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47a,47&49 Lower Mortlake Road

Surface & Foul Water Drainage Strategy (including Flood Risk Assessment)

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QUALITY MANAGEMENT

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SURFACE AND FOUL WATER DRAINAGE STRATEGY
INCLUDING FLOOD RISK ASSESSMENT

CONTENTS

1. ACRONYMS AND ABBREVIATIONS

CIRIA	Construction Industry Research and Information Association
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ha	Hectares
LLFA	Lead Local Flooding Authority
LPA	Local Planning Authority
m	Metres
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance to the National Planning Policy Framework
NTS	Non-statutory Technical Standards
LFRA	Local Flood Risk Assessment
SuDS	Sustainable Drainage Systems
LBRUT	London Borough of Richmond Upon Thames
PPG	Planning Practise Guide
BGS	British Geological Society
TE2100	Thames Estuary 2100
SPZ	Source Protection Zone
CDA	Critical Drainage Area

APPENDICES

- Appendix A Existing Site Plan
- Appendix B Proposed Site Plans
- Appendix C Thames Water Asset Plans
- Appendix D Surface Water Calculations
- Appendix E Foul Water Calculations
- Appendix F Environment Agency Flood Map
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- Appendix H Possible Drainage Layout
- Appendix I Storage Volume Calculations
- Appendix J London Sustainable Drainage Pro Forma

SECTION 1
INTRODUCTION

1. INTRODUCTION

1.1. Appointment and Brief

This Surface and Foul Water Drainage Strategy (DS) including a Flood Risk Assessment (FRA) has been prepared by Constructure Ltd on behalf of Westlake Property Limited ("The Applicant"), for the Proposed Development at 47, 47a & 49 Lower Mortlake Road, Richmond, London, TW9 2LW (hereby referred to as the 'Site').

The purpose of this document is to outline the development of the proposed DS, providing sufficient detail to enable both a thorough review of design principles adopted and further refinement of the design as part of the ongoing development of the project.

It aims to demonstrate the foul and surface water management at the Application Site, as follows:

- By providing an analysis of the impact of the proposed development on surrounding foul water infrastructure and identify the constraints present on the site in terms of suitability of conventional gravity drainage; and
- By demonstrating the principles of surface water management in terms of constraints on discharge, permitted discharge rates and required volumes of attenuation (where required), describing how these can be accommodated within the development proposals.

The proposed DS outline below may be subject to further detailed analysis at design stage.

1.2. Aims and Objectives

The DS has been prepared with reference to the following requirements:

- The DS must:
  - Ensure that flood risk to the Application Site and surrounding area is not increased over the lifetime of the Proposed Development;
  - Conform with all relevant national and local flood risk polices;
  - Adopt current design standards; and
  - Consider long-term maintenance with respect to practicality, ownership and funding.

- The DS should:
  - Mimic the existing drainage characteristics of the Application Site as far as is practical;

- Look for opportunities to provide a reduction in flood risk to the Application Site and the surrounding area;
- Adhere to current best practice guidance;
- Contribute to the enhanced amenity and aesthetic value of the Application Site; and
- Propose opportunities for biological enhancement and provide habitats for wildlife in urban areas.

1.3. Limitations

The purpose of this report is as outlined in Section 1.2, together with those related matters specifically referred to, and it is not intended to be used for any other purposes. The report is for the sole benefit and may only be relied upon by the addressee, to whom we will owe a duty of care. The report and any part of it is confidential to the addressee and should not be disclosed to any third party for any purpose, without the prior written consent of Constructure Ltd as to the form and context of such disclosure. The granting of such consent shall not entitle the third party to place reliance on the report, nor shall it confer any third-party rights pursuant to the Contracts (Rights of Third Parties) Act. The report may not be assigned to any third party.

1.4. Reference Information

The following information has been obtained and interrogated as part of this study:

- Lynas Smith Drawing Ref: 15-001-P1 – Location Plan.
- British Geological Society – Geological Maps.
- UK SUDS HR Wallingford – Surface Water Storage Requirements

In addition, the following documents have been consulted:

- Communities and Local Government Document. (2021). The National Planning Policy Framework;
- Environment Agency. (2016). Flood Risk Assessments: Climate Change Allowances;
- Environment Agency. (2013). Rainfall Runoff Management for Developments;
- Environment Agency. (2019). Flood Risk Assessments: Climate Change Allowances;
- CIRIA. (2015). C753 – The SuDS Manual;
- Secretary of State. (2015). Building Regulations Approved Document H;
- Butler & Davies. (2012). 2nd Ed. Urban Drainage;
- DEFRA / EA Interactive online mapping (magic.defra.gov.uk);
- Department for Environment, Food and Rural Affairs. (2015). Non-Statutory Technical Standards for Sustainable Drainage Systems;
- Department for Environment, Food and Rural Affairs & Environment Agency. (2017). Flood Risk Assessment for Planning Applications;
- London Borough of Richmond upon Thames Design Guide, Design Strategy SPD;
- London Borough of Richmond upon Thames Design Local Development Framework, Core Strategy and Policies for Management of Development; and
- London Borough of Richmond upon Thames Design Local Flood Risk Management Strategy.
- London Borough of Richmond upon Thames (LoDEG pro forma)

SECTION 2

PROJECT BACKGROUND

2. PROJECT BACKGROUND

2.1. Site Location and Existing Land Use

The Application Site is situated off Lower Mortlake Road. Specifically, the Site is located close to the junction with Salisbury Road.

The Ordinance Survey (OS) grid reference for the application site is 518381 E, 175449 N and the post code is TW9 2LW.

The Site is currently an un-occupied yard that formally was a car wash business site and consists of addresses 47, 47a and 49. Where oriented North:-

- The North elevation abuts residential properties 1-3 Avoca Villas with access off Blue Anchor Alley;
- The East elevation abuts a residential dwelling 51 Lower Mortlake Road;
- The South elevation faces onto Lower Mortlake Road; and
- The West elevation faces onto 45 Lower Mortlake Road.

2.2. Existing Drainage Infrastructure

The Sewerage Undertaker for the area is Thames Water and review of their asset records (see appendices) suggests the following public infrastructure within close vicinity of the Application Site:

- To the South Elevation:
  - 750 mm diameter foul water sewer flowing West to East along Lower Mortlake Road (Northern side) its depth is not known.
  - 300mm diameter foul water sewer flowing West to East along Lower Mortlake Road (Northern side) its depth is not known.
  - 600 mm diameter surface water sewer flowing West to East along Lower Mortlake Road (Northern side) its depth is not known.
  - 750 mm diameter surface water sewer flowing West to East along Lower Mortlake Road (Southern side) its depth is not known.

The existing Application Site is not known to have any surface water flow restriction or benefit from existing SuDS features.

Similarly, it is assumed that the existing Application Site discharges both foul and surface water to the public sewer network. However, at the time of writing the exact location and condition of the existing connection is unknown as a CCTV survey has not yet been carried out but is likely to form part of the intrusive surveys.

2.3. Topography

Currently there is no topographical survey drawing available. However, the Site appears to be around 6.5m Above Ordnance Datum and is generally flat with a possible slight fall towards the highway. It is approximately 610m² in area and therefore below the 1.0ha trigger for a full Flood Risk Assessment.

2.4. Geology and Hydrogeology

British Geological Survey (BGS) online mapping indicates that the Application Site is situated on a bedrock of London Clay overlain by the Kempton Park Gravel Member. This is a coarse to fine grain superficial deposit.

Due to the London Clay bedrock, the Environment Agency's online groundwater mapping confirms that the site is not located within a Groundwater Source Protection Zone (SPZ). The Kempton Park Gravel Member may contain a perched water table trapped above the Clay and therefore trenches may require pumping out during construction. However, both bedrock and superficial soils are classified as unproductive or secondary undifferentiated aquifers, which are not permeable layers capable of supporting water supplies at a local or strategic level.

Trial pits will confirm at what level this water table may be (see Hydrology below).

2.5. Hydrology

From Thames Waters sewer records, there appears to be two foul/combined and two surface water sewers in Lower Mortlake Road. One of the foul sewers is a 30" (750mm) pipe. The other is 12" (300mm). From the writers experience it is likely that the larger of the two is a main trunk sewer and will be relatively deep in comparison to the more local 300mm. It is to this (the 300mm) that the Application Site is likely to connect. Unfortunately, the sewer records do not provide invert or cover levels.

A 24" (600mm) and a 30" (750mm) diameter surface water sewer lie either side of Lower Mortlake Road with the smaller being on the Application Site's side.

It is assumed that surface water currently generated by the Application Site is combined with its foul water and discharges to the foul/combined sewer as was normal practice in London. If this is the case, the separation of surface water for the new development will occur on site and discharge to the 600mm surface water sewer, this is subject to Thames Waters agreement and their capacity check.

The British Geological Survey maps show that Kempton Park Gravels are present may enable infiltration to take place. This is the preferred method of surface water disposal, at source, in the SuDS hierarchal tree.

On site infiltration testing should therefore be carried out to provide:

- An insight as to a safe method of excavation should a high perched water table be found;

- And if not, its infiltration capabilities.

For the purposes of this report an estimated figure, $3.0x10^{-5}$m/s from table 25.1 of the CIRIA C753 manual has been used to provide a guide as to the size of a possible infiltration method most suited to this site. This does not preclude during final design stages other infiltration techniques or methods from being implemented. It is merely to demonstrate what could be achieved.

Clearly, should a better infiltration rate be recorded the size and scope of attenuation devices can be reduced. Conversely, should it be worse, it will need to be increased. It is likely that the requirement of Part H of the Building Regulations may preclude the use of some infiltration techniques, due to the lack of space to locate such devices between or near structures. See 2.6 below.

Greenfield Runoff Rates

Greenfield runoff rates have been estimated for the site using the Institute of Hydrology Report 124 method, in accordance with the latest Environment Agency Guidance, as summarised below and are included within the appendices of this study:

CATCHMENT	AREA	1:1 AEP EVENT	1:30 AEP EVENT	1:100 AEP EVENT
Total Site	0.060 Ha	0.1l/s	0.2 l/s	0.3 l/s

Peak Existing Runoff Rates

Peak existing runoff rates have been calculated using the Modified Rational Method and obtained from the Causeway Flow simulation model for the 1:1 AEP, 1:30 AEP and 1:100 AEP events respectively with a 20 % and 40 % climate change allowances included to the 1:100 AEP event.

The following design inputs were adopted in accordance with guidance contained within the Flow Design software:

- Storm Duration: 60 Minutes.
- Volumetric Runoff Coefficient (Cv): 0.75
- Routing Coefficient (Cr): 1.30

Findings as summarised below and included within the appendices of this study:

CATCHMENT	AREA	% IMPERMEABLE	1:1 AEP EVENT	1:30 AEP EVENT	1:100 AEP EVENT	1:100 AEP + 1.2 CC	1:100 AEP + 1.4 CC
Total Site	0.060Ha	100 %	7.4 l/s	17.9 l/s	23.2 l/s	27.9 l/s	32.6 l/s

2.6. Proposed Development

The scheme as outlined on the proposed layouts (see appendices) proposes the construction of a part 1/2/3 storey building (plus lower ground) to provide 14 co-living units (sui generis) and associated internal amenity space at lower ground floor level, with new lower ground level amenity space to neighbouring buildings, and alongside external communal space at ground and lower ground

The basement to No 47a has ‘external’ areas that could house an infiltration structure, providing a relaxation of the Building Regulation requirement of ‘No soakaway within 5.0m of a structure’ is given. The areas to the remaining basements of 47 and 49, currently land beneath existing 47 and 49 are too small to be of any beneficial SuDS use.

The roof could house a ‘blue roof’ configuration to enable high level attenuation and thus reduce the volume of storage required at lower level. It is possible that during the design stage it becomes apparent that pumping beneath the lower level is required.

SECTION 3

ANALYSIS OF NATIONAL AND LOCAL POLICY

3. ANALYSIS OF NATIONAL AND LOCAL POLICY

3.1. National Policy

National Planning Policy Framework (NPPF)

Communities and Local Government Document. (2021). *The National Planning Policy Framework* requires any Planning Application to demonstrate that the Proposed Development will be safe for the duration of its' design life, taking into account the vulnerability of its' users and without increasing flood risk elsewhere and reducing flood risk overall, where possible.

Non-Statutory Technical Standards for Sustainable Drainage Systems

Department for Environment, Food and Rural Affairs. (2015). *Non-Statutory Technical Standards for Sustainable Drainage Systems* state that the peak rate of discharge from a redevelopment during the 1:1 year and 1:100 year rainfall events should be as close as reasonably practical to the corresponding greenfield runoff rate, but should never exceed that of the pre-development state.

The standards also recommend that, where reasonably practicable, the runoff volume generated from the 1:100 year, 6 hour rainfall event should be constrained to the corresponding greenfield runoff volume.

Building Regulations Approved Document H

Secretary of State. (2015). *Building Regulations Approved Document H* establishes a hierarchy for surface water disposal and encourages a SuDS approach. The hierarchy stipulates that surface water runoff which is not collected for re-use must be discharged in the following order of priority:

1. Discharge to ground via infiltration; or, where not reasonably practicable;
2. Discharge to a surface water body (i.e. river, watercourse or the like); or, where not reasonably practicable:
3. Discharge to a surface water sewer, highway drain or other surface water drainage system; or, where not reasonably practicable:
4. Discharge to a combined sewer.

3.2. Local Policy

Lead Local Flood Authority SUDS Policy Statement

The London Borough of Richmond upon Thames, in their role as Lead Local Flood Authority (LLFA), stipulates the required standards for sustainable drainage systems for all major developments within their jurisdiction.

The London Borough of Richmond upon Thames, Local Development Framework, Design Guide and the Flood Risk Management Strategy outlines the following main policies, relevant to the development of the DS, as follows:

- Developments will be expected to incorporate Sustainable Drainage Systems (SuDS) to reduce the risk of surface water flooding, both to the site in question and to the surrounding area;
- Any proposed development must attempt to make use of and work within the constraints of the existing site topography where possible;
- Any SuDS system must consider the effects of climate change and reduce the potential for environmental damage both on and off site;
- Preference should be for the adoption of SuDS systems which enhance public realm, wherever possible;
- Drainage Strategies must assess the hydrology of the site along with landform, geology, drainage and flood risk and incorporate this within the adopted SuDS proposal; and
- Recommendations given within national policy (as outlined above) should be adhered to in full, unless demonstrated to be inappropriate.

3.3. Assessing Flood Risk

The Department for Environment, Food and Rural Affairs & Environment Agency (2017). *Flood Risk Assessment for Planning Applications* confirms that detailed flood risk assessment is required where the Application Site is:

- Located in Flood Zone 2 or 3, including minor development and change of use; or
- More than 1 hectare (Ha) in Flood Zone 1; or
- Less than 1 Ha in Flood Zone 1, including change of use in a development type to a more vulnerable class, where the development could be affected by sources of flooding other than by rivers and the sea; or
- In an area within Flood Zone 1 that has critical drainage problems as notified by the Environment Agency.

The Government's online Flood Map for Planning indicates that the Proposed Development is situated within Flood Zone 1. In accordance with Table 1 (Flood Zones) of the NPPF, this classifies the site of having a less than 1:1000 annual probability of river or sea flooding. See appendices.

Table 2 (Flood Risk Vulnerability Classification) of the NPPF classifies the existing commercial yard as 'Less Vulnerable', with a change in proposed use of the site and an introduction of a basement this is classed as 'More Vulnerable'.

Table 3 (Flood Risk Vulnerability and Flood Zone Compatibility) of the NPPF states that More Vulnerable development is compatible within Flood Zone 1 and therefore the Sequential Test is considered to be satisfied and an Exception Test is not required here.

Data as to recorded flood sources other than from a from rivers and the sea have been requested from the LLFA and Environment Agency for completeness. At the time of writing, we are yet to receive a formal response from either party.

Finally, the site is within Flood Zone 1 and the total area for the Application Site has been determined as 0.061 hectares (610m²), both fall below the trigger criteria for a formal Flood Risk Assessment

Therefore, on this basis provision of a full formal Flood Risk Assessment is not considered to be required for the Proposed Development and it is felt that flood risk does not represent a constraint to the development of the Site.

3.4. Easements and Other Constraints

Utilities records obtained for the site included within the Appendices of this study suggest the presence of several existing utilities on, or within the immediate vicinity, of the Application Site. All of these may benefit from easements and may therefore impact on the future development of the Application Site and DS, during the course of the ongoing design development.

3.5. Below Ground Drainage Diversions and Other Constraints

No diversions of publicly owned drainage infrastructure are known to be present at the Application Site at the time of writing.

Similarly, no other notable constraints are envisaged apart from the size of the proposed footprint and the area available for SuDS structures

3.6. Opportunities

The redevelopment of the Application Site presents an opportunity to contribute to a reduction in flood risk by reducing the current rate of discharge to the public sewer network and whilst not decreasing the overall volume discharged, the reduced rate proposed will ease the immediate burden on the sewerage network during peak storm events.

The incorporation of attenuation within the Proposed Development should seek to offer a reduction in peak runoff rates in accordance with both the national and local policies described above. Subsequently, a reduction in peak flow rates would result in a lower surface water flood risk downstream of the Proposed Development, with larger reductions providing a greater betterment.

Surface water generated by the Application Site is believed to discharge un-treated directly to the public surface water network. Subsequently the management of surface water in accordance with the requirements of local policy and CIRIA. (2015). *C753 – The SuDS Manual* would result in an increase in the quality of the surface water generated by the Application Site as a result of the Proposed Development.

SECTION 4

FOUL WATER MANAGEMENT

4. FOUL WATER MANAGEMENT

4.1. Existing Discharge Rates and Points of Connection

Currently, the Application Site features an existing car wash facility and a lock up facility

At the time of writing, the location of the existing point of connection to the public foul water sewer is unknown and it is intended that this will be investigated further as part of ongoing intrusive survey works.

Estimated foul water volume has been determined as **4000 l/day** in accordance with Butler & Davies. (2012). 2nd Ed. *Urban Drainage*, assuming the following:

- Infiltration Factor: 1.10
- Peak Flow Factor: 6
- Per Capita Contribution: 200 l/person/day (or 4000 l/unit/day, whichever is the greater in accordance with recommendations within Design & Construction Guidance.

We do not know what the level of peak foul water flows for the existing premises may have been, as it would have been dependent on the number of cars per day that were valeted, and the number of people formerly employed on site.

4.2. Proposed Discharge Rates and Points of Connection

The Proposed Development will provide a total of fourteen new co-living flats. A population of 1 persons per unit has been assumed as part of this assessment. A schedule of accommodation has been provided which does not increase the foul flows from previously

Using similar design assumptions, the estimated foul water volume has been determined as the equivalent of **39600 l/day**, corresponding to a peak foul water flow of **0.46 l/s** assuming a 24 hour ‘usage’.

Where possible, existing foul water connections will be re-utilised for the Proposed Development and all foul water drainage will be designed and constructed in accordance with the Building Regulations Part H and/or Design and Construction Guidance.

The proposed foul water drainage will require pumping to a shallow on-site termination chamber, prior to discharge via gravity to the public sewer. This will be smaller in size than the surface water systems submersible pump and separate to it. Its discharge rate will be subject to the most efficient impeller/motor combination for the head with the maximum discharge rate limited to **2.0l/s** unless the manufacturers are happy that their units can discharge at lower values without causing possible future maintenance issues.

4.3. Analysis

The Proposed Development will generate a nett increase in foul water volume and therefore demand to the public foul water sewer network. This can be offset by the controlled volume discharged by the surface water system

Given however the relatively small nature of the increased flow assuming a conventional gravity discharge, it would be unlikely that the public sewer network would not have enough capacity to cater for the Proposed Development. However, this will be discussed with Thames Water at the time of S106 application.

Confirmation as to the capacity of the combined sewer has not been sought from Thames Water at the time of writing. However, it is recommended that a S106 application be made at an early design stage to clarify. It should also be remembered that the increase in foul water waste is easily offset by the decrease in surface water discharge rate due to the flow control device restriction.

SECTION 5

SURFACE WATER MANAGEMENT

5. SURFACE WATER MANAGEMENT

5.1. Proposed Drainage Catchments

Owing to the relatively small area of the Application Site less than 1.0ha, it is proposed to utilise a single drainage catchment in the development of the surface water drainage design.

5.2. SuDS Management Train

In accordance with the discharge hierarchy identified in Section 3, surface water generated by the Proposed Development should be discharged to ground via infiltration, where practicable to do so.

Infiltration / percolation testing in accordance with BRE Digest 367 could be undertaken at the application site as part of intrusive site investigation. This test comprises the formation of a trial pit to a depth of 1.00 m below ground level, squaring of the pit sides and subsequent rapid filling with potable water. The fall in water level from 75 % to 25 % effective fill depth is then timed to ascertain an infiltration rate in m/s.

In the case of the Application Site, an infiltration method of disposal is unlikely to be accepted due to the current Building Regulation requirement that a minimum of 5.0m should be maintained between a soakaway and a structure.

Similarly, the presence of a watercourse as a method of disposal is not available and therefore, the Public Combined Sewer to the South of the Application Site is believed the most likely receptive point into which surface water could be discharged.

Subsequently it is proposed that the Application Site will dispose of surface water into this public system, re-utilising existing connections where possible or via new appropriately designed connections. This is subject to seeking appropriate approvals from the sewerage undertaker.

5.3. Catchment Contributing Areas

A breakdown of the contributing areas for the proposed surface water drainage system, are as follows:

CATCHMENT	OPEN SPACE	DEVELOPABLE AREA	%IMPERMEABLE	IMPERMEABLE / DESIGN AREA
Total Site	0.010 Ha	0.051 Ha	83.0 %	**0.050 Ha**

It should be noted that as the Application Site proposes no permeable surfaces owing to the constraints and subsequently no allowance for urban creep has been considered. However due to the London Clay the total area of **0.061Ha** has been used in the calculations.

5.4. Allowance for Climate Change

Table 2 (Peak Rainfall Intensity Allowance in Small and Urban Catchments) of Environment Agency. (2019). Flood Risk Assessments: Climate Change Allowances

confirms the climate change allowance of 40% should be adopted for the Application Site, assuming a lifespan of 100 years for residential development as recommended within the NPPF.

5.5. Allowable Discharge Rates

In accordance with the national and local policies outlined within Section 3 the Proposed Development should seek to limit the peak flow rate to the greenfield runoff rates, wherever practicable. Where this cannot be achieved, a betterment rate may be considered acceptable.

As has already been confirmed in Section 2, the greenfield runoff rate for the Application Site has been determined as 0.3 l/s for the 1:100 AEP event and it is not considered practicable to limit the discharge rate to such a low value in this instance.

Environment Agency. (2013). *Rainfall Runoff Management for Developments* stipulates that a minimum discharge rate of 5.0 l/s should be adopted to mitigate risks associated with blockage of the flow control device, which could present an unacceptable increase in flood risk.

It should however be noted that, commercially available flow control technologies have since been developed which can better this minimum value, with published minimum flow rates of 0.7 l/s being achievable using vortex-flow systems, for design head values as low as 0.4 m.

Notwithstanding this, a clear balance must be struck between limiting discharge flows, maintaining practicality of construction, minimising ongoing maintenance requirements, and ensuring the scheme remains commercially viable.

Owing to the constraints present at the Application Site due to its small plan area and likely space restrictions, it is considered prudent, from a design perspective, to ensure a constant discharge flow to minimize attenuation volume requirements and mitigate flood risk.

This limits the choice of available flow control devices to that of a float operated system as other types (i.e. vortex systems, throttle pipes, orifice plates etc.) are reliant upon the generation of head pressure to develop the specified peak discharge rates. In simple terms, these systems require a larger volume of water behind the device to activate the peak discharge flows and hence require larger attenuation volumes.

It is therefore proposed to limit the discharge from the Proposed Development to **5.0 l/s**.

Limiting the maximum discharge rate from the Proposed Development to this value would present a reduction in peak discharge rates for the key design events and an overall betterment of:

- **84.7 %** during the 1:100 AEP event, including the 40 % allowance for climate change.
- **78.4 %** during the 1:100 AEP event.
- **72.0 %** during the 1:30 AEP event.

5.6. Proposed SUDS Features

Due to the constraints imposed on the Proposed Development, the incorporation of above-ground SuDS features offering complementary benefits is not considered feasible, save for the use of a communal water butt to store water for irrigation purposes.

Similarly, owing to the limited area of proposed external works, it is not considered feasible to adopt permeable surfaces at the Proposed Development. It is likely that the during the design stage it will become apparent that some form of pumping will be necessary to lift the surface water to a higher level chamber to enable it to discharge to the public sewer via gravity.

Options available are either;

- to install a 2.1m dia concrete ring 4.4m deep beneath the basement to form the attenuation tank within the limited area of external works. The attenuation tank will also act as the wet well for a twin pump system the eventual design of which will take into consideration the head and the distance to the termination inspection chamber. It will discharge at a rate of no more than 5.0l/s or;
- To provide the attenuation at roof level in the form of a Blue Roof and enabling the discharge to continue under gravity to the Public Sewer or/and;
- By creating blue roofs, reduce the volume and therefore depth of any pumping station at below basement level, if a suitable arrangement for a direct outfall to the public sewer cannot be found.

The required attenuation volume has been determined for a range of storm events in accordance with the requirements of the non-statutory standards for sustainable drainage systems. See appendix D

Estimated attenuation volumes have been calculated in two stages. Firstly, an anticipated range has been determined using the Quick Storage Estimate function of an Industry Standard design package, to inform further rigorous assessment. Secondly, a preliminary model has then been developed using that package to determine a more refined attenuation estimate as summarised in the table below, with calculations given in the appendices.

The preliminary model is based upon a single attenuation tank, with discharge from the structure limited to 5.0 l/s via a pump to the existing surface water sewer in Lower Mortlake Road. The rising main should discharge to a termination inspection chamber enabling a gravity to outfall to the sewer, as required by the Water Authority.

Following a storage estimate exercise, a minimum volume of 12.5 m^3 will be required in order to provide the maximum achievable betterment of 84.7% during the 1:100 AEP event plus a 40% allowance for climate change, as outlined above. However, during the extreme event 0.3m^3 of flooding will occur, this is deemed acceptable.

It should also be understood that the during the peak storm event the neighbourhood might be experiencing is unlikely to be at the same time as a pumps automated system reaches the start level within the pumping station, should such a system be fitted. As such the peak flow in the receiving sewer may have already passed or not yet occurred.

As there is minimal change in impermeable area, there would be little increase in discharge volumes as a result of the 1:100 AEP 6-hour event and therefore this has not been considered further.

STORM EVENT	CONTRIBUTING AREA	MAXIMUM DISCHARGE	ATTENUATION VOL (RANGE)	ATTENUATION VOL (OPTIMISED)
1:1 AEP	0.060 Ha	5.0 l/s	1.0 – 3.0 m^3	3.0m^3
1:30 AEP	0.060 Ha	5.0 l/s	3.0 - 7.0 m^3	7.0m^3
1:100 AEP	0.060 Ha	5.0 l/s	7.0 – 9.0 m^3	9.0m^3
1:100 AEP + 20% CC	0.060 Ha	5.0 l/s	9.0 – 12.0 m^3	12.0m^3
1:100 AEP + 40% CC	0.060 Ha	5.0 l/s	12.0 – 15.0 m^3	15.0m^3

With the above in consideration, the Proposed Development would therefore contribute to a reduction in flood risk associated with the exceedance of the public surface water sewer network in the vicinity of the Application Site. But it would provide a significant reduction in peak runoff rates and avoid an increase in the total runoff volume.

5.7. Water Quality

The Proposed Development would utilise existing connections to the public surface water sewers in the immediate vicinity of the site, wherever possible.

As there is a significant change of use of the Proposed Development this would greatly reduce former pollutant loading and subsequently the vulnerability of the existing surface water sewer is considered to be high with likely hydrocarbon levels.

5.8. Ownership and Maintenance

To ensure the long-term performance of the proposed DS, the on-site drainage system will be owned and maintained by the site operator or a maintenance company (MC) in accordance with the indicative schedule below:

ELEMENT / DRAINAGE COMPONENT	OWNERSHIP / ADOPTION	MAINTENANCE REQUIREMENTS
Pumping stations	Site Operator / MC	To be monitored electronically and be on a maintenance regime with a professional service team. **Inspection and service annually**.
Rain Water Pipes	Site Operator / MC	Clearance of leaves / debris from guttering and hopper inlets. Rodding points provided to clear blockages via conventional rodding methods. **Inspection annually and before / after extreme storm events.**
Soil Vent Piles / “Stub Stacks”	Site Operator / MC	Rodding points to be provided to clear blockages via conventional rodding methods. **Inspection annually**.
Gullies (Internal & External)	Site Operator / MC	To be monitored for silt build-up and cleaned as required. Where provided, ensure air traps are primed and sealed to prevent smells. **Inspection quarterly.**
Surface Water Drainage Channels	Site Operator / MC	To be monitored and cleaned via jetting when any debris / silt reduces the cross-sectional area by 25% or more. Inspection to include both the channel and silt trap / gulley outlets. **Inspection annually and before / after extreme storm events**.

Below Ground Pipework Generally	Site Operator / MC	To be inspected for reduction in cross-sectional area (i.e due to blockage, silt or debris build-up, root ingress etc) general condition of materials, pipe displacement and the like. **Inspection annually and where appropriate before / after extreme storm events**.
Manholes / Inspection Chambers Generally	Site Operator / MC	To be inspected for debris and integrity of chambers and covers generally. **Inspection annually and where appropriate before / after extreme storm events.**

SECTION 6
CONCLUSIONS

6. CONCLUSIONS

- The scheme proposes the construction of a part 1/2/3 storey building (plus lower ground) to provide 14 co-living units, basements and associated internal amenity space at lower ground floor level, with new lower ground level amenity space to neighbouring buildings, and alongside external communal space at ground and lower ground.
- It is assumed that both surface and foul water sewer currently generated by the Site is discharged to the combined public sewer network in Lower Mortlake Road. The number of connections is likely to be one of both foul and surface water. However, the location and condition of the existing connection to the public sewer is not at present known at the time of writing.
- Due to the proximity of the foundations and adjacent structures, the incorporation of soakaways or other infiltration devices is not considered to be practical.
- The peak greenfield runoff rate at the site has been determined as being well below the minimum practicable discharge rates for commercially available flow restriction devices. A discharge limit of 5.0 l/s has been adopted as the minimum. To limit discharge to less than this value would result in an unacceptable increase in flood risk associated with surcharge of the limited area available for the wet well and the vast increase in volume needed to achieve Greenfield rates. Consequently, it is not considered practicable to limit discharge from the development to the greenfield runoff rate in accordance with SuDS Policy 14.
- The discharge from the site post-development will be limited to a maximum rate of 5.0 l/s during all events up to and including the 1:100 AEP event including a 40% allowance for climate change. This would provide a significant betterment to the existing condition without introducing an additional source of flood risk.
- To achieve the above limitations of discharge, a 10.0m^3 of wet well attenuation will be provided under the proposed sunken garden, pumping to a termination inspection chamber prior to out falling, by gravity, to the Public sewerage system.
- Alternately, and subject to the final design, a blue roof could be considered to attenuate at least part of the volume required enabling discharge by gravity reducing the size of wet well for a submersible pumping station or eliminating it.
- A separate and smaller pumping station will be located under the bin store for the foul waste ensuring the minimum 24hr storage capacity.
- The development proposals will increase the peak foul water flows from the site. However, given the relatively small flow rates in either instance, it would be unlikely that the public sewer network would not have sufficient capacity to cater for the Proposed Development. Clarification has not been sought from Thames Water at the time of writing.
- The development proposals will contribute to a reduction in flood risk associated with the exceedance of the public surface water sewer network in the vicinity of the site by providing a significant reduction in both peak discharge rates and reducing volume during peak storm intensities.
- The proposed Drainage Strategy has been prepared to be robust and to demonstrate that it is possible to drain the site in a sustainable manner in keeping with local policy requirements without increasing flood risk to or from the Proposed Development. It should be noted that this

strategy presents one possible solution to demonstrate that the Proposed Development can be sustainably drained and should not be interpreted as the definitive solution.

APPENDIX A

EXISTING SITE PLAN

N

0 5 10 50 M

1	Planning Permission Submission	24.01.22	ML

Project No: 018

Last Issued: 24.01.22

47a, 47 & 49 Lower Mortlake Road

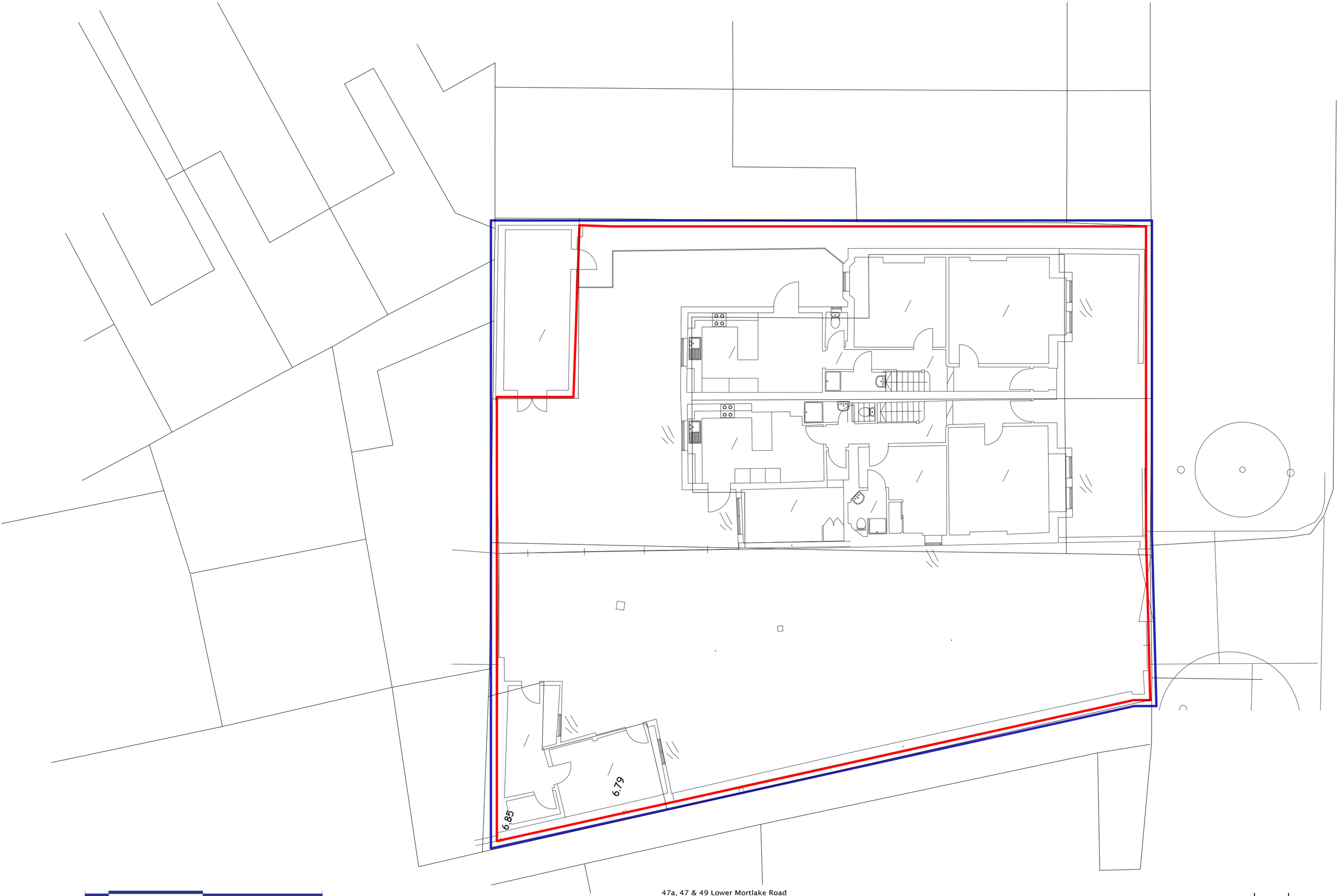
Existing Site Plan

1 : 500 @A3

BL-01-010 - P1

Original drawing is A3. Do not scale from this drawing.

boehm - lynas



47a, 47 & 49 Lower Mortlake Road

Existing Ground Floor Plan

0 1 5 10 M

N

P	1	Planning Permission Submission	24.01.22	ML

Drawn: ML

Project No: 018

24.01.22

1 : 100 @A3

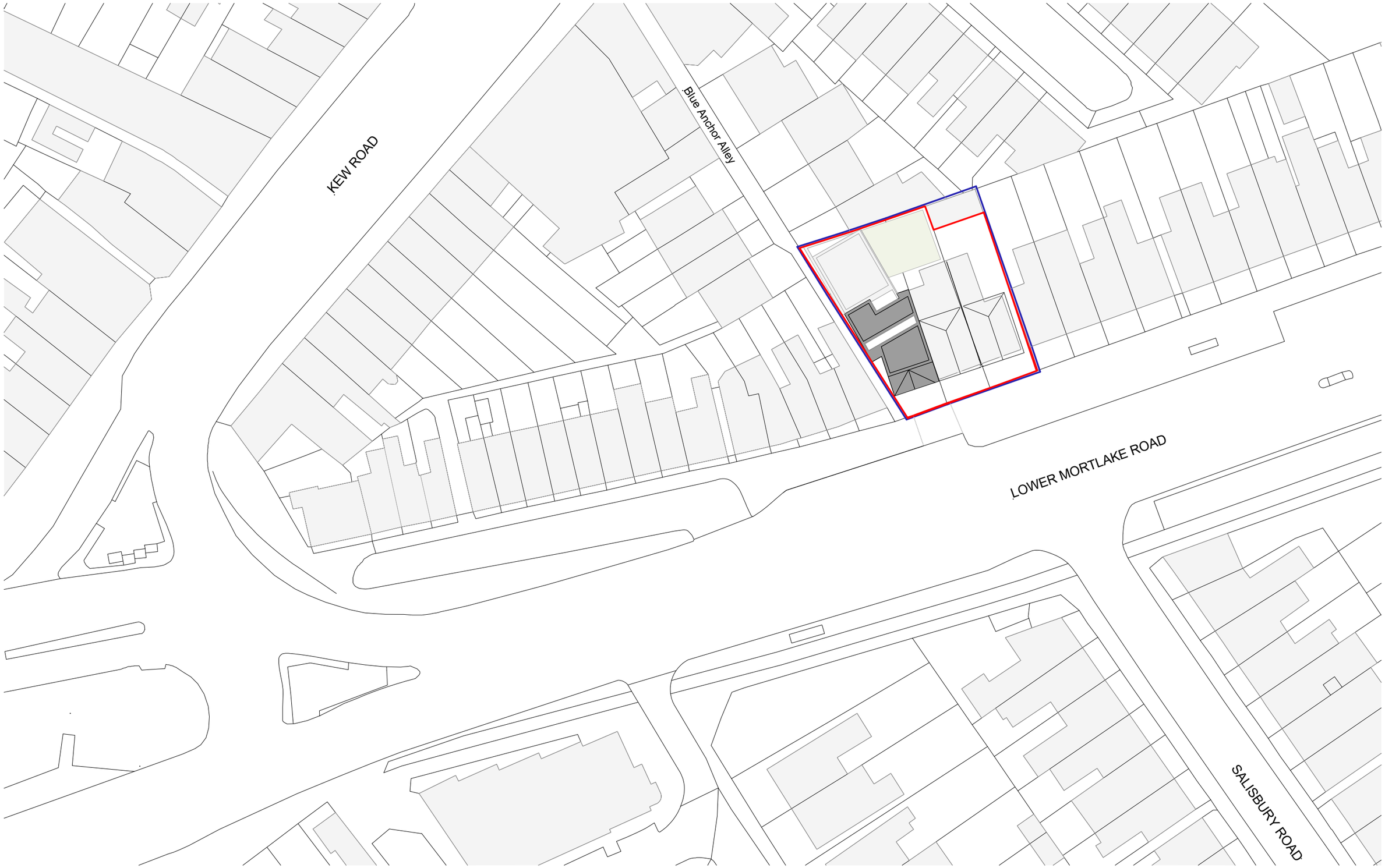
BL-15-020 - P1

Original drawing is A2. Do not scale from this drawing.

boehm - lynas

APPENDIX B

PROPOSED SITE PLANS



N

0 5 10 50 M

1	Planning Permission Submission	24.01.22	ML

Project No: 018

Last Issued: 24.01.22

47a, 47 & 49 Lower Mortlake Road

Proposed Site Plan

1 : 500 @A3

BL-10-010 - P1

Original drawing is A3. Do not scale from this drawing.

boehm - lynas

0 1 5 10 M

N

P	1	Planning Permission Submission	24.01.22	ML

Drawn: ML
Project No: 018
24.01.22

47a, 47 & 49 Lower Mortlake Road
Lower Ground Floor Plan

1 : 100 @A3
BL-15-099 - P1
Original drawing is A2. Do not scale from this drawing.

boehm - lynas

0 1 5 10 M

N

P	1	Planning Permission Submission	24.01.22	ML

Drawn: ML
Project No: 018
24.01.22

47a, 47 & 49 Lower Mortlake Road

Ground Floor Plan

1 : 100 @A3
BL-15-100 - P1

Original drawing is A2. Do not scale from this drawing.

boehm
- lynas

APPENDIX C

THAMES WATER

ASSET PLANS

Asset location search

Thames Water Property Searches

Constructure Ltd
Bell Yard Mews
15Bermondsey Street
LONDON
SE1 3TY

Search address supplied 47a
Lower Mortlake Road
Richmond
TW9 2LW

Your reference 1899 - 47A Lower Mortlake Road

Our reference ALS/ALS Standard/2019_4072169

Search date 9 September 2019

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.

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

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

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: 47a, Lower Mortlake Road, Richmond, TW9 2LW

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

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

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

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.

Further contacts:

Waste Water queries

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

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

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

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

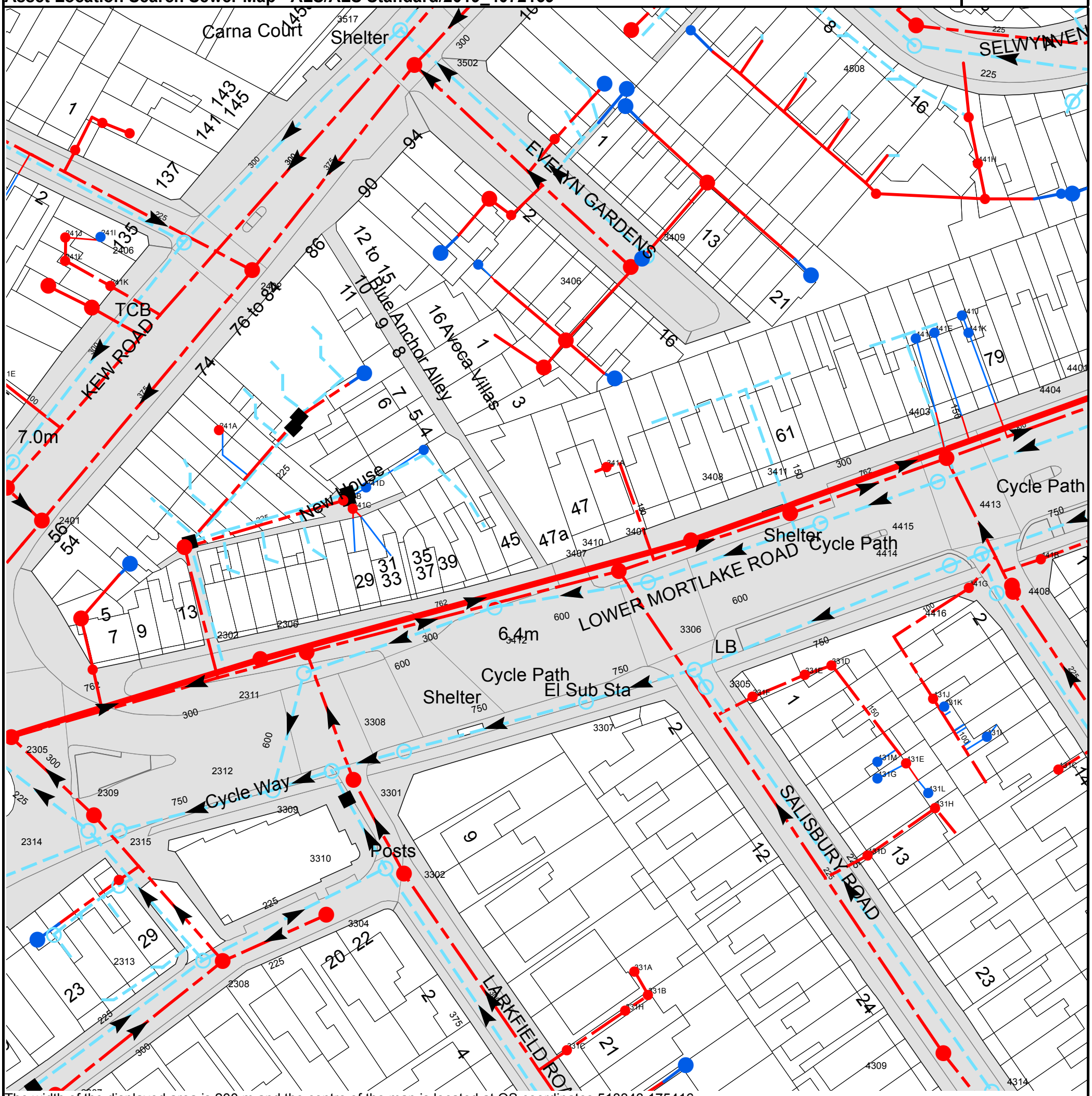
Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4072169



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 518343,175416

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

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
44XV	n/a	n/a
4408	6.27	2.34
441B	n/a	n/a
431C	n/a	n/a
44XS	n/a	n/a
44WZ	n/a	n/a
44WX	n/a	n/a
44WR	n/a	n/a
34ZS	n/a	n/a
35YV	n/a	n/a
3406	6.92	4.36
35YR	n/a	n/a
34ZV	n/a	n/a
3409	6.88	5.61
35XR	n/a	n/a
34ZQ	n/a	n/a
34ZP	n/a	n/a
44XT	n/a	n/a
4508	6.9	5.24
4501	6.92	3.98
441F	n/a	n/a
441E	n/a	n/a
441J	n/a	n/a
441K	n/a	n/a
44XR	n/a	n/a
441H	n/a	n/a
3407	6.62	2.28
331A	n/a	n/a
3410	6.64	3.63
331B	n/a	n/a
3401	n/a	-3.52
3306	6.61	3.21
3305	6.58	4.22
331F	n/a	n/a
3408	n/a	n/a
331E	n/a	n/a
3411	6.51	3.65
331D	n/a	n/a
431D	n/a	n/a
431G	n/a	n/a
431M	n/a	n/a
431E	n/a	n/a
431L	n/a	n/a
431J	n/a	n/a
431H	n/a	n/a
4413	6.38	3.65
431K	n/a	n/a
4403	n/a	n/a
4414	6.42	3.35
441G	n/a	n/a
4415	6.34	3.35
431I	6.63	5.99
4416	6.22	4
4314	6.96	5.19
33ZW	n/a	n/a
4309	6.94	4.48
331H	n/a	n/a
2402	6.92	1.21
34YY	n/a	n/a
241L	n/a	n/a
34YS	n/a	n/a
2406	6.98	3.63
241J	n/a	n/a
241I	n/a	n/a
34YP	n/a	n/a
34YQ	n/a	n/a
24YZ	n/a	n/a
34XX	n/a	n/a
24ZR	n/a	n/a
24ZQ	n/a	n/a
35YW	n/a	n/a
3502	6.75	1.4
3517	6.75	3.7
3307	6.55	3.15
2311	6.18	3.62
23ZX	n/a	n/a
2302	n/a	-3.45
2306	6.15	2.61
24YV	n/a	n/a
3412	6.48	3.62
24YX	n/a	n/a
24YR	n/a	n/a
2401	6.76	.86
341C	n/a	n/a
341B	n/a	n/a
2407	n/a	n/a
341D	n/a	n/a
341A	n/a	n/a
2405	n/a	n/a
34WZ	n/a	n/a
241A	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
34YW	n/a	n/a
34XQ	n/a	n/a
34ZX	n/a	n/a
34ZW	n/a	n/a
24ZT	n/a	n/a
24ZV	n/a	n/a
241K	n/a	n/a
331C	n/a	n/a
2308	6.57	4.78
2313	6.58	4.64
23XW	n/a	n/a
23YS	n/a	n/a
3304	6.5	4.16
23YP	n/a	n/a
23XT	n/a	n/a
3302	6.53	4.46
3310	n/a	n/a
2315	6.61	2.98
2314	6.51	4.37
2309	6.58	4.47
2312	6.62	3.06
3301	6.39	4.22
3309	6.4	3.09
3308	6.43	3.12
2305	6.88	2.37

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

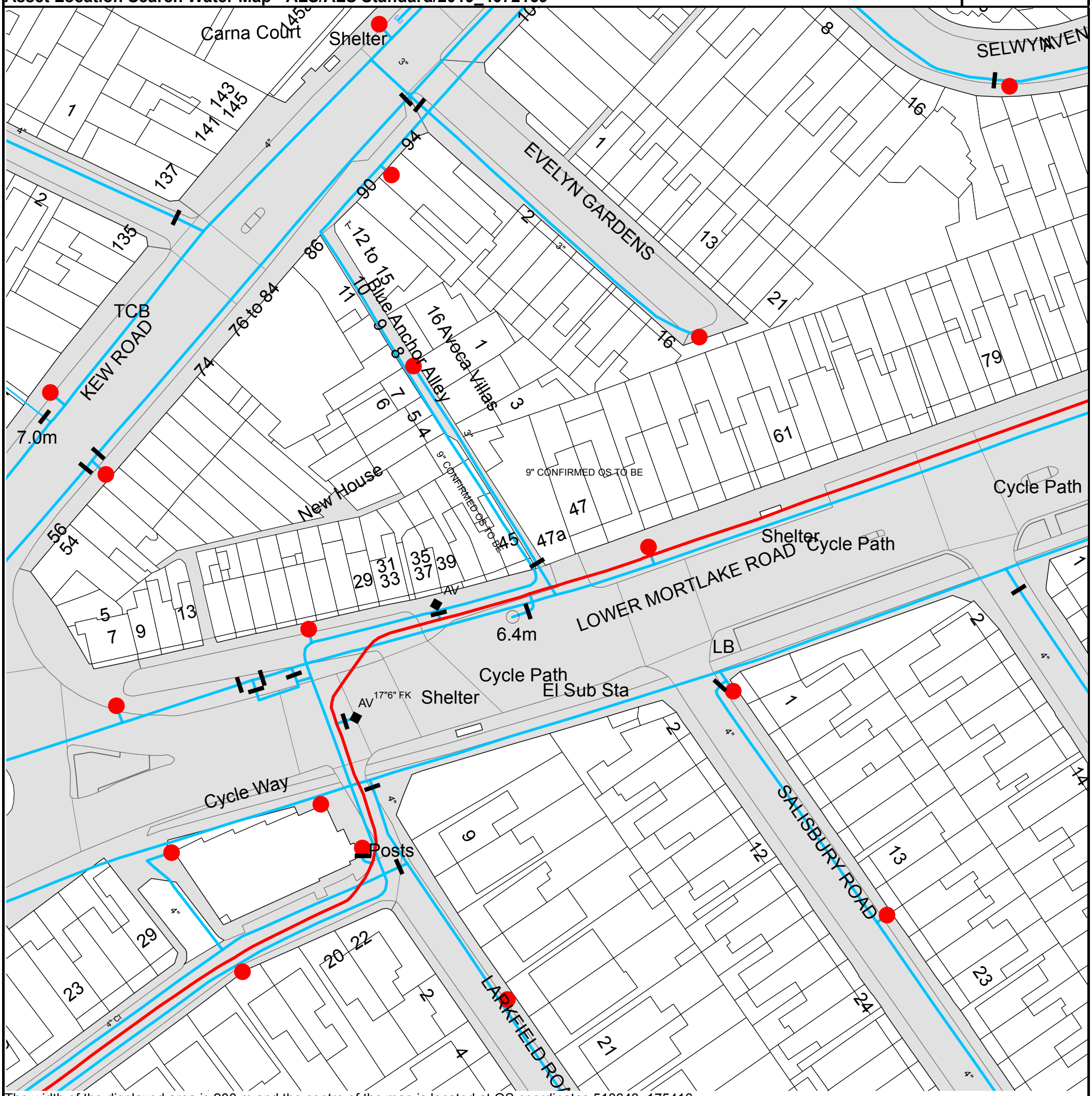
Proposed

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/2019_4072169



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 518343, 175416.

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 her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

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

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

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 the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience 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
Web site: www.tpos.co.uk
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 D

SURFACE WATER CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	2.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
ic1	0.040	2.00	16.160	600	440	568869.272	182379.460	0.560
ic2	0.020	2.00	16.000	1200		568877.428	182363.662	0.550
Sewer			15.620			568880.003	182358.418	1.270
Depth/Area 1						568877.345	182363.993	

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	ic1	ic2	17.779	0.600	15.600	15.450	0.150	118.5	150	2.32	50.0
1.001	ic2	Sewer	5.842	0.600	15.450	14.350	1.100	5.3	150	2.34	50.0

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.1
Summer CV	0.750	30 year (l/s)	0.2
Winter CV	0.840	100 year (l/s)	0.3
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +40% 360 minute (m³)	7

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	20	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SPR	0.30
Greenfield Method	IH124	Region	6
Positively Drained Area (ha)	0.060	Growth Factor 1 year	0.85
SAAR (mm)	599	Growth Factor 30 year	2.40
Soil Index	2	Growth Factor 100 year	3.19

Pre-development Discharge Rate

Betterment (%)	0	Q 30 year (l/s)	0.2
QBar	0.1	Q 100 year (l/s)	0.3
Q 1 year (l/s)	0.1		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	40
Positively Drained Area (ha)	0.060	Storm Duration (mins)	360
Soil Index	2	Betterment (%)	0
SPR	0.30	PR	0.280
CWI	90.222	Runoff Volume (m^3)	15

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m^3)	
Full Bore Velocity	✓		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.678	0.078	7.5	0.1318	0.0000	OK
15 minute summer	ic2	9	15.490	0.040	11.3	0.0745	0.0000	OK
15 minute summer	Sewer Depth/Area 1	9	14.389	0.039	11.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	7.5	1.167	0.460	0.1156	
15 minute summer	ic2	1.001	Sewer	11.3	3.073	0.145	0.0215	3.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.776	0.176	18.4	0.2972	0.0000	SURCHARGED
15 minute summer	ic2	9	15.514	0.064	26.3	0.1185	0.0000	OK
15 minute summer	Sewer Depth/Area 1	9	14.410	0.060	26.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	17.1	1.421	1.053	0.2199	
15 minute summer	ic2	1.001	Sewer	26.2	3.835	0.337	0.0400	8.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.906	0.306	23.9	0.5187	0.0000	FLOOD RISK
15 minute summer	ic2	9	15.523	0.073	33.2	0.1359	0.0000	OK
15 minute summer	Sewer Depth/Area 1	9	14.418	0.068	33.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	21.3	1.419	1.307	0.2323	
15 minute summer	ic2	1.001	Sewer	33.0	4.054	0.424	0.0476	11.0

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	16.031	0.431	28.7	0.7292	0.0000	FLOOD RISK
15 minute summer	ic2	9	15.531	0.081	39.1	0.1505	0.0000	OK
15 minute summer	Sewer Depth/Area 1	9	14.425	0.075	38.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	24.8	1.602	1.521	0.2427	
15 minute summer	ic2	1.001	Sewer	38.8	4.207	0.499	0.0539	13.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	16.160	0.560	33.5	0.9481	0.3166	FLOOD
15 minute summer	ic2	9	15.539	0.089	44.8	0.1649	0.0000	OK
15 minute summer	Sewer Depth/Area 1	9	14.431	0.081	44.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	28.2	1.772	1.729	0.2530	
15 minute summer	ic2	1.001	Sewer	44.6	4.335	0.573	0.0601	15.4

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	2.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
ic1	0.040	2.00	16.160	600	440	568869.272	182379.460	0.660
ic2	0.020	2.00	16.000	1200		568877.428	182363.662	1.800
Sewer			15.620			568880.003	182358.418	1.770
Depth/Area 1						568877.345	182363.993	

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	ic1	ic2	17.779	0.600	15.500	15.350	0.150	118.5	225	2.25	50.0
1.001	ic2	Sewer	5.842	0.600	14.500	13.850	0.650	9.0	150	2.28	50.0

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.1
Summer CV	0.750	30 year (l/s)	0.2
Winter CV	0.840	100 year (l/s)	0.3
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +40% 360 minute (m³)	15

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	20	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SPR	0.30
Greenfield Method	IH124	Region	6
Positively Drained Area (ha)	0.060	Growth Factor 1 year	0.85
SAAR (mm)	599	Growth Factor 30 year	2.40
Soil Index	2	Growth Factor 100 year	3.19

Pre-development Discharge Rate

Betterment (%)	0	Q 30 year (l/s)	0.2
QBar	0.1	Q 100 year (l/s)	0.3
Q 1 year (l/s)	0.1		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	40
Positively Drained Area (ha)	0.060	Storm Duration (mins)	360
Soil Index	2	Betterment (%)	0
SPR	0.30	PR	0.280
CWI	90.222	Runoff Volume (m³)	15

Node ic2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	14.500	Product Number	CTL-SHE-0103-5000-1200-5000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node ic2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	14.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	43

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.5	0.0	1.000	12.5	0.0	1.001	0.0	0.0

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.562	0.062	7.5	0.0917	0.0000	OK
15 minute winter	ic2	12	14.655	0.155	10.0	2.0573	0.0000	SURCHARGED
15 minute summer	Sewer Depth/Area 1	1	13.850	0.000	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	7.5	0.864	0.157	0.1543	
15 minute winter	ic2	Hydro-Brake®	Sewer	4.5				3.9

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.602	0.102	18.3	0.1506	0.0000	OK
30 minute winter	ic2	23	15.011	0.511	17.0	6.7882	0.0000	SURCHARGED
15 minute summer	Sewer Depth/Area 1	1	13.850	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	18.4	1.095	0.387	0.2995	
30 minute winter	ic2	Hydro-Brake®	Sewer	5.0				12.5

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.619	0.119	23.8	0.1763	0.0000	OK
30 minute winter	ic2	27	15.268	0.768	22.3	10.1936	0.0000	SURCHARGED
15 minute summer	Sewer Depth/Area 1	1	13.850	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	24.0	1.166	0.502	0.3652	
30 minute winter	ic2	Hydro-Brake®	Sewer	5.0				16.3

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ic1	9	15.634	0.134	28.6	0.1983	0.0000	OK
30 minute winter	ic2	28	15.472	0.972	26.8	12.8951	0.0000	SURCHARGED
15 minute summer	Sewer Depth/Area 1	1	13.850	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	ic1	1.000	ic2	28.8	1.216	0.603	0.4206	
30 minute winter	ic2	Hydro-Brake®	Sewer	5.0				19.6

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	ic1	23	16.008	0.508	21.0	0.7495	0.0000	FLOOD RISK
30 minute winter	ic2	23	16.000	1.500	31.2	13.9779	0.3030	FLOOD
15 minute summer	Sewer Depth/Area 1	1	13.850	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	ic1	1.000	ic2	20.7	1.124	0.435	0.7071	
30 minute winter	ic2	Hydro-Brake®	Sewer	5.5				22.6

APPENDIX E

FOUL WATER CALCULATIONS

	PROJECT	CALCULATION SHEET			
	47,47a & 49 Lower Mortlake Road	JOB No.			
	CALCULATION	PAGE			
	Proposed Foul Water Flow Estimate	DATE	24/01/2022		
		BY	JMB	CHECKED	

Foul water discharge rates are to be calculated in accordance with Sewers for Adoption and Urban Drainage (*Butler & Davies, 2nd Ed, 2004*):

RESIDENTIAL *(Note that minimum design flow of 4000 l/s/unit applies, after recommendations given in SfA)*

Description	Units	Persons	G	Infiltration	Peak Flow	Volume	
			l/hd.day	*Factor*	*Factor*	*l/day/unit*	*l/day*
1 Bed 1 person	14	1	200	1.10	6	*4000*	*18480*
1 bed 2 person	0	0	200	1.10	6	*4000*	*0*
2 bed 4 person	0	0	200	1.10	6	*4000*	*0*
3 bed 6 person	0	0	200	1.10	6	*4000*	*0*
4 bed 6 person	0	0	200	1.10	6	*4000*	*0*
5 bed 6 person	0	0	200	1.10	6	*4000*	*0*
6 bed 8 person	2	8	200	1.10	6	*10560*	*21120*
	16					**TOTAL:**	**39600**

Anticipated Usage Hours: 24 hrs = 86400 s **Estimated Flow (Q_f):** **0.46** **l/s**

Total flow **0.46** **l/s**

APPENDIX F
ENVIRONMENT AGENCY FLOOD MAP

Environment Agency

Flood map for planning

Your reference
47a Lower Mor

Location (easting/northing)
518343/175419

Scale
1:10000

Created
9 Sep 2019 16:00

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 100 200 300m

APPENDIX G

BRITISH GEOLOGICAL SURVEY SOILS MAP

Geology of Britain viewer (classic)

British Geological Survey

Try the 3D version of the Geology of Britain viewer

More BGS map viewers

Surface Geology | 3D Models | Borehole Scans | Earthquake Timeline

Surface Geology

- Superficial only
- Bedrock only
- Bedrock and Superficial

Visible geology: 1:50 000 scale

Geology Key

More on digital geology

Go to Location

Switch Basemap

100% 0%

Geology Transparency

Grid Ref: 517459, 174833

Bedrock geology | Superficial deposits

1:50 000 scale superficial deposits description: Kempton Park Gravel Member - Sand And Gravel. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U).

Setting: rivers (U). These sedimentary deposits are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river or estuary (if in a coastal setting).

Further details | What are Superficial Deposits?

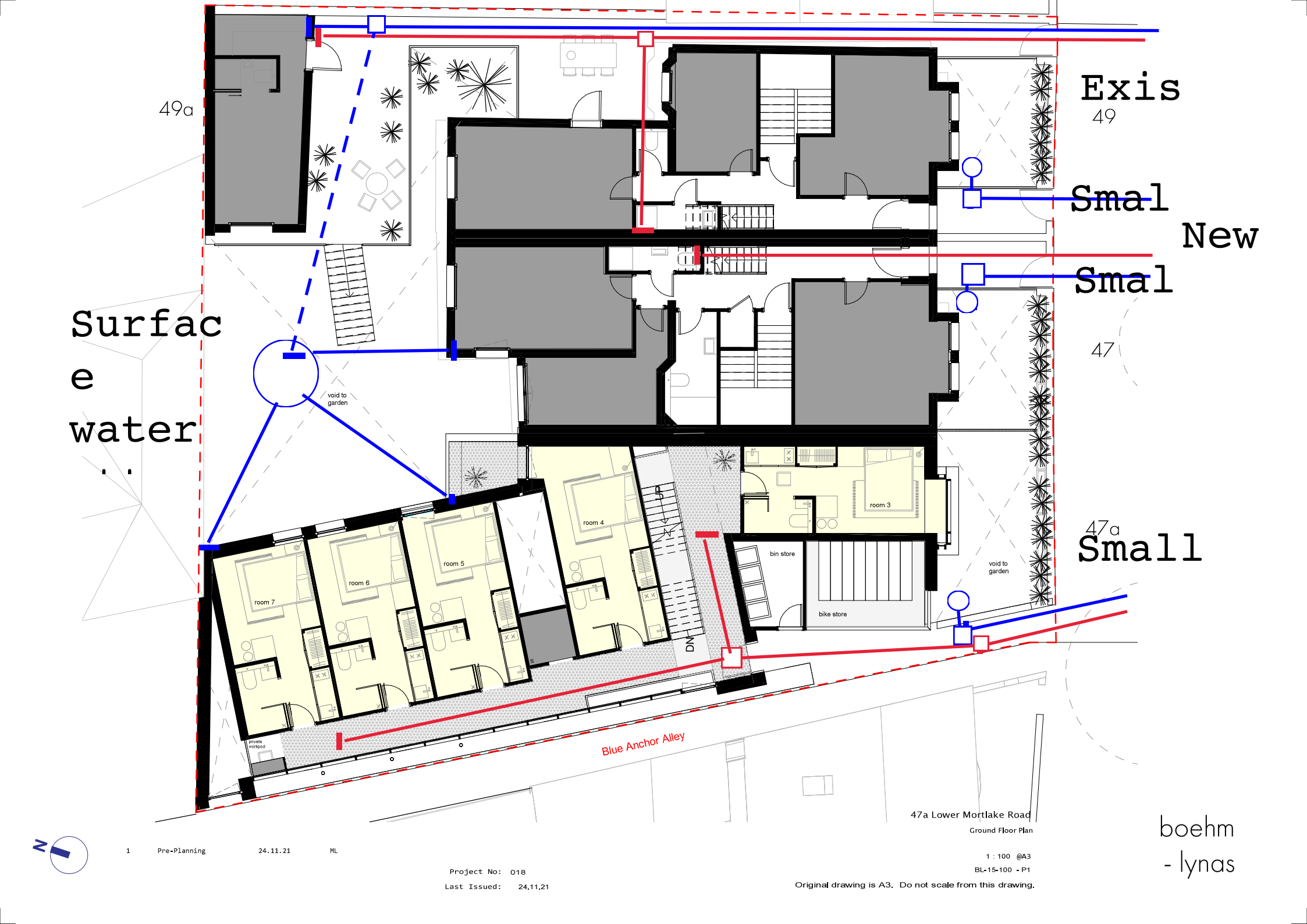
To purchase detailed geological reports for this area, try our GeoReports service

0 0.3 0.6km

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA

POWERED BY esri

APPENDIX H
POSSIBLE DRAINAGE LAYOUT



47a Lower Mortlake Road

Ground Floor Plan

1 : 100 @A3

BL-15-100 - P1

Original drawing is A3. Do not scale from this drawing.

1	Pre-Planning	24.11.21	ML

Project No: 018

Last Issued: 24.11.21

boehm
- lynas

APPENDIX I
STORAGE VOLUME CALCULATIONS

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	
Site name:	47a Lower Mortlake Rd
Site location:	Richmond

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

Latitude:	51.46540° N
Longitude:	0.29767° W

Reference:	
Date:	2019-08-12 10:43

Methodology	IH124

Site characteristics

Total site area (ha)	0.06
Significant public open space (ha)	0
Area positively drained (ha)	0.06
Pervious area contribution (%)	30
Impermeable area (ha)	0.06
Percentage of drained area that is impermeable (%)	100
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	0.06
Net impermeable area for storage volume design (ha)	0.06

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage

	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
Qbar total site area (l/s)	0.09	--
SOIL type	2	2
HOST class	N/A	N/A
SPR	0.3	0.3

Hydrology

	Default	Edited
SAAR (mm)	599	599
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.4	0.4
Rainfall 100 yrs 6 hrs	63	
Rainfall 100 yrs 12 hrs	97.79	
FEH/FSR conversion factor	1.27	1.27
Hydrological region	6	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	0.09	0.09
Qbar net site area (l/s)	0.09	0.09
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

Estimated storage volumes

	Default	Edited
Interception storage (m^3)	2	2
Attenuation storage (m^3)	13	13
Long term storage (m^3)	0	0
Treatment storage (m^3)	7	7
Total storage *(excluding treatment)* (m^3)	15	15

APPENDIX J

LB Richmond Upon Thames

Pro Forma

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	47a, 47 & 49, Lower Mortlake Road
Address & post code	Richmond London TW9 2LW
OS Grid ref. (Easting, Northing)	E 518381
	N 175449
LPA reference (if applicable)	
Brief description of proposed work	Demolition of the existing single storey garages/lock ups and construction of a new three storey structure plus basement, housing fifteen new one-bedroom residential apartments with shared facilities to the lower ground
Total site Area	600 m^2
Total existing impervious area	600 m^2
Total proposed impervious area	500 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Former car wash assume to foul sewer only
Designer Name	Jon Burgess
Designer Position	Principal Infrastructure Engineer
Designer Company	Constructure Ltd

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	None
Bedrock geology classification	London Clay overlain by Kempton Park Gravels
Site infiltration rate	0.00003 m/s
Depth to groundwater level	(1-5) m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
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	Y	Y
7 discharge rainwater to the combined sewer.	Y	N

2c. Proposed Discharge Details

Proposed discharge location	use Existing for foul and provide new for Sur
Has the owner/regulator of the discharge location been consulted?	No but a S106 will be applied for

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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	0.1			
1 in 1	0.1	7.4	3	5
1 in 30	0.2	17.9	7	5
1 in 100	0.3	23.2	9	5
1 in 100 + CC			15	5
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Hydrobrake/Pump		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		1
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	100	10
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		(15/5)
Total	**0**	**100**	**11**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 5 Surface Water Management
Drainage hierarchy (2b)	SuDS
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix C
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix D & I
Proposed SuDS measures & specifications (3b)	Attenuation
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix B
Detailed drainage design drawings, including exceedance flow routes	not undertaken at this stage Appen
Detailed landscaping plans	See Architects
Maintenance strategy	Section 5
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	No longer a car wash
b) biodiversity?	Garden areas proposed
c) amenity?	Green spaces provided