DRAINAGE STRATEGY

13 & 15 LANCASTER ROAD, UXBRIDGE

FOR THE TRUSTEES OF UURCC

REPORT REF: 1813-DR002

REVISION 1

30 MAY 2025

DOCUMENT RECORD

Document Ref:	**1813-DR002**				
Revision	**Date**	**Remarks**	**Originator**	**Checked**	**Approved**
1	30/05/25	First Issue	BR	TL	MDI

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1. INTRODUCTION

1.1. Structa LLP have been commissioned by The Trustees of UURCC to prepare a Drainage Strategy for a proposed residential development at 13 & 15 Lancaster Road, Uxbridge. Refer to Figure 1 for the site location plan.

1.2. The proposals comprise the demolition of the existing residential buildings at No.13 & 15 Lancaster Road, followed by the construction of 4No. 1 bed flats, as well as the provision of on-site parking, drainage and other necessary infrastructure.

1.3. Refer to the Planning Application Drawings for details of the proposed site layout.

1.4. The proposed foul and surface water drainage arrangements are described within Section 6.

1.5. Opportunities to incorporate water conservation measures into the proposed sustainable surface water drainage scheme have been considered and are described at Section 7.

1.6. This document has been prepared in accordance with the Hillingdon Borough Council SuDS Design and Evaluation Guide, current national and local policy, and best practice guidance.

2. POLICY CONTEXT

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1. The NPPF was adopted in March 2012, revised in July 2018 and last updated in February 2025. One of the overarching objectives of the NPPF is the encouragement of growth and acknowledgement that decision-makers should adopt a presumption in favour of sustainable development. Paragraphs 10-11 of the document state:

> *'So that sustainable development is pursued in a positive way, at the heart of the Framework is a **presumption in favour of sustainable development**.*
>
> *...*
>
> *For **decision-taking** this means:*
>
> - *approving development proposals that accord with an up-to-date development plan without delay; or*
> - *where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:*
>   - *the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed*; or*
>   - *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.'*
>
> * This includes policies within the Framework relating to areas at risk of flooding or coastal change.

2.2. Section 14 of the NPPF seeks to address the issues of climate change, flooding and coastal change. In paragraph 170 it states: "*Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*"

PLANNING PRACTICE GUIDANCE TO THE NATIONAL PLANNING POLICY FRAMEWORK

2.3. The Planning Practice Guidance (PPG) was first published in March 2014 and at the same time the Technical Guidance to the NPPF was withdrawn. Guidance on Flood Risk and Coastal Change was last updated in August 2022.

2.4. Further detail on the lifetime of development is also given in the PPG, which advises for residential development that a period of 100 years should be considered.

2.5. The use of sustainable drainage systems is considered by the PPG to offer the following benefits:

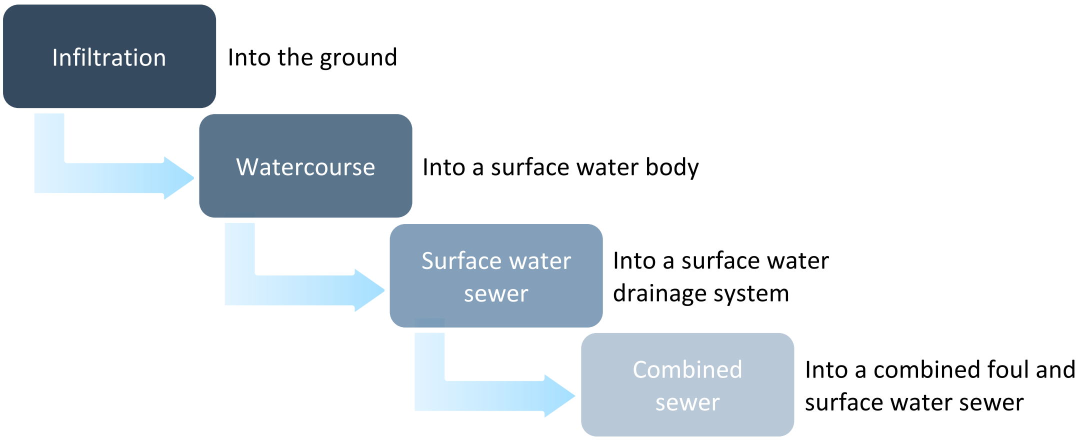
- Reduce the causes and impacts of flooding
- Remove pollutants from urban run-off at source
- Combine water management with green space with benefits for amenity, recreation and wildlife

2.6. In the consideration of major developments, sustainable drainage should be provided unless it can be demonstrated that this would be inappropriate. Major developments are defined in the Town and Country Planning Order 2015; some of these definitions encompass the following:

- Development site area of 1 hectare or more
- Provision of 10 or more residential dwellings
- Development of residential dwellings on a site having an area of 0.5 hectares or more and where the proposed no. of dwellings is not known to fall into the above criterion or not
- Provision of buildings where the floor space to be created by the development is 1,000m² or greater

2.7. The aim of sustainable drainage systems is to dispose of surface water using the following hierarchy where reasonably practicable.

TABLE 1: SURFACE WATER DISPOSAL HIERARCHY



2.8. The assessment of what is considered to be reasonably practicable in terms of sustainable drainage system provision should consider the costs associated with the design, construction, operation and maintenance of the system, and whether these are economically proportionate in relation to the consumer costs for an effective drainage system that instead connects directly to a public sewer.

THE LONDON PLAN 2021

2.9. The London Plan 2021 is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. This also forms part of the wider Development Plan for Southwark Council.

2.10. Chapter 9 of the London Plan is titled 'Sustainable Infrastructure' and accordingly addresses matters in relation to the promotion of sustainable development.

2.11. Policy SI 12 entitled 'Flood Risk Management' sets out a coordinated approach to dealing with flood risk on new developments across the London Boroughs. This is replicated below for reference:

A Current and expected flood risk from all sources (as defined in paragraph 9.2.12) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.

B Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify *areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.*

C *Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.*

D *Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.*

E *Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.*

F *Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.*

G *Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.*

2.12. Policy SI 13 entitled 'Sustainable Drainage' sets out the overarching principles for sustainable drainage designs on new developments within the London Boroughs. This is replicated below for reference:

A *Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.*

B *Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*

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

C *Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.*

D *Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.*

LOCAL PLAN

2.13. The Hillingdon Local Plan Part 1 was adopted in November 2012 and forms the strategic basis for controlling planning within the borough along with core policies. Part 2 was adopted in January 2020 and details development management policies, site allocations and designations.

2.14. Policy EM6 entitled '*Flood Risk Management*' sets out:

- requirements for locating development in accordance with the sequential and exception tests, in line with national policy;
- requirements for Flood Risk Assessments to support planning applications;
- requirements for the use of sustainable urban drainage systems (SuDS); and
- requirements for water efficiency.

2.15. Policy DMEI 10 entitled 'Water Management, Efficiency, and Quality' requires that development proposals include:

- appropriate SuDS in line with London Plan Policy 5.13;
- surface water runoff rates including climate change allowance should be designed to not exceed the pre-development 1 in 100 year return period greenfield runoff rates;
- SuDS management and maintenance plan;
- methods to improve water quality;
- methods to improve water efficiency, including collection and reuse; and
- adequate sewerage and drainage infrastructure capacity.

HILLINGDON SUDS DESIGN AND EVALUATION GUIDE

2.16. Hillingdon County Council have prepared a SuDS Design and Evaluation Guide in collaboration with other Local Authorities and industry consultants.

2.17. The purpose of this guide is to set out the Lead Local Flood Authority's (LLFA's) standards for the design of SuDS within the Borough. Generally, this accords with The SuDS Manual (Ciria Report C753) but also sets out specific parameters for use in detailed design.

2.18. Hillingdon also provide a SuDS proforma that is required to accompany planning submissions.

3. GEOLOGY & HYDROLOGY

3.1. The site falls from approximately 50mAOD in the northeast corner to 48.69mAOD in the southwest corner at an average gradient of 1 in 21.

3.2. Refer to Appendix A for the Site Topographical Survey.

3.3. British Geological Survey mapping indicates that the site is underlain by superficial deposits comprising Lynch Hill River Terrace Deposits and bedrock comprising the London Clay Formation.

3.4. During August 2020, a site investigation was undertaken by Structa including 6No. exploratory holes across the adjoining land. This encountered Made Ground from 0.4-1.2m depth overlying gravelly silty Clay to 2.0-3.0m depth, and Gravel to completion with the exception of 1 hole which encountered further bands of clay and gravel.

3.5. Further, Structa undertook a subsequent site investigation in March 2025, comprising one mechanically excavated trial pit to determine the infiltration potential of the underlying ground conditions within the proposed development site.

3.6. The intrusive investigation encountered topsoil to a depth of 0.3 m, underlain by sandy gravelly clay of the Lynch Hill Gravel Member, extending to the base of the trial pit at 3.4 mbgl.

3.7. Groundwater was not encountered to the depth of the trial pit.

3.8. The soakage test was completed within the predominantly cohesive and locally granular materials of the Lynch Hill Gravel Member. The soakaway test did not record positive infiltration, and results are shown at Appendix B. Accordingly, infiltration is not considered a viable means of surface water disposal at this site.

4. FLOOD RISK SUMMARY

4.1. The NPPF and the SFRA identify several potential sources of flooding that must be considered when assessing flood risk, these are considered below in the following order:

- Flooding from rivers (fluvial flooding)
- Flooding from the sea (tidal flooding)
- Flooding from land
- Flooding from sewers
- Flooding from groundwater
- Flooding from reservoirs, canals, and other artificial sources

FLOODING FROM RIVERS (FLUVIAL FLOODING) & SEA (TIDAL FLOODING)

4.2. The indicative flood maps published by the Environment Agency (EA) identify that the entirety of the site is outside an area at risk of fluvial/tidal flooding i.e. located in Flood Zone 1.

4.3. Refer to Figure 2 for the EA Flood Map for Planning.

4.4. The risk of flooding at the site from rivers and the sea is considered to be very low.

FLOODING FROM LAND & SEWERS

4.5. Refer to Figure 3 for the EA Flood Risk from Surface Water map.

4.6. The map indicates that the site is not at risk of surface water flooding and is considered to be very low. There is a small area with a low risk of flooding west of the development, however, due to the topography of the land, this minor flooding will not flow onto the proposed site.

FLOODING FROM GROUNDWATER

4.7. The site investigation undertaken as part of the assessment did not encounter any groundwater within the trial pits up to a depth of 3.4m bgl.

4.8. The risk of groundwater flooding within the development site is considered to be very low.

FLOODING FROM RESERVOIRS, CANALS & OTHER ARTIFICIAL SOURCES

4.9. Environment Agency Reservoir Flood Mapping shows that flooding from any reservoir failure in this area would not extend into the development site.

5. EXISTING CONDITIONS

5.1. The application site comprises a rectangular parcel of land approximately 0.25km north of Uxbridge Town Centre. The site occupies an area of approximately 0.05ha.

5.2. The site is bordered to the west by a carpark and a building materials supplier; to the southwest by car parking serving adjacent offices; to the south the rear gardens of dwellings fronting Wilmar Close; and to the north/northwest Lancaster Road and dwellings that front this.

5.3. The proposed site is currently occupied by two dwellings in the form of a semi-detached house with a total footprint of approximately 94m^2. Residential parking is provided within two marked bays on Penfield Estate to the northwest and access to the dwellings can be achieved from the footway along Lancaster Road.

5.4. Thames Water Asset Location Plans identify a 225mm dia. Foul sewer beneath Lancaster Road to the northeast and a 150mm diameter Foul Sewer to the South, in Wilmar Close. This is shown at Appendix C. No surface water sewers have been identified near to the site.

5.5. The existing roof drainage outfalls into hoppers on either site of the existing building along with the first-floor waste connections. The topographical survey identifies existing manholes adjacent to these and at the front of No.13, which is considered to be the shared point of connection from this combined drainage system to the existing Thames Water Public Sewer.

5.6. The estimated existing brownfield runoff rates from the existing development are tabulated below. In line with best practice, FEH-22 rainfall data has been used, which permits a minimum return period of 1 in 2 years. Refer to Appendix D for modelling outputs.

TABLE 2: BROWNFIELD RUN-OFF RATES

Rainfall Event	Brownfield run-off rate (l/s)
1 in 2 year	2.3
1 in 30 year	6.7
1 in 100 year	8.3

5.7. No allowance has been made for the existing foul water flows from the 2No. residential units as these will be small. In accordance with the Sewerage Sector Guidance, and based on a foul water peak design flow of 4,000 litres per dwelling per day, the total peak foul water discharge from the site is calculated to be 0.1 litres per second.

5.8. The table below sets out the estimated greenfield run-off rates at the site. The greenfield runoff rates for the development site have been calculated using the online tool provided by HR Wallingford, using the FEH methodology. The table includes rates in l/s/ha as well as equivalent greenfield run-off rates for the site, which have been calculated by multiplying the rates per ha by the proposed positively drained area for the development (0.194ha).

5.9. Refer to Appendix E for output from the HR Wallingford 'Greenfield runoff estimation for sites' tool.

TABLE 3: GREENFIELD RUN-OFF RATES

Rainfall Event	Greenfield run-off rate (l/s/ha)	Equivalent greenfield run-off rate (l/s)
Qbar	4.9	0.23
1 in 1 year	4.1	0.19
1 in 30 year	11.2	0.53
1 in 100 year	15.6	0.73

6. PROPOSED DRAINAGE STRATEGY

SURFACE WATER

6.1. The following general principles shall be applied to the drainage design for the proposed development:

- The run-off generated by the proposed development should be minimised by the use of Sustainable Drainage Systems (SuDS) techniques.
- The surface water drainage system should be designed to convey the design storm event of a 1 in 100 year storm plus 40% climate change allowance.
- An additional 10% impermeable area will be modelled to allow for urban creep.

6.2. The surface water drainage strategy for the development will ensure that:

- The surface water drainage network will be sufficiently robust to withstand the impacts of climate change over the lifetime of the development.
- The risk of flooding to surrounding areas will not be increased as a result of the development.
- Surface water run-off will be controlled on-site and the development will not increase flood risk.

6.3. The proposed drainage strategy is provided on drawing 1813-1901 (included at Appendix F).

6.4. There are no watercourses bordering the site and infiltration testing found low soakage potential, and so in accordance with the surface water disposal hierarchy set out at Table 1 above, discharging to separate surface and foul water sewers is the third preference. However, as stated in section 5 above, there are no surface water sewers, and as such the existing onsite foul and surface water system is combined. Therefore, the only viable option is for the proposed development to discharge surface and foul water to the Thames Water Public Foul Sewer, as per the existing arrangement.

6.5. It is proposed that surface water run-off from parking bays will discharge into the permeable paving sub-base prior to onward conveyance via sub-base collection units to the underground piped drainage network. This in turn will be conveyed with roof water run-off via gravity to the on-site surface water drainage network which will then discharge to at a restricted rate of 1 l/s to the final on-site chamber on the existing sewer lateral, which connects into the existing foul sewer on Lancaster Road.

6.6. The development will utilise a combination of geocellular storage and permeable sub-base paving to provide the necessary attenuation storage volume in order to accommodate the design 1 in 100 year + 40% climate change storm event without flooding of the site.

6.7. The geocellular storage units and permeable paving will be lined with an impermeable liner to prevent any inflow of groundwater that may be present in these areas.

6.8. It is proposed that surface water runoff from the on-site parking areas will pass through the permeable sub-base paving before being directed into the underground piped surface water network.

6.9. The surface water discharge rate from the proposed development will be restricted to 1 l/s for all rainfall events up to and including the 1 in 100 year + 40% Climate Change storm event, providing a 57%-87% improvement over the existing brownfield run-off rates. An orifice flow control chamber will be utilised to achieve this and include a wire mesh guard to prevent blockage.

6.10. An inline non-return valve will be fitted to the surface water connection into the final on-site chamber where the separate onsite foul and surface water drainage networks combine. This prevents backflow and helps protect against flooding or contamination from reverse flows during heavy rainfall or surcharged drainage systems.

6.11. The surface water drainage network has been modelled in Causeway Flow. Refer to the output reports included at Appendix G for details of the model. The impermeable areas used in the model are shown on drawing 1813-1910, included at Appendix H.

6.12. For storm events with return periods greater than the design storm, exceedance flow routing will ensure that the development, as far as reasonably practicable, prevents flooding of property on and off-site. The dwelling will be set above the level of the site access road, which will capture and convey the majority of overland flows. Refer to Appendix F for details.

6.13. In line with Hillingdon Council requirements, a completed Hillingdon SuDS Proforma is included in Appendix I.

WATER TREATMENT

6.14. Surface water run-off will be treated on-site in order to reduce the concentration of pollutants prior to discharge to the drainage system.

6.15. In accordance with Council recommendations, the simple index approach set out in CIRIA publication C753 (The SuDS Manual) has been used to assess the level of treatment that will be achieved.

6.16. The SuDS Manual notes that treatment of run-off is essential for frequent rainfall events, typically this includes storms with return periods of up to around 1 in 1 year.

6.17. Environmental risks to receiving surface waters will be reduced during rainfall events greater than the 1 in 1 year event, due to dilution available in the receiving waters.

6.18. The simple index approach sets out pollution hazard indices according to the land use categories throughout the proposed development. The indices relevant to the proposed development are shown in the table below.

TABLE 4: POLLUTION HAZARD INDICES

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads	Low	0.5	0.4	0.4

6.19. In order to provide sufficient treatment to run-off from each of the land use types, water should be passed through SuDS components that have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index for each contaminant type.

6.20. The table below summarises the pollution mitigation indices for the various SuDS components proposed throughout the development.

TABLE 5: POLLUTION MITIGATION INDICES

Type of SuDS component	Mitigation indices

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

6.21. Based on the hazard indices of the proposed land uses on-site, passing run-off through the permeable pavement would provide adequate levels of treatment for all sources of run-off.

FOUL WATER

6.22. It is proposed that foul water will be collected from the proposed development via an underground piped drainage network as per the existing foul water drainage arrangements. This will then be conveyed to the existing foul sewer on Lancaster Road.

6.23. The level of the on-site sewer lateral connection for the existing dwellings will be investigated for reuse. If not found to be sufficiently deep enough, then the lateral will be re-laid.

6.24. In accordance with the Sewerage Sector Guidance and based on a foul water peak design flow of 4,000 litres per dwelling per day, the total peak foul water discharge from the site is calculated to be 0.2 litres per second for 4No. units. A 100mm diameter foul sewer can adequately convey the flow rate of 0.2 l/s plus the 1.0 l/s peak surface water discharge, therefore providing sufficient hydraulic capacity for this development.

6.25. Refer to Proposed Drainage Strategy drawing in Appendix F.

7. WATER CONSERVATION MEASURES

7.1. To reduce the demand on the water supply network and at the same time reduce the volume of run-off entering the surface water drainage network, rainwater may be collected for the purposes of internal use and external irrigation.

7.2. Water butts should be installed to store rainwater collected from the rear of the house roofs. This water can be made available for use as a replacement for potable water in suitable non-potable applications, such as irrigation.

7.3. These shall be sized in accordance with BS 8515 to store water collected from the majority of the roof as is practical BS EN 16941-1:2024 Rainwater harvesting systems - Code of practice states that: 'storage capacity should be calculated from the following equations and should be the lesser of 5% of the annual rainwater yield or 5% of the annual non-potable water demand.'

7.4. An external water use of 5 litres per person per day has been adopted for the purposes of the calculations set out below.

5% ANNUAL RAINWATER YIELD

$Y_R = A \times e \times h \times \eta \times 0.05$

A = Yield coefficient (m^2) = 150 (rear roof area)
e = Yield coefficient = 0.9
h = Depth of rainfall (mm) = 641
η = Hydraulic filter efficiency = 0.9

Y_R = Rainwater yield (5% of annual) = 3,894 l

5% ANNUAL NON-POTABLE WATER DEMAND

$D_N = P_d \times n \times 365 \times 0.05$

P_d = Daily requirement per person (l) = 5
n = Number of persons = 4 (typical occupancy)

D_N = Potable water demand (5% of annual) = 365 l

7.5. Therefore, a suitable size of water butt for the dwelling would be in the region of 400 litres ($0.4m^3$) i.e. 2No. 200 litre water butts.

7.6. At a rate of 5 l/person/day, and an average occupancy of 4, this would reduce the daily surface water run-off into the on-site drainage network by $3.5m^3$.

7.7. As it cannot be guaranteed that the water butt storage will be available during the design storm event (particularly as water butts are more likely to be full during the winter) the reduction to run-off entering the surface water drainage network has not been taken into account during the design of the surface water system.

8. MAINTENANCE AND MANAGEMENT

8.1. This section provides guidance on the maintenance of specific Sustainable Drainage Systems (SuDS) components, the management for which will be the responsibility of an appointed management company.

8.2. The relevant party or parties responsible for the maintenance of the SuDS components listed are identified in the corresponding sub-sections below. These sub-sections outline the maintenance requirements for the SuDS components within the proposed drainage network, however they do not set out all of the drainage that is to be maintained.

8.3. It is possible in the future that parts of the drainage network will automatically be transferred to the sewer authority under the Flood and Water Management Act, however this legislation is still under scrutiny and not yet fully implemented.

PERMEABLE BLOCK PAVEMENT

8.4. Permeable block paving allows water to infiltrate through the gaps between the blocks into a layer of open-graded aggregate, where the water is attenuated before passing into the piped drainage network.

8.5. Permeable pavement increases the time that surface water run-off takes to enter the main drainage system and can provide attenuation storage of run-off in the permeable sub-base.

8.6. Surface water run-off passing through the permeable sub-base also receives treatment through the removal/breakdown of pollutants.

8.7. The operation and maintenance requirements are given in the table below.

TABLE 6: PERMEABLE PAVEMENT MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Sweeping. **Note**: Any jointing material between the blocks that is lost or displaced as a result of sweeping must be replaced. New jointing material must be the same type as that removed or a suitable replacement.	Three times a year at the end of winter, mid-summer and after autumn leaf fall. Also as required based on site-specific observations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas to prevent excess sediment being washed into the paving.	As required.
	Removal of weeds.	As required.
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.
	Rehabilitation of surface and underlying sand and geotextile.	As required (if infiltration performance is significantly reduced as a result of significant clogging).
Monitoring	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	Three-monthly, 48h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.

8.8. Maintenance of permeable pavement in public areas (e.g. shared drives and parking areas) will be the responsibility of an appointed management company.

8.9. Permeable pavement in areas of land conveyed during the sale of property (i.e. private driveways) will be maintained by the owners of the associated property. Householders must be informed of the maintenance requirements associated with any privately-owned permeable pavement for which they are responsible.

8.10. Refer to the drainage strategy drawing for the location of the permeable block pavement.

GEOCELLULAR ATTENUATION STORAGE

8.11. These features can provide a large volume of below ground attenuation storage in a relatively small area due to the high void ratio of the modular geocellular units. Each unit is typically 1.0m x 0.5m x 0.4m high and units can be connected to create an attenuation tank.

8.12. Each tank is wrapped in an impermeable liner to prevent the transfer of water between the tank and the surrounding ground.

8.13. Tanks can be located under soft landscaping or under paved surfaces such as roads and parking areas.

8.14. The operation and maintenance requirements are set out in the table below.

TABLE 7: GEOCELLULAR ATTENUATION STORAGE MAINTENANCE

Maintenance Schedule	Required Action	Recommended 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 sediment from pre-treatment structures and/or internal forebays.	Annually, or as required.
Remedial actions	Repair/rehabilitate inlets, outlets, 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.

8.15. Refer to the drainage strategy drawing for the locations of the geocellular attenuation tanks.

8.16. Maintenance of the attenuation tanks will be the responsibility of an appointed management company.

FLOW CONTROL MANHOLES

8.17. Flow control manholes limit the downstream discharge rate, allowing the drainage network to be designed to mimic the hydrological regime of the existing site.

8.18. Where low flow rates are required, flow control devices may have small outlets that could increase the chance of blockage. Additional measures may be required to reduce the chance of blockage, such as:

- a removable filter;

- a mesh screen around the flow control device;
- a weir wall within the flow control chamber to provide an emergency overflow; and/or
- screens/filters upstream of the flow control chamber (e.g. at the outlet of an upstream attenuation basin).

8.19. The operation and maintenance requirements are given in the table below.

TABLE 8: FLOW CONTROL MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Inspect flow control for any damage/defects. Remove any debris/blockages.	Monthly for first three months then every six months.
	Clean/replace filters.	At intervals recommended by the manufacturer and as required following inspections.

8.20. Refer to the drainage strategy drawing for details of the flow controls.

8.21. Maintenance of the flow controls will be the responsibility of an appointed management company.

DESIGN LIFE

8.22. The design life of the development is likely to exceed the design life of each of the components listed above.

8.23. During the routine inspections of any components it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability repairs should be the first choice solution where practicable. If this is not the case then it will be necessary for the responsible party to undertake complete replacement of the component in question.

8.24. The design life of modular geocellular storage systems is unproven, but BBA certification states that for the majority of geocellular units a design life in excess of 50years should be expected when installed as per the certification. Therefore, the routine assessment and maintenance should take into account an assessment of creep deflection and visual monitoring of the surface above any underground geocellular units.

9. RECOMMENDATIONS AND CONCLUSIONS

9.1. The application site is located within Flood Zone 1 and the risk of flooding from all sources is considered to be very low.

9.2. There are no watercourses or surface water sewers within the vicinity of the site. Infiltration has also been discounted due to insufficient permeability measured in soakaway testing on-site. Therefore, it is proposed that surface water run-off be discharged to the foul sewer, as per the existing arrangements.

9.3. Surface water will be discharged at a restricted rate of 1 l/s and conveyed to the existing foul sewer on Lancaster Road. This is a betterment over the existing site behaviour, and therefore offers a drainage and flood risk benefit to the surrounding area.

9.4. The proposed permeable paving will provide adequate treatment to surface water runoff during regular storm events. The extent of water treatment has been assessed using the simple index method, as set out in CIRIA publication C753 (The SuDS Manual).

9.5. Foul water will be collected and discharged to the existing foul sewer on Lancaster Road as per the existing site arrangements.

9.6. This Drainage Strategy has been prepared in accordance with current national and local drainage policy. The report demonstrates that the proposed development can be implemented with no material adverse drainage or flood risk impact on- or off-site.

9.7. The assessment concludes that there is no reason to refuse planning permission on the grounds of drainage.

FIGURES

FIGURE 1

SITE LOCATION PLAN

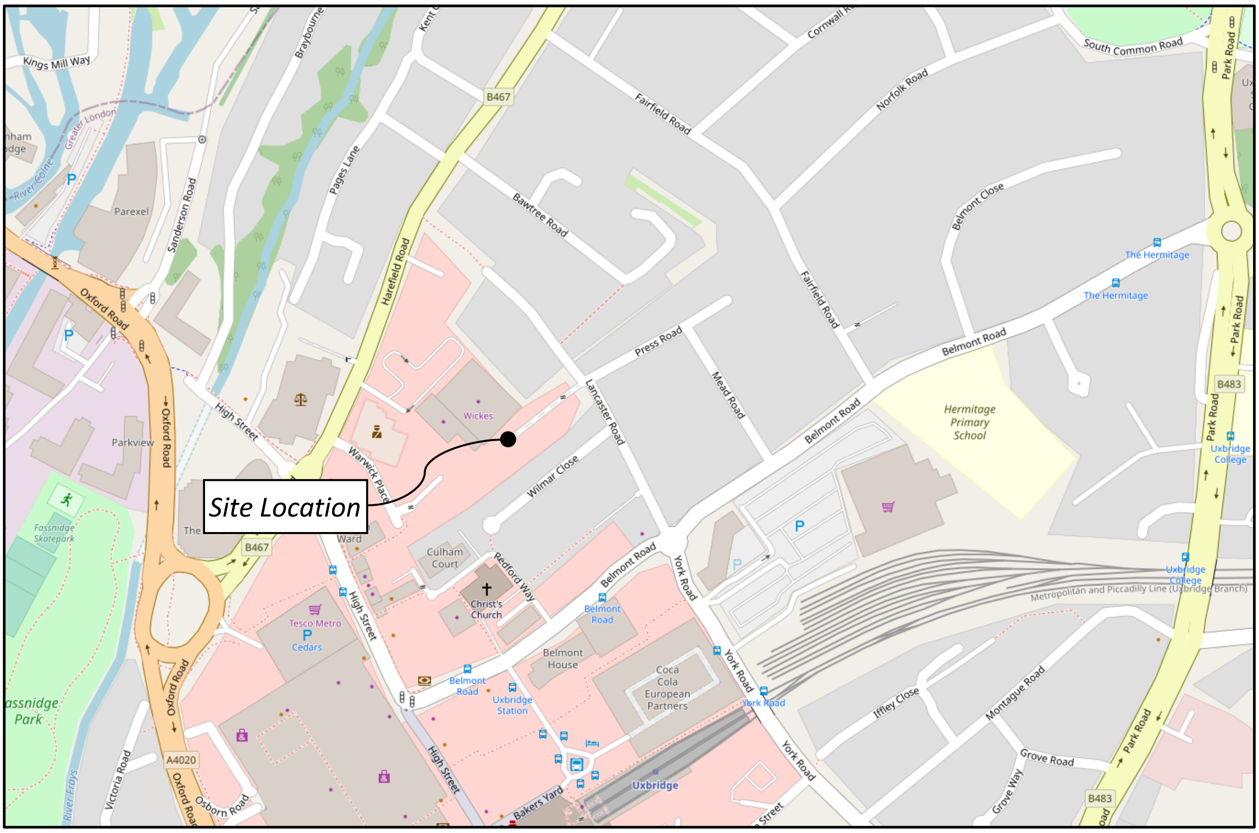


FIGURE 2

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

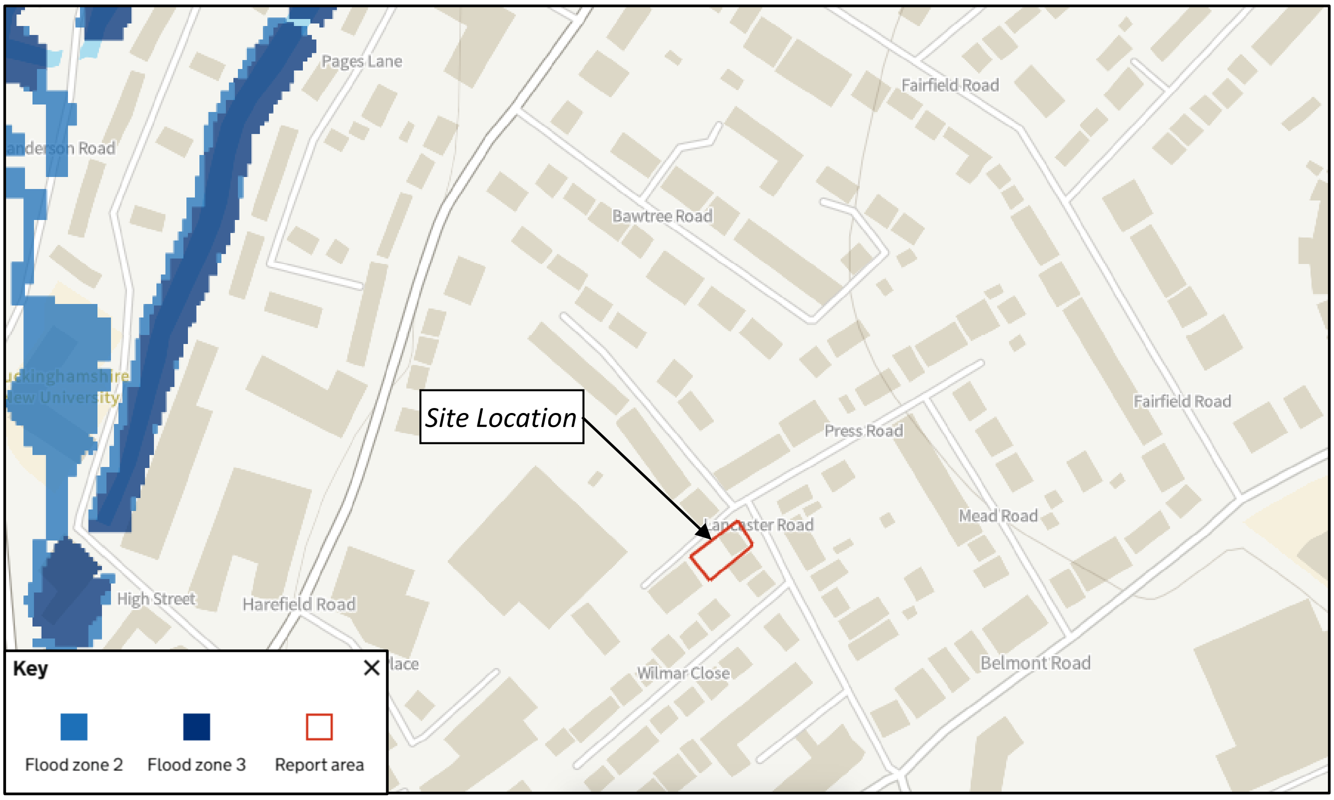
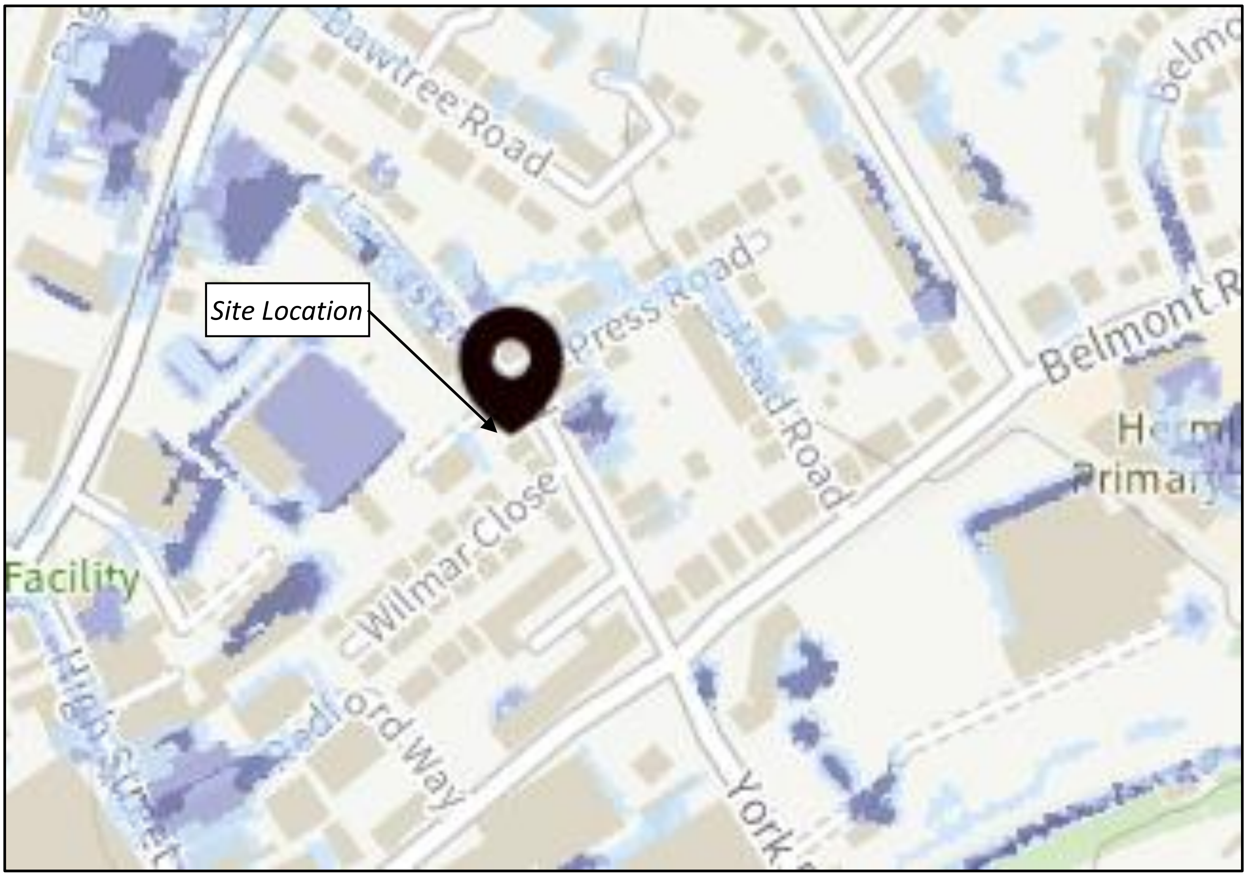


FIGURE 3

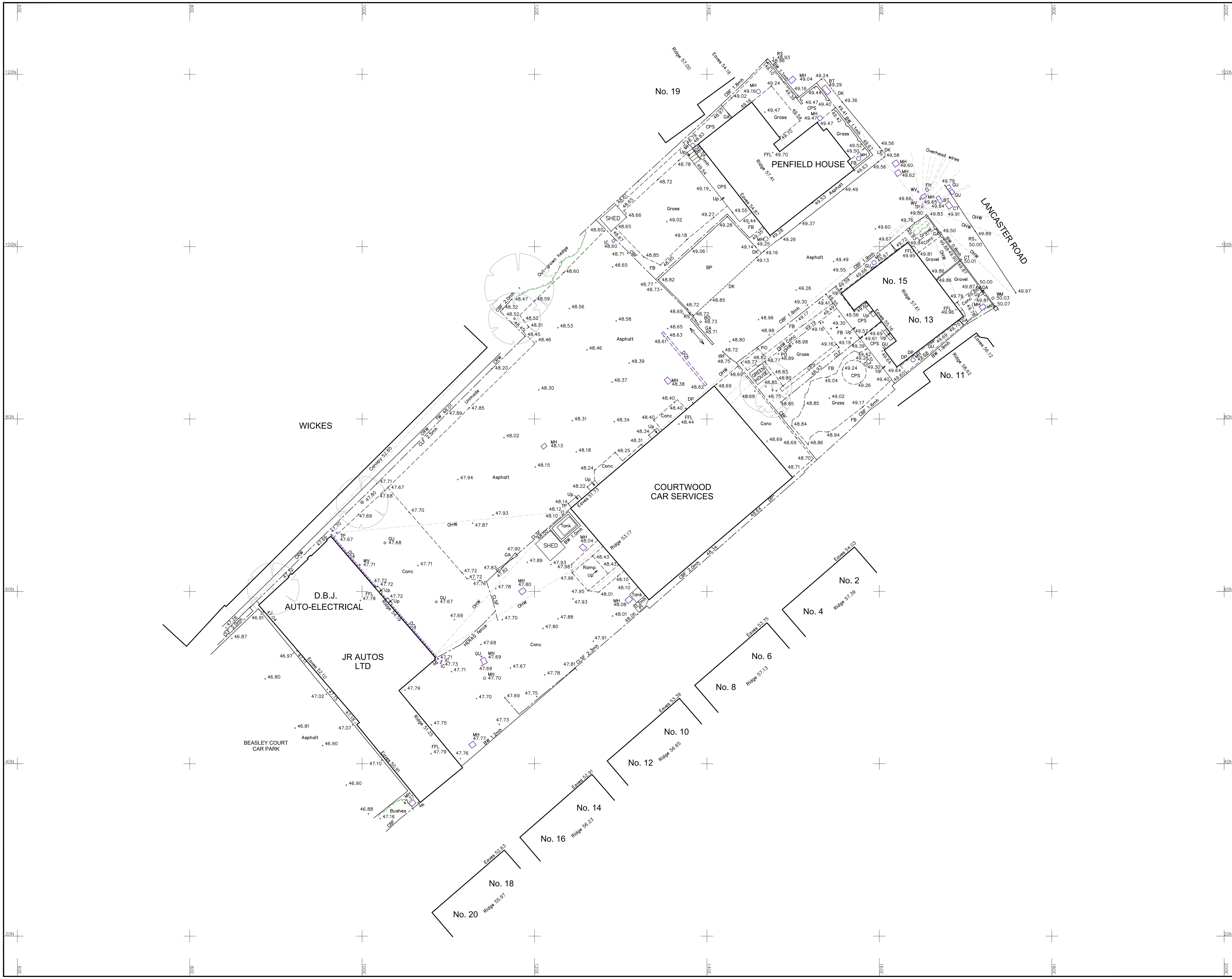
ENVIRONMENT AGENCY `FLOOD RISK FROM SURFACE WATER' MAP



APPENDICES

APPENDIX A

TOPOGRAPHICAL SURVEY



NOTES

Survey has been undertaken to an accuracy commensurate with a scale of 1:100.

Plan co-ordinates are based on previous survey. GS270373/100

Levels are based on previous survey. GS270373/100

Levels on kerb lines are channel levels unless specified.

The position and level of adjacent buildings that overlook the site have been obtained using non-contact measurements from within the site. For this reason some details may not be shown, as they are either below the line of sight or are obscured.

ABBREVIATIONS

ACU	Air Conditioning Unit	IRS	Illuminated Road Sign
AL	Access Ladder	KD	Drainage Kerb
AR	Assumed Route	KO	Kerb Outlet
AV	Air Valve	LB	Litter Bin
BB	Belisha Beacon	LP	Lamp Post
BH	Borehole	MH	Manhole
BL	Basement Light	MK	Marker Post
BO	Bollard	MPF	Mesh Panel Fence
BP	Block Paving	MS (x)	Multi-Stemmed Tree (No. of Stems)
BRW	Brick Retaining Wall		
BS	Bus Stop	NB	Notice Board
BSh	Bus Shelter	NP	Street Name Plate
BT	British Telecom IC	OHW	Overhead Wire
BW	Brick Wall	OSBM	OS Bench Mark
BWF	Barbed Wire Fence	P	Pillar
CB	Control Box	PB	Post Box
CBF	Close Board Fence	PC	Pedestrian Crossing
CCTV	Closed Circuit Television	PCF	Post & Chain Fence
CIF	Corrugated Iron Fence	PF	Palisade Fence
CK	Containment Kerb	PK	Portakabin
CL	Cover Level	Pl	Planter
CLF	Chain Link Fence	PL	Plinth
CLSF	Chain Link Security Fence	PM	Parking Meter
Conc	Concrete	PO	Post
Co	Column	PRF	Post & Rail Fence
CPS	Concrete Paving Slabs	PSF	Palisade Security Fence
CPF	Chestnut Paling Fence	PWF	Post & Wire Fence
CP	Concrete Plinth	RE	Rodding Eye
CR	Cycle Rack	RH	Road Hump
CRW	Concrete Retaining Wall	RL	Ridge Level
CS	Cobblestones	RS	Road Sign
CT	Cable TV IC	RW	Retaining Wall
CW	Concrete Wall	SEP	Service Entry Point
DC	Duct Covers	SL	Soffit Level
DCh	Drainage Channel	SM	Sump Level
DK	Drop Kerb	SP	Stand Pipe
DP	Down Pipe	SRW	Stone Retaining Wall
DPC	Damp-Proof Course Level	SW	Stone Wall
EIC	Electricity IC	SWMH	Surface Water Manhole
EL	Eaves Level (at Drip Edge)	SY	Stay Wire
EP	Electricity Pole	TCB	Telephone Call Box
ER	Earthing Rod	TDR	Traffic Direction Restrictor
FB	Flower Bed	THL	Threshold Level
FFL	Finished Floor Level	TK	Top of Kerb Level
FH	Fire Hydrant	TL	Traffic Light
FL	Flood Light	TM	Ticket Machine
FP	Fuel Pump	TP	Telegraph Pole
FR	Flat Roof	TPS	Tactile Paving Slabs
FWMH	Foul Water Manhole	TW	Top of Wall
GA	Gate	UTL	Unable To Lift:
GB	Grit Box		UTL(1) Covered
GC	Grasscrete		UTL(2) Immovable
GP	Gate Post		UTL(3) Damaged
GR	Guard Rail		UTL(4) Bolted Down
GU	Gully		UTL(5) Traffic Management
GV	Gas Valve	VP	Vent Pipe
HW	Head Wall	WB	Wheel Barrier
IB	Illuminated Bollard	WL	Water Level
IC	Inspection Cover	WM	Water Meter
IL	Invert Level	WO	Washout
IRF	Iron Railing Fence	WV	Water Valve
		VDL	Vehicle Detector Loop

Rev.	Description	Date	Svyr	Chkd
-	-	18/11/21	JM	MG

Glanville
Cornerstone House
62 Foxhall Road, Didcot
Oxon, OX11 7AD
Tel: (01235) 515550 Fax: (01235) 817799
postbox@glanvillegroup.com www.glanvillegroup.com

Client : UXBRIDGE UNITED REFORM CHURCH CHARITY

Project : PENFIELD ESTATE UXBRIDGE

Title : SITE SURVEY

Project Engineer :	JM	Scale :	1:200 @ A1
Project Director :	JHJ	Date :	NOV 2021
Status :			

Drawing No. 8210926/4101 Rev

APPENDIX B

SOAKAWAY TESTING

structa			Trial Pit No. **TP1** Sheet 1 of 1
Project Name: **13&15 Lancaster Road, Uxbridge**	Project No.: **1813**		Hole Type TP
Location: **13&15 Lancaster Road, Uxbridge**	Co-ords: 505586.99 E 184465.44 N	Level: 45.66m AOD	Scale 1:25
Client: **THE TRUSTEES OF UURCC**	Dates: Start 27/03/2025	Finish 27/03/2025	Logged By JT

Sample and In Situ Testing: Depth (m)	Type	HVP (KPa)	PID (ppm)	Depth (m)	Level (m)	Stratum Description	Legend	W/S
0.10	ES2					MADE GROUND: Dark brown slightly gravelly very clayey SAND with frequent rootlets. Gravel is angular to rounded fine to coarse quartzite, ceramic, roadstone, brick and granite. (Topsoil)		
0.20	ES1							
				0.30	45.36	Firm brown and grey brown slightly sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse quartzite and flint. (Lynch Hill Gravel Member)		
				1.00	44.66	Firm to stiff orange brown and grey brown becoming orange brown mottled grey with depth slightly gravelly slightly sandy locally sandy CLAY. Gravel is subrounded to rounded fine to coarse flint. (Lynch Hill Gravel Member)		
1.10	D3							
1.60	D4							
2.10	D5							
2.50	D6							
3.00	D7							
				3.30	42.36	Orange brown slightly sandy clayey subangular to rounded fine to coarse GRAVEL of quartzite with frequent pockets (<10cm) of clay. (Lynch Hill Gravel Member)		
3.40	D8			3.40	42.26	End of Trial Pit at 3.400m		

Remarks

Mechanically excavated from ground level to completed depth. Groundwater not encountered. Trial pit terminated at limit of depth of excavation. Pit utilised for soakaway testing. Backfilled with arisings on completion.

Key

D - Disturbed Sample
ES- Environmental Sample
B - Bulk Sample
U - Undisturbed Sample
SS - Surface Sample
VS - Validation Sample
W - Water Sample
N/R - No Recovery
HVP - Hand Vane Shear Test
W/S - Water Strike

AGS

Trial Pit Field Soakaway Test

Project : 13&15 Lancaster Road, Uxbridge
Project No. : 1813
Date : 27/03/25
Test Number : TP1

Time	Cumulative Elapse Time (min)	Depth to Water (m)	Depth of Water (m)
09:05:00	0	2.180	1.220
09:15:00	10	2.180	1.220
09:20:00	15	2.180	1.220
09:25:00	20	2.180	1.220
09:28:00	23	2.180	1.220
09:35:00	30	2.180	1.220
09:58:00	53	2.180	1.220
10:22:00	77	2.180	1.220
11:05:00	120	2.180	1.220
12:05:00	180	2.180	1.220

Results

Trial Pit Dimensions (m)

Length:	2.1
Width:	0.5
Depth before test:	3.4

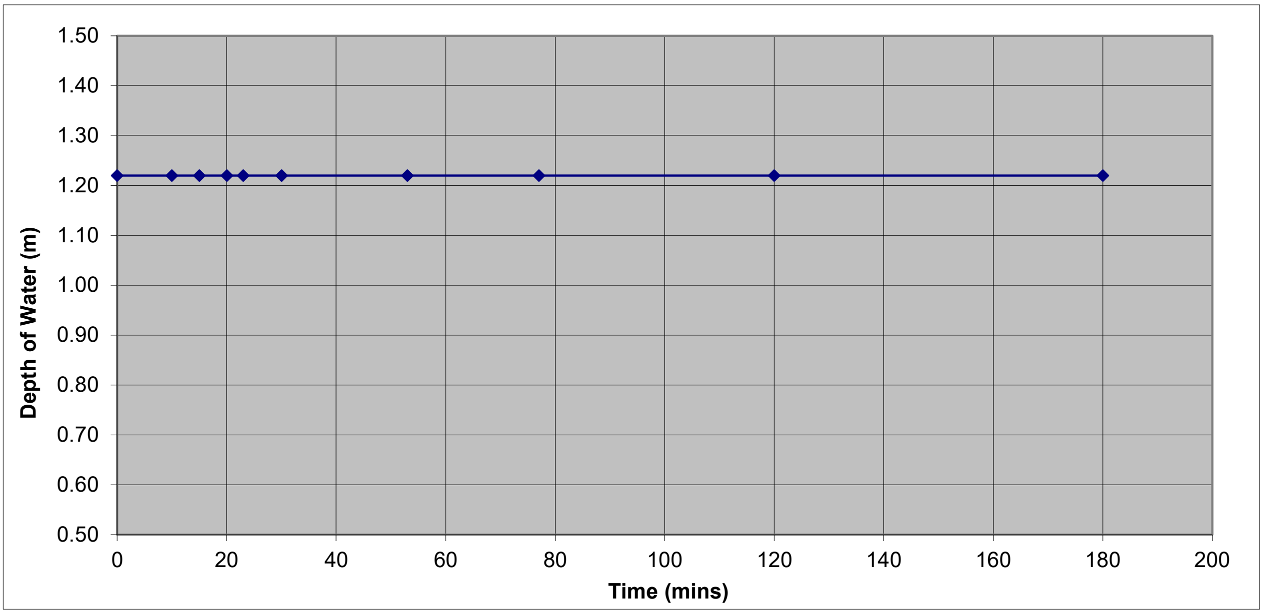
Effective Depth of Water (m)

75%	-
50%	-
25%	-

Calculations

Vp(75-25) in m³:	-
Ap50 in m²:	-
Tp(75) in seconds:	-
Tp(25) in seconds:	-
Tp(75-25) in seconds:	-

Soil infiltration rate (f) in m/s	**No Infiltration**



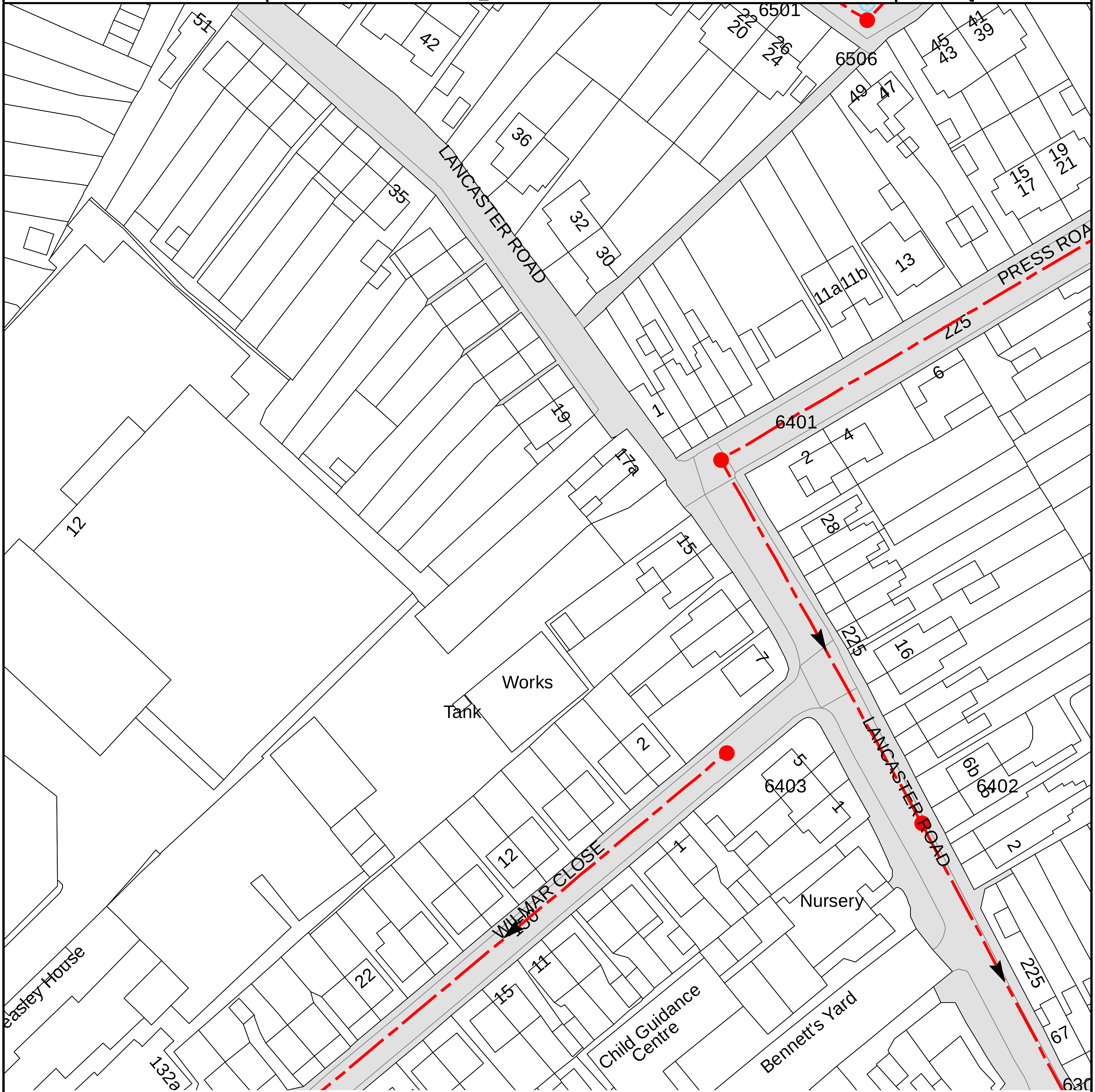
Notes:
Trial pit soakaway test completed in general accordance with BRE 365. Where full effective depth soakage is not achieved, infiltration rates are calculated based on 75% and 25% of effective depth achieved during test.

Comments:
Mechanically excavated from ground level to completed depth. Groundwater not encountered. All sides stable during soakage test.

APPENDIX C

ASSET LOCATION PLANS

Asset Location Search Sewer Map - ALS/ALS Standard/2011_1993283	TQ0584SE



The width of the displayed area is 200m and the centre of the map is located at OS coordinates 505575,184483

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
6402	n/a	n/a
6403	n/a	n/a
6506	n/a	n/a
6507	n/a	n/a
-	-	-
6401	46.91	45.61

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

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

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

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

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

Control Valve

Drop Pipe

Ancillary

Weir

End Items

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

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

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

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

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

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

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

2) All measurements on the plans are metric.

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

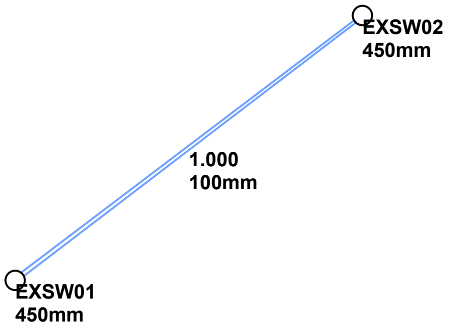
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

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

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0118 925 1504.

APPENDIX D

BROWNFIELD RUN-OFF ESTIMATE


EXSW02
450mm
1.000
100mm
EXSW01
450mm

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.900	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
EXSW01	0.015	5.00	49.680	450	163.909	86.865	1.300
EXSW02			49.810	450	171.979	93.006	1.601

Links

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	EXSW01	EXSW02	10.141	0.600	48.380	48.209	0.171	59.3	100	5.17	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.002	7.9	2.4	1.200	1.501	0.015	0.0	38	0.880

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	10.141	59.3	100	Circular	49.680	48.380	1.200	49.810	48.209	1.501

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	EXSW01	450	Manhole	Adoptable	EXSW02	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
EXSW01	163.909	86.865	49.680	1.300	450	0	1.000	48.380	100
EXSW02	171.979	93.006	49.810	1.601	450	1	1.000	48.209	100

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.900	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	0.900	Additional Storage (m³/ha)	20.0		

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 %)
2	0	0	0
30	0	0	0
100	0	0	0

Results for 2 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	EXSW01	10	48.418	0.038	2.3	0.0149	0.0000	OK
15 minute summer	EXSW02	10	48.246	0.037	2.3	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	EXSW01	1.000	EXSW02	2.3	0.850	0.289	0.0272	1.0

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	EXSW01	10	48.457	0.077	6.8	0.0300	0.0000	OK
15 minute summer	EXSW02	10	48.280	0.071	6.7	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	EXSW01	1.000	EXSW02	6.7	1.081	0.852	0.0629	2.9

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	EXSW01	11	48.521	0.141	8.7	0.0549	0.0000	SURCHARGED
15 minute summer	EXSW02	11	48.299	0.090	8.3	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	EXSW01	1.000	EXSW02	8.3	1.066	1.059	0.0774	3.7

APPENDIX E

GREENFIELD RUN-OFF ESTIMATE

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

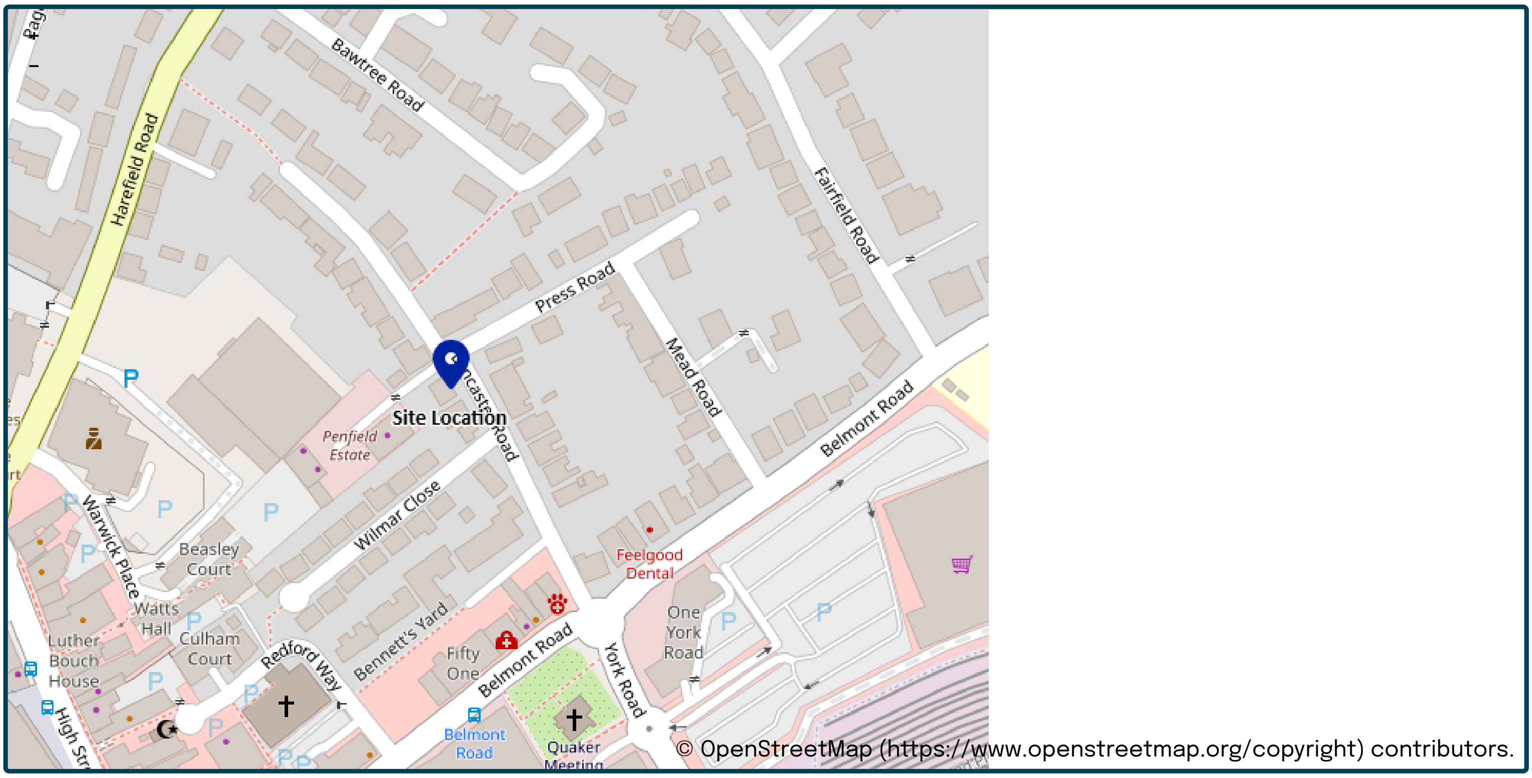
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	14/05/2025
Calculated by	
Reference	
Model version	2.0.0

Location

Site name	
Site location	



Site easting	505604
Site northing	184470

Site details

Total site area (ha)	1 ha

Greenfield runoff

Method

Method	FEH statistical

FEH statistical

	My value	Map value
SAAR (mm)	636 mm	636
BFIHOST	.197	
QMed-QBar conversion	1.136	1.136
QMed (l/s)	4.3 l/s	
QBar (FEH statistical) (l/s)	4.9 l/s	

Growth curve factors

	My value	Map value
Hydrological region	6	6
1 year growth factor	0.85	
2 year growth factor	0.88	
10 year growth factor	1.62	
30 year growth factor	2.3	
100 year growth factor	3.19	
200 year growth factor	3.74	

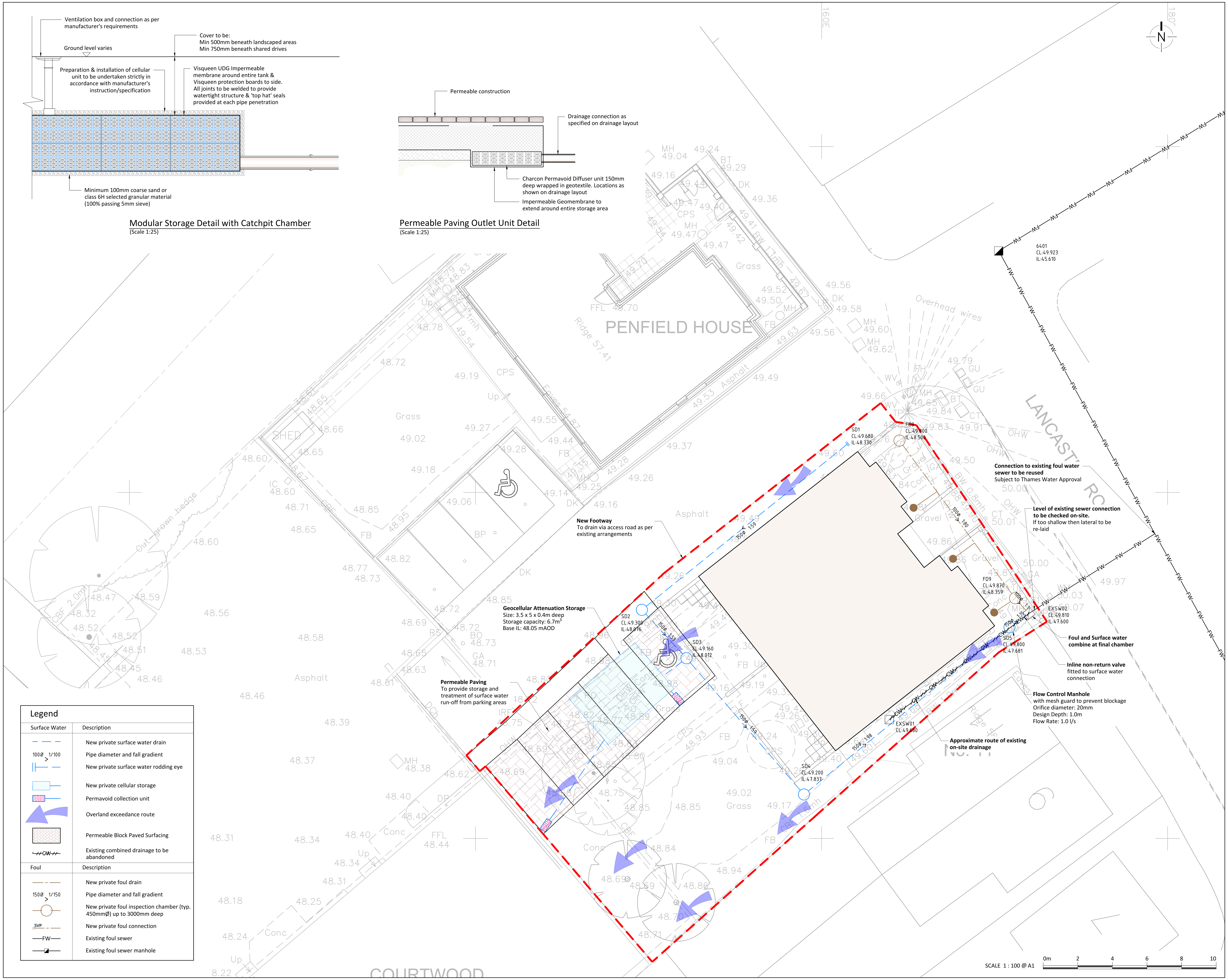
Results

Method	FEH statistical
Flow rate 1 year (l/s)	4.1 l/s
Flow rate 2 year (l/s)	4.3 l/s
Flow rate 10 years (l/s)	7.9 l/s
Flow rate 30 years (l/s)	11.2 l/s
Flow rate 100 years (l/s)	15.6 l/s
Flow rate 200 years (l/s)	18.3 l/s

Disclaimer

APPENDIX F

PROPOSED DRAINAGE STRATEGY



HEALTH, SAFETY & ENVIRONMENT

It is the responsibility of the client to ensure that those undertaking the works are competent and experienced in the type of work to be undertaken.

In addition to the hazards usually associated with the types of work detailed on this drawing, the following specific hazards have been identified through design risk assessment. The planning and execution of the works should take into account all usual and specific hazards.

Hazards should also be taken into account in the maintenance, operation, decommissioning and demolition of the works.

None Identified

NOTES

1. All dimensions are in millimetres (mm) and levels in metres Above Ordnance Datum (mAOD) unless noted otherwise.
2. Do not scale from this drawing.
3. The copyright in this drawing belongs to Structa LLP; the designs and details may not be used on any project other than that indicated in the titleblock.
4. Where CAD or BIM files of the drawing are issued, they are provided for the convenience of others, and shall not be used for construction purposes or relied upon for accuracy or completeness.

Rev.	Date	Description	Drawn	Checked	Approved
P1	29.05.25	FIRST ISSUE	BR	TL	MDI

NOT FOR CONSTRUCTION

13 & 15 LANCASTER ROAD, UXBRIDGE

DRAINAGE STRATEGY

- Structural
- Civil
- Geo-environmental

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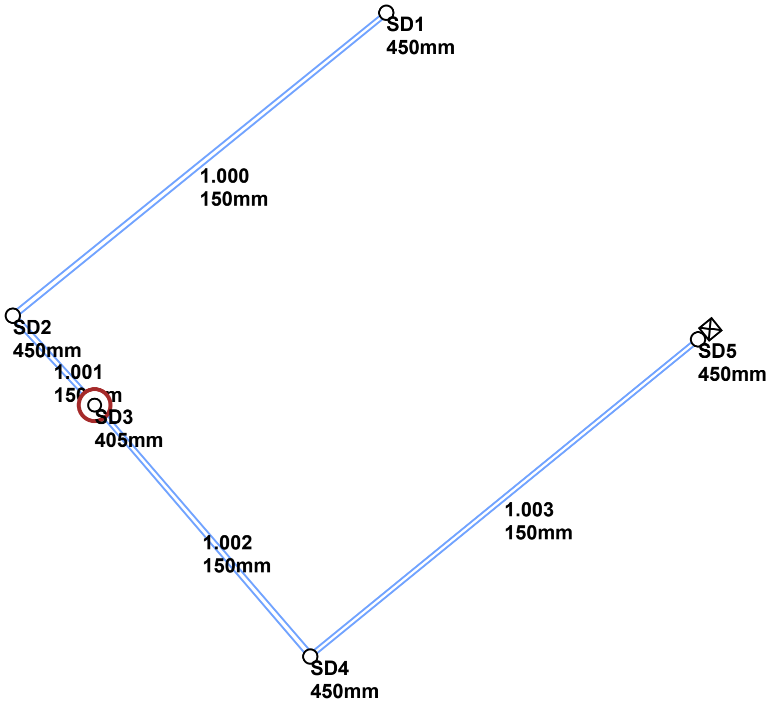
London | Hemel Hempstead | Swindon | Warwick | www.structa.co.uk

Drawing No: 1813-1900

Revision: P1

APPENDIX G

FLOW MODEL OUTPUTS


SD1
450mm
1.000
150mm
SD2
450mm
1.001
SD3
405mm
1.002
150mm
SD4
450mm
1.003
150mm
SD5
450mm

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.900	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SD1	0.008	5.00	49.680	450	161.377	102.706	1.350
SD2			49.300	450	149.616	93.218	1.224
SD3	0.009	5.00	49.160	405	152.191	90.416	1.148
SD4	0.008	5.00	49.200	450	158.983	82.540	1.363
SD5			49.800	450	171.192	92.475	2.119

Links

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	SD1	SD2	15.111	0.600	48.330	48.076	0.254	59.5	150	5.19	50.0
1.001	SD2	SD3	3.805	0.600	48.076	48.012	0.064	59.5	150	5.24	50.0
1.002	SD3	SD4	10.400	0.600	48.012	47.837	0.175	59.4	150	5.37	50.0
1.003	SD4	SD5	15.741	0.600	47.837	47.681	0.156	100.9	150	5.64	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.306	23.1	1.3	1.200	1.074	0.008	0.0	24	0.708
1.001	1.307	23.1	1.3	1.074	0.998	0.008	0.0	24	0.709
1.002	1.307	23.1	2.8	0.998	1.213	0.017	0.0	35	0.881
1.003	1.000	17.7	4.1	1.213	1.969	0.025	0.0	49	0.814

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.111	59.5	150	Circular	49.680	48.330	1.200	49.300	48.076	1.074
1.001	3.805	59.5	150	Circular	49.300	48.076	1.074	49.160	48.012	0.998
1.002	10.400	59.4	150	Circular	49.160	48.012	0.998	49.200	47.837	1.213
1.003	15.741	100.9	150	Circular	49.200	47.837	1.213	49.800	47.681	1.969

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SD1	450	Manhole	Adoptable	SD2	450	Manhole	Adoptable
1.001	SD2	450	Manhole	Adoptable	SD3	405	Manhole	Adoptable
1.002	SD3	405	Manhole	Adoptable	SD4	450	Manhole	Adoptable
1.003	SD4	450	Manhole	Adoptable	SD5	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SD1	161.377	102.706	49.680	1.350	450	0	1.000	48.330	150
SD2	149.616	93.218	49.300	1.224	450	1	1.000	48.076	150
						0	1.001	48.076	150
SD3	152.191	90.416	49.160	1.148	405	1	1.001	48.012	150
						0	1.002	48.012	150
SD4	158.983	82.540	49.200	1.363	450	1	1.002	47.837	150
						0	1.003	47.837	150
SD5	171.192	92.475	49.800	2.119	450	1	1.003	47.681	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.900	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	0.900	Additional Storage (m³/ha)	20.0		

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 %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node SD5 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.200	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	1.0		
Invert Level (m)	47.681	Diameter (m)	0.020		

Node SD3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	48.430	Slope (1:X)	80.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	32	Depth (m)	0.150
Safety Factor	2.0	Width (m)	12.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

Node SD3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	48.012	Slope (1:X)	80.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	104	Depth (m)	0.400
Safety Factor	2.0	Width (m)	3.500	Inf Depth (m)	
Porosity	0.95	Length (m)	5.000		

Results for 2 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	SD1	10	48.354	0.024	1.3	0.0067	0.0000	OK
15 minute summer	SD2	11	48.100	0.024	1.3	0.0039	0.0000	OK
180 minute summer	SD3	116	48.090	0.078	1.1	0.8045	0.0000	OK
180 minute summer	SD4	116	48.091	0.254	1.3	0.0700	0.0000	SURCHARGED
180 minute summer	SD5	116	48.091	0.410	0.8	0.0652	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	SD1	1.000	SD2	1.3	0.691	0.055	0.0279	
15 minute summer	SD2	1.001	SD3	1.3	0.550	0.055	0.0098	
180 minute summer	SD3	1.002	SD4	0.9	0.416	0.038	0.1398	
180 minute summer	SD4	1.003	SD5	0.8	0.284	0.046	0.2771	
180 minute summer	SD5	Orifice		0.5				5.1

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	SD1	10	48.371	0.041	3.7	0.0115	0.0000	OK
120 minute summer	SD2	96	48.316	0.240	2.2	0.0382	0.0000	SURCHARGED
120 minute summer	SD3	96	48.316	0.304	5.6	4.6106	0.0000	SURCHARGED
120 minute summer	SD4	96	48.316	0.479	1.6	0.1323	0.0000	SURCHARGED
120 minute summer	SD5	96	48.316	0.635	0.9	0.1010	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	SD1	1.000	SD2	3.6	0.932	0.158	0.1295	
120 minute summer	SD2	1.001	SD3	3.1	0.398	0.135	0.0670	
120 minute summer	SD3	1.002	SD4	0.9	0.387	0.039	0.1831	
120 minute summer	SD4	1.003	SD5	0.9	0.404	0.050	0.2771	
120 minute summer	SD5	Orifice		0.7				10.3

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
120 minute winter	SD1	114	48.484	0.154	1.5	0.0428	0.0000	SURCHARGED
120 minute winter	SD2	114	48.484	0.408	1.9	0.0648	0.0000	SURCHARGED
120 minute winter	SD3	114	48.484	0.472	4.2	6.6746	0.0000	SURCHARGED
120 minute winter	SD4	114	48.484	0.647	1.5	0.1785	0.0000	SURCHARGED
120 minute winter	SD5	114	48.483	0.802	0.9	0.1276	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)
120 minute winter	SD1	1.000	SD2	1.5	0.608	0.065	0.2660	
120 minute winter	SD2	1.001	SD3	2.2	0.398	0.097	0.0670	
120 minute winter	SD3	1.002	SD4	0.9	0.435	0.039	0.1831	
120 minute winter	SD4	1.003	SD5	0.9	0.368	0.050	0.2771	
120 minute winter	SD5	Orifice		0.7				13.6

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
240 minute winter	SD1	184	49.064	0.734	1.5	0.2039	0.0000	SURCHARGED
240 minute winter	SD2	184	49.064	0.988	1.6	0.1570	0.0000	FLOOD RISK
240 minute winter	SD3	184	49.064	1.052	2.7	8.5635	0.0000	FLOOD RISK
240 minute winter	SD4	184	49.063	1.226	1.7	0.3385	0.0000	FLOOD RISK
240 minute winter	SD5	184	49.063	1.382	1.5	0.2197	0.0000	OK

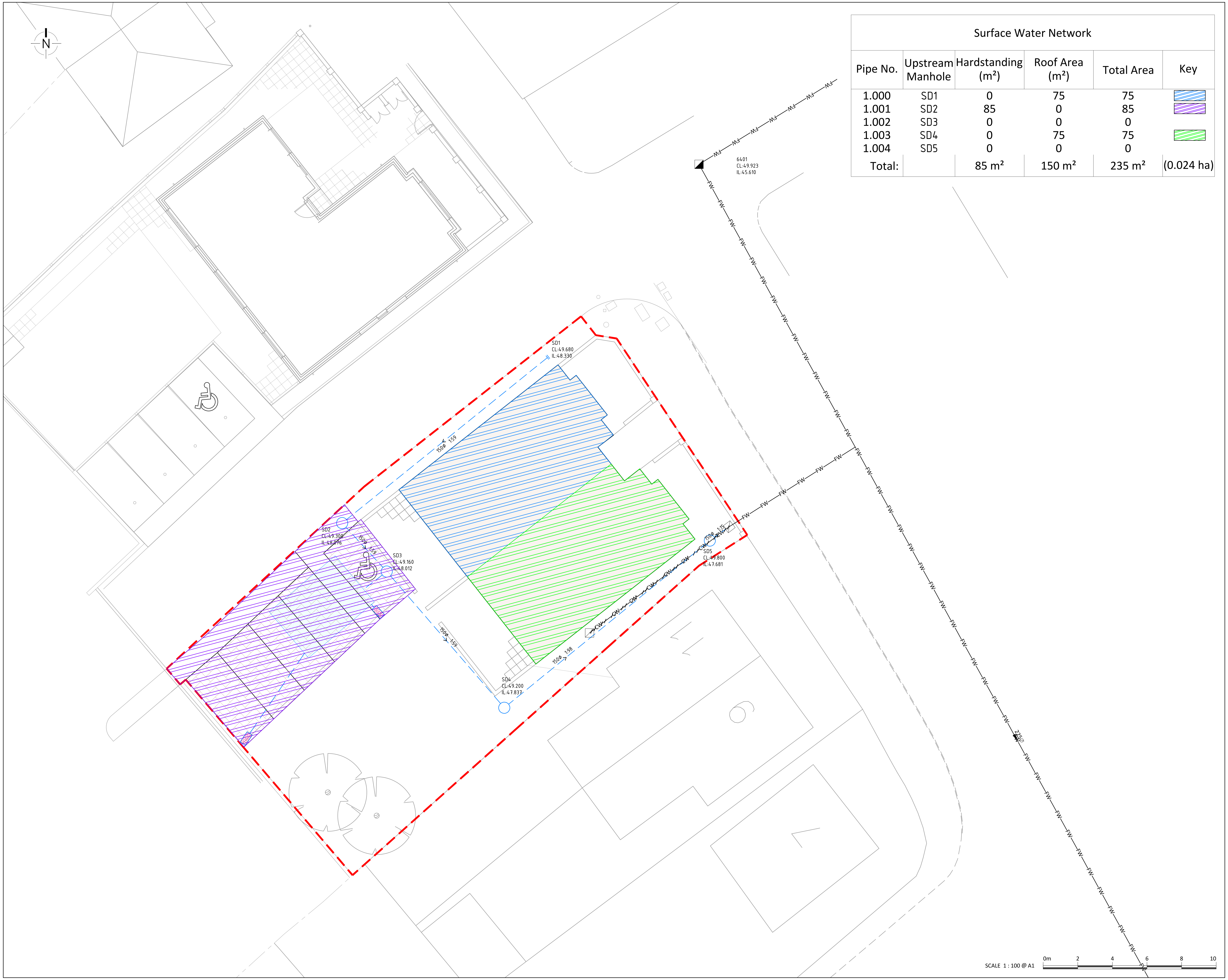
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	SD1	1.000	SD2	1.3	0.528	0.056	0.2660	
240 minute winter	SD2	1.001	SD3	1.0	0.351	0.045	0.0670	
240 minute winter	SD3	1.002	SD4	0.8	0.417	0.034	0.1831	
240 minute winter	SD4	1.003	SD5	1.5	0.366	0.082	0.2771	
240 minute winter	SD5	Orifice		1.0				22.8

APPENDIX H

IMPERMEABLE AREAS

Surface Water Network

Pipe No.	Upstream Manhole	Hardstanding (m²)	Roof Area (m²)	Total Area	Key
1.000	SD1	0	75	75	blue hatch
1.001	SD2	85	0	85	purple hatch
1.002	SD3	0	0	0	
1.003	SD4	0	75	75	green hatch
1.004	SD5	0	0	0	
Total:		85 m²	150 m²	235 m²	(0.024 ha)



HEALTH, SAFETY & ENVIRONMENT

It is the responsibility of the client to ensure that those undertaking the works are competent and experienced in the type of work to be undertaken.

In addition to the hazards usually associated with the types of work detailed on this drawing, the following specific hazards have been identified through design risk assessment. The planning and execution of the works should take into account all usual and specific hazards.

Hazards should also be taken into account in the maintenance, operation, decommissioning and demolition of the works.

⚠ None Identified

NOTES

1. All dimensions are in millimetres (mm) and levels in metres Above Ordnance Datum (mAOD) unless noted otherwise.
2. Do not scale from this drawing.
3. The copyright in this drawing belongs to Structa LLP; the designs and details may not be used on any project other than that indicated in the titleblock.
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Rev.	Date	Description	Drawn	Checked	Approved
P1	29.05.25	FIRST ISSUE	BR	TL	MDI

NOT FOR CONSTRUCTION

13 & 15 LANCASTER ROAD, UXBRIDGE

IMPERMEABLE AREAS

- Structural
- Civil
- Geo-environmental

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APPENDIX I

HILLINGDON SUDS PROFORMA

GREATER**LONDON**AUTHORITY

1. Project & Site Details	
Project / Site Name (including sub-catchment / stage / phase where appropriate)	13 & 15 Lancaster Road, Uxbridge
Address & post code	13 & 15 Lancaster Road, Uxbridge UB8 1AP
OS Grid ref. (Easting, Northing)	E 505598 N 184476
LPA reference (if applicable)	TBC
Brief description of proposed work	Demolition of existing residential buildings ar No. 13 & 15 Lancaster road and construction of 4No. 1 bed flats, as well as the provision of site access road, drainage and necessary infrastructure
Total site Area	500 m^2
Total existing impervious area	194 m^2
Total proposed impervious area	235 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	Surface and foul water manholes draining to a foul sewer. To be confirmend on-site
Designer Name	Tom Lafford
Designer Position	Associate Director
Designer Company	Structa LLP

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Lynch Hill River Terrace Deposits	
Bedrock geology classification	London Clay Formation	
Site infiltration rate	n/a	m/s
Depth to groundwater level	n/a	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	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	225mm dia. Foul sewer to the northeast
Has the owner/regulator of the discharge location been consulted?	No

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	0.23			
1 in 1	0.19	2.3		1
1 in 30	0.53	6.7		1
1 in 100	0.73	8.3		1
1 in 100 + CC			10	1
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Orifice Plate		

3c. Proposed SuDS Measures			
	Catchment area (m^2)	*Plan area (m^3)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	62.5	62.5	3
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	17.5		7
Total	80	62.5	10

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 3
Drainage hierarchy (2b)	Section 6.4
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 G
Proposed SuDS measures & specifications (3b)	Section 6.5-6.8

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Refer to Application drawings
Detailed drainage design drawings, including exceedance flow routes	Appendix F
Detailed landscaping plans	Refer to Application drawings
Maintenance strategy	Section 8
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Section 6.12-6.19
b) biodiversity?	n/a
c) amenity?	n/a