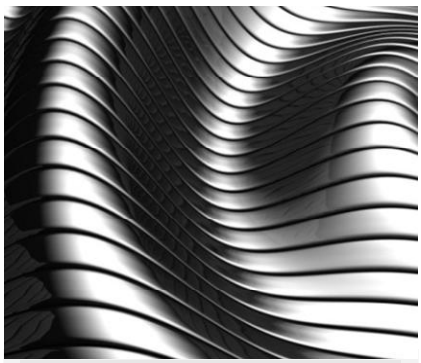

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BASEMENT IMPACT ASSESSMENT

FOR EXTENSION OF BASEMENT BELOW EXISTING GARDEN TERRACE

7 TATHAM PLACE
LONDON NW8 6AF

Ref: ZB/L/2122 / July 2021

zussmanbear

7 Tatham Place
London NW8 6AF

CONSTRUCTION METHOD STATEMENT FOR PROPOSED SUBTERRANEAN DEVELOPMENT PLANNING REPORT

CONTENTS

APPENDICES

1. INTRODUCTION

The site address is 7 Tatham Place, St John's Wood, London NW8 6AF.

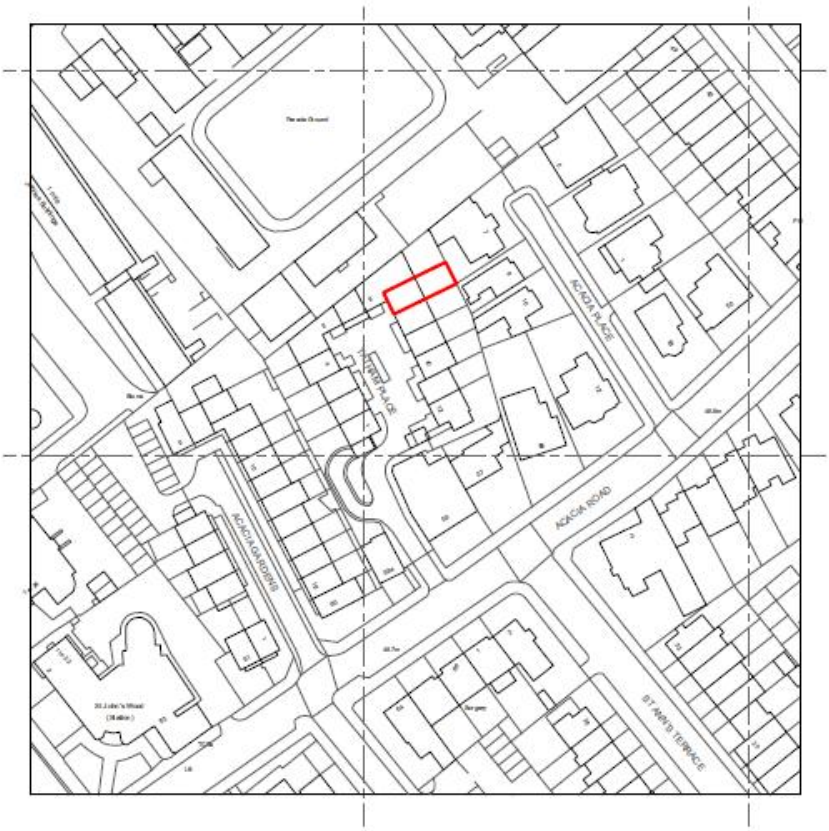


FIGURE 1 – SITE LOCATION

FIGURE 2 – GOOGLE MAP LOCATION

Zussman Bear Structural Engineers were appointed by 3S Architects in April 2021 to produce a structural feasibility report to be submitted as part of the overall planning application for the site.

ZB have a great deal of experience in the formation of basements within London and have undertaken several successful Construction Method Statements.

The report covers the proposed form of construction to be used in creation of a new single storey extension basement extending beneath the rear garden terrace of the existing building adjacent to existing properties without causing undue damage or disruption to these.

2. EXISTING BUILDING

2.1 SITE LOCATION

The site is referred to 7 Tatham Place and is in St John's Wood, London

It is approximately centred at National Grid Reference TQ 26817 83431.

The site is located in the north eastern corner of Tatham Place (previously known as Ellington Place) in St John's Wood, NW8 6AF.

Vehicular and pedestrian access is via a gated entrance from Acacia Road opposite St Ann 's Terrace.

2.2 EXISTING STRUCTURE

Tatham Place is a development built in a mock Georgian style in the early 2000s comprising 13 five storey townhouses arranged in a u-shaped open ended courtyard configuration.

Each townhouse within Tatham Place comprises 4 storeys above ground level, and basement level accommodation. A shared car park is located underneath the central open courtyard.

Many houses include habitable accommodation in the basement with direct access from the car park as well as lower courtyard gardens. Several of the townhouses have gained approval for and have implemented full width basement level extensions, converting the existing lightwells into additional bedrooms and habitable accommodation, and relocating garden terraces to ground level.

A number of properties within Tatham Place have gained planning approval for, and have implemented, extensions at the lower ground floor level. These include no.s 2, 8, 9, 10 and 11, providing full width rear basement level extensions for habitable accommodation, replacing existing lower courtyard terrace light-wells with ground level terrace gardens

EXISTING PLANS AND ELEVATIONS

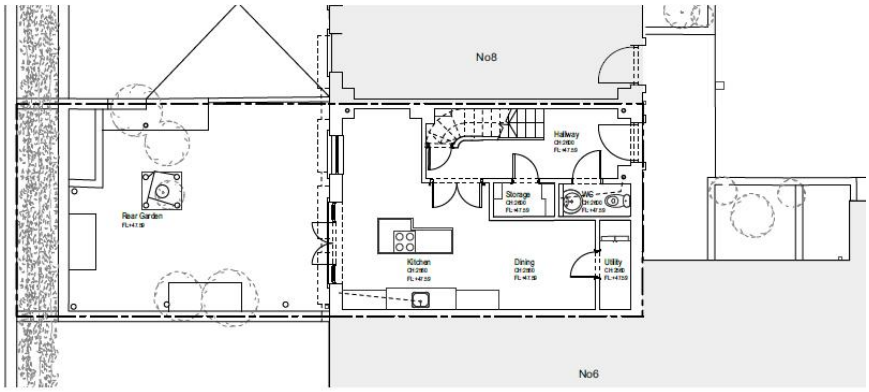


FIGURE 3 - EXISTING GROUND FLOOR PLAN

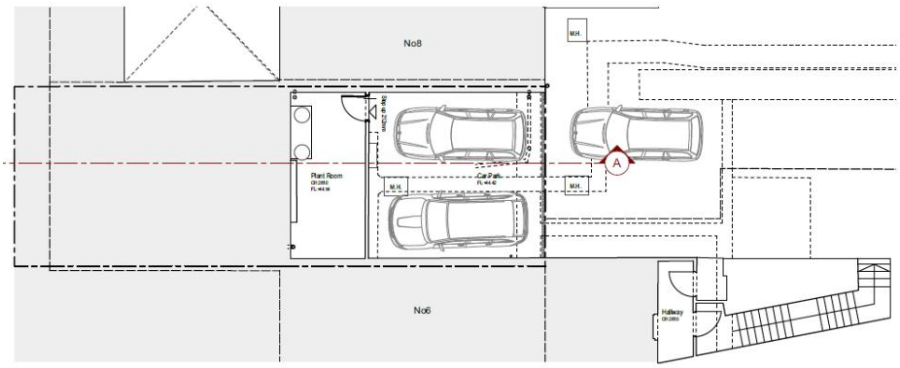


FIGURE 4 - EXISTING BASEMENT PLAN

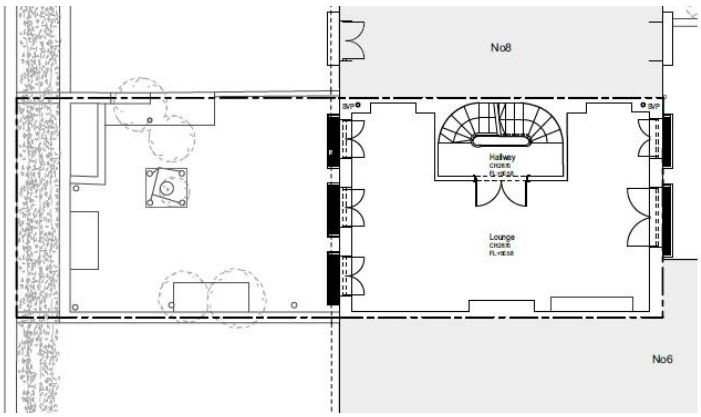


FIGURE 5 - EXISTING FIRST FLOOR PLAN

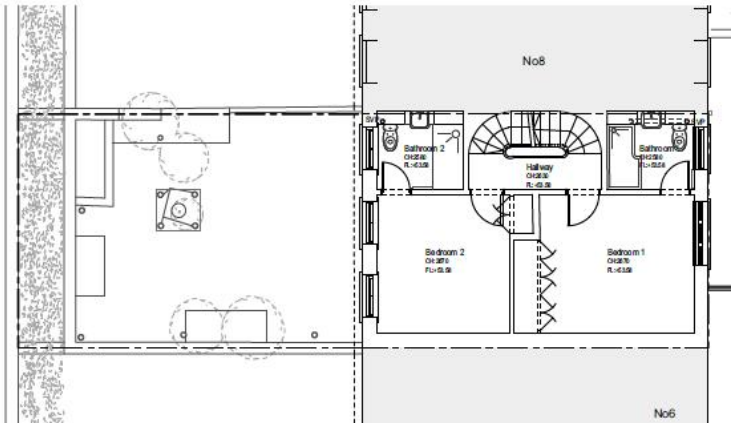


FIGURE 6 - EXISTING SECOND FLOOR PLAN

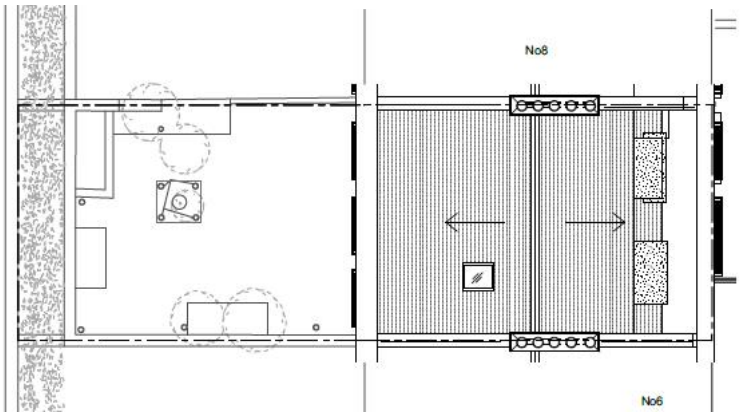


FIGURE 7 - EXISTING ROOF PLAN

FIGURE 8 - EXISTING FRONT & REAR ELEVATION

3. SITE GEOLOGY

3.1 GEOLOGY

The British Geological Survey (BGS) map of the area indicates that the site is underlain by London Clay Formation which consist of CLAY, SILT and SAND. Qualified Geotechnical Engineers have undertaken site specific investigations and the data can be seen in Appendix 1.

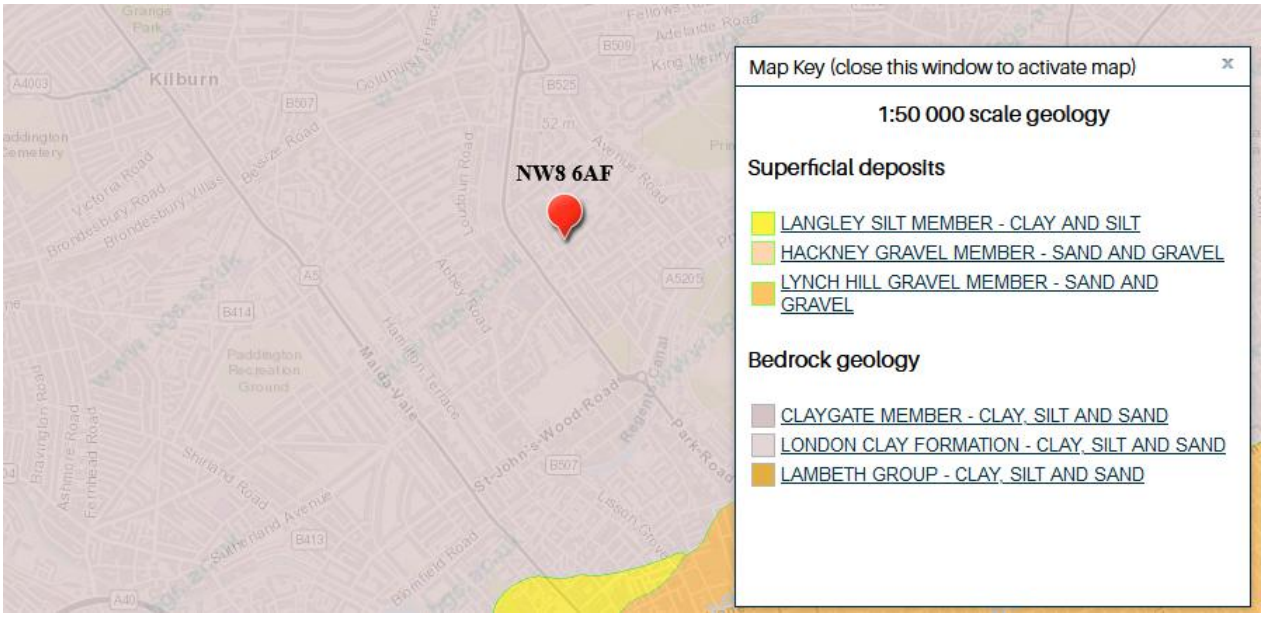


FIGURE 9 - GEOLOGICAL SURVEY

3.2 SITE INVESTIGATIONS

Site investigations were undertaken during July 2021. The works were undertaken by **SITE ANALYTICAL SERVICES LIMITED.** The scope of their work was to determine existing profile of the foundations consisting of hand excavated trial pits and a borehole to establish geology at depth for the proposed extension of the existing basement which is proposed below the existing rear garden.

Trial pit locations can be seen in **FIGURE 10** of this report.
Borehole results can be seen in **FIGURE 11** of this report.

For the full ground investigation report please refer to **APPENDIX B**.

The approximate locations of the exploratory holes are illustrated on the site sketch plan, Figure 1 below.

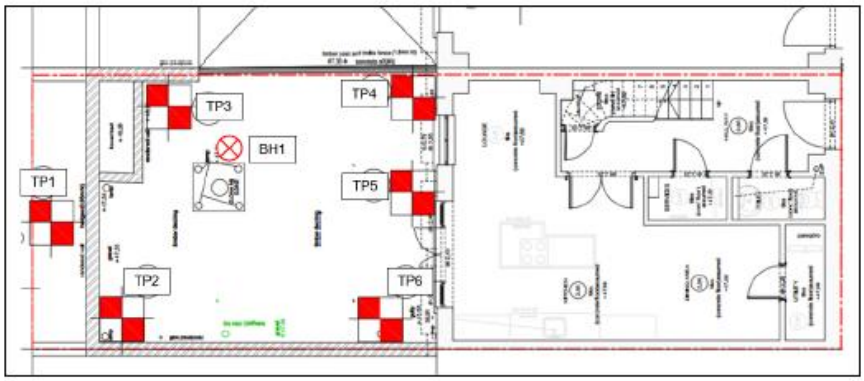


Figure 1. Site Sketch Plan

FIGURE 10 – LOCATION OF TRIAL PITS AND BOREHOLE IN REAR GARDEN

Site Analytical Services Ltd.

Site: 7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF			Borehole Number: BH1
Boring Method: CONTINUOUS FLIGHT AUGER	Casing Diameter: 100mm cased to 0.00m	Ground Level (mOD):	Client: ELMGROVE DEVELOPMENT LIMITED	Job Number: 2133630
	Location: TQ268834	Dates: 04/06/2021	Engineer: ZUSSMANBEAR	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30) 0.30	MADE GROUND: Brown silty clayey fine to coarse grained sand containing brick and concrete fragments		
0.25	D1						Soft, light brown grey silty organic CLAY		
0.50	D2					(0.90)			
0.75	D3								
1.00 1.00	D4 V1 38					1.20	Firm becoming stiff, dark grey very silty organic CLAY		
1.50 1.50	D5 V2 49					(0.80)			
2.00 2.00	D6 V3 84					2.00	Stiff, mottled brown orange silty sandy CLAY. Occasional blue grey veining		
2.50 2.50	D7 V4 102					(0.50) 2.50	Stiff, brown silty sandy CLAY		
3.00 3.00	D8 V5 130+								
3.50 3.50	D9 V6 130+					(1.50)			
4.00 4.00	D10 V7 130+					4.00	Stiff, mottled brown CLAY containing orange fine grained sandy pockets		
4.50 4.50	D11 V8 130+					(0.80)			
5.00 5.00	D12 V9 130+					4.80	Stiff, brown silty sandy CLAY		
6.00 6.00	D13 V10 130+					(2.70)			
7.00 7.00	D14 V11 130+					7.50	Stiff, dark brown grey silty sandy CLAY containing partings of silty fine grained sand and occasional gypsum crystals		
8.00 8.00	D15 V12 130+								
9.00 9.00	D16 V13 130+					(2.50)			
10.00 10.00	D17 V14 130+					10.00			

Remarks
Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
D= Disturbed Sample

Scale (approx): 1:50 | Logged By: EW
Figure No.: 2133630.BH1

FIGURE 11 – BOREHOLE RESULTS

SUMMARY OF GROUND INVESTIGATIONS

As expected, the borehole and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.50m in thickness resting on a thin layer of Alluvial deposits with the London Clay Formation at depth.

It should be noted that groundwater was not encountered in the borehole or any of the trial pits and the material remained essentially dry throughout.

Groundwater was recorded in the monitoring standpipe installed in Borehole 1 after a period of approximately three weeks at a depth of 4.19m below ground level. Based on the ground conditions it is considered that this water level represents trapped water rather than true groundwater.

Sketches of the existing foundations can be seen in **APPENDIX B.**

For more detailed information on the ground conditions encountered please see **FIGURE 11** above or view for the borehole results within the full ground investigation report in **APPENDIX B**.

4. SITE HYDROLOGY AND HYDROGEOLOGY

From the figure below it can be seen that the site is outside the identified hotspot locations for Surface Water Flood Risk.

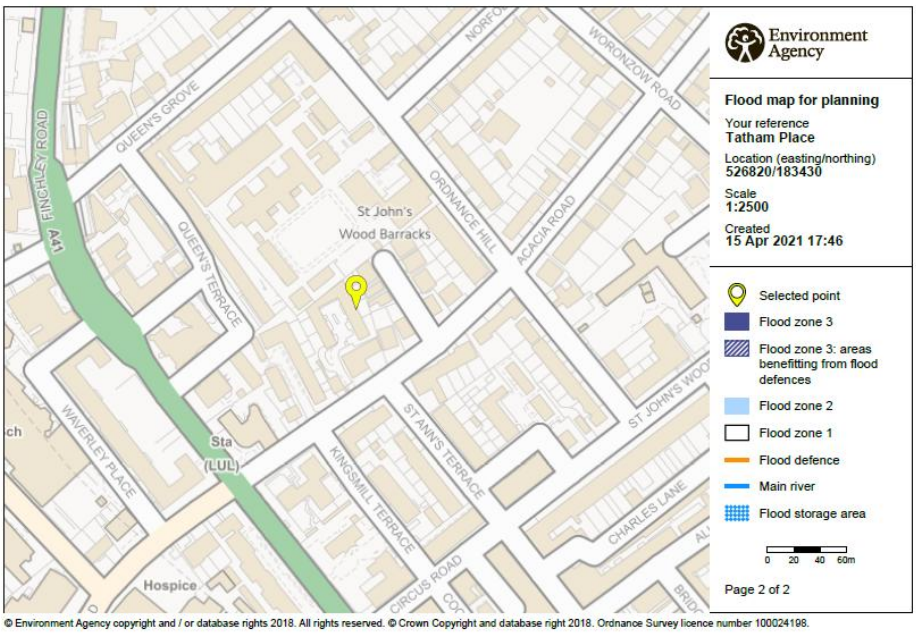


FIGURE 12 – FLOOD MAP

The site is underlain by unproductive strata in accordance with the data maps provided by Magic Defra website. Key legend shown in grey and as mentioned unproductive.

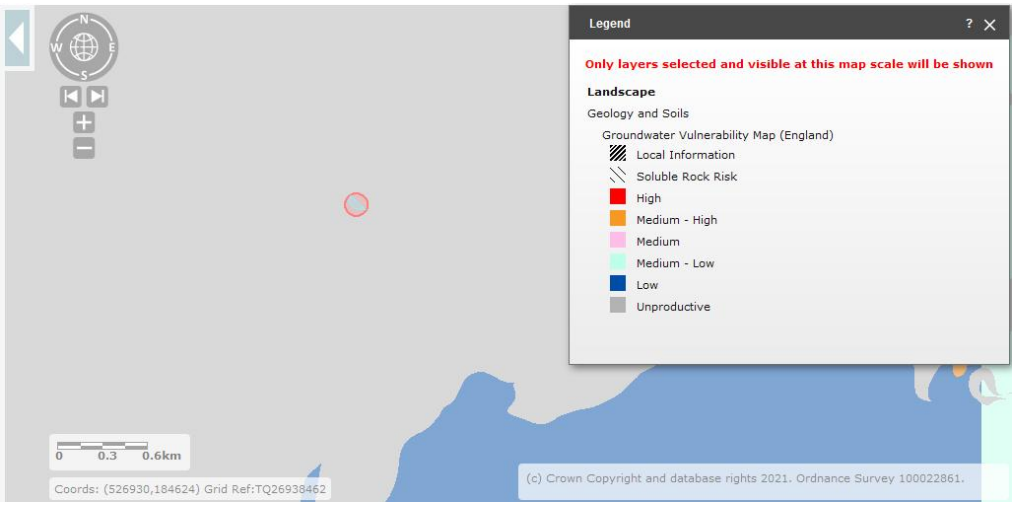


FIGURE 13 – SURFACE WATER VUNERABILITY MAP

5. PROPOSED WORKS

5.1 ARCHITECTURAL PLANNING DRAWINGS

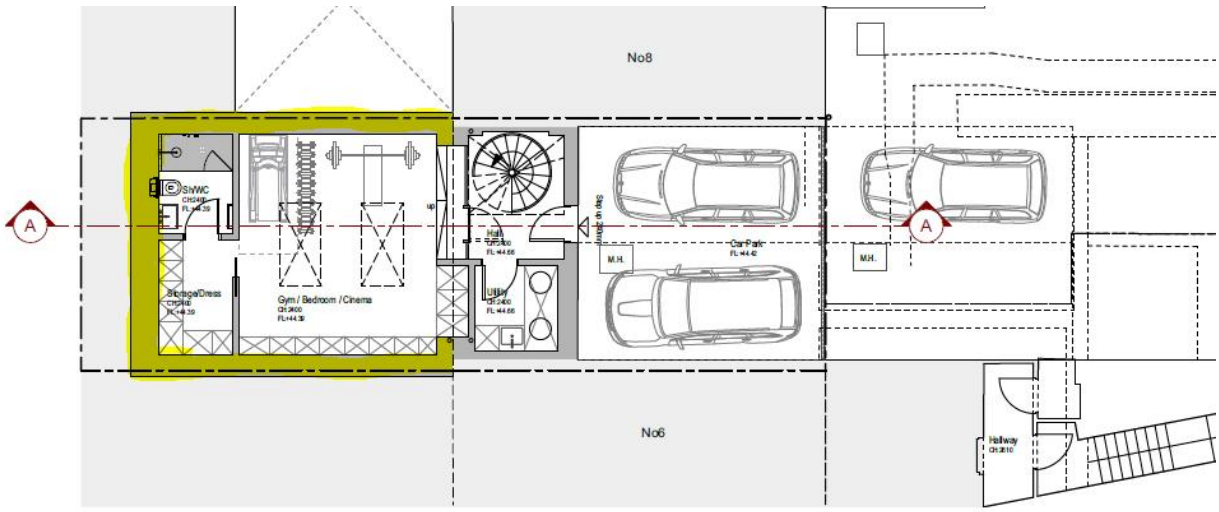


FIGURE 14 – PROPOSED BASEMENT (HIGHLIGHTED) BELOW EXISTING TERRACE

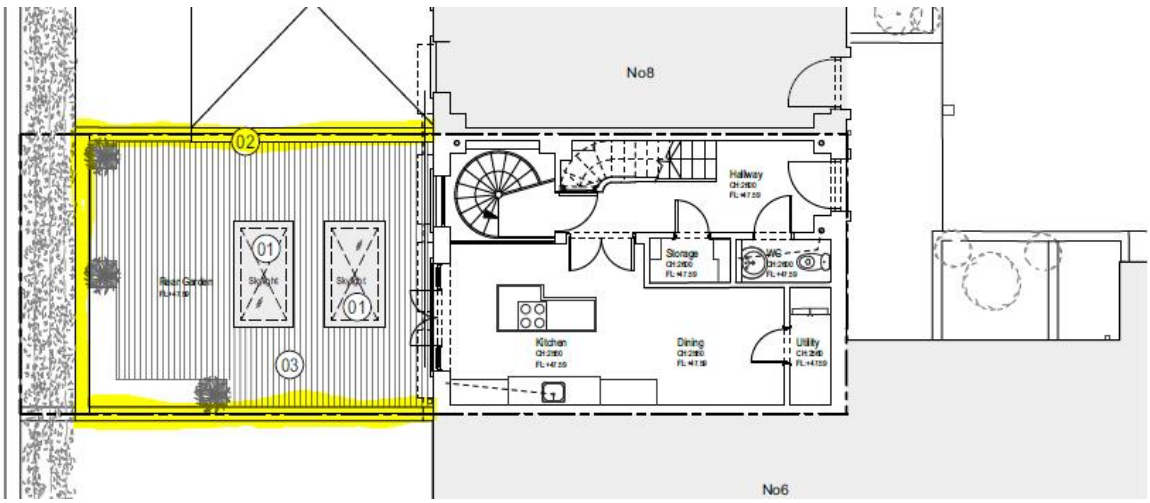


FIGURE 15 – PROPOSED GROUND FLOOR (BASEMENT BELOW HIGHLIGHTED)

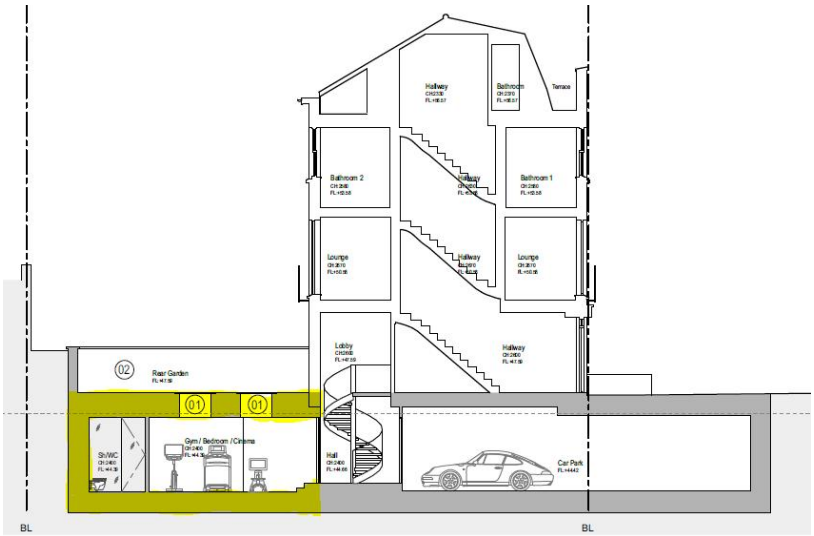


FIGURE 16 – PROPOSED SECTION A-A (NEW BASEMENT HIGHLIGHTED)

FIGURE 17 – PROPOSED REAR & FRONT ELEVATION (NEW BASEMENT HIGHLIGHTED)

5.2 STRUCTURAL WORKS

The below drawings within this report illustrates the proposed structural scheme. At this early stage in the design process, there are several construction methods that would be suitable for the scheme. The proposed scheme has been based on the basement box being formed using a reinforced concrete underpinning where the permanent floor plates act to prop retaining walls, meaning the design spans are never greater than a storey height.

RC underpinning is suitable in soils with a low water table level and affords the maximum useable space for the basement.

The basic proposals for this project are to construct and extend the existing basement directly underneath the existing rear garden. The existing rear wall will be underpinned to a suitable depth to avoid any surcharge with the existing planter wall underpinned to the proposed depth. Both Party Walls will be underpinned and carried out in a hit and miss process with a carefully worked out sequence to ensure it provides full structural stability and protection along all adjoining party walls. These party walls will be supported directly over the newly formed L shaped pins along their entire length. A steel box frame will be fully integrated into the new basement construction where the existing rear basement wall is to be demolished and replaced with. The basement slab will be formed to resist any possible hydrostatic pressure and will be designed as a suspended slab.

5.3 STRUCTURAL OUTLINE PROPOSAL DRAWINGS

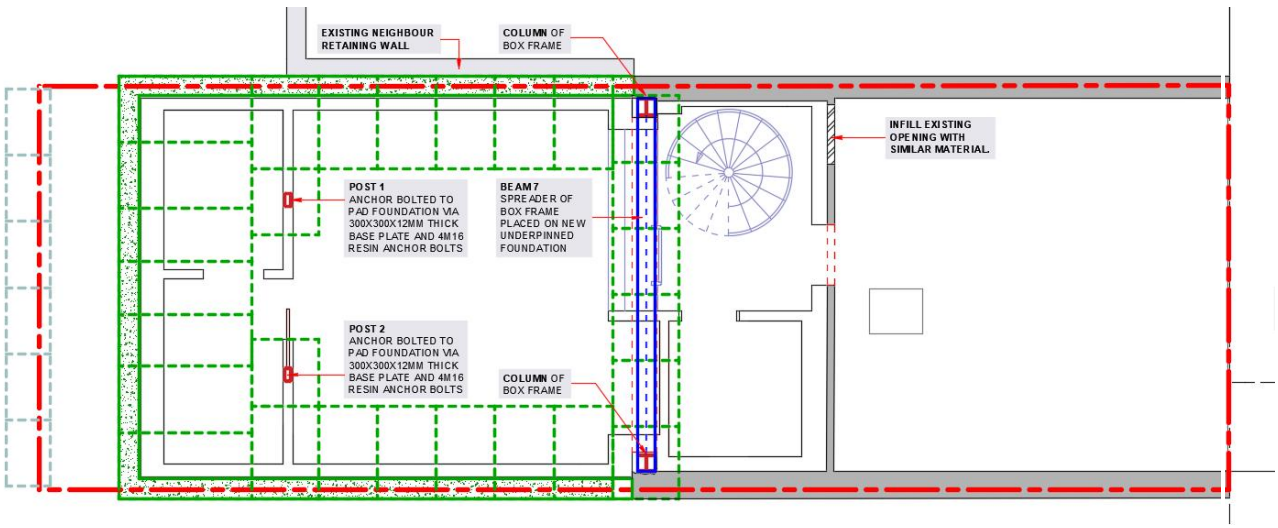


FIGURE 18 – PROPOSED BASEMENT LEVEL

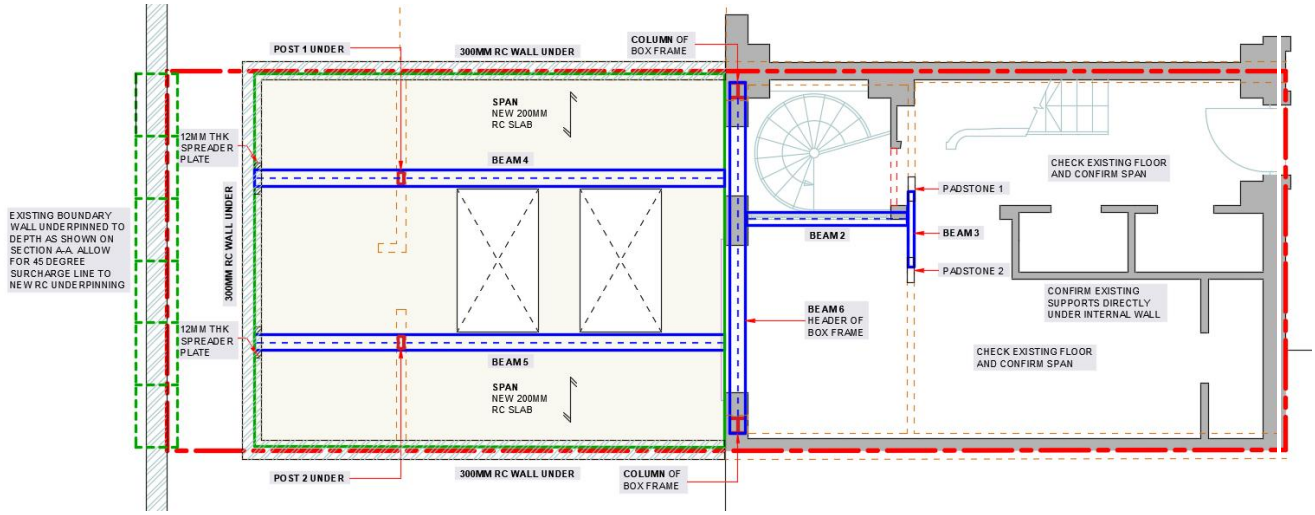


FIGURE 19 – PROPOSED GROUND FLOOR/GARDEN TERRACE LEVEL

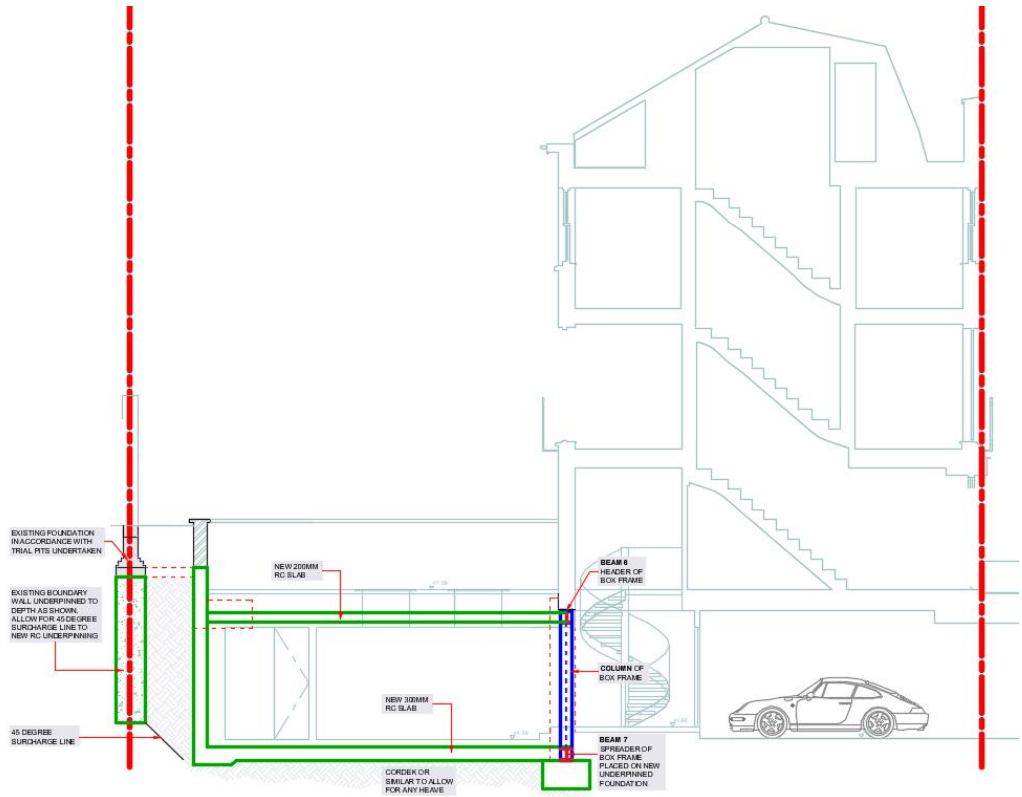


FIGURE 20 – PROPOSED SECTION A-A

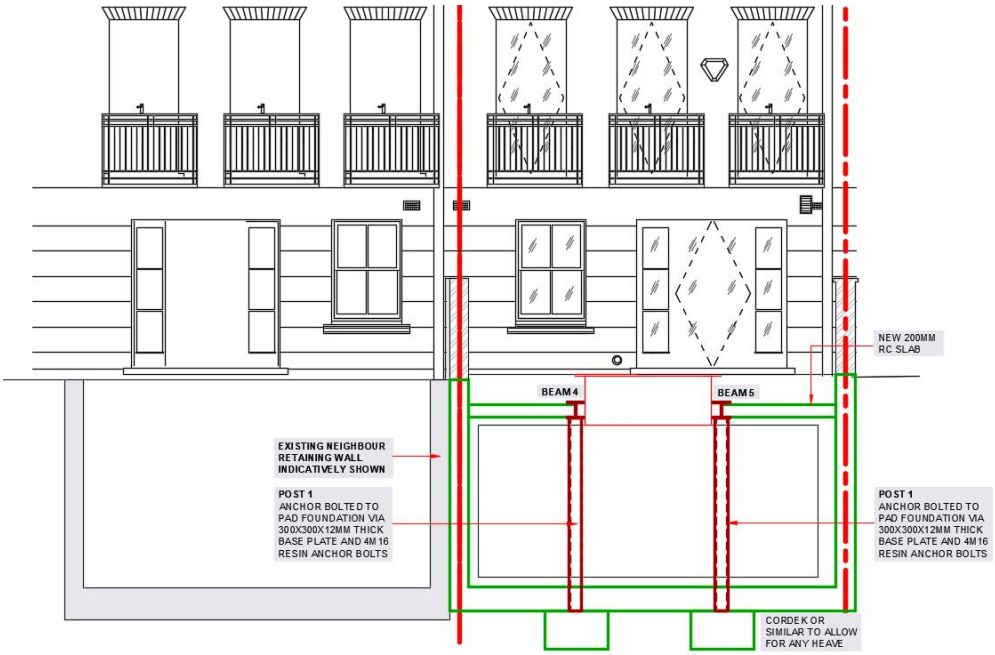


FIGURE 21 – PROPOSED REAR ELEVATION

5.4 DEMOLITION

The proposal is for demolition of existing rear basement garage wall to be replaced by the new steel box frame. Existing planter walls may be retained or demolished and will be determined for the full detailed design.

5.5 REINFORCED CONCRETE UNDERPINNING

The proposed basement under the footprint of the house will be formed using RC underpinning, to extend the existing walls down. These will be formed underneath the party walls to No. 6 and No. 8

The basement will be formed using reinforced concrete retaining elements, installed in a traditional hit-and-miss underpinning sequence. This involves the formation of pins maximum 1.2 wide with minimum 2 bays between working pins. This will avoid instability of the existing perimeter walls as the soil behind and masonry over will arch around local excavations.

The underpins will be founded within the London Clay Formation which in accordance with ground investigations has a bearing pressure of 250kN/m and will be designed with these parameters.

Typically, each stage will involve a shored/propped excavation to the proposed level, where a temporary mass concrete pad will be formed, and the stem built off. The stem will have the

required reinforcement continuity strips arranged as part of the steel fixing, as well as dowels for

shear connections, so later adjacent pins will be bonded with full tension laps or shear connections where required.

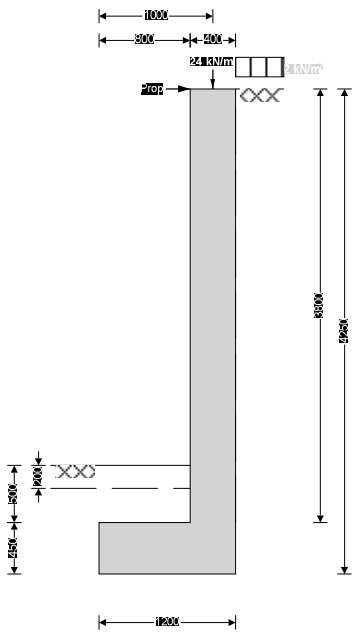
Once the formation of the retaining wall and underpinning walls around the perimeter of the extended basement have been completed, then an arrangement of props and temporary wailers will be installed tight to the face of the walls to prop the top of the walls and to allow the bulk excavation to occur. Props could be the permanent lower ground floor steelwork, or temporary props, and would be removed once the permanent lower ground floor slab formed in concrete is installed.

This will enable excavation of bulk soil, to just above the base of this stage, where another layer of perimeter and cross-props can be installed. The next stage of underpinning can then commence.
When basement level is reached, reinforced concrete bases are included as part of the underpinning process.

The arrangement of the props is shown indicatively on the Assumed Sequence drawings within this report. All temporary works will be designed by the temporary works Engineer. The RC retaining/underpinned walls will be designed to resist active soil pressures, surcharge forces, and a conservative water pressure taken as 1m below ground level. Retaining walls will act vertically in bending to resist these loads, between the proposed floor plates which prop the head of the wall.

5.6 RETAINING WALL CALCULATIONS
DESIGN BOUNDARY WALLS – STEM HEIGHT 3.8M

G WALL ANALYSIS (BS 8002:1994)



Wall details

Retaining wall type;	**Cantilever propped at top**
Height of retaining wall stem;	h_{stem} = **3800** mm
Thickness of wall stem;	t_{wall} = **400** mm
Length of toe;	l_{toe} = **800** mm
Length of heel;	l_{heel} = **0** mm
Overall length of base;	$l_{base} = l_{toe} + l_{heel} + t_{wall}$ = **1200** mm
Thickness of base;	t_{base} = **450** mm
Depth of downstand;	d_{ds} = **0** mm
Position of downstand;	l_{ds} = **700** mm
Thickness of downstand;	t_{ds} = **450** mm
Height of retaining wall;	$h_{wall} = h_{stem} + t_{base} + d_{ds}$ = **4250** mm
Depth of cover in front of wall;	d_{cover} = **500** mm
Depth of unplanned excavation;	d_{exc} = **200** mm
Height of ground water behind wall;	h_{water} = **0** mm
Height of saturated fill above base;	$h_{sat} = \max(h_{water} - t_{base} - d_{ds}, 0\text{ mm})$ = **0** mm
Density of wall construction;	γ_{wall} = **23.6** kN/m^3
Density of base construction;	γ_{base} = **23.6** kN/m^3
Angle of rear face of wall;	α = **90.0** deg
Angle of soil surface behind wall;	β = **0.0** deg
Effective height at virtual back of wall;	$h_{eff} = h_{wall} + l_{heel} \times \tan(\beta)$ = **4250** mm

Retained material details

Mobilisation factor;	M = **1.5**
Moist density of retained material;	γ_m = **21.0** kN/m^3
Saturated density of retained material;	γ_s = **23.0** kN/m^3
Design shear strength;	ϕ' = **24.2** deg
Angle of wall friction;	δ = **23.0** deg

Base material details

Moist density;	γ_{mb} = **21.0** kN/m^3
Design shear strength;	ϕ'_b = **27.5** deg
Design base friction;	δ_b = **21.3** deg
Allowable bearing pressure;	$P_{bearing}$ = **250** kN/m^2

Using Coulomb theory

Active pressure coefficient for retained material

$$K_a = \sin(\alpha + \phi')^2 / (\sin(\alpha)^2 \times \sin(\alpha - \delta) \times [1 + \sqrt{(\sin(\phi' + \delta) \times \sin(\phi' - \beta) / (\sin(\alpha - \delta) \times \sin(\alpha + \beta)))}]^2) = \mathbf{0.366}$$

Passive pressure coefficient for base material

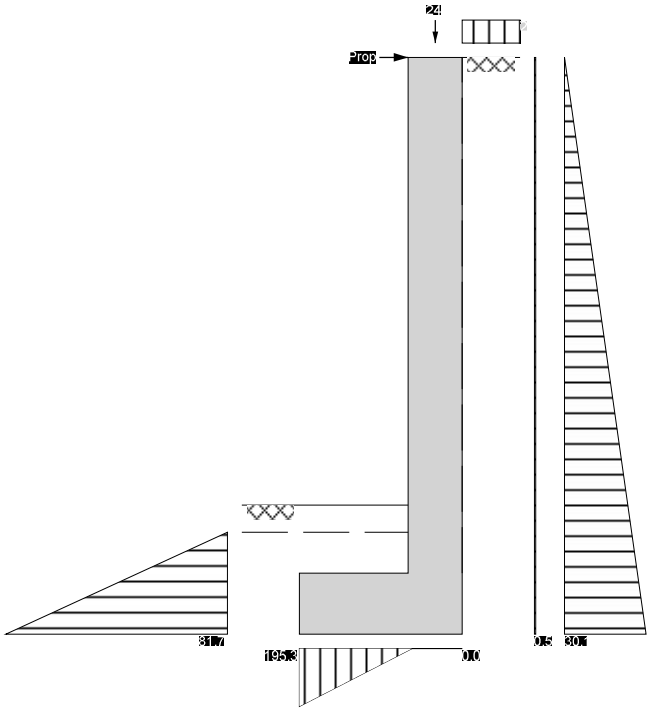
$$K_p = \sin(90 - \phi'_b)^2 / (\sin(90 - \delta_b) \times [1 - \sqrt{(\sin(\phi'_b + \delta_b) \times \sin(\phi'_b) / (\sin(90 + \delta_b)))}]^2) = \mathbf{5.571}$$

At-rest pressure

At-rest pressure for retained material;	$K_0 = 1 - \sin(\phi') =$ **0.590**

Loading details

Surcharge load on plan;	Surcharge = **1.5** kN/m^2
Applied vertical dead load on wall;	W_{dead} = **14.0** kN/m
Applied vertical live load on wall;	W_{live} = **10.0** kN/m
Position of applied vertical load on wall;	l_{load} = **1000** mm
Applied horizontal dead load on wall;	F_{dead} = **0.0** kN/m
Applied horizontal live load on wall;	F_{live} = **0.0** kN/m
Height of applied horizontal load on wall;	h_{load} = **0** mm



Loads shown in kN/m, pressures shown in kN/m^2

Vertical forces on wall

Wall stem; $w_{wall} = h_{stem} \times t_{wall} \times \gamma_{wall}$ = **35.9** kN/m

Wall base; $w_{base} = l_{base} \times t_{base} \times \gamma_{base}$ = **12.7** kN/m

Soil in front of wall; $w_p = l_{toe} \times d_{cover} \times \gamma_{mb}$ = **8.4** kN/m

Applied vertical load; $W_v = W_{dead} + W_{live}$ = **24** kN/m

Total vertical load; $W_{total} = w_{wall} + w_{base} + w_p + W_v$ = **81** kN/m

Horizontal forces on wall

Surcharge; $F_{sur} = K_a \times \cos(90 - \alpha + \delta) \times \text{Surcharge} \times h_{eff}$ = **2.1** kN/m

Moist backfill above water table; $F_{m\_a} = 0.5 \times K_a \times \cos(90 - \alpha + \delta) \times \gamma_m \times (h_{eff} - h_{water})^2$ = **63.9** kN/m

Total horizontal load; $F_{total} = F_{sur} + F_{m\_a}$ = **66** kN/m

Calculate propping force

Passive resistance of soil in front of wall; $F_p = 0.5 \times K_p \times \cos(\delta_b) \times (d_{cover} + t_{base} + d_{ds} - d_{exc})^2 \times \gamma_{mb}$ = **30.7** kN/m

Propping force; $F_{prop} = \max(F_{total} - F_p - (W_{total} - w_p - W_{live}) \times \tan(\delta_b), 0 \text{ kN/m})$

F_{prop} = **11.0** kN/m

Overturning moments

Surcharge; $M_{sur} = F_{sur} \times (h_{eff} - 2 \times d_{ds}) / 2$ = **4.6** kNm/m

Moist backfill above water table; $M_{m\_a} = F_{m\_a} \times (h_{eff} + 2 \times h_{water} - 3 \times d_{ds}) / 3$ = **90.5** kNm/m

Total overturning moment; $M_{ot} = M_{sur} + M_{m\_a}$ = **95.1** kNm/m

Restoring moments

Wall stem; $M_{wall} = w_{wall} \times (l_{toe} + t_{wall} / 2)$ = **35.9** kNm/m

Wall base; $M_{base} = w_{base} \times l_{base} / 2$ = **7.6** kNm/m

Design vertical dead load; $M_{dead} = W_{dead} \times l_{load}$ = **14** kNm/m

Total restoring moment; $M_{rest} = M_{wall} + M_{base} + M_{dead}$ = **57.5** kNm/m

Check bearing pressure

Propping force;	$M_{prop} = F_{prop} \times (h_{wall} - d_{ds})$ = **46.6** kNm/m
Soil in front of wall;	$M_{p\_r} = w_p \times l_{toe} / 2$ = **3.4** kNm/m
Design vertical live load;	$M_{live} = W_{live} \times l_{load}$ = **10** kNm/m
Total moment for bearing;	$M_{total} = M_{rest} - M_{ot} + M_{prop} + M_{p\_r} + M_{live}$ = **22.4** kNm/m
Total vertical reaction;	$R = W_{total}$ = **81.0** kN/m
Distance to reaction;	$x_{bar} = M_{total} / R$ = **277** mm
Eccentricity of reaction;	$e = abs((l_{base} / 2) - x_{bar})$ = **323** mm

Reaction acts outside middle third of base

Bearing pressure at toe;	$p_{toe} = R / (1.5 \times x_{bar})$ = **195.3** kN/m^2
Bearing pressure at heel;	p_{heel} = 0 kN/m^2 = **0** kN/m^2

PASS - Maximum bearing pressure is less than allowable bearing pressure

RETAINING WALL DESIGN (BS 8002:1994)

TEDDS calculation version 1.2.01.06

Ultimate limit state load factors

Dead load factor; γ_{f_d} = **1.4**

Live load factor; γ_{f_l} = **1.6**

Earth and water pressure factor; γ_{f_e} = **1.4**

Factored vertical forces on wall

Wall stem; $w_{wall\_f} = \gamma_{f\_d} \times h_{stem} \times t_{wall} \times \gamma_{wall}$ = **50.2** kN/m

Wall base; $w_{base\_f} = \gamma_{f\_d} \times l_{base} \times t_{base} \times \gamma_{base}$ = **17.8** kN/m

Soil in front of wall; $w_{p\_f} = \gamma_{f\_d} \times l_{toe} \times d_{cover} \times \gamma_{mb}$ = **11.8** kN/m

Applied vertical load; $W_{v\_f} = \gamma_{f\_d} \times W_{dead} + \gamma_{f\_l} \times W_{live}$ = **35.6** kN/m

Total vertical load; $W_{total\_f} = w_{wall\_f} + w_{base\_f} + w_{p\_f} + W_{v\_f}$ = **115.4** kN/m

Factored horizontal at-rest forces on wall

Surcharge; $F_{sur\_f} = \gamma_{f\_l} \times K_0 \times \text{Surcharge} \times h_{eff}$ = **6** kN/m

Moist backfill above water table; $F_{m\_a\_f} = \gamma_{f\_e} \times 0.5 \times K_0 \times \gamma_m \times (h_{eff} - h_{water})^2$ = **156.7** kN/m

Total horizontal load; $F_{total\_f} = F_{sur\_f} + F_{m\_a\_f}$ = **162.7** kN/m

Calculate propping force

Passive resistance of soil in front of wall; $F_{p\_f} = \gamma_{f\_e} \times 0.5 \times K_p \times \cos(\delta_b) \times (d_{cover} + t_{base} + d_{ds} - d_{exc})^2 \times \gamma_{mb}$ = **42.9** kN/m

Propping force; $F_{prop\_f} = \max(F_{total\_f} - F_{p\_f} - (W_{total\_f} - w_{p\_f} - \gamma_{f\_l} \times W_{live}) \times \tan(\delta_b),$ 0 kN/m)

F_{prop_f} = **85.6** kN/m

Factored overturning moments

Surcharge; $M_{sur\_f} = F_{sur\_f} \times (h_{eff} - 2 \times d_{ds}) / 2$ = **12.8** kNm/m

Moist backfill above water table; $M_{m\_a\_f} = F_{m\_a\_f} \times (h_{eff} + 2 \times h_{water} - 3 \times d_{ds}) / 3$ = **222** kNm/m

Total overturning moment; $M_{ot\_f} = M_{sur\_f} + M_{m\_a\_f}$ = **234.7** kNm/m

Restoring moments

Wall stem; $M_{wall\_f} = w_{wall\_f} \times (l_{toe} + t_{wall} / 2)$ = **50.2** kNm/m

Wall base; $M_{base\_f} = w_{base\_f} \times l_{base} / 2$ = **10.7** kNm/m

Soil in front of wall; $M_{p\_r\_f} = w_{p\_f} \times l_{toe} / 2$ = **4.7** kNm/m

Design vertical load; $M_{v\_f} = W_{v\_f} \times l_{load}$ = **35.6** kNm/m

Total restoring moment; $M_{rest\_f} = M_{wall\_f} + M_{base\_f} + M_{p\_r\_f} + M_{v\_f}$ = **101.2** kNm/m

Factored bearing pressure

Propping force; $M_{prop\_f} = F_{prop\_f} \times (h_{wall} - d_{ds})$ = **363.8** kNm/m

Total moment for bearing; $M_{total\_f} = M_{rest\_f} - M_{ot\_f} + M_{prop\_f}$ = **230.3** kNm/m

Total vertical reaction; $R_f = W_{total\_f}$ = **115.4** kN/m

Distance to reaction; $x_{bar\_f} = M_{total\_f} / R_f$ = **1995** mm

Eccentricity of reaction; $e_f = \text{abs}((l_{base} / 2) - x_{bar\_f})$ = **1395** mm

WARNING - Beyond scope of calculation

Bearing pressure at toe; p_{toe_f} = 0 kN/m^2 = **0** kN/m^2

Bearing pressure at heel; $p_{heel\_f} = R_f / (1.5 \times (l_{base} - x_{bar\_f}))$ = **-96.8** kN/m^2

Rate of change of base reaction; rate = $- p_{heel\_f} / (3 \times (l_{base} - x_{bar\_f}))$ = **-40.57** kN/m^2/m

Bearing pressure at stem / toe; $p_{stem\_toe\_f} = \max(p_{heel\_f} + (\text{rate} \times (l_{heel} + t_{wall})), 0 \text{ kN/m}^2)$ = **0** kN/m^2

Bearing pressure at mid stem; $p_{stem\_mid\_f} = \max(p_{heel\_f} + (\text{rate} \times (l_{heel} + t_{wall} / 2)), 0 \text{ kN/m}^2)$ = **0** kN/m^2

Bearing pressure at stem / heel; $p_{stem\_heel\_f} = \max(p_{heel\_f} + (rate \times l_{heel}), 0\ kN/m^2) =$ **0** kN/m^2

Design of reinforced concrete retaining wall toe (BS 8002:1994)

Material properties

Characteristic strength of concrete; $f_{cu} =$ **40** N/mm^2

Characteristic strength of reinforcement; $f_y =$ **500** N/mm^2

Base details

Minimum area of reinforcement; k = **0.13** %

Cover to reinforcement in toe; $c_{toe} =$ **50** mm

Calculate shear for toe design

Shear from weight of base; $V_{toe\_wt\_base} = \gamma_{f\_d} \times \gamma_{base} \times l_{toe} \times t_{base} =$ **11.9** kN/m

Shear from weight of soil; $V_{toe\_wt\_soil} = w_{p\_f} - (\gamma_{f\_d} \times \gamma_m \times l_{toe} \times d_{exc}) =$ **7.1** kN/m

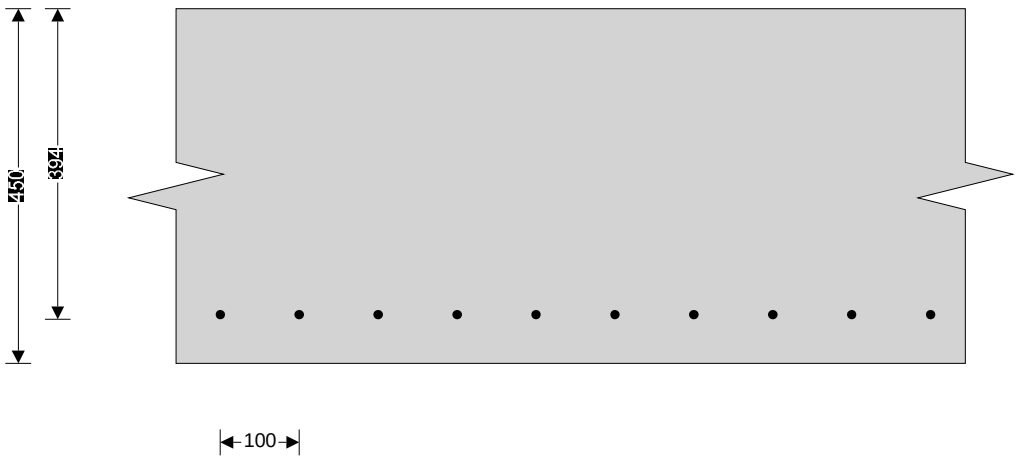
Total shear for toe design; $V_{toe} = V_{toe\_wt\_base} - V_{toe\_wt\_soil} =$ **4.8** kN/m

Calculate moment for toe design

Moment from weight of base; $M_{toe\_wt\_base} = (\gamma_{f\_d} \times \gamma_{base} \times t_{base} \times (l_{toe} + t_{wall} / 2)^2 / 2) =$ **7.4** kNm/m

Moment from weight of soil; $M_{toe\_wt\_soil} = (w_{p\_f} - (\gamma_{f\_d} \times \gamma_m \times l_{toe} \times d_{exc})) \times (l_{toe} + t_{wall}) / 2 =$ **4.2** kNm/m

Total moment for toe design; $M_{toe} = M_{toe\_wt\_base} - M_{toe\_wt\_soil} =$ **3.2** kNm/m



Check toe in bending

Width of toe; b = **1000** mm/m

Depth of reinforcement; $d_{toe} = t_{base} - c_{toe} - (\phi_{toe} / 2) =$ **394.0** mm

Constant; $K_{toe} = M_{toe} / (b \times d_{toe}^2 \times f_{cu}) =$ **0.001**

Compression reinforcement is not required

Lever arm; $z_{toe} = \min(0.5 + \sqrt{}(0.25 - (\min(K_{toe}, 0.225) / 0.9)), 0.95) \times d_{toe}$

$z_{toe} =$ **374** mm

Area of tension reinforcement required; $A_{s\_toe\_des} = M_{toe} / (0.87 \times f_y \times z_{toe}) =$ **20** mm^2/m

Minimum area of tension reinforcement; $A_{s\_toe\_min} = k \times b \times t_{base} =$ **585** mm^2/m

Area of tension reinforcement required; $A_{s\_toe\_req} = \max(A_{s\_toe\_des}, A_{s\_toe\_min}) =$ **585** mm^2/m

Reinforcement provided; **B1131 mesh**

Area of reinforcement provided; $A_{s\_toe\_prov} =$ **1131** mm^2/m

PASS - Reinforcement provided at the retaining wall toe is adequate

Check shear resistance at toe

Design shear stress; $v_{toe} = V_{toe} / (b \times d_{toe})$ = **0.012** N/mm^2

Allowable shear stress; $v_{adm} = \min(0.8 \times \sqrt{(f_{cu} / 1\ N/mm^2)}, 5) \times 1\ N/mm^2$ = **5.000** N/mm^2

PASS - Design shear stress is less than maximum shear stress

From BS8110:Part 1:1997 – Table 3.8

Design concrete shear stress; v_{c_toe} = **0.489** N/mm^2

$v_{toe} < v_{c\_toe}$ - No shear reinforcement required

Design of reinforced concrete retaining wall stem (BS 8002:1994)

Material properties

Characteristic strength of concrete; f_{cu} = **40** N/mm^2

Characteristic strength of reinforcement; f_y = **500** N/mm^2

Wall details

Minimum area of reinforcement; k = **0.13** %

Cover to reinforcement in stem; c_{stem} = **50** mm

Cover to reinforcement in wall; c_{wall} = **25** mm

Factored horizontal at-rest forces on stem

Surcharge; $F_{s\_sur\_f} = \gamma_{f\_l} \times K_0 \times \text{Surcharge} \times (h_{eff} - t_{base} - d_{ds})$ = **5.4** kN/m

Moist backfill above water table; $F_{s\_m\_a\_f} = 0.5 \times \gamma_{f\_e} \times K_0 \times \gamma_m \times (h_{eff} - t_{base} - d_{ds} - h_{sat})^2$ = **125.3** kN/m

Calculate shear for stem design

Surcharge; $V_{s\_sur\_f} = 5 \times F_{s\_sur\_f} / 8$ = **3.4** kN/m

Moist backfill above water table; $V_{s\_m\_a\_f} = F_{s\_m\_a\_f} \times b_l \times ((5 \times L^2) - b_l^2) / (5 \times L^3)$ = **97.2** kN/m

Total shear for stem design; $V_{stem} = V_{s\_sur\_f} + V_{s\_m\_a\_f}$ = **100.5** kN/m

Calculate moment for stem design

Surcharge; $M_{s\_sur} = F_{s\_sur\_f} \times L / 8$ = **2.7** kNm/m

Moist backfill above water table; $M_{s\_m\_a} = F_{s\_m\_a\_f} \times b_l \times ((5 \times L^2) - (3 \times b_l^2)) / (15 \times L^2)$ = **73.8** kNm/m

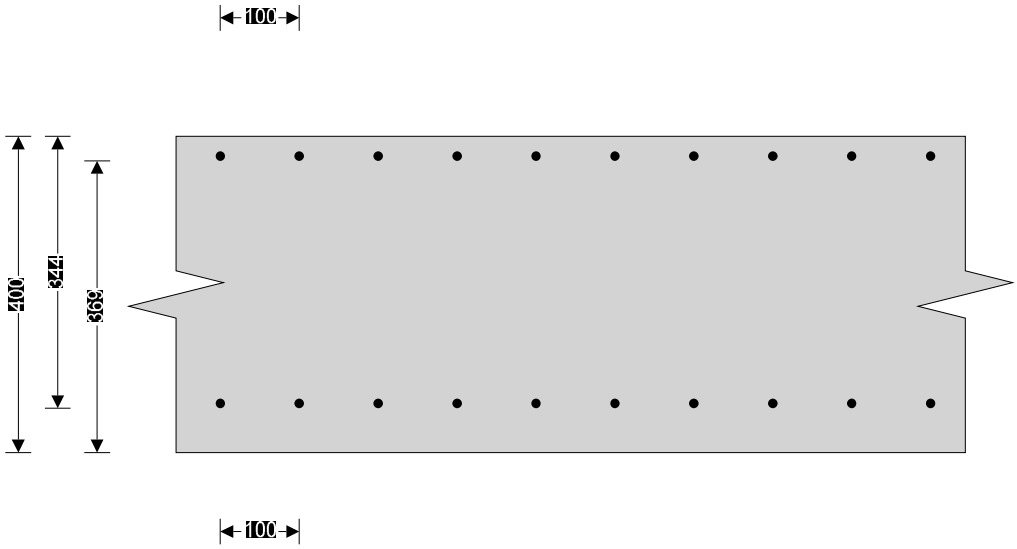
Total moment for stem design; $M_{stem} = M_{s\_sur} + M_{s\_m\_a}$ = **76.5** kNm/m

Calculate moment for wall design

Surcharge; $M_{w\_sur} = 9 \times F_{s\_sur\_f} \times L / 128$ = **1.5** kNm/m

Moist backfill above water table; $M_{w\_m\_a} = F_{s\_m\_a\_f} \times 0.577 \times b_l \times [(b_l^3 + 5 \times a_l \times L^2) / (5 \times L^3) - 0.577^2 / 3]$ = **31.1** kNm/m

Total moment for wall design; $M_{wall} = M_{w\_sur} + M_{w\_m\_a}$ = **32.6** kNm/m



Check wall stem in bending

Width of wall stem;	b = **1000** mm/m
Depth of reinforcement;	$d_{stem} = t_{wall} - c_{stem} - (\phi_{stem} / 2)$ = **344.0** mm
Constant;	$K_{stem} = M_{stem} / (b \times d_{stem}^2 \times f_{cu})$ = **0.016**
	Compression reinforcement is not required
Lever arm;	$z_{stem} = \min(0.5 + \sqrt{}(0.25 - (\min(K_{stem}, 0.225) / 0.9)), 0.95) \times d_{stem}$
	z_{stem} = **327** mm
Area of tension reinforcement required;	$A_{s\_stem\_des} = M_{stem} / (0.87 \times f_y \times z_{stem})$ = **538** mm²/m
Minimum area of tension reinforcement;	$A_{s\_stem\_min} = k \times b \times t_{wall}$ = **520** mm²/m
Area of tension reinforcement required;	$A_{s\_stem\_req} = \max(A_{s\_stem\_des}, A_{s\_stem\_min})$ = **538** mm²/m
Reinforcement provided;	**B1131 mesh**
Area of reinforcement provided;	$A_{s\_stem\_prov}$ = **1131** mm²/m
	PASS - Reinforcement provided at the retaining wall stem is adequate

Check shear resistance at wall stem

Design shear stress;	$v_{stem} = V_{stem} / (b \times d_{stem})$ = **0.292** N/mm²
Allowable shear stress;	$v_{adm} = \min(0.8 \times \sqrt{}(f_{cu} / 1\ N/mm^2), 5) \times 1\ N/mm^2$ = **5.000** N/mm²
	PASS - Design shear stress is less than maximum shear stress

From BS8110:Part 1:1997 – Table 3.8

Design concrete shear stress;	v_{c_stem} = **0.530** N/mm²
	$v_{stem} < v_{c\_stem}$ - No shear reinforcement required

Check mid height of wall in bending

Depth of reinforcement;	$d_{wall} = t_{wall} - c_{wall} - (\phi_{wall} / 2)$ = **369.0** mm
Constant;	$K_{wall} = M_{wall} / (b \times d_{wall}^2 \times f_{cu})$ = **0.006**
	Compression reinforcement is not required
Lever arm;	$z_{wall} = \text{Min}(0.5 + \sqrt{}(0.25 - (\min(K_{wall}, 0.225) / 0.9)), 0.95) \times d_{wall}$
	z_{wall} = **351** mm
Area of tension reinforcement required;	$A_{s\_wall\_des} = M_{wall} / (0.87 \times f_y \times z_{wall})$ = **214** mm²/m
Minimum area of tension reinforcement;	$A_{s\_wall\_min} = k \times b \times t_{wall}$ = **520** mm²/m
Area of tension reinforcement required;	$A_{s\_wall\_req} = \max(A_{s\_wall\_des}, A_{s\_wall\_min})$ = **520** mm²/m
Reinforcement provided;	**B1131 mesh**
Area of reinforcement provided;	$A_{s\_wall\_prov}$ = **1131** mm²/m

PASS - Reinforcement provided to the retaining wall at mid height is adequate

Check retaining wall deflection

Basic span/effective depth ratio; $ratio_{bas}$ = **20**

Design service stress; $f_s = 2 \times f_y \times A_{s\_stem\_req} / (3 \times A_{s\_stem\_prov})$ = **158.6** N/mm^2

Modification factor; $factor_{tens} = \min(0.55 + (477\ N/mm^2 - f_s)/(120 \times (0.9\ N/mm^2 + (M_{stem}/(b \times d_{stem}^2)))),2)$ = **2.00**

Maximum span/effective depth ratio; $ratio_{max} = ratio_{bas} \times factor_{tens}$ = **40.00**

Actual span/effective depth ratio; $ratio_{act} = h_{stem} / d_{stem}$ = **11.05**

PASS - Span to depth ratio is acceptable

5.7 BASEMENT SLAB

The basement slab in accordance with the ground conditions is to be formed as a suspended concrete slab spanning between the perimeter underpinned walls and the internal spreader of the box frame.

5.8 PROPOSED METHOD OF ANALYSIS

The overall construction sequence and temporary/permanent propping regime will require detailed design to ensure that potential movements are minimized and will be undertaken by the contractor following their appointment.

Condition surveys of the adjoining property will also be undertaken prior to the commencement and at the end of the site works.

The party wall process may also require that targets are installed on this building and monitored on a regular basis throughout the duration of the works to ensure that any movements are kept within acceptable and pre-agreed levels.

Structural steel stability frames will be designed using relative stiffness software to derive applied stresses, to be verified by hand calculation. Members will be sized using hand calculations in accordance with BS5950. Applied deflections will be limited to the following:

- Vertical supporting existing masonry = temporary + permanent < Span/500.
- Lateral = sway deflection < Height/300.

Retaining walls will be checked for their external stability to BS 8004. Internal stability of the reinforced concrete will be checked in accordance with BS8110. Bearing pressures will be limited to the recommended values given in the site investigation.

5.9 PROTECTION OF ADJACENT STRUCTURES

Party Wall Matters

The proposed development falls within the scope of the Party Wall Act 1996. Procedures under the Act will be dealt with by the Employer's Party Wall Surveyor. The Party Wall Surveyor will prepare necessary notices under the provisions of the Act and agree Party Wall Awards in the event of any disputes.

The proposed works to form the basement will be designed and detailed so that any movement of the existing structure is no worse than "Category 2", defined as Slight within the BRE Digest 251 Table 1 and CIRIA 580 (Burland et Al). This will be agreed as part of the party wall process, and the movement of the existing building will be monitored twice weekly during the formation of the basement using targets placed to the face of the walls. Monitoring is discussed in more detail in Section 6.3

Condition surveys of the adjoining properties will be undertaken prior to commencement of the site works. Data from monitoring stations will be regularly checked during construction to ensure that there is no unexpected movement that may affect the adjoining and neighbouring properties.

6. BELOW GROUND DRAINAGE

The proposed site area consists of an area of 52 square metres with a proposed impermeable area of 101 square metres.

CCTV survey confirms the presence of a combined sewer on site which serves other residential units within this closed community off Acacia Road.

The drainage strategy for 7 Tatham Place can be seen within **APPENDIX A** of this report.

7. TEMPORARY WORKS

The design of the temporary works and the temporary stability of any existing structure to be retained as part of the permanent works is entirely the responsibility of the contractor.

The temporary works discussed below is the expected temporary works required. All this information will be firmed up by the contractor following their appointment.

The contractor is to submit an overall Method Statement prior to a site start and detailed drawings and calculations which are to include an assessment of the anticipated ground movement due to; temporary works, underpinning, this is also to cover each stage of construction, initial excavation, propping, full excavation etc.

The contractor will also be required to appoint a Temporary Works Co-Ordinator for the duration of the contract in accordance with the specification.

The temporary works mentioned below are what is thought to be required at this stage, and further temporary works may come out once the detailed design is progressed.

- Temporary propping will be required to each individual excavation which forms the retaining wall and underpin sections around the perimeter of the basement.

- Temporary works will be required to prop the top of the new basement perimeter walls. The extent of this will depend on when the permanent structure is installed.

- Temporary props will be required to the upper levels of the house when the existing structure is removed when installing the proposed steel box frame.

- Temporary needle beams, columns and stability elements will be required to install the permanent steel beams where openings are being created internally.

8. PROPOSED SEQUENCE OF CONSTRUCTION

Drawings below in **FIGURES 22 - 26** illustrates an assumed sequence of construction for the formation of the basement box. These summarise our initial thinking as to how the proposed structural works will be undertaken. They do not relieve the contractor from undertaking this exercise, as the design of all temporary works associated with the temporary stability of all existing structures in the temporary condition, together with the stability of the permanent structure in the temporary condition, is entirely the responsibility of the contractor.

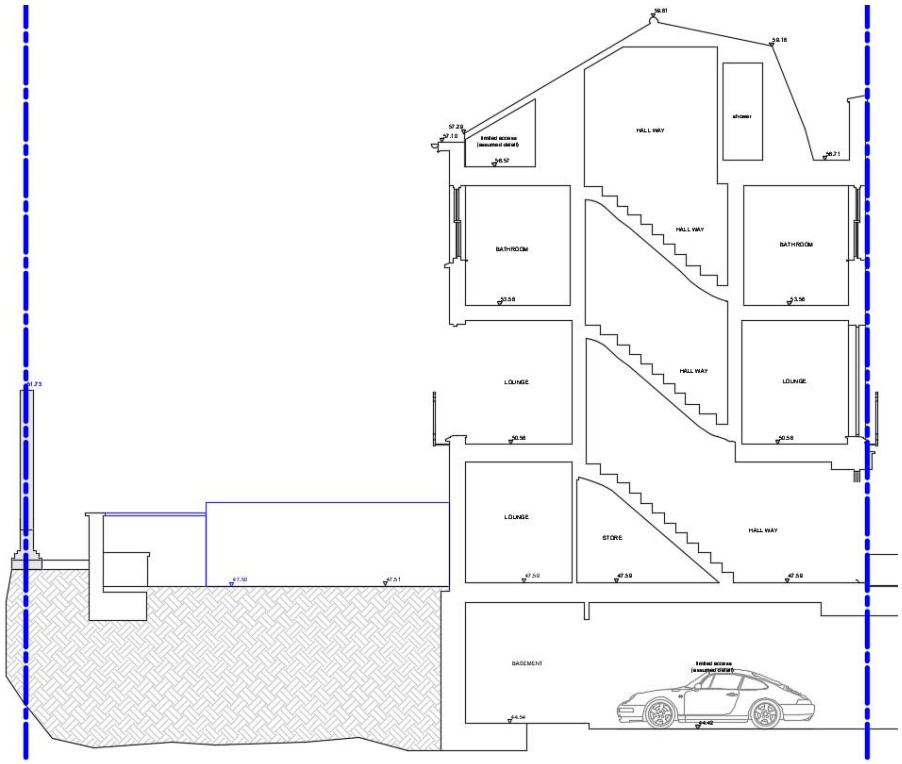


FIGURE 22 – EXISTING

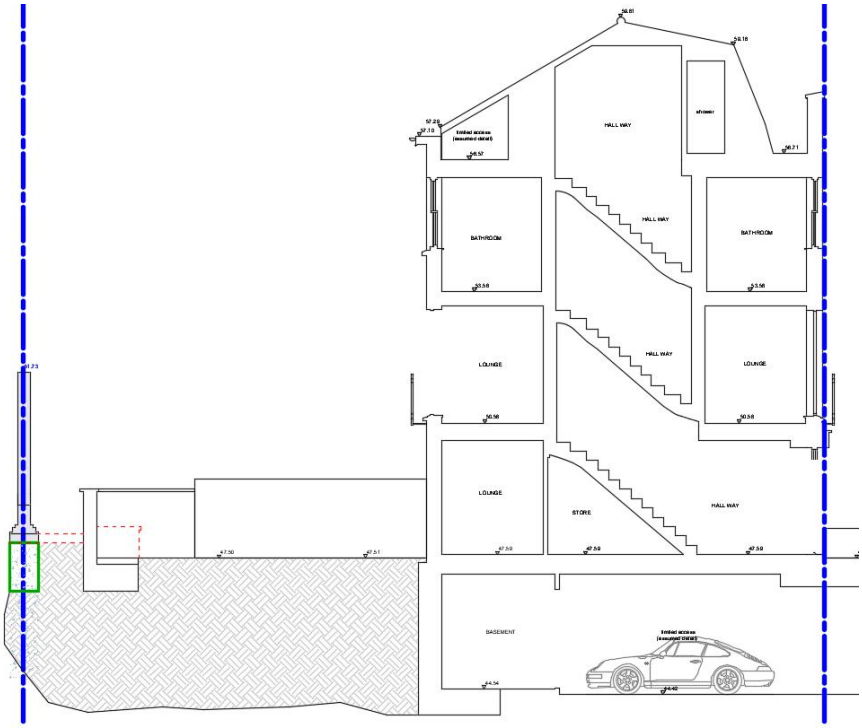


FIGURE 23 – STAGE 1 SEQUENCE

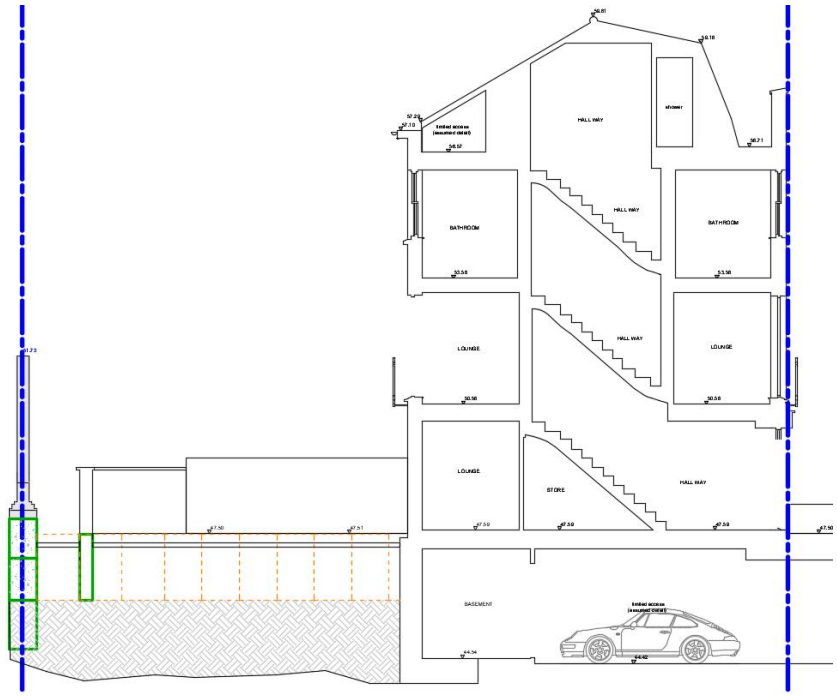


FIGURE 24 – STAGE 2 SEQUENCE

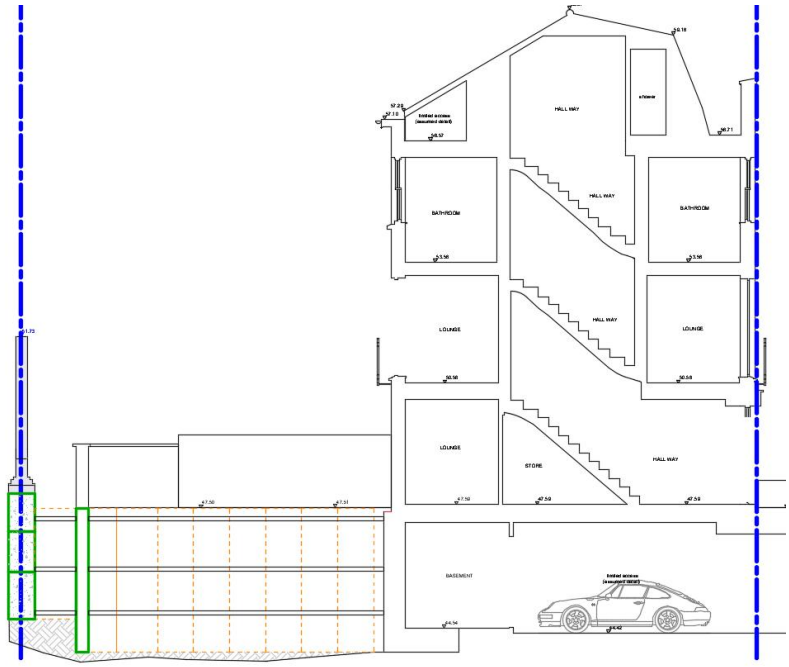


FIGURE 25 – STAGE 3 SEQUENCE

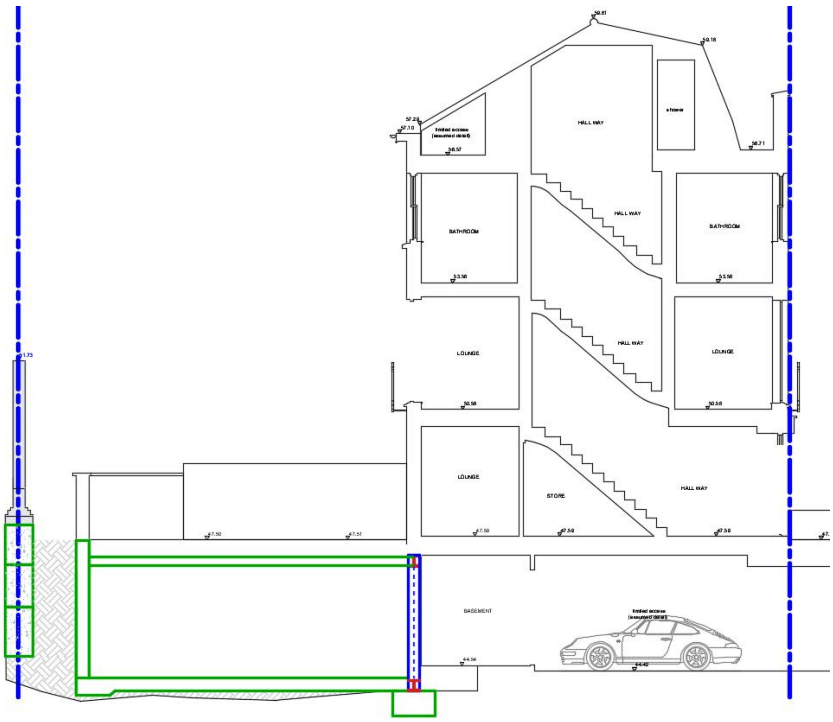


FIGURE 26 – STAGE 2 SEQUENCE

WRITTEN SEQUENCE OF CONSTRUCTION

1. Mobilisation - site hut and welfare units established within the site.

2. All services will be carefully located and exposed where necessary.

3. Underpin existing rear garden wall at max 1m deep and demolish existing rear planters.

4. Sequentially excavate existing garden in 1.0m max wide in suitable sequence to form underpinning to all perimeter walls in L-shaped reinforced walls. Install cross props across site at proposed ground floor level.

5. Once first stage perimeter is complete carry out second stage of underpinning as above to a further 1m deep from new underpinned level.

6. Repeat above until RC underpinning reaches required depth of proposed basement level.

7. Once complete, reduce levels down to top-of-concrete of underpin bases, and cross prop through the site. Install new steelwork stability frames. Install under-slab drainage and remaining portions of slab over heave protection.

9. MONITORING STRATEGY

All items of temporary works and surrounding structures are to be monitored in a manner and frequency commensurate with the construction activity taking place. As a minimum the monitoring should include a daily full visual survey of all temporary works and surrounding structures, and a twice weekly measured survey of the existing structure using fixed survey points to be agreed with the Party Wall Surveyors.

The limits of any movement may be set against the colours **green**, **amber** and **red**:

- **Green**: - Settlement recorded within predicted movements.
- **Amber**: - Settlement recorded is approaching the predicted movements.
- Red: - Settlement recorded is above the predicted movements.

8.1 REMEDIATION MEASURES SHOULD LEVELS BE EXCEEDED

- If the **amber** levels are exceeded, the contractor is to notify the Engineer and review the construction sequence.
- If the **red** levels are exceeded at any point during the underpinning works, the contractor is to immediately cease the construction works and install temporary props/reinstall excavated material such as required to the face of the wall in order to prevent any further movement. These measures are to be kept in place until such time as the engineer deems them suitable to be removed.

The contractor is to ensure he has either have adequate provision in terms of props on site during the works or be able to obtain temporary props required at short notice to install these in the event of the **amber** levels being exceeded.

8.2 OUTLINE MONITORING SPECIFICATION

Target locations for monitoring are to be agreed with the adjoining owners Party Wall Surveyors for inclusion on the Party Wall Award. The frequency of monitoring is to be agreed prior to execution of the works. A recommended frequency for monitoring is outlined below:

Prior to the commencement of the works: - Baseline readings are to be taken
During the installation of the underpins - Weekly readings
At the completion of each phase of the work: - Single readings taken
End of the construction stage: - Final readings taken

- A stable datum must be maintained, and the observed monitoring points must be an integral part of the structure. Targets are to be surveyed to an accuracy of ±1mm and read in three dimensions, i.e. the X, Y and Z axes.
- Recordings should demonstrate the vertical and horizontal movements that have occurred since the previous measurements were taken.

Lateral and vertical movement limits are to be set against **green, amber** and **red** limits. These limits are to be agreed by the Party Wall Engineer during the party wall process.

10. RECOMMENDATIONS AND CONCLUSIONS

All the necessary factors and considerations have been considered and assessed.

The design proposed, its construction methods, materials and sequence will ensure that the risk of damage to adjacent properties, utilities, infrastructure, tunnels, or highways is minimised during construction.

During construction, lateral and vertical stability of the garden and boundary walls will be maintained by temporarily propping, such that no significant adverse movement is expected.

Environmental impacts have been assessed, and the response to geotechnical and hydrological aspects have been considered. The proposals are deemed to not have any adverse impact in this respect.

The construction of the retaining structures and basement will be carried out by competent and experienced contractors and precautions will be taken to maintain the stability of the excavations.

Once complete, the new structure will provide a robust and secure support for both new and existing structure, without detriment to the overall stability of the building or adjoining properties.

None of the proposed superstructure alterations will fundamentally affect the integrity and stability of the original structure.

Written by:

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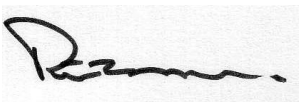
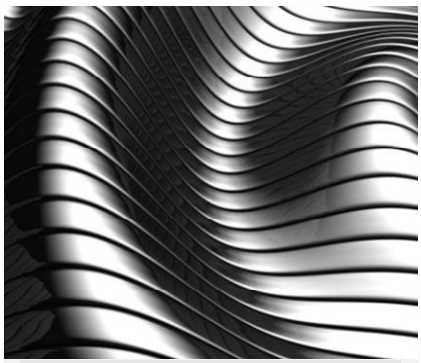
Chartered Structural engineer





APPENDIX A

DRAINAGE STRATEGY

BELOW GROUND DRAINAGE

zussmanbear

7 Tatham Place
London NW8 6AF

DRAINAGE STRATEGY

Contents

1. INTRODUCTION

INTRODUCTION

The proposed residential development is at 7 Tatham Place London Post Code NW8 6AF.

The proposed site area consists of an area of 52 square metres with a proposed impermeable area of 101 square metres.

CCTV survey confirms the presence of a combined sewer on site which serves other residential units within this closed community off Acacia Road.

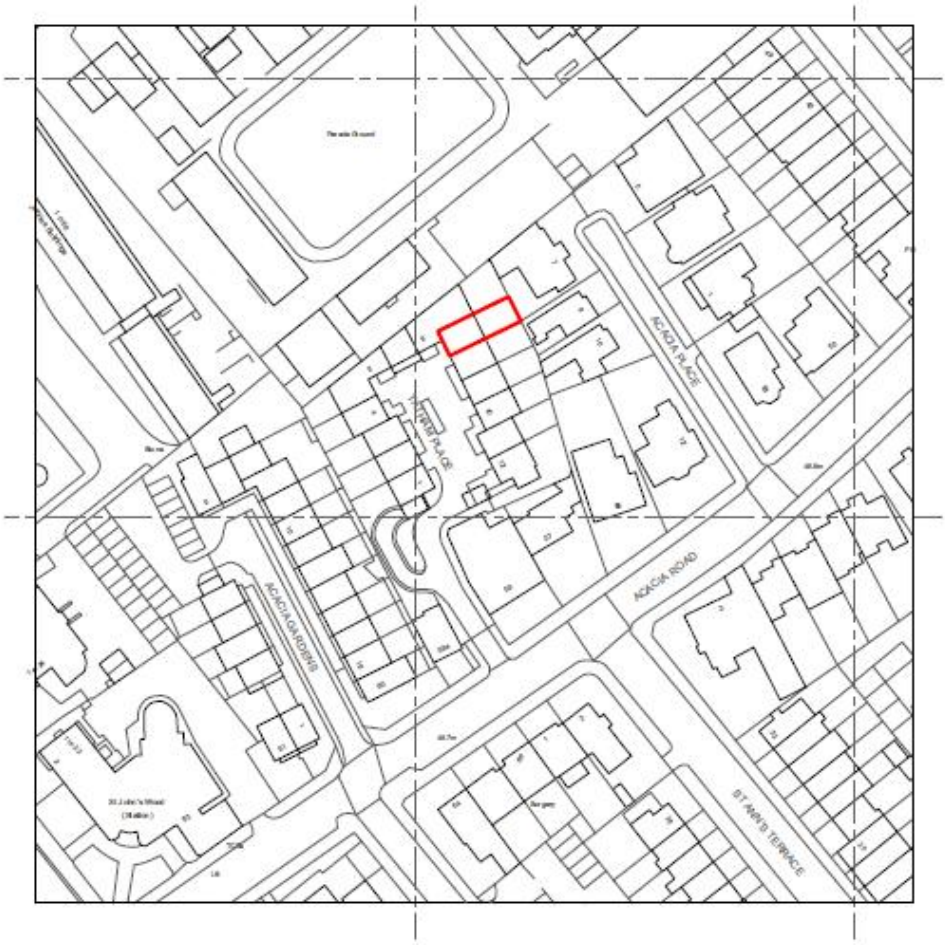


FIGURE 1 – SITE LOCATION

PROPOSED SURFACE WATER DRAINAGE

1. The surface water sewer system for the residential development has been designed to convey surface water only with foul water being discharged separately to an existing combined manhole and private sewers within the site and within the communal basement car park that serves other residential units. Sewers will be designed to comply with BS EN 752 and Building Regulations Part H.

2. The Thames water Asset plans indicate that the sewer in the basement is now adopted possibly under the Private Regulation Bill.

3. A Pre-Development Enquiry will be submitted to Thames Water to discharge into the sewer based on the existing flow rate discharging into the combined sewer.

4. The existing surface water network and blue roof will be designed to accommodate a 1 in 100 year storm event plus climate change in the event that on site flooding cannot be accommodated without flooding adjacent properties and the proposed development.

5. Existing development is being retained and a new basement is being proposed below the external garden areas which is partially impermeable.

6. The surface water drainage has been designed using the WINDES computer program to confirm the level and depth of blue roof that can be provided below the amenity areas over the proposed basement.

7. The surface water rate from the existing development will be maintained with an additional increase of 0.2 l/s per second above the existing rate, with flow rate being controlled from the blue roof.

PROPOSED FOUL WATER DRAINAGE

8. The design of the foul water drainage will be in accordance with BS EN 752 – Drain and Sewer Systems Outside Buildings, BS EN 12056.

9. The foul flow rates were calculated based on the water consumption method in accordance with Flow Loads by British Water and Urban Drainage by Butler & Davies. Thames Water has also been engaged with regard to the foul water rates.

10. The proposed foul water flow rate of the Development was calculated to be 0.1 l/s (daily peak flow) based on the number of occupancies for the development.

11. Foul water from the basement development will discharge to the external private sewer by gravity.

12. The foul water connection will be made to the public sewer system through a Section 106 Agreement with Thames Water under the Water Industry Act 1991 through an indirect connection

THAMES WATER ASSET PLANS

See APPENDIX A.

PROPOSED DRAINAGE DRAWINGS

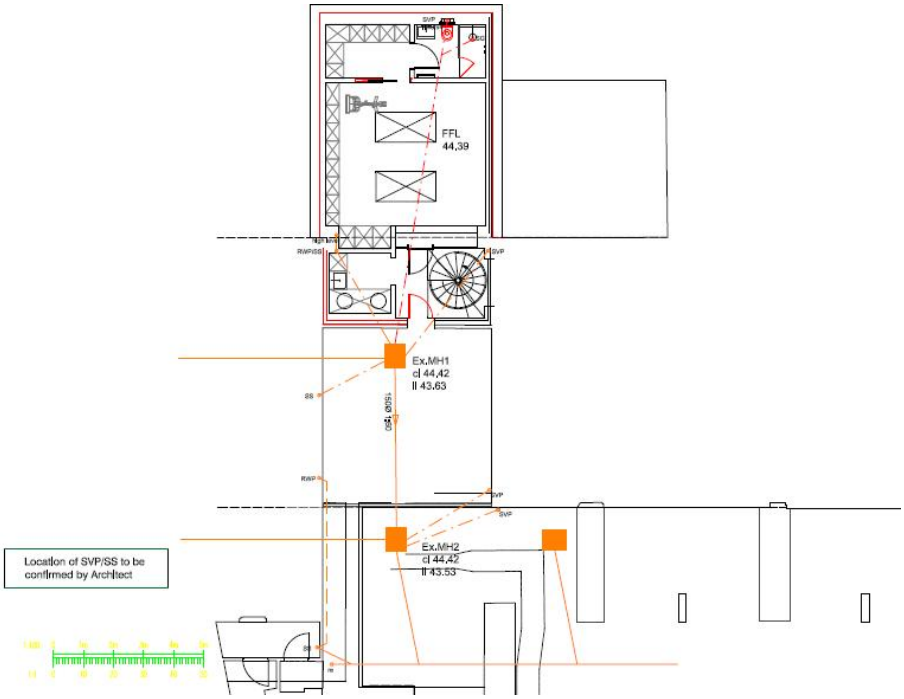


FIGURE 2 – BASEMENT PLAN

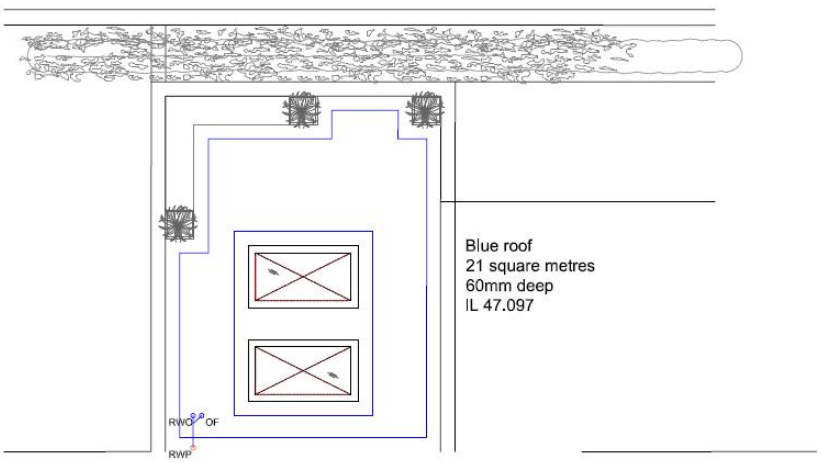
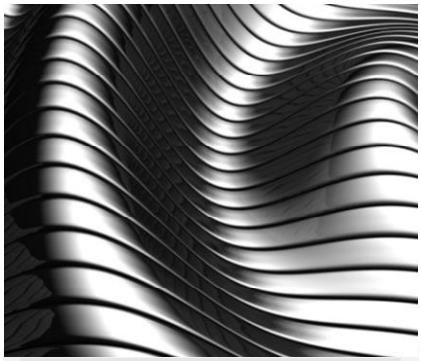


FIGURE 3 – BASEMENT PLAN

CALCULATIONS

See APPENDIX B.



APPENDIX A

OF DRAINAGE STATEGY

ASSET LOCATION PLAN

Asset location search

Property Searches

Search address supplied	7 Tatham Place London NW8 6AF
Your reference	7 Tatham Place
Our reference	ALS/ALS/24/2021_4472775
Search date	21 July 2021

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Asset location search

Property Searches

Search address supplied: 7, Tatham Place, London, NW8 6AF

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset location search

Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

Asset location search

Property Searches

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Asset location search

Property Searches

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

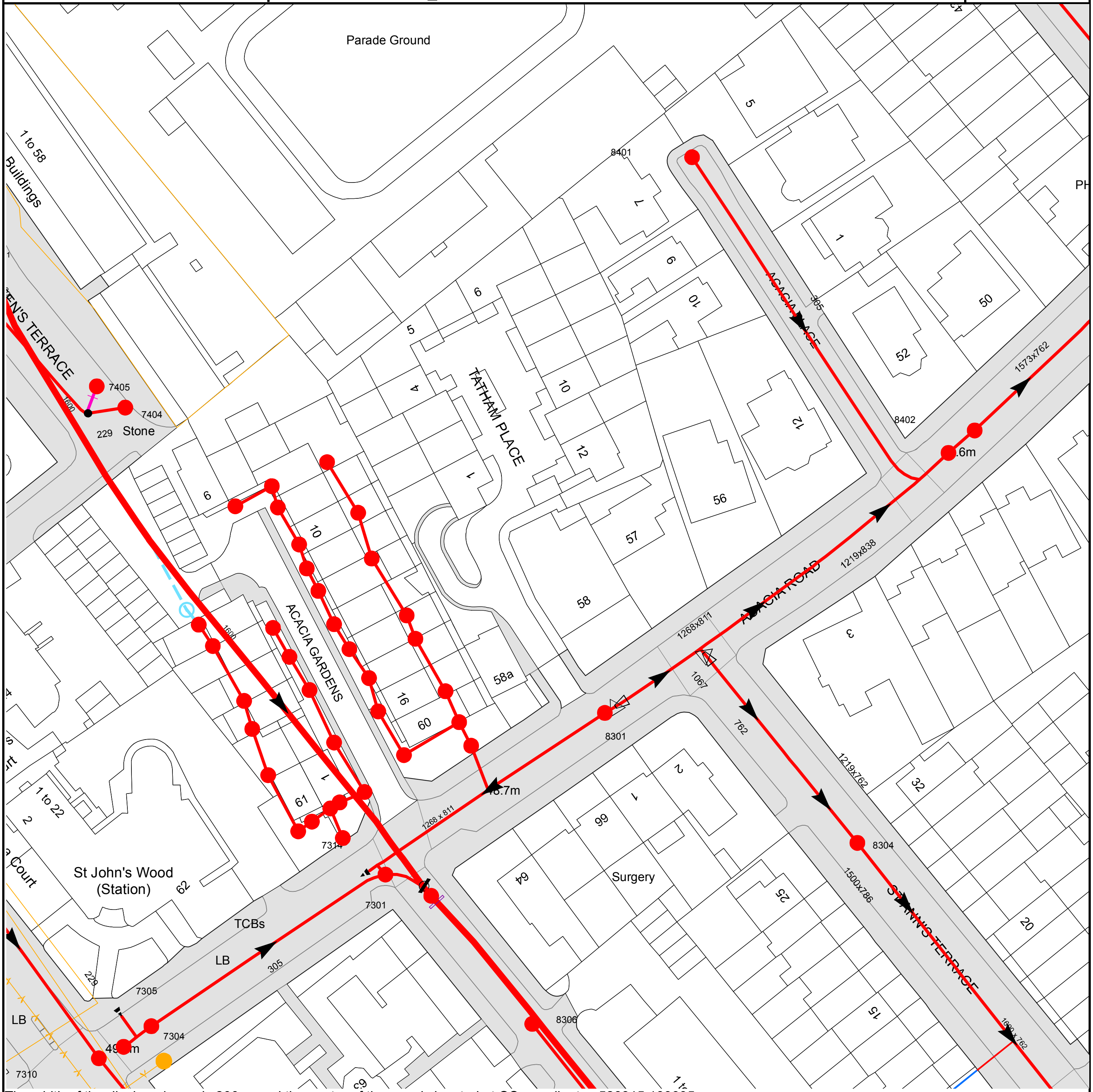
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS/24/2021_4472775



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 526815,183395

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8401	48.33	45.78
73DH	n/a	n/a
73DG	n/a	n/a
73DF	n/a	n/a
73DE	n/a	n/a
73DD	n/a	n/a
73DC	n/a	n/a
74BC	n/a	n/a
7404	49.94	46.59
7405	n/a	n/a
74BD	n/a	n/a
73EA	n/a	n/a
74BE	n/a	n/a
73EB	n/a	n/a
73DI	n/a	n/a
73CD	n/a	n/a
73CE	n/a	n/a
73EC	n/a	n/a
73EG	n/a	n/a
73CF	n/a	n/a
74BB	n/a	n/a
73DJ	n/a	n/a
73CG	n/a	n/a
73ED	n/a	n/a
73EF	n/a	n/a
73EH	n/a	n/a
73CH	n/a	n/a
73BH	n/a	n/a
73EE	n/a	n/a
73CI	n/a	n/a
73BI	n/a	n/a
73CJ	n/a	n/a
7314	48.83	44.66
73DA	n/a	n/a
73BJ	n/a	n/a
73CA	n/a	n/a
7301	48.77	29.37
8306	47.96	44.52
8304	47.02	43.01
83AJ	n/a	n/a
73CC	n/a	n/a
8301	48.38	45.47
73CB	n/a	n/a
8402	46.62	43.78
84AE	n/a	n/a
7310	48.96	45.26
7304	48.95	47.4
7305	48.92	44.89

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lnes denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

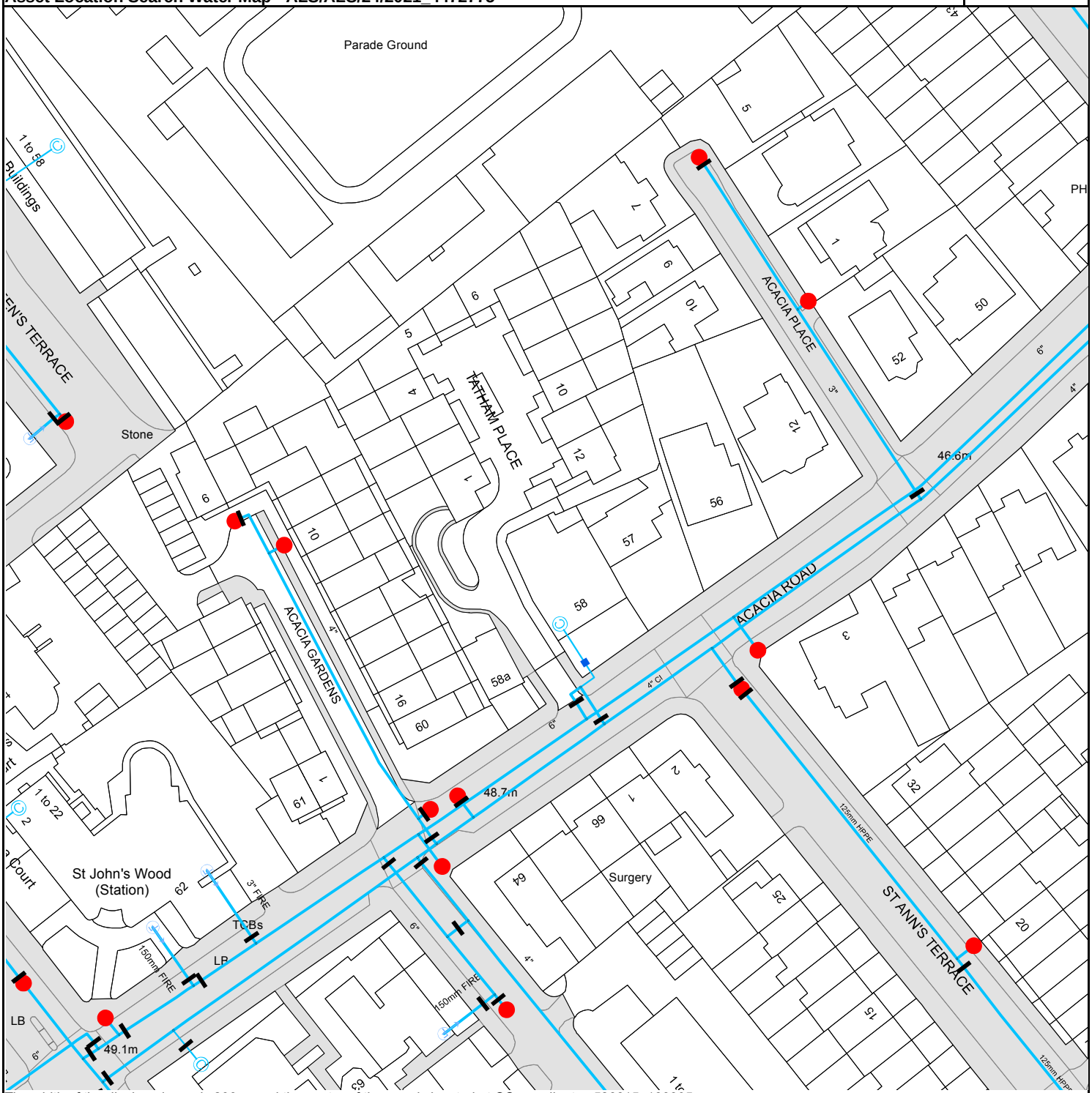
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS/24/2021_4472775



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 526815, 183395.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

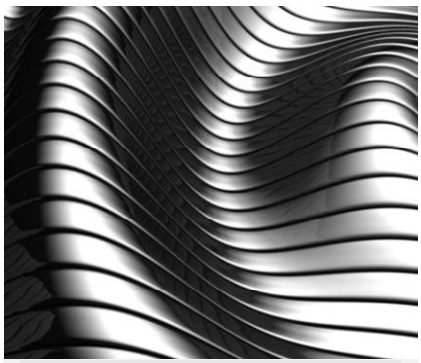
We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0800 009 4540** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**



APPENDIX B

OF DRAINAGE STATEGY

CALCULATIONS

	7 Tatham Place SW Design
Date 21/07/2021 File 210720 SW TP.MDX	Designed by Checked by PZ
Innovyze	Network 2019.1

Existing Network Details for Storm

* - Indicates pipe has been modified outside of System 1

	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
*	1.000	1.500	0.001	1500.0	0.005	5.00	0.600	o	100	Pipe/Conduit
*	1.001	3.650	3.160	1.2	0.000	0.00	0.600	o	100	Pipe/Conduit
*	1.002	11.300	0.260	43.5	0.005	0.00	0.600	o	100	Pipe/Conduit
*	1.003	6.100	0.076	80.3	0.000	0.00	0.600	o	150	Pipe/Conduit

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
*	1.000	1	47.590	47.097	0.393	47.590	47.096	0.394		300
*	1.001	2	47.590	47.096	0.394	44.390	43.936	0.354	Orifice	300
*	1.002	3	44.390	43.936	0.354	44.420	43.676	0.644		300
*	1.003	7	44.420	43.626	0.644	44.420	43.550	0.720		600 x 600

Online Controls for Storm

Orifice Manhole: 2, DS/PN: 1.001, Volume (m³): 0.0

Diameter (m) 0.047 Discharge Coefficient 0.600 Invert Level (m) 47.096

	7 Tatham Place SW Design
Date 21/07/2021 File 210720 SW TP.MDX	Designed by Checked by PZ
Innovyze	Network 2019.1

Storage Structures for Storm

Porous Car Park Manhole: 1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	4.2
Max Percolation (l/s)	5.8	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	47.097	Cap Volume Depth (m)	0.060

	7 Tatham Place SW Design
Date 21/07/2021 File 210720 SW TP.MDX	Designed by Checked by PZ
Innovyze	Network 2019.1

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.700	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	30 Winter	100	+40%	100/30 Winter				47.201
1.001	2	30 Winter	100	+40%	100/30 Winter				47.198
1.002	3	15 Winter	100	+40%					43.983
1.003	7	15 Winter	100	+40%					43.675

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.004	0.000	0.32		1.3	SURCHARGED	
1.001	2	0.002	0.000	0.03		1.3	SURCHARGED	
1.002	3	-0.053	0.000	0.44		3.8	OK	
1.003	7	-0.101	0.000	0.23		3.8	OK	

CALCULATIONS

Company:		Office:	London
Sheet No:	1	Project No:	
By:		Date:	
Checked:	PZ	Date:	21.7.21

Project Title: **7 Tatham Place**

Calculations Title: **Proposed Foul Flow Estimate** **Summary Sheet**

LOCATION	CALCULATIONS				OPTIONS
	Foul water discharge from proposed development to adjacent public sewers calculated based on water consumption method in accordance to Sewers for Adoption 6th Edition, Urban Drainage by Butler & Davies and Thames Water guidelines.				
	Residential - Number of Units	=	**2**		
	Hotel - Number of Bedrooms	=	**0**		
	Hostel - Number of Beds	=	**0**		
	Student Accommodation - Number of Beds	=	**0**		
	Offices - Floor Area	=	**0**		
	Shops - Floor Area	=	**0**		
	Cinema - Floor Area / Number of Seats	=	**0**	= **0**	
	Gym - Number of Persons	=	**0**		
	Day School - Number of Pupils	=	**0**		
	Boarding School - Number of Pupils	=	**0**		
	Hospital - Number of Beds / Floor Area	=	**0**	= **0**	
	Nursing Home - Number of Beds	=	**0**		
	Restaurant - Number of Customers	=	**0**	= **0**	
	Pub / Club - Floor Area / No. of Customers	=	**0**	= **0**	
	Laboratory - Floor Area / No. of People	=	**0**	= **0**	
	Community / Assembly Hall - No. Seats	=	**0**		
	Commercial Premises- Floor Area	=	**0**		
	Assumed to 2 Residential Units for 6 persons occupancies				
	TOTAL FOUL WATER DISCHARGE	=	**0.09**	**l/s**	

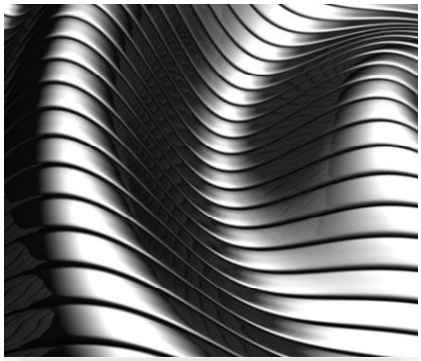
CALCULATIONS

Company:		Office:	London
Sheet No:	2	Project No:	0
By	0	Date	0
Checked:	PZ	Date	21.7.21

Project Title

Calculations Title **Proposed Foul Flow Estimate** **Calculation Sheet**

LOCATION	CALCULATIONS	OPTIONS
	Foul water discharge from proposed development to adjacent public sewers calculated based on water consumption method in accordance to Sewers for Adoption 6th Edition, Urban Drainage by Butler & Davies and Thames Water guidelines.	
	Residential	
	Flow base on daily flow rate for **Residential Unit** of 4000 litres per day per unit [= 0.046l/s/unit (6DWF)]	
	Number of Residential Units = 2	
	Estimated Foul Flow Q_f = 2 x 0.046	
	Q_f = 0.09 l/s	
	Hotel	
	Flow base on daily flow rate for **Hotel** of 550 litres per 24 hour per room [= 0.038l/s/room (6DWF)]	
	Number of Hotel Bedrooms = 0	
	Estimated Foul Flow Q_f = 0 x 0.038	
	Q_f = 0.00 l/s	
	Hostel	
	Flow based on daily flow rate for **Hostels** of 300 litres per 24 hour day per bed [= 0.021l/s/bed(6DWF)]	
	Number of Beds = 0	
	Estimated Foul Flow Q_f = 0 x 0.021	
	Q_f = 0.00 l/s	



APPENDIX B

OF BIA

GROUND INVESTIGATIONS

BY SITE ANALYTICAL
REFRENCE NUMBER: 21/33630 | Date: July 2021

Report on a

GEOTECHNICAL GROUND INVESTIGATION

Ref: 21/33630 | Date: July 2021

7 Tatham Place
St John's Wood
London
NW8 6AF

Prepared for:
Elmgrove Developments Limited

DOCUMENT CONTROL

Project	7 Tatham Place, St John's Wood, London, NW8 6AF
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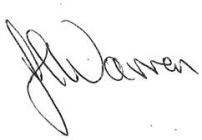	
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CONTENTS

1.0 Executive Summary

Site Location	7 Tatham Place, St John's Wood, London, NW8 6AF
Client	Elmgrove Developments Limited
Proposed Development	It is proposed to extend the existing basement to the rear of the property into the rear garden.
Environmental Setting	The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain by deposits of London Clay Formation at depth. A surface cover of Made Ground should also be expected. The Bedrock geology underlying the site has been classified as a non-aquifer.

GEOTECHNICAL INVESTIGATION

Ground Conditions Encountered	The borehole and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.50m in thickness resting on a thin layer of Alluvial deposits with the London Clay Formation at depth.
Groundwater	Groundwater was recorded in the monitoring standpipe installed in Borehole 1 after a period of approximately three weeks at a depth of 4.19m below ground level. Based on the ground conditions it is considered that this water level represents trapped water rather than true groundwater.
Engineering Observations & Recommendations	Based on the ground and groundwater conditions encountered in the borehole, it could, in theory, be possible to support the proposed new development on conventional strip foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff silty sandy clay deposits which occur at a depth of 2.00m across the site. Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 250kN/m^2 at 3.00m depth below ground level in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from "Foundation Design and Construction", Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

2.0 Introduction

2.1 Outline and Limitations of Report

At the request of Elmgrove Developments Limited, a ground investigation was carried out in connection with a proposed development at the above site.

The information was required for the design and construction of foundations and infrastructure for the proposed development, which includes the extension of the existing basement to the rear of the property into the rear garden.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

3.0 Site Details

National Grid Reference: TQ – 268 834

3.1 Site Location

The site is located on the north eastern side of Tatham Place, St John's Wood at approximate postcode NW8 6AF. The site consists of a mid-terraced three storey residential property, with an existing basement level under the property.

The site is bound by residential properties to the north, east and west.

3.2 Published Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain by deposits of London Clay Formation at depth. A surface cover of Made Ground should also be expected.

4.0 Scope of Work

4.1 Site Works

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of one continuous flight auger borehole to a depth of 10.00m below ground level (Borehole 1).
- The installation of a groundwater monitoring standpipe to a depth of 6.00m depth in Borehole 1, together with a single return monitoring visit.
- The logging of the previously excavated trial pits on-site (Trial Pits 1-6 inclusive). Trial Pit 5 was not completed.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the borehole and trial pits.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.
- Interpretative reporting on foundation options for the proposed building and infrastructure.

4.2 Ground Conditions

The approximate locations of the exploratory holes are illustrated on the site sketch plan, Figure 1 below.

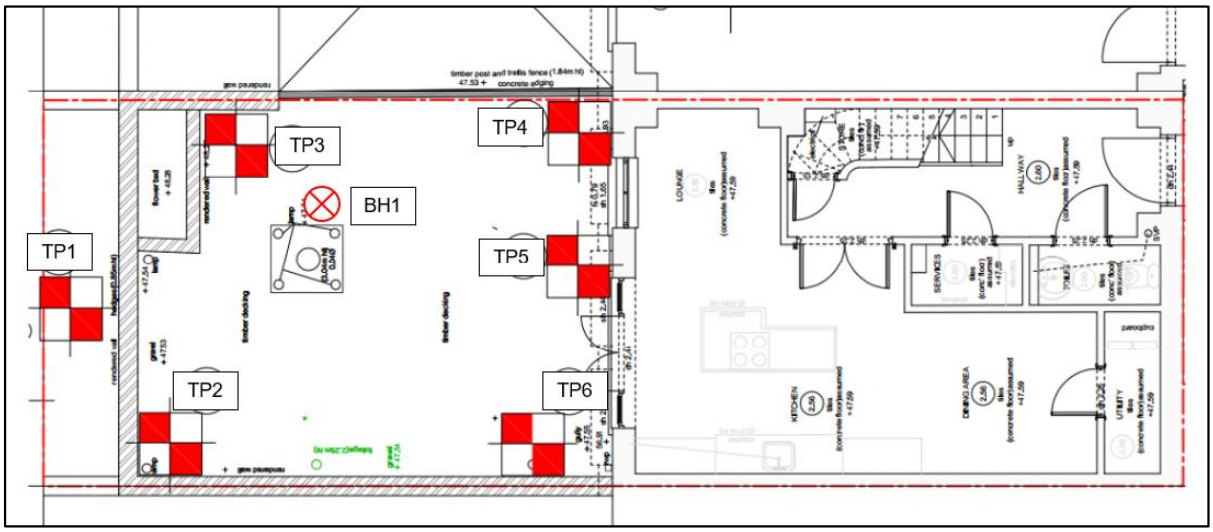

Figure 1. Site Sketch Plan

The borehole and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.50m in thickness resting on a thin layer of Alluvial deposits with the London Clay Formation at depth.

For detailed information on the ground conditions encountered in the borehole and trial pits, reference should be made to the exploratory hole records presented in Appendix A.

4.3 Groundwater

Groundwater was not encountered in the borehole or any of the trial pits and the material remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the borehole and trial pits and hence be detected, particularly within more cohesive soils.

Groundwater was recorded in the monitoring standpipe installed in Borehole 1 after a period of approximately three weeks at a depth of 4.19m below ground level. Based on the ground conditions it is considered that this water level represents trapped water rather than true groundwater.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (June 2021) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.4 Existing Foundations

Sketches of the foundations exposed in Trial Pits 1 to 6 inclusive are presented on the appropriate exploratory hole records contained in Appendix A.

5.0 In-Situ and Laboratory Tests

5.1 In-Situ Tests

In the essentially cohesive natural soils encountered at the site, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930 (2015).

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

Mackintosh Probe tests were made at regular depth increments in order to assess the relative density of the soils encountered in the trial pits. The results can be interpreted using the generally accepted correlation for Mackintosh Probe Tests which is as follows:

Mackintosh N75 X 0.38 = SPT 'N' Value

or

Mackintosh N300 X 0.1 = SPT 'N' Value

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

5.2 Classification Tests

Atterberg Limit tests were conducted on three selected samples taken from the cohesive portion of the natural soils in Borehole 1 and showed the samples tested to fall into Classes CH and CV according to the British Soil Classification System.

These are fine grained silty clay soils of high to very high plasticity and as such generally have a low permeability and a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 42% and 48%, with all samples being above the 40% boundary between soils assessed as being of medium swelling and shrinkage potential and those assessed as being of high swelling and shrinkage potential.

The results of the tests are presented on Table 1, contained in Appendix B.

5.3 Chemical Attack on Buried Concrete

Using the results contained in Appendix B, the following table provides the highest values encountered for the BRE SD1 Suite D specification and the equivalent DS and ACEC classes, based on a static ground water:

Strata	pH	2:1 Water Soluble SO4 (g/l)	Total Sulphur (%)	Total Sulphate (%)	Magnesium (mg/l)	DS Class	ACEC Class
London Clay Formation	7.9 - 8.4	4.1	0.678	1.43	1000	DS-4	AC-3s

Worst case DS and ACEC classes based on the BRE SD1 Suite D results

6.0 Waste Acceptance Criteria Testing

6.1 Waste Acceptance Criteria Analysis

A sample was obtained from 0.25m depth below ground level in Borehole 1 made at the location indicated on the site sketch plan (Figure 1).

The sample selected for analysis was sub-contracted to DETS Limited (a UKAS and MCERTS accredited laboratory) and their report is contained in Appendix B.

The sample was analysed using the Catwastesoil assessment tool, which concluded that the sample was not hazardous in nature.

The sample was analysed for Waste Acceptance Criteria (WAC) testing in order to classify soils on site for disposal purposes.

For the purpose of waste disposal, the soil sample would be classified as:

BH1 @ 0.25m **Inert Waste**

7.0 Foundation Design

7.1 General

It is proposed to extend the existing basement to the rear of the property into the rear garden. Details of the structures, layouts etc. have been provided, although details of the loadings were not available at the time of preparation of this report.

7.2 Site Preparation Works

The main contractor should be informed of the site conditions and risk assessments should be undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man-made services are undertaken over the site prior to final design works.

7.3 Conventional Spread Foundations

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Based on the ground and groundwater conditions encountered in the borehole, it could, in theory, be possible to support the proposed new development on conventional strip foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff silty sandy clay deposits which occur at a depth of 2.00m across the site.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 250kN/m^2 at 3.00m depth below ground level in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from “Foundation Design and Construction”, Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, “Building near Trees" and it is considered that this document is relevant in this situation.

7.4 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

7.5 Retaining Walls

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in the table below to assist the design of these structures.

Stratum	Depth to top	Bulk Density (Mg/m3) (ɣ)	Effective Angle of Internal Friction (Φ)
Recent Alluvium	0.90	1.80	25
London Clay Formation	1.50 to 2.00	2.00	23

Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients ka and kp. The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

7.6 Floor Slabs

Due to the presence of soils assessed to be of high swelling and shrinkage potential below, it is recommended that ground slabs should be fully suspended.

Within the zone of influence of trees, either retained or removed, floor slabs should incorporate either underfloor voids or suitable depths of compressible material in accordance with NHBC requirements, for soils with high volume change potential.

Based on the excavation depth, the unloading of the ground will equate to 70kN/m^2. Short term heave is anticipated to be in the region of 9mm to 14mm with long term heave of approximately 19mm. Heave pressures are typically 50% to 60% of the unloading pressure at 35kN/m^2 to 42kN/m^2.

7.7 Excavations

Given the presence of a non-aquifer below the site it is likely that the groundwater recorded within these soils relates to perched water within the Made Ground and is recharged via intermittent seepages from surface water associated with weather conditions rather than any large-scale subterranean groundwater flow. As a result, the impact on excavations carried out at the site from this perched water is expected to be minimal.

However, it may still be necessary to control this water during the construction period and consideration could be given to conventional internal pumping methods from open sumps.

It is recommended that the water levels in the monitoring borehole be periodically measured immediately prior to and during, the development. Should groundwater levels rise to within the excavation volume, or should significant groundwater inflow be observed during excavation, professional advice should be sought.

8.0 List of Appendices

Appendix A – Borehole / Trial Pit Logs

Appendix B – Laboratory Test & Groundwater Monitoring Data

9.0 References

1. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

2. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London

3. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London

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6. Building Research Establishment Special Digest 1, 2005, "Concrete in Aggressive Ground – Third Edition."

7. Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107

8. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London

9. Nathanail C.P., McCaffrey, C., Ashmore, M.H., Cheng, Y.Y., Gillet, A., Ogden, R. & Scott, D., 2009. The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition). Land Quality Press, Nottingham.

10. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

11. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

12. Stroud M.A. and Butler F.G. (1975) Symposium on the Engineering Behaviour of Glacial Materials; the Midland Soil Mechanics and Foundation Engineering Society; pgs 124 et seq.

13. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

APPENDIX A

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site	Borehole Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location	**Dates**	**Engineer**	**Sheet**
	TQ268834	04/06/2021	ZUSSMANBEAR	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Brown silty clayey fine to coarse grained sand containing brick and concrete fragments		
0.25	D1					0.30	Soft, light brown grey silty organic CLAY		
0.50	D2								
0.75	D3					(0.90)			
1.00	D4								
1.00	V1 38					1.20	Firm becoming stiff, dark grey very silty organic CLAY		
1.50	D5					(0.80)			
1.50	V2 49								
2.00	D6					2.00	Stiff, mottled brown orange silty sandy CLAY. Occasional blue grey veining		
2.00	V3 84					(0.50)			
2.50	D7					2.50	Stiff, brown silty sandy CLAY		
2.50	V4 102								
3.00	D8								
3.00	V5 130+					(1.50)			
3.50	D9								
3.50	V6 130+								
4.00	D10					4.00	Stiff, mottled brown CLAY containing orange fine grained sandy pockets		
4.00	V7 130+					(0.80)			
4.50	D11								
4.50	V8 130+					4.80	Stiff, brown silty sandy CLAY		
5.00	D12								
5.00	V9 130+								
6.00	D13					(2.70)			
6.00	V10 130+								
7.00	D14								
7.00	V11 130+					7.50	Stiff, dark brown grey silty sandy CLAY containing partings of silty fine grained sand and occasional gypsum crystals		
8.00	D15								
8.00	V12 130+					(2.50)			
9.00	D16								
9.00	V13 130+								
10.00	D17								
10.00	V14 130+					10.00			

Remarks
Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
D= Disturbed Sample

Scale (approx)	Logged By
1:50	EW

Figure No.
2133630.BH1

Site Analytical Services Ltd.

Site	Borehole Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	BH1

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
ELMGROVE DEVELOPEMENTLIMITED

Job Number
2133630

Location
TQ268834

Ground Level (mOD)

Engineer
ZUSSMANBEAR

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
				1.00	Bentonite Seal
				5.50	Slotted Standpipe
				6.50	Bentonite Seal
				10.00	General Backfill

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks
Lockable cover set in cement

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.92m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.92)	MADE GROUND: Planting area over reinforced bars in pre-existing wall		
					0.92	Complete at 0.92m		

Plan

Remarks

Groundwater was not encountered during boring/excavation

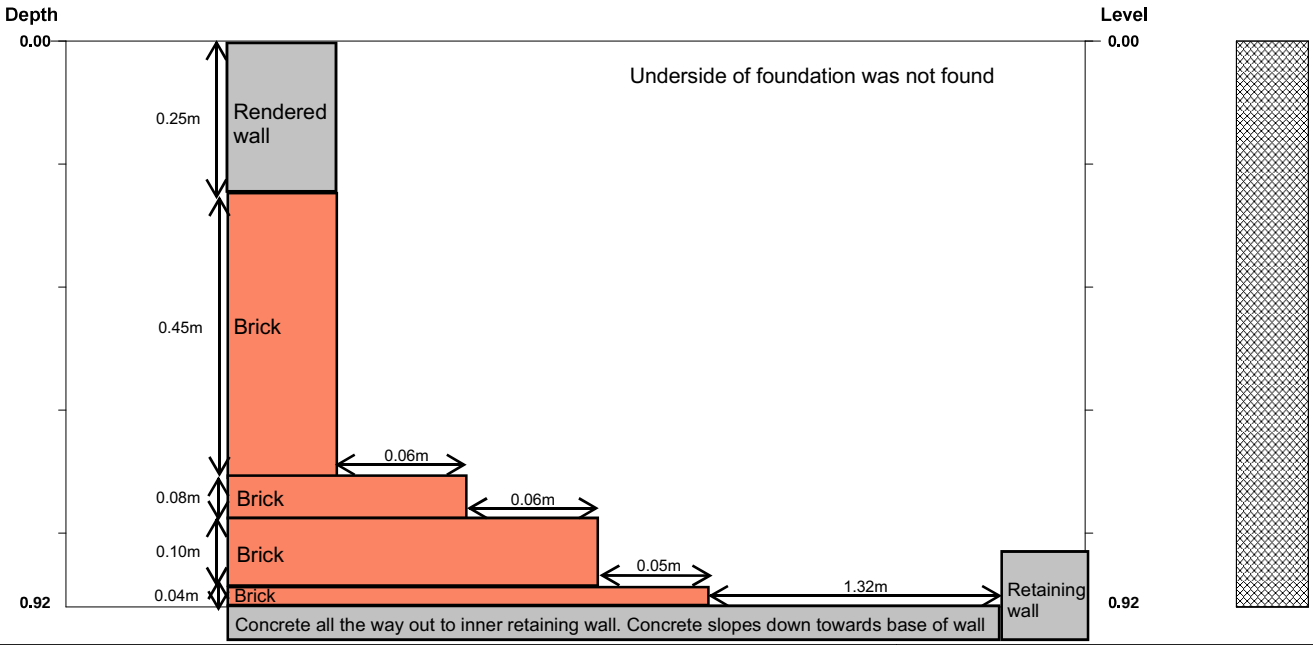
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP1

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP1

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.92m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata

Depth (m)	No.	Description
0.00-0.92	1	MADE GROUND: Planting area over reinforced bars in pre-existing wall

Samples and Tests

Depth (m)	Type	Field Records

Excavation Method:
HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks
Groundwater was not encountered during boring/excavation

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP1

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP2A

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.85m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	D1				(0.85)	MADE GROUND: Pre-existing deck over firm, mottled orange brown silty sandy clay containing brick and concrete fragments		
0.75	D2				0.85	Complete at 0.85m		
0.75	V1 61							

Plan

Remarks

Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
D= Disturbed Sample

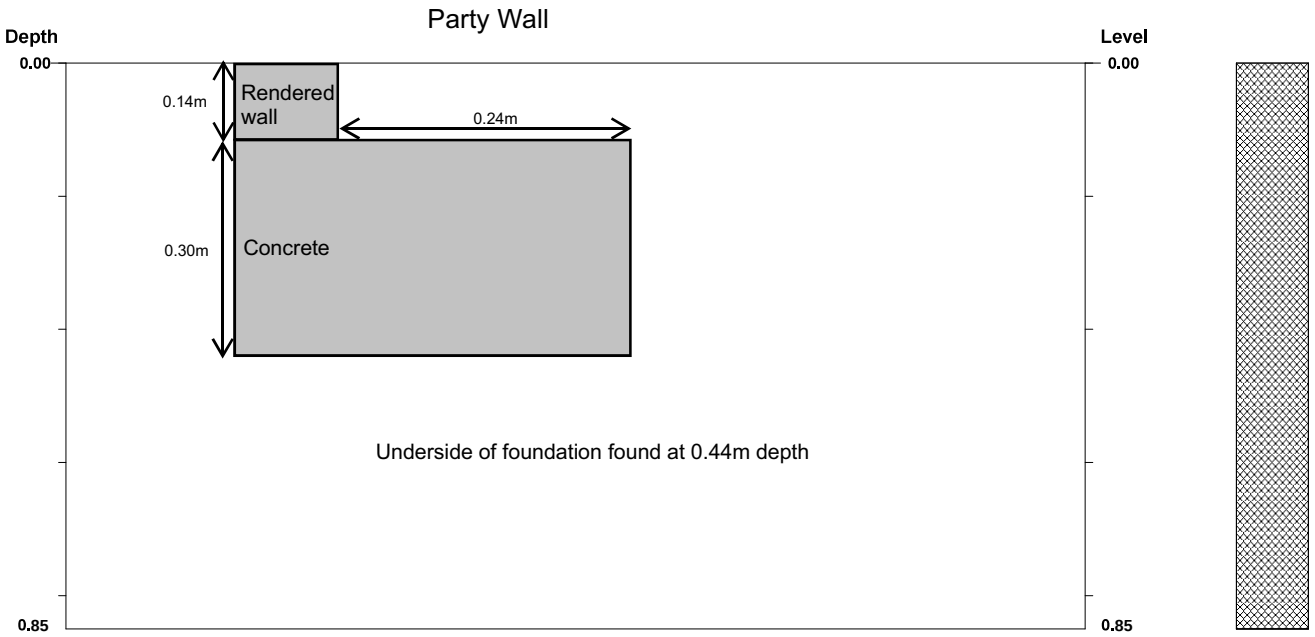
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP2A

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP2A

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.85m(D)		ELMGROVE DEVELOPEMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-0.85	1	MADE GROUND: Pre-existing deck over firm, mottled orange brown silty sandy clay containing brick and concrete fragments	0.50 0.75 0.75	D1 V1 61 D2	

Excavation Method:

HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks

Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
D= Disturbed Sample

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP2A

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP2B

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.85m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	D1				(0.85)	MADE GROUND: Pre-existing deck over firm, mottled orange brown silty sandy clay containing brick and concrete fragments		
0.75 0.75	D2 V1 61				0.85	Complete at 0.85m		

Plan

Remarks

Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
D= Disturbed Sample

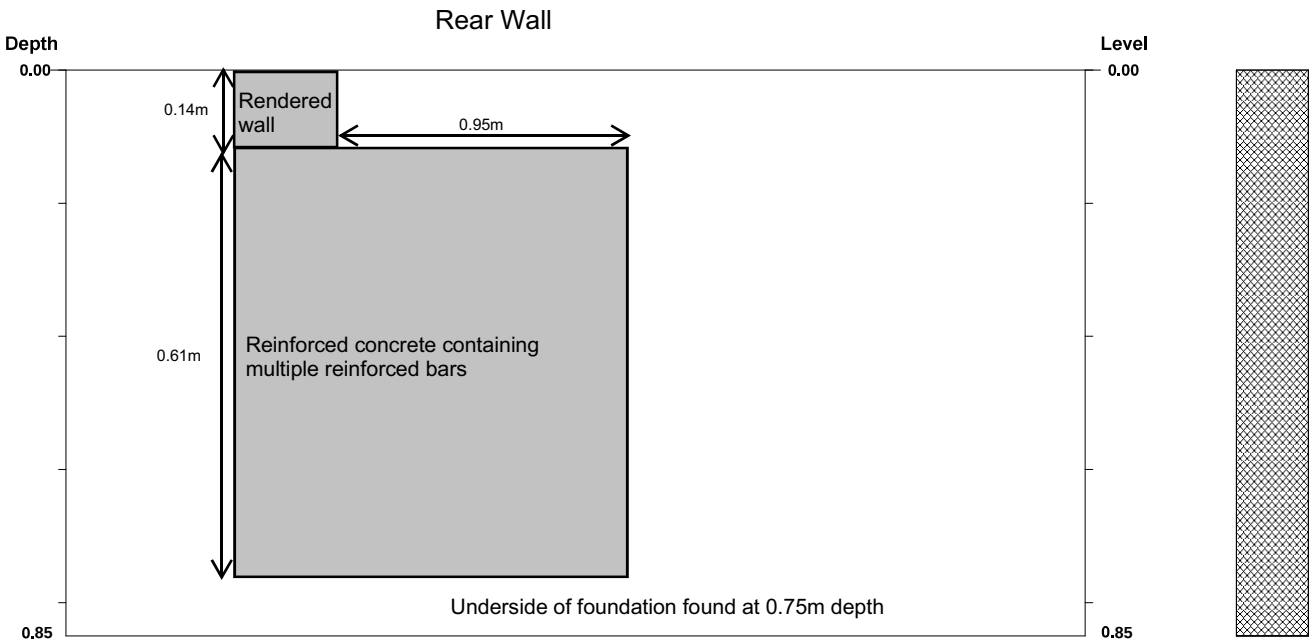
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP2B

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP2B

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.85m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-0.85	1	MADE GROUND: Pre-existing deck over firm, mottled orange brown silty sandy clay containing brick and concrete fragments	0.50 0.75 0.75	D1 V1 61 D2	

Excavation Method:

HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks

Groundwater was not encountered during boring/excavation
V= Vane Test - Results in kPa
D= Disturbed Sample

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP2B

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP3A

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.70m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.25	D1				(0.70)	MADE GROUND: Pre-existing deck over brown silty gravelly clay containing brick and concrete		
0.60	D2				0.70	Complete at 0.70m		

Plan

Remarks

Groundwater was not encountered during boring/excavation
D= Disturbed Sample

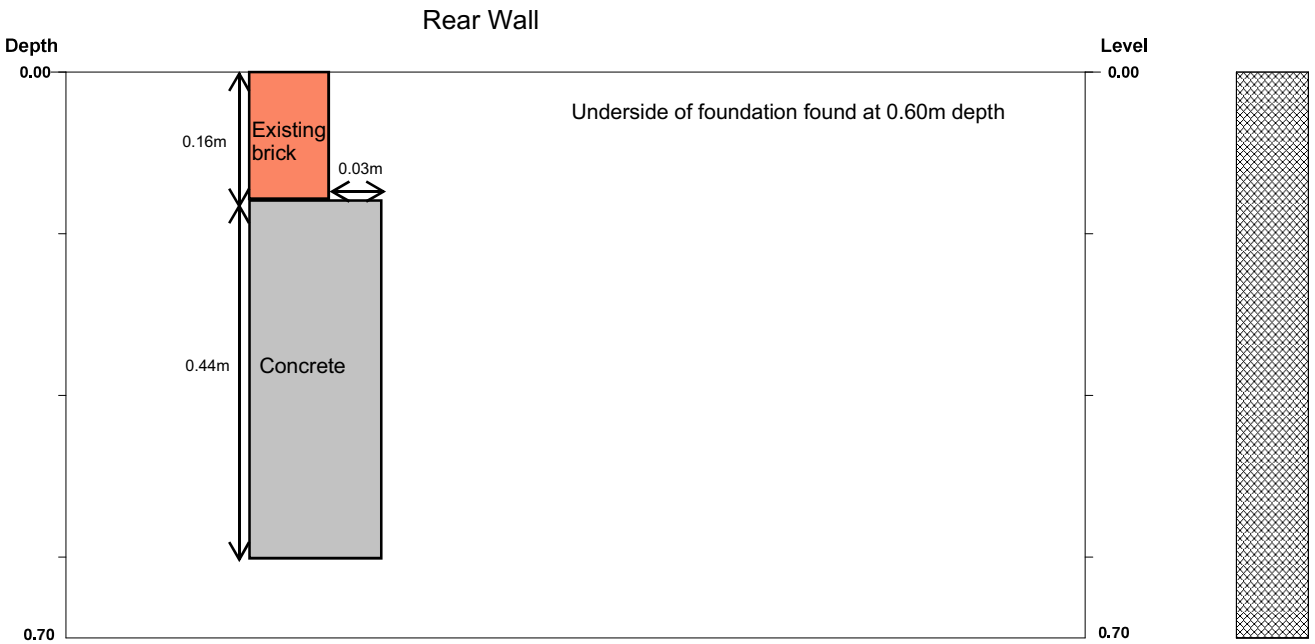
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP3A

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP3A

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.70m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-0.70	1	MADE GROUND: Pre-existing deck over brown silty gravelly clay containing brick and concrete	0.25 0.60	D1 D2	

Excavation Method:
HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks
Groundwater was not encountered during boring/excavation
D= Disturbed Sample

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP3A

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP3B

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.70m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.25	D1				(0.70)	MADE GROUND: Pre-existing deck over brown silty gravelly clay containing brick and concrete		
0.60	D2				0.70	Complete at 0.70m		

Plan

Remarks

Groundwater was not encountered during boring/excavation
D= Disturbed Sample

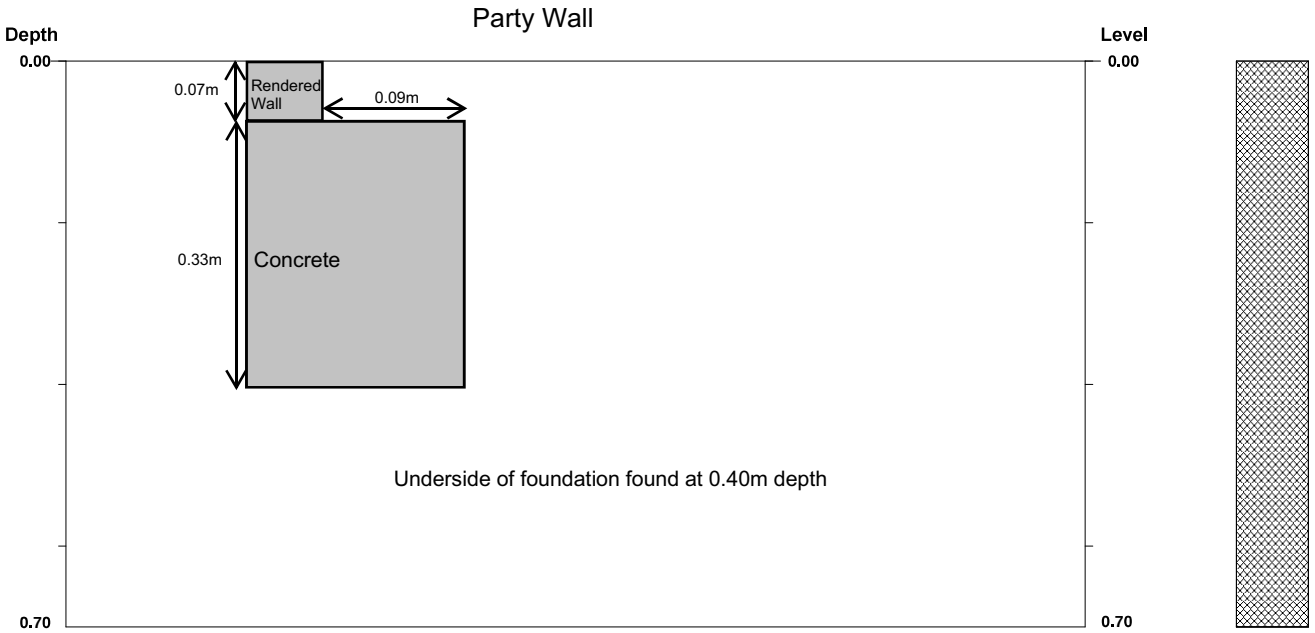
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP3B

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP3B

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.70m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-0.70	1	MADE GROUND: Pre-existing deck over brown silty gravelly clay containing brick and concrete	0.25 0.60	D1 D2	

Excavation Method:
HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks
Groundwater was not encountered during boring/excavation
D= Disturbed Sample

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP3B

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP4A

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 1.50m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(1.50)	MADE GROUND: Pre-exisiting level over mixed rubble		
					1.50	Complete at 1.50m		

Plan

Remarks

Groundwater was not encountered during boring/excavation

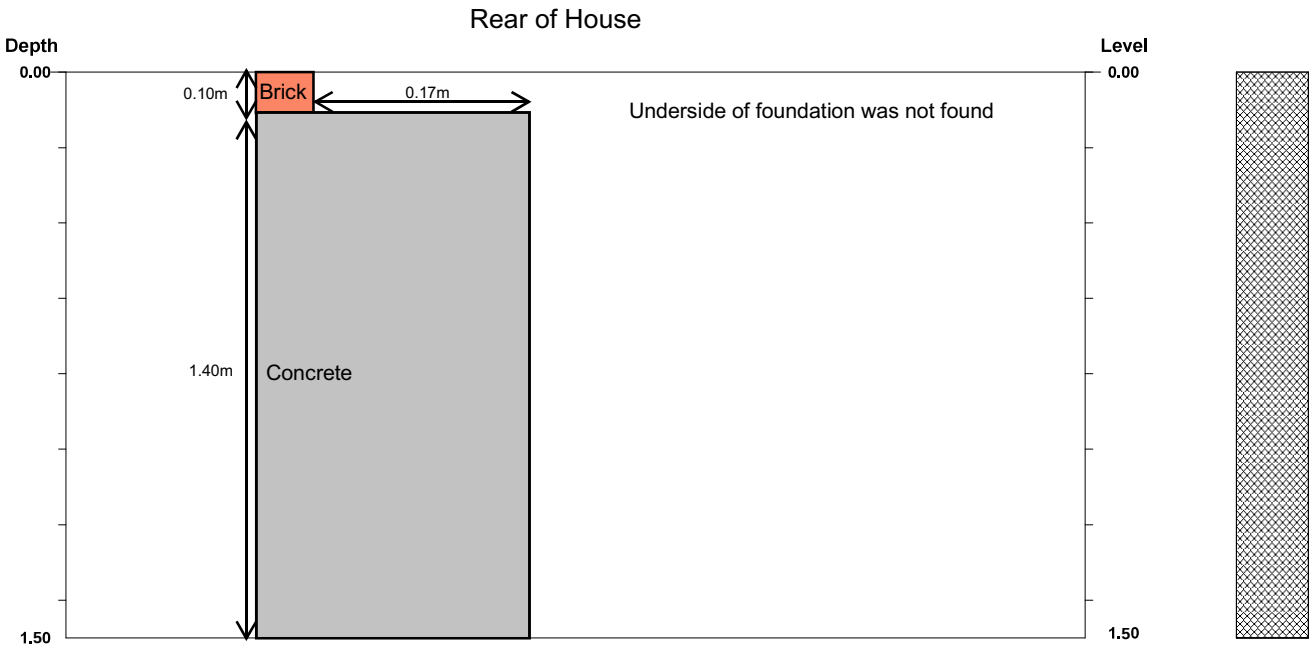
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP4A

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP4A

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 1.50m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A D B C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-1.50	1	MADE GROUND: Pre-exisiting level over mixed rubble			

Excavation Method:
HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks
Groundwater was not encountered during boring/excavation

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP4A

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP4B

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 1.50m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(1.50)	MADE GROUND: Pre-exisiting level over mixed rubble		
					1.50	Complete at 1.50m		

Plan

Remarks

Groundwater was not encountered during boring/excavation

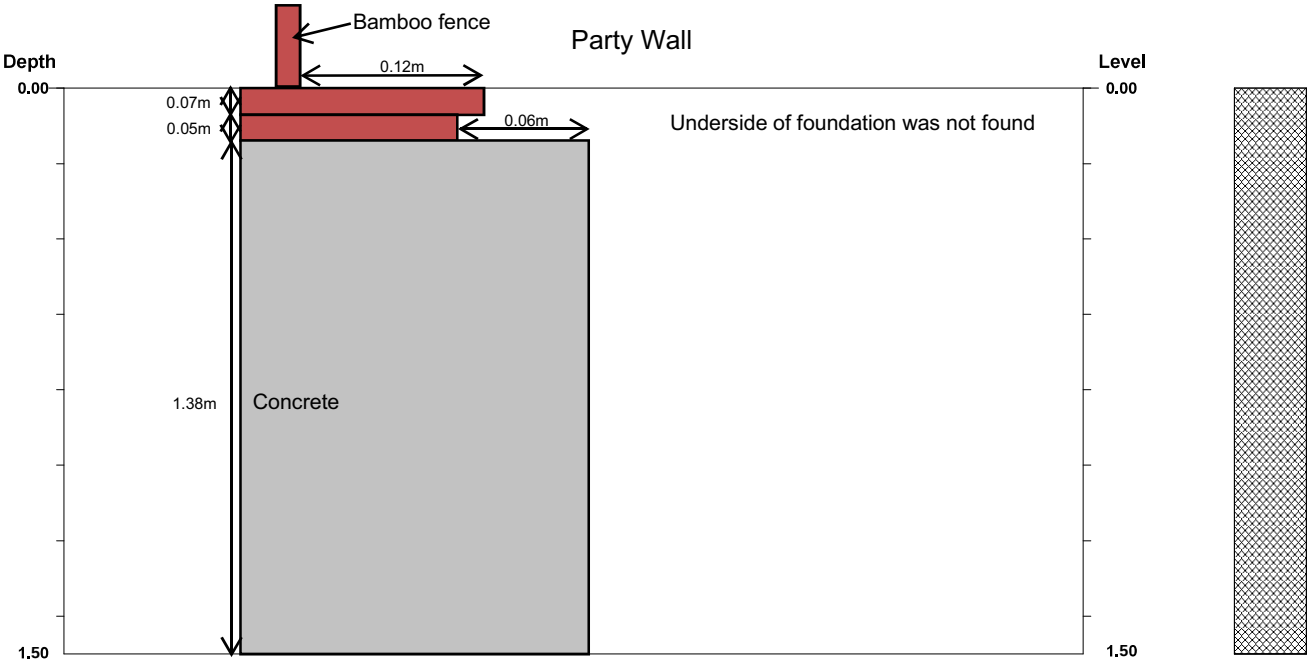
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP4B

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP4B

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 1.50m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-1.50	1	MADE GROUND: Pre-exisiting level over mixed rubble			

Excavation Method:
HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks
Groundwater was not encountered during boring/excavation

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP4B

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP6

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.80m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630
	Location TQ268834	**Dates** 04/06/2021	**Engineer** ZUSSMANBEAR	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.25	D1				(0.80)	MADE GROUND: Pre-existing deck over soft, brown sandy clay containing rubble		
0.50 0.50-0.80	D2 M1 67/300				0.80	Complete at 0.80m		

Plan

Remarks

Groundwater was not encountered during boring/excavation
M= Makintosh Probe-Blows/Penetration (mm)
D= Disturbed Sample

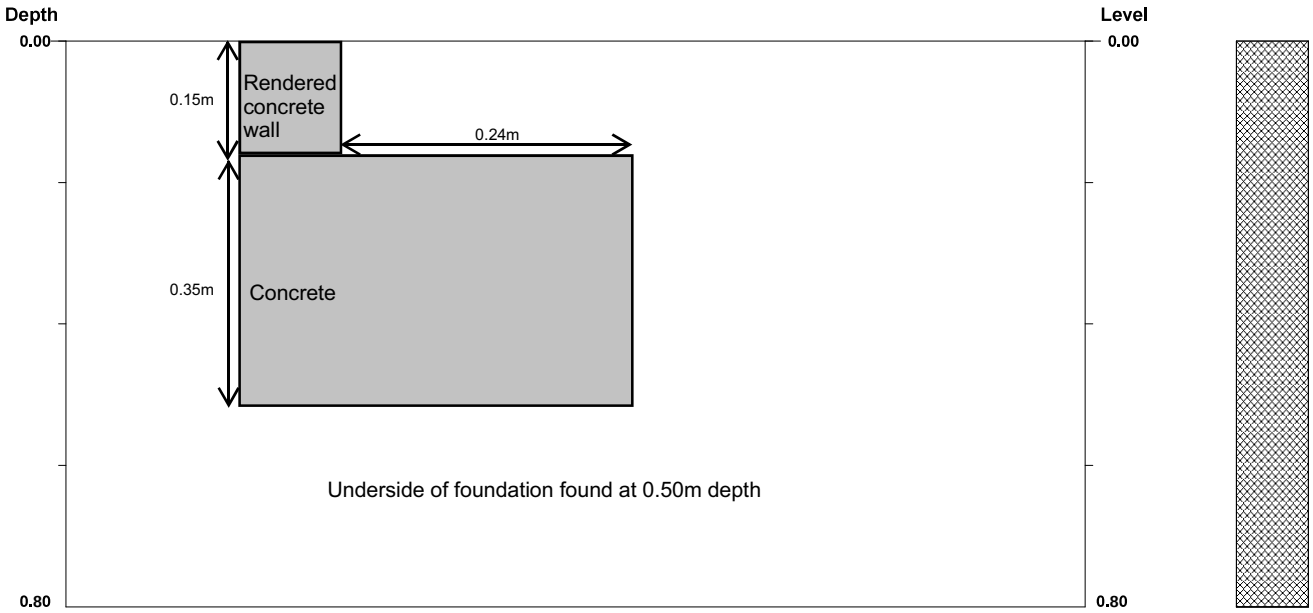
Scale (approx)	Logged By	Figure No.
1:50	EW	2133630.TP6

Site Analytical Services Ltd.

Site	Trial Pit Number
7 TATHAM PLACE, ST JOHN'S WOOD, LONDON, NW8 6AF	TP6

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.80m(D)		ELMGROVE DEVELOPMENT LIMITED	2133630

Orientation	Location	Dates	Engineer	Sheet
A D B C	TQ268834	04/06/2021	ZUSSMANBEAR	1/1



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Field Records
0.00-0.80	1	MADE GROUND: Pre-existing deck over soft, brown sandy clay containing rubble	0.25 0.50 0.50-0.80	D1 D2 M1 67/300	

Excavation Method:

HAND EXCAVATION

Shoring / Support:

Stability:

Backfill:

Remarks

Groundwater was not encountered during boring/excavation
M= Makintosh Probe-Blows/Penetration (mm)
D= Disturbed Sample

Logged By	: EW
Checked By	:
Figure No.	: 2133630.TP6

APPENDIX B

Laboratory Test & Groundwater Monitoring Data

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

BH/TP No.	Depth (m)	Natural Moisture (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 μm (%)	Modified Plasticity Index (%)	Class
BH1	1.00	49	75	27	48	100	48	CV
	2.00	38	68	26	42	100	42	CH
	3.00	36	67	25	42	100	42	CH

Table 1

GROUNDWATER MONITORING

GROUNDWATER MONITORING RECORD			
Date	**Weather Conditions**	**Ground Conditions**	**Temperature (°C)**
24/06/2021	Sunny	Dry	22.0
Monitoring Point Location	**Depth to water (mBGL)**		**Depth to Base of well (mBGL)**
BH1	4.19		5.53

Table 2

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Site Analytical Services Ltd
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33 River Road
Barking
Essex
IG11 0EA

t: 0208 5948134
f: 0208 5948072
e: SAS -

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-79751

Project / Site name:	7 Tatam Place, ST Johns Wood	**Samples received on:**	08/06/2021
Your job number:	21-33630	**Samples instructed on/ Analysis started on:**	08/06/2021
Your order number:	8781	**Analysis completed by:**	15/06/2021
Report Issue Number:	1	**Report issued on:**	15/06/2021
Samples Analysed:	3 soil samples		

Signed: A. Czerwińska

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-79751
Project / Site name: 7 Tatam Place, ST Johns Wood
Your Order No: 8781

Lab Sample Number				1895715	1895716	1895717
Sample Reference				BH1	BH1	BH1
Sample Number				D5	D11	D15
Depth (m)				1.50	4.50	8.00
Date Sampled				04/06/2021	04/06/2021	04/06/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Moisture Content	%	0.01	NONE	28	21	16
Total mass of sample received	kg	0.001	NONE	1.5	1.3	1.0
Whole Sample Crushed		N/A	NONE	Crushed	Crushed	Crushed

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	7.9	8.4
Total Sulphate as SO4	%	0.005	MCERTS	0.068	1.43	0.184
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.32	4.1	1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	317	4120	1010
Total Sulphur	%	0.005	MCERTS	0.171	0.678	0.361

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	98	1000	270

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-79751
Project / Site name: 7 Tatam Place, ST Johns Wood

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1895715	BH1	D5	1.5	Brown clay and sand.
1895716	BH1	D11	4.5	Brown clay.
1895717	BH1	D15	8	Brown clay.

Analytical Report Number : 21-79751
Project / Site name: 7 Tatam Place, ST Johns Wood

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Crush Whole Sample	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis; OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis.	In house method, applicable to dry samples only.	L019-PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

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IG11 0EA

DETS Ltd
Unit 1
Rose Lane Industrial Estate
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Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 21-07391

Site Reference:	7 Tatham Place, St Johns Wood, London, NW8 6AF
Project / Job Ref:	21/33630
Order No:	8780
Sample Receipt Date:	09/06/2021
Sample Scheduled Date:	09/06/2021
Report Issue Number:	1
Reporting Date:	18/06/2021

Authorised by:

Ela Mysiara
Quality Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

For Topsoil and WAC analysis the expanded uncertainty measurement should be considered while evaluating results against compliance values.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 21-07391	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF	**TP / BH No**	BH1				
Project / Job Ref: 21/33630	**Additional Refs**	D1				
Order No: 8780	**Depth (m)**	0.25				
Reporting Date: 18/06/2021	**DETS Sample No**	548348				

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected				
pH	pH Units	N/a	MCERTS	7.8				
Total Cyanide	mg/kg	< 2	NONE	< 2				
Complex Cyanide	mg/kg	< 2	NONE	< 2				
Free Cyanide	mg/kg	< 2	NONE	< 2				
Total Sulphate as SO_4	mg/kg	< 200	MCERTS	1454				
Total Sulphate as SO_4	%	< 0.02	MCERTS	0.15				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	194				
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.19				
Sulphide	mg/kg	< 5	NONE	< 5				
Organic Matter (SOM)	%	< 0.1	MCERTS	7				
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	1.8				
Arsenic (As)	mg/kg	< 2	MCERTS	23				
W/S Boron	mg/kg	< 1	NONE	< 1				
Cadmium (Cd)	mg/kg	< 0.2	NONE	< 0.2				
Chromium (Cr)	mg/kg	< 2	MCERTS	27				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	MCERTS	86				
Lead (Pb)	mg/kg	< 3	MCERTS	275				
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1				
Nickel (Ni)	mg/kg	< 3	MCERTS	17				
Selenium (Se)	mg/kg	< 2	MCERTS	< 3				
Zinc (Zn)	mg/kg	< 3	MCERTS	125				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

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4480

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 21-07391	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF	**TP / BH No**	BH1				
Project / Job Ref: 21/33630	**Additional Refs**	D1				
Order No: 8780	**Depth (m)**	0.25				
Reporting Date: 18/06/2021	**DETS Sample No**	548348				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1				
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1				
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1				
Coronene	mg/kg	< 0.1	NONE	< 0.1				
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1				
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1				
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6				
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7				

DETS Ltd
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Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 21-07391	**Date Sampled**	None Supplied				
Site Analytical Services Ltd	**Time Sampled**	None Supplied				
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF	**TP / BH No**	BH1				
Project / Job Ref: 21/33630	**Additional Refs**	D1				
Order No: 8780	**Depth (m)**	0.25				
Reporting Date: 18/06/2021	**DETS Sample No**	548348				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21			
Total >C5 - C35	mg/kg	< 42	NONE	< 42			

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Soil Analysis Certificate - BTEX / MTBE							
DETS Report No: 21-07391	**Date Sampled**	None Supplied					
Site Analytical Services Ltd	**Time Sampled**	None Supplied					
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF	**TP / BH No**	BH1					
Project / Job Ref: 21/33630	**Additional Refs**	D1					
Order No: 8780	**Depth (m)**	0.25					
Reporting Date: 18/06/2021	**DETS Sample No**	548348					

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2				
Toluene	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene	ug/kg	< 2	MCERTS	< 2				
p & m-xylene	ug/kg	< 2	MCERTS	< 2				
o-xylene	ug/kg	< 2	MCERTS	< 2				
MTBE	ug/kg	< 5	MCERTS	< 5				

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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3

DETS Report No: 21-07391	**Date Sampled**	None Supplied	
Site Analytical Services Ltd	**Time Sampled**	None Supplied	
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF	**TP / BH No**	BH1	
Project / Job Ref: 21/33630	**Additional Refs**	D1	
Order No: 8780	**Depth (m)**	0.25	
Reporting Date: 18/06/2021	**DETS Sample No**	548348	

Determinand	**Unit**	**MDL**		**Landfill Waste Acceptance Criteria Limits**		
				Inert Waste Landfill	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
TOC[MU]	%	< 0.1	1.8	3%	5%	6%
Loss on Ignition	%	< 0.01	6.10	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1	1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10	500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7	100	--	--
pH[MU]	pH Units	N/a	7.8	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1	--	To be evaluated	To be evaluated

Eluate Analysis	**2:1 mg/l**	**8:1 mg/l**		**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01	< 0.01		< 0.2	0.5	2	25
Barium[U]	< 0.02	0.02		0.2	20	100	300
Cadmium[U]	< 0.0005	< 0.0005		< 0.02	0.04	1	5
Chromium[U]	< 0.005	< 0.005		< 0.20	0.5	10	70
Copper[U]	< 0.01	< 0.01		< 0.5	2	50	100
Mercury[U]	< 0.0005	< 0.0005		< 0.005	0.01	0.2	2
Molybdenum[U]	0.011	0.006		< 0.1	0.5	10	30
Nickel[U]	< 0.007	< 0.007		< 0.2	0.4	10	40
Lead[U]	< 0.005	< 0.005		< 0.2	0.5	10	50
Antimony[U]	< 0.005	< 0.005		< 0.05	0.06	0.7	5
Selenium[U]	< 0.005	< 0.005		< 0.05	0.1	0.5	7
Zinc[U]	0.062	0.009		< 0.2	4	50	200
Chloride[U]	5	5		50	800	15000	25000
Fluoride[U]	0.5	< 0.5		< 1	10	150	500
Sulphate[U]	22	12		132	1000	20000	50000
TDS	163	84		902	4000	60000	100000
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-
DOC	5.5	6.4		62.9	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.22						
Dry Matter (%)	79.7						
Moisture (%)	25.6						
Stage 1							
Volume Eluate L2 (litres)	0.31						
Filtered Eluate VE1 (litres)	0.14						

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 21-07391	
Site Analytical Services Ltd	
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF	
Project / Job Ref: 21/33630	
Order No: 8780	
Reporting Date: 18/06/2021	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 548348	BH1	D1	0.25	20.4	Brown sandy clay with stones and brick

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S
^ no sampling date provided; unable to confirm if samples are within acceptable holding times

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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 21-07391
Site Analytical Services Ltd
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF
Project / Job Ref: 21/33630
Order No: 8780
Reporting Date: 18/06/2021

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

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UKAS TESTING
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Water Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 21-07391
Site Analytical Services Ltd
Site Reference: 7 Tatham Place, St Johns Wood, London, NW8 6AF
Project / Job Ref: 21/33630
Order No: 8780
Reporting Date: 18/06/2021

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 – C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichlorometha	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

Parameter	Matrix Type	Suite Reference	Expanded Uncertainity Measurement	Unit
TOC	Soil	BS EN 12457	20.0	%
Loss on Ignition	Soil	BS EN 12457	35.0	%
BTEX	Soil	BS EN 12457	14.0	%
Sum of PCBs	Soil	BS EN 12457	23.0	%
Mineral Oil	Soil	BS EN 12457	9.0	%
Total PAH	Soil	BS EN 12457	11.6	%
pH	Soil	BS EN 12457	0.28	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18.0	%
Arsenic	Leachate	BS EN 12457	18.7	%
Barium	Leachate	BS EN 12457	11.6	%
Cadmium	Leachate	BS EN 12457	20.3	%
Chromium	Leachate	BS EN 12457	18.3	%
Copper	Leachate	BS EN 12457	24.3	%
Mercury	Leachate	BS EN 12457	23.7	%
Molybdenum	Leachate	BS EN 12457	14.7	%
Nickel	Leachate	BS EN 12457	16.1	%
Lead	Leachate	BS EN 12457	15.7	%
Antimony	Leachate	BS EN 12457	17.9	%
Selenium	Leachate	BS EN 12457	22.0	%
Zinc	Leachate	BS EN 12457	17.4	%
Chloride	Leachate	BS EN 12457	15.3	%
Fluoride	Leachate	BS EN 12457	16.4	%
Sulphate	Leachate	BS EN 12457	20.6	%
TDS	Leachate	BS EN 12457	12.0	%
Phenol Index	Leachate	BS EN 12457	14.0	%
DOC	Leachate	BS EN 12457	10.0	%
Clay Content	Soil	BS 3882: 2015	15.0	%
Silt Content	Soil	BS 3882: 2015	14.0	%
Sand Content	Soil	BS 3882: 2015	13.0	%
Loss on Ignition	Soil	BS 3882: 2015	35.0	%
pH	Soil	BS 3882: 2015	0.14	Units
Carbonate	Soil	BS 3882: 2015	16.0	%
Total Nitrogen	Soil	BS 3882: 2015	12.0	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24.0	%
Potassium (Extractable)	Soil	BS 3882: 2015	20.0	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26.0	%
Zinc	Soil	BS 3882: 2015	14.9	%
Copper	Soil	BS 3882: 2015	16.0	%
Nickel	Soil	BS 3882: 2015	17.7	%
Available Sodium	Soil	BS 3882: 2015	23.0	%
Available Calcium	Soil	BS 3882: 2015	23.0	%
Electrical Conductivity	Soil	BS 3882: 2015	10.0	%