ground Engineering Limited. The works were carried out making due reference to generic and site specific risk assessments, and method statements. The intrusive works were undertaken within working areas delineated by Heras fencing and Chapter 8 barriers.

The investigation was undertaken following the WSP specifications and the protocols detailed in British Standards (BS) 'Code of Practice for Site Investigations' (BS5930:1999+A1:2020), 'Methods of test for soils for engineering purposes' (BS1377:1990), and 'Investigation of Potentially Contaminated Sites' (BS10175:2001+A2:2017). The exploratory hole records and the results of in-situ tests are presented in Appendix 3.

Services information was provided prior to the start of the investigation and was referenced in relation to the exploratory hole positions prior to boring and a scan was undertaken using a cable avoidance tool (CAT). The elevation of each exploratory hole position was determined by a surveyor using on-site measurements and a topographical site survey plan provided by the Engineer.

London Underground – Bakerloo Line Tunnel

The proximity of a Bakerloo Line London Underground railway tunnel to the south-eastern corner of the site meant that prior to undertaking borehole BH 2, a correlation survey provided by the Engineer was used by a surveyor to set out and mark on the ground an exclusion zone (agreed with LUL/TfL), within which no drilling took place.

Unexploded Ordnance

A detailed unexploded ordnance threat assessment was obtained for the site (Appendix 2), which concluded that the probability of encounter with unexploded World War II ordnance is likely. Consequently, a UXO specialist attended site during the intrusive works to advise personnel during a pre-start briefing of the potential risks from encountering UXO and appropriate safe systems of work. In addition, the UXO specialist carried out regular magnetometer checks as the cable percussive and window sample boreholes were advanced through the near surface made ground and underlying soils.

Cable Percussive Boreholes

Two approximately 50.00m deep boreholes (BH 1A & BH 2) were successfully undertaken by a standard cable percussive boring rig in April and June/July 2021. Prior to boring, at each position the surface layers were cored and starter pits were dug to 1.20m below ground level using hand tools, in order to ensure the absence of buried services. The boreholes were then advanced using weighted shell and claycutter tools, working initially within 200mm diameter casing, and then continued at 200mm and then 150mm diameter using open hole boring.

Borehole BH 1 had been abandoned at 2.60m after chiselling on a suspected concrete 'slab' obstruction. After further instruction, and at a later date following the ramp investigation works (see below) and the installation of temporary props, a replacement borehole

(BH 1A) was undertaken from the podium deck car park level through cored holes in the supported podium deck and basement car park floor.

Chiselling techniques were employed to advance the holes through 'claystone' nodules/layers within the London Clay in the two deep boreholes. The boreholes were completed at depths of 51.00m (BH 1A) below podium deck level and 50.00m (BH 2) below ground level, as instructed.

Standard penetration tests were undertaken in order to give an indication of the in-situ relative density/shear strength of the soils encountered at the instructed intervals. The test was made by driving a 50mm diameter solid cone point (C) or similar diameter open shoe and split spoon sampler (S) into the soil at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 760mm. The penetration resistance was determined as the number of blows (N) required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. The results are presented on the respective borehole records and are tabulated to the rear of the borehole records. The current calibration certificate for the SPT hammer used by the cable percussion rig is also presented to the rear of the borehole records.

Undisturbed samples nominally 100mm in diameter were taken in clay, where possible, using thin wall steel samplers (UT100s), at the instructed intervals. The ends of the samples were capped and sealed to maintain them in as representative condition as possible during transit to the laboratory.

Falling head tests were undertaken within BH 1A, as required by the WSP specification. The results of the falling head tests are presented to the rear of this borehole record in Appendix 2.

Representative small (D) and bulk (B) disturbed samples of soil were taken from the boring tools at regular intervals throughout the depth of the boreholes. The supervising Geo-environmental Engineer also took environmental samples (ES) in polycarbonate pots, glass jars and vials at regular intervals within made ground and in the underlying naturally deposited soils, and from the bulk disturbed samples recovered by the driller.

Samples of groundwater (W) were recovered from the boreholes once sufficient water had accumulated for collection.

On completion, 50mm diameter HDPE gas and groundwater monitoring standpipes were installed to depths of 5.50m and 13.80m below podium deck level in BH 1A, and to 3.50m and 11.30m below ground level in BH 2. In addition, 19mm diameter Casagrande type standpipe piezometers were installed to 50.00m below podium deck level (BH 1A) and 38.00m below ground level (BH 2). These installations had associated gravel response zones that were separated by bentonite backfill, the top of the standpipes had gas valves inserted in them, and steel protective covers were concreted into the ground flush with the surface over each installation. The standpipes/piezometer in BH 1A were trimmed to basement floor level, following removal of the borehole casing. The depths and types of installations are detailed on each borehole record, where they are also illustrated pictorially.

The borehole records give the descriptions and depths of the various strata encountered, details of all in-situ tests, the samples taken and the groundwater conditions observed during boring and on completion.

Window Sample Boreholes

Eight window sample boreholes (WS 1 to WS 8) were undertaken by a standard dynamic sampling rig during four days (4th to 6th and 13th May 2021). The surface layers of concrete hardstanding/floor slab were cored using diamond drilling equipment. Starter pits were dug to 1.20m depth using hand tools at each position prior to boring, in order to ensure the absence of buried services.

The dynamic/window sampling equipment consisted of 1.00m long drive-in samplers of specially constructed and strengthened 87mm to 57mm diameter steel sample tubes with a plastic core-liner. The samplers were driven into the ground by an automatic trip hammer weighing 63.50kg falling freely through 750mm. Upon extraction a continuous profile of the soil was obtained in the plastic liners (U) inserted in the samplers.

The boreholes were either completed at the originally intended depth of 6.00m, or abandoned at 5.70m below basement floor level (WS 2, WS 3 & WS 4).

The window sample liners were split, sub-sampled and described on site by the supervising Geo-environmental Engineer. Throughout these boreholes representative disturbed samples were taken from the starter pits and liners, and placed in polycarbonate pots, glass vials and amber glass jars (ES samples), or sealed in small or large plastic bags (D and B samples, respectively).

On completion of boring, 50mm diameter HDPE standpipes were installed to instructed depths between 3.00m and 6.00m. The annulus around each pipe was backfilled with pea gravel and a bentonite seal placed around the top of the installations within 0.30m to 1.00m of ground level. A protective stopcock cover was concreted into the ground flush with the surface over each installation. The window sample boreholes beneath the installations were also backfilled with bentonite.

The window sample borehole records give the descriptions and depths of the various strata encountered, details of all in-situ tests, the samples taken and the groundwater conditions observed during boring, on completion and during the return monitoring visits.

Dynamic Probing

Following the abandonment of BH 1 on a substantial concrete obstruction, a row of three dynamic probe tests (DP 1 to DP 3) were undertaken on the western down ramp access to the basement car park, in order to assess whether or not the possible concrete slab struck in BH 1 continued beneath this part of the site.

The ramp was cored using diamond drilling equipment at each location and starter pits hand excavated to 1.20m at DP 2 and DP 3, whilst at DP 1 (near base of the ramp) concrete was found to at least 0.45m depth using a masonry drill.

The probe tests were driven using the super heavy dynamic probing rig and abandoned on refusal at 3.00m (DP 2) and 1.70m (DP 3) below ramp surface level. The test comprised driving a 90º cone, 150mm^2 in area, on 35mm diameter rods using a 63.5kg hammer falling through 750mm. The blow count was recorded for every 100mm of penetration (N100).

The results are presented as a plot of hammer blow counts against depth.

The dynamic probe hole records give the descriptions and depths of the various strata encountered, and the groundwater conditions observed on completion.

The supervising Geo-environmental Engineer determined the elevation of each probe position by measurement using surveying equipment.

Retaining Wall Investigation

Following further instruction, two horizontally cored holes were undertaken using diamond drilling equipment on 23rd June 2021. The positions, HC1 and HC 2, were indicated by the client, and drilled approximately 1.00m above basement car park floor level into the southern retaining wall.

The 100mm diameter cored holes were completed at 0.80m (HC 1) and abandoned on a vertical steel sheet pile at 0.94m (HC 2), from the face of the basement wall.

The extracted cores were logged and photographed by the supervising Geo-environmental Engineer. The photographs are presented on the pages following the respective hole record, which detail the wall construction materials, and the depths of the concrete core sub-samples recovered from these horizontal boreholes, pending strength testing in the laboratory.

The cored holes were reinstated with lean mix concrete.

The results of this retaining wall investigation have been provided directly to the client, and are also included within Appendix 4 of this report.

Monitoring

The borehole installations were checked and purged prior to monitoring for methane, carbon dioxide and oxygen gas levels. The installations were monitored on 16th & 30th July, and 6th, 13th, 20th and 26th August 2021. Ambient pressures and flow rates were recorded together with the depth to groundwater. The water levels in the standpipes were also recorded, and together with the gas levels are presented in Appendix 5.

Samples of groundwater were recovered from the standpipes, where sufficient water was present, using nominated bailers during the first two monitoring visits in July 2021. These samples were taken in plastic and amber glass bottles, and glass vials, and taken directly to the analysing laboratory pending scheduling by the Engineer.

LABORATORY TESTING

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil sample descriptions are in accordance with BS5930:2015+A1:2020.

The geotechnical and chemical testing schedules were devised by WSP. The testing was completed within UKAS accredited laboratories.

The geotechnical tests were conducted to BS1377:1990 & 2016 and other relevant industry standards, and the results are presented in Appendix 6. The results of the chemical tests are presented in Appendices 7 (sulphates), 8 (soil & leachate), 9 (WAC) and 10 (groundwater), and are presented within each appendix broadly, but not entirely, in borehole/date order.

Geotechnical Testing

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The liquid limit was determined by the cone penetrometer method.

The particle size distributions of selected samples were obtained by sieve analysis. The particle size distribution passing the 63μm sieve was obtained for selected samples using a hydrometer. Results of these tests are given as particle size distribution curves at the end of this report. Where sieve analysis and sedimentation were carried out on the same sample the results are presented as a single combined distribution curve.

Test specimens were prepared at full diameter from the thin wall undisturbed samples from the cable percussive boreholes. Immediate undrained triaxial compression tests were made on each sample at full diameter and at the instructed cell pressures. The moisture content and bulk densities of the specimens were also determined.

An indication of the settlement characteristics of a single selected sample were obtained from tests in the consolidation apparatus or oedometer. The test was performed on a

75mm diameter sample, about 19mm thick, contained in a steel ring. The sample was saturated and the swelling pressure balanced prior to applying a constant load with drainage at both ends. When primary compression was complete, the load was increased and this repeated for several increments of load, as instructed by the Engineer. The sample was then unloaded in two stages. The rate and total amount of consolidation were continually monitored using a computer controlled E.L.E. Datasystem 7 Unit. The results were plotted and analysed by the computer for each increment of load to obtain the coefficients of compressibility (m_v), and of consolidation (c_v), which govern the amount and rate of settlement, respectively.

Core samples of concrete from the retaining wall construction in horizontal boreholes HC1 and HC 2 were crushed in the laboratory in order to determine their uniaxial compressive strength. The results are presented to the rear of Appendix 4.

Chemical Testing

Selected samples of soil were analysed to determine the concentration of soluble sulphates, total sulphur and acid soluble sulphate. The pH values were also determined using an electrometric method (Appendix 7).

A number of soil samples recovered from the exploratory holes were tested for total concentrations of arsenic, barium, boron, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, zinc, pH, soluble sulphate, organic matter, speciated total petroleum hydrocarbons (TPH) Criteria Working Group (CWG), speciated polyaromatic hydrocarbons (PAH), speciated and monohydric phenols, free/total/complex cyanides, and polychlorinated biphenyls (PCBs) – 7 congeners (Appendix 8). These samples were also screened for the presence/absence of asbestos containing material (ACM). Some of these soil samples were also tested for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).

Leachates were derived from a number of these soil samples, and tests for a similar suite of contaminants was then undertaken on the resultant leachate (Appendix 8).

Selected samples of soil were also scheduled for a full Waste Acceptance Criteria (WAC) CEN Leachate Suite at 10l/kg (Appendix 9).

Water samples, recovered from deep borehole standpipes on 16th and 30th July 2021, were tested for a similar suite of metals, compounds and speciated hydrocarbons as detailed above for the soil samples. In addition, alkalinity, hardness, and concentrations of ammonium as nitrogen, free cyanides, and speciated phenols were also determined for these sets of water samples (Appendix 10).

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APPENDIX 1

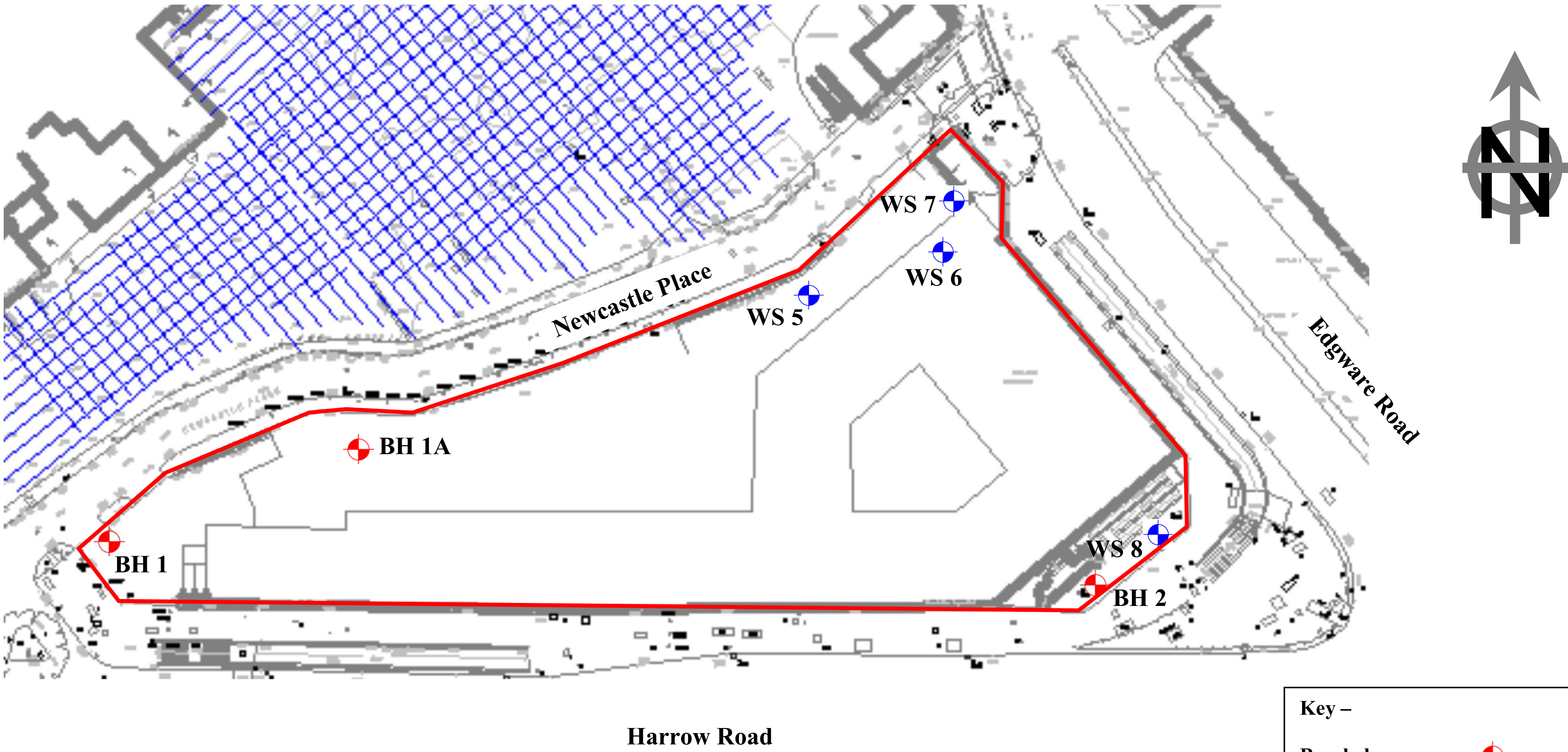
EXPLORATORY HOLE LOCATION PLAN – GROUND LEVEL

EXPLORATORY HOLE LOCATION PLAN – BASEMENT LEVEL

EXPLORATORY HOLE LOCATION PLAN – BOREHOLE/RAMP PROBES

Exploratory Hole Location Plan – Ground Level

Based on a topographic plan provided by the Engineer



Key –

Borehole

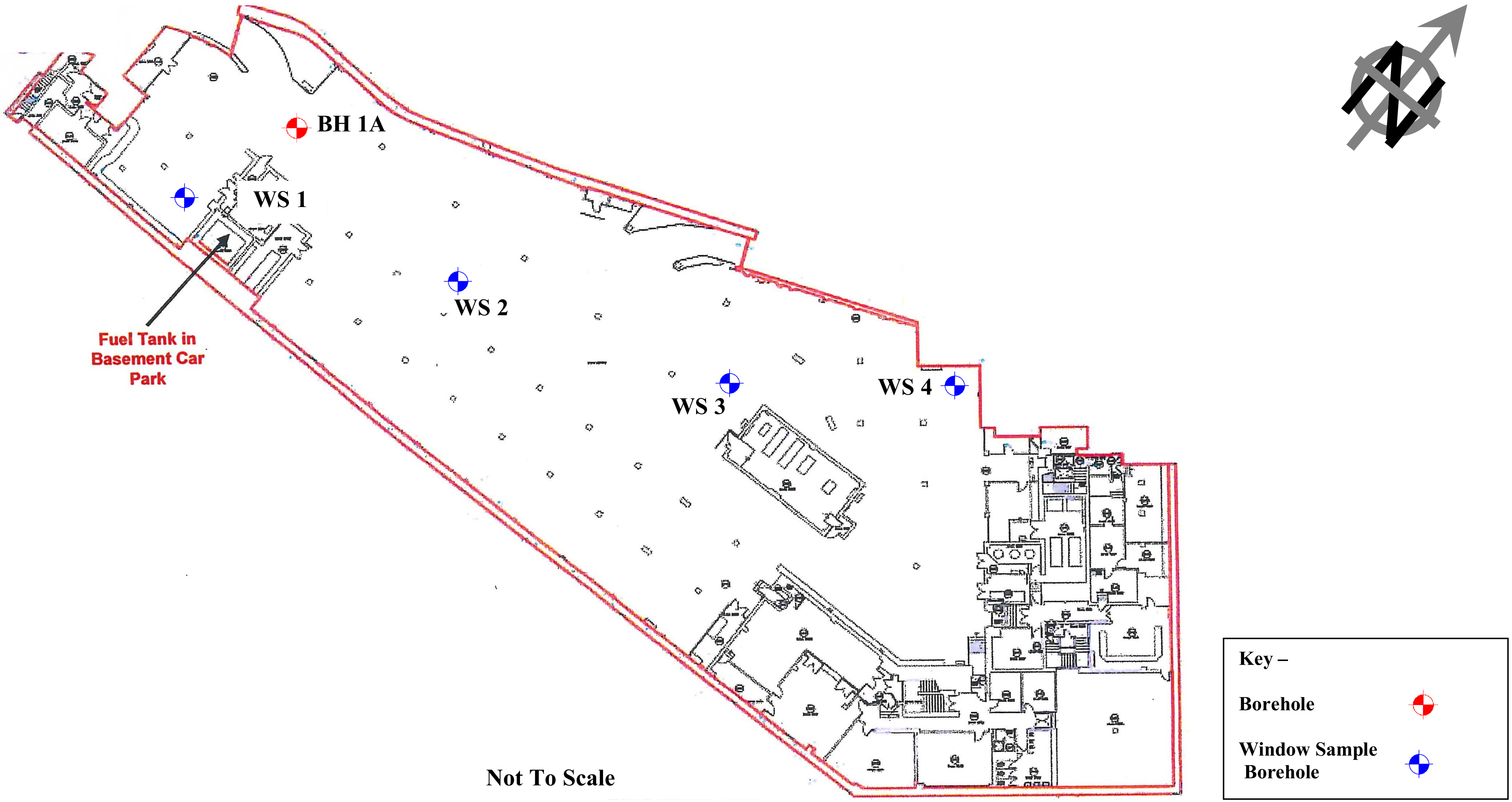
Window Sample Borehole

NOT TO SCALE

Project	**Paddington Green Police Station, London W2**	**GROUND ENGINEERING LIMITED**	**Project No.**
Client	**Berkeley Homes Limited**	Peterborough Tel : 01733 566566	**C15340**

Exploratory Hole Location Plan – Basement Level

Based on a plan provided by the Engineer



Project	**Paddington Green Police Station, London W2**
Client	**Berkeley Homes Limited**

GROUND ENGINEERING LIMITED

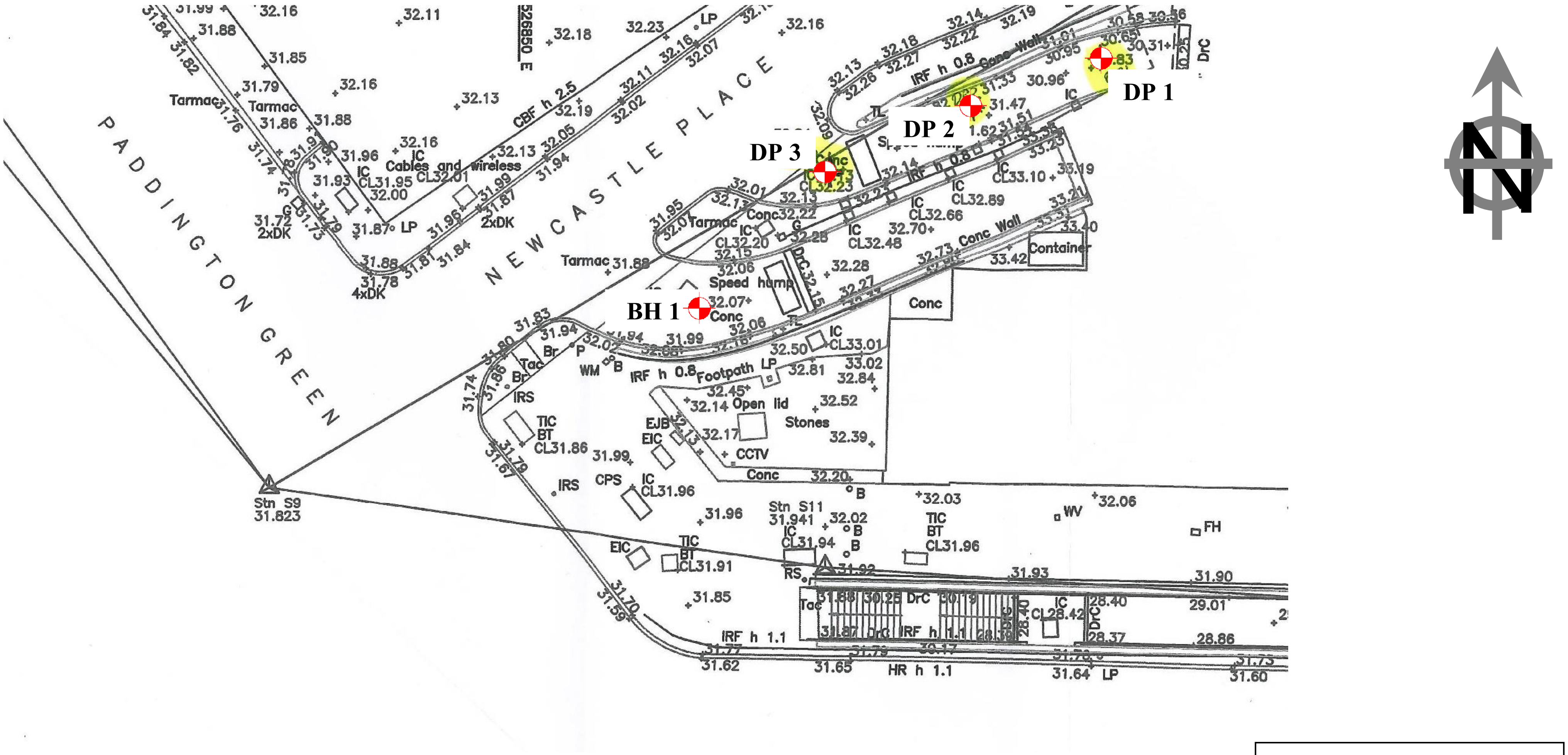
Peterborough Tel : 01733 566566

Project No.

C15340

Exploratory Hole Location Plan – Borehole/Ramp Probes

Based on a plan provided by the Engineer



NOT TO SCALE

Key –

Borehole/probe position

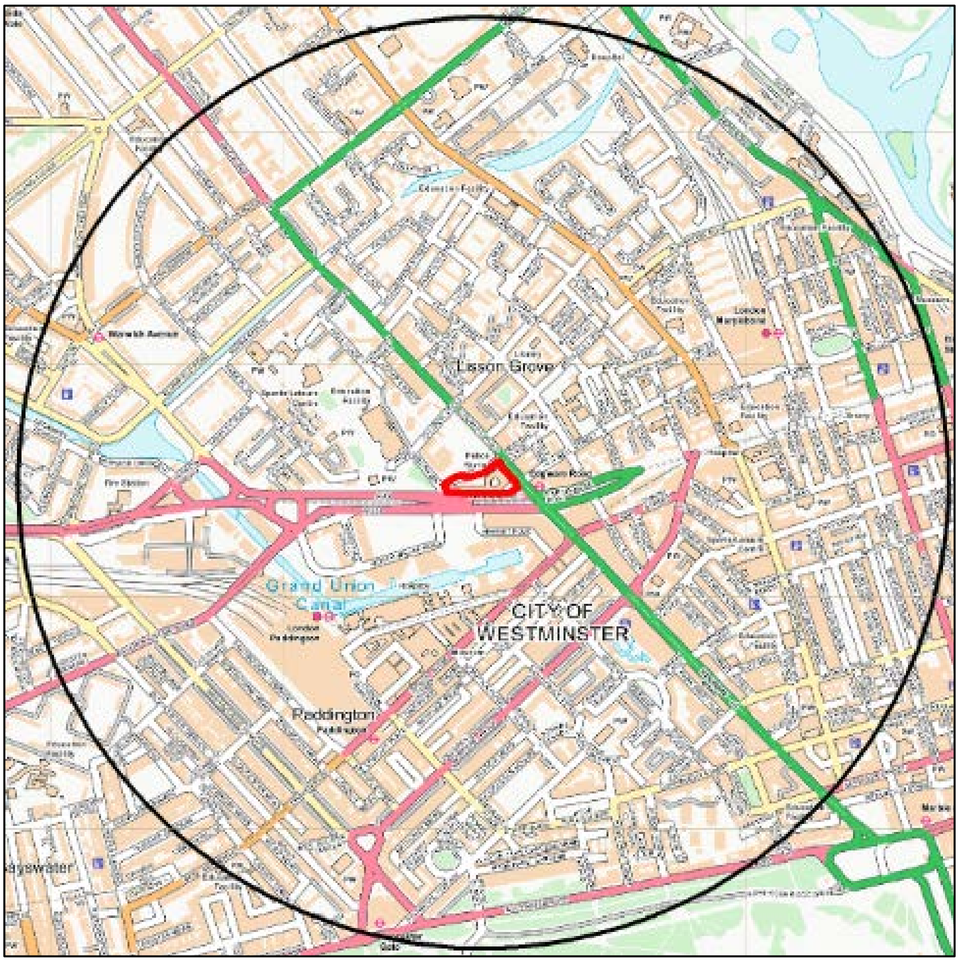
Project	**Paddington Green Police Station, London W2**	**GROUND ENGINEERING LIMITED**	**Project No.**
Client	**Berkeley Homes Limited**	Peterborough Tel : 01733 566566	**C15340**

APPENDIX 2

DETAILED UNEXPLODED ORDNANCE (UXO) THREAT ASSESSMENT

Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment

Meeting the requirements of *CIRIA* C681 'Unexploded Ordnance (UXO) A guide for the Construction Industry' Risk Management Framework



PROJECT NUMBER	8896	**ORIGINATOR**	D. Barrett
VERSION NUMBER	1.0	**REVIEWED BY**	R. Griffiths (21st April 2021)
CLIENT	Ground Engineering	**RELEASED BY**	L. Hayes (22nd April 2021)
STUDY SITE	Paddington Green Police Station, London W2		
RATING	**HIGH** - This Study Site requires further action to reduce risk to ALARP during intrusive activities.		

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Contents

Contents 1
Acronyms and Abbreviations 2
EXECUTIVE SUMMARY 3
EXECUTIVE SUMMARY (…continued) 4
ASSESSMENT METHODOLOGY 5
STAGE ONE – STUDY SITE LOCATION AND DESCRIPTION 6
Proposed Works 6
Ground Conditions 6
STAGE TWO – REVIEW OF HISTORICAL DATASETS 8
STAGE THREE – DATA ANALYSIS 12
STAGE FOUR – RISK ASSESSMENT 13
Threat Items 13
Bomb Penetration Depth 13
UXO Risk Calculation Table 14
STAGE FIVE – RECOMMENDED RISK MITIGATION MEASURES 15
Report Figures 16

FIGURES

Figure One - Study Site Location
Figure Two - Study Site Boundary
Figure Three - Aerial Photography (2020)
Figure Four - Aerial Photography (1945)
Figure Five - WWII High Explosive Bomb Density
Figure Six - WWII *Luftwaffe* Bombing Targets
Figure Seven - WWII Consolidated Bomb Strikes
Figure Eight – *London County Council* WWII Bomb Damage Map

Acronyms and Abbreviations

AA	Anti-Aircraft
AAA	Anti-Aircraft Ammunition
ALARP	As Low As Reasonably Practicable
AOD	Above Ordnance Datum
ARP	Air Raid Precaution
AXO	Abandoned Explosive Ordnance
BD	Bomb Disposal
BDO	Bomb Disposal Officer
bgl	Below Ground Level
BGS	British Geological Survey
BH	Borehole
BPD	Bomb Penetration Depth
CDP	Cast Driven Piles
CFA	Continuous Flight Auger
CIRIA	Construction Industry Research and Information Association
CPT	Cone Penetration Testing
CS	County Series
EO	Explosive Ordnance
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
GI	Ground Investigation
GIS	Geographic Information Systems
GL	Ground Level
GP	General Purpose
GPS	Global Positioning Systems
HAA	Heavy Anti-Aircraft
HE	High Explosive
HO	Home Office
HSE	Health and Safety Executive
IB	Incendiary Bomb
kg	Kilograms
km	Kilometres
LAA	Light Anti-Aircraft
LCC	London County Council
LE	Low Explosive
LSA	Land Service Ammunition
m	Metres
MoD	Ministry of Defence
mm	Millimetres
NEQ	Net Explosive Quantity
NFF	National Filling Factory
NGR	National Grid Reference
OD	Ordnance Datum
OS	Ordnance Survey
PM	Parachute Mine
PoW	Prisoner of War
RADAR	Radio Detection And Ranging
RAF	Royal Air Force
RN	Royal Navy
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SAA	Small Arms Ammunition
TA	Territorial Army
TNT	Trinitrotoluene
UK	United Kingdom
UN	United Nations
USAAF	United States Army Air Force
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V Weapons	*Vergeltungswaffen* – Vengeance Weapons
WD	War Department
WWI	World War One
WWII	World War Two

EXECUTIVE SUMMARY

Study Site

The Client has defined the Study Site as "Paddington Green Police Station, London W2" and is centred on NGR 526933, 181743.

Risk Level

HIGH

Potential Threat Sources

The most probable UXO threat is posed by WWII *German* HE bombs, whilst IBs and *British* AAA projectiles (which were used to defend against *German* bombing raids) pose a residual threat.

Risk Pathway

Given the types of UXO that might be present on-site, all types of aggressive intrusive engineering activities may generate a significant risk pathway.

Key Findings

During WWII, the Study Site was situated within *St Marylebone* and *Paddington Metropolitan Boroughs,* which recorded 67 and 54 HE bomb strikes per 100 hectares respectively, both very high levels of bombing.

Luftwaffe aerial reconnaissance photography associated with the Study Site identified *Paddington Basin Canal and Warehouses* (located 75m to the south), *Paddington Town Hall* (125m to the west), *Paddington Station* (405m to the south-west), *Marylebone Goods Station* (470m to the north-east) and *Marylebone Station* (640m to the north) as primary bombing targets.

ARP records associated with the Study Site did not note any HE bomb strikes within it. However, five were recorded in the vicinity; 10m to the east, 80m to the north-east, 90m to the north-east, 90m to the north-west and 95m to the north-east.

LCC bomb damage mapping associated with the Study Site recorded *"Blast Damage; Minor in nature"* on-site. In addition, *"Damage Beyond Repair"* was identified 20m to the north-west, and *"Seriously Damaged; Doubtful if repairable"* 70m to the south-east. Further research of historical records noted bomb damage near *Edgeware Road Station* (35m to the east).

Pre-WWII mapping (1938) and aerial photography (1945) associated with the Study Site shows that it was located within a densely developed urban area during WWII, with the Study Site itself consisting of numerous structures. However, given that bomb damage was recorded on-site and in close proximity, it is plausible bomb damage debris may have masked a UXB entry hole – causing it to go unnoticed.

The Study Site had undergone extensive redevelopment by 1969, when previous structures were demolished, and a *Police Station & Section House* built on-site – although subsequent redevelopment has been limited. Consequently, it is considered likely that any UXO within post-war disturbed and developed ground would potentially have been discovered and removed, however, the potential for deep buried UXO to be present within remaining areas is assessed to be extant.

Given that bomb damage was recorded on-site, with WWII bomb strikes documented in the immediate vicinity, the following risk mitigation measures are recommended as a minimum, in order to reduce risks ALARP, during intrusive works in all previously undisturbed ground i.e. that which has not previously been excavated, probed, drilled or otherwise intrusively disturbed since it was potentially contaminated with UXO.

EXECUTIVE SUMMARY (…continued)

Recommended Risk Mitigation Measures Overview						
"Blind" Intrusive Works						
Engineering Methodology	**UXO Emergency Response Plan**	**UXO Safety and Awareness Briefing**	**Non-Intrusive Survey**	**EODE Watching Brief**	**Intrusive Magnetometer Survey**	**UXO Risk Rating (Post-Mitigation)**
Boreholes	✔	✔	✘	✘	✔	**ALARP**
Window Sampling	✔	✔	✘	✘	✔	
A full and detailed guide to the recommended risk mitigation measures is presented at Section 5 of this report.						

For further information, please contact *6 Alpha Associates*:

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ASSESSMENT METHODOLOGY

Approach

6 Alpha Associates is an independent, specialist risk management consultancy practice, which has assessed the risk of encountering UXO (as well as buried bulk high explosives) at this Study Site, by employing a process advocated for this purpose by *CIRIA*. The *CIRIA* guide for managing UXO risks in the construction industry (C681) not only represents best practice but has also been endorsed by the *HSE*. Any risk mitigation solution is recommended *only* because it delivers the Client a risk reduced to ALARP at best value.

UXO hazards can be identified through the investigation of local and national archives associated with the Study Site, *MoD* archives, local historical sources, historical mapping as well as contemporaneous aerial photography (if it is available). Hazards will have only been recorded if there is specific information that could reasonably place them within the boundaries of the Study Site. The amalgamation of information is then assessed to enable the researcher to provide relevant and accurate risk mitigation practices.

The assessment of UXO risk is a measure of *probability of encounter* and *consequence of encounter*; the former being a function of the identified hazard and proposed development methodology; the latter being a function of the type of hazard and the proximity of personnel (and/or other 'sensitive receptors', such as equipment) to the hazard, at the moment of encounter.

If UXO risks are identified, the methods of mitigation we have recommended are considered reasonably and sufficiently robust to reduce them to ALARP. We advocate the adoption of the legal ALARP principle because it is a key factor in efficiently and effectively ameliorating UXO risks. It also provides a ready means for assessing the Client's tolerability of UXO risk. In essence, the principle states that if the cost of reducing a risk significantly outweighs the benefit, then the risk may be considered tolerable. This does not mean that there is never a requirement for UXO risk mitigation, but that any mitigation must demonstrate that it is beneficial. Any additional mitigation that delivers diminishing benefits and that consume disproportionate time, money and effort are considered *de minimis* and thus unnecessary. Because of this principle, UXB and UXO risks will rarely be reduced to zero (nor need they be).

Important Notes

Key source material is referenced within this document, whilst secondary/anecdotal information may be available upon request.

Although this report is up to date and accurate at the time of writing, our databases are continually being populated as and when additional information becomes available. Nonetheless, *6 Alpha* have exercised all reasonable care, skill and due diligence in providing this service and producing this report.

The assessment levels are based upon our professional opinion and have been supported by our interpretation of historical records and third-party data sources. Wherever possible, *6 Alpha* has sought to corroborate and to verify the accuracy of all data we have employed, but we are not accountable for any inherent errors that may be contained in third party data sets (e.g. *National Archive* or other library sources), and over which *6 Alpha* cannot exercise control.

STAGE ONE – STUDY SITE LOCATION AND DESCRIPTION

Study Site

The Client has defined the Study Site as "Paddington Green Police Station, London W2". The Study Site is centred at NGR 526933, 181743 as presented at *Figures 1* and *2,* respectively.

Location Description

The Study Site is situated within *London Borough of Westminster* and totals an area of 0.61 hectares (ha).

Furthermore, the Study Site is bounded by:

- North: *Newcastle Place* and various structures and areas of hardstanding*;*
- East: *Edgware Road;*
- South: *A404* and *Marylebone Flyover;*
- West: *Paddington Green* and *Newcastle Place*.

Aerial Photography (2020) (*Figure 3*)

Current aerial photography corroborates the information above and shows that the Study Site is situated within a densely developed urban area. The Study Site itself consists of a large structure (formerly *Paddington Green Police Station)*, *Newcastle Place* and areas of hardstanding.

Proposed Works

The Client has provided *6 Alpha* with the document *"PGMS hole locn plan.pf"* which outlines that window sampling and boreholes will be undertaken. In addition, the Client has informed *6 Alpha*:

"Note that the four window sample boreholes within the building's basement car park (green dots) are 2m to 3m below ground level. External work totals 2 x 50m cable percussive holes and four 6m deep window sample holes, at ground level."

Ground Conditions

It is important to establish the specific ground conditions in order to determine the maximum *German* UXB penetration depth as well as the potential for other types of munitions to be buried.

If the site investigations and/or construction methodologies change, and/or if a specific methodology is to be employed, and/or if the scope of work is focused upon a specific part of the Study Site, then *6 Alpha* are to be informed so that the prospective UXO risks and the associated risk mitigation methodology might be re-assessed. Certain ground conditions may also constrain certain types of UXO risk mitigative works e.g. magnetometer survey is adversely affected in mineralised and made ground.

It is important to establish the provenance of made ground, where this is recorded as being part of the ground make-up, in order to accurately determine the ground levels at the time when UXO contamination may have occurred so as to accurately determine the average/maximum bomb penetration depths and subsequently to make appropriate recommendations aimed at reducing the risk to ALARP.

STAGE ONE – STUDY SITE LOCATION AND DESCRIPTION (…continued)

Ground Conditions

BGS borehole log "TQ28SE1608 – Harrow Road to Marylebone Road Improvement 11" (located 10m to the south of the Study Site), recorded the following strata:

Depth bgl (m)	Strata	Description
0.00m to 0.40m	Concrete	6" concrete over rubble and soft clay
0.40m to 1.00m	Clay	Stiff brown, sandy CLAY with fine and medium gravel
1.00m to 3.20m	Clay	Stiff brown sandy CLAY
3.20m to 6.90m	Sand	Medium dense clayey fine to medium SAND with occasional pockets of firm brown sandy clay
6.90m to 8.80m	Sand/Gravel	Dense fine to medium GRAVEL and brown medium SAND
8.80m to 9.00m	Clay	Stiff brown CLAY
9.00m to 15.20m	Clay	Stiff fissured dark grey silty CLAY

STAGE TWO – REVIEW OF HISTORICAL DATASETS

Sources of Information Consulted

The following primary information sources have been used in order to establish the background UXO threat:

1. *6 Alpha*'s *Azimuth* Database;
2. *Home Office* WWII Bomb Census Maps;
3. WWII and post-WWII aerial photography;
4. Official Abandoned Bomb Register;
5. *LCC* Bomb Damage maps;
6. Information gathered from the *National Archives* at *Kew*;
7. Historic UXO information provided by *33 Engineer Regiment* (Explosive Ordnance Disposal) at *Carver Barracks, Wimbish*.

Potential Sources of UXO Contamination

In general, there are several activities that might contaminate a site with UXO, but the three most common ways are: legacy munitions from military training/exercises; deliberate or accidental dumping (AXO) and ordnance resulting from war fighting activities (also known as the Explosive Remnants of War (ERW)).

During WWII, the *Luftwaffe* undertook bombing campaigns all over the *UK*. The most common type of UXO discovered today is the aerially delivered high explosive (HE) bomb, which are comparatively thick-skinned and were dropped from aircraft. If the bomb did not detonate when it was dropped, the force of impact enabled the UXO to penetrate the ground, often leaving behind it a UXB entry hole. These entry holes were not always apparent, and some went unreported, leaving the bomb buried and unrecorded. More rarely, additional forms of *German* UXO are occasionally discovered including *inter alia V1* and *V2* rockets, Incendiary Bombs (IBs), and Anti-personnel (AP) bomblets.

Although the *Luftwaffe* had designated primary bombing targets across the *UK*, their high-altitude night bombing was not accurate. As a result, thousands of buildings were damaged and civilian fatalities were common. Bombs were also jettisoned over opportunistic targets and residential areas were sometimes struck.

As the threat of invasion lingered over *Britain* during WWII, defensive actions were undertaken. The *British* and *Allied Forces* requisitioned large areas of land for military training and bomb storage (including HE bombs, naval shells, artillery and tank projectiles, explosives, LSA and SAA). Thousands of tonnes of these munitions were used for the *Allied Forces* weapon testing and military training alone. It has been estimated that at least 20 per cent of the *UK*'s land has been used for military training at some point.

The best practice guide for dealing with your UXO risks on land (CIRIA publication C681) suggests that approximately 10 per cent of all munitions deployed failed to function as designed. ERW are therefore, still commonly encountered, especially whist undertaking construction and civil engineering groundwork.

Furthermore, in exceptional circumstances, UXO is discovered unexpectedly and without apparent rational explanation. There are several ways this might occur:

- When *Luftwaffe* aircraft wished to swiftly escape e.g. from an aerial attack, they would jettison some or all of their bombs and flee. This is commonly referred to as *tip and run* and it has resulted in bombs being found in unexpected locations;
- Transportation of aggregate containing munitions to an area that was previously free of UXO, usually related to construction activities employing material dredged from a contaminated offshore borrow site;
- Poor precision during targeting (due to high altitude night bombing and/or poor visibility) resulted in bombs landing off target, but within the surrounding area;
- *British* decoy sites were also constructed to deliberately cause incorrect targeting. For obvious reasons, such sites were often built in remote and uninhabited areas.

Study Site Development History

From an analysis of the CS and OS historical mapping associated with the Study Site, the following history can be deduced:

Year	Analysis
1896 CS Map	The Study Site was located in a densely developed urban area. The Study Site consisted of numerous structures and *Newcastle Mews* which partially ran through the Study Site.
1916 CS Map	*Metropolitan Theatre of Varieties* and a *Public House* were labelled on-site.
1938 CS Map	Changes were not recorded at the Study Site.
1954 OS Map	*Warehouses* were labelled in the central and south-western sectors. A number of structures in the central sector had been cleared.
1962 OS Map	The *Metropolitan Theatre of Varieties* was relabelled *Metropolitan Theatre*. *Newcastle Mews* was renamed *Newcastle Place*.
1969 OS Map	All previous structures on-site had been demolished, and a *Police Station & Section House* developed which covered the majority of the Study Site.
1974 OS Map	Changes were not recorded at the Study Site.
1987 OS Map	A small structure had been cleared from the south-western section.
1991 OS Map	Changes were not recorded at the Study Site.
1999 Aerial Photography	Hardstanding was visible across the Study Site.
2006 OS Map	Changes were not recorded at the Study Site.
2016 OS Map	Changes were not recorded at the Study Site.
2021 OS Map	A small structure had been built, and the *Police Station* extended in the northern sector.

The Study Site history assessment is our best interpretation of the data available at the time of writing. Given that yearly revisions of neither CS and OS mapping, nor aerial photography, are available for analysis, there are gaps between the mapping revisions.

Consequently, it should not be assumed that any new structures and/or features that are labelled on a map revision were constructed, developed, installed or demolished in the exact year that the mapping illustrates the change. It is possible – and indeed likely – that the exact date of development occurred somewhere between the two closest mapping revisions. Specifically, this may be particularly relevant where there is a gap between pre and post-WWII mapping, as it may not be clear whether structures were present during WWII or if they were constructed in the post-WWII period.

WWII Site Use (*Figure 4*)

The CS mapping prior to WWII (1938) and 1945 aerial photography, shows that the Study Site was located within a densely developed urban area during WWII, with the Study Site itself consisting of numerous structures. As a result, it is considered likely that footfall throughout the Site would have been relatively high. However, given that bomb damage was recorded on-site and in close proximity, it is plausible bomb damage debris may have masked a UXB entry hole – causing it to go unnoticed.

WWII Bombing of *London*

The most intensive period of bombing over *London* was the nine months between October 1940 and May 1941, known as 'The Blitz'. During this period the *Luftwaffe* attempted to overwhelm *Britain's* air defences, destroy key military and industrial facilities, as well as logistical capabilities, prior to invasion.

A total of 18,000 tons of bombs were dropped on *London* between 1940 and 1945. Many residential, commercial and industrial buildings were targeted during air raids and sustained large scale damage. Public services were also affected, with gas, electricity and water supplies often cut-off following damage to either the installations themselves or to the supply infrastructure. In addition, thousands of civilians were killed and injured, and many were forced to evacuate as their homes were destroyed.

WWII HE Bomb Density (*Figure 5*)

The Study Site was located within *St Marylebone* and *Paddington Metropolitan Boroughs,* which recorded 67 and 54 HE bombs per 100 hectares respectively, both very high levels of bombing.

WWII Luftwaffe Bombing Targets (*Figure 6*)

Prior to WWII, the *Luftwaffe* conducted numerous aerial photographic reconnaissance missions over *Britain*, recording key military, industrial and commercial facilities for attack, in the event of war. In addition, logistics infrastructure and public services, such as railways, canals, power stations, reservoirs, water and gas works were also considered viable bombing targets.

Luftwaffe aerial reconnaissance photography associated with the Study Site identified *Paddington Basin Canal and Warehouses* (located 75m to the south), *Paddington Town Hall* (125m to the west), *Paddington Station* (405m to the south-west), *Marylebone Goods Station* (470m to the north-east) and *Marylebone Station* (640m to the north)) as primary bombing targets.

WWII HE Bomb Strikes (*Figure 7*)

During WWII, ARP wardens compiled detailed logs of bomb strikes across their respective districts. However, ARP records associated with the Study Site did not note any HE bomb strikes within it. Nonetheless, five were recorded in its vicinity; 10m to the east, 80m to the north-east, 90m to the north-east, 90m to the north-west and 95m to the north-east. Furthermore, whilst IBs may have fallen within the Study Site, they fell in such large numbers that accurate record keeping was either non-existent or perfunctory therefore, their prospective presence cannot be either corroborated or discounted. Nonetheless, further research noted IB strikes impacting on *Paddington Station* 405m to the south-west. In addition, two parachute mines were identified landing near *Edgware Station* 35m to the east and on *Paddington Station* 405m to the south-west.

In addition to IBs and HE bomb strikes, during the latter part of the war when aerial bombing had significantly declined, the main threat came from *V* type weapons. The first recorded *V1* strike on *London* was on the 13th June 1944, with the first recorded *V2* strike on *London* on the 8th September 1944. *V1* and *V2* rockets were thin-skinned, unmanned and inaccurate weapons. Three *V2* rocket strikes were recorded landing; 730m to the north-west, 800m to the north-east and 960m to the south-east.

The potential penetration depth of an UXB was dependent on a number of factors including but not restricted to those prior to striking the ground e.g. velocity and orientation of the UXB which in turn will be influenced on factors such as the release altitude from the aircraft and encounters with infrastructure during its fall; those encountered at the point of impact i.e. was the impact on concrete, grass, water etc. and finally, the below ground level conditions which were encountered such as infrastructure e.g. services, basements, foundations, and geology e.g. made ground, clay, sand, etc. Further, as the UXB penetrated the ground, it's velocity naturally slowed where, it either came to an abrupt stop e.g. against foundations or would continue for 10's of feet along a route of least resistance which often resulted in a curving of the trajectory back towards the surface. This is known as the "J Curve" effect and often resulted in a considerable horizontal off-set from the point of entry. This is often the reason why UXBs have been discovered against or under the foundations of buildings, which were present during WWII, or many meters from the point of impact.

WWII Bomb Damage (*Figure 8*)

LCC bomb damage mapping associated with the Study Site recorded *"Blast Damage; Minor in nature"* on-site. In addition, *"Damage Beyond Repair"* was identified 20m to the north-west, and *"Seriously Damaged; Doubtful if repairable"* 70m to the south-east.

In addition, an analysis of post-war mapping identified a large clearance area 110m to the north-west which could be indicative of bomb damage, and *"Ruins"* were noted 140m to the south-east, which analysis of *LCC* bomb damage mapping confirms was likely caused by bomb damage. Finally, further research of historical records noted bomb damage near *Edgeware Road Station* (35m to the east), *St Michael and All Angels' Church* (275m to the south), and to *Paddington Station* (405m to the south-west).

Abandoned Bombs

An examination of the official abandoned bomb records did not identify any abandoned bombs on-site, nor within 1,000m of the Study Site boundary.

Records of WWII UXB Disposal Tasks

An examination of the civil defence records listing UXBs dealt with in the *Borough of St Marylebone* and *Paddington* from 1940-45 has identified the following tasks within the Study Site's vicinity:

- One 50kg UXIB was found burnt in situ at *14, Maida Vale* (situated 580m to the north-west) on the 21st February 1944;
- One 50kg UXIB was found burnt in situ at *26, Warwick Avenue* (located 710m to the north-west) on the 21st February 1944;
- One 50kg UXIB was found burnt in situ at *Holy Trinity Church, Bishops Bridge Road* (located 750m to the south-west) on the 22nd February 1944;
- One 50kg UXB was found burnt in situ at *12, Orsett Mews* (located 895m to the south-west) on the 17th March 1944;
- One 50kg UXB was found burnt in situ at *212, Gloucester Terrace* (located 920m to the south-west) on the 16th March 1944.

Records of Post-WWII UXB Disposal Tasks

An examination of the post-WWII BDO tasks associated with the area has not identified any BDO operations within the Study Site itself, however the following tasks were undertaken in the area:

- The removal of one 250kg UXB from at *Site of New Swiss Embassy, Bryanston Square, London* (located 735m to the south-east) on the 7th August 1969.

Military Activity

Harrow Road Drill Hall was identified 330m to the west and was the Battalion HQ for the *3rd (City of London) Battalion (Royal Fusiliers)* during WWII - although the Drill Hall was subsequently demolished in 1965. In addition, *22 Hyde Park Gardens PoW Camp* was located 775m to the south, with further research indicating it was likely used for either administration purposes or for holding high-ranking prisoners.

Paddington Green Police Station, built in 1969, was used as an anti-terror policing station until 2018. As part of this, urban warfare training activities, including the use of firearms and grenades, was undertaken on-site. However, it is considered highly unlikely (although not impossible) that these activities would have generated an immediate UXO threat as it is highly unlikely that munitions would have been buried and/or abandoned on-site (as is sometimes the case at other former military installations).

Sources of UXO Contamination

The most likely source of UXO contamination is from *German* aerially delivered ordnance, which ranges from small IBs through to large HE bombs (the latter forms the principal threat). Additional residual contamination may be present from *British* AAA projectiles (which were used to defend the UK against *German* bombing raids).

STAGE THREE – DATA ANALYSIS

Variable	Result	Comment
Was the area considered to be a primary bombing target?	✔	Five primary bombing targets were identified within 640m, the closest being *Paddington Basin Canal and Warehouses* (located 75m to the south).
Was the Study Site or the immediate area bombed during WWII?	✔	ARP records identified five HE bomb strikes within 95m, the closest being 10m to the east.
Did the Study Site or the immediate area experience bomb damage?	✔	LCC bomb damage mapping recorded *"Blast Damage; Minor in nature"* on-site.
Was the ground undeveloped during WWII?	✔	The Study Site consisted of numerous structures during WWII.
Would the footfall have been high in the area?	✔	Given the level of development on-site and in the immediate vicinity, it is likely that footfall would have been high.
Would a UXB entry hole have been observed during WWII?	✘	Given that bomb damage was recorded on-site, it is possible that bomb damage debris may have concealed a UXB entry hole and therefore it may have gone unnoticed.
Have military personnel ever occupied the Study Site?	✘	No military facilities were identified on-site or in the immediate vicinity.
Would munitions have been manufactured, stored and/or fired from the Study Site?	✘	There is no evidence to suggest munitions were located or fired from this Study Site.
Would previous intrusive works have removed the potential for UXO to be present?	✘	The Study Site has been subjected to significant redevelopment; therefore, it is likely that any UXO within post-war disturbed and developed ground would potentially have been discovered and removed, whilst the surrounding areas remain extant.
Are proposed intrusive works likely to extend into previously undisturbed ground?	✔	Some areas of the Study Site have remained undeveloped since WWII and therefore some proposed works may extend into previously undisturbed ground.
Is there potential for an unplanned encounter with UXO to occur during proposed intrusive works?	✔	Given that bomb strikes were recorded in very close proximity, it is considered possible for an unplanned encounter with UXO to occur.
Does the probability of UXO vary across the Study Site?	✔	The probability of discovering UXO within post-war disturbed and developed ground is considered to be remote, however, the probability of UXO discovery within all previously undisturbed areas of the Study Site is extant.

N.B. The ✔ / ✘ symbology is intended to act only as a succinct visual indicator as to whether the data analysis has returned a positive (i.e. ✔) or negative (✘) answer to each question concerning the potential for UXO contamination at the Study Site.

STAGE FOUR – RISK ASSESSMENT

Threat Items

The most probable UXO threat items are *German* HE bombs, whilst IBs and *British* AAA projectiles pose a residual threat. The consequences of initiating *German* HE bombs are more severe than initiating IBs or AAA projectiles, and thus they pose the greatest prospective risk to intrusive works.

Bomb Penetration Depth

Considering the ground conditions (highlighted in Stage 1), the average BPD for a 250kg *German* HE bomb is assessed to be approximately 6m bgl, with the maximum BPD considered to be approximately 14m bgl. Although it is possible that the *Luftwaffe* deployed larger bombs in the area, their deployment was infrequent, and to use such larger (or the largest) bombs for BPD calculations are not justifiable on either technical or risk management grounds.

WWII *German* bombs have a greater penetration depth when compared to IBs and AAA projectiles, which are unlikely to be encountered at depths greater than 1m bgl. However, due to the "J Curve" and the potential for structures to impede the penetration into the ground, HE bombs have been discovered at much shallower depths than the average.

Risk Pathway

Given the types of UXO that might be present on-site, all types of aggressive intrusive engineering activities (i.e. investigative groundworks) may generate a significant risk pathway. Whilst not all UXO encountered aggressively will initiate upon contact, such a discovery could lead to serious impact on the project especially in terms of critical injury to personnel, damage to equipment and project delay.

Prospective Consequences

Consequences of UXO initiation include:

1. Fatally injure personnel;
2. Severe damage to plant and equipment;
3. Deliver blast and fragmentation damage to nearby buildings;
4. Rupture and damage underground utilities/services.

Consequences of UXO discovery include:

1. Delay to the project and blight;
2. Disruption to local community/infrastructure;
3. The expenditure of additional risk mitigation resources and EOD clearance;
4. Incurring additional time and cost.

UXO RISK CALCULATION

Site Activities

Although there is some variation in the probability of encountering and initiating items of UXO when conducting different types of intrusive activities, a number of investigative methodologies have been described for analysis at this Study Site. The consequences of initiating UXO vary greatly, depending upon, *inter alia* the mass of HE in the UXO and how aggressively it might be encountered. For this reason, *6 Alpha* has conducted separate risk rating calculations for each investigative methodology that might be employed.

Risk Rating Calculation

6 Alpha's Semi-Quantitative Risk Assessment assesses and rates the risks posed by the most probable threat items when conducting a number of different activities on the site. Risk Rating is determined by calculating the probability of encountering UXO and the consequences of initiating it.

UXO Risk Calculation Table – All Areas				
Activity	**Threat Item**	**Probability (SH+EM=P)**	**Consequence (D+PSR=C)**	**Risk Rating (PXC=RR)**
Window Sampling (6m bgl)	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	1+3=4	3+1=4	4x4=16
	IBs	1+3=4	3+1=4	4x4=16
Boreholes (50m bgl)	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	1+3=4	3+1=4	4x4=16
	IBs	1+3=4	3+1=4	4x4=16
Abbreviations – Site History (SH), Engineering Methodology (EM), Probability (P), Depth (D), Consequence (C), Proximity to Sensitive Receptors (PSR) and Risk Rating (RR).				

STAGE FIVE – RECOMMENDED RISK MITIGATION MEASURES

Do the ground conditions support a geophysical UXO survey?

Non-Intrusive Methods of Mitigation – Magnetometer results may be affected by ferro-magnetic contamination due to previous construction activities and made ground within the Study Site.

Intrusive Methods of Mitigation – Intrusive magnetometry may be effective on this Study Site, prior to boreholing especially. However, any ferrous metal/red brick contamination in made ground/old foundations may affect the detection capability of the UXB survey equipment, as it passes through the contaminated layer especially. Nonetheless, beyond the contaminated strata such a survey should prove effective.

Mitigation Measures to Reduce Risk to 'ALARP'

Activity	Risk Mitigation Measures	Final Risk Rating
All Activities in All Areas	1. **Operational UXO Emergency Response Plan;** appropriate site management documentation should be held on-site to guide and plan for the actions which should be undertaken in the event of a suspected or real UXO discovery (this plan can be supplied by *6 Alpha*); **2. UXO Safety & Awareness Briefings;** the briefings are essential when there is a possibility of explosive ordnance encounter and are a vital part of the general safety requirement. All personnel working on the site should receive a briefing on the identification of a UXB, what actions they should take to keep people and equipment away from such a hazard and to alert site management. Information concerning the nature of the UXB threat should be held in the site office and displayed for general information on notice boards, both for reference and as a reminder for ground workers. The safety awareness briefing is an essential part of the *Health & Safety Plan* for the site and helps to evidence conformity with the principles laid down in the *CDM* regulations 2015 (this brief can be delivered directly, or in some cases remotely, by *6 Alpha*).	ALARP
Window Sampling and Boreholing into Previously Undisturbed Ground	**3. Intrusive UXO Survey;** Where 'blind' intrusive works into previously undisturbed ground are proposed, an intrusive UXO survey (employing down-hole magnetometer or MagCone techniques) is strongly recommended. Such a survey should extend to the *assessed average bomb penetration depth* or to the maximum depth of the works, whichever is encountered first, or until geology is encountered through which it is assessed a UXB would not penetrate, to identify for signs of sub-surface anomalies which may model as the target UXO in advance of said works. (this service can be provided by *6 Alpha*).	

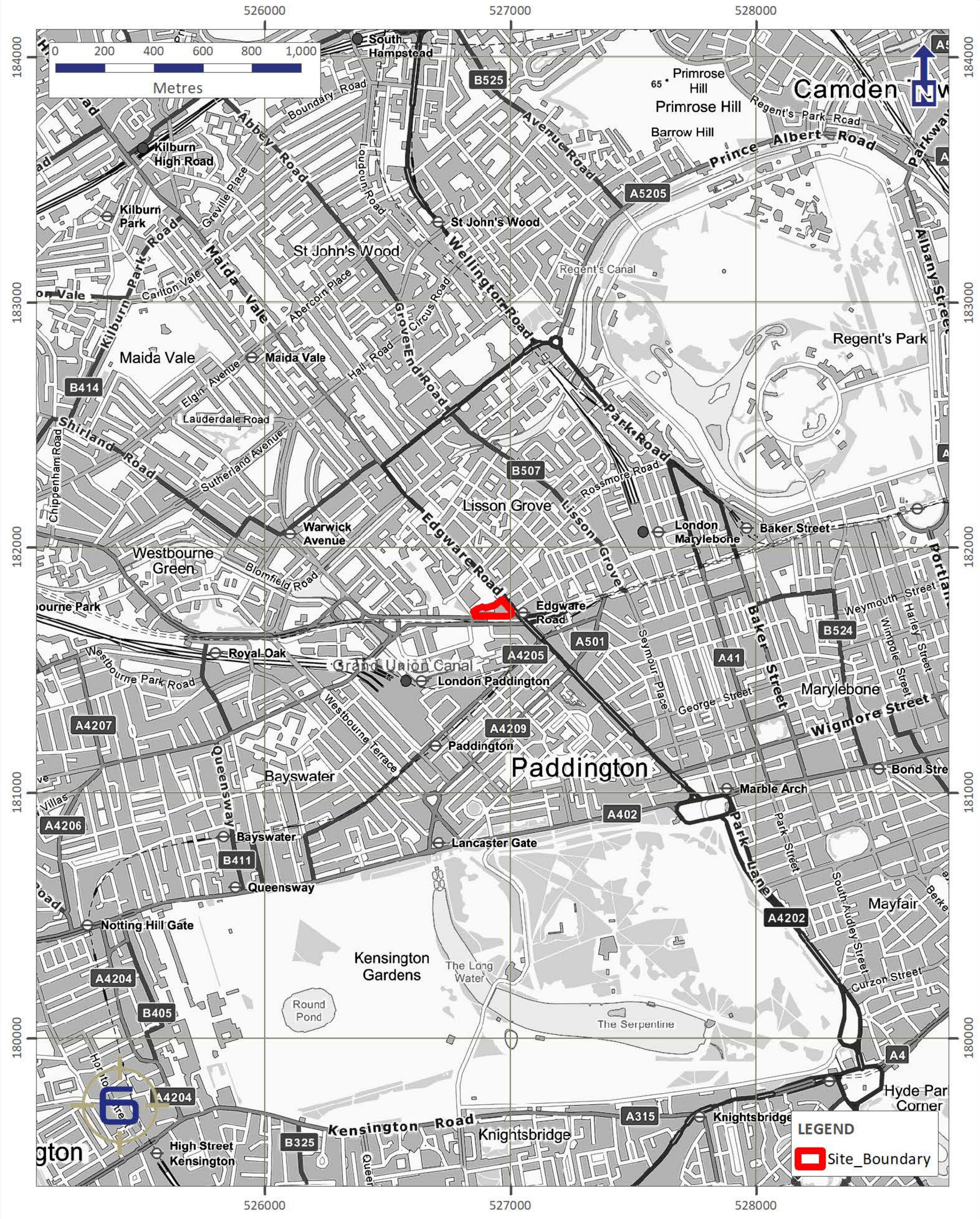
This assessment has been conducted based on the information provided by the Client, should the proposed works change then *6 Alpha* should be re-engaged to refine this risk assessment

Report Figures

Figure One - Study Site Location

PADDINGTON GREEN POLICE STATION, LONDON W2

Site Location



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
8896	1	CC	LG	19 April 2021

Figure Two - Study Site Boundary

PADDINGTON GREEN POLICE STATION, LONDON W2

Site Boundary

BRITISH NATIONAL GRID

BOMB SEARCH
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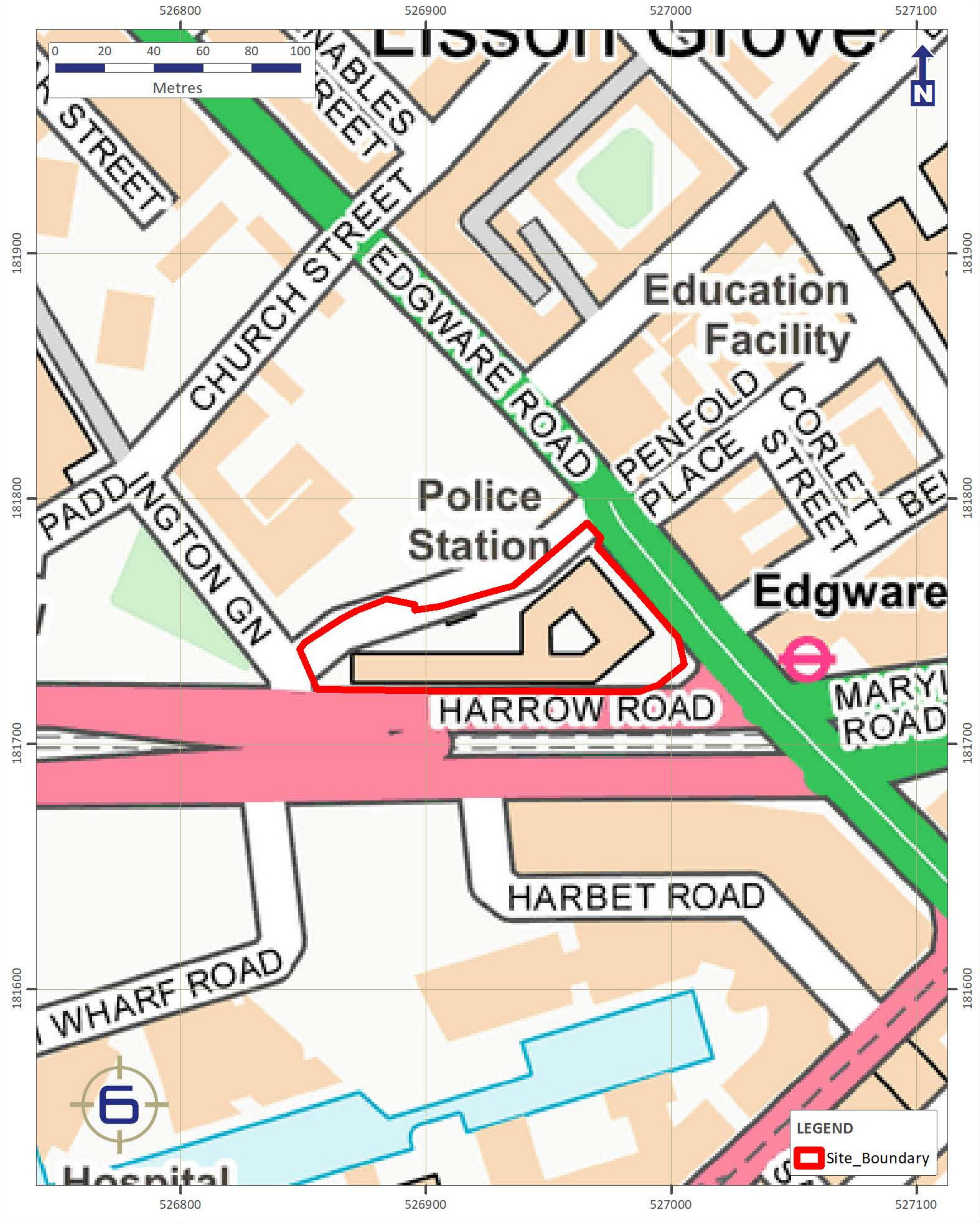


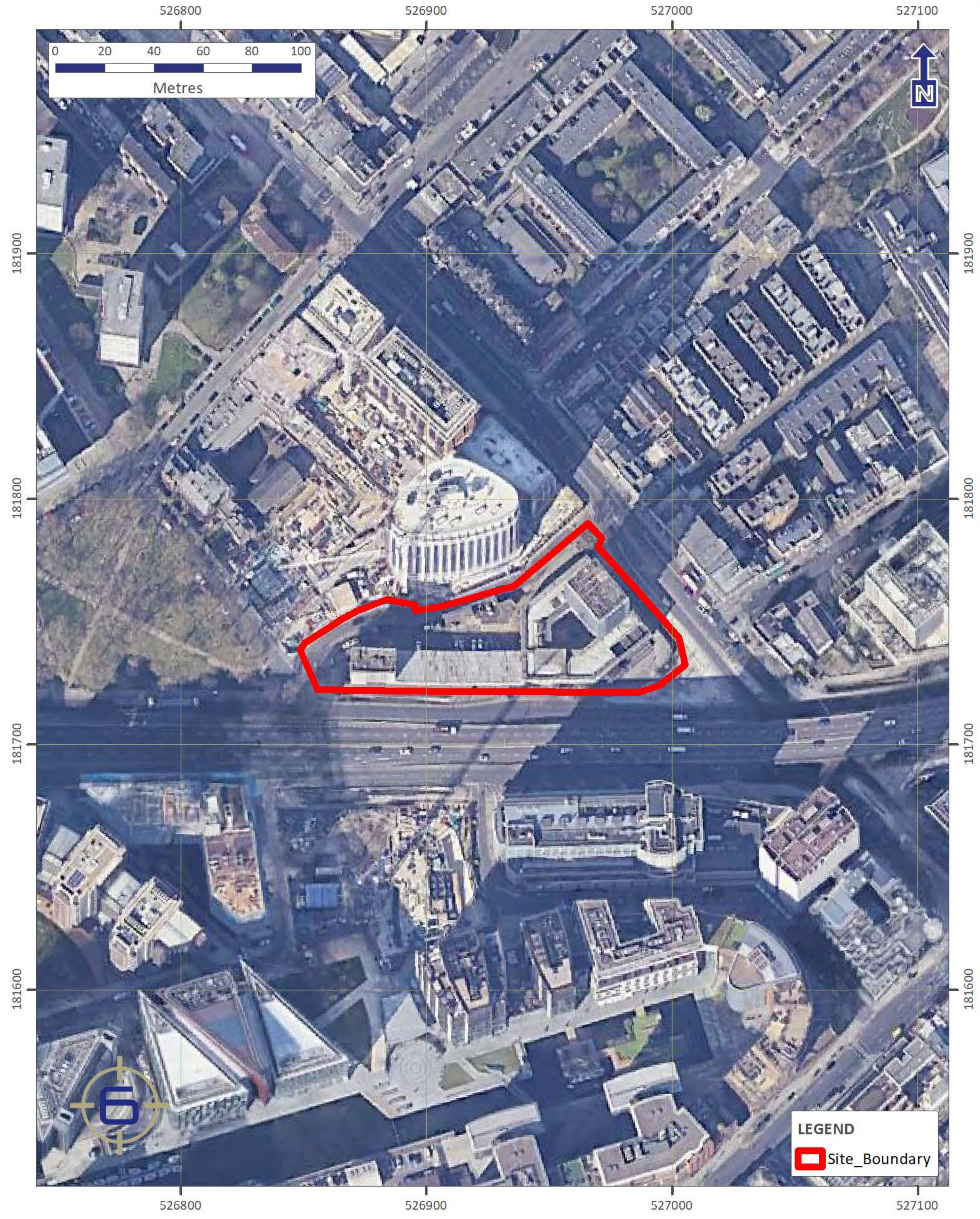
PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
8896	2	CC	LG	19 April 2021	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Figure Three - Aerial Photography (2020)

BRITISH NATIONAL GRID

PADDINGTON GREEN POLICE STATION, LONDON W2

Aerial Photography (2020)



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE		
8896	3	CC	LG	20 April 2021	Map data: Google	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.

Figure Four - Aerial Photography (1945)

PADDINGTON GREEN POLICE STATION, LONDON W2

Aerial Photography (1945)

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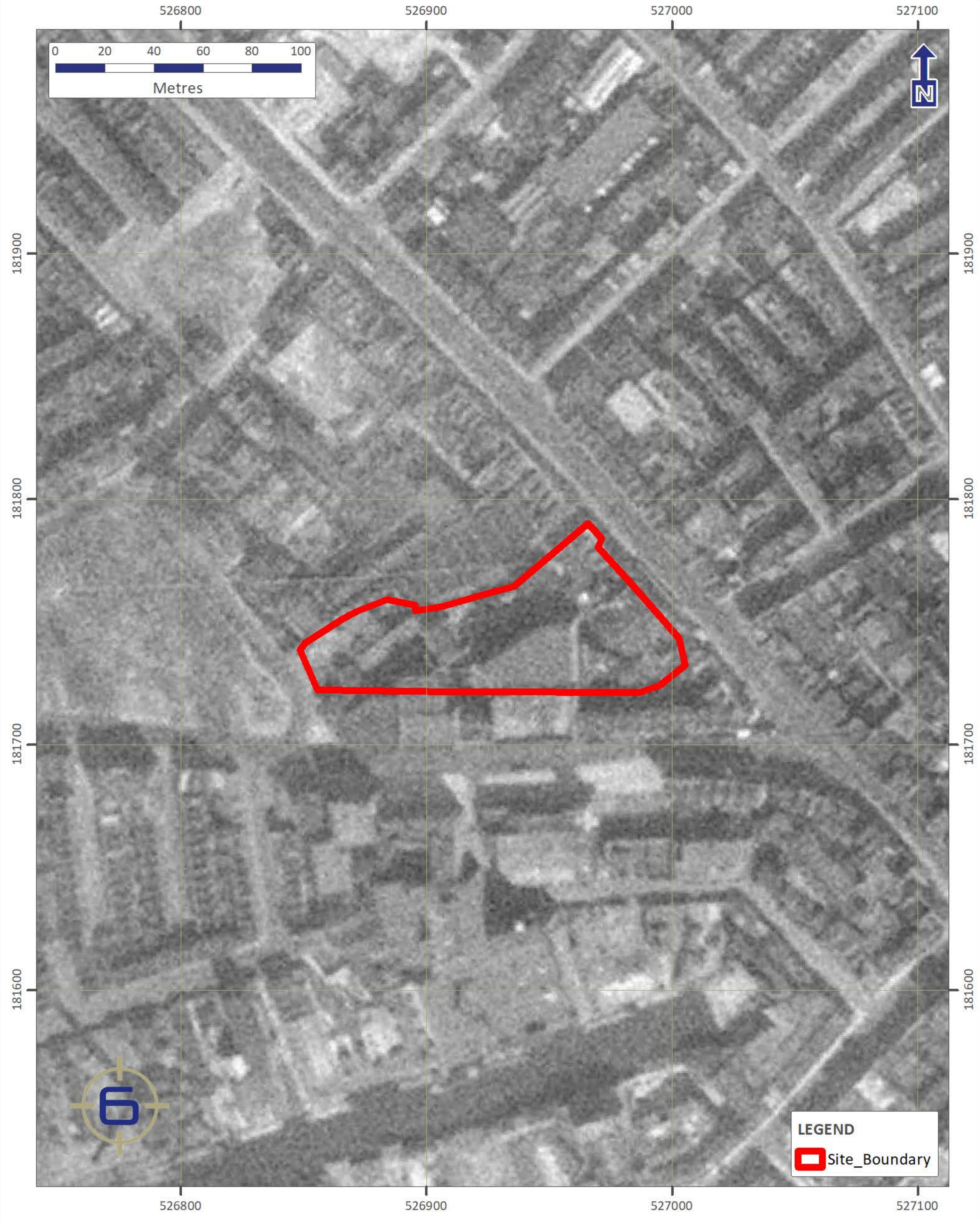

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8896	4	CC	LG	20 April 2021	Map data: Google, The GeoInformation Group	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Figure Five - WWII High Explosive Bomb Density

BRITISH NATIONAL GRID

PADDINGTON GREEN POLICE STATION, LONDON W2

WWII High Explosive Bomb Density

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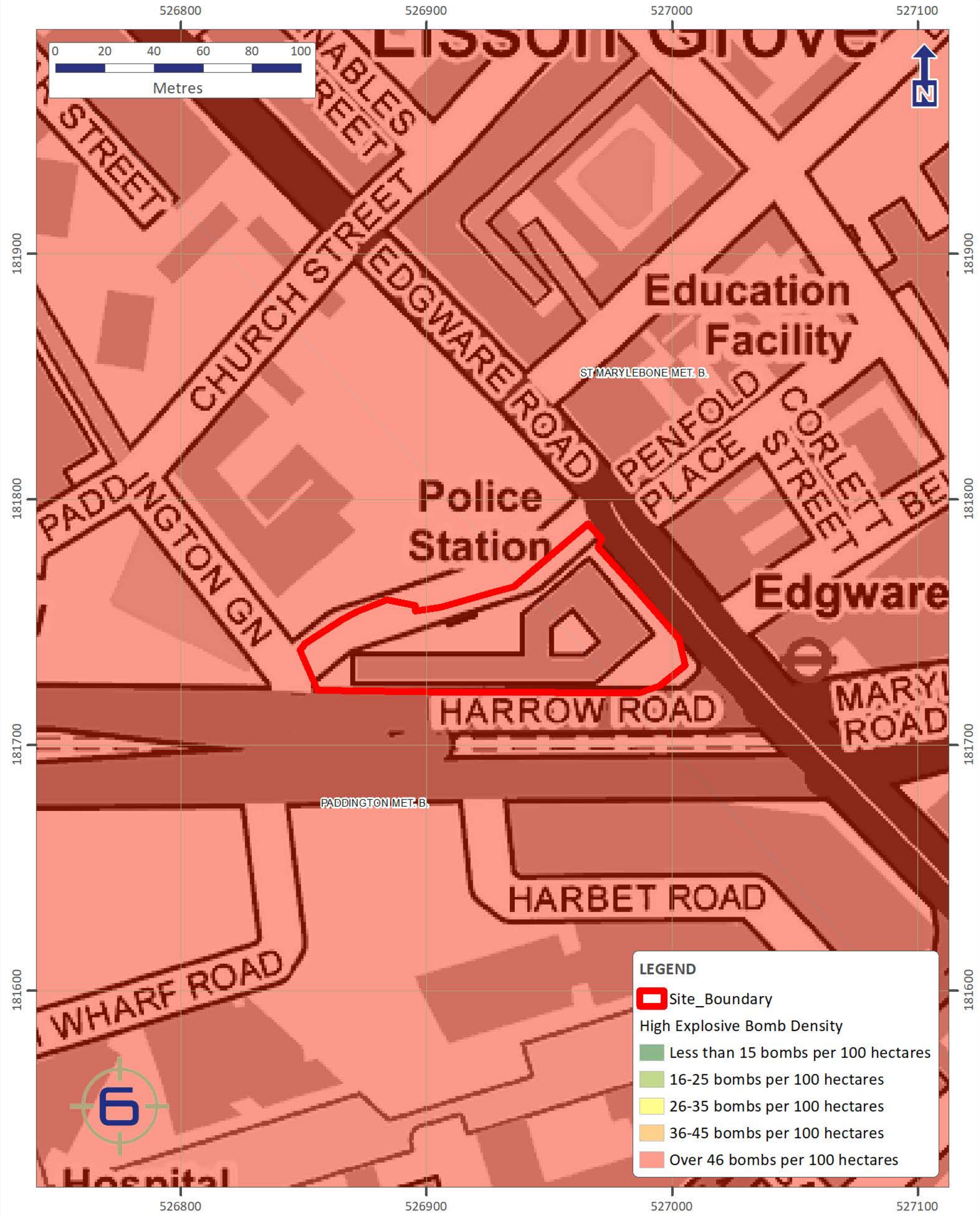

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Figure Six - WWII *Luftwaffe* Bombing Targets