G Sustainable Drainage Strategy

ElliottWood

12 Pilgrim’s Lane

Camden, London, NW3 1SN

Sustainable Drainage Strategy Report

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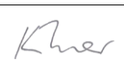
Date: 10.12.2024	Signature:		Signature:		Signature:	

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Contents

1. Executive Summary

Elliott Wood Partnership Ltd have prepared this Sustainable Drainage Strategy to support the full planning application for the proposed redevelopment of 12 Pilgrim's Lane. The site is located within the London Borough of Camden (LBC) who are also the Lead Local Flood Authority (LLFA).

The existing development is a two-storey semi-detached residential building,. The site includes a garden to the south, east, and west of the building. In 2022, a planning application was approved (reference: 2022/2398/P) for the extension and refurbishment of the existing property. This incorporated a new lower ground floor, with a floor area of approximately 205m^2, which contained a pool, plant room, gym and new bedroom

An updated scheme has now been proposed. Whilst the majority of the approved scheme is being kept, there have been minor amendments to massing on the right and left sides of the building, and a reduction in the footprint of the new lower ground floor. This report has been prepared to support the planning application for this updated scheme,

Surface water runoff from the proposed development will be managed through the use of permeable paving and below ground geo-cellular attenuation, with the peak discharge rate restricted to 2.0 l/s, for all storm events including the 1-in-100-year plus 40% climate change allowance. In order to achieve the proposed discharge rates, an attenuation volume of approximately 11.5 m^3 is required. This has been incorporated in the form of a 9.6m^2 geocellular attenuation tank, and a 54.5m^2 area of permeable paving, with a 250mm deep lined porous sub-base beneath, with an attenuation volume of 4.1m^3.

All foul water drainage from above ground floor will offset at high-level within the building, as designed by the M&E engineer, and drop to the below ground drainage network. All ground floor drainage will be connected to this network. All foul drainage below ground floor level will be positively pumped, discharging to the external below ground drainage network.

2. Introduction

The purpose of this report is to explain the approach taken with regards to the below ground drainage strategy. It evaluates the selection of SuDS devices and highlights how the drainage disposal hierarchy has been followed.

3. Policy

This report has been prepared in accordance with the National Planning Policy Framework (NPPF) 2023, GOV.UK Sustainable Drainage Systems: Non-statutory Technical Standards, London Local Plan 2021, and the London Borough of Camden (LBC) Camden Local Plan (Adopted 2017).

The NPPF states the following:

> *"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures."*

The London Local Plan 2021, Policy SI 13: Sustainable Drainage, states the following:

> *"Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*
>
> *1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)*
> *2) rainwater infiltration to ground at or close to source*
> *3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)*
> *4) rainwater discharge direct to a watercourse (unless not appropriate)*
> *5) controlled rainwater discharge to a surface water sewer or drain*
> *6) controlled rainwater discharge to a combined sewer"*

The London Borough of Camden [LBC] Local Plan (Adopted 2017), Policy CC3: Water and Flooding states the following:

> *"[LBC] will require development to:*
>
> *a) incorporates water efficiency measures;*
> *b) avoid harm to the water environment and improve water quality;*
> *c) considers the impact of development in areas at risk of flooding (including drainage);*
> *d) incorporates flood resilient measures in areas prone to flooding;*
> *e) utilises Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and*
> *f) does not locate vulnerable development in flood-prone areas".*

4. Site Context

4.1 Site Location

The site is located on Pilgrims Lane, within Hampstead Town which is situated within the London Borough of Camden (LBC). The site centred OS grid reference is 526850E: 185679N and the total site boundary is approximately 785m^2 (0.0785ha). The area surrounding the site consists of residential properties with associated hard and soft landscaping.

The closest stations to the site are Hampstead Underground Station, which is approximately 575m to the west and Hampstead Heath Overground Station which is located 675m to the east. The site is bounded by Pilgrim's Lane to the west and private residential developments to the north, east and south.

The Lead Local Flood Authority (LLFA), responsible for all flood risk matters that do not relate directly to designated Main Rivers is the LBC. The Environment Agency (EA) are responsible for flood risk related to the nearby watercourses. The Statutory Sewerage Undertaker for the area is Thames Water (TW). The site is located within the Hampstead Conservation Area.

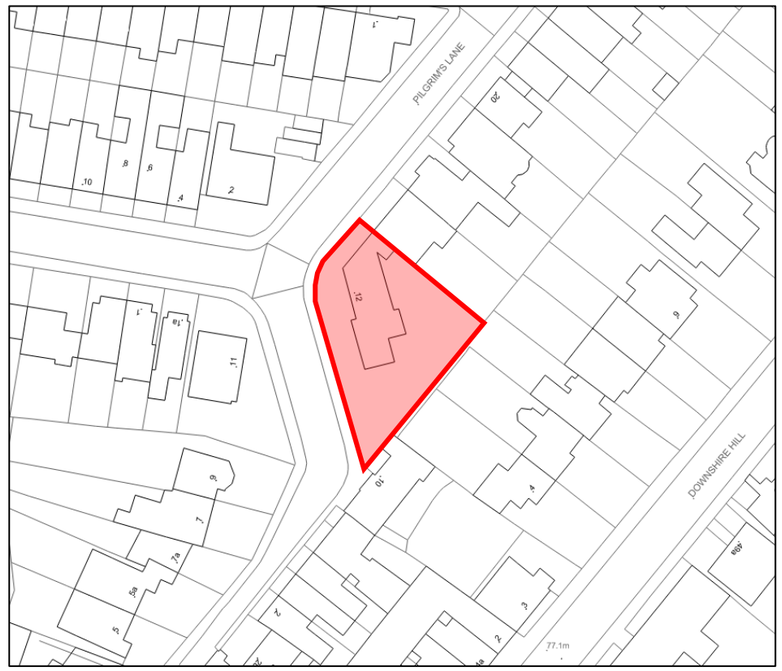


Figure 1: Site Location

4.2 Existing Development

The existing development is a two-storey semi-detached residential building, oriented south to north. The site includes a garden to the south, east, and west of the building.

Existing development floor plans and elevations can be found in **Appendix A**.

Figure 2: Photograph of Existing Development

4.3 Existing Site Topography

A Measured Building Survey was undertaken by Target Surveys in September 2021, which can be found in **Appendix B**.

External levels show that the site is largely flat but with differing topographical features on the west and east sides of the building. The westside falls to the southeast towards the building, with levels starting at 99.90m AOD and falling to 99.70m AOD. The eastern side has a fall to the southeast away from the building, with levels starting at approximately 97.55m AOD and falling to approximately 97.25m AOD at the boundary of the garden.

4.4 Underlying Site Geology and Hydrology

4.4.1 Geology

In accordance with British Geological Survey (BGS) online mapping tool, the underlying ground conditions for the site should consist of bedrock deposits of Claygate member and London clay member, with no superficial deposits recorded. Additionally, site specific ground investigations where undertaken by Geotechnical & Environmental Associates Ltd. (GEA) in September 2021. These investigations encountered ground conditions consistent with those published in BGS records and online mapping tools. The investigations confirmed that beneath a moderate thickness of made ground (between 0.60m and 2.00m), clay was encountered. GEA's site specific borehole logs can be found in **Appendix C**.

4.4.2 Hydrology

The borehole investigations carried out by Geotechnical & Environmental Associates Ltd. (GEA) in September 2021 state that no groundwater was encountered during the borehole investigations. Standpipes were installed into a selection of the boreholes and the results indicate that the groundwater was not encountered and hence "unlikely to be encountered within basement excavations".

Note that groundwater levels are subject to variations caused by local drainage and seasonal effects.

4.5 Flood Risk Assessment

A site-specific Flood Risk Assessment (FRA) prepared by Elliott Wood Partnership Ltd. has been carried out and is to be read in conjunction with this Sustainable Drainage Strategy report. (Report reference: 2210419-EWP-ZZ-XX-RP-C-00001).

5. Existing Drainage

5.1 Public Sewer

Thames Water is the principal sewerage provider for the area. A copy of the Thames Water asset maps can be found in **Appendix D**. These show that the area is served by a network of combined sewers.

The asset map indicates a 940mm x 635mm combined water sewer beneath Pilgrim's Lane, running in a north-eastern direction, with a recorded depth of 3.15m from Thames Water manhole 8606 (located adjacent to No. 12). Additionally, a 305mm diameter combined sewer runs beneath Pilgrim's Lane in a south-eastern direction, with a recorded depth of 2.04m from Thames Water manhole 8602 (situated on the southern corner of No. 12).

The development boundary is over 6.0m away from the Thames Water sewer on plan, and as such there is no need for a sewer build near or build over agreement. Confirmation of this has been included in **Appendix E**.

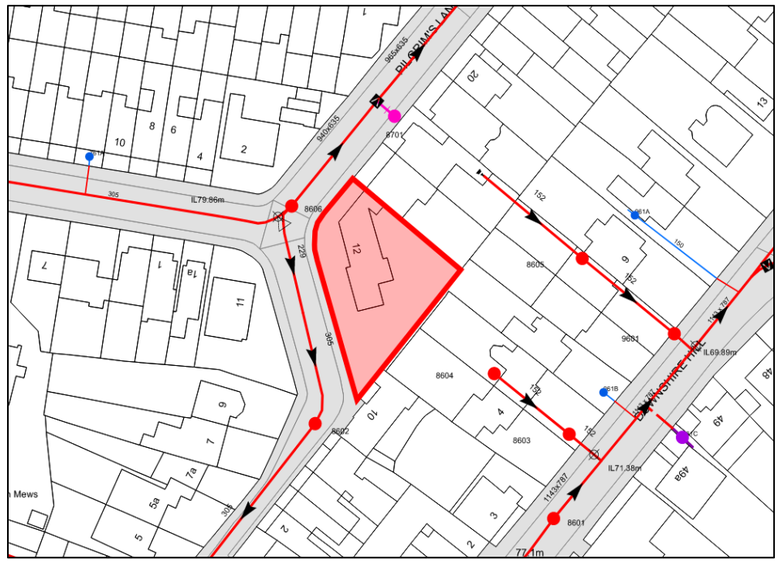


Figure 3: Extract from Thames Water Asset Records – Sewer Map

5.2 Private Drainage

A below-ground CCTV drainage survey was undertaken by GO Drainage Services Ltd. in June 2022. The CCTV survey shows the existing site to be served by a combined below ground drainage network which discharges via a 150mm diameter vitrified clay outfall to the Thames Water combined sewer located beneath Pilgrim's Lane.

The below-ground CCTV drainage survey can be found in **Appendix F**.

6. Existing Surface Water Run-off Rates

6.1 Existing Surface Water Run-off Rates

The surface water run-off rates for the existing site have been calculated using the Modified Rational Method equation below (based on CIRIA C697) and are shown in Table 1**:**

Q = 2.78C.i.A

Where Q = Existing peak runoff (l/s), C = non-dimensional runoff coefficient=1.0, I = Rainfall intensity (see table 1) and A = total catchment area being drained = 0.033ha

Table 1: Existing Surface Water Run-off Rates

Storm Return Period	Average Rainfall Intensity (mm/hr)	Brownfield Run-off Rate (l/s)
1-in-1-year event	31.74	2.8
1-in-30-year event	79.87	7.1
1-in-100-year event	101.88	9.1
1-in-100-year + 40% climate change event	142.6	12.8

Note that the rainfall intensities used in the above calculations have been based on average rainfall intensities for a 15-minute storm using the Wallingford Procedure. The existing run-off rates have been calculated assuming there are no current flow restrictions on surface water run-off leaving the site.

The calculations of the existing surface water runoff from the brownfield site can be found in **Appendix G.**

6.2 Greenfield Run-off Rates

The London Plan guidance states that developments should aim to achieve greenfield runoff rates. Therefore, the greenfield runoff for the site has been calculated using the HR Wallingford Online Tool.

The results are shown in **Table 2** and are based on a total site area of 0.033ha.

The greenfield run-off rate calculations can be found in **Appendix H**.

Table 2: Greenfield Run-off Rate Estimations

Storm return period	Greenfield Run-off Rate (l/s)
Qbar	0.44
1-in-1-year event	0.38
1-in-30-year event	1.02
1-in-100-year event	1.41
1-in-200-year event	1.66

7. Proposed Development

In 2022, a planning application was approved (reference: 2022/2398/P) for the extension and refurbishment of the existing property. This incorporated a new lower ground floor, with a floor area of approximately 205m^2, which contained a pool, plant room, gym and new bedroom..

An updated scheme has now been proposed. Whilst the majority of the approved scheme is being kept, there have been minor amendments to massing on the right and left sides of the building, and a reduction in the footprint of the new lower ground floor. This report has been prepared to support the planning application for this updated scheme.

The proposed development plans and elevations can be found in **Appendix I**.

Figure 4: Proposed Development (Front Elevation)

Figure 5: Proposed Development (Rear Elevation)

8. Proposed Surface Water Drainage Strategy & SuDS

8.1 SuDS / Surface Water Drainage Appraisal

The surface water drainage strategy has been designed in accordance with the requirements of National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG), the London Plan, and the COL Local Plan (2015) and Draft City Plan 2024.
The following drainage hierarchy has therefore been considered:

1. Rainwater uses as a resource (for example rainwater harvesting)
2. Rainwater infiltration to ground at or close to source
3. Rainwater attenuation in green infrastructure features for gradual release (for example blue/green roofs, rain gardens)
4. Rainwater discharge direct to a watercourse (unless not appropriate)
5. Controlled rainwater discharge to a surface water sewer or drain
6. Controlled rainwater discharge to a combined sewer

8.1.1 Appraising the use of Rainwater Re-Use

It is not proposed to implement rainwater harvesting. The works that would be required to the existing structure and water supply system in order to accommodate a harvesting system are not considered feasible, given the proposed scope of works. Low flow appliances will be installed to reduce the building's demand on potable water.

8.1.2 Appraising the use of Infiltration Techniques

In order to comply with building regulations, infiltration techniques such as soakaways must not be installed within 5m of a building or highway. Due to the nature of the building taking up so much of the site there is not sufficient space for infiltration techniques to be practicable.

The underlying geology comprises clay and silty gravels, with made ground above which does not lend itself to effective infiltration techniques.

Based on the above, infiltration has not been deemed feasible for this site.

8.1.3 Appraising the use of Open Water Features

There is little external area on site available and space for open water features is limited. Open water features are deemed not to be feasible due to the proposed usage of the site.

8.1.4 Appraising the use of Above/Below Ground Attenuation

A blue roof system restricts surface water at the rainwater outlets and provides temporary attenuation at roof level through the use of a layer of geocellular crate. As the proposed development has a pitched roof, there is insufficient flat space throughout to incorporate a blue roof for water attenuation.

There is an opportunity to locate a below ground geocellular attenuation tank beneath the parking area in the northwest of the site. The area and depth available for this tank is limited by tree root protection areas, the building foundations, and the existing drainage outfall depth.

8.1.5 Appraising the use of Permeable Surfacing

The proposed development includes approximately 70m^2 of open, external hardstanding areas, comprising parking and the building entrance. Permeable paving with a lined porous sub-base will be utilised in this area to provide attenuation storage for run-off from the paved areas. The permeable paving will help control surface water runoff at source, providing attenuation and filtration of runoff in these areas.

8.1.6 Appraising Draining to a Watercourse

There are no nearby accessible water courses, therefore surface water generated from the development will discharge to the local Thames Water sewer network, at a restricted rate.

8.1.7 Appraising Draining to a Public Water Sewer

There is no surface water sewers located in the vicinity of the development, and so it is proposed to discharge surface water at a controlled rate to the combined Thames Water sewer network.

8.2 Evaluation of SuDS Techniques

The evaluation of SuDS is demonstrated in Table 3 below.

Table 3: Evaluation of SuDS Techniques

SuDS Techniques	Inclusion	Comments
Rainwater Re-Use	N	Rainwater reuse is not proposed for the development, low flow appliances to be installed.
Infiltration Devices	N	Soakaways are not deemed feasible for this site due to restricted space on site. The underlying ground conditions are also not conducive to infiltration
Attenuation in Open Water Features	N	The confined nature of the development makes open water features unfeasible.
Attenuation in Blue Roofs	N	Blue roofs are not proposed for the site as there is insufficient flat roof space.
Attenuation in Green Roofs	N	A green roof is not proposed for this development.
Discharge Direct to a Watercourse	N	There are no nearby accessible watercourses.
Attenuation with Permeable Surfacing	Y	The proposed development has sufficient external hardstanding area to the front of the building to introduce permeable surfaces.
Attenuation within a Below Ground Tanked System	Y	A buried tank will help achieve suitable water attenuation for the development.

8.3 Proposed Surface Water Drainage Strategy

The development will use a combination of permeable surfacing and a below ground storage tank with vortex flow control to provide sufficient attenuation to achieve the peak surface water discharge rate of 2.0 l/s for all storms up to and including the 1-in-100-year return + 40% climate change allowance.

Table 4 highlights the proposed development areas, showing that the below-ground surface water drainage network serves a total of 358 m^2. This area includes contributions from the building footprint, permeable paving, and an underdrain to the rear of the property at lower ground floor level serving the pedestal paving. This underdrain is pumped to the ground floor level surface water network, where it is then attenuated via a geo-cellular attenuation tank.

Table 4: Proposed Development Area's

	m2	ha
Total Site Boundary Area	782	0.00782
Building Footprint	272	0.00272
Permeable Paved Area	54.6	0.00546
Area Served by Underdrain	31.4	0.0031
Total	358	0.0358

While the greenfield runoff rates are lower for the 1-in-1-year, 1-in-30-year and 1-in-100-year return periods, the area available for attenuation is limited by root protection areas and building foundations, and the increased restriction of the flow control devices would increase the risk of blockage and subsequent flooding.

The permeable surfacing with porous subbase adheres to the CIRIA guidelines, providing improvements to water quality via filtration through the gravels and permeable materials while also increasing the time of entry into the accepting sewer.

In order to achieve the proposed discharge rates, an attenuation volume of approximately 11.5 m^3 is required. This has been incorporated in the form of a 9.6m^2 geocellular attenuation tank, and a 250mm granulation sub-base beneath permeable surfacing with an area of 54.5m^2 (attenuation volume of 13.6m^3).

Refer to **Appendix J** for MicroDrainage hydraulic modelling calculations.

Proposed Surface Water discharge rates for the full site are presented in **Table** 5, alongside a comparison against the existing scheme.

Table 5: Pre and Post Development Surface Water Discharge Rate Comparison

Return Period	Brownfield / Existing Run-off Rate (l/s)	Greenfield Run-off Rate (l/s)	Proposed Run-off Rate (l/s)	Percentage Betterment on Existing Run-off Rate
1-in-1-year event	2.8	0.38	1.7	35.7%
1-in-30-year event	7.1	1.02	2.0	71.8%
1-in-100-year event	9.1	1.41	2.0	78.0%
1-in-100-year + 40% climate change event	12.8		2.0	84.4%

As can be seen in the table above, although it is not possible to achieve greenfield runoff rates a significant betterment can be achieved over the existing runoff rates. The proposed SuDS strategy reduces surface water runoff by 78% in the 1-in-100-year return event.

Refer to **Appendix K** for the London Borough of Camden SuDS Pro-Forma.

Refer to **Appendix L** for the proposed below ground drainage layout.

8.4 Proposed Surface Water Outfalls

The CCTV survey illustrates that the existing site is served by a combined below ground drainage network which eventually discharges via a 150mm diameter vitrified clay outfall connection to the Thames Water combined sewer located beneath Pilgrim's Lane. The proposed below-ground drainage works involve removing all existing drainage and replacing it with new systems. However, the existing demarcation manhole and combined water outfall to the Thames Water sewer will be retained, as they are deemed to be in suitable condition for reuse, provided minor remediation works are undertaken.

9. Proposed Foul Water Strategy

All foul water drainage from above ground floor will offset at high-level within the building, as designed by the M&E engineer, and drop to the below ground drainage network. All ground floor drainage will be connected to this network.

To protect the building from flooding due to sewer surcharge all foul drainage below ground floor level will be positively pumped, discharging to the high-level suspended gravity network. Pumping stations are to include dual vortex pumps (duty and standby), non-return valves located in an accessible location to protect against public sewer surcharge, alarms, and telemetry.

It is proposed that foul water will outfall from the site via the existing 150mm diameter combined outfall to Pilgrim's Lane. A Pre-planning enquiry has been submitted to Thames Water to confirm the capacity of the downstream sewer network. No issues are foreseen as there is no change in use.

10. Thames Water Consultation

A pre-planning enquiry has been submitted to Thames Water to agree points of connection (including reuse of existing connections) and proposed flow rates to the sewer network. A response is currently awaited.
The reuse of the existing connections to the public sewer will be subject to a S106 agreement with Thames Water, to be secured by way of a planning condition.

Due to the existence of many combined sewers and water mains within the site vicinity, should extensive substructure or excavation works be required, Thames Water should be consulted to satisfy that their assets will not be compromised as a result of the development works.

11. Pollution Prevention and Surface Water Treatment

Pollution control and treatment has been developed in line with the recommendations and guidance within the CIRIA SuDS Manual C753.

The Simple Index Approach has been used to evaluate the site's pollution hazards and proposed mitigation. The Simple Index Approach assigns pollution indices to different land use classifications and mitigation indices to SuDS elements. Depending on whether surface water is being discharged to the ground or to surface waters, the mitigation indices can be used to provide a total mitigation index which is equal to or higher than the pollution hazard index.

Pollution hazard indices for land usage have been evaluated in accordance with the CIRIA SuDS Manual – refer to Table 6. Residential roofs represent a very low pollution hazard level, with individual property driveways representing a low pollution hazard level.

Table 6: Pollution Hazard Indices for Various Land Uses (taken from the SuDS Manual Table 26.2 Annex 5)

Land use	Pollution Hazard Level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential Roof	Very Low	0.2	0.2	0.05
Individual Property Driveways	Low	0.5	0.4	0.4

Reference is made to Table 26.3 of the SuDS Manual for pollution mitigation indices for permeable pavement and proprietary treatment systems for discharges to surface waters (Table 7).

Table 7: SuDS Mitigation Indices for Permeable Paving (taken from the SuDS Manual Annex 5)

SuDS component	Total suspended solids (TSS)	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7

As per the SuDS Manual, provided that all roof water downpipes are sealed against pollutants entering the system from polluted surface runoff, it is deemed acceptable to discharge surface water captured on a residential roof to groundwater, and subsequently, it can be assumed acceptable to discharge to a combined public sewer. Additionally, mitigation indices for the permeable pavement are shown to be higher than the pollution indices for its specific catchment.
Based on the SuDS mitigation indices for the proposed SuDS features it is considered that adequate treatment is provided on site for all surface water runoff.

12. Operation and Maintenance Requirements

During the construction phase of the development, the responsibility for the maintenance of below ground drainage lies with the developer. Post-construction, all proposed drainage within the site is to be private (i.e., does not lie on public land) therefore all below ground drainage will be maintained by the site owner for the lifetime of the development.
The drainage system should be regularly inspected and maintained to ensure that is kept clear of silt and debris. Permanent inspection records should be kept by the site owner or management company, recording any previous issues and future work to be carried out.

There are three categories of maintenance activities, as follows:

a) Regular maintenance (including inspections and monitoring)
b) Occasional maintenance
c) Remedial maintenance

Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks (e.g., sediment removal or filter replacement). **Error! Reference source not found.**, **Error! Reference source not found.**, **Table 9**, and **Table 10** summarises the likely maintenance activities required for each SuDS component and guidance on specific maintenance activities is given in the following sections.

Remedial maintenance describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design, construction, and regular maintenance activities. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and so timings are difficult to predict. Remedial maintenance can comprise activities such as:

- inlet/outlet repairs
- erosion repairs
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control
- infiltration surface rehabilitation
- replacement of blocked filter fabrics
- construction stage sediment removal (although this activity should have been undertaken before the start of the maintenance contract)
- system rehabilitation immediately following a pollution event.

It is important to note that these remedial activities will not be required for all systems, but for the purpose of estimating whole life maintenance costs, a contingency sum of 15-20% should be added to the annual regular and occasional maintenance costs to cover the risk of these activities being required.

The sections below summarise the proposed schedule of maintenance for below ground drainage elements.

12.1 Permeable Paving

Regular inspection and maintenance are important for the effective operation of pervious pavements. Maintenance responsibility for a pervious pavement and its surrounding area should be placed with an appropriate responsible organisation. The facility should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. Experience in the UK is limited, but advice issued with permeable precast concrete paving has suggested a minimum of three surface sweepings per year. Manufacturers' recommendations should always be followed.

A brush and suction cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

- End of winter (April) – to collect winter debris.
- Mid-summer (July/August) – to collect dust, flower, and grass-type deposits.
- After autumn leaf fall (November).

Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced.

Operation and maintenance requirements for permeable paving are described below:

Table 8: Permeable Paving Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weed.	As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.
	Rehabilitation of surface and upper sub-structure.	As required (if infiltration performance is reduced as a result of significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	3-monthly, 48 h after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.

12.2 Geocellular Attenuation Systems

Regular inspection and maintenance are required to ensure the effective long-term operation of attenuation storage systems. Maintenance responsibility for systems should be placed with a responsible organisation. Maintenance requirements for attenuation systems are described in **Table 9** below. Maintenance plans and schedules should be developed during the design phase. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Table 9: Attenuation Systems Maintenance Schedule

Maintenance Schedule	Required Actions	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

12.3 Drainage Pipes, Manholes and Silt Traps

Maintenance requirements of general drainage items is listed in **Table 10**.

Table 10: Drainage Pipes, Manholes and Silt Traps Maintenance Schedule

Maintenance Schedule	Required Actions	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface and chambers (where may cause risks to performance)	Monthly
	Inspection of manholes, silt traps and catchpits to assess silt accumulation	Monthly (and after large storms)
	Removal of accumulated silt from silt trap and catchpit sumps	Annually, or as required
Remedial actions	Cleaning/jetting of pipework if silt/debris is building up in system	As required
		As required
Monitoring	Inspect/check all inlets, outlets, and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms

NOTE: Manhole covers can be heavy and suitable lifting equipment / procedures should be used. Where possible, personnel should not enter manholes to carry out maintenance.

12.4 Gullies / Linear Channels

Inspection and removal of debris from silt trap every 3 months, preferably after leaf fall in the autumn. (Timeframe can be adjusted to suit actual site conditions.) Charge water trap where necessary.

12.5 Pumping Stations

Pumping stations are to be maintained in accordance with the pump supplier/maintenance company requirements and in accordance with British Standards (BS EN 12056-4), i.e. inspections every quarter.

13. Conclusion

Elliott Wood Partnership Ltd have prepared this Sustainable Drainage Strategy to support the full planning application for the proposed redevelopment of 12 Pilgrim's Lane. The site is located within the London Borough of Camden (LBC) who are also the Lead Local Flood Authority (LLFA).

The SuDS Hierarchy has been followed in order to employ the most suitable and practicable SuDS techniques to improve surface water management across the site. The development will provide benefits to surface water runoff and water quality, through the proposal of permeable paving and below ground attenuation.

Surface water runoff from the proposed development will be managed through the use of permeable paving and below ground geo-cellular attenuation, with the peak discharge rate restricted to 2.0 l/s, for all storm events including the 1-in-100-year plus 40% climate change allowance. In order to achieve the proposed discharge rates, an attenuation volume of approximately 11.5 m^3 is required. This has been incorporated in the form of a 9.6m^2 geocellular attenuation tank, and a 54.5m^2 area of permeable paving, with a 250mm deep lined porous sub-base beneath, with an attenuation volume of 4.1m^3.

All foul water drainage from above ground floor will offset at high-level within the building, as designed by the M&E engineer, and drop to the below ground drainage network. All ground floor drainage will be connected to this network. All foul drainage below ground floor level will be positively pumped, discharging to the external below ground drainage network.

ElliottWood

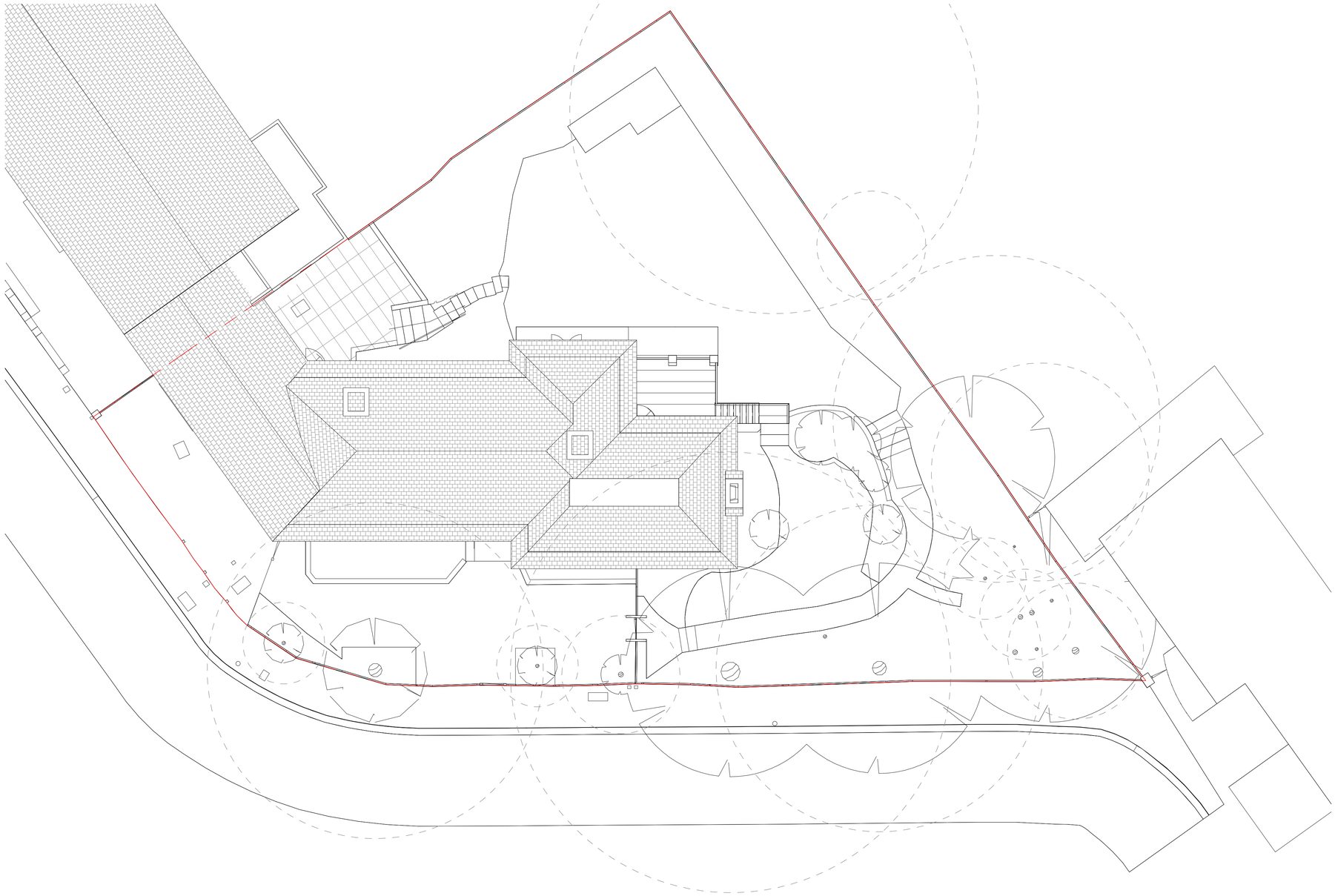
Appendices

Appendix A

Existing Development Floor Plans & Elevations

Notes:

1 0 1 2 3 4 5
SCALE 1:100 m



Existing Site Plan
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Site Plan

date: **02/02/22**
scale: **1 : 100**

dwg no: **2160-PL-010**
rev no: **0**

Notes:

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SCALE 1:100 m

Existing Lower Ground Floor Plan
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Lower Ground Floor Plan

date: **11/18/21**
scale: **1 : 100**

dwg no: **2160-PL-151**
rev no: **0**

Notes:

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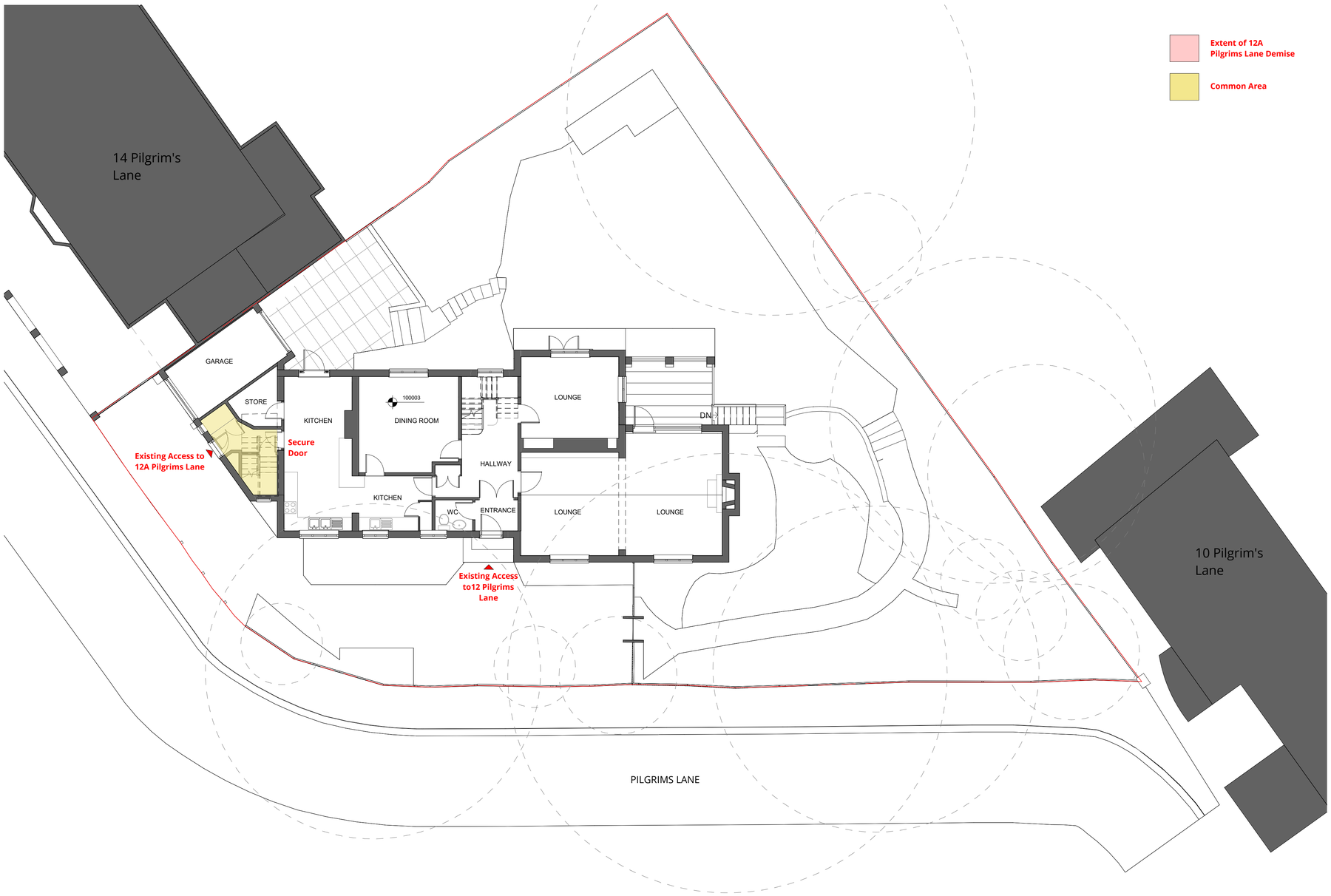
SCALE 1:100 m



Existing Ground Floor Plan
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS
16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Ground Floor Plan

date: **01/21/22**
scale: **1 : 100**

dwg no: **2160-PL-152**
rev no: **0**

Notes:

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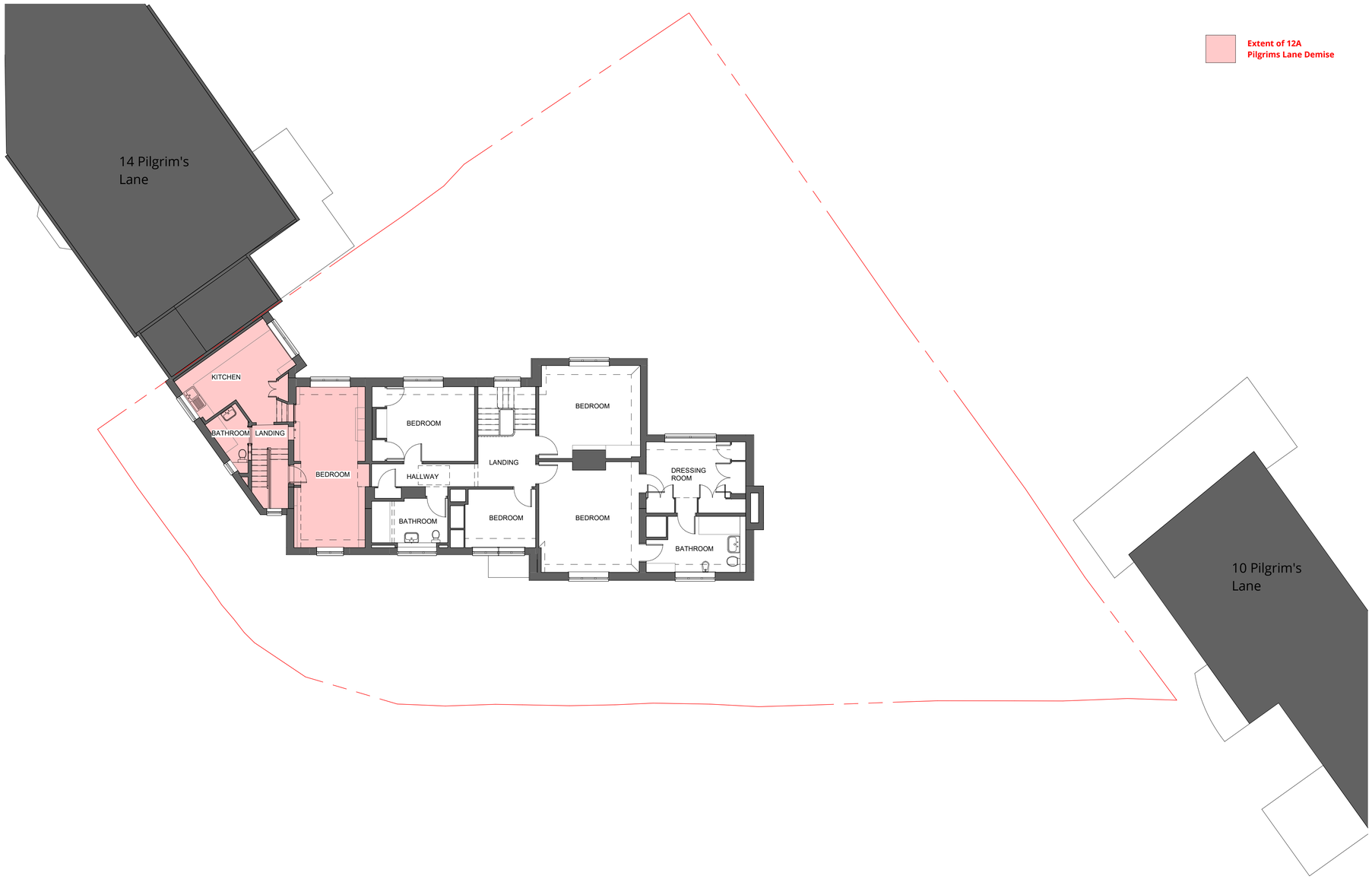
SCALE 1:100 m



Existing First Floor Plan
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS
16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing First Floor Plan

date: **01/21/22**
scale: **1 : 100**

dwg no: **2160-PL-153**
rev no: **0**

Notes:

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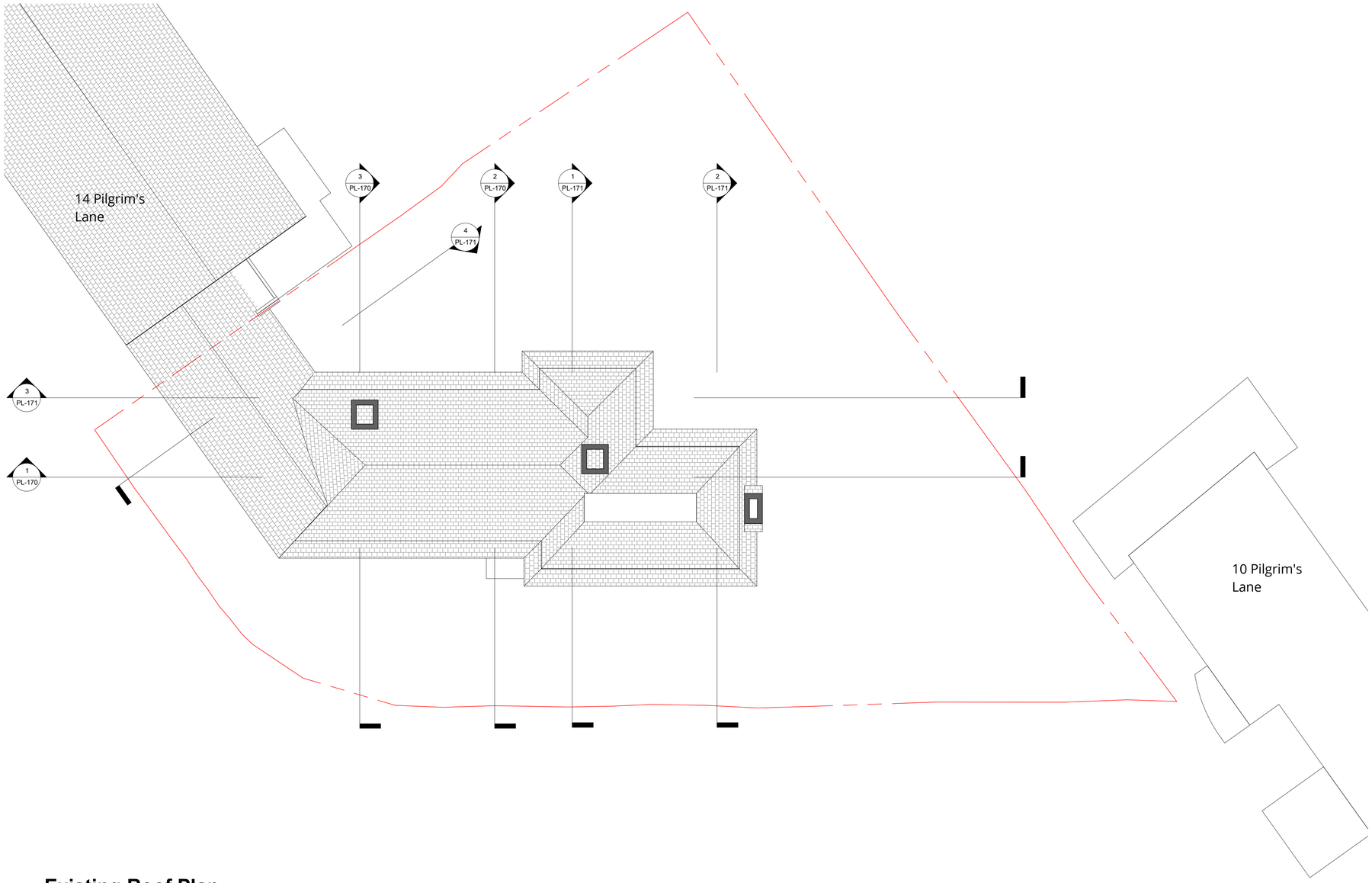
SCALE 1:100 m



Existing Roof Plan
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Roof Plan

date: **01/21/22**
scale: **1 : 100**

dwg no: **2160-PL-154**
rev no: **0**

Notes:

1 0 1 2 3 4 5
SCALE 1:100 m

South Elevation - Existing
1 : 100

North Elevation - Existing
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Front & Rear Elevations

date: **11/19/21**
scale: **1 : 100**

dwg no: **2160-PL-160**
rev no: **0**

Notes:

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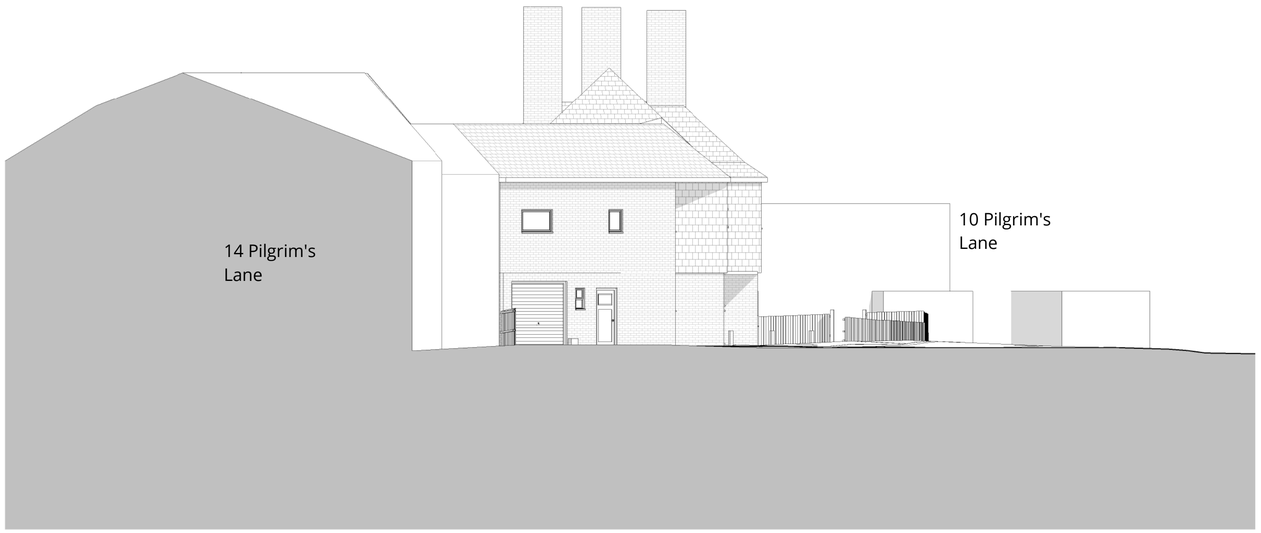
SCALE 1:100 m

East Elevation - Existing
1 : 100



West Elevation - Existing
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Side Elevations

date: **01/24/22**
scale: **1 : 100**

dwg no: **2160-PL-161**
rev no: **0**

Notes:

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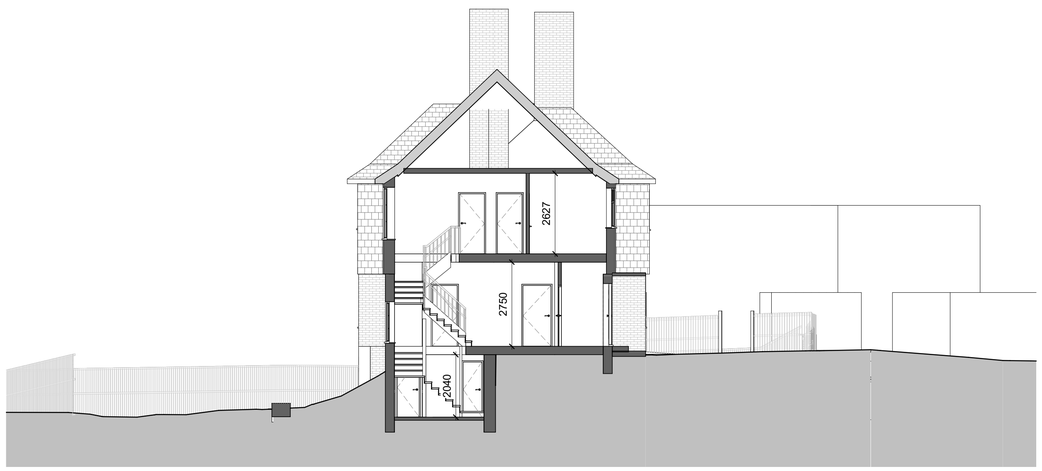
SCALE 1:100 m

Section AA - Existing
1 : 100



Section BB - Existing
1 : 100

Section CC - Existing
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

drawing title:
Existing Sections 1

date: **01/24/22**
scale: **1 : 100**

dwg no: **2160-PL-170**
rev no: **0**

Notes:

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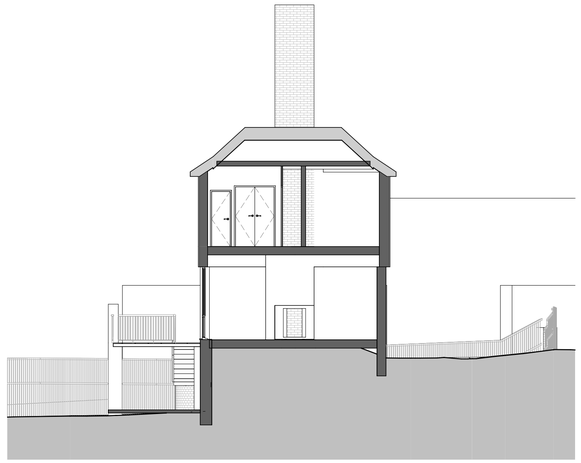
SCALE 1:100 m

Section DD - Existing
1 : 100



Section EE - Existing
1 : 100

Section GG - Existing
1 : 100

Section HH - Existing
1 : 100

Rev	Description	Date	Drwn	Ckd
0	First Issue	25.05.22		

WOLFF ARCHITECTS

16 lambton place
notting hill
london w112sh
t 02072293125
f 02072293257
e info@wolffarchitects.co.uk

status:
PLANNING

project:
12 Pilgrim's Lane
Hampstead, London

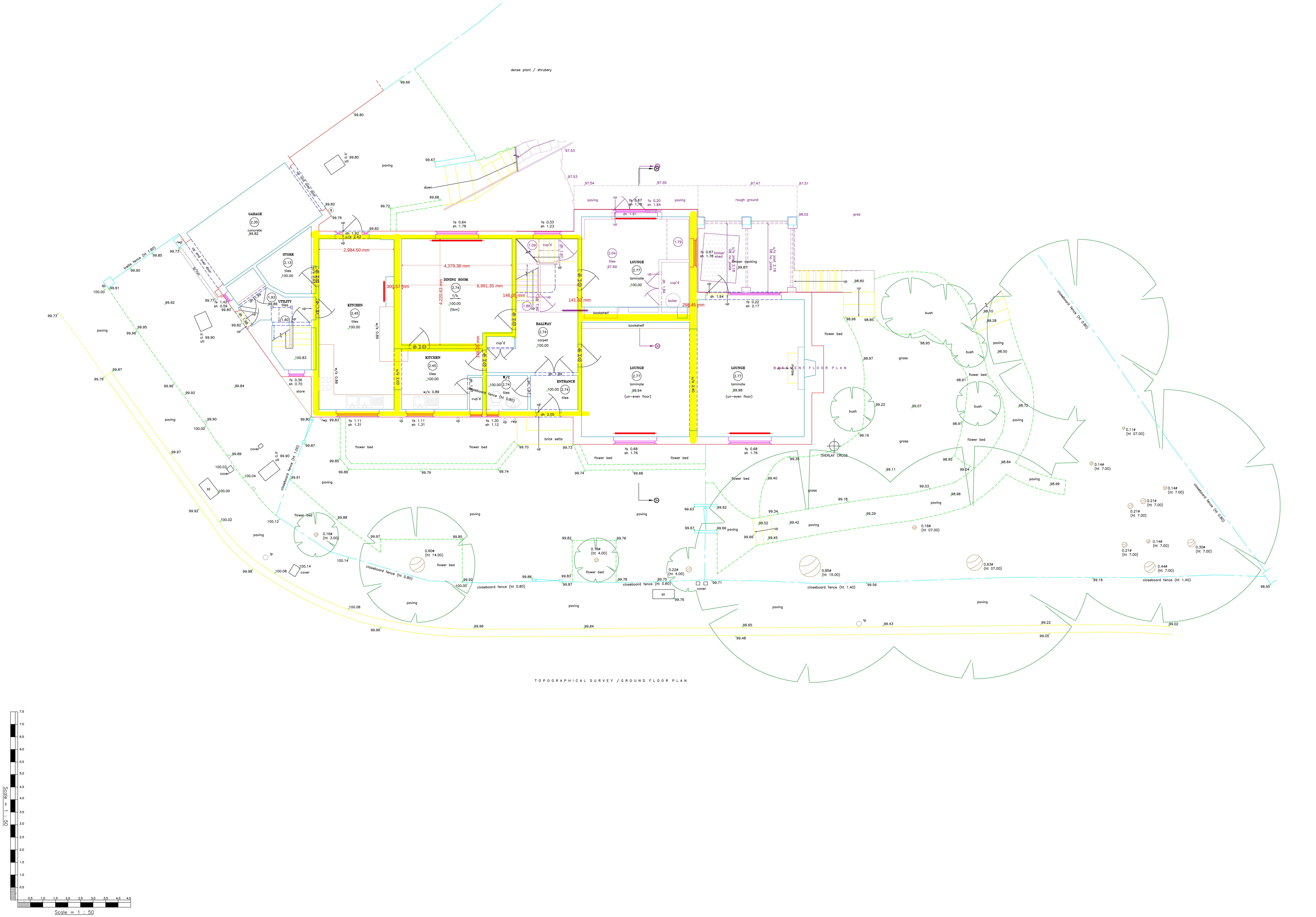
drawing title:
Existing Sections 2

date: **01/24/22**
scale: **1 : 100**

dwg no: **2160-PL-171**
rev no: **0**

Appendix B

Measured Building Survey



TOPOGRAPHICAL SURVEY / GROUND FLOOR PLAN

NOTES

ALL LEVELS ARE IN METRES RELATED TO AN ASSUMED DATUM LOCATED ON THE GROUND FLOOR AS SHOWN (VALUE 100.00m).

THE COORDINATE GRID IS BASED ON ASSUMED VALUES.

OVERHEAD CABLES WILL BE SHOWN INDICATIVELY AND ARE SUBJECT TO SEASONAL VARIATION. THESE WILL BE MEASURED USING REMOTE METHODS.

TREE SPECIES SHOULD ALWAYS BE CONFIRMED BY A TREE SPECIALIST.

SERVICE COVERS WILL BE LIFTED AND DETAIL SHOWN WHERE POSSIBLE. ALL INFORMATION WILL BE TAKEN FROM SURFACE LEVEL ONLY.

DAMAGED COVERS OR THOSE WITHIN HIGHWAYS WILL NOT BE LIFTED. INFORMATION MAY BE OMITTED DUE TO OBSTRUCTIONS AT TIME OF SURVEY.

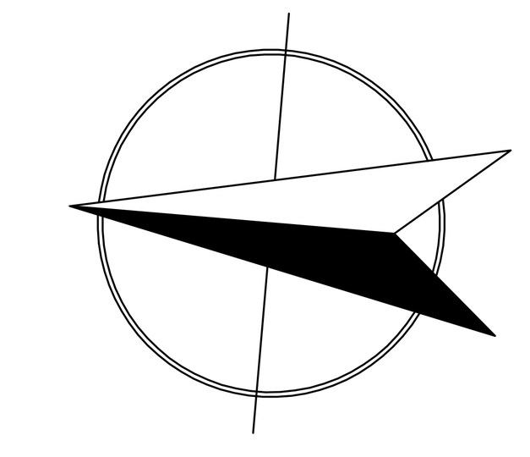
LEGEND

TOPOGRAPHICAL SURVEY KEY:–

osbm	ORDANANCE SURVEY BENCH MARK	fh	FIRE HYDRANT
tbm	TEMPORARY BENCH MARK	g	GULLY
ffl	FINISHED FLOOR LEVEL	re	RODDING EYE
tl	THRESHOLD LEVEL	bt	BRITISH TELECOM
mh	MANHOLE COVER	catv	CABLE TELEVISION
ic	INSPECTION COVER	conc	CONCRETE
cl	COVER LEVEL	bk	BRICK
il	INVERT LEVEL	f/b	FLOWER BED
wl	WATER LEVEL	ht	HEIGHT
bl	BED LEVEL	tow	TOP OF WALL
ø	PIPE DIAMETER	tof	TOP OF FENCE
wfc	WATER FILLED CHAMBER	toh	TOP OF HEDGE
utl	UNABLE TO LIFT	ep	ELECTRICITY POLE
d–chan	DRAINAGE CHANNEL	tp	TELEGRAPH POLE
g–run	GULLY RUN	lp	LAMP POST
rwp	RAIN WATER PIPE	ts	TRAFFIC SIGNAL
svp	SOIL VENT PIPE	rs	ROAD SIGN
vp	VENT PIPE	sp	SIGN POST
wp	WASTE PIPE	nb	NOTICE BOARD
cr	CABLE RISER	bol	BOLLARD
er	EARTH ROD	c/b	CLOSEBOARD
sv	STOP VALVE	c/l	CHAINLINK
gv	GAS VALVE	p/r	POST & RAIL
wm	WATER METER	p/w	POST & WIRE
		i/r	IRON RAILING

MEASURED BUILDING SURVEY KEY:–

0.00	ROOM HEIGHT		switch
	ROOF SLOPE (DOWN)		double switch
fs	FLOOR TO SILL		socket
sh	SILL TO HEAD	2	double socket
fh	FLOOR TO HEAD	TH	thermostat
dh	DOOR HEIGHT	T	telephone socket
u/s	UNDERSIDE	TV	tv socket
t/s	TOPSIDE		fuse
s/c	SUSPENDED CEILING		
rl	ROOFLIGHT		
fp	FIREPLACE		
sd	SLIDING DOOR		
fb	FLOORBOARDS		
cup'd	CUPBOARD		
elec	ELECTRICS		
	RADIATOR		
htr	HEATER		
hwt	HOT WATER TANK		



STATION COORDINATES

STATION	EASTINGS	NORTHINGS	LEVEL	REMARKS

REVISIONS

Revision	Date	Remarks

target surveys

SITE:	12 PILGRIM'S LANE, LONDON, NW3 1SN		
CLIENT:	ALEX SHAMASH		
REF:	4757/1	DATE:	SEP 2021
SCALE:	1:50@A0	SURVEYOR:	DR/DB

REGISTERED OFFICE: 5 CLARENDON PLACE, LEAMINGTON SPA, WARWICKSHIRE CV32 5QL
PHONE: 01926 313419 WEBSITE: www.targetsurveys.co.uk EMAIL: mail@targetsurveys.co.uk

NOTES

ALL LEVELS ARE IN METRES RELATED TO AN ASSUMED DATUM LOCATED ON THE GROUND FLOOR AS SHOWN (VALUE 100.00m).

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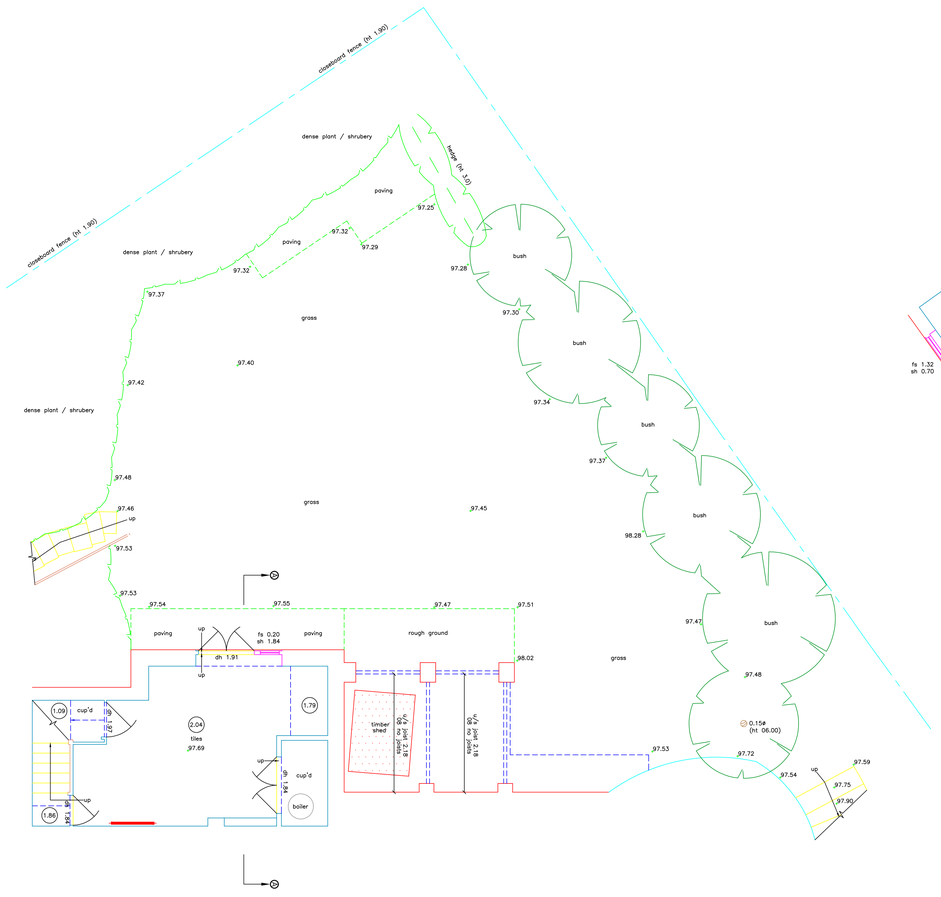
LEGEND

TOPOGRAPHICAL SURVEY KEY:-

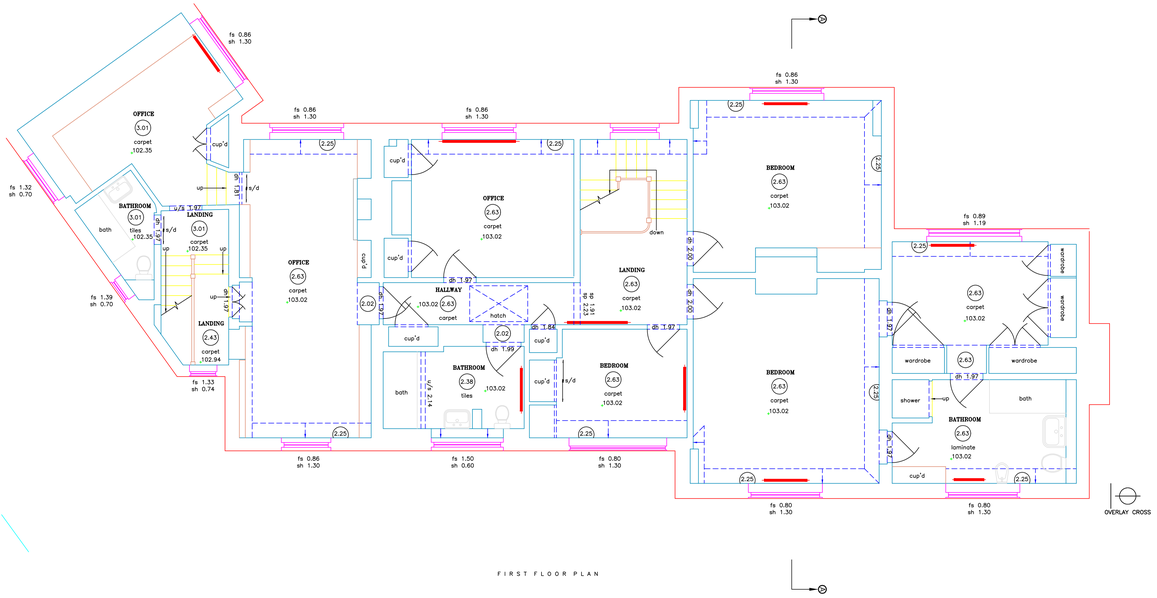
cobm	ORDNANCE SURVEY BENCH MARK	fh	FIRE HYDRANT
tbm	TEMPORARY BENCH MARK	g	GULLY
tl	TRIGONOMETRICAL LEVEL	ge	GROUND EVE
ts	THRESHOLD LEVEL	bt	BRITISH TELECOM
mh	MANHOLE COVER	catv	CABLE TELEVISION
ch	CHAMBER COVER	conc	CONCRETE
cl	COVER LEVEL	bk	BRICK
il	INVERT LEVEL	f/b	FLOWER BED
sol	SOFFIT LEVEL	h	HEDGE
bl	BED LEVEL	tow	TOP OF WALL
p	PIPE DIAMETER	tof	TOP OF FENCE
ufc	UNABLE TO FIND CHAMBER	bof	BOTTOM OF FENCE
utl	UNABLE TO LIFT	ep	ELECTRICITY POLE
d-chan	DRAINAGE CHANNEL	tp	TELEGRAPH POLE
s/pipe	SOIL PIPE	lp	LIGHTING POST
r/pipe	RAIN WATER PIPE	ts	TRAFFIC SIGNAL
pvp	SOIL VENT PIPE	rs	ROAD SIGN
vp	VENT PIPE	sp	SIGN POST
fp	MISC. FIRE	sb	NOTICE BOARD
cr	CABLE RISER	bol	BOLLARD
ev	EARTH ROD	c/b	CHESSBOARD
ew	EARTH WIRE	kerb	KERBSTONE
gv	GAS VALVE	o/r	POST & RAIL
wm	WATER METER	p/w	POST & WIRE
		i/r	IRON RAILING

MEASURED BUILDING SURVEY KEY:-

	ROOM HEIGHT		switch
fs	ROOF SLOPE (DOWN)		double switch
fs	FLOOR TO SILL		socket
sh	SILL TO HEAD		double socket
dh	FLOOR TO HEAD		
ch	DOOR HEIGHT		thermostat
u/s	UNDERSIDE	tel	
c/s	CEILING		telephone socket
s/d	SUSPENDED CEILING	tv	
rl	ROOFLIGHT		tv socket
fp	FIREPLACE		
sd	SLIDING DOOR		fuse
fb	FLOORBOARDS		
cup'd	CUPBOARD		
rad	RADIATOR		
rad	RADIATOR		
htr	HEATER		
hwt	HOT WATER TANK		



BASEMENT FLOOR PLAN



FIRST FLOOR PLAN

OVERLAY CROSS

Scale = 1 : 50

NORTH

STATION COORDINATES

STATION	EASTINGS	NORTHINGS	LEVEL	REMARKS

REVISIONS

Revision	Date	Remarks

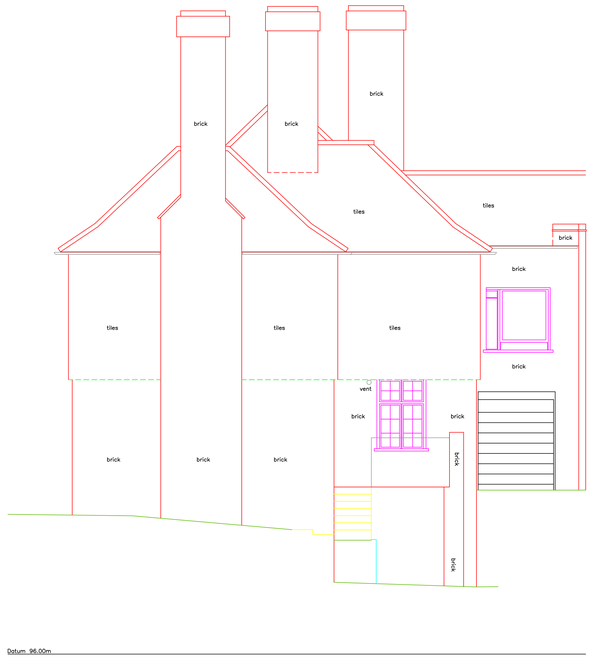
target surveys

SITE:	12 PILGRIM'S LANE, LONDON, NW3 1SN		
CLIENT:	ALEX SHAMASH		
REF:	4757/2	DATE:	SEP 2021
SCALE:	1:50@A0	SURVEYOR:	DR/DB

COMPANY NUMBER: 7846319 REGISTERED OFFICE: 5 CLARENDON PLACE, LEAMINGTON SPA, WARWICKSHIRE CV32 5QL
PHONE: 01926 313419 WEBSITE: www.targetsurveys.co.uk EMAIL: mail@targetsurveys.co.uk

Datum 96.00m

FRONT ELEVATION



Datum 96.00m

SIDE ELEVATION

Datum 96.00m

REAR ELEVATION

Datum 96.00m

FRONT ELEVATION

Scale = 1 : 50

Scale = 1 : 50

NOTES

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LEGEND

TOPOGRAPHICAL SURVEY KEY:-

osbm	ORDNANCE SURVEY BENCH MARK	fh	FIRE HYDRANT
tbm	TEMPORARY BENCH MARK	g	GULLY
spot	SPOT HEIGHT LEVEL	ke	KERBING EYE
th	THRESHOLD LEVEL	bt	BRITISH TELECOM
mh	MANHOLE COVER	catv	CABLE TELEVISION
ch	CHAMBER COVER	conc	CONCRETE
cl	COVER LEVEL	bk	BRICK
il	INVERT LEVEL	f/b	FLOWER BED
sof	SOFFIT LEVEL	tof	TOP OF
bl	BED LEVEL	bow	BOTTOM OF WALL
ø	PIPE DIAMETER	tof	TOP OF FENCE
ufc	UNABLE TO FIND CHAMBER	bof	BOTTOM OF FENCE
ult	UNABLE TO LIFT	ep	ELECTRICITY POLE
d-chan	DRAINAGE CHANNEL	tp	TELEGRAPH POLE
s-inv	SURFACE INLET	lp	LAMP POST
rwp	RAIN WATER PIPE	ts	TRAFFIC SIGNAL
svp	SOIL VENT PIPE	rs	ROAD SIGN
wp	WASTE PIPE	sp	SIGN POST
sp	SOIL STACK PIPE	bb	NOTICE BOARD
cp	CABLE RISER	bol	BOLLARD
er	EARTH ROD	c/b	CURB/BOARD
ev	ELECTRIC VENT	c/s	CURB/STONE
gv	GAS VALVE	p/r	POST & RAIL
wm	WATER METER	p/w	POST & WIRE
		i/r	IRON RAILING

MEASURED BUILDING SURVEY KEY:-

rh	ROOM HEIGHT		switch
	ROOF SLOPE (DOWN)		double switch
fs	FLOOR TO SILL		socket
sh	SILL TO HEAD		double socket
dh	DOOR HEIGHT		
ch	DOOR HEADHEAD		
u/s	UNDERSIDE		
t/s	TOPSIDE	tst	thermostat
s/c	SUSPENDED CEILING		telephone socket
rl	ROOFLIGHT		
fp	FIREPLACE		tv socket
td	TRAP DOOR	tv	
fb	FLOORBOARDS		
cup'd	CUPBOARD		fuse
rwp	RAIN WATER PIPE		
rad	RADIATOR		
htr	HEATER		
hwt	HOT WATER TANK		

STATION COORDINATES

STATION	EASTINGS	NORTHINGS	LEVEL	REMARKS

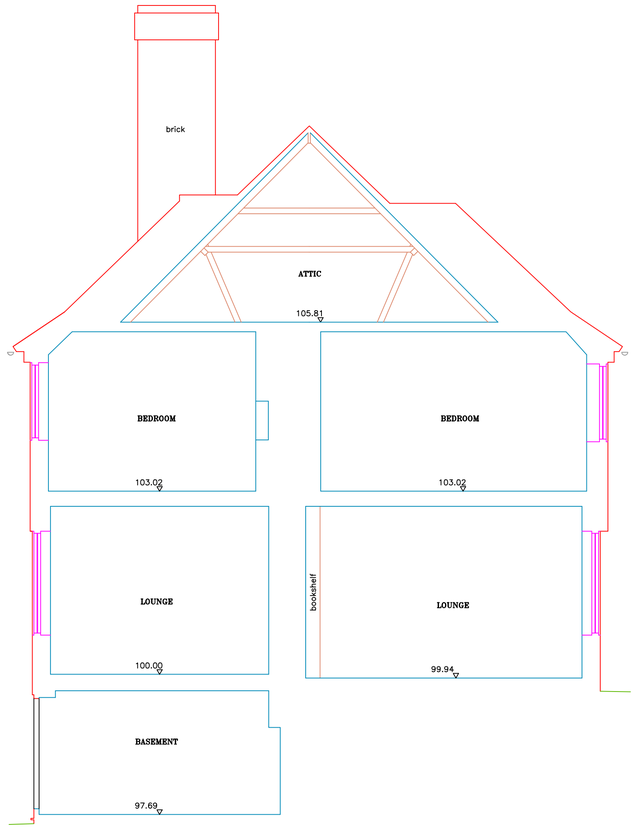
REVISIONS

Revision	Date	Remarks

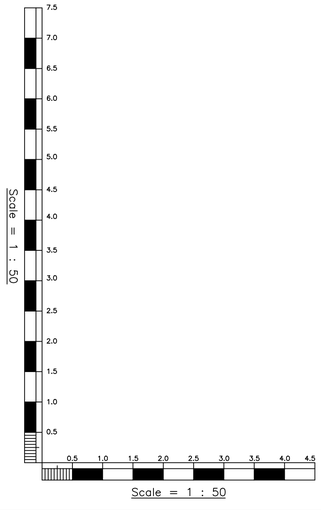
target surveys

SITE:	12 PILGRIM'S LANE, LONDON, NW3 1SN		
CLIENT:	ALEX SHAMASH		
REF:	4757/3	DATE:	SEP 2021
SCALE:	1:50@A0	SURVEYOR:	DR/DB

COMPANY NUMBER: 7846319
REGISTERED OFFICE: 5 CLARENDON PLACE, LEAMINGTON SPA, WARWICKSHIRE CV32 5QL
PHONE: 01926 313419 WEBSITE: www.targetsurveys.co.uk EMAIL: mail@targetsurveys.co.uk



SECTION A–A



NOTES

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LEGEND

TOPOGRAPHICAL SURVEY KEY:–

osbm	ORDANANCE SURVEY BENCH MARK	fh	FIRE HYDRANT
tbm	TEMPORARY BENCH MARK	g	GULLY
ffl	FINISHED FLOOR LEVEL	re	RODDING EYE
tl	THRESHOLD LEVEL	bt	BRITISH TELECOM
mh	MANHOLE COVER	catv	CABLE TELEVISION
ic	INSPECTION COVER	conc	CONCRETE
cl	COVER LEVEL	bk	BRICK
il	INVERT LEVEL	f/b	FLOWER BED
wl	WATER LEVEL	ht	HEIGHT
bl	BED LEVEL	tow	TOP OF WALL
ø	PIPE DIAMETER	tof	TOP OF FENCE
wfc	WATER FILLED CHAMBER	toh	TOP OF HEDGE
ul	UNABLE TO LIFT	ep	ELECTRICITY POLE
d-chan	DRAINAGE CHANNEL	tp	TELEGRAPH POLE
g-run	GULLY RUN	lp	LAMP POST
rwp	RAIN WATER PIPE	ts	TRAFFIC SIGNAL
svp	SOIL VENT PIPE	rs	ROAD SIGN
vp	VENT PIPE	sp	SIGN POST
wp	WASTE PIPE	nb	NOTICE BOARD
cr	CABLE RISER	bol	BOLLARD
er	EARTH ROD	c/b	CLOSEBOARD
sv	STOP VALVE	c/l	CHAINLINK
gv	GAS VALVE	p/r	POST & RAIL
wm	WATER METER	p/w	POST & WIRE
		i/r	IRON RAILING

MEASURED BUILDING SURVEY KEY:–

2.50	ROOM HEIGHT		switch
—	ROOF SLOPE (DOWN)		double switch
fs	FLOOR TO SILL		socket
sh	SILL TO HEAD		double socket
fh	FLOOR TO HEAD		
dh	DOOR HEIGHT		thermostat
u/s	UNDERSIDE	TH	
f/f	FLOOR		telephone socket
s/c	SUSPENDED CEILING		
r	ROOFLIGHT	TV	tv socket
fp	FIREPLACE		
sd	SLIDING DOOR		fuse
fb	FLOORBOARDS		
cup'd	CUPBOARD		
elec	ELECTRICS		
	RADIATOR		
htr	HEATER		
hwt	HOT WATER TANK		

STATION COORDINATES

STATION	EASTINGS	NORTHINGS	LEVEL	REMARKS

REVISIONS

Revision	Date	Remarks

target surveys

SITE:	12 PILGRIM'S LANE, LONDON, NW3 1SN		
CLIENT:	ALEX SHAMASH		
REF:	4757/4	DATE:	SEP 2021
SCALE:	1:50@A1	SURVEYOR:	DR/DB

COMPANY NUMBER: 7846319

REGISTERED OFFICE: 5 CLARENDON PLACE, LEAMINGTON SPA, WARWICKSHIRE CV32 5QL
PHONE: 01926 313419 WEBSITE: www.targetsurveys.co.uk EMAIL: mail@targetsurveys.co.uk

Appendix C

Borehole Logs

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
12 Pilgrims Lane, London, NW3 1SN				**BH1**
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J21282	21-09-21 21-09-21			
Client		Engineer		Sheet
		Elliott Wood		1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.25	D						PAVING SLABS over MADE GROUND (stiff brown slightly desiccated sandy silty clay, with frequent fine to coarse gravel sized fragments of brick and flint. Occasional roots.)	
0.50	D					(1.20)		
0.75	D							
1.00	D					1.20		
1.20-1.65	D	2,3/3,3,3,4 N60 = 18				1.50	Stiff becoming firm slightly desiccated brown sandy silty clay with frequent partings of orange brown clayey sand and grey silt	
1.85	D						Firm becoming stiff with depth fissured slightly sandy silty clay with frequent partings of orange brown clayey sand and grey silt. Occasional blue-grey veining. Occasional roots.	
2.00-2.45	U100							
2.75	D							
3.00-3.45	D	2,3/2,3,3,3 N60 = 15					3.00 Occasional fine gravel sized selenite crystals below 3.00 m	
3.75	D					(4.80)		
4.00-4.45	U100						4.00 Sand partings are only occasional and no roots below 4.00 m	
4.75	D							
5.00-5.45	D	2,2/2,4,3,4 N60 = 18						
6.00	D					6.30		
6.50-6.95	U100						Stiff becoming very stiff with depth fissured brown-grey silty clay with occasional partings of brown-grey sand and silt. Frequent fine crystals (mica) and occasional white shell fragments.	
7.50	D					(2.15)		
8.00-8.45	D	2,3/4,4,4,5 N60 = 23				8.45		

Boring Progress and Water Observations					
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Hand dug services pit to 1.20 m
No groundwater encountered
Standpipe installed to depth of 8.0 m

All dimensions in metres Scale 1:62.5	Method/ Plant Used CFA / Percussive sampler	Logged By AG

Report ID: CABLE PERCUSSION || Project: J21282 - 12 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 12 November 2021

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
12 Pilgrims Lane, London, NW3 1SN				**BH2**
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J21282	21-09-21 21-09-21			
Client	Engineer			Sheet
	Elliott Wood			1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.25	D					(0.60)	PAVING SLABS over MADE GROUND (stiff brown slightly desiccated sandy silty clay, with frequent fine to coarse gravel sized fragments of brick and flint. Occasional roots.)	
0.50	D					0.60		
0.75	D						Stiff becoming firm slightly desiccated brown sandy silty clay with frequent partings of orange brown clayey sand and grey silt	
1.00	D					(0.90)		
1.20-1.65	D	1,2/2,2,2,1 N60 = 9				1.50		
1.85	D						Firm becoming stiff with depth fissured slightly sandy silty clay with frequent partings of orange brown clayey sand and grey silt. Occasional blue-grey veining. Occasional roots.	
2.00-2.45	U100							
							2.50 Occasional coarse sand to fine gravel sized selenite crystals below 2.50 m	
2.75	D							
3.00-3.45	D	1,2/3,4,3,3 N60 = 18						
							3.50 Sand partings are only occasional and no roots below 3.50 m	
3.75	D					(4.80)		
4.00-4.45	U100							
4.75	D							
5.00-5.45	D	1,2/2,3,4,4 N60 = 18						
6.00	D					6.30		
6.50-6.95	U100						Stiff becoming very stiff with depth fissured brown-grey silty clay with occasional partings of brown-grey sand and silt. Frequent fine crystals (mica) and occasional white shell fragments.	
7.50	D					(2.15)		
8.00-8.45	D	2,3/3,4,4,6 N60 = 23				8.45		

Boring Progress and Water Observations					
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Hand dug services pit to 1.20 m
No groundwater encountered
Standpipe installed to depth of 8.0 m

All dimensions in metres Scale 1:62.5	Method/ Plant Used CFA / Percussive sampler	Logged By AG

Report ID: CABLE PERCUSSION || Project: J21282 - 12 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 12 November 2021

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
12 Pilgrims Lane, London, NW3 1SN				**BH3**
Job No: J21282	Date: 24-09-21 24-09-21	Ground Level (m OD)	Co-Ordinates ()	
Client		Engineer: Elliott Wood		Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.50	D					(1.00) 1.00	TURF over MADE GROUND (brown sandy silty clay with frequent fine to coarse gravel sized fragments of brick, flint and rare charcoal. Occasional tree roots)	
1.30	D					(3.00)	Firm becoming stiff with depth brown mottled orange-brown fissured silty clay with partings of clayey sand and silt. Rare blue-grey veining.	
2.00	D							
2.80	D							
3.20	D						3.00 Occasional coarse sand sized selenite crystals below 3.00 m	
4.00	D					4.00		

Boring Progress and Water Observations

Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Hand dug services pit to 1.20 m
No groundwater encountered
Standpipe installed to depth of 4.0 m

All dimensions in metres Scale 1:62.5	Method/ Plant Used: Hand-held window sampler	Logged By: AG

Report ID: CABLE PERCUSSION || Project: J21282 - 12 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 12 November 2021

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
12 Pilgrims Lane, London, NW3 1SN				**BH4**
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J21282	24-09-21 24-09-21			
Client		Engineer		Sheet
		Elliott Wood		1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
1.00	D					(2.00)	TURF over MADE GROUND (stiff desiccated slightly organic brown sandy silty clay with frequent fine to coarse gravel sized fragments of brick, flint and rare charcoal. Occasional roots)	
1.60	D					2.00		
2.10	D					(2.00)	Stiff locally firm brown mottled orange-brown fissured silty clay with partings of clayey sand and silt. Rare blue-grey veining.	
2.80	D							
3.20	D					4.00		
4.00	D							

Boring Progress and Water Observations

Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Hand dug services pit to 1.20 m
No groundwater encountered
Borehole backfilled with arisings on completion

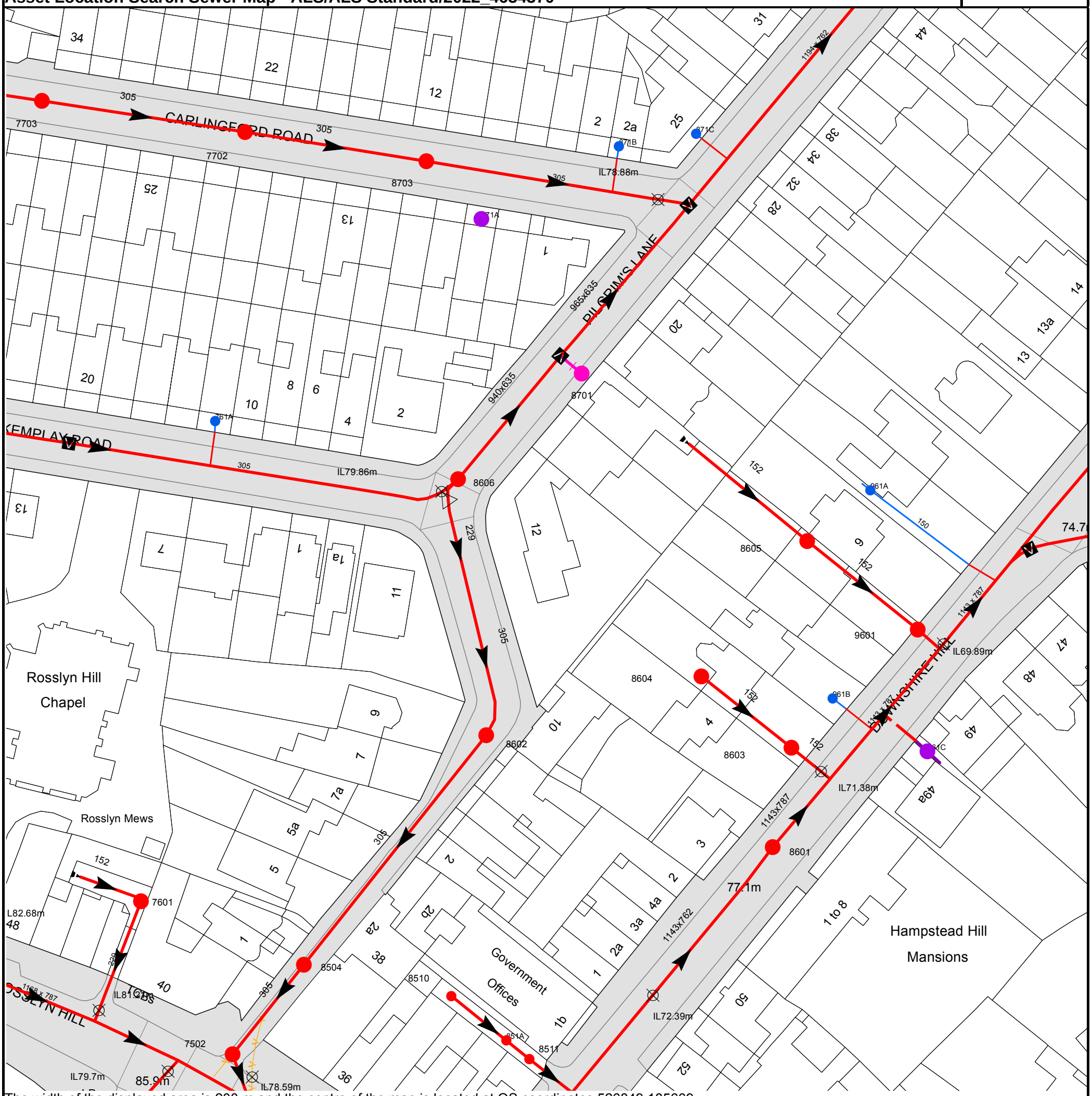
All dimensions in metres Scale 1:62.5	Method/ Plant Used Hand-held window sampler	Logged By AG

Report ID: CABLE PERCUSSION || Project: J21282 - 12 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 12 November 2021

Appendix D

Thames Water Asset Maps

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4634370



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 526849,185669

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.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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
8602	81.66	79.62
851A	n/a	n/a
8511	n/a	n/a
8701	n/a	n/a
871B	n/a	n/a
871C	n/a	n/a
8604	76.28	75.87
8601	76.83	71.48
8603	76.27	74.59
8605	77.22	75.79
961B	n/a	n/a
961A	n/a	n/a
9601	75.48	73.59
961C	n/a	n/a
7502	85.03	78.75
8510	n/a	n/a
8504	83.95	79.05
7601	87.09	86.02
8606	83.06	79.91
761A	n/a	n/a
871A	n/a	n/a
8703	85.06	81.88
7702	86.83	83.6
7703	89.01	85.67

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.

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

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
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- 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.

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

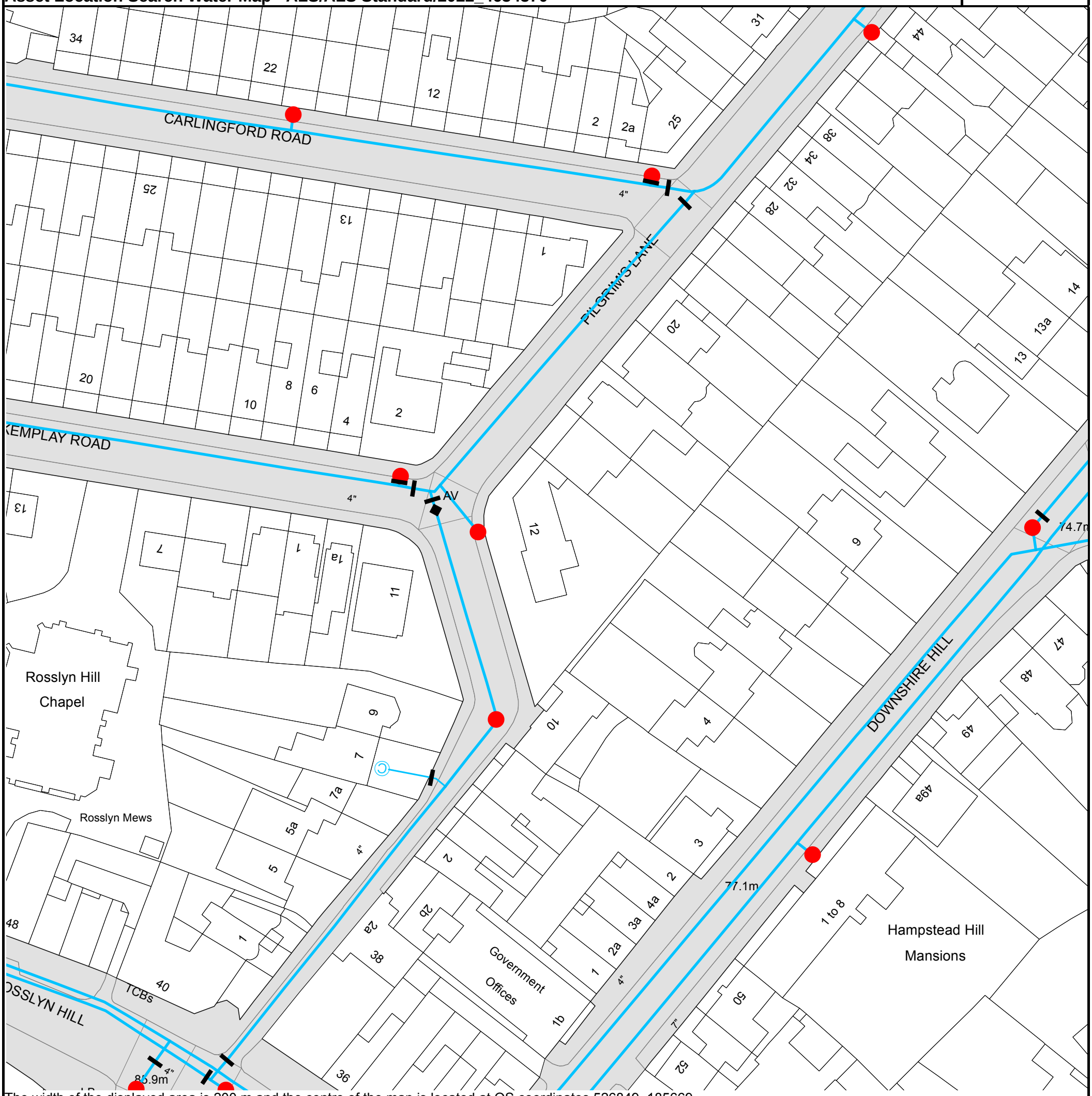
Ducts may contain high voltage cables. Please check with Thames Water.

- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the 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 indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. 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, please contact Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2022_4634370



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 526849, 185669.

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.

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

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

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.

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

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

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

Casement: Ducts may contain high voltage cables. Please check with Thames Water.

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.

Appendix E

Thames Water Build-Over Correspondence

55 Whitfield Street
London W1T 4AH
020 7499 5888 | DDI: 020 3982 7926
Lines operational as usual

Website
Twitter
Instagram
LinkedIn

Discover our new co-working
space for the built environment
at The Building Society

TIME TO DO MORE
Let's not go back to 'normal'. It's time for us all to do more to engineer a better, healthier society. Watch our video here on giving back to the industry and join the discussion #EngineeringaBetterSociety

---

From: DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Sent: 28 June 2022 09:59
To: Keri Trimmer <k.trimmer@elliottwood.co.uk>
Subject: 12 Pilgrims Lane NW3 1SN

You don't need to apply for a build over agreement

Dear Keri Trimmer

Thank you for your email dated 21st June 2022, regarding **12 Pilgrims Lane, London, NW3 1SN**. We've reviewed your drawing and are satisfied that no further action is required, as the proposed work won't be within three metres of a public sewer or one metre of a lateral drain.

This means you can go ahead with the work, without the need to enter into an agreement with us.

However, please note that if you find a shared drainage pipe within three metres of your proposed building once you've started work, you need to tell us immediately so that we can review any new information.

If you've any further questions, please contact our helpdesk on 0800 009 3921, selecting Option 1, or email us at developer.services@thameswater.co.uk.

Regards

Karla Denton
Pre App Build Over Team, (Previously LA Team)
Part H4 Consultations, Buildovers, Developer Services Wastewater
Clearwater Court, Vastern Road, Reading, RG1 8DB
Helpdesk 0800 009 3921, **email** developer.services@thameswater.co.uk
Apply to build within 3m or connect to a public sewer online - www.thameswater.co.uk/buildover

Original Text

From: Keri Trimmer <k.trimmer@elliottwood.co.uk>

To: BUILDOVERS@THAMESWATER.CO.UK

CC: Rishi Bodhani <Rishi.Bodhani@stature.london>; ;DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>

Sent: 21.06.22 16:37:55

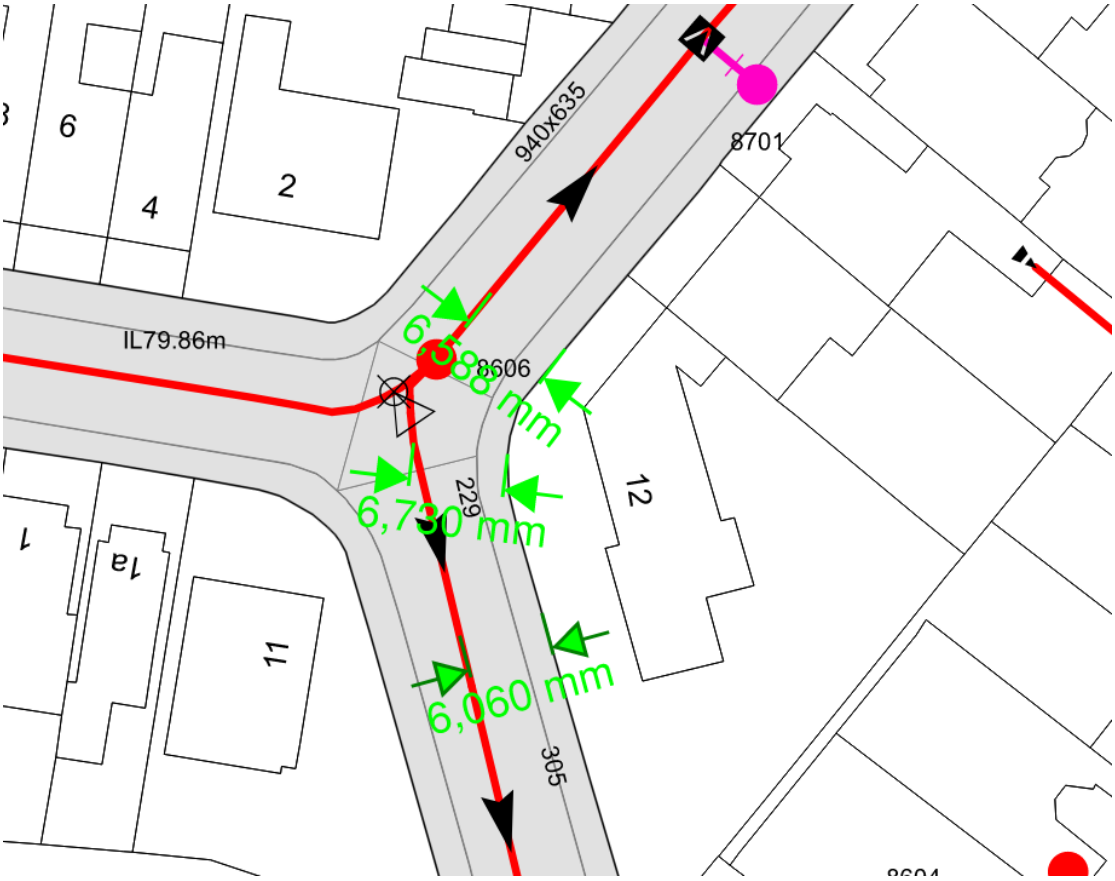
Subject: TW Build-Over: 12 PILGRIMS LANE LONDON NW3 1SN

Dear Sir / Madam,

We are the civil and structural engineers working on a development at the above address and have recently received the below email from the Thames Water build-over team.

We would like to confirm that the combined sewers beneath Pilgrims Lane are over 6m away from the development boundary, therefore a build-near or build-over application should not be required. We have also had a CCTV drainage survey undertaken which shows that all drainage on site is private, with no third-party sewers passing through the site footprint, the CCTV survey report is attached FYI. We will be reviewing the drainage strategy for the site in due course and will submit any relevant S106 applications during detailed design.

In the interim, could you please confirm that we do not need a sewer build-near or build-over agreement as part of any works on site.



Kind Regards

Keri Trimmer
MEng CEng MICE
Associate

elliottwood

Engineering a better society

55 Whitfield Street
London W1T 4AH
020 7499 5888 | DDI: 020 3982 7926
Lines operational as usual

Website
Twitter
Instagram
LinkedIn

From: BUILDOVERS@THAMESWATER.CO.UK <BUILDOVERS@THAMESWATER.CO.UK>
Sent: 17 June 2022 12:03
To: Rishi Bodhani <Rishi.Bodhani@stature.london>
Subject: Building over or within 3 metres of a sewer

Building over or near sewers.

Site location: 12 PILGRIMS LANE LONDON NW3 1SN

Dear Mr BODHANI,

Thank you for your enquiry.

If you're planning a new building, a conservatory, a garage or any other extension to your home, it's important you let us know. We need to make sure your work doesn't accidentally affect a sewer, or limit our access if we have to repair it. I've provided some information below about build over agreements, which I hope you find helpful.

Types of build over agreements

If you're building over or near a domestic sewer with a diameter of **160mm or less**, you can potentially apply for a **self-certified build over agreement**. We may grant this if you're able to confirm that your plans pose little risk to the pipe. This free service is only available online, and

requires you to complete a questionnaire at www.thameswater.co.uk/buildover.

If your answers don't meet our requirements, we'll redirect you to apply for an **approved build over agreement**, for which you'd need to pay. You'll need to apply for this full agreement if you're unsure of any of the answers, or if you want to build over or near a sewer with a diameter **above 160mm**.

If you're applying for an **approved build over agreement**, in addition to contact information, you'll need to provide the following:

- A drawing showing the cross-sectional foundation plan, including clearance distances and size of the sewer being built over
- A drawing showing the location of the sewer relative to the existing property and proposed work
- A copy of the drawings submitted for Building Regulations approval
- Credit or debit card details, in order to pay the required deposit and charges

Ownership of sewers

The start of the drain is the responsibility of the property owner until it crosses the boundary into land owned by someone else. At that point it becomes a 'public lateral drain'. Once a second property connects into the public lateral drain, it becomes a 'public sewer'. We're responsible for all public sewers and lateral drains in our region. You can view typical examples of the different types of drains and sewers on page 2 of our guidance booklet attached.

How to apply

You can apply online on our website . Alternatively download the application form from our website which then can be emailed to us at developer.services@thameswater.co.uk or posted to us at Developer Services, Clearwater Court, Vastern Road, Reading RG1 8DB.

Next steps

If you apply for a self-certified build over agreement, you'll find out whether you qualify as soon as you submit the completed questionnaire online.

If you apply for an approved build over agreement, we'll review your application and contact you within three weeks providing we have all relevant plans and payment.

If you'd like to speak to me about this, please call me on 0800 009 3921 between 8am and 5pm, Monday to Friday.

Yours sincerely,

Jordan

Customer Service Advisor
Developer Services

Appendix F

Below Ground Drainage Survey