Chalton Street & Churchway, London

Flood Risk Assessment & Drainage Strategy

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Waterco Ltd, Eden Court, Lon Parcwr Business Park, Ruthin, Denbighshire LL15 1NJ
Tel: 01824 702220 **Email:** enquiries@waterco.co.uk **Web:** www.waterco.co.uk

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DOCUMENT REVIEW & APPROVAL

AUTHOR:	Sally Pettit BSc
CHECKER:	Aled Williams BSc (Hons) MCIWEM
APPROVER:	Victoria Griffin BSc (Hons) MSc CEnv MIEnvSc

ISSUE HISTORY

ISSUE DATE	COMMENTS
23/03/2017	First issue
13/08/2018	Second issue – Updated to account for revised development plans
25/01/2019	Third issue – Updated to include a Flood Risk Assessment and revised Drainage Strategy (incorporating mixture of blue and green roofs)

Contents

Appendices

Tables

Introduction

Waterco Consultants have been commissioned to undertake a Flood Risk Assessment and Drainage Strategy in relation to a proposed hotel and residential development at 53-55 Chalton Street, 60 Churchway and 70 Churchway, London NW1 1HY / NW1 1LT.

The purpose of this report is to outline the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk. This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF), revised in 2018, and the National Planning Practice Guidance (NPPG): Flood Risk and Coastal Change.

From April 2015, the London Borough of Camden as a Lead Local Flood Authority (LLFA), is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including sustainable drainage systems (SuDS), to provide surface water runoff reduction and treatment.

This report is an update to a previously submitted Drainage Strategy. The report has been updated following LLFA comments received in November 2018. The LLFA response is included in Appendix A. The LLFA have stated:

'*Policy compliance and further information required*

Submit an FRA if >1ha or in an area of heightened flood risk.

Action for applicant: The applicant should demonstrate an understanding of the local risks form surface water and how the proposed development will a) be resilient to surface water flooding and b) not displace surface surface water flooding and c) where possible reduce risk from surface water flooding.

***Major developments to achieve Greenfield run-off rates wherever feasible and as a minimum 50% reduction in run off rates**.*

Action for applicant: The applicant must revise their drainage strategy to incorporate the following information;

- *Completed SuDS proforma*
- *Calculations to demonstrate greenfield runoff rates*

- *Calculations of runoff and attenuation volumes for a range of return periods up to the 1 in 100 year + 40% climate change event, demonstrating how the drainage system will reduce runoff as close to greenfield as feasible with a minimum 50% reduction.*
- *Detailed drawings showing details of SuDS extent and location*
- *A drainage layout plan with details of the proposed connection to the existing sewer (including invert levels/pipe sizes)*

Developments to include SuDS unless inappropriate. Development should follow the drainage hierarchy in policy 5.13 of the London Plan.

Action for applicant: The applicant should review their drainage proposals giving further consideration to blue roof attenuation and below ground attenuation. The current proposals are not acceptable.

Developments in areas known to be at risk of surface water flooding are designed to reduce the risk of flooding in the site and surrounding areas as a result of the development, and to cope with being flooded.

Action for applicant: Applicant to demonstrate how the basement and ground floor will be resilient to surface water flooding and not increase the risk elsewhere.'

Existing Conditions

The 553m^2 development site is located at Chalton Street and Churchway, London (National Grid Reference: 529786, 182835). A location plan and an aerial image are included in Appendix B.

Online mapping (including Google maps / Google Streetview imagery, accessed January 2019) shows that the existing land use for 53-55 Chalton and 60 Churchway currently comprises of ground floor retail and two storeys of residential use. A basement floor is currently used for storage and office accommodation. The land at 70 Churchway currently comprises a two-storey building with a basement level. The existing use of 70 Churchway is unknown.

The site is within a predominantly residential and commercial land use area. Access to the site is provided from Churchway to the west and north and Chalton Street to the east.

The site is currently occupied by approximately 553m² (100% of the total site area) of hard standing in the form of building cover.

Local Topography

A topographical survey of 53-55 Chalton and 60 Churchway has been undertaken by Hook Survey Partnership in July 2014 and is included as Appendix C. The topographical survey shows that the basement level of the site is situated at 16.77metres Above Ordnance Datum (m AOD) and the ground floor unit has a split level of 19.49m AOD and 18.72 AOD. No topographical levels have been provided for 70 Churchway.

Topographic levels to m AOD have also been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that the ground floor of 70 Churchway is situated at levels of between approximately 18.08m AOD and 18.378m AOD. A LiDAR extract is included in Appendix C.

Ground Conditions

Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by bedrock deposits consisting of the London Clay Formation which is generally described as comprising Clay, Silt and Sand. No superficial deposits are recorded.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

BGS borehole scans identify a borehole located approximately 40m north-west of the site (BGS ref. TQ28SE348). The borehole indicates Made Ground to 0.6m below ground level (m. bgl). The Made Ground is underlain by soft to firm brown clay down to 2.1m bgl. This is underlain by stiff to very stiff fissured grey silty clay associated with the London Clay Formation down to 19.8m bgl, which is underlain by very stiff to hard fissured mottled blue, brown and red silty or sandy clay associated with the Woolwich and Reading Beds down to 32.9m bgl. This is underlain by dense grey clayey fine to medium sand down to the borehole base of 36.5 m bgl. The borehole record is included in Appendix D.

According to the EA's Aquifer Designation data, obtained from MAGIC's online mapping [accessed January 2019] the London Clay Formation is classified as Unproductive Strata. Unproductive Strata is described as rock layers with low permeability that have negligible significance for water supply or river base flow.

The EA's 'Source Protection Zones' data, obtained from MAGIC's online mapping [accessed January 2019] indicates that the site is not located within a groundwater Source Protection Zone.

The Cranfield University 'Soilscapes' map [accessed January 2019] indicates that the site is underlain by 'slowly permeable seasonally wet loamy and clayey soils.'

Local Drainage

Public sewer records have been requested from Thames Water and are included as Appendix E. The Thames Water sewer records show that a 305mm diameter combined sewer trends in a north westerly direction within Churchway. The 305mm combined sewer drains into a 1245mm x 813mm public combined sewer originating from Doric Way, ultimately draining into a 1168mm x 686mm combined sewer trending in a south easterly direction in Chalton Street. The 305mm public combined sewer immediately south-west of the site has an identified invert level of 16.32m AOD.

Foul and surface water from the site currently discharge to the public combined sewer network. An existing public combined sewer is shown beneath 70 Churchway and serves the existing building.

Development Proposals

The proposed development is for a hotel and residential units. The hotel development covers 430m^2 and comprises a four-storey hotel with a basement level and an associated bar, restaurant and hotel reception on the first floor.

The residential development covers 122m^2 and comprises a four-storey block comprising a 2-bed apartment and 2No. 1-bed apartments. The 2-bed apartment will occupy the basement and ground floor (with sleeping accommodation at ground floor level) and includes an enclosed garden area. Development plans are included in Appendix F.

The proposed development will not increase hardstanding areas across the site. The hotel development site will remain entirely occupied by building cover. The residential site will introduce approximately 42m^2 of permeable area in the form of an enclosed garden (7.6% of the total area).

Flood Zone Classification and Policy Context

The EA 'Flood Map for Planning', included in Appendix G, shows that the site is located within Flood Zone 1 - an area outside of the extreme flood extent, considered to have a less than 0.1% annual probability of flooding from rivers or the sea.

In accordance with Table 2 of the NPPG: Flood Risk and Coastal Change, residential development is classified as 'more vulnerable' with commercial development classified as 'less vulnerable'. Table 3 of the NPPG states that 'more vulnerable' and 'less vulnerable' developments are considered appropriate within Flood Zone 1. The development therefore passes the flood risk Sequential Test and the Exception Test does not need to be applied.

The London Plan

The site is located within the London Borough of Camden, which is covered by The London Plan (Adopted 2011, updated March 2015). The London Plan contains the following policy pertaining to drainage:

Policy 5.13 – Sustainable Drainage

A. *Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:*
    1. *store rainwater for later use*
    2. *use infiltration techniques, such as porous surfaces in non-clay areas*
    3. *attenuate rainwater in ponds or open water features for gradual release*
    4. *attenuate rainwater by storing in tanks or sealed water features for gradual release*
    5. *discharge rainwater direct to a watercourse*
    6. *discharge rainwater to a surface water sewer/drain*
    7. *discharge rainwater to the combined sewer.*

Drainage should be designed and implemented in ways that deliver other policy objectives of the Plan, including water use efficiency and quality, biodiversity, amenity and recreation".

The London Plan is supported by the Supplementary Planning Guidance: Sustainable Design and Construction, April 2014. In relation to Surface Water Flooding and Sustainable Drainage, the guidance

states that *'developers should design SuDS that incorporate attenuation for surface water runoff. The minimum expectation is to achieve 50% attenuation of the undeveloped site's surface water runoff at peak times. The Mayor's priority is to achieve greenfield runoff rates. Development on greenfield sites must maintain a greenfield runoff rate. Development on previously developed sites should have a runoff rate no greater than three times the calculated greenfield runoff rate'*.

Local Policy

The London Borough of Camden's 'Camden Local Plan' (July 2017) contains the following policies relating to drainage:

Policy D1 Design

The Council will seek to secure high quality design in development. The Council will require that development:

c. *is sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation;*

Policy CC2 Adapting to Climate Change

The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

a. *the protection of existing green spaces and promoting new appropriate green infrastructure;*
b. *not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;*
c. *incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and*
d. *measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.*

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable Design and Construction Measures

The Council will promote and measure sustainable design and construction by:

e. *ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;*
f. *encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;*
g. *encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and*
h. *expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.*

Policy CC3 Water and Flooding

The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible. We will require development to:

a. *incorporate water efficiency measures;*
b. *avoid harm to the water environment and improve water quality;*
c. *consider the impact of development in areas at risk of flooding (including drainage);*
d. *incorporate flood resilient measures in areas prone to flooding;*
e. *utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and*
f. *not locate vulnerable development in flood-prone areas.*

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore.

The London Borough of Camden have produced the Camden Planning Guidance 3 – Sustainability which indicates the council expects the following with regards to surface water flooding:

All developments are expected to manage drainage and surface water on-site or as close to the site as possible, using Sustainable Drainage Systems (SuDS).

The Council will expect plans and application documents to describe how water will be managed within the development, including an explanation of the proposed SuDS, the reason why certain SuDS have been ruled out and detailed information on materials and landscaping.

The Council will expect developments to achieve a greenfield surface water run-off rate once SuDS have been installed. As a minimum, surface water run-off rates should be reduced by 50% across the development.

Local guidance documents including the London Borough of Camden Strategic Flood Risk Assessment (SFRA) (July 2014) and the London Borough of Camden Preliminary Flood Risk Assessment (PFRA) (December 2011) have been reviewed for site specific information.

Sources of Flooding and Probability

Fluvial

The nearest watercourse is a culverted watercourse located approximately 75m north-east of the site. The culverted watercourse flows south-east, originating from Highgate Ponds on Hampstead Heath approximately 4km north-west of the site. The SFRA London Borough of Camden 'Surface Waterbodies' map shows the location of the culverted watercourse and is included in Appendix H.

Other watercourses in the area include the River Thames which is located approximately 2.4km south-east of the site. The River Thames flows east in this location. There are no other watercourses within the vicinity of the site.

The EA 'Flood Map for Planning', included in Appendix G, shows that the site is located within Flood Zone 1 - an area outside of the extreme flood extent, considered to have a less than 0.1% annual probability of flooding from rivers or the sea.

The EA 'Historical Flood Map' (Appendix G) indicates that there are no records of fluvial flooding at or near to the site.

The LLFA have stated in their correspondence, '*The site is not within a [local flood risk zone] LFRZ. It is 300m west of the boundary of the Kings Cross LFRZ.'*

The SFRA states, *'all main rivers historically located within LBC are now culverted and incorporated into the TWUL sewer network and therefore there is no fluvial flood risk within LBC.'*

It can therefore be concluded that the risk of fluvial flooding is very low.

Tidal

The site is situated at a minimum of approximately 18.72m AOD. Therefore, the risk from tidal flooding is considered to be low.

Surface Water

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground. It is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen or developed, resulting in overland flow and ponding in depressions in topography. Surface water flooding can occur anywhere without warning. However, flow paths can be determined by consideration of contours and relative levels.

The EA 'Flood Risk from Surface Water' map (Appendix G) indicates that 53-55 Chalton Street and 60 Churchway are at very low risk of surface water flooding, meaning they have a less than 0.1% annual probability of flooding. 70 Churchway is shown at medium risk of surface water flooding, meaning it has between a 1% and a 3.3% annual probability of flooding.

Chalton Street to the east of the site is shown at low risk of surface water flooding, meaning it has between a 1% and 0.1% annual probability of flooding. Churchway immediately north of the site is shown at high risk of surface water flooding with a greater than 3.3% annual probability. Churchway immediately west of the site is shown at medium risk of flooding.

A review of the online EA surface water velocity mapping and LiDAR data identifies that surface water in Chalton and Churchway would be directed to a local topographical low point at the junction of Churchway, Doric Way and Drummond Crescent, immediately north-west of the site. A review of topographical data confirms that Chalton Street is elevated above Churchway and that the junction of Churchway, Doric Way and Drummond Crescent forms a low topographical point in the area.

The EA flood mapping provides a conservative estimation of flood risk and does not account for the public sewer system. The area is served by large diameter (1245mm x 813mm) public combined sewers. When accounting for the public sewerage system, the risk of surface water flooding within adjacent roads is reduced.

53-55 Chalton Street and 60 Churchway are elevated above adjacent roads and as confirmed by the EA surface water flood mapping are at very low risk of surface water flooding. 70 Churchway is identified at medium risk with flooding derived from Churchway (road) to the north. The risk of flooding to 70 Churchway will be reduced through the inclusion of flood resistance and resilience measures as discussed in the mitigation section below.

Sewer

Flooding from sewers can occur when a sewer is overwhelmed by heavy rainfall, becomes blocked, is damaged, or is of inadequate capacity. Flooding is mostly applicable to combined and surface water sewers.

The Thames Water sewer records (Appendix E) show that a 305mm diameter combined sewer trends in a north westerly direction within Churchway. The 305mm combined sewer drains into a 1245mm x 813mm public combined sewer originating from Doric Way, ultimately draining into a 1168mm x 686mm combined sewer trending in a south easterly direction in Chalton Street.

Similar to surface water flooding, any potential flooding arising from the sewers in the adjacent roads would be directed towards the junction of Doric Way, Drummond Street and Churchway, following the local topography.

The SFRA 'DG5 Internal Sewer Flooding' and the 'DG5 External Sewer Flooding' maps, included in Appendix H, shows that there have been no records of sewer flooding at or near the site. This indicates that the public sewers in this area do not have capacity issues.

The PFRA contains no records of sewer flooding at the site stating; *'There are no records of properties affected by sewer flooding with significant consequences within Camden.'*

Similar to surface water flooding, 53-55 Chalton Street and 60 Churchway are elevated above adjacent roads are considered at very low risk of sewer flooding. 70 Churchway may be at potential risk of sewer flooding should flood depths exceed threshold levels in Churchway north of the site.

The risk of flooding to 70 Churchway will be reduced through the inclusion of flood resistance and resilience measures as discussed in the mitigation section below.

Groundwater

Groundwater flooding occurs when water levels underneath the ground rise above normal levels. Prolonged heavy rainfall soaks into the ground and can cause the ground to become saturated. This results in rising groundwater levels which leads to flooding above ground.

Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by bedrock of London Clay. Given the presence of London Clay, the vertical migration of groundwater will be limited.

There are no records of groundwater flooding at or near to the site. It can therefore be concluded that the risk of groundwater flooding is low.

Artificial Sources

The Regents Canal / Grand Union Canal is located approximately 605m north-east of the site.

The SFRA states, '*The water level within Regent's Canal is controlled by a series of lock gates, and the risk of flooding as a result of overtopping or breaching of the canal is low. The Canal and River Trust (C&RT) was consulted during the writing of this SFRA and confirmed that there are no recorded incidents of overtopping or breaches of the Regent's Canal in or within 500m of LBC.'*

The online EA 'Risk of Flooding from Reservoirs' map shows that the site is not at risk of flooding from reservoirs. It can therefore be concluded that the risk of flooding from artificial sources is very low.

Summary of Potential Flooding and Mitigation

It can be concluded that 53-55 Chalton and 60 Churchway are at very low risk of flooding from all sources.

70 Churchway is shown to have a medium risk of surface water flooding. The flood risk is derived from surface water collecting in Churchway north and north-west of the site. The identified flood risk will be mitigated by installing the following flood resilience and resistance measures:

- Raise external threshold levels as high as practical. This could include an up and over step at the property threshold;
- Should it not be possible to raise the external threshold, internal thresholds should be raised where practical. This could include an up and over ramp or step at the access to the ground floor flat and at the stairs leading to the basement;

- Install a demountable flood guard to the access door leading to Churchway to the north of the site;
- Install non-return valves to drains;
- Seal cable entry points (if at ground floor level);
- Raise electronic control units as high as practical.

The introduction of flood risk resilience and resistance measures will create betterment in terms of flood risk to the property over the existing situation.

Surface Water Management

The site is currently 100% hardstanding comprising residential and retail buildings. Surface water runoff currently drains at an unrestricted rate to the public combined sewer.

The proposed development plans indicate that building cover will occupy 92.4% of the site. The development will reduce the amount of impermeable area through the introduction of a 42m² garden.

In their correspondence the LLFA state, '*Calculations of runoff and attenuation volumes for a range of return periods up to the 1 in 100 year + 40% climate change event, demonstrating how the drainage system will reduce runoff as close to greenfield as feasible with a minimum 50% reduction. … The applicant should review their drainage proposals giving further consideration to blue roof attenuation and below ground attenuation. …*'

The greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. A summary of the greenfield runoff rates for a range of events is provided as Appendix I. The existing 1 in 1 year greenfield runoff rate for the 553m^2 development site is 0.075 l/s.

The Modified Rational Method (2.78 x i x Ap) was used to estimate existing brownfield runoff rates. Whereby 'I' is the rainfall intensity for a 360min storm duration derived from FEH data. 'Ap' is the existing impermeable area in ha (0.0553ha). Existing brownfield runoff rates for a range of events are shown in Table 1.

Table 1 – Existing Brownfield Runoff Rates

Return Period (yr)	Rainfall Intensity (mm)	Existing Brownfield Runoff Rate (l/s)
1 in 2	26.5	4.1
1 in 30	63	9.7
1 in 100	87.4	13.4

Discharge Method

Paragraph 080 of the NPPG: Flood Risk and Coastal Change sets out the following hierarchy of drainage options: into the ground (infiltration); to a surface water body; to a surface water sewer, highway drain or another drainage system; to a combined sewer.

Infiltration

The first consideration for the disposal of surface water is infiltration. As described above the site is underlain by the London Clay Formation. Therefore, ground conditions do not appear suitable for the use of soakaways.

In accordance with Building regulation, soakaways should be a minimum of 5m from buildings. The proposed buildings will occupy 92.4% of the site with the proposed garden (42m^2) being within 5m of buildings. As such, there is insufficient space to accommodate soakaways. Permeable surfaces will be used within the garden area.

Watercourse

As soakaways are not suitable, a connection to a watercourse is the next consideration.

The nearest watercourse is a culverted watercourse located 75m north-east of the site. The site is separated from the culverted watercourse by third party, urbanised land. A direct connection to this watercourse is therefore not a feasible option.

Sewer

As disposal of surface water to watercourse is not feasible, a connection to the public sewer system is the final consideration. There is a 305mm public combined sewer located in Churchway to the west of the site and a 1245mm x 813mm public combined sewer located in Churchway north of the site. There is also a 1168mm x 686mm public combined sewer in Chalton Street east of the site. Surface water

should discharge to the public combined sewer network. A restricted flow rate of 1 l/s (for each individual discharge / outfall point) is proposed to ensure the drainage system is self-cleansing, reducing the risk of blockage.

A gravity connection is feasible as per the existing situation. Existing connections could be re-used.

Sustainable Drainage Systems

In order to achieve a discharge rate of 1 l/s (for each discharge point), attenuation storage will be required. Due to the building coverage on site and constraints associated with access for maintenance, below ground or surface level attenuation storage features such as attenuation tanks, ponds and basins are not considered feasible.

As per LLFA correspondence, consideration should be given to attenuation within a green / blue roof system.

A review of the proposed roof plans shows separate areas of flat roof. The roof levels vary across the site with four distinct flat roof areas identified as:

- **55m²** - 70 Churchway
- **95m²** - 60 Churchway
- **67m²** - 53-55 Chalton
- **70m²** - area of lower roof centrally within the site.

The areas of flat roofs are considered suitable for the use of blue roof attenuation. A small area of pitched roof centrally within the site will be formed as a green roof and will drain towards the adjacent flat blue roof areas.

Given the varying roof areas and levels across the entire site, a separate surface water discharge will be required for each of the four flat roof areas described above. Each discharge will be limited to 1 l/s, equating to a total combined discharge rate of 4 l/s for the site. A combined discharge rate of 4 l/s is equivalent to the 1 in 2 year brownfield runoff rate and provides 58.8% betterment over the brownfield 1 in 30 year runoff rate and a 70.2% betterment over the 1 in 100 year brownfield runoff rate.

Areas of existing pitched roofs and mansards at the property frontages, which fall away from the blue roof areas and towards adjacent roads will drain to the public sewer at an unrestricted rate. These areas cover a minimal footprint and as such, runoff rates will be minimal.

To establish the attenuation volume required for each area of blue roof, storage estimates have been calculated using MicroDrainage and are included in Appendix J. Storage volumes are based on a limited discharge rate of 1 l/s, storage within a tank structure and a design head of 0.1m.

70 Churchway

Based on a roof area of 55m^2, an estimated storage volume of 2.2m^3 will be required to accommodate the 1 in 100 year plus 40% climate change event. The maximum water depth within the blue roof (tank) structure identified by MicroDrainage is 55mm.

60 Churchway

Based on a roof area of 95m^2, an estimated storage volume of 4.3m^3 will be required to accommodate the 1 in 100 year plus 40% climate change event. The maximum water depth within the blue roof (tank) structure identified by MicroDrainage is 78mm.

53-55 Chalton Street

Based on a roof area of 67m^2 an estimated storage volume of 2.7m^3 will be required to accommodate the 1 in 100 year plus 40% climate change event. The maximum water depth within the blue roof (tank) structure identified by MicroDrainage is 59mm.

Central Area

Based on a contributing roof area of 100m^2 (includes 30m^2 pitched green roof area) and a blue roof area of 70m^2, an estimated storage volume of 4.3m^3 will be required to accommodate the 1 in 100 year plus 40% climate change event. The maximum water depth within the blue roof (tank) structure identified by MicroDrainage is 78mm.

Concept Surface Water Drainage Scheme

Surface water runoff for the four distinct roof areas will be discharged to the public combined sewers located in Churchway and Chalton Street at a combined discharge rate of 4 l/s (1 l/s per roof area). Surface water runoff from roof areas (excluding lightwells, pitched roofs and mansards) will be attenuated on site with attenuation provided in the form of blue roofs to accommodate the 1 in 100 year plus 40% CC event.

The proposed surface water drainage scheme will ensure no increase in runoff over the lifetime of the development and will create betterment over existing brownfield runoff rates.

A plan identifying the areas of blue and green roofs is included as Appendix K.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), other roofs (applicable to hotel roofs) are be categorised as having a 'low' pollution hazard level. Table 2 shows the pollution hazard indices for the proposed use.

Table 2 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other roofs (typical commercial/industrial roofs)	Low	0.3	0.2	0.05

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2
** Indices values range from 0-1.*

Blue roof systems include a surface finish above the water attenuation layers to provide filtration of airborne debris to prevent blockages and ballasting preventing wind uplift and flotation of the components. Blue roofs are considered to provide sufficient treatment. No further treatment (in addition to debris / sediment removal) is considered necessary given that surface water will discharge to the public combined sewer.

Maintenance

Maintenance of communal drainage features such as a 'blue roof' attenuation system will be the responsibility of the site owner. Maintenance of shared surface water drainage systems can be arranged through appointment of a site management company.

In accordance with the guidance given in British Standard 6229:2003 it is recommended to carry out a twice-yearly maintenance check of the blue roof system. The recommended maintenance is as follows;

- Clear all debris from the roof surface, rainwater outlets, chutes, gutters etc. Debris must be removed from the roof and not simply flushed down rainwater pipes.

- Inspect the waterproofing system visible at all upstands, to ensure it is firmly adhered to the detail that it is waterproofing.
- Cut back tree limbs that overhang the roof to give a 1 metre clearance outside the roof edge. This will significantly reduce blockage of drainage ways due to fallen leaves.
- Ensure that all rainwater pipes are free from blockages and that water flows freely through them.

A maintenance schedule for green roofs is included in Appendix L.

Foul Drainage

Foul flows from the hotel development should be discharged to the public combined sewer network as per the existing situation. Based on the basement floor level of 16.77m AOD and a sewer invert level of 16.32m AOD (for the 305mm public combined sewer west of the site), a gravity connection to the public sewer network appears feasible. Non-return valve should be fitted to prevent backflow. Foul flows from the residential development should connect to the public combined sewer located within 70 Churchway as per the existing situation.

Conclusions

The proposal is for a hotel and residential units.

This report has been produced in consultation with the LLFA and in accordance with the guidance detailed in the CIRIA SuDS manual (C753) and the London Plan.

The site is located within Flood Zone 1 on the Environment Agency (EA) 'Flood Map for Planning' – an area considered to have the lowest probability of fluvial and tidal flooding. The site is shown to be located outside of the extreme 0.1% annual probability fluvial and tidal flood extent.

The risk of flooding from all sources has been assessed and the flood risk to the majority of the site is considered to be low. 70 Churchway is identified at medium risk of surface water flooding with between a 1% and 3.3% annual probability of occurrence. A review of the online EA surface water velocity mapping and LiDAR data identifies that surface water in Chalton and Churchway would be directed to a local topographical low point at the junction of Churchway, Doric Way and Drummond Crescent, immediately north-west of the site.

In order to mitigate the potential surface water flood risk to 70 Churchway, flood resilience and resistance measures should be incorporated including raising threshold levels and / or installing a demountable flood guard to the access door from Churchway to the north.

The proposed development will lead to a reduction in impermeable area. This will result in a reduction in surface water runoff, however in order to comply with LLFA requirements, flow control will be used and attenuation provided on site to accommodate storm events up to and including the 1 in 100 year plus 40% climate change event.

All methods of surface water discharge have been assessed. Surface water runoff will be discharged to the public combined sewers located in Churchway and Chalton Street. Given the varying roof levels and areas across the site, multiple discharge points are required.

Due to the building coverage on site and constraints associated with access for maintenance, below ground and surface level surface water attenuation features such as attenuation tanks, ponds and basins are not considered practical.

In order to reduce the rate of surface water runoff a mixture of green and blue roofs area proposed at four distinct flat roof areas. Each area of flat blue roof will provide attenuation storage and each blue roof will discharge at a limited rate of 1 l/s.

Foul flows should be discharged to the public sewer network as per the existing situation. Based on the floor level of the basement within the hotel development, a gravity connection appears to be feasible.

Recommendations

1. Submit this Drainage Strategy to the Planning Authority in support of the Planning Application;
2. Consult Thames Water over re-using connections to the sewer.

Appendix A – LLFA Correspondence

Lead Local Flood Authority – London Borough of Camden
Statutory Consultee for all Major Developments (SuDS)
Statutory Consultee for all Major developments >1ha

Scheme Address	Chalton Street and Churchway, London
Planning Reference	2016/5266/P
Size of site (as stated on application form)	0.0553ha
Date	13/11/18
Recommendation:	Objection

Description of Development:

Erection of part 4 part 2 storey plus basement building, comprising 46 room hotel (C1 Use Class) fronting Chalton Street and Churchway (following demolition of existing building); in association with application 2015/5041/P [70 Churchway] erection of 3 storey building plus basement with rear garden and roof terrace at 1st floor level, comprising 4x Residential units (1x2 bed & 2x1bed unit) (C3 Use Class)to allow for offsetting of residential accommodation (following demolition of existing building). REVISED DRAWINGS: The key changes are: height reduced by 1 storey, design alterations, reduction in number of bedrooms.

Policy Requirement:

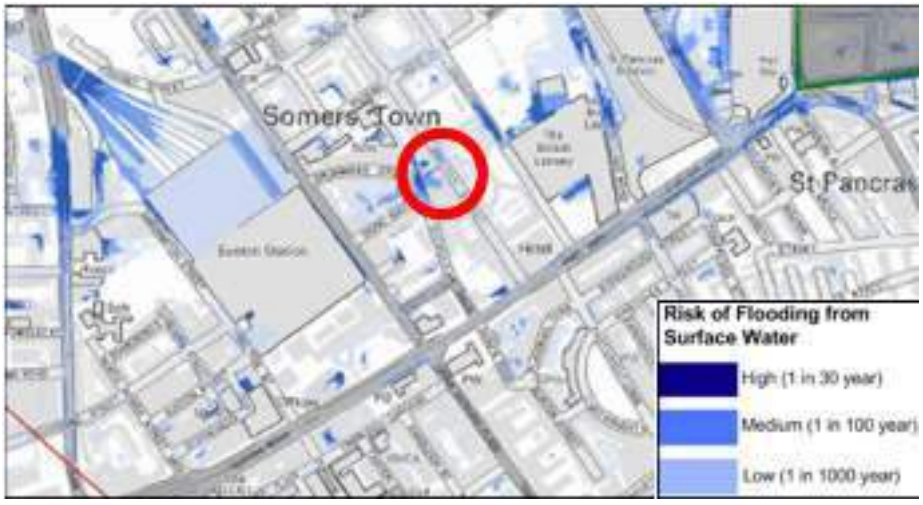
- Submit an FRA if >1ha
- Major developments to achieve greenfield run-off rates wherever feasible and as a minimum 50% reduction in run off rates.
- NPPF requires all major developments to include SuDS unless demonstrated to be inappropriate (as set out in the Ministerial Statement by the Secretary of State on 18 December 2014).
- Development should follow the drainage hierarchy in policy 5.13 of the London Plan below:
    - store rainwater for later use
    - use infiltration techniques, such as porous surfaces in non-clay areas
    - attenuate rainwater in ponds or open water features for gradual release
    - attenuate rainwater by storing in tanks or sealed water features for gradual release
    - discharge rainwater direct to a watercourse
    - discharge rainwater to a surface water sewer/drain
    - discharge rainwater to the combined sewer
- Developments in areas known to be at risk of surface water flooding are designed to reduce the risk of flooding in the site and surrounding areas as a result of the development, and to cope with being flooded.

Best practice guidance recommended within the non-statutory technical standards:

- Constrain run-off volumes to greenfield run off volumes for the 1 in 100 year 6 hour event.

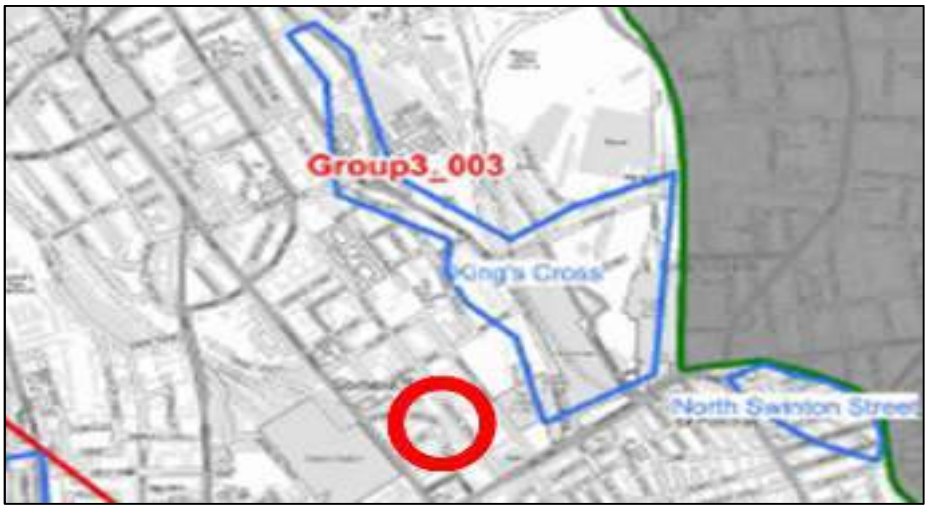
Location of development relative to surface water flood risk:

The site located in an area of medium (1 in 100 year) surface water flood risk and borders an area of high (1 in 30 year) surface water flood risk.

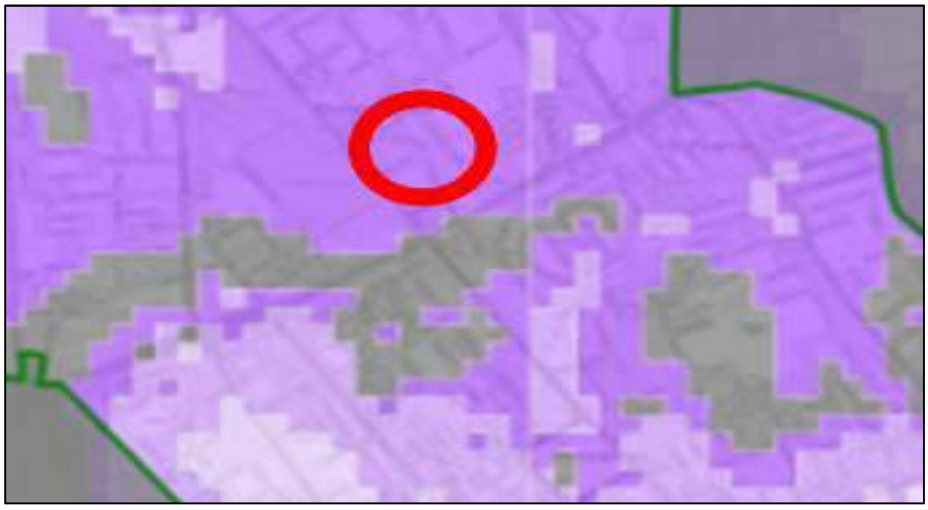


Location of development relative to Local Flood Risk Zone:

The site is not within a LFRZ. It is 300m west of the boundary of the Kings Cross LFRZ.



Location of development relative to infiltration compatibility:



Documents submitted (✓ = YES, × = NO):

✓ Surface water drainage statement
X Drawings showing details of SuDS extent and position (including outfalls and control points)
X Completed drainage proforma
X SuDs lifetime maintenance plan (site specific)
X Microdrainage run-off (rates and volumes) calculations
X Details of flow routes for exceedance events

Proposed SuDS:

- Green Roof (Volume/Area – **Not Provided**);
- Raised box planters discharging to existing combined sewer connection on Churchway (Volume/Area – **Not Provided**);.

Greenfield, Existing and Proposed Run off rates:

Not Provided. No information in relation to the Greenfield runoff rates, and the existing and proposed runoff rates provided.

Proposed volume of water attenuated

Not Provided. The Drainage Strategy does not indicate the attenuation to be provided by the green roof and raised box planters.

Policy compliance and further information required

Submit an FRA if >1ha or in an area of heightened flood risk.

Comment: The applicant has not submitted an assessment of flood risk or acknowledged surface water risk within their drainage statement.

Action for applicant: The applicant should demonstrate an understanding of the local risks form surface water and how the proposed development will a) be resilient to surface water flooding and b) not displace surface surface water flooding and c) where possible reduce risk from surface water flooding

Major developments to achieve Greenfield run-off rates wherever feasible and as a minimum 50% reduction in run off rates.

Comment: The drainage strategy has not demonstrated that greenfield runoff rates can be achieved as no calculations to verify the greenfield runoff rates for the site were provided. Furthermore the applicant has made no efforts to demonstrate how they may achieve the runoff reductions required by Camden and London Plan policy.

Action for applicant: The applicant must revise their drainage strategy to incorporate the following information;

- *Completed SuDS proforma*
- *Calculations to demonstrate greenfield runoff rates*
- *Calculations of runoff and attenuation volumes for a range of return periods up to the 1 in 100 year + 40% climate change event, demonstrating how the drainage system will reduce runoff as close to greenfield as feasible with a minimum 50% reduction.*
- *Detailed drawings showing details of SuDS extent and location*
- *A drainage layout plan with details of the proposed connection to the existing sewer (including invert levels/pipe sizes)*

Developments to include SuDS unless inappropriate
Development should follow the drainage hierarchy in policy 5.13 of the London Plan

Comment: An option appraisal of various SuDS options is undertaken in Section ‘Surface Water Management’ of the drainage strategy. The appraisal provides justification for the selection and exclusion of SuDs features from the proposed drainage scheme. However, the justification provided is not sufficient.

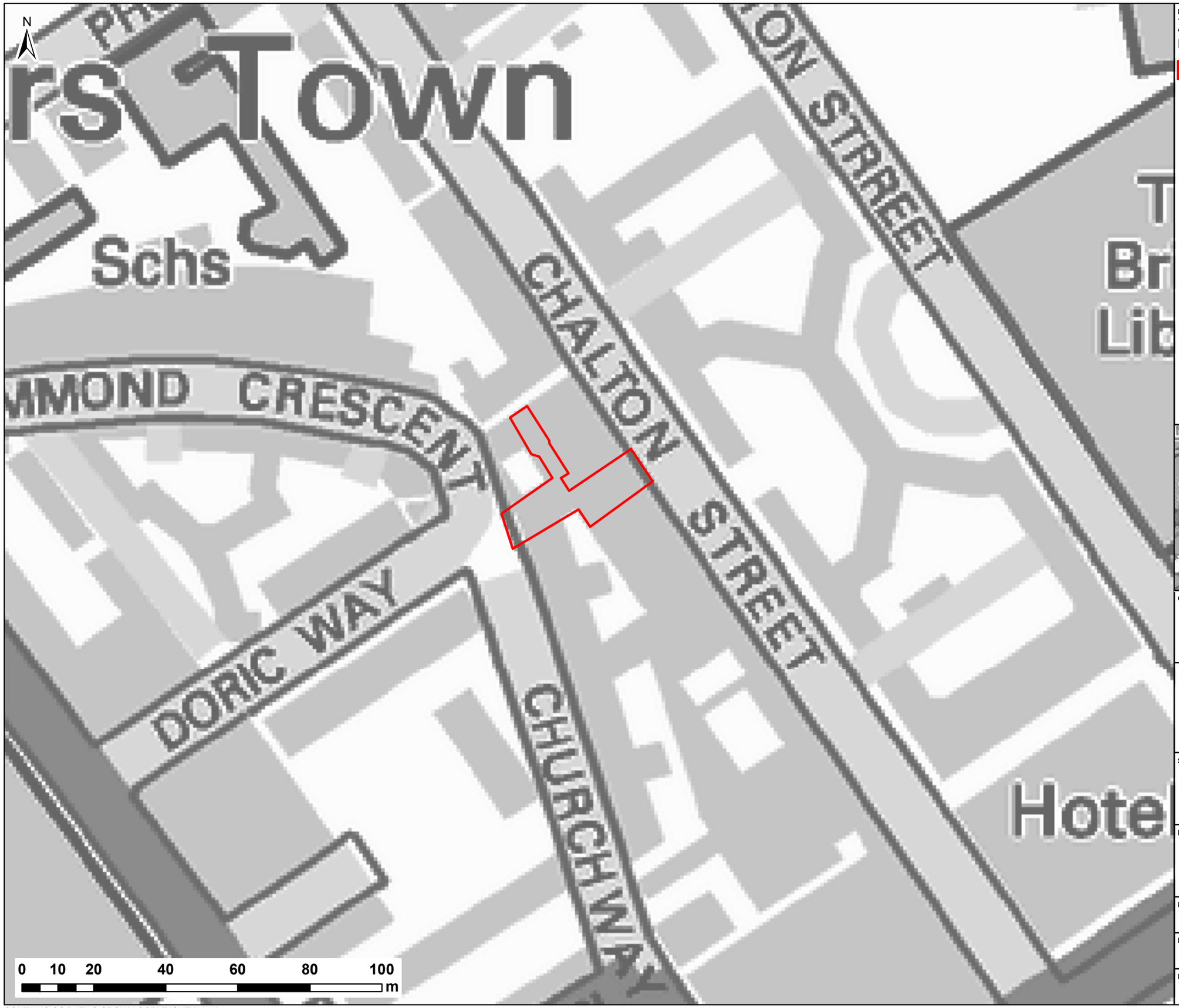
Action for applicant: The applicant should review their drainage proposals giving further consideration to blue roof attenuation and below ground attenuation. The current proposals are not acceptable.

Developments in areas known to be at risk of surface water flooding are designed to reduce the risk of flooding in the site and surrounding areas as a result of the development, and to cope with being flooded.

Comment:
The development appears to overlap an area of medium risk of flooding from surface water and sits adjacent to an area of high risk. Further the Drainage Strategy by (*Waterco Consultant, Document Ref: w10253-180813-Drainage Strategy)* state under Development Proposals the "*The 2-bed apartment will occupy the basement and ground floor (with sleeping accommodation at ground floor level) and includes an enclosed garden area*". There is no mention of flood mitigation measures.

Action for applicant: Applicant to demonstrate how the basement and ground floor will be resilient to surface water flooding and not increase the risk elsewhere.

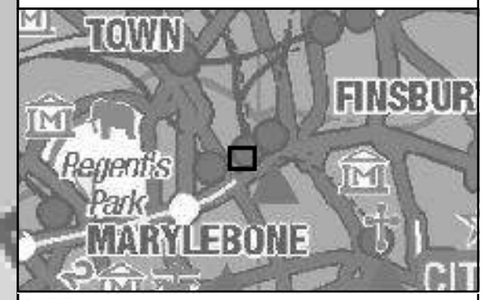
Appendix B – Aerial and Location Plan



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

Site Boundary



CLIENT:

RANGEPAY LTD

waterco

www.waterco.co.uk

SCHEME:

CHALTON ST & CHURCHWAY, LONDON

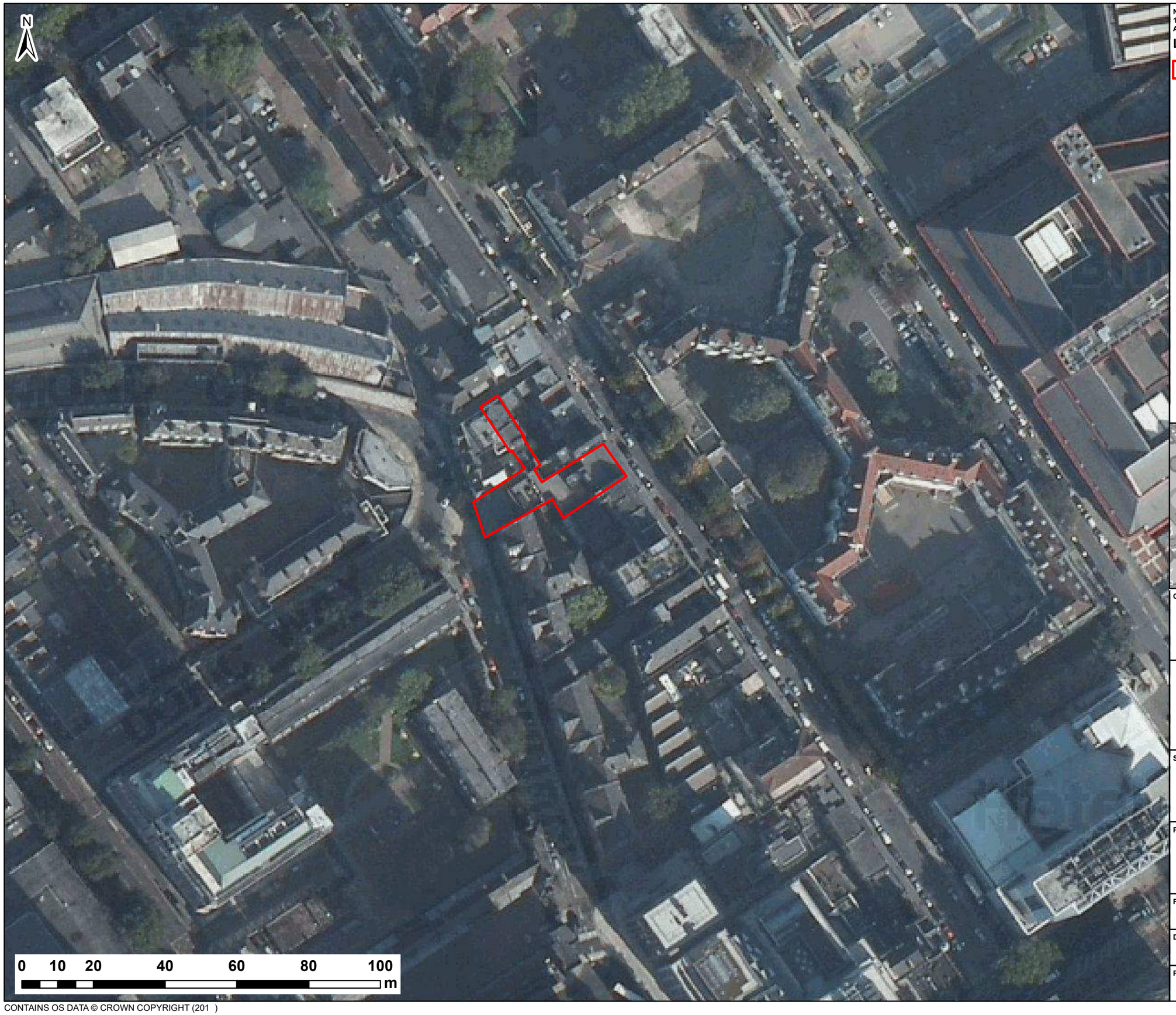
PLOT TITLE:

LOCATION PLAN

PLOT STATUS:	DATE:
FINAL	22/01/2019

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
RP	AW	VG	1:1,000 (UNLESS STATED OTHERWISE)

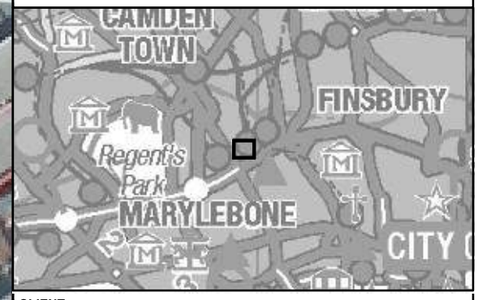
PLOT NAME:	REV:
w10253_Location_Plan	-



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

Site Boundary



CLIENT:

RANGEPAY LTD

waterco consultants

www.waterco.co.uk

SCHEME:

CHALTON ST & CHURCHWAY, LONDON

PLOT TITLE:

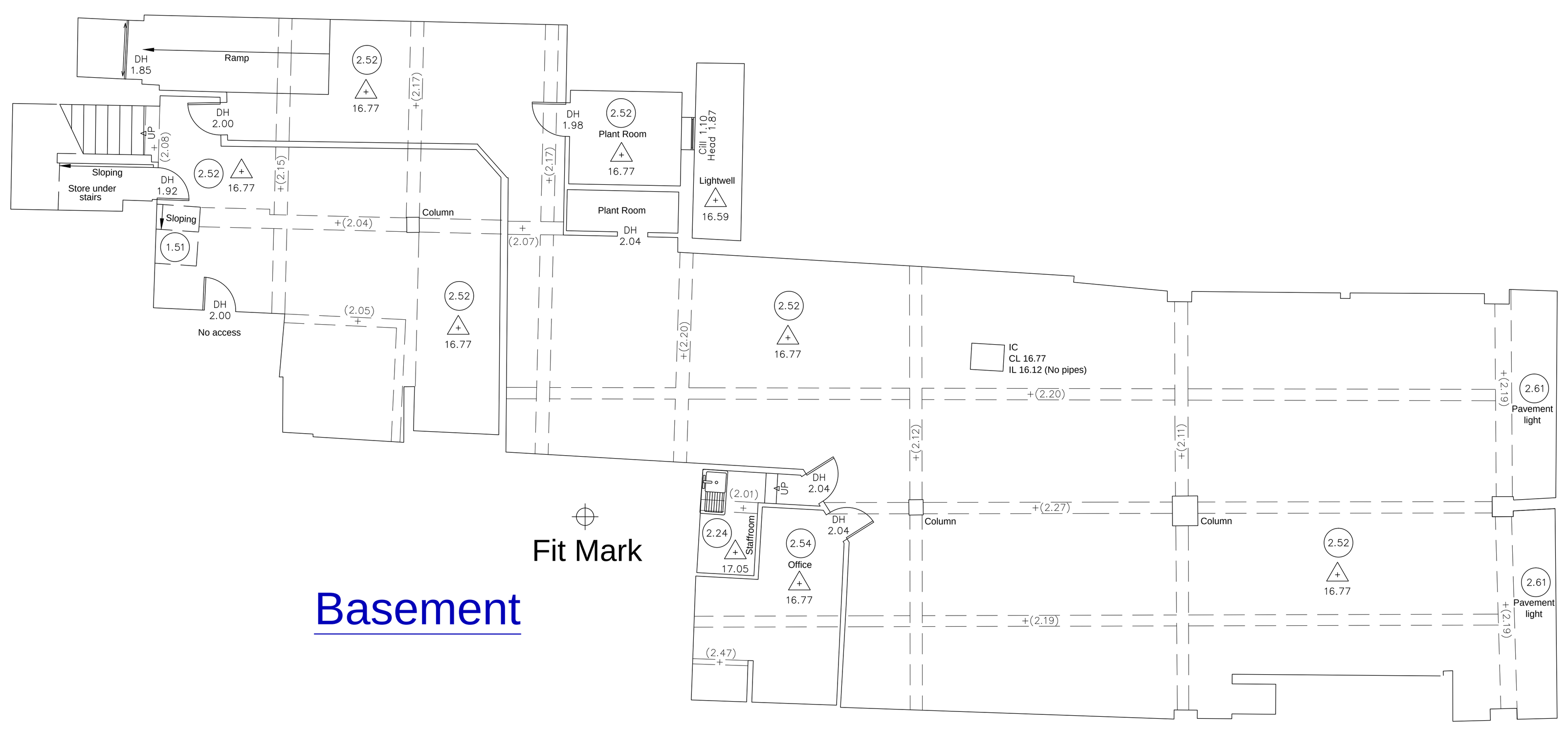
AERIAL PLAN

PLOT STATUS:	DATE:
FINAL	02/08/2018

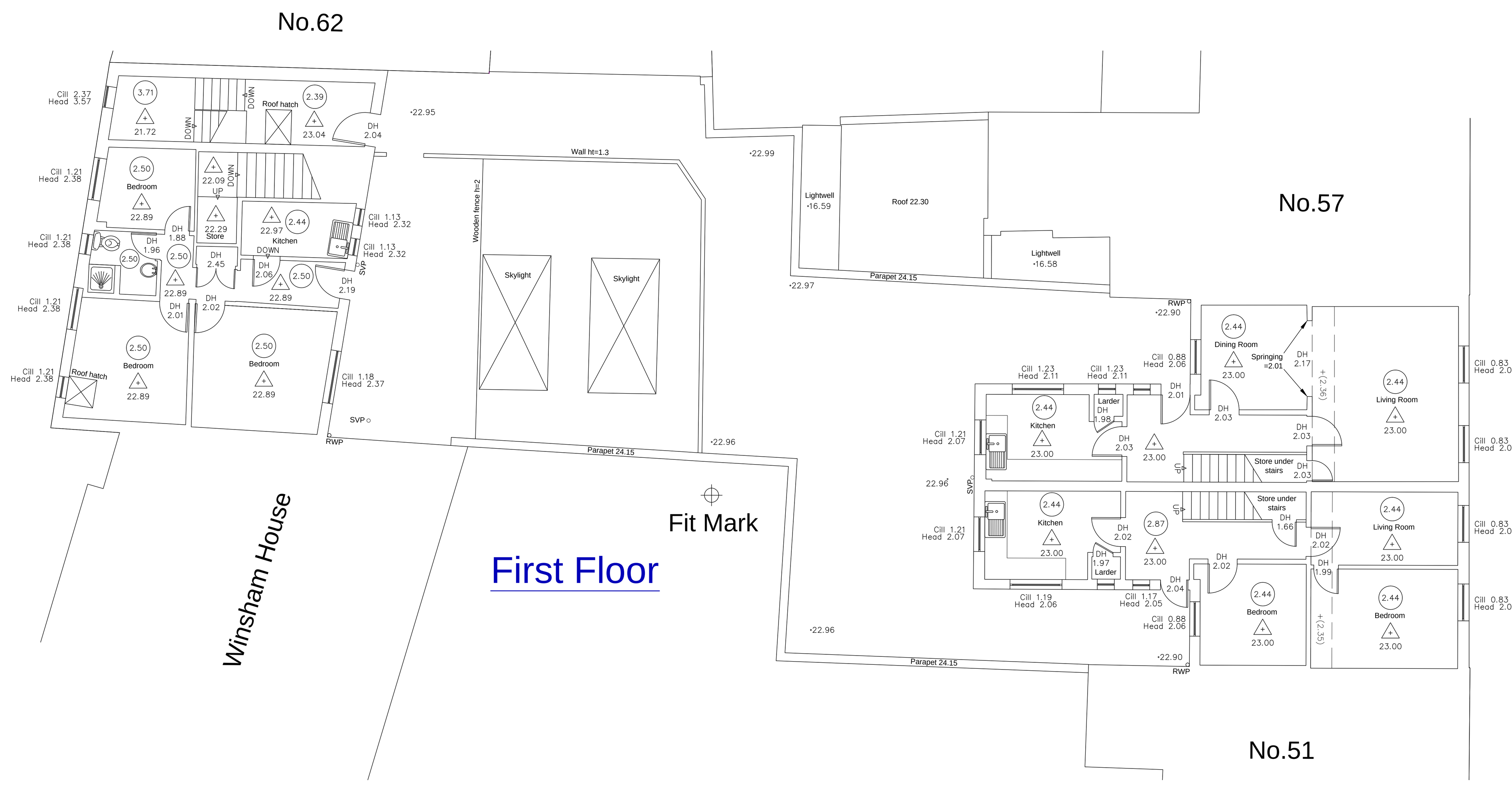
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
HW	AW	VG	1:1,000 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
w10253-Aerial_Plan	-

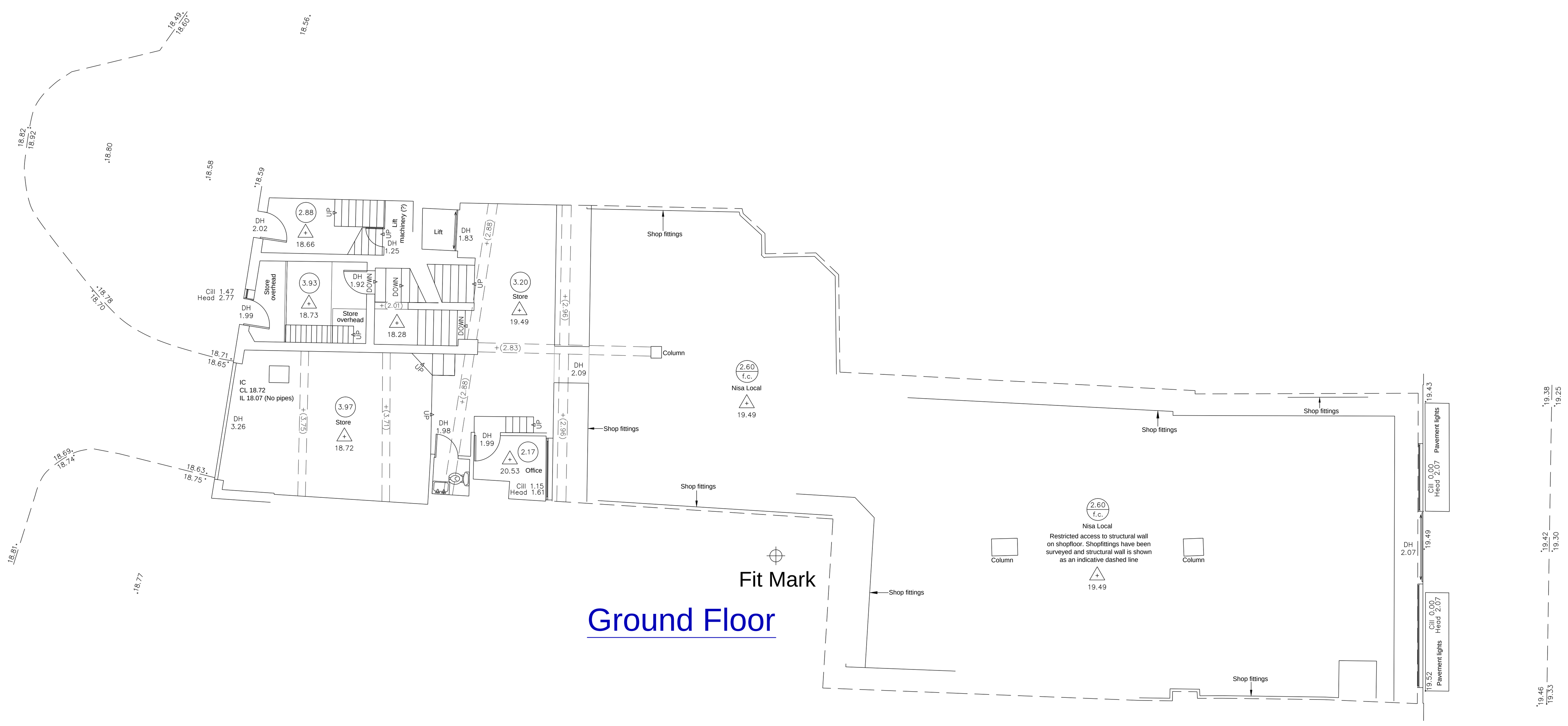
Appendix C – Topographical Survey and LiDAR Extract



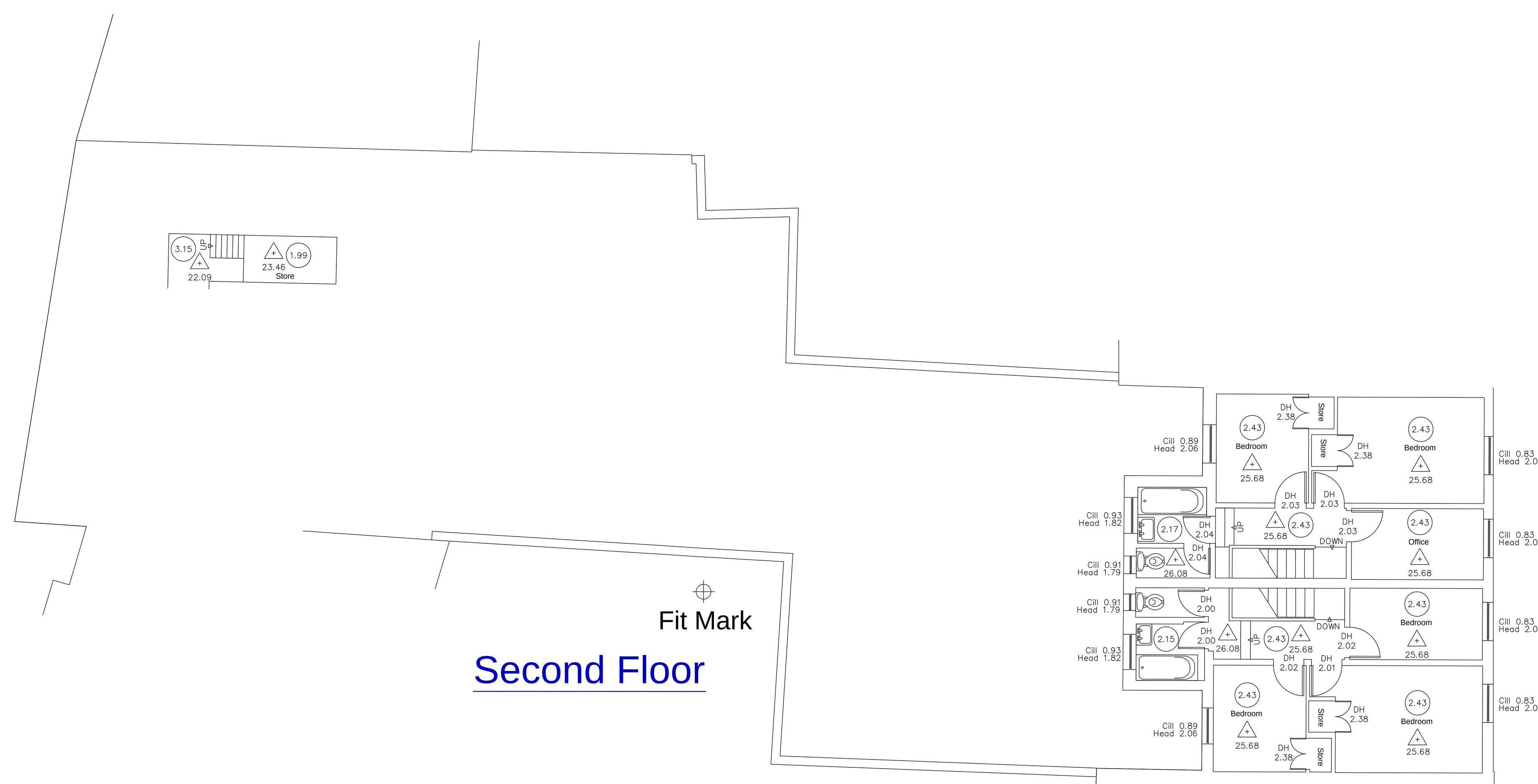
Basement



First Floor



Ground Floor



Second Floor

DO NOT SCALE

All critical dimensions must be checked on site prior to commencement of any works.

This is a CAD drawing - some layers may not be shown on this drawing

Hook Survey Legend

DH 2.10	Door head height
123.45	Floor level
2.39	Ceiling height
2.39 f.c.	False Ceiling height
Cill 11.05 Head 12.27	Window cill height Window head height
Sc ht=4.05	Level at change in ceiling slope
+ (2.75)	Floor to beam soffitt

Notes

Beams and columns surveyed where accessible - some beams and columns may not be shown.

Elevation details surveyed where accessible

All measurements have been taken to existing wall, floor and ceiling finishes.

HOOK SURVEY PARTNERSHIP
Land & Building Surveyors

Project :
No's 53-55 Chalton Street,
London, NW1 1HY

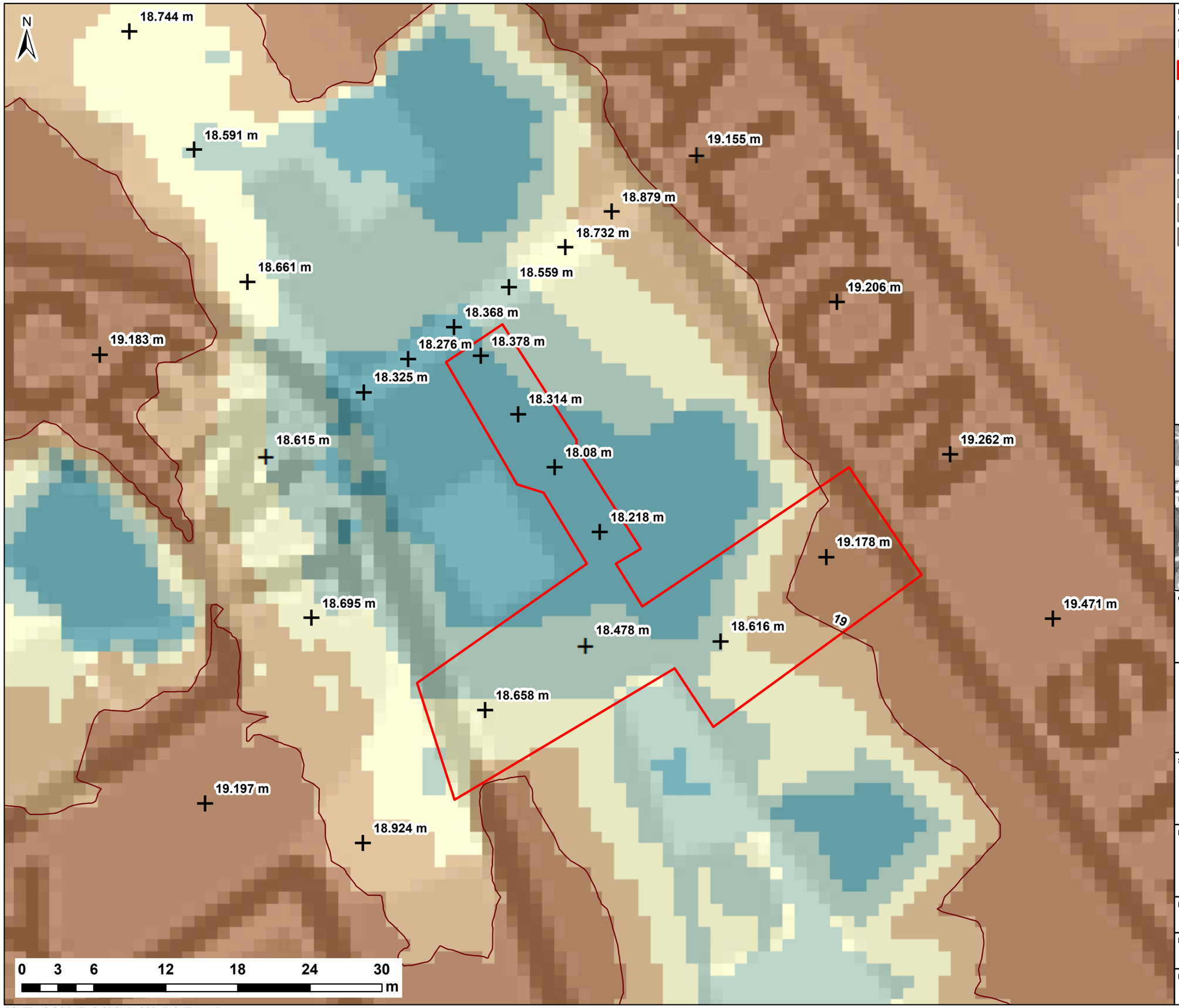
Client :
Goalsave Services Ltd

Drawing title :
Floor Plans

Job No. :	Dwg No. :	Revision :
S14/4318	S13/4318/01	-
Scale : 1:100	Date : July 2014	Drawn by : B.C.

Grid & Levels related to :
OSGB36 GPS Network

Head Office
Unit 3 Whiffens Farm
Clement Street
Hextable, Nr Swanley
Kent BR8 7PQ
Midlands Office
54 Stratford Road
Shipston on Stour
Warwickshire
CV36 4AZ
01322 660662
01322 618651
mail@hooksurvey.com
www.hooksurvey.com



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Spot Levels

Ground Elevation (mAOD)

- < 18.4
- 18.4 - 18.6
- 18.6 - 18.8
- 18.8 - 19
- > 19

CLIENT:

RANGEPAY LTD

waterco

www.waterco.co.uk

SCHEME:

CHALTON ST & CHURCHWAY, LONDON

PLOT TITLE:

LIDAR ELEVATIONS

1m RESOLUTION

PLOT STATUS:	DATE:
FINAL	25/01/2019

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
RP	AW	VG	1:300 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
w10253_LiDAR	-

Appendix D – Borehole Record

RECORD OF BOREHOLE NO. 14

TQ/28SE/348

2975 8289

Ground level + 61.5ft. O.D. Newlyn

Dia of boring 8in. to 85ft. 6in. to 120ft.

Type of boring Shell and Auger

Lining tubes 8in. to 30ft. 6in. to 90ft.

Daily Progress	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: O.D. Level	Description of Strata
	2'0"	D		2'0"	+59.5	Concrete floor and base
	3'0"	D				
						Soft to firm brown clay
	7'0"	D		7'0"	+54.5	
						Firm to stiff fissured brown silty clay (London Clay)
	12'0"	D				
	15'0"	D		15'0"	+46.5	
	20'0"	D				
	25'0"	D				
3.12.58						
	30'0"	D				
	35'0"	D				
						Stiff to very stiff fissured grey silty clay with occasional partings below 60ft. (London Clay)
	40'0"	D				
	45'0"	D				
	50'0"	D				
	55'0"	D				
4.12.58	60'0"	D		60'0"	+ 1.5	
	63'0"	D				
	65'0"	D				
	68'0"	D				
	73'0"	D				
	75'0"	D				
	80'0"	D				
						Very stiff to hard fissured mottled blue, brown and red silty or sandy clay (Woolwich and Reading Beds)
6.12.58	85'0"	D				
	86'0"	D				
	89'0"	D				

8.12.58	99'0"	D				
	100'0"	D				
	105'0"	D				
	109'0"	D		108'0"	-46.5	
9.12.58	114'0"	D				Dense grey clayey fine to medium sand. (Thanet Sand)
10.12.58	119'0"	D		120'0"	-58.5	

Key to type of sample:

U (N) -- 4 in. dia undisturbed sample.
U (H) -- 1 3/8 in. " "
D -- disturbed sample
W -- water " "
S ( ) -- standard penetration test.
No. in brackets gives
No. of blows/12 in. penetration

Remarks: (Observations on ground-water, etc.)

A slight seepage of ground-water into the borehole was noticed at a depth of 85ft. below ground level.
Water level stood at a depth of 55ft. below ground level on the morning of 8.12.58). It was sealed off by the U(N)H tubes at a depth of 90ft. below ground level.

Location: Vacant site between Courchway and Chalton Street

LONDON TRANSPORT EXECUTIVE

BORINGS FOR PROPOSED VICTORIA LINE UNDERGROUND RAILWAY.
(CONTRACT 859)

Soils No.
S/1931

FIG. 12

GEORGE WIMPEY & CO., LTD. CENTRAL LABORATORY HAYES

Appendix E – Thames Water Sewer Plan

Asset Location Search

Waterco Ltd

RUTHIN
LL15 1NJ

Search address supplied

Chalton Street & Churchway
60
Churchway
London
London
NW1 1LT

Your reference w10253

Our reference ALS/ALS Standard/2017_3517388

Search date 1 March 2017

Notification of Price Changes…

From **1 September 2016** Thames Water Property Searches will be increasing the prices of its Asset Location Searches. This will be the first price rise in three years and is in line with the RPI at 1.84%. The increase follows significant capital investment in improving our systems and infrastructure.

Enquiries received with a higher payment prior to 1 September 2016 will be non-refundable. For further details on the price increase please visit our website at

www.thameswater-propertysearches.co.uk

Asset Location Search

Search address supplied: Chalton Street & Churchway, 60, Churchway, London, London, NW1 1LT

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 0845 070 9148, 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

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

Asset Location Search

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.

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

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: 0845 850 2777
Email: developer.services@thameswater.co.uk

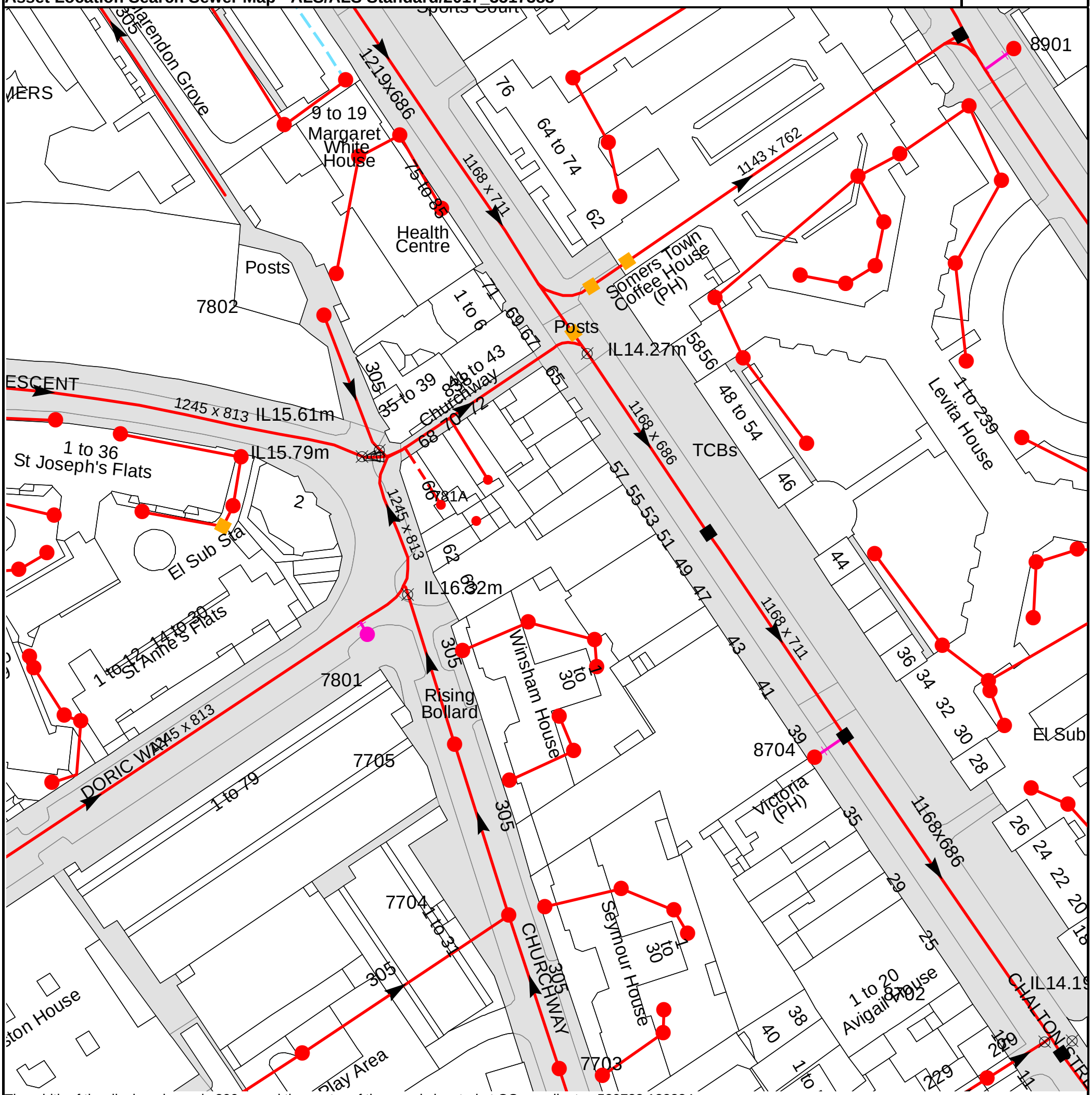
Clean Water queries

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: 0845 850 2777
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2017_3517388



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 529783,182834

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
8702	20.21	17.28
77BC	n/a	n/a
7703	21.08	17.39
87DA	n/a	n/a
87CJ	n/a	n/a
87CH	n/a	n/a
7704	20.29	16.86
87CI	n/a	n/a
77BB	n/a	n/a
77BA	n/a	n/a
87BI	n/a	n/a
87BH	n/a	n/a
77AH	n/a	n/a
8704	n/a	n/a
77AG	n/a	n/a
7705	19.28	16.61
88BE	n/a	n/a
78EF	n/a	n/a
88BF	n/a	n/a
88BD	n/a	n/a
78EA	n/a	n/a
78ED	n/a	n/a
88AD	n/a	n/a
78EB	n/a	n/a
78EC	n/a	n/a
88CG	n/a	n/a
88CH	n/a	n/a
88AC	n/a	n/a
88CI	n/a	n/a
78CJ	n/a	n/a
781A	n/a	n/a
78DE	n/a	n/a
88AE	n/a	n/a
88BG	n/a	n/a
88CF	n/a	n/a
88AF	n/a	n/a
88BI	n/a	n/a
88CB	n/a	n/a
88CA	n/a	n/a
88CC	n/a	n/a
88CE	n/a	n/a
88CD	n/a	n/a
78CG	n/a	n/a
78BI	n/a	n/a
89BF	n/a	n/a
89BE	n/a	n/a
89BB	n/a	n/a
79BF	n/a	n/a
89BC	n/a	n/a
79BG	n/a	n/a
8901	n/a	n/a
68FA	n/a	n/a
78EJ	n/a	n/a
78FB	n/a	n/a
78EI	n/a	n/a
78EH	n/a	n/a
68FE	n/a	n/a
7802	18.62	16.39
78CH	n/a	n/a
79BI	n/a	n/a
79BH	n/a	n/a
79AF	n/a	n/a
79BA	n/a	n/a
7702	20.59	17.47
67BC	n/a	n/a
68EA	n/a	n/a
68DJ	n/a	n/a
68DI	n/a	n/a
68DH	n/a	n/a
7801	19.03	n/a
68DE	n/a	n/a
68DD	n/a	n/a

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 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

Lines 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.

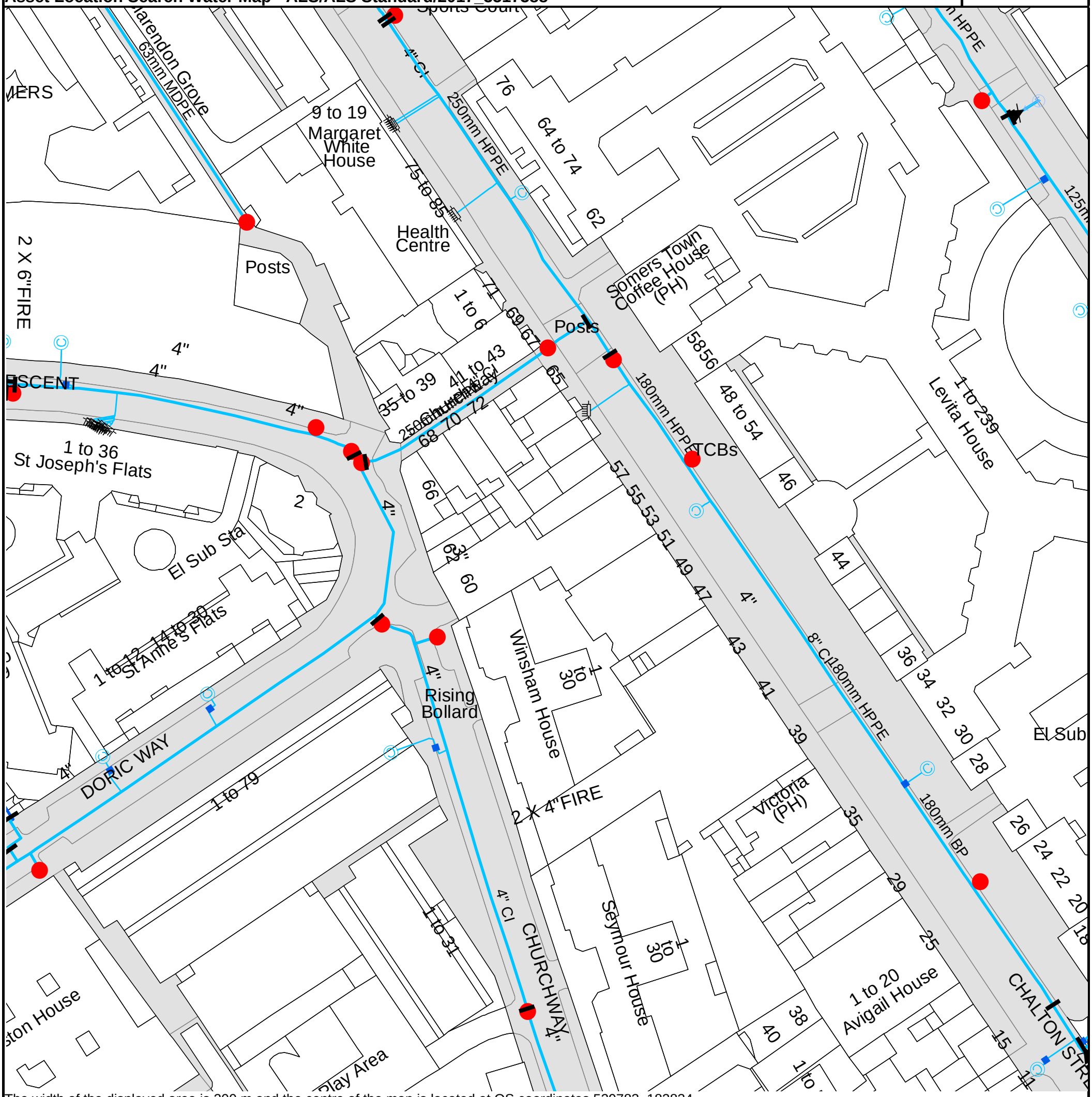
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

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 Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2017_3517388



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 529783, 182834.

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.

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

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')

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 him 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 **0845 070 9148** quoting your invoice number starting CBA or ADS.	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**

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Appendix F – Development Plans

divine ideas architects

Legacy Business Centre, Suite 126, 2A Ruckholt Road, Leyton E10 5NP
T | +44(0)20 8556 7404 W | divineideas.co.uk E | info@divineideas.co.uk

Notes REV A : Sept 2016- Basement and ground converted to one flat and number of units reduced by 1.

Client Rangepay Ltd.

Project 70 Churchway, London, NW1 1LT

Status Planning Application 02 - June 2016

Drawing Proposed Basement Floor Plan

Project Number	Drawing Ref	Revision	Scale	Page size
1512A	230	C	1:100	A3

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T | +44(0)20 8556 7404 W | divineideas.co.uk E | info@divineideas.co.uk

Notes REV A : Sept 2016- Basement and ground converted to one flat and number of units reduced by 1.

Client Rangepay Ltd.

Project 70 Churchway, London, NW1 1LT

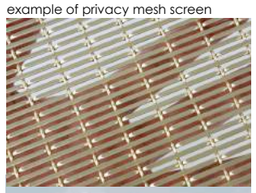
Status Planning Application 02 - June 2016

Drawing Proposed Ground Floor Plan

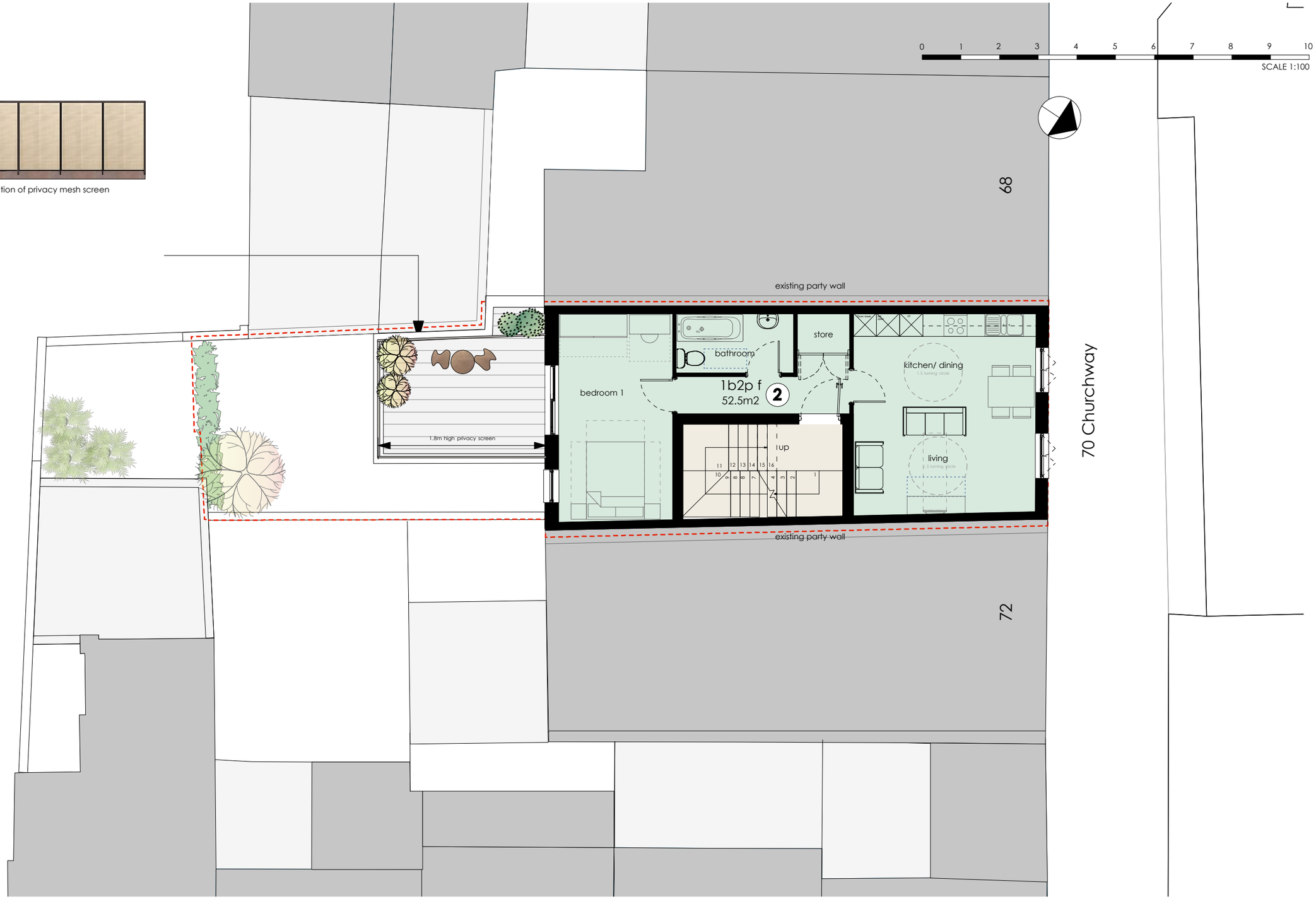
Project Number	Drawing Ref	Revision	Scale	Page size
1512A	231	C	1:100	A3

Privacy Screen To Terrace

example of privacy mesh screen



elevation of privacy mesh screen



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Legacy Business Centre, Suite 126, 2A Ruckholt Road, Leyton E10 5NP
T | +44(0)20 8556 7404 W | divineideas.co.uk E | info@divineideas.co.uk

Notes
REV A : Sept 2016- Basement and ground converted to one flat and number of units reduced by 1. Screen added to terrace
REV B : June 2017- window adjusted

Client
Rangepay Ltd.

Project
70 Churchway, London, NW1 1LT

Status
Planning Application 02 - June 2016

Drawing
Proposed First Floor Plan

Project Number	Drawing Ref	Revision	Scale	Page size
1512A	232	C	1:100	A3

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T | +44(0)20 8556 7404 W | divineideas.co.uk E | info@divineideas.co.uk

Notes
REV A : Sept 2016- Basement and ground converted to one flat and number of units reduced by 1. Screen added to terrace

Client
Rangepay Ltd.

Project
70 Churchway, London, NW1 1LT

Status
Planning Application 02 - June 2016

Drawing
Proposed Second Floor Plan

Project Number	Drawing Ref	Revision	Scale	Page size
1512A	233	C	1:100	A3

Luna Apartments: Melbourne
Example of glazed building with
bronze transparant mesh screen

0 1 2 3 4 5 6 7 8 9 10

SCALE 1:100

70 Churchway
Front Elevation

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Notes
REV B : June 2017- window adjusted

Client
Rangepay Ltd.

Project
70 Churchway, London, NW1 1LT

Status
Planning Application 02 - June 2016

Drawing
Proposed Front Elevation

Project Number	Drawing Ref	Revision	Scale	Page size
1512A	241	D	1:100	A3

0 1 2 3 4 5 6 7 8 9

SCALE 1

70 Churchway

Rear Elevation

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Notes: REV A : Sept 2016- Basement and ground converted to one flat and number of units reduced by 1. Screen added to terrace

Client: Rangepay Ltd.

Project: 70 Churchway, London, NW1 1LT

Status: Planning Application 02 - June 2016

Drawing: Proposed Rear Elevation

Project Number	Drawing Ref	Revision	Scale	Page size
1512A	242	C	1:100	A3

Courtyard treatment precedents

0 1 2 3 4 5 6 7 8 9 10

SCALE 1:100

63 Chalton Street | 61 Chalton Street | 59 Chalton Street | 57 Chalton Street

Outline of existing building

Second floor

FLAT 3

Bedroom

First floor

FLAT 2

Bedroom

Ground floor

Living / reception

Bedroom

Bedroom

Lower ground floor

kitchen/ dining/ family room

FLAT 1

study

kitchen

2500

919

Churchway

12.630

Existing Party Wall

Courtyard

Hotel Rooms

Restaurant

Hotel Rooms

Proposed Section A-A

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Notes

Client

Rangepay Ltd.

Project

70 Churchway, London, NW1 1LT

Status

Planning Application 02 - June 2016

Drawing

Proposed Section A-A

Project Number	Drawing Ref	Revision	Scale	Page size
1512A	250	D	1:100	A3