HARRINGTON SQUARE, CAMDEN

OUTLINE DRAINAGE STRATEGY

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APPENDICES

1.0 INTRODUCTION

1.1 Purpose of this report

This Outline Drainage Strategy has been prepared to support the planning application for the proposed Harrington Square development in Camden.

The assessment includes a summary of the site, an estimate of the existing and proposed surface water discharge rates, an infiltration assessment, a SuDS assessment, and outline drainage proposals and performance criteria.

This report should be read in conjunction with the Flood Risk Assessment,(renaissance, HSC-REN-XX-XX-RP-C-00001, June 2023) and the completed Camden Borough Coundil SuDS Pro-Forma.

The proposals within this report are intended to demonstrate the feasibility of the overarching drainage strategy to support the planning proposal.

2.0 THE SITE

2.1 Site Location

The proposed development site is located off Harrington Square, Camden.
The site location is described below:

- Post Code NW1 2JJ
- OS X (Easting) 529212
- OS Y (Northing) 183240
- Nat. Grid TQ 29212 83240

The site location is illustrated in Figure 2.1 below.

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Figure 2.1: Indicative Site Location

2.2 Site Description

The site is circa 0.05 hectares and was historically used as a car parking area for the adjacent residential buildings. The site comprises 66% impermeable hard standing and is bounded by residential buildings to the north and southeast, and Harrington Square to the southwest.

Access to the site can be gained from Harrington Square to the south.

The topographical survey (Appendix A) indicates that the site lies approximately between 24.220 AOD at the eastern boundary and 23.65m to the east.

A Thames Water Combined Sewer is present to the south of the site within Harrington Square and a Thames Water Surface Water Sewer is present to the east of the site within the private access road. Refer to Appendix B for Thames Water Sewer Records.

2.3 Existing Site Drainage

The site is 66% impermeable with associated existing drainage. A CCTV survey has been carried out to trace the onsite drainage and is included in Appendix C for reference.

Upon review of the survey information, surface water from the site is indicated to be collected by gullies before discharging into the Thames Water surface water Sewer to the east of the site which then ultimately discharges into the Thames Water Combined Sewer to the south of the site which is assumed to connect into the main combined sewer beneath Harrington Square.

The CCTV information indicates surface water drainage to the east of the site and that surface water from the site currently drains into it before discharging into the combined sewer downstream.

2.4 Geology

British Geological Survey mapping does not display any made ground deposits on site, however based on the historical mapping and the development that has taken place, made ground deposits are likely to be present. Information from the Geo-Environmental Data Report also indicates no made ground on site, however worked ground has been identified 20m west of this site.

No superficial deposits are mapped onsite. BGS mapping indicates the Langley Slit Member, which typically consists of silt to clay, is located approximately 725m to the south of the site.

The deeper solid geology is indicated to be part of the London Clay Formation which typically comprises of clay, silt and sand.

No faults are shown on or within an influencing distance of the site.

For further details, reference should be made to the phase 1 geo-environmental report by renaissance.

2.5 Hydrology

The nearest watercourse to the site is the Regents Canal which is located 740m to the north east.

BGS mapping indicates the site to be underlain by the London Clay formation which has low permeability and a negligible significance for water supply or river base flow.

The site is not within a groundwater Source Protection Zone. There is one active licensed groundwater abstraction site, located 978m north west of the site.

The River Irwell is immediately adjacent to the northern site boundary. Given the proximity to the site this is likely to impact the groundwater flow system beneath the site and locally drain groundwater.

2.6 Proposed Development

The scheme for the proposed development comprises a four story residential building including a single storey basement. For the purposes of this report the basement floor depth is assumed at 20.295Mod, A bored piled solution is currently being proposed.

Minimal soft-landscaping is incorporated as part of the proposed development plans in the form of grass to the west and southwest corner of the site and hedging is present along the southern boundary of the site.

The proposals are to work within the existing site levels on the site.

Refer to Appendix D for the proposed development plans

3.0 EXISTING & PROPOSED SURFACE WATER DISCHARGE RATES

3.1 Pre-Development Surface Water Run-Off Rates

The privately drained area of the development site is approximately 0.051 Ha (510m^2) comprising 0.034 Ha (340m^2) of impermeable area and 0.017 Ha (165m^2) of permeable soft landscaping. Refer to the topographical survey in Appendix A and existing drained areas drawing HSC-REN-XX-00-DR-C-00050 in Appendix E.

3.1.1 Existing Brownfield Run-Off Rates

To estimate the pre-development surface water discharge into the public sewer, a two-pipe model has been created in industry approved MicroDrainage Software (Appendix F). The model uses a variable rainfall intensity for the different storm events and is based on a 60-minute storm duration. A summary of the results is presented in the Tables 3.1:

RETURN PERIOD	$Q_{BROWNFIELD}$ (l/s)
1 in 1-year	5.0
1 in 2-year	6.4
1 in 30-year	12.2
1 in 100-year	22.3

Table 3.1 –Brownfield Run-off Rates

3.1.2 Existing Greenfield Run-Off Rates

As a comparison, the greenfield run-off for the site area has been considered. This has been calculated using the ICP SUDS method in Micro Drainage (Appendix G). The rates presented below are what would be typical of a site with an equivalent area that remains undeveloped / covered in grass or vegetation. For a partly urbanised catchment ratio of 0.75, Q_{bar} has a return period of 2.3 years.

The equivalent greenfield run-off rate is tabled below: -

RETURN PERIOD	$Q_{GREENFIELD}$ (l/s)
1 in 1-year	0.2
1 in 2-year	0.3
1 in 30-year	0.5
1 in 100-year	0.6
Q_{bar}	0.3

Table 3.2 – Greenfield Run-off Rates

3.2 Proposed Surface Water Discharge Rates

As set out within the Strategic Flood Risk Assessment (SFRA) for Camden Borough Council and the Camden Local Plan (policy CC3), developments should aim to restrict the runoff rate from site to greenfield run-off rate where feasible.

Restricting the flow rate to Q_{bar} (0.3 l/s) would present a blockage risk to the system and therefore it is considered that restricting the discharge rate to this rate is not feasible and instead it is proposed that the discharge rate from site is limited to a maximum of 2.0 l/s for all storm events up to the 1 in 100 year storm with an allowance for climate change. This rate is based on the use of a 57mm orifice plate with an expected design head of 1.5m.

Restricting the run-off to this rate would result in a 93% betterment from the existing run-off rates which complies with the requirements outlined in the Non-Statutory Technical Standards for Sustainable Drainage noted above.

A pre-development enquiry has been submitted to Thames Water to confirm whether this rate is acceptable.

3.3 Attenuation Requirements

The proposed development results in circa 470m^2 of impermeable area. Refer to Appendix H for the proposed impermeable areas.

Urban creep has not been considered as it is unlikely that the percentage of impermeable area will increase during the lifetime of the development due to its nature.

The post development discharge rates will include for an increase in the rainfall intensity of 40% for the 1 in 100-year storm event to allow for climate change. This is consistent with a design life for the development of 100 years, as outlined by the National Planning Practice Framework (NPPF).

Quick storage estimates for the above return periods, using MicroDrainage, indicate that the approximate attenuation volumes shown in table 3.4 are required to limit the peak surface water discharge to 2.0 l/s. The MicroDrainage calculations can be seen in Appendix I.

RETURN PERIOD	DEVELOPMENT AREA (ha)	SURFACE WATER ATTENUATION ESTIMATE (m^3)
1:100 Year +40% CC	0.047	13-22

Table 3.4 – Surface Water Attenuation Estimates

4.0 SURFACE WATER DISCHARGE & SUDS ASSESSMENT

4.1 Surface Water Discharge Assessment

In accordance with the NPPF, the following hierarchy of surface water drainage options have been considered:

- Rainwater Storage for later use; Due to the limited space and availability of usage, rainwater storage for later use is not considered feasible as the primary method of wastewater disposal, however, the use of small scale rainwater storage for later use will be investigated as part of the next stage of the design.
- Discharge into the ground (infiltration); Due to the limited space on site away from adjacent buildings or highways to accommodate soakaways and the potential contamination risk posed given the presence of made ground on site, infiltration has been discounted as the primary method of discharging surface water.
- Discharge to a surface water body; The nearest named watercourse is the Regent's Canal approximately 740m to the north east of the site. The drainage network would have to cross third party land to form the connection which is not feasible and as a result, this method of discharge has been discounted.
- Discharge to a surface water sewer, highway drain, or another drainage system; A surface water sewer is present to the north east of the development site. The invert level of the surface water sewer is such that forming a gravity only connection would not be feasible and as a result, this method of discharge has been discounted. It should also be noted that the surface water sewer immediately discharges into the combined sewer to the west of the site; reducing the benefits of connecting into the surface water sewer
- Discharge to a combined sewer; a combined sewer is present to the south of the site A combined sewer is present to the east of the site to connects into the main sewer running beneath Harrington Square. A predevelopment enquiry has been submitted.

Therefore, surface water will be collected by a dedicated gravity system designed in accordance with BS EN 752 before discharging to the 100mm combined public sewer to the south of the site via a manhole connection into the Thames Water manhole ref TQ298312AJ. The connection will be subject to a S106 application with Thames Water under the Water Industry Act.

4.2 Sustainable Urban Drainage

Table 4.1 below provides a summary of typical SuDS techniques outlined within the CIRIA C753 SuDS manual. Based on a review of the suitability of SuDS techniques it is proposed that the development may incorporate the following:

SUDS TECHNIQUE	DESCRIPTION	SUITABILITY FOR DEVELOPMENT SITE	
Rainwater Harvesting	Collection of rainwater run-off for use	**The feasibility of small scale rainwater harvesting will be investigated in the next stage of the design**	✓
Soft Landscaping	Grassed areas that allow direct infiltration of rainwater	Not suitable due to limited space	×
Filter Drains	Granular filled Linear drains / soakaway with either granular fill and perforated pipe, or dense vegetation that treat runoff from adjacent impermeable areas	Not suitable due to limited space	×
Swales	Shallow landscape channel that can infiltrate or convey runoff.	Not suitable due to limited space	×
Infiltration Basins	Depressions in the ground designed to store and infiltration runoff to the ground. Can be landscaped to provide amenity value.	Not suitable due to limited space	×
Wet Ponds	Basins with permanent pool of water providing water quality treatment, wildlife, and amenity benefit.	Not suitable due to limited space	×

	Designed to provide temporary storage for additional runoff.		
Extended Detention Basins	Dry basins that are designed to temporarily store runoff providing water quality treatment.	Not suitable due to limited space	×
Constructed Wetland	Ponds and shallow wetland areas with vegetation to improve pollution removal and enhance wildlife habitat.	Not suitable due to limited space	×
Porous Paving	Granular build-up beneath permeable paving systems that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	Not suitable due to limited space	×
Trees Pits	Managed permeable paving systems around tree pits that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	**Suitable in localised areas around the building**	✓
Soakaways	Infiltration device to temporarily store runoff and allow it to percolate into the ground.	Not suitable due to limited space	×
Green Roof	Vegetated roof area that reduces runoff and increases time of concentration.	**Suitable to building roofs**	×
Blue Roof	Roof area designed to store and reduce peak runoff rates during intense storms.	**Suitable to building roofs**	✓
Underground Storage	Attenuation structures installed below ground to provide runoff storage.	**Suitable beneath the building footprint**	✓

× Not suitable ? Potentially suitable subject to further investigation ✓ Suitable

Table 4.1 – SUDs Techniques & Suitability for Development Site

4.2.1 SuDS Benefits

As detailed in the CIRIA SuDS manual, implementing the SuDS technique that have been classified as suitable in section 4.3 above will provide the following benefits with regards to the Amenity Value and Biodiversity of the development:

- The adoption of a Green Roof, trees and planters will enhance the visual character of the building.
- Rainwater harvesting, if adopted, will reduce the water main demand of the development, contributing to water security and resilience to climate change.
- The blue/green roof system will help to provide cooling via the return of moisture to the air through evapotranspiration.
- Tree pits will help to promote biodiversity within the soft landscaping by attracting different species of insect and plants.

4.3 Water Quality Assessment

The drainage from the site is from the roof and terrace areas of the building. Water quality is generally affected by frequent rainfall events (1 in 1-year events or less), which is circa 5mm/hr for the proposed development site. To assess the water quality, consideration will be given to the guidance within the National Standard for Sustainable Urban Drainage (NSSUD) and CIRIA Guide C753. The pollution hazard levels for different land uses are presented in table 4.2 and are based on the definitions in the NSSUD and C753.

POLLUTION HAZARD LEVEL	LAND USE
Very Low	Residential roofs
Low	Individual property driveways, non-residential roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (e.g. Schools, offices)
Medium	Commercial yards and delivery areas, non-residential car parking with frequent change (e.g. hospital, retail), minor roads
High	Site with heavy pollution (e.g. Haulage yards, lorry parks, waste sites, sites with chemical and fuels are delivered, handled, stored etc.)

Table 4.2 – Pollution Hazard Levels

The pollution hazard level is low based on Table 4.2 with the primary consideration given to removal of gross solids and sediment.

The following tables indicate the minimum number of treatment stages required before surface run-off should reach the infiltration or receiving water body and are extracted from the NSSUD.

POLLUTION HAZARD LEVEL	LAND USE	LOW	MEDIDUM	HIGH
G1	Source Protection Zone 1, within 50m of a well, spring or borehole that supplies potable water.	1	3	Consult the EA
G2	Into or immediately adjacent to a sensitive receptor that could be influenced by infiltrated water. Includes designated nature conservation, heritage, and landscape sites – including Biodiversity Action Plan (BAP) habitats and Protected Species.	1	3	
G3	Source Protection Zone II and III or Principal Aquifer	1	3	
G4	Secondary Aquifer	1	2	
G5	Unproductive strata	1	2	

Table 4.3 – Groundwater Minimum Treatment Stages

POLLUTION HAZARD LEVEL	NORMAL SURFACE WATER	SENSITIVE SURFACE WATER
Low	0	1
Medium	2	3
High	Consult the EA	

Table 4.4 – Surface Water Body Minimum Treatment Stages

Infiltration is not viable due to the limited space on site. However, discharge into the principal and secondary aquifers would require 1 level of treatment for a low pollution level.

Discharge of surface water to the receiving public sewer requires no treatment stages due to the low pollution hazard level. However, the adoption of SuDS, sumps and good practice will provide inherent treatment to improve the water quality of the runoff.

External areas will pass through silt traps/sumps prior to entering the attenuation tank and flow control device. The silt traps and sumps will allow most of the sediment and solids to settle out under low flows, prior to discharging to the public sewer.

4.4 SuDS Management Plan

The Sustainable Urban Drainage systems are to be maintained by the property owner and/or a maintenance company on their behalf. They will be required to maintain the SuDS features in line with the following recommendations and suppliers' requirements of the various features. These requirements are general and have been extracted from the CIRA Guide C753.

Table 12.5 – Operation and maintenance requirements for Green Roofs

Table 19.3 – Operation and maintenance requirements for trees

Table 21.3 – Operation and maintenance requirement for Attenuation storage tanks

The Contractor delivering the development is to update the general requirements to reflect the product specific requirements of the as-installed proprietary SuDS and incorporate these into the Operation & Maintenance manual for the development.

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate 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
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

TABLE 19.3 Operation and maintenance requirements for trees (after CRWA, 2009)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

5.0 OUTLINE DRAINAGE STRATEGY

Refer to Appendix J for the general arrangement drawing of the proposed below ground drainage strategy.

5.1 Surface Water System

The development will have a dedicated surface water network that will collect the rainwater from the proposed building and hard standing areas. The network will then discharge under gravity to the 100 public combined sewer within the hard landscape to the east of the site, subject to a S106 agreement under the Water Industry Act.

The surface water discharge from the site is to be limited to the rate detailed within Section 3.2 of this report using a flow control device within the final manhole of the surface water network prior to combining with the foul water network and discharging into the combined public sewer within the hard landscaping to the east of the site. Proposed discharge rates are to be confirmed with the Lead Local Flood Authority and Thames Water as part of the detailed design.

Attenuation will be provided by a combination of geo-cellular storage tanks, and a blue / green roof system.

The surface water drainage network is to be designed in accordance with Building Regulations Part H, BS EN 752 and Code for Adoption. In addition, the following requirements will also be adopted in accordance with the Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance and Camden borough Council SuDS requirements for new developments:

- The below ground drainage system will be designed to ensure flooding does not occur on site for the 1 in 30-year rainfall event with no internal flooding for the 1 in 100-year rainfall event.
- The surface water system is to be designed to accommodate the 1-, 2-, 30- and 100-year rainfall events with 40% climate change allowance 100-year events. The system will be designed for a maximum storm duration of 6 hours.

The proposed surface water drainage strategy is also in line with the policies related to surface water and sustainable drainage outlined in the London Plan adopted in January 2023 and Camden Local Plan

MicroDrainage calculations for the proposed surface water system are available in Appendix K.

The Camden Borough Council SuDS Proforma has also been completed to support this application. Refer to Appendix L.

In an exceedance event, surface water is expected follow the overland flood routes shown in appendix M.

5.2 Foul Water System

The site will have a dedicated foul water network that will collect the foul water associated with the development before combining with the surface water network in the final manhole on site and discharging into the 100mm public combined sewer within the hard landscaping to the east of the site.

The combined drainage connection will be subject to a section 106 application with Thames Water

The drainage system is to be designed in accordance with Building Regulations Part H, BS EN 752 and Codes for Adoption.

5.3 Phasing & Surface Water Management During Construction

Given the scale of the development, it is assumed that it will be delivered in a single phase.

Surface water management during construction will be addressed by the Main Contractor as part of their 'Construction Management Plan'.

A brief overview of the key considerations relating to surface water management and flood risk that will need to be incorporated into the Main Contractor's construction methodology include:

- Subject to the level of contamination beneath the site and site remediation required, as well as the quality of working platform compaction to reduce infiltration, consideration should be given to the risk of residual contamination on site affecting groundwaters and the adjacent watercourse.
- The risk of diesel spillage and other contamination risk during construction activities are to be assessed and measures implemented to ensure they do not cause a risk to groundwaters and the adjacent watercourse.

6.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SuDS techniques in accordance with the CIRIA SUDS Manual C753. The following SUD's features has been adopted in the Harrington Square drainage strategy:-

- Geocellular attenuation tank
- Inspection chambers, manholes and catchpits.
- Pipes.
- Drainage channels and gullies.
- Flow control Device

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

The Main Contractor delivering the development is to update the general requirements to reflect the product specific requirements of the as installed proprietary SuDS and incorporate these into the Operation & Maintenance manual for the building.

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should be supplied by the Main Contractor where the construction of the drainage varies from the construction drawings.

As such, the maintenance of the specified SuDS should be included within the developments Operation and Maintenance Manual and should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

6.1 General Maintenance & Inspection Requirements

No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.

Maintenance/inspection work shall be carried out in a safe/planned manner.

All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.

Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped personnel working in accordance with current statutory safe working policies.

Drainage systems shall be inspected on a regular basis or when any problems arise. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.

It is recommended that the drainage system is inspected a minimum of twice a year, with the system also being inspected after all major storm events.

Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;

- Rodding – Manual/Mechanical with flexible rods.
- Jetting – High pressure water jetting.
- Plunging.

6.2 Geocellular attenuation tank

Regular inspection and maintenance is important to identify if the inlet/outlets have become obstructed /clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

The maintenance requirements for cellular attenuation tanks are outlined within table 21.3 of the CIRIA SuDS Manual C753. A copy of that table is replicated below to set out the maintenance schedule for the cellular attenuation tank component of the proposed drainage systems.

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required, take remedial action.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.

6.3 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually:

- Covers of inspection chambers and manholes shall be removed and the sides, benching and channels cleared.
- Deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall has halted.
- Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

6.4 Pipes

Regular inspection and maintenance are important to identify areas which may have become obstructed/clogged and may not be draining correctly, failure to do so would expose the development to flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes. The below table sets out the maintenance schedule for the pipe components of the proposed drainage systems.

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required, take remedial action.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.

6.5 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below table sets out the maintenance schedule for the drainage channel and gullys components of the proposed drainage systems.

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.

6.6 Flow Control Device

Regular inspection and maintenance is important, to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a risk of flooding.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, the manufacturer's recommendations should be followed. Normally, little maintenance is required as a vortex flow control device has no moving parts.

If blockages occur they tend to do so at the intake of the vortex flow control device.

Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

The smaller type conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the vortex flow control device it is vitally important that any building materials etc. are removed from the unit and the chamber.

After the system is made fully functional, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

6.7 Cellular Attenuation Tank

Regular inspection and maintenance is important to identify if the inlets/outlets have become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

The maintenance requirements for cellular attenuation tanks are outlined within Table 21.3 of the CIRIA SUDS Manual C753. A copy of that table is replicated below to set out the maintenance schedule for the cellular attenuation tank component of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate 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
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Note: The above is to be undertaken in accordance with the manufacturers specification and details.

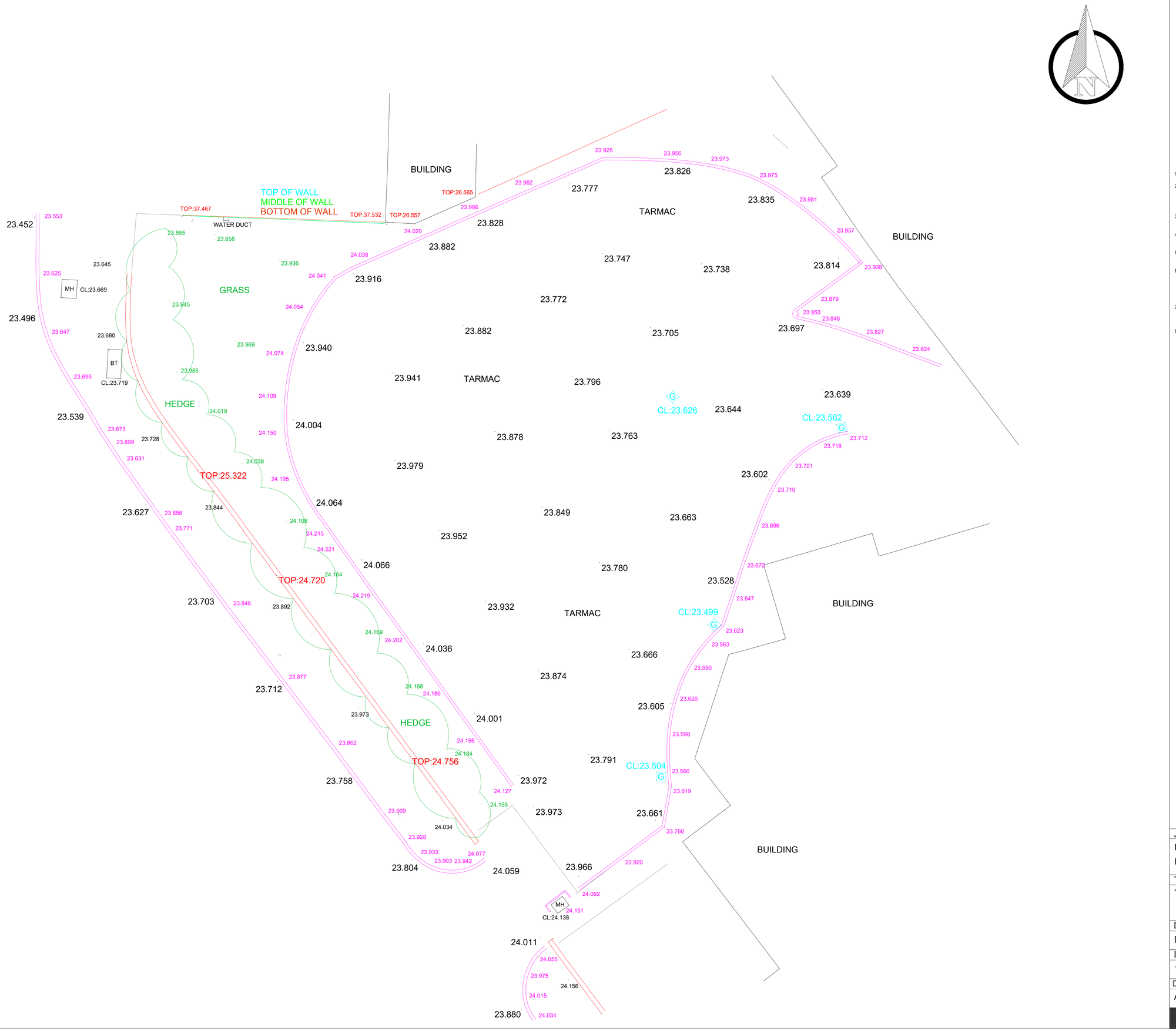
6.8 Surface Water Management During Construction

The management of surface water management during construction will be addressed by the Main Contractor as part of their 'Construction Management Plan'.

A brief overview of the key consideration relating to surface water management and flood risk that will need to be incorporated into the Main Contractors construction methodology include:

- The existing buildings on site are to be demolished. Stockpiling of material on site is to be minimised to ensure that the flood storage capacity for the 1 in 1000 year (0.1% AEP) event is not compromised.
- Due to the industrial history of the site it is anticipated that ground remediation may be required. A working platform will also be required during construction to allow for formation of piled foundations etc. The top of the working platform is to be located at or lower than existing site levels to ensure that the flood storage capacity for the 1 in 1000 year (0.1% AEP) event is not compromised.
- Subject to the level of contamination beneath the site, level of site remediation, and quality of working platform compaction to reduce infiltration, consideration should be given to the risk of residual contamination on site affecting groundwaters.
- The risk of spillage of diesel and other contamination risks during construction activities are to be assessed, and measures implemented to ensure they do not cause a risk to groundwaters.

APPENDIX A
Existing Topographical Survey



NOTES

23.973 — MAGENTA - KERB LINE AND BACK OF KERB SPOT LEVEL

TOP:24.720 — RED - BRICK WALL

1. THIS SURVEY IS ACCURATE AS OF 17TH NOV' 2022
2. THE ACCURACY AND AMOUNT OF DETAIL SHOWN IS ONLY EQUIVALENT WITH THE GEOGRAPHICAL SCALE OF MAPPING. CARE SHOULD BE TAKEN WHEN USING LARGER SCALES
3. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY
4. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED
5. ALL LEVELS SHOWN ON THIS DRAWING ARE IN METRES AOD UNLESS OTHERWISE STATED
6. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS
7. GPS COORDINATED CONTROL STATIONS WERE USED AS A BASE IN WHICH TO RELATE THE SURVEY BACK TO ORDNANCE SURVEY GRID
8. ANY DESIGN UNDERTAKEN BASED ON THIS TOPO SURVEY SHOULD BE CONSULTED WITH GRIDPOINT IN THE FIRST INSTANCE

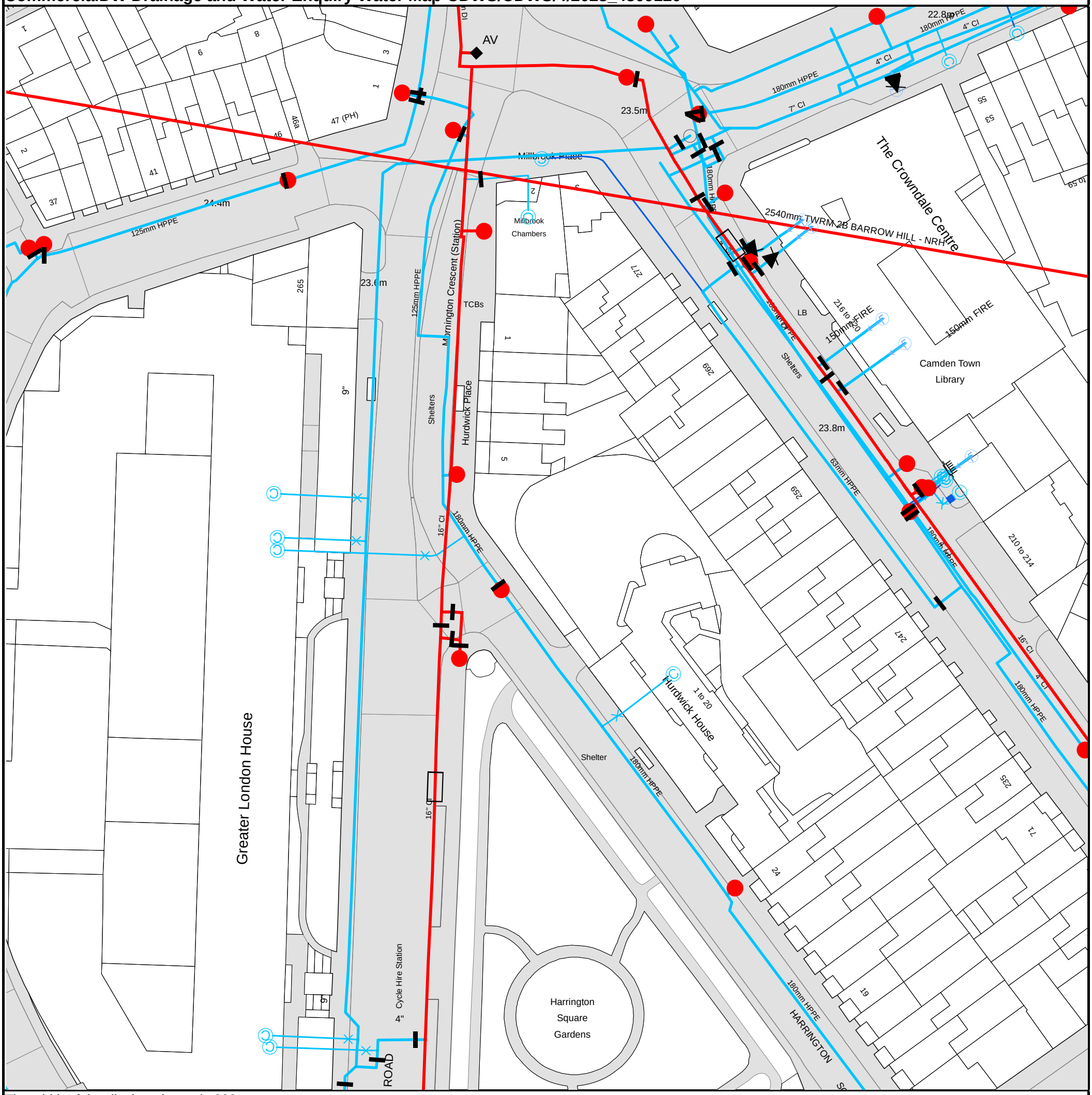
GRIDPOINT SURVEYS
GRIDPOINT SITE ENGINEERS
GRIDPOINT EARTHWORKS
0118 466 0293
Albany House, 14 Shute End
Wokingham, Berkshire, RG40 1BJ
www.grid-point.co.uk
enquiries@grid-point.co.uk

Job Title:	
DOMIS CONSTRUCTION HARRINGTON SQUARE	
Title:	
TOPOGRAPHICAL SURVEY	
Drawing No.	Rev.:
DOMI-R636-01	-
Date:	Scale:
17.11.2022	NTS
Drawn by:	Checked by:
AD	JA

INFORMATION

APPENDIX B
Thames Water Sewer Records

CommercialDW Drainage and Water Enquiry Water Map-CDWS/CDWS/4/2023_4809120



The width of the displayed area is 200m

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.

APPENDIX C
CCTV Survey Information

PAS 128: 2014 QUALITY LEVEL GUIDE

Q-LEVEL	DESCRIPTION	ACC.	Q-LEVEL	DESCRIPTION
QL-D	Service positions taken from records.	Undefined	QL-B2	Horizontal & vertical location using only one geophysical technique.
QL-C	Visual evidence of service existence but undetectable by geophysical technology.	Undefined	QL-B1	Horizontal & vertical location using multiple geophysical techniques.
QL-B4	Undetectable service present shown as an assumed route. (AR)	± +/- 400mm or N/A	QL-A	Horizontal & vertical position verification by open excavation, manholes and/or inspection chambers.
QL-B3	Horizontal location by one geophysical technique but with none or poor depth information.			

DETECTION METHOD

IN ACCORDANCE WITH PAS 128: 2014 SURVEY TYPE B

DRAINAGE SURVEY

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/types and service data recorded from ground level. All connections from DPs, Gullies, Drains, VP's, RE's and lampholes have been proven wherever possible using audible connections (AC) and/or sonde instrumentation where applicable. Where these methods have proved unsuccessful then assumed (AR) straight line connections will be shown.

CCTV DRAINAGE SURVEY

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/type and service data recorded from ground level. Pipework has been traced, accessed and collected for post processing. Drainage layout, including manhole covers not located by topographical survey, may be taken from CCTV chainage and will be shown as indicative only.

Electricity

Elec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

British Telecoms

BT cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Due to current laws and legislation protecting all BT apparatus, cabling can only be located remotely. We therefore compare all our telecom findings against record information to produce the final service layout. In some instances, where high amount of cable ducts are present, we may only be able to identify a linear centre peak signal rather than identifying all the individual duct positions. For further information regarding Telecoms apparatus, please contact Openreach directly.

Cable TV & Communications

CTV and/or Com cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Fibre Optic

FO cables will have been predominantly located using GPR methodology. This is due to the materials used within fibre optic cabling. In some rare instances, tracer cabling or conductible non fibre optic cabling will be present within some or all ducting. When this is the case, both EML and GPR methodology will be combined to identify service network and achieve greater quality levels.

Lighting, Traffic Signal & Security Cables

LC, TS and/or Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Gas & Water Inc. Fuel Pipes and Hot Water Pipes

GM/GS and/or WM/WS pipe work will have been attempted and located using both EML & GPR methodology with electronically derived depths shown for the former and depths to crown levels shown for the latter.
When the Gas/Water pipe work is constructed using conductible materials, then we are able to to employ multiple geophysical techniques to identify service network and achieve greater quality levels. When a non conductible material is used, GPR methodology will be employed to locate and plot the final service layout.

Ground Penetrating Radar

GPR methodology is used to identify and locate all non metallic, non conductible piping and cabling. We also employ GPR to obtain a greater accuracy levels on EML located services. The GPR has a greater success rate on pipe or service diameter upward of Ø63mm,C63mm, as size increments increase, so does the chance of detection. The GPR can produces varying results and as such, wouldn't be used as an independent utility surveying instrument.

Unidentified Traces

All UITs will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Every effort has been made to identify the service but in this instance, is not achievable. We recommend excavation work to determine identity and depth where applicable.

Scarring (QL-C)

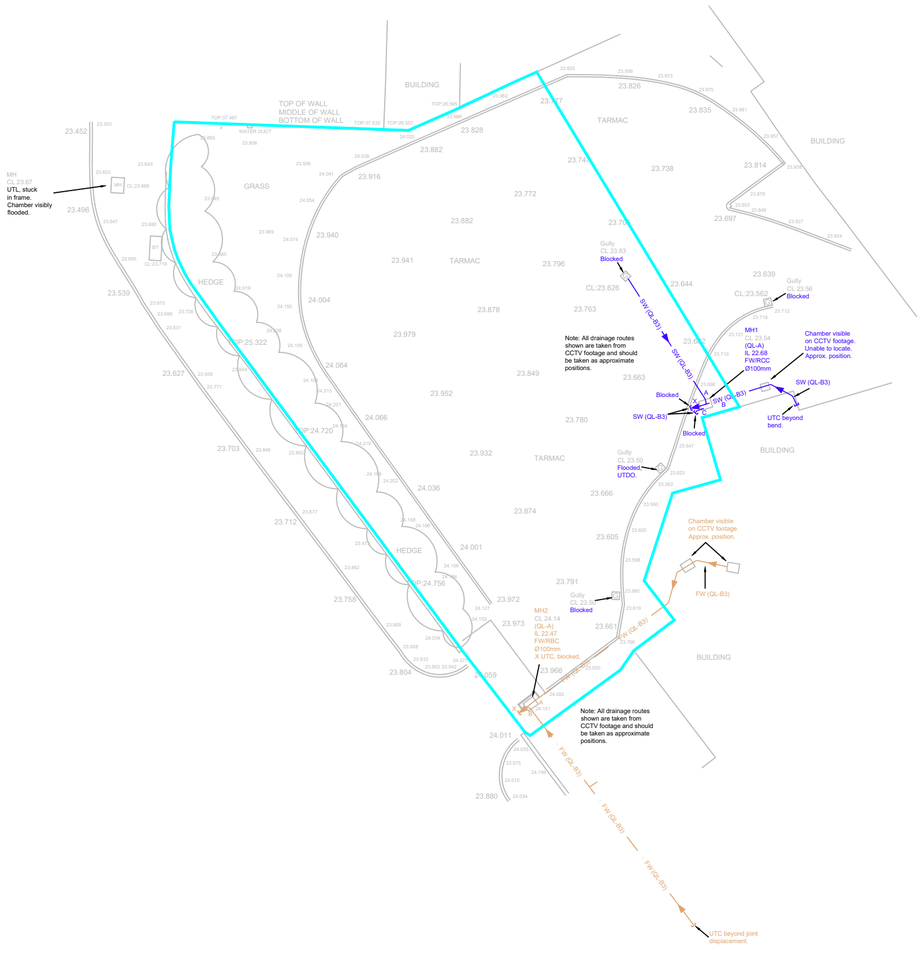
Scarring has been identified on site with a potential of an undetectable service present.

Assumed Routes & Taken from Records (QL-B4/D)

Assumed routes (AR) are shown if there is evidence that a service exists but we are unable to trace it whilst on site. The surveyor will attempt to locate various risers/ics/valves/meters (service evidence) etc. around site area to successfully determine an assumed route between these points. If there is little evidence on site but they believe a service is still present, then a common sense approach to an assumed route shall be employed.

Taken from records (TFR) are service routes that are taken from STAT record plans or previous survey information and overlaid onto our drawings.

NORTH
Indicative



UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

1D 5C	1 Duct 5 Cables	DCr	Depth To Crown	RBC	Rectangular Brick Chamber
Ø	Diameter	DI	Depth To Invert	RCC	Rectangular Conc Chamber
AC	Audible Connection	DS	Depth To Silt	RE	Rodding Eye
AG	Above Ground	DTB	Depth To Base	SA	Survey Abandoned
AR	Assumed Route	DTW	Depth To Water	SL	Silt Level
BL	Base Level	DTS	Depth To Surcharge	SuL	Surcharge Level
CB	Concrete Benching	EBD	External Backdrop	TFR	Taken From Records
CBC	Circular Brick Chamber	EOT	End Of Trace ⟶	UTC	Unable To CCTV
CCC	Circular Conc Chamber	IBD	Internal Backdrop	UTDO	Unable To Determine Outfall
CL	Cover Level	IL	Invert Level	UTL	Unable To Lift
CPC	Circ Plastic Chamber	OH	Overhead	UTS	Unable To Survey
CrL	Crown Level	PDR	Poor Depth Response	UTT	Unable To Trace
CU	Camera Under Water ⟶	RB ●	Rest Bend	WL	Water Level

- BT — BT CABLE(S)
- OHBT — OVERHEAD BT CABLE(S)
- COM — COMMUNICATIONS CABLE(S)
- CTV — CABLE TV CABLE(S)
- DUCT — EMPTY DUCT
- E — ELECTRIC CABLE(S)
- OE — OVERHEAD ELECTRIC CABLE(S)
- FO — FIBREOPTIC CABLE(S)
- FUEL — FUEL PIPE(S)
- GM — GAS MAIN
- GS — GAS SERVICE
- GPR — GROUND PENETRATING RADAR (GPR) TRACE
- HW — HOT WATER PIPE
- LC — LIGHTING CIRCUIT
- OIL — OIL PIPE(S)
- SCAR — VISIBLE SCARRING
- SEC — SECURITY CABLING
- TC — TELECOM CABLE(S)
- TS — TRAFFIC SIGNAL
- UIS — UNIDENTIFIED SERVICE
- UIT — UNIDENTIFIED TRACE
- WM — WATER MAIN
- WS — WATER SERVICE
- CW — COMBINED SEWER
- CW RM — COMBINED WATER RISING MAIN
- EW — EFFLUENT WATER
- FOUL SEWER
- FW RM — FOUL WATER RISING MAIN
- RM — RISING MAIN
- SURFACE WATER SEWER
- SW RM — SURFACE WATER RISING MAIN
- INVESTIGATION EXTENTS

Note: ……

UTILITIES COMMENT BOX (GENERAL NOTES)

d0.37m — DEPTH TO SERVICE

- ??-AC — AUDIBLE CONNECTION
- ??-AG — SERVICE ABOVE GROUND
- ??-CU — CAMERA UNDER WATER
- ??-OH — SERVICE OVERHEAD

NORTH
Indicative

GENERAL SYNOPSIS

This survey has been carried out in accordance with PAS 128: 2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specification for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of 47219BWUG from Civilistix Consulting Engineers. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL/.DWG DRAWING INFORMATION

TOPOGRAPHICAL SURVEY DATE 17/11/2022

SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
TOPO	Client supplied	
OUTDATED		
OS		
NTS		

GENERAL SITE CONDITIONS

EXCELLENT

ADDITIONAL INFORMATION	EFFECT ON SURVEY RESULTS

SURVEY RECOMMENDATIONS

We recommend a PAS utility survey of the entire site to establish the position of underground services.

The sewers with high levels of silt or blockages to be jetted to extend the CCTV drainage survey, if any of these areas are deemed critical or of high importance.

We recommend full statutory record information be obtained to confirm site findings and to position undetectable which may be present.

Due to the geophysical nature of subsurface technology, we always recommend excavation works to be carried out within critical areas for verification and to eliminate the possibility of undetectable services present.

UTILITIES & UNDERGROUND INVESTIGATIONS

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out to confirm any identifications, positions and depths.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

Do not scale from this drawing.

DESKTOP UTILITY RECORDS (PAS 128: 2014 SURVEY TYPE D) PREREQUISITE FOR PAS 128: 2014 SURVEY TYPE B COMMISSIONED: NO

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	NO	N/A
WATER MAIN	N/A	N/A
GAS MAIN	N/A	N/A
TELECOM	N/A	N/A
CABLE TV	N/A	N/A
ELECTRICITY	N/A	N/A
OIL PIPES	N/A	N/A
OTHER	NO	N/A

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE
HARRINGTON SQUARE, CAMDEN,
LONDON, NW1 2JN.

DRAWING DETAIL
CCTV DRAINAGE SURVEY.
SHEET 1 OF 1

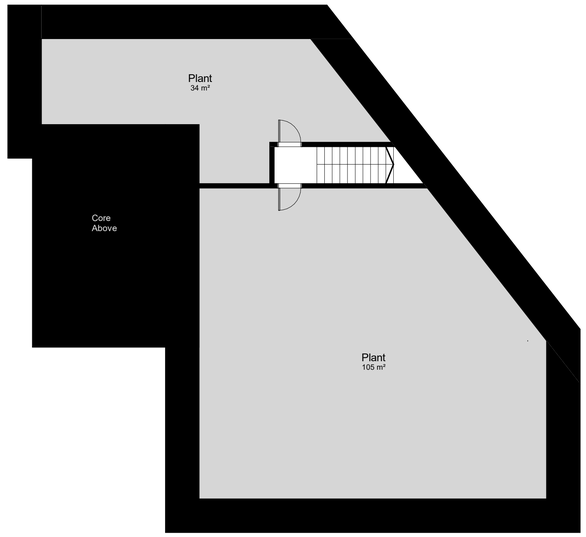
CLIENT	SCALE
CIVILISTIX CONSULTING ENGINEERS	1:250

SURVEYOR	SURVEY DATE	CHECKED BY	APPROVED BY	DWG STATUS
JJJ	09/03/2023	SJH	GSB	FINAL

DRAWING NUMBER	REVISION	ISSUE DATE
47219BWUG-01		17/03/2023

RICS chartered ices · THE SURVEY ASSOCIATION · ISO 14001 : 2015 REGISTERED

APPENDIX D
Proposed Development Plans



STUDIO
POWER

Unit 3
3 Crescent
Manchester
M5 4PF

Tel: +XX (X)XXX XXX XXXX
www.studiopower.co.uk

NOTES:

Rev	Description	Date	By

INFORMATION

Client
Salboy

Project
Harrington Square

Title
Basement Floor Plan

Status
Planning

Project number
0010

Date
06/26/23

Drawn by
JB

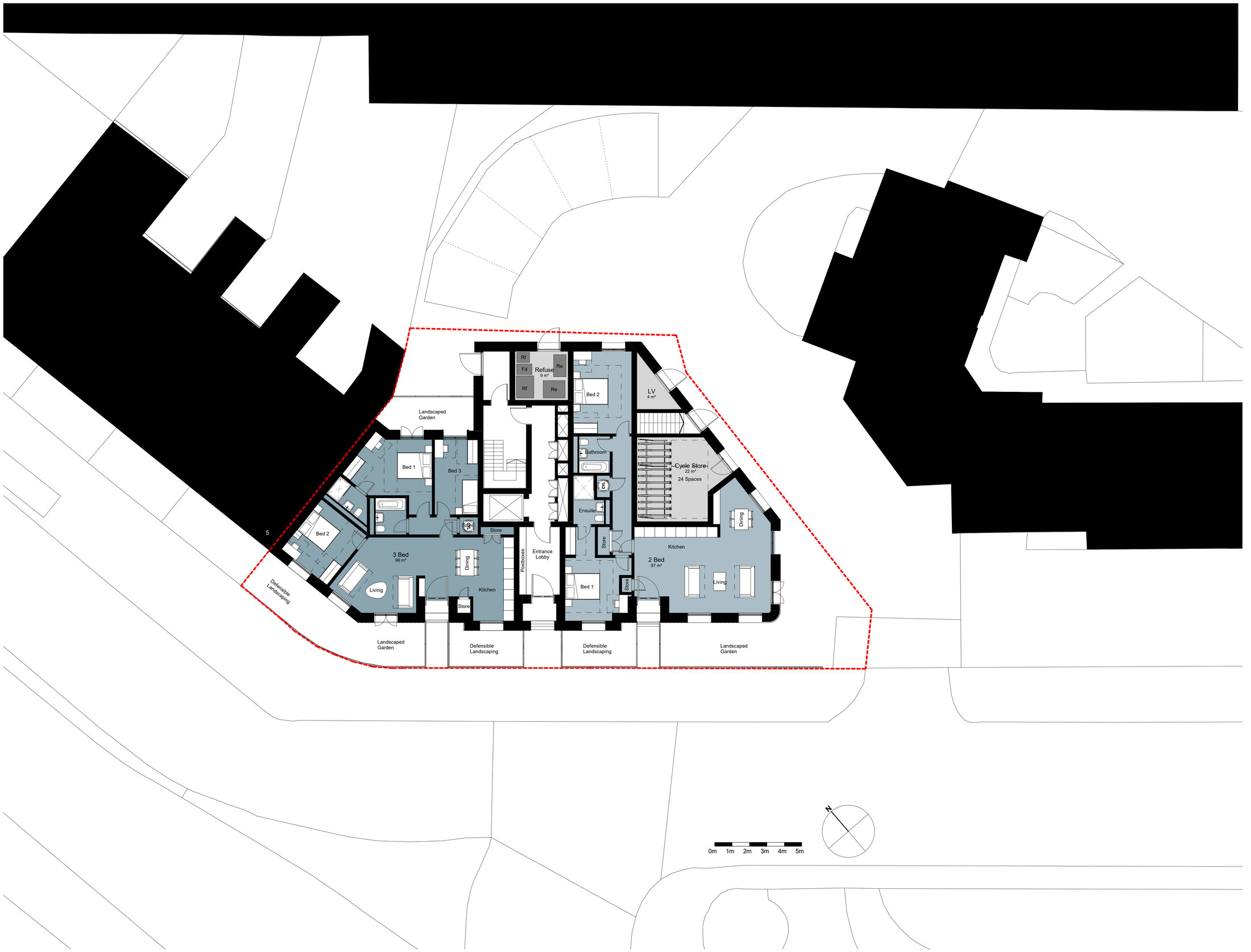
Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
0010-SP-XX-B-DR-A-0300

28/06/2023 15:06:27



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NOTES:

Rev	Description	Date	By

PLANNING

Client
Salboy

Project
Harrington Square

Title
Ground Floor Plan

Status
Planning

Project number
0010

Date
19/10/22

Drawn by
JB

Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
0010-SP-XX-00-DR-A-0301

28/06/2023 15:08:34

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NOTES:

Rev	Description	Date	By

PLANNING

Client
Salboy

Project
Harrington Square

Title
First Floor Plan

Status
Planning

Project number
0010

Date
19/10/22

Drawn by
JB

Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
0010-SP-XX-01-DR-A-0302

28/06/2023 15:09:12

PLANNING

Client
Salboy

Project
Harrington Square

Title
Second Floor Plan

Status
Planning

Project number
0010

Date
19/10/22

Drawn by
JB

Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
0010-SP-XX-02-DR-A-0302

28/06/2023 15:10:41

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3 Crescent
Manchester
M5 4PF

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NOTES:

Rev	Description	Date	By

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3 Crescent
Manchester
M5 4PF

Tel: +XX (X)XXX XXX XXXX
www.studiopower.co.uk

NOTES:

Rev	Description	Date	By

PLANNING

Client
Salboy

Project
Harrington Square

Title
Third Floor Plan

Status
Planning

Project number
0010

Date
19/10/22

Drawn by
JB

Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
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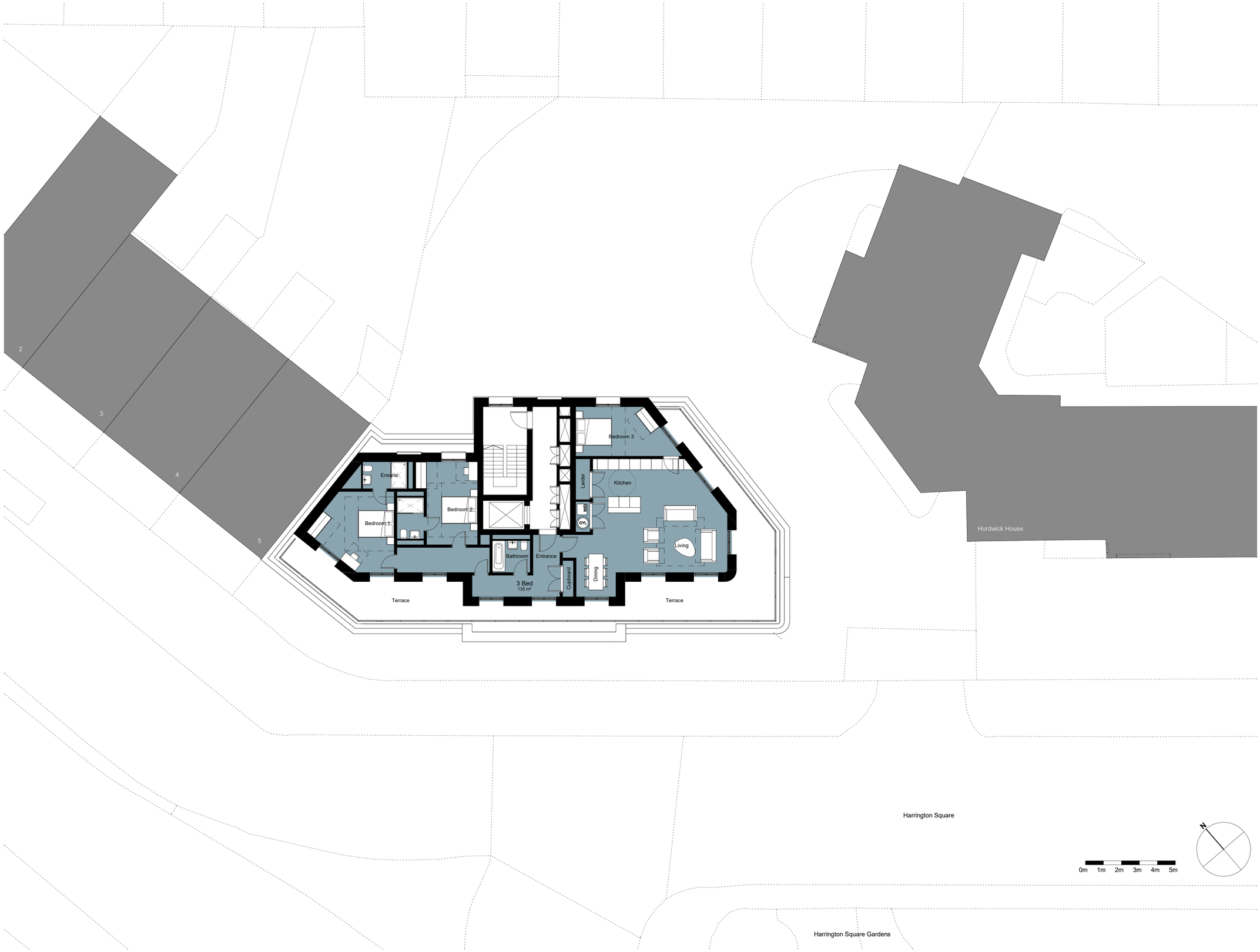
28/06/2023 15:11:15



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3 Crescent
Manchester
M5 4PF

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NOTES:

Rev	Description	Date	By

PLANNING

Client
Salboy

Project
Harrington Square

Title
Fourth Floor Plan

Status
Planning

Project number
0010

Date
19/10/22

Drawn by
JB

Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
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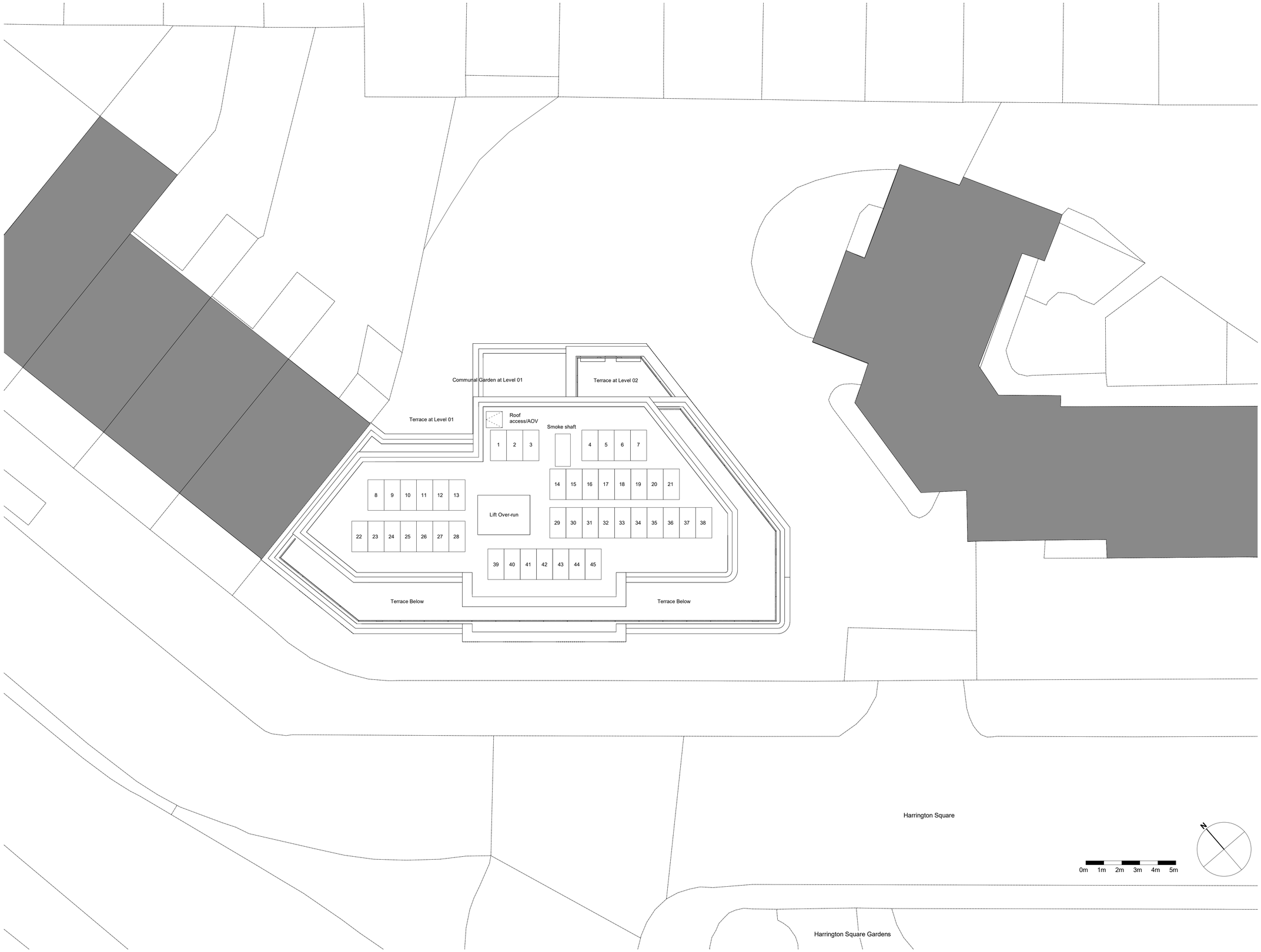
28/06/2023 15:13:02



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3 Crescent
Manchester
M5 4PF

Tel: +XX (X)XXX XXX XXXX
www.studiopower.co.uk

NOTES:

Rev	Description	Date	By

PLANNING

Client
Salboy

Project
Harrington Square

Title
Roof Plan

Status
Planning

Project number
0010

Date
12/06/22

Drawn by
JB

Checked by
SP

Scale
1 : 100@A1

Revision

Drawing No.
0010-SP-XX-RF-DR-A-0306

28/06/2023 15:13:29

APPENDIX E
Existing Impermeable Areas

NOTES:

1. THIS DRAWING IS INTENDED TO INDICATE THE EXISTING DRAINED AREAS FROM THE TRINITY WAY DEVELOPMENT. IT IS BASED UPON A REVIEW OF THE TOPOGRAPHICAL SURVEY AND AERIAL IMAGES OF THE SITE.
2. FOR TOPOGRAPHICAL SURVEY REFER SURVEY SOLUTIONS DRAWING DOMI-R636-01
3. EXISTING DISCHARGE RATES GIVEN HAVE BEEN CALCULATED USING MICRODRAINAGE. BROWNFIELD RUN-OFF RATES ARE BASED ON THE HARD PAVED AREAS.

KEY

INDICATIVE PLANNING BOUNDARY - TOTAL AREA: 510m² (0.051ha)

SOFT LANDSCAPE AREA TOTAL AREA: 165m² (0.017ha)

IMPERMEABLE AREA TOTAL AREA: 340m² (0.034ha)

BROWNFIELD RUN-OFF RATES

EVENT	BROWNFIELD RUN-OFF
1:1	5.0 l/s
1:2	6.4 l/s
1:30	12.2 l/s
1:100	22.3 l/s

- BROWNFIELD RUN-OFF CALCULATED IN MICRODRAINAGE USING 2-PIPE MODEL

GREENFIELD RUN-OFF RATES

EVENT	GREENFIELD RUN-OFF
1:1	0.2 l/s
1:2	0.3 l/s
1:30	0.5 l/s
1:100	0.6 l/s
Q_{BAR}	0.3 l/s

- GREENFIELD RUN-OFF CALCULATED IN MICRODRAINAGE USING SOURCE CONTROL

Rev:	Description:	Date:	By:	Chkd:
P01	ISSUED FOR PLANNING	18.05.23	HW	

renaissance

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

HARRINGTON SQUARE, CAMDEN

Drawing Title:

EXISTING DRAINED AREAS

Status:

INFORMATION

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	MAY 23	HW	--	AI

Scale:	Project No:
1:100	2202-03

Project: Originator: Volume: Level: Type: Role: Category/Number: Rev:

HSC-REN-XX-FN-DR-C-00050-P01

APPENDIX F
MicroDrainage Pre-Development Surface Water Run-Off

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.600	Add Flow / Climate Change (%)	0
Ratio R	0.437	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.024	4-8	0.010

Total Area Contributing (ha) = 0.034

Total Pipe Volume (m³) = 1.590

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	20.000	0.200	100.0	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	20.000	0.200	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.25	18.000	0.034	0.0	0.0	0.0	1.31	52.0	4.6
1.001	50.00	5.51	17.800	0.034	0.0	0.0	0.0	1.31	52.0	4.6

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.034	0.034	0.034
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.034	0.034	0.034

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		20.000	17.600	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Storm Duration (mins)	30
Ratio R	0.437		

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	400.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+0%					18.049
1.001	2	15 Winter	1	+0%					17.849

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.176	0.000	0.11			5.0	OK	
1.001	2	-0.176	0.000	0.11			5.0	OK	

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	400.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	2	+0%					18.056
1.001	2	15 Winter	2	+0%					17.856

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.169	0.000	0.14			6.4	OK	
1.001	2	-0.169	0.000	0.14			6.4	OK	

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	400.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%					18.078
1.001	2	15 Winter	30	+0%					17.878

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.147	0.000	0.26			12.2	OK	
1.001	2	-0.147	0.000	0.26			12.2	OK	

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

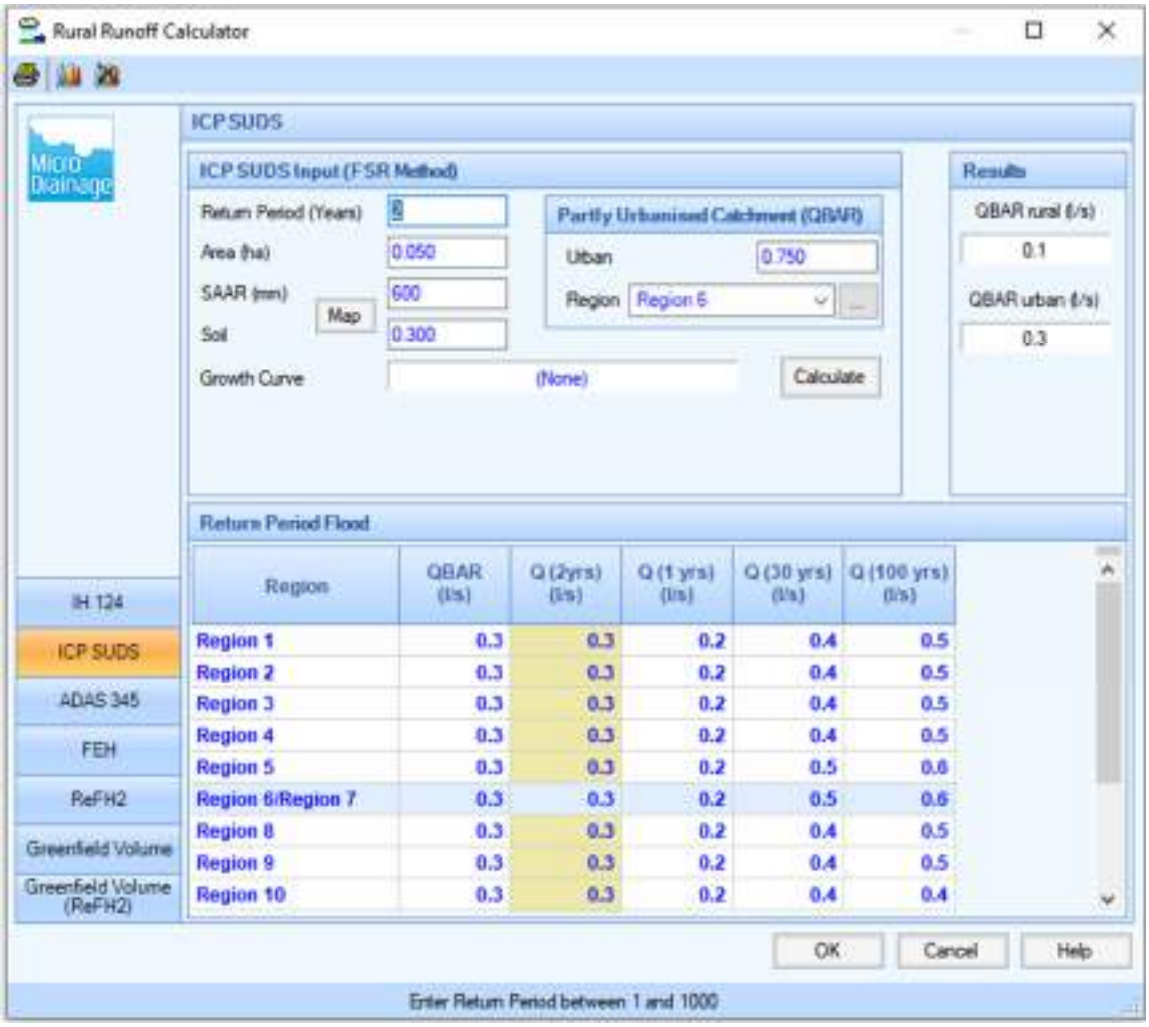
Margin for Flood Risk Warning (mm)	400.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%					18.110
1.001	2	15 Winter	100	+40%					17.910

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.115	0.000	0.47			22.3	OK	
1.001	2	-0.115	0.000	0.47			22.3	OK	

APPENDIX G
MicroDrainage Greenfield Run-Off Rates



Region	QBAR (l/s)	Q (2yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	0.3	0.3	0.2	0.4	0.5
Region 2	0.3	0.3	0.2	0.4	0.5
Region 3	0.3	0.3	0.2	0.4	0.5
Region 4	0.3	0.3	0.2	0.4	0.5
Region 5	0.3	0.3	0.2	0.5	0.6
Region 6/Region 7	0.3	0.3	0.2	0.5	0.6
Region 8	0.3	0.3	0.2	0.4	0.5
Region 9	0.3	0.3	0.2	0.4	0.5
Region 10	0.3	0.3	0.2	0.4	0.4

APPENDIX H
Proposed Impermeable Areas

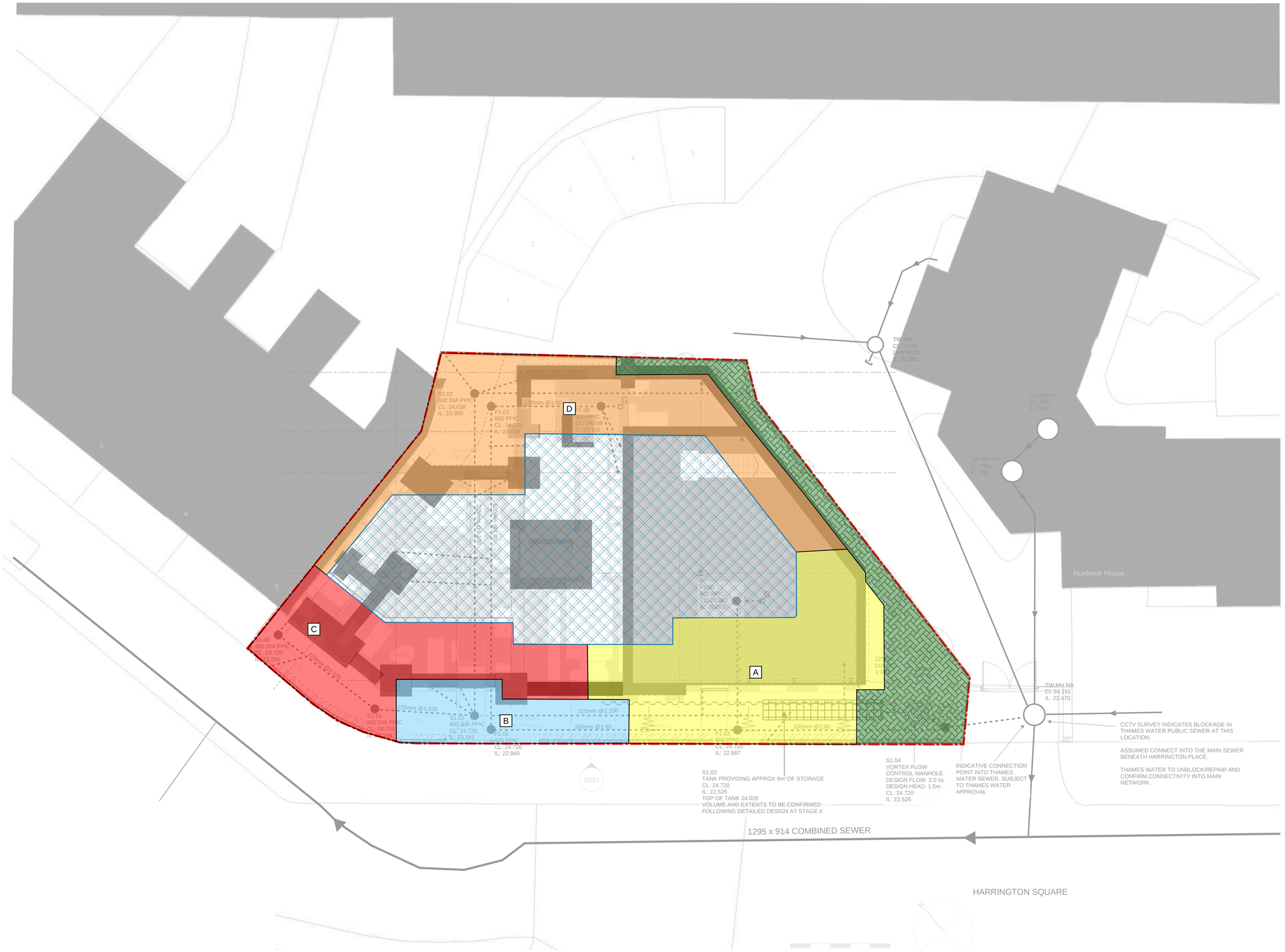
NOTES:

1. THIS DRAWING IS INTENDED TO INDICATE THE PROPOSED DRAINED AREAS FROM THE HARRINGTON SQUARE DEVELOPMENT AND SHOULD BE READ IN CONJUNCTION WITH:
   - PROPOSED BELOW GROUND DRAINAGE DRAWING
   - MICRODRAINAGE MODEL AND CALCULATION OUTPUTS

PROPOSED IMPERMEABLE AREA SUMMARY		
MANHOLE	**HATCH**	**AREA (ha)**
S1.00	C	0.007
S1.02	B	0.003
S1.03	A	0.009
S2.00	D	0.010
BLUE ROOF		0.018
	TOTAL	0.047

KEY

INDICATIVE PLANNING BOUNDARY - CURRENTLY TAKEN AS BUILDING OUTLINE
TOTAL AREA: 504m² (0.051ha)



P02	ISSUED FOR PLANNING	31.07.23	SA	AI
P01	ISSUED FOR PLANNING	26.05.23	HW	AI
Rev:	Description:	Date:	By:	Chkd:

renaissance

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

HARRINGTON SQUARE, CAMDEN

Drawing Title:

PROPOSED DRAINED AREA PLAN

Status:

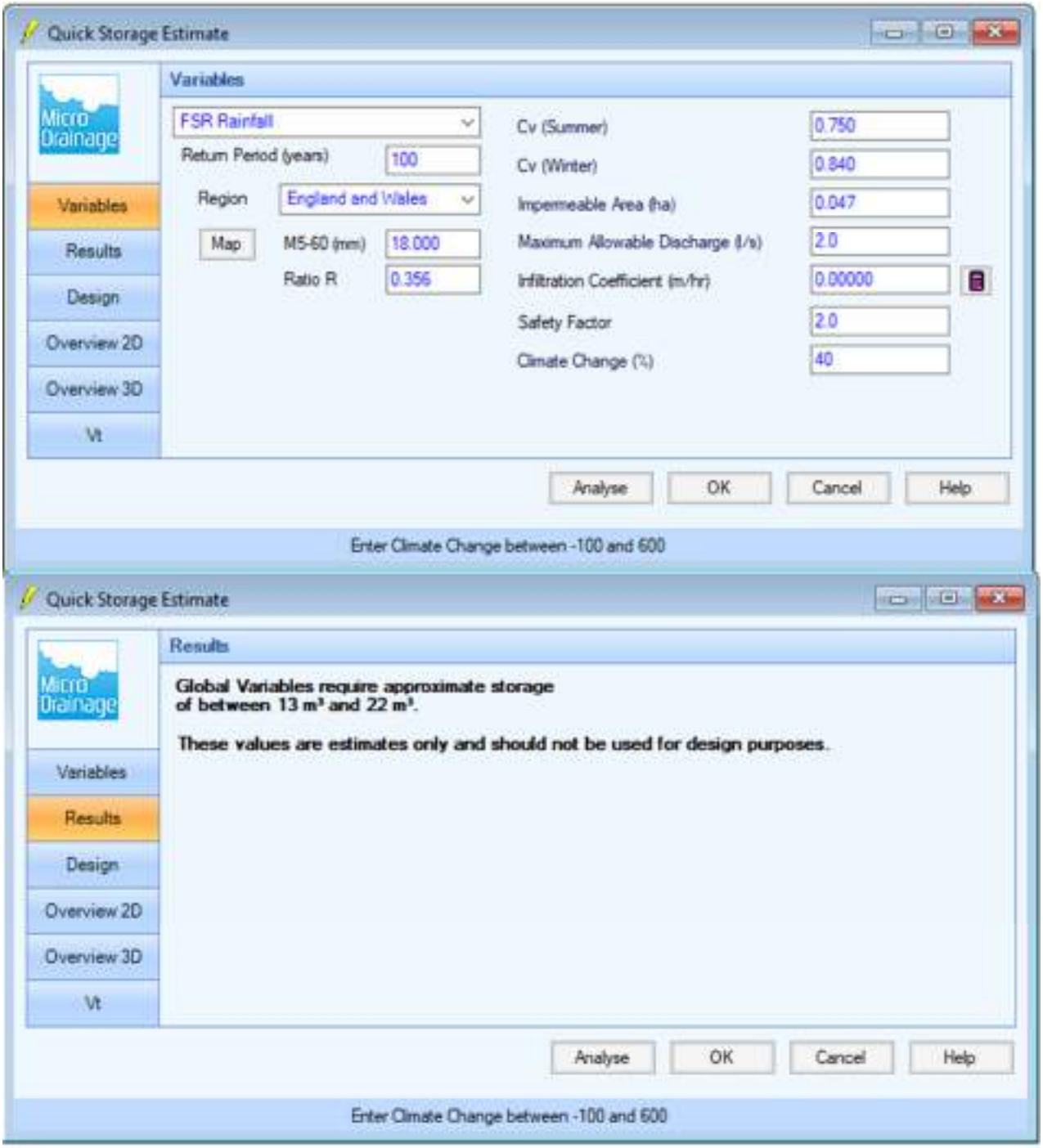
INFORMATION

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	MAY 23	HW	--	AI

Scale:	Project No:
1:100	2201-02

Project:	Originator:	Volume:	Level:	Type:	Role:	Category/Number:	Rev:
HSC	REN	XX	00	DR	C	00060	P02

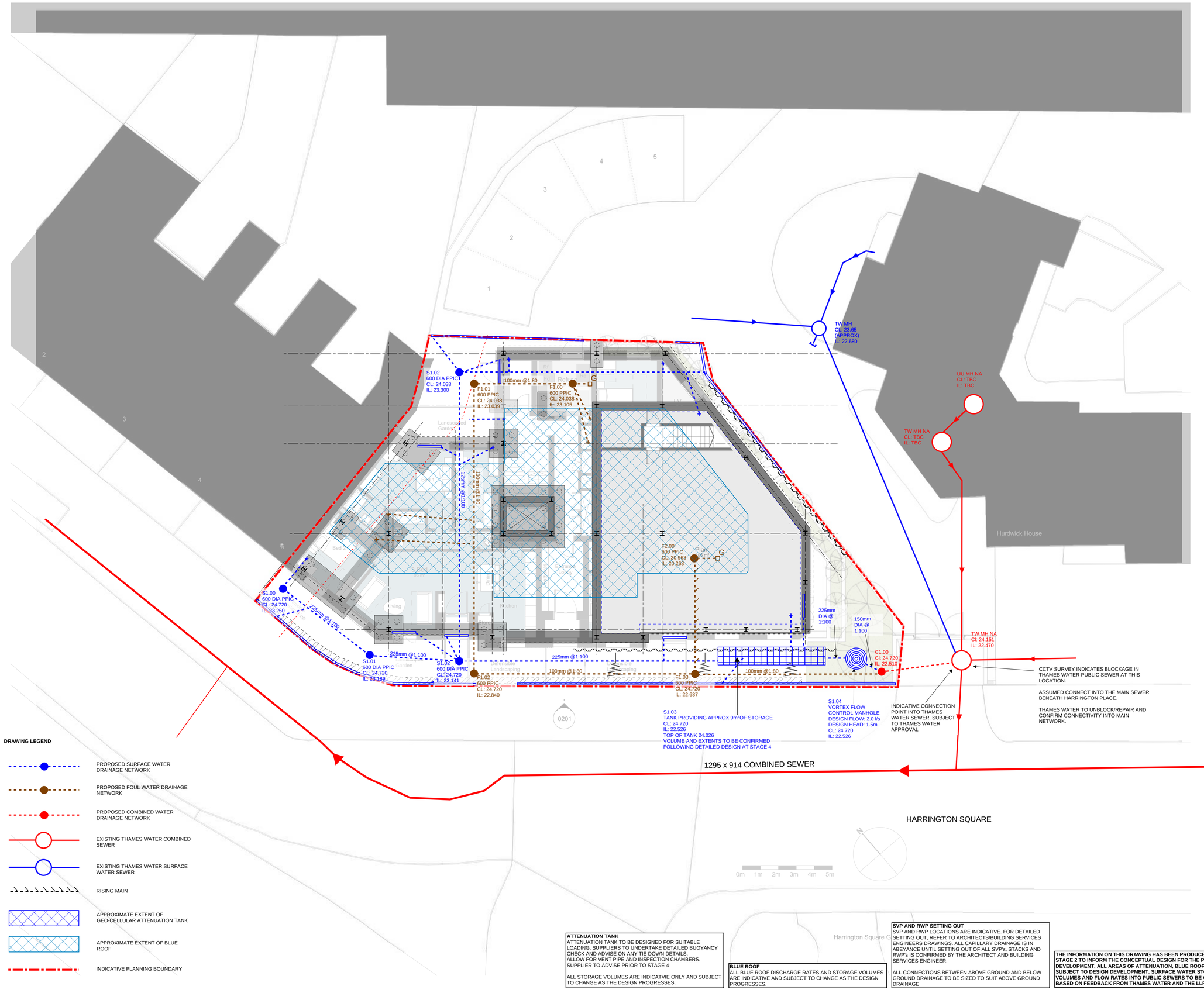
APPENDIX J
MicroDrainage Quick Storage Estimates


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 18.000
Ratio R 0.356
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 0.047
Maximum Allowable Discharge (l/s) 2.0
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600
Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 13 m³ and 22 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

APPENDIX K
Below Ground Drainage GA

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE BELOW GROUND DRAINAGE SPECIFICATION SP-C-00050, MANHOLE SCHEDULE ON DRAWING C-01301 AND DETAILS SHOWN ON DRAWING SERIES C-03301 & C-03311 TO C-03312.
3. THE FINAL CONNECTION TO THE PUBLIC SEWER IS SUBJECT TO UNITED UTILITIES APPROVAL AND IS TO BE IN ACCORDANCE WITH THEIR AGREED DETAILS.
4. FOR ALL ABOVE GROUND DRAINAGE AND ASSOCIATED PUMPS REFER TO BUILDING SERVICES AND ARCHITECT'S DRAWINGS.
5. ALL BELOW GROUND DRAINAGE WORKS TO BE IN ACCORDANCE WITH RELEVANT BUILDING REGULATIONS AND SEWER SECTOR GUIDANCE APPENDIX C- DESIGN AND CONSTRUCTION GUIDANCE. IF DISCREPANCIES ARE NOTED BETWEEN SSG AND DRAWINGS THESE SHOULD BE BROUGHT TO THE ATTENTION OF RENAISSANCE FOR REVIEW.
6. RWPs, SVPs, SSs AND FLOOR GULLIES ARE TO HAVE RODDABLE ACCESS POINTS ABOVE GROUND FLOOR TO BUILDING SERVICES DETAILS. ALL FLOOR GULLEYS AND RWP'S ARE TO BE TRAPPED.
7. ALL GULLY AND CHANNEL DRAIN LOCATIONS INDICATIVE. REFER TO ARCHITECT AND LANDSCAPE ARCHITECT DRAWINGS FOR SETTING OUT AND SPECIFICATION.
8. ALL FOUL AND SURFACE WATER DRAINAGE TO BE 150mm DIA UNLESS NOTED OTHERWISE.
9. THE ATTENUATION TANK AND FLOW CONTROL ARE TO BE TO SUPPLIERS DESIGN AND DETAILS. INSTALLATION IS TO BE IN ACCORDANCE WITH THE SUPPLIERS REQUIREMENTS.
10. SEWERS TO BE LAID IN CLASS S BEDDING (150mm GRANULAR BED AND SURROUND). WHERE DEPTH OF COVER TO TOP OF THE SEWER IS LESS THAN. 1.2m IN HIGHWAYS OR VERGES, OR LESS THAN 0.9m IN PEDESTRIAN AREAS, THEN A 150mm CONCRETE SLAB SHOULD BE PROVIDED ABOVE THE GRANULAR BED AND SURROUND. REFER TO DETAILS SHEETS.
12. THE CONTRACTOR IS TO UNDERTAKE A FULL CCTV SURVEY AT COMPLETION OF THE PROJECT TO DEMONSTRATE THAT THE DRAINAGE IS CLEAN.
13. ANY DEFECTS ARE TO BE CORRECTED BY THE CONTRACTOR PRIOR TO HANDOVER OF THE SYSTEM TO THE CLIENT.
14. THE CONTRACTOR IS TO KEEP A RECORD SET OF THE AS INSTALLED DRAINAGE ON SITE AND PROVIDE THIS TO RENAISSANCE UPON COMPLETION OF THE WORKS TO ALLOW FOR PRODUCTION OF A 'FINAL CONSTRUCTION' ISSUE DRAWING.
15. DURING THE WORKS ALTERATIONS TO THE DRAINAGE LAYOUT ARE TO BE MARKED UP BY THE CONTRACTOR AND AGREED WITH RENAISSANCE IN WRITING.
16 THE CHAMBER SIZE OF PCC MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
17. MANHOLE COVERS ARE TO BE ACCORDANCE WITH BS EN 124 FOR THE RATING INDICATED IN THE MANHOLE SCHEDULE.
18. THE CONTRACTOR IS TO SUBMIT DETAILS FOR THE PROPOSED MANHOLE COVERS TO THE ENGINEER AND LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION.
19. COVER SLABS MUST CARRY THE BSI KITEMARK. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOAD BEARING REDUCING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO REQUIRED SIZE.
20. ALL SEWERS TO BE BSI KITEMARK (CERTIFIED TO WIS 4-35-01) 18.ALL CONCRETE PIPES TO BE TO ES EN 1916 CLASS 120 (54kN/m).
21. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2).
22. IF PLASTIC PIPES ARE TO BE USED THEN THE FOLLOWING MUST APPLY:
A. BSI KITEMARK (CERTIFIED TO BS EN 13476-1 AND WIS 4-35-01)
B. PIPES LESS THAN OR EQUAL TO 500mm DIA
C. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE
D. REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2)
23. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m, 150mm DIA. 40kN/m, 225mm DIA. 45kN/m AND 300mm DIA. 72kN/m.
24. THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE -(CLASS 120 TO EN 1916/BS5911-1 2002). PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN13476.
25. SULPHATE RESISTANT CEMENT (C20-DC2) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVIDING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
26. SEWER PIPES TO BE LAID IN MAXIMUM 3 METER LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER PIPES, AND THIS IS AGREED BY THE CONTRACTOR WITH THE PIPE MANUFACTURER.
27. ALLOW FOR ALL EXISTING DRAINAGE ON SITE TO BE GRUBBED UP AND BACKFILLED.
28. ANY CONNECTIONS FROM THE SITE TO THE PUBLIC SEWER TO THE SITE ARE TO BE CAPPED AND GROUTED.



DRAWING LEGEND

- PROPOSED SURFACE WATER DRAINAGE NETWORK
- PROPOSED FOUL WATER DRAINAGE NETWORK
- PROPOSED COMBINED WATER DRAINAGE NETWORK
- EXISTING THAMES WATER COMBINED SEWER
- EXISTING THAMES WATER SURFACE WATER SEWER
- RISING MAIN
- APPROXIMATE EXTENT OF GEO-CELLULAR ATTENUATION TANK
- APPROXIMATE EXTENT OF BLUE ROOF
- INDICATIVE PLANNING BOUNDARY

ATTENUATION TANK
ATTENUATION TANK TO BE DESIGNED FOR SUITABLE LOADING. SUPPLIERS TO UNDERTAKE DETAILED BUOYANCY CHECK AND ADVISE ON ANY TIE DOWN DETAILS. ALLOW FOR VENT PIPE AND INSPECTION CHAMBERS. SUPPLIER TO ADVISE PRIOR TO STAGE 4

ALL STORAGE VOLUMES ARE INDICATVIE ONLY AND SUBJECT TO CHANGE AS THE DESIGN PROGRESSES.

BLUE ROOF
ALL BLUE ROOF DISCHARGE RATES AND STORAGE VOLUMES ARE INDICATIVE AND SUBJECT TO CHANGE AS THE DESIGN PROGRESSES.

SVP AND RWP SETTING OUT
SVP AND RWP LOCATIONS ARE INDICATIVE. FOR DETAILED SETTING OUT, REFER TO ARCHITECTS/BUILDING SERVICES ENGINEERS DRAWINGS. ALL CAPILLARY DRAINAGE IS IN ABEYANCE UNTIL SETTING OUT OF ALL SVP's, STACKS AND RWP's IS CONFIRMED BY THE ARCHITECT AND BUILDING SERVICES ENGINEER.

ALL CONNECTIONS BETWEEN ABOVE GROUND AND BELOW GROUND DRAINAGE TO BE SIZED TO SUIT ABOVE GROUND DRAINAGE

THE INFORMATION ON THIS DRAWING HAS BEEN PRODUCED DURING RIBA STAGE 2 TO INFORM THE CONCEPTUAL DESIGN FOR THE PROPOSED DEVELOPMENT. ALL AREAS OF ATTENUATION, BLUE ROOF AND ARE SUBJECT TO DESIGN DEVELOPMENT. SURFACE WATER STORAGE VOLUMES AND FLOW RATES INTO PUBLIC SEWERS TO BE CONFIRMED BASED ON FEEDBACK FROM THAMES WATER AND THE LLFA.

Rev:	Description:	Date:	By:	Chkd:
P02	DRAFT ISSUE	28.07.23	SA	EM
P01	DRAFT ISSUE	14.04.23	HW	??

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Project:
HARRINGTON SQUARE CAMDEN

Drawing Title:
BELOW GROUND DRAINAGE GENERAL ARRANGEMENT

Status:
STAGE 2

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	JUL 23	SA	SA	EM

Scale: 1:100 | Project No: 2202-03

Project: | Originator: | Volume: | Level: | Type: | Role: | Category/Number: | Rev:

HSC-REN-ZZ-FN-DR-C-01100-P02

APPENDIX L
Proposed Surface Water MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.600	Add Flow / Climate Change (%)	0
Ratio R	0.436	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.024	4-8	0.005

Total Area Contributing (ha) = 0.029

Total Pipe Volume (m³) = 1.736

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.007	0.007	0.007
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.010	0.010	0.010
1.002	-	-	100	0.003	0.003	0.003
1.003	-	-	100	0.009	0.009	0.009
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.029	0.029	0.029

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		24.720	22.510	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Storm Duration (mins)	30
Ratio R	0.436		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 1.04, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference	MD-SCL-0058-2000-1500-2000
Design Head (m)	1.500
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	22.526
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	2.0
Flush-Flo™	0.239	1.6
Kick-Flo®	0.522	1.2
Mean Flow over Head Range	-	1.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.8	3.000	2.7	7.000	4.1
0.200	1.6	1.400	1.9	3.500	2.9	7.500	4.2
0.300	1.6	1.600	2.1	4.000	3.1	8.000	4.3
0.400	1.5	1.800	2.2	4.500	3.3	8.500	4.4
0.500	1.3	2.000	2.3	5.000	3.5	9.000	4.6
0.600	1.3	2.200	2.4	5.500	3.6	9.500	4.7
0.800	1.5	2.400	2.5	6.000	3.8		
1.000	1.7	2.600	2.6	6.500	3.9		

Storage Structures for Storm

Cellular Storage Manhole: 1.03, DS/PN: 1.003

Invert Level (m) 22.526 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	6.0	0.0	1.501	0.0	0.0
1.500	6.0	0.0			

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.437
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1.00	15 Winter	1	+0%	30/180 Winter				23.275
1.001	1.01	15 Winter	1	+0%	30/120 Winter				23.216
2.000	2.00	15 Winter	1	+0%	100/30 Summer				23.336
1.002	1.02	360 Winter	1	+0%	30/120 Summer				23.201
1.003	1.03	360 Winter	1	+0%	1/15 Summer				23.199
1.004	1.04	360 Winter	1	+0%	1/15 Summer				23.199

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.00	-0.200	0.000	0.03			1.0	OK	
1.001	1.01	-0.198	0.000	0.03			1.0	OK	
2.000	2.00	-0.189	0.000	0.06			2.9	OK	
1.002	1.02	-0.165	0.000	0.04			1.8	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	1.03	0.430	0.000	0.05			1.6	SURCHARGED*	
1.004	1.04	0.523	0.000	0.15			1.6	SURCHARGED	

APPENDIX L
Camden Borough Council SuDS Pro-Forma

Camden

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Harrington Square
Address & post code	NW1 2JJ
OS Grid ref. (Easting, Northing)	E 529212
	N 183240
LPA reference (if applicable)	
Brief description of proposed work	The proposed development is the erection of a 6-storey building comprising 11 residential flats with, plant rooms, accessible roof terraces, and engineering works. The proposals are to work within the
Total site Area	510 m^2
Total existing impervious area	340 m^2
Total proposed impervious area	m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	GROUP_003
Existing drainage connection type and location	
Designer Name	Henry Wilkinson
Designer Position	Civil Engineer
Designer Company	renaissance Associates LTD

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	None
Bedrock geology classification	London Clay formation
Site infiltration rate	m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	Combined sewer to east of site
Has the owner/regulator of the discharge location been consulted?	Yes

Camden GREATERLONDONAUTHORITY LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.3			
1 in 1	0.2	5		
1 in 30	0.5	12.2		
1 in 100	0.6	22.3		
1 in 100 + CC				
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Vortex Flow Control Device		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	210	166	0
Blue roofs	210	166	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	**420**	**332**	**0**

4. Supporting Information

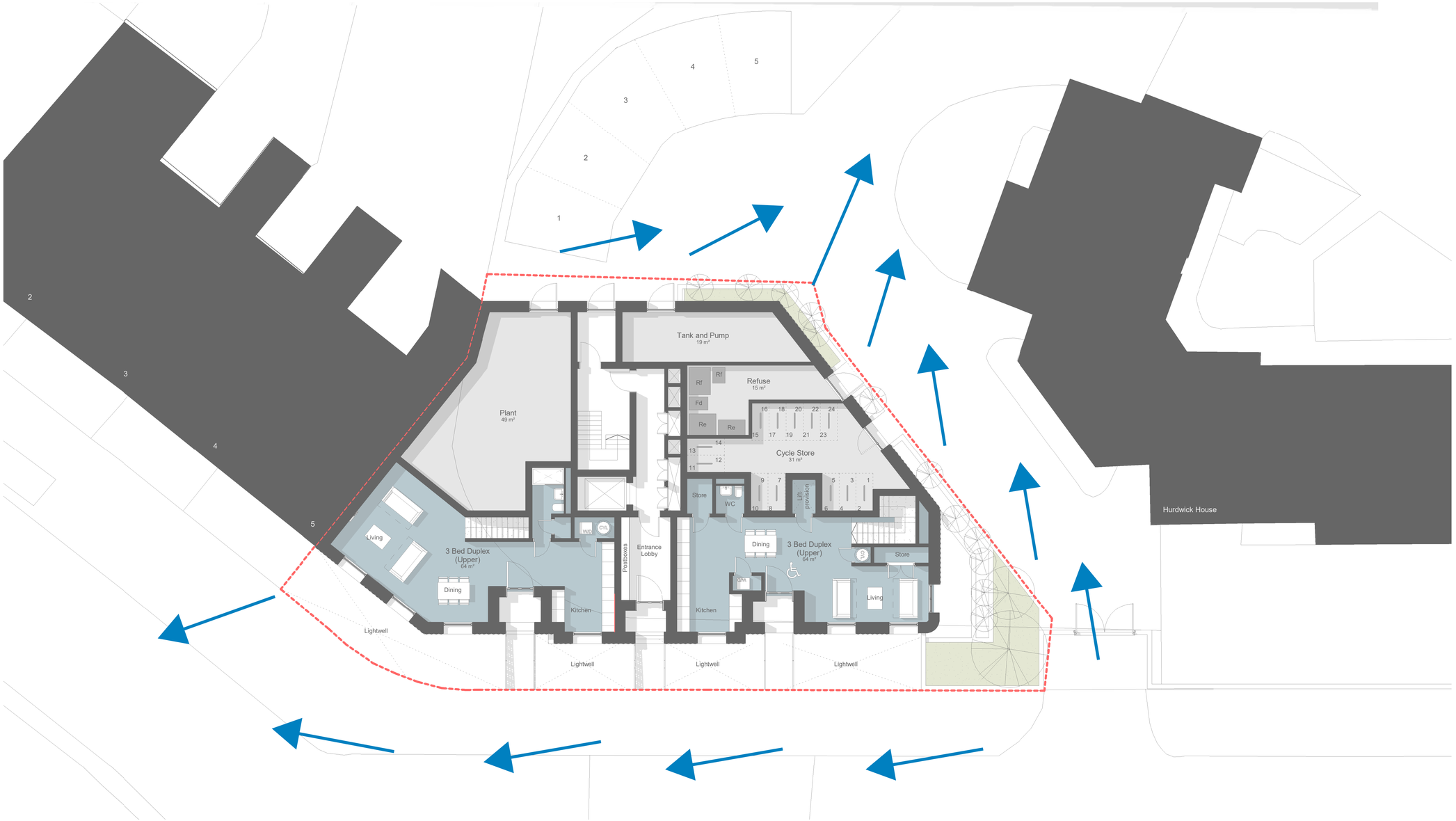
4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Page 6-7 of Outline Drainage Strategy (HSC-REN-XX-XX-RP-C-00002)
Drainage hierarchy (2b)	Page 6 - HSC-REN-XX-XX-RP-C-00002
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	ting response for Pre-planning applic
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	pendix L - HSC-REN-XX-XX-RP-C-000
Proposed SuDS measures & specifications (3b)	& Appednxi K - HSC-REN-XX-XX-RP-
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	pendix D - HSC-REN-XX-XX-RP-C-000
Detailed drainage design drawings, including exceedance flow routes	pednxi K - HSC-REN-XX-XX-RP-C-000
Detailed landscaping plans	pendix D - HSC-REN-XX-XX-RP-C-000
Maintenance strategy	ge 12-15 - HSC-REN-XX-XX-RP-C-000
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Page 7-8 - HSC-REN-XX-XX-RP-C-000
b) biodiversity?	Page 7 - HSC-REN-XX-XX-RP-C-00002
c) amenity?	Page 7 - HSC-REN-XX-XX-RP-C-00002

APPENDIX M
Overland Flow Routes

NOTES:

1. THIS DRAWING IS INTENDED TO OUTLINE THE KNOWN CIVIL AND STRUCTURAL ENGINEERING SITE CONSTRAINTS.
2. DO NOT SCALE FROM THIS DRAWING
3. FOR FURTHER DETAILS OF ITEMS NOTED ON THIS DRAWING, REFER TO ARCHITECTURAL AND CIVIL AND STRUCTURAL INFORMATION

OVERLAND FLOOD RISK
OVERLAND FLOOD ROUTING MIMICS THE EXISITNG SCENARIO WITH OVERLAND SURFACE FLOWS, DIRECTED AROUND BUILDING AS IS CURRENTLY THE CASE WITH THE EXISTING BUILDING. THEREFORE THE NEW BUILDING DOES NOT INCREASE THE FLOODING RISK TO ADJACENT PROPERTIES OR THE HIGHWAY.



P01	FOR INFORMATION	15.06.23	HW	AI
Rev:	Description:	Date:	By:	Chkd:

renaissance
Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

HARRINGTON SQUARE, CAMDEN

Drawing Title:

OVERLAND FLOOD ROUTES

Status:

FOR INFORMATION

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	JUN 23	HW	HW	AI

Scale:	Project No:
1:100	2202-03

Project: Originator: Volume: Level: Type: Role: Category/Number: Rev:

HSC-REN-XX-00-DR-C-00070 P01