BURLINGTON PROPERTY GROUP

OXHEY LANE, CARPENDERS PARK

LAND AT CARPENDERS PARK FARM

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

REPORT REF.
2403160-ACE-XX-XX-RP-C-0301

September 2025

HEAD OFFICE (LONDON): 3rd Floor, The Hallmark Building, 52-56 Leadenhall Street, London, EC3M 5JE **T** | 020 7680 4088
SUFFOLK: Suffolk Enterprise Centre, 44 Felaw Street, Ipswich, IP2 8SJ **T** | 01473 407 321
ESSEX: 1 - 2 Crescent Court, Billericay, Essex, CM12 9AQ **T** | 01277 657 677
NOTTINGHAM: Office 3, Garage Studios, 41-43 St Mary's Gate, Lace Market, Nottingham, NG1 1PU **T** | 0115 697 0940
KENT: Suite 10, Building 40, Churchill Business Centre, Kings Hill, Kent, ME19 4YU **T** | 01732 752 155
BRISTOL: Temple Studios, Temple Gate, Bristol, BS1 6QA **T** | 0117 456 4994
EDINBURGH: 4-5 Lochside Way Edinburgh EH12 9DT **T** | 0131 516 8111
MANCHESTER: Chancery Place, 50 Brown Street, Manchester, M2 2JG **T** | 020 7680 4088

Email: enquiries@ardent-ce.co.uk

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REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	FINAL FOR PLANNING	NC	JH	DM	25/03/25
-	UPDATE WITH LLFA COMMENTS	NC	JH	DM	17/09/25

Distribution

1. Introduction

1.1. Ardent Consulting Engineers (hereafter referred to as Ardent) has been appointed by Burlington Property Group (hereafter referred to as Burlington) to undertake a Flood Risk Assessment & Drainage Strategy (hereafter referred to as the FRA) for the proposed development on land at Oxhey Lane, Carpenders Park (hereafter referred to as the Site).

1.2. The Local Planning Authority for the area is Three Rivers District Council (hereafter referred to as the 'LPA'), with the Lead Local Flood Authority is Hertfordshire County Council (hereafter referred to as the 'LLFA').

1.3. The Site is approximately 12.7ha in area, and with reference to the Environment Agency (EA) flood risk mapping for planning, is located broadly within Flood Zone 1, with a nominal encroachment of Flood Zone 2 toward the southwest corner. Based on the partial flood designation of the Site and as the application area exceeds 1ha, an FRA is required to support any development planning application.

1.4. This FRA has been prepared with specific reference to the requirements of the National Planning Policy Framework (NPPF) updated in December 2024, and the Planning Practice Guidance (PPG) updated in August 2022. This report also takes into consideration the requirements of non-statutory technical standards by DEFRA, Sustainable Drainage Systems of June 2025.

Site Location

1.5. The Site is located east of Oxhey Lane, Carpenders Park (**Figure 1-1**), approximately centred on National grid reference 512910mE, 193527mN (TQ 12910 93527). The Site is primarily bound by open land, with exception of the western boundary with Oxhey Lane, an existing care home and residential units beyond.

1.6. The Site is formed as open ground, with rows of natural vegetation and trees in parts, but with no areas of existing hard development.

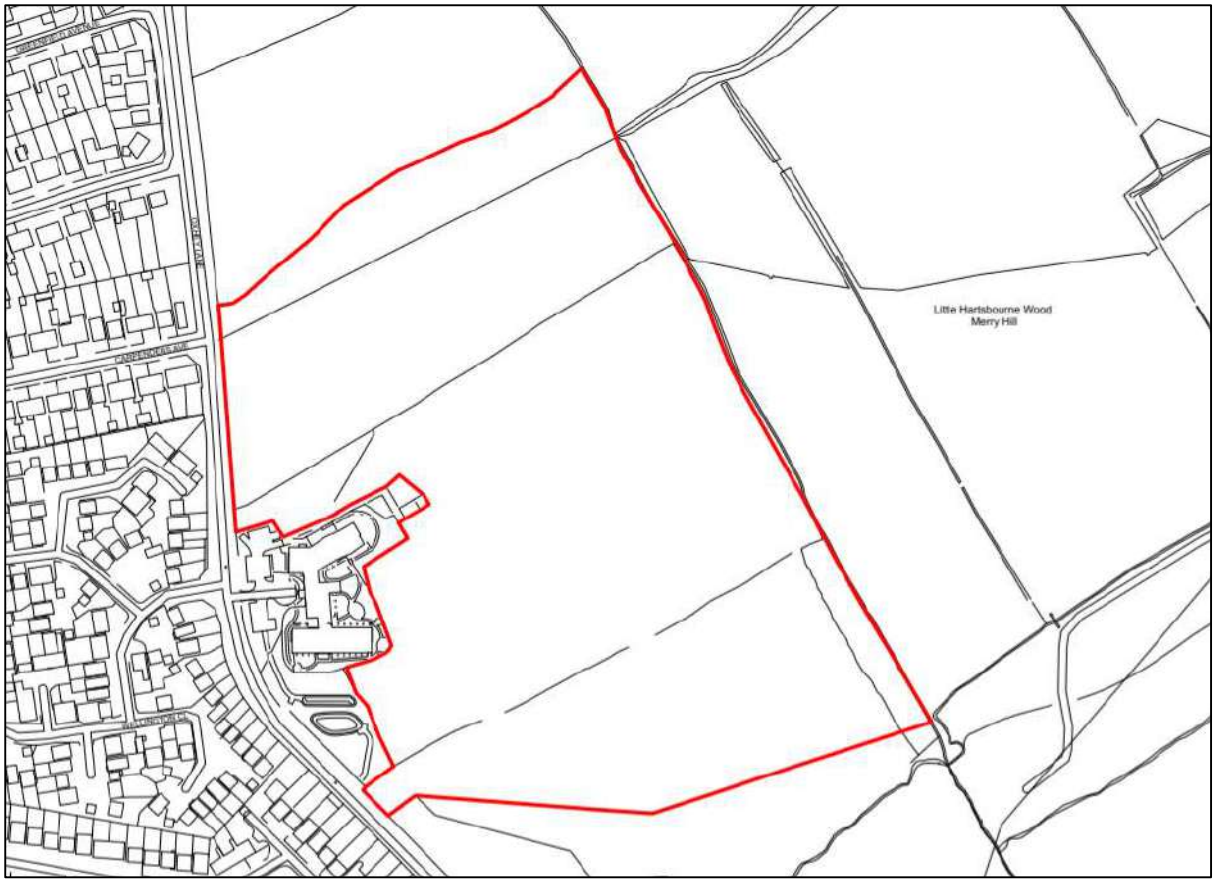


Figure 1-1: Site Location Plan (Source: Pegasus Group)

Development Proposals

1.7. The planning application seeks outline planning permission for the erection of housing with care, a children's care home and up to 256 new homes, together with associated car parking, open space and landscaping.

1.8. The proposed development plan is included in **Appendix A,** with an extract shown in **Figure 1-2** below.

Figure 1-2: Illustrative Masterplan extract (Source: Pegasus Group)

2. Policy Context

National Planning Policy Framework (December 2024)

2.1. The National Planning Policy Framework (NPPF) paragraphs 170 to 182 inclusive, establish the Planning policy relating to flood risk management. The Technical Guide to the NPPF was superseded by the Planning Practice Guidance (PPG), with the flood risk management element of the publication last updated in August 2022.

2.2. The focus of the policy is to direct development towards areas of the lowest practicable flood risk and to ensure that all development is safe, without increasing flood risk elsewhere. The main considerations are:

- Applying the Sequential Test, and if necessary, apply the Exception Test to appropriately locate development.
- Safeguarding land from development that is required for current and future flood management.
- Using opportunities offered by new development to reduce the causes and impacts of flooding.
- Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.

2.3. The *NPPF* states that a Flood Risk Assessment is required for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving:

- Sites of 1 hectare or more.
- Land which has been identified by the Environment Agency as having critical drainage problems.
- Land identified in a strategic flood risk assessment as being at increased flood risk in future.
- Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

Planning Practice Guidance

2.4. The accompanying planning practice guidance to the NPPF provides additional guidance to local planning authorities to ensure the effective implementation of the planning policy set out in the National Planning Policy Framework on development in areas at risk of flooding.

2.5. The PPG provides supporting information on:

- The application of the sequential approach, Sequential and Exception Tests.
- Measures to reduce flood risk to acceptable levels.
- How to manage residual risks.
- Guidance on how to take climate change into account.
- Guidance relating to SuDS drainage principles.

Best practise guidance for the design of drainage

2.6. Various non-statutory publications offer guidance on the design, implementation, maintenance and operation of drainage, with these including for:

- National standards for drainage systems (SuDS) – the current version published in June 2025, which sets-out a prescriptive approach to the delivery of surface water drainage and SuDS.
- Practise guidance to the previous (2015) version of the National standards for drainage systems (SuDS) – whilst relating to the replaced version of guidance, this publication of 2016 by LASOO retains relevant advice.
- Ciri 753 SuDS Manual – the current version published in 2015, provides detailed guidance on the appropriate provision of SuDS features.
- SSG Appendix C - the current version published in 2023, provides detailed guidance for compliant delivery of adoptable foul and surface water drainage, including for limited SuDS components.

Sequential and Exception Test

2.7. According to Annex 3 of the NPPF, the proposed residential development for the Site is classified as 'More Vulnerable.' As the Site is located within a worst-case Flood Zone 2, the development is considered appropriate within this Site in fluvial/tidal flood risk terms without the need to apply the Exception Test (**Figure 2-1**).

2.8. As detailed within the following, as there are instances of fluvial and pluvial flooding within areas of proposed development, a Sequential Test should be undertaken. The parameters and reporting of this will be agreed with the LPA and provided under separate cover.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Figure 2-1: Extract of Flood Risk and Costal Change Guidance Table 2, Flood Risk Vulnerability

3. Baseline

Hydrology

3.1. The Environment Agency (EA) online main river map shows a Main River passes the southern boundary of the Site, namely the Hartsbourne Stream (**Figure 3-1**). This watercourse passes the site from the east, flowing in a westerly direction to the River Colne.

Figure 3-1: Main River Map Extract (Source: EA Statutory Main River Map)

Topography

3.2. A topographical survey of the Site was carried out in October 2024 by Anthony Brookes Surveys Ltd, and is included in **Appendix B**.

3.3. The topographical survey shows the Site to have a ridge line falling east to west, that broadly separates the site one-third to the north and two-thirds to the south. Levels across the Site range from a high of approximately 104.25mAOD on the east boundary at the ridge, to low points of approximately 82.70mAOD at the north-west corner, and 79.80mAOD at the south-west corner.

Ground Conditions

3.4. The BGS online mapping indicates that no superficial deposits (**Figure 3-2**) exist over the Site or wider area.

Figure 3-2: Superficial Deposits (Source: British Geological Society)

3.5. The BGS mapping indicates that the site bedrock geology (**Figure 3-3**) is that of the London Clay formation, which consists of silty and sandy clays.

Figure 3-3: Bedrock Geology (Source: British Geological Society)

3.6. To date no findings of any intrusive investigations have been made available, and therefore BGS borehole records for adjacent areas would be relied upon to give further guidance on likely ground conditions. Near-by bores are shown to be limited within the general area of the Site (**Figure 3-4**), with a single bore within the care home site considered to offer a most likely gauge of Site conditions.

Figure 3-4: Historic Investigations (Source: British Geological Society)

3.7. The findings from this historic investigation of 1972 are summarised within Table 3-1.

3.8. Under the next stage of any application, a full intrusive investigation is to be allowed for as follows: to validate BGS findings; to confirm any reasonable infiltration potential on the Site; to ascertain seasonal groundwater levels.

3.9. For this stage of application, the BGS findings will be relied upon, which would be considered to bring a conservative approach to development drainage design, with disposal of surface water limited to discharge to near-by features at greenfield rates. If infiltration was found to be viable, this would increase the effective development discharge rates and reduce the volume and extent of balancing SuDS required.

Reference	Location	Ground Level and Depth	Findings
TQ19SW37/A	512740mE, 193380mN	GL – Unknown Depth – 3.20m	0.00-0.90m depth: Silty CLAY; 0.90-1.80m depth: Firm CLAY; 1.80-3.20m depth Firm to stiff CLAY
TQ19SW37/B	512740mE, 193380mN	GL – Unknown Depth – 3.00m	0.00-0.90m depth: Sandy, silty CLAY; 0.90-1.20m depth: MADE GROUND; 1.20-2.30 Soft to firm CLAY; 2.30-3.00m depth Firm to stiff CLAY
TQ19SW37/C	512740mE, 193380mN	GL – Unknown Depth – 3.20m	0.00-1.00m depth: Silty CLAY; 1.00-2.30m depth: Soft to firm CLAY; 2.30-3.20m depth Firm to stiff CLAY
TQ19SW37/D	512740mE, 193380mN	GL – Unknown Depth – 3.20m	0.00-0.50m depth: CLAY with topsoil; 0.50-2.30m depth: Soft to firm CLAY; 2.30-3.20m depth Firm CLAY

Table 3-1: BGS Borehole Summary

Existing Drainage Infrastructure

3.10. Thames Water sewer asset plans (**Appendix C**) show there are foul and surface water networks near the north-west corner of the Site (**Figure 3-5**), and which are as follows: 225mm diameter foul flowing east through rear gardens of houses on the nearside of Weston Road; 225mm diameter foul flowing west on the nearside of Weston Road; 225mm diameter foul flowing east on the offside of Weston Road.

3.11. Limited information on the invert levels of these sewers is known, however given the Site is near the head of these sewers, they would be anticipated to be at minimum cover to the ground level.

Figure 3-5: Sewer Asset Plan Extract (Source: Thames Water asset records)

4. Sources of Flooding

4.1. The NPPF requires flood risk from the following sources to be assessed, each of which are considered separately below:

- Tidal sources (flooding from the sea).
- Fluvial sources (river flooding).
- Pluvial sources (flooding resulting from overland flows).
- Groundwater sources.
- Sewer surcharge.
- Artificial sources, canals, reservoirs etc.
- It also requires the risk from increases in surface water discharge to be assessed (surface water management).

Tidal/Fluvial Flooding

4.2. The EA distinguish between three different flood zones as described below:

- **Flood Zone 1** is land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- **Flood Zone 2** is land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
- **Flood Zone 3** is land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

4.3. The EA flood maps for planning indicate the Site is primarily located within Flood Zone 1, with slight encroachment of Flood Zone 2 at the southwest corner (**Figure 4-1**). Excluding this nominal area, the Site is considered to have a very low annual probability of tidal/fluvial flooding, at less than 0.1%.

4.4. Through consideration of the EA fluvial flood map data, it has been ascertained that the 100-year plus climate change level adjacent to the Site is at 78.540mAOD, with the 1,000-year level at 79.570mAOD. These extents have been plotted upon the topographical survey, along with the mapped extents of the flood storage (**Figure 4-2**), which confirms the Site boundary to be north of both the 100-year with climate change extent and the flood storage.

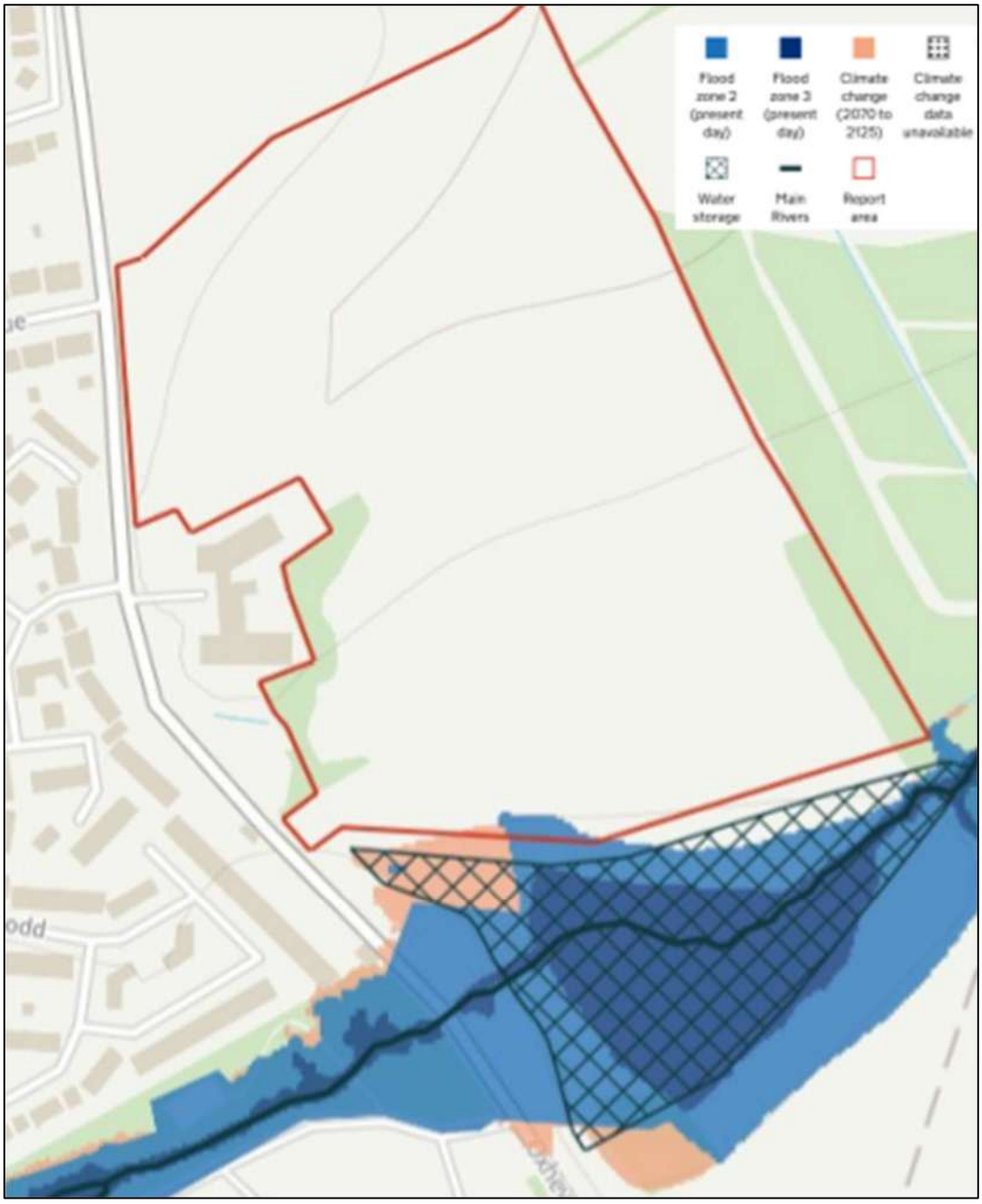


Figure 4-1: Fluvial Flood Zone (Source: EA mapping)

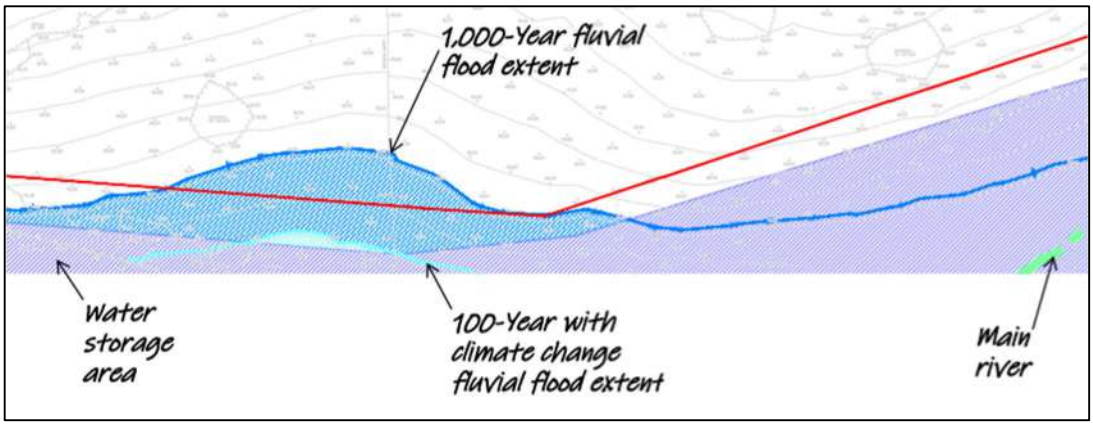


Figure 4-2: Fluvial Flood Extents at Southern Boundary

Surface Water Flooding

4.5. The EA distinguishes between four levels surface water flood risk as defined below:

- **Low risk** is defined as an area of land which has an AEP between 0.1% and 1%;
- **Medium risk** is defined as an area of land which has an AEP between 1% and 3.3%; and
- **High risk** is defined as an area of land which has an AEP greater than 3.3%.

4.6. Long term flood risk mapping **(Figure 4-3** to **4-4)** shows a ribbon of pluvial flooding along the localised valley in topography. This runs from a high point toward the centre of the Site, down toward the south and the watercourse.

4.7. With consideration of the proposals, it would be noted that the flooding extents for all risk profiles encroach into areas of the Site, however it would be considered that the flooding is generated by current site run-off with no flooding shown as entering from offsite areas.

4.8. Based upon site run-off generating the pluvial flooding, this would be reasonably mitigated through the positive draining of the Site that would be provided as part of the development and as is proposed within the drainage strategy.

Figure 4-1: High Risk Pluvial Flooding Extents (Source: EA mapping)

Figure 4-2: Medium Risk Pluvial Flooding Extents (Source: EA mapping)

Figure 4-3: Low Risk Pluvial Flooding Extents (Source: EA mapping)

Groundwater Sources

4.9. With reference to the Three Rivers Level 1 SFRA and accompanying flood mapping (**Figure 4-4**), it would be noted the Site is in an area where the depth to groundwater exceeds 5m, therefore the risk would be considered very low.

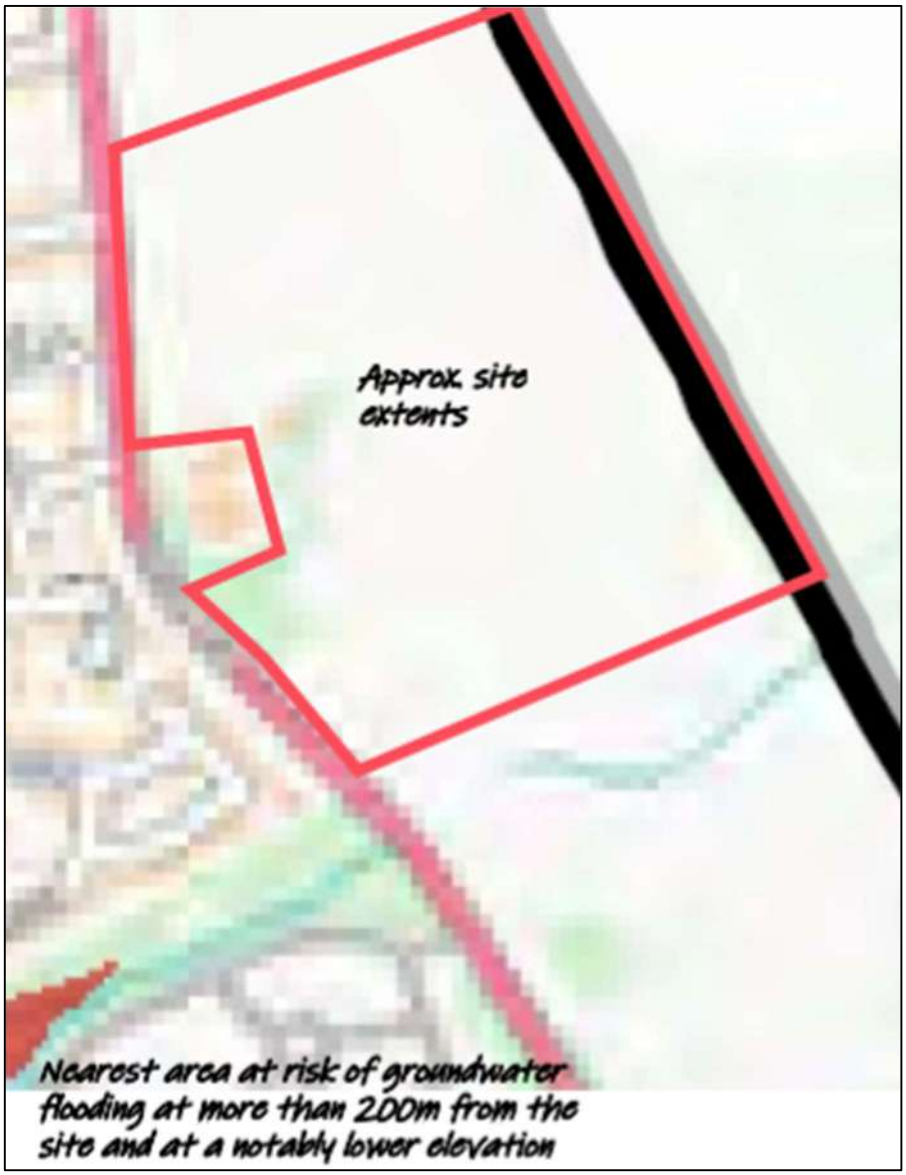


Figure 4-4: Groundwater Flooding Extents (Source: South West Hertfordshire Level 1 SFRA Appendix A by JBA Consulting)

Artificial Sources

4.10. Risk of flooding from artificial sources has been checked with reference to long term flood risk mapping (**Figure 4-5**), from which it would be interpreted that the flood storage area of the Hartsbourne Stream would contain inundation immediately south of the Site. With this the risk would be considered very low with such an event having low chance of occurrence generally.

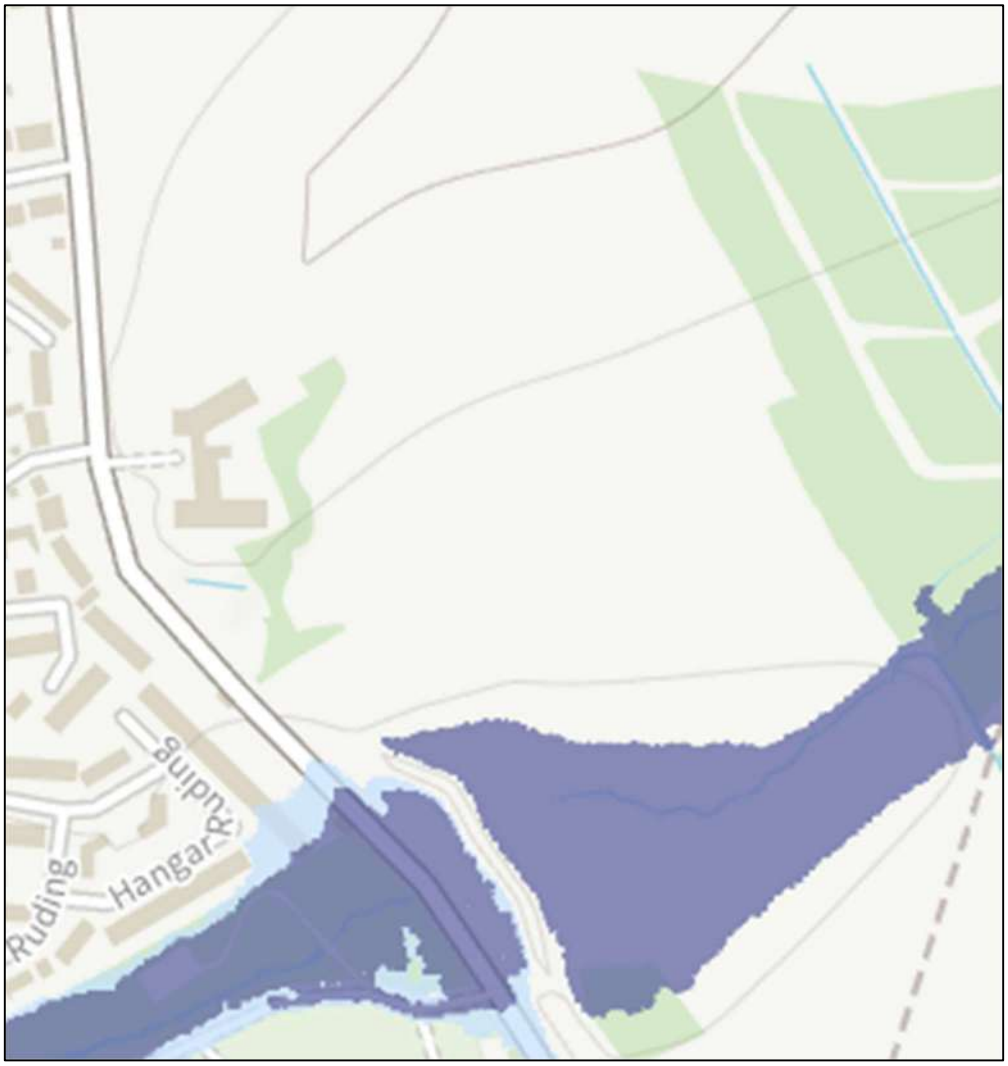


Figure 4-5: Groundwater Flooding Extents (Source: South West Hertfordshire Level 1 SFRA Appendix A by JBA Consulting)

Sewer Flooding

4.11. A sewer flooding report for the Site and surrounding area has been received from Thames Water, which was requested based upon the nearest postal address (Carpenders Park Care Home, Oxhey Lane, Watford, WD19 5RJ) and provided site location plan. The returned report confirms, *flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers*.

Flood Risk Summary

4.12. The risk of flooding pre and post development by varying source are summarised below (**Table 4-1**). Based upon the information available, consideration of the development form and future drainage provisions, the Site in the end condition would be concluded to be at low risk of flooding and would bring no undue increased risk on downstream receptors through introduction of an appropriately designed and managed drainage network.

4.13. As the Site is nominally within Flood Zone 2, with areas of current medium or high pluvial flood risk, a Sequential Test will be required to support the application.

Flooding Type	Pre-Development	Post-Development	Comments
Tidal/Fluvial	Very low to low	Very low to low	Site confirmed as being primarily located within Flood Zone 1, with a minor area within Flood Zone 2.
Surface Water Flooding	Very low to high	Low	An area of the Site is at high risk of flooding; however, through the effective development and positive draining of the Site, this risk will be significantly reduced or removed.
Groundwater Flooding	Very low	Very low	Site is not within an area recorded as being at risk of groundwater flooding.
Sewer Flooding	Very low	Very low	Thames Water have no flood incidents recorded within the vicinity of the Site.
Artificial Sources	Very low	Very low	Site is considered to be outside the inundation extent of any artificial sources.
Overall assessment of site risk = Low and suitable for residential development without flood mitigation measures.			

Table 4-1: Summary of Flood Risk Pre and Post Development

Flood Resistance

4.14. Notwithstanding the Site being at a reasonably low risk of flooding, resilience would be provided by setting of unit floor levels as noted below, to provide a freeboard from fluvial risk and offer protection from overland flows.

- Finished floor levels of units adjacent to the fluvial flood extent to be set at a minimum level of 600mm above the 100-year with climate change level, and therefore at not lower than 79.140mAOD.
- Finished floor levels should be set with a freeboard of 150mm to external ground, with levels falling locally away from units where practicable.

5. Surface Water Disposal and Rates of Discharge

Surface Water Disposal

5.1. The means of discharging surface water will require to be reviewed against the drainage hierarchy as contained within *Standard 1* of the current national SuDS standards, as replicated below.

- Priority 1 – collected for non-potable use
- Priority 2 - infiltration to ground
- Priority 3 - discharged to an above ground surface water body
- Priority 4 - discharged to a surface water sewer, or another piped surface
- water drainage system
- Priority 5 - discharged to a combined sewer

5.2. Notwithstanding that the non-potable water demands of the development as a residential use could not provide a primary means for disposing of all the potential run-off generated by the catchment, rainwater harvesting could be locally provided for to deliver water savings.

5.3. As rainwater harvesting would not fully dispose of surface water run-off generated by the catchment, disposal through infiltration to ground shall next be considered as a primary means for disposal of run-off.

5.4. Whilst no infiltration testing has been completed to date, the presence of shallow clay-based bedrock would be considered to preclude the use of infiltration to ground as a standalone means for disposal of surface water run-off.

5.5. Based upon the anticipated ground conditions, infiltration to ground as a means for disposal of surface water run-off would be currently ruled out.

5.6. A review of the Site topography and surrounding area shows that overland run-off from the site would partially pass toward the existing watercourse on the southern boundary. Connection to this watercourse at a controlled rate would therefore form the preferred means for partial disposal of the development surface water run-off.

5.7. With the topography of the Site, a northern portion of the development would be directed to the surface water sewer in Carpenders Avenue, with a gravity connection to the watercourse in the south not reasonably achievable.

Existing and Proposed Discharge Rates

5.8. The application boundary for the Site equates to an area of approximately 12.7ha, comprising of greenfield land. Approximately 7.0ha of the application area would be considered as proposed for development, with the remainder retained as common open space.

5.9. As the Site is greenfield and with only a nominal reduction in volume of run-off from the proposed development expected through any re-use, interception and/or infiltration; this will exceed that of the pre-developed situation.

5.10. With the volume of run-off from the Site to increase following development, and in accordance with Standard 3 of the current national SuDS standards, the discharge from the development will be restricted to Qbar for up to the 100-year return period storm with climate change allowance.

5.11. With consideration of the current national SuDS standards, the allowable rate of run-off will be calculated based upon the development area (application area less public open space) being potentially drained, which is considered at this stage to equate to 7.0ha.

5.12. Pro-rata greenfield run-off rates utilising FEH22 rainfall data for key return periods are presented within **Tale 5-1** (calculation and FEH data within **Appendix D)**.

Return Period	Per Hectare (l/s)	Application Area of 12.7ha (l/s)	Developable Area of 7.0ha (l/s)
Qbar	5.69	72.3	39.8
Q1	4.83	61.3	33.8
Q30	13.08	166.1	91.6
Q100	18.14	230.4	127.0

Table 5-1: Greenfield Run-off Rates

5.13. Considering the prevailing falls of the Site (**Figure 5-1**) the allowable rate of discharge will be split for a north and south catchment area of 3.6ha north, and 9.1ha south.

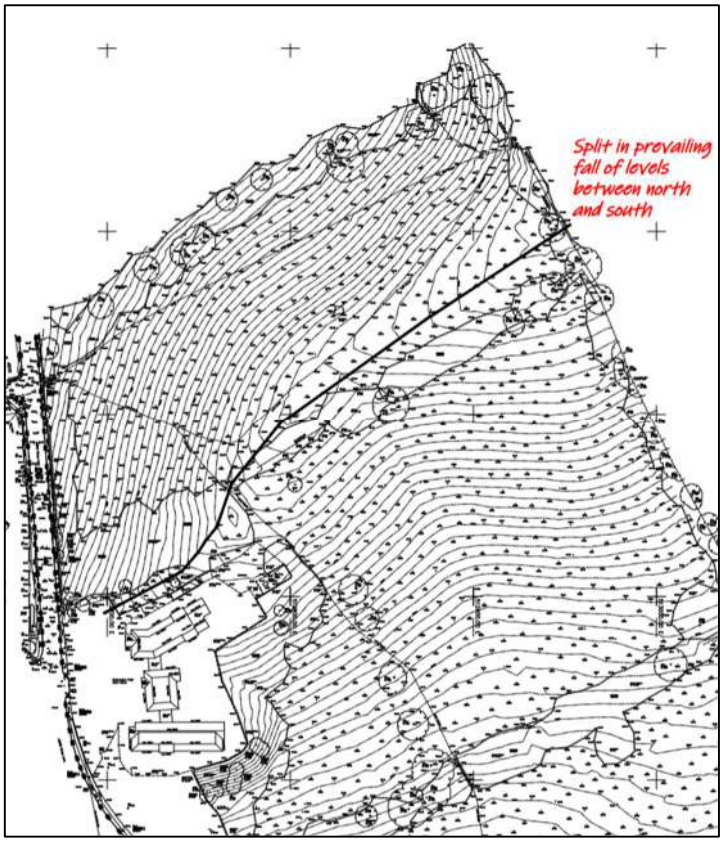


Figure 5-1: Break in prevailing levels

5.14. Based upon the catchment split of the Site and under current conditions, the greenfield run-off to the north under Qbar is 20.5l/s, and 51.8l/s to the south from the application area.

5.15. To the north, 1ha of developable area is within the current north catchment, but a total of 2. 3ha of developable area is proposed to drain in that direction following re-profiling of the Site. With that the restriction to the north will be set at a rate of 5.7l/s, the Qbar greenfield rate from the 1ha area.

5.16. To the south, the restriction rate will be set by the developable area draining in that direction under the proposed condition, with an area of 4.7ha giving a rate of 26.7l/s.

5.17. With the noted controls, the total developable area run-off from the Site will be restricted to 32.4l/s for up to the 100-year return period storm with climate change allowance. This will bring a significant reduction in run-off rates when compared with the pre-development condition, therefore reasonably ensuring the development brings no undue increase in downstream flood risk.

6. Surface Water Drainage Strategy

Sustainable Drainage Systems (SuDS)

6.1. The current national standards for SuDS and CIRIA SuDS manual have been used to determine an appropriate SuDS strategy, which considers the spatial and environmental constraints of the site.

6.2. Based upon the above guidance, constraints, and opportunities for the use of SuDS techniques are outlined in **Table 6-1**, appraised using the Management Train approach outlined in CIRIA C753.

Green Roofs (Source Control)	
Constraints:	Subject to Architect's design.
Opportunities:	Deemed incompatible with type of development, with low density housing and likely preference for pitched roofs.
Lined Permeable Paving (Source Control)	
Constraints:	It is considered unfeasible to provide widespread infiltrating permeable paving due to site characteristics (see infiltration devices below).
Opportunities:	Permeable paving with a drained outfall to provide a stage of at-source treatment would be considered reasonable (see infiltration devices below).
Rainwater Harvesting (Source Control)	
Constraints:	The benefits of rainwater harvesting on a specific design storm event cannot be quantified, due to the seasonal availability of storage within the structure.
Opportunities:	Opportunities to provide local/nominal harvesting features exist, for re-use in irrigation and for grey water uses. However, it is difficult to quantify contributions from these, so no consideration of the benefits offered are made within the attenuation calculations.
Infiltration Devices (Source Control)	
Constraints:	Based upon anticipated clay soils, discharges to ground would be considered unsuitable.
Opportunities:	Subject to BRE 365 testing, anticipate none at this stage.
Tree Pits/Bio-retention (Source Control)	
Constraints:	Subject to Landscape Architect's design.
Opportunities:	Opportunities to use landscaped space to incorporate tree pits and bio-retention areas.

Swales (Conveyance and Storage)	
Constraints:	To provide practicable attenuation benefits, 1:3 side-slope swales tend to require a significant land requirement.
Opportunities:	Opportunities to provide as at source conveyance features, which will provide treatment to run-off and allow drainage to be kept at a shallower depth.
Filter trenches (Conveyance and Storage)	
Constraints:	At c30% void, filter trenches do not provide a significant volume of storage and are therefore not feasible as primary attenuation.
Opportunities:	Opportunities to provide as conveyance features which will provide treatment to run-off and potentially nominal volumes of attenuation.
Detention/Retention Basins (Storage)	
Constraints:	Subject to Architect's site layout.
Opportunities:	It would be anticipated that current areas of open space would offer ample area for provision of basins.
Attenuation Tanks (Storage)	
Constraints:	None
Opportunities:	Potential to locate belowground within private parking courts and areas of public open space, providing efficient attenuation with void ratios typically of 95% or greater.

Table 6-1: SuDS Features Appraisal

6.3. With consideration of the above with noted purpose of SuDS to offer interception of run-off, removal of pollutants and balancing of flows; a combination of the following forms is proposed:

- Water butts to offer partial interception and re-use of clean roof water run-off for garden irrigation.
- Drained permeable paving to private and shared driveways to offer interception and at-source treatment to the given pavement area, and nominal adjacent impermeable finishes.
- Drained swales and bioretention features to offer interception and at-source treatment to adjacent roads.
- Detention basins for balancing of run-off, along with residual interception and treatment of run-off.

Climate Change Allowance

6.4. The National Planning Policy Framework (NPPF) of December 2024, paragraphs 162 to 164(a) inclusive, establish the Planning policy relating to climate change in the context of flood risk and drainage.

6.5. The focus of the policy is to direct development towards areas of the lowest practicable flood risk and to ensure that all development is safe, without increasing flood risk elsewhere. As part of this, it is noted that proposals should take a proactive approach to mitigating and adapting to climate change, considering the long-term implications for flood risk.

6.6. Guidance on how climate change is predicted to alter peak rainfall intensity has been considered, and for this site the upper requirements are noted as below.

- **30-year** return period storms – **35%** allowance for climate change
- **100-year** return period storms – **40%** allowance for climate change

Surface Water Drainage Network

6.7. Refer to **Appendix E** for drawing nos. 2403160-ACE-XX-XX-DR-C-0601 and 0602, showing the preliminary surface water drainage layout and provision of SuDS, based upon the illustrative masterplan.

6.8. Based upon the prevailing levels of the Site against anticipated levels of the watercourse and sewer, draining of the development surface water by gravity would be considered achievable.

6.9. Points of connection from the surface water drainage will be to the existing Thames Water surface water sewer in the north, and the watercourse to the south. The rate of discharge to each point will not exceed the greenfield run-off for the catchment, with a restriction of 5.7l/s for the sewer connection and 26.7l/s for the watercourse connection.

6.10. To achieve the restrictions in discharge rate without undue flood risk to the development or surrounding area, a total storage volume of approximately 3,650m^3 is to be provided. This is based upon balancing of the 100-year return period event with 40% climate change allowance, and the following parameters:

- Catchment area (north) - impermeable area of 1.52ha (with a 10% urban creep allowance) and equates to 66% of a 2.3ha primary development area.
- Catchment area (southeast) - impermeable area of 2.73ha (with a 10% urban creep allowance) and equates to 70% of the 3.9ha primary development area.
- Catchment area (southwest) - impermeable area of 0.53ha (with a 10% urban creep allowance) and equates to 66% of the 0.8ha primary development area.
- Cv values – based upon 'default' values of 0.75 for summer and 0.84 for winter storm events, considered appropriate with provision of interception.

6.11. The calculated balancing volume will be allowed for within detention basins provided to the north and south of the Site within the proposed public open space, with modelling results from Causeway Flow provided within **Appendix F**.

6.12. The surface water drainage network will be designed to ensure appropriate conveyance and containment of run-off for storm events up to the 1 in 100-year event with 40% allowance for climate change. Through appropriate setting of levels, exceedance flows brought beyond this return period event will be reasonably directed away from buildings, toward open spaces and roads to reduce the risk to person and property.

Surface Water Quality

6.13. SuDS features to be provided by area drained are as follows, with review of the combined pollution mitigation through the Simple Index approach provided within **Appendix G.**

- **Higher traffic roads** (including adjacent footways and parking bays) – drained at or near source by swales or bio-retention features; further site wide treatment provided through detention basins.
- **Low traffic roads** (including adjacent footways and parking bays) – with potentially reduced opportunity to provide at source SuDS for these areas with lesser or no verge areas, treatment will be provided through the end-of-line detention basins.
- **Shared driveways and plot run-off** – drained at or near source by permeable paving; further site wide treatment provided through detention basins.

Future Maintenance

6.14. Where not adopted by a relevant authority, a management company will be appointed to maintain communal areas, landscaping and shared SuDS throughout the development.

6.15. All maintenance will be in accordance with the best practices and the CIRIA Manual C753 (see **Appendix H**).

7. Foul Water Drainage Strategy

7.1. Refer to **Appendix E** for the drawing no. 2403160-ACE-XX-XX-DR-C-0601, showing the preliminary foul water drainage layout.

7.2. As the existing site is greenfield, it will currently generate no foul water demand, nor have an existing connection to the sewer network or similar.

7.3. A peak foul water discharge of 12.80l/s would be generated from the up to 256 No. dwellings, based upon SSG guidance of 0.05l/s peak per dwelling.

7.4. A peak foul water discharge of 3.00l/s has been allowed for from the 0.4ha area allocated for a care provision facility. This is based upon capacity for 60 No. residents, with a peak of 0.05l/s peak per resident.

7.5. As the Development will be split between a direct gravity connection and pumped discharge, the final peak discharge will be adjusted, based upon 70% of the residential units and the care facility discharging via a pump. Assuming this will discharge at 50% of the incoming peak, a total peak of 9.80l/s for the development would currently be allowed for.

7.6. With review of the Thames Water record plans, the nearest foul water asset is noted as a 225mm diameter gravity sewer that runs west from the north-west corner of the Site. From the asset plan, whilst there appears to be a chamber located within the Site, this has not been located as part of the topographical survey works, but covers are located within Oxhey Lane.

7.7. Based upon invert levels denoted upon Thames Water record plans around the point of the proposed connection, a gravity discharge would be achieved from the section of development to the north of the Site ridge. The southern area would broadly follow the prevailing topography of the Site to the south-west corner by gravity, with a rising main then provided back up to the head of the north catchment gravity network.

7.8. In accordance with Part H of Building Regulations, emergency storage should be provided at the pump station to offer reasonable protection from flooding to upstream properties in the event of pump failure. As more than 30 No. properties would be connecting to the pump, storage requirements of SSG Appendix C would be considered more appropriate at 160 litres per unit, opposed to 150 litres per person.

7.9. With equivalent of 240 No. units connected, the volume of emergency storage to be provided within the wet well and supplemented by an appropriate belowground tank or similar would be 38.4m^3

8. Conclusions

8.1. This Flood Risk Assessment & Drainage Strategy has been prepared to accompany the planning application for the development of an existing greenfield site.

8.2. According to Environment Agency flood mapping, the Site is within Flood Zone 1. On this basis the NPPF classified 'more vulnerable' form of development is considered sequentially appropriate for the site and does not require application of the exception test.

8.3. The potential risk of flooding to the Site from all sources has been assessed, and following development would be considered appropriately low without need for mitigation measures.

8.4. As in the current condition the Site is partially within Flood Zone 2 and has an increased risk of pluvial flooding, the Sequential test will need to be completed.

8.5. The surface water drainage strategy will manage flood risk downstream of the proposed development, by restricting the permitted rate of discharge to not exceed Qbar. This restriction will be applied for up to the 100-year event with 40% allowance for climate change.

8.6. The surface water run-off from the development will primarily be attenuated within basins, with a total volume of approximately 3,650m^3 required to balance run-off, with the discharge of run-off split between an existing watercourse and surface water sewer which bound the Site to south and north, respectively.

8.7. An adopting authority or management company will be appointed to maintain SuDS within the development. As appropriate, funding for the maintenance regime will be through annual factoring fees, with maintenance techniques to accord with best practise and CIRIA Manual C753.

8.8. It is proposed that foul water generated by the development will discharge into a Thames Water sewer running from the edge of the Site Oxhey Lane. Based upon the Site topography, a portion of the Development will need to connect via a pump.

8.9. In summary this Flood Risk Assessment & Drainage Strategy demonstrates that the proposals are consistent with the aims of the NPPF and planning guidance. The development will not be at undue risk of flooding, nor will it unduly increase flood risk downstream.

Appendix A

Illustrative Masterplan

KEY - ILLUSTRATIVE MASTERPLAN

- SITE BOUNDARY
- PROPOSED VEHICULAR ACCESS
- PROPOSED PEDESTRIAN ACCESS
- PROPOSED EMERGENCY ACCESS
- PROW
- OPEN SPACE
- RESIDENTIAL PARCELS
- PROPOSED SUDS
- EXISTING VEGETATION
- INDICATIVE PROPOSED PLANTING
- PROPOSED LEISURE ROUTE
- INDICATIVE STREETS

N 0 25 50 m

DRAFT

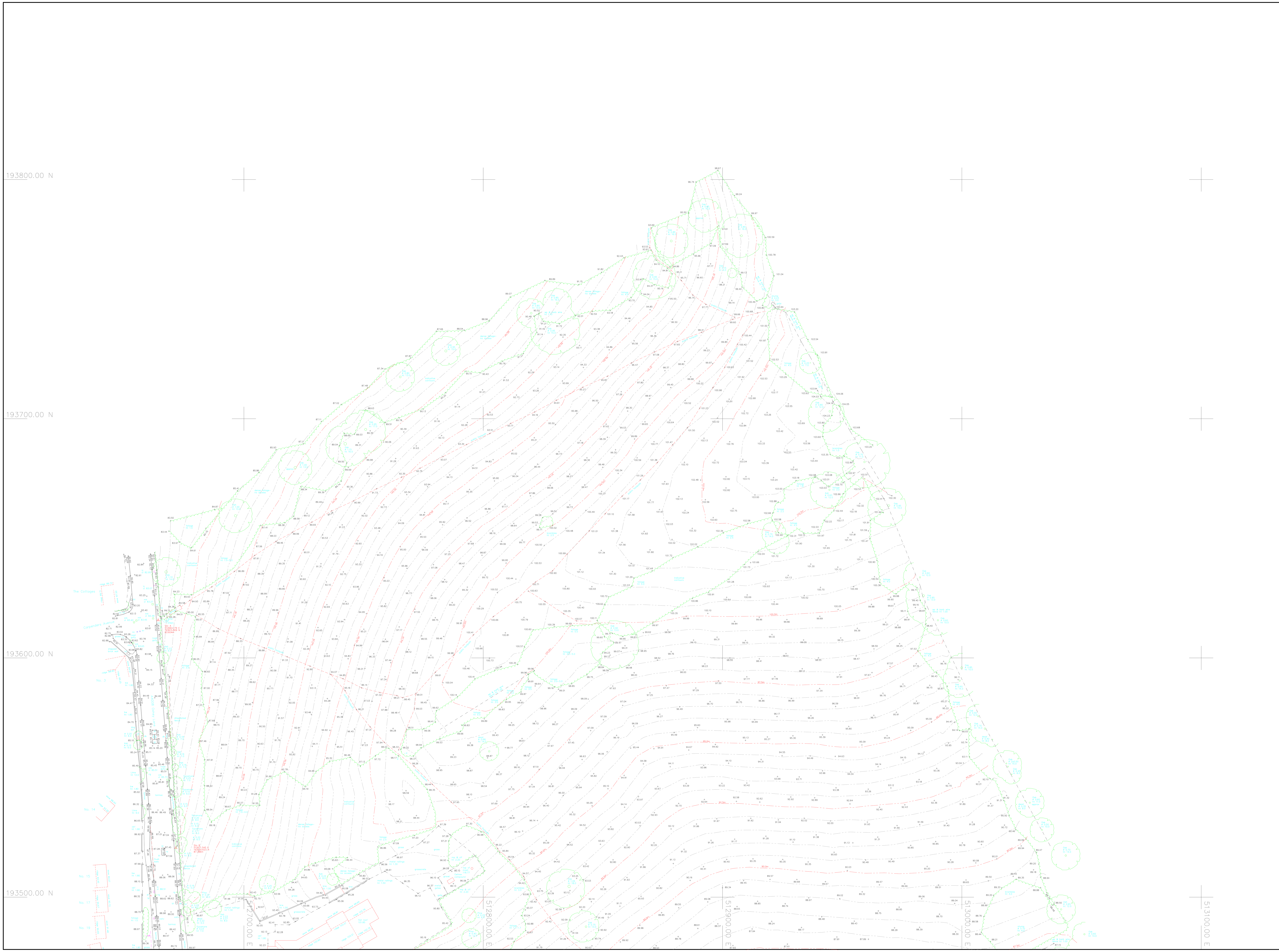
LAND AT CARPENDERS PARK FARM - ILLUSTRATIVE MASTERPLAN

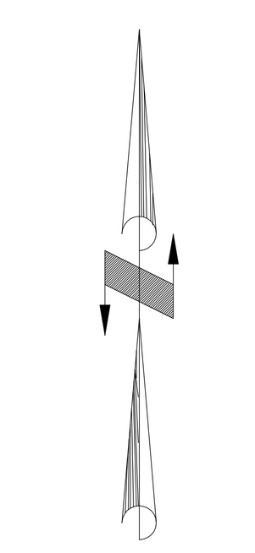
PEGASUS GROUP

| PEGASUSGROUP.CO.UK | TEAM/DRAWN BY: LT | APPROVED BY: JF | DATE: 18/02/2025 | SCALE: 1:1000@A1 | DRWG: P24-2204_DE_003_A_01 | CLIENT: BURLINGTON DEVELOPMENTS |

Appendix B

Topographical Survey





APPROX.

STANDARD REFERENCES

ABBREVIATIONS

bb	belisha beacon	ko	kerb outlet
bl	bollard	lb	light bollard
brw	brick ret. wall	lp	lamp post
bs	bus stop	mh	manhole
bt	telecoms cover	mk	marker post
bw	brick wall	mp	metal post
catv	cable TV cover	np	nameplate (road)
cbf	closeboarded fence	obf	open boarded fence
cbrw	conc block ret. wall	p	post
cbw	conc block wall	pb	post box
cl	cover level	ret.	retaining wall
clf	chainlink fence	re	rodding eye
conc	concrete	rg	road gully
cp	concrete post	rs	road sign
cw	concrete wall	rwp	rainwater pipe
cws	combined sewer	sp	signpost
dk	drop kerb	srw	stone ret. wall
ep	electricity pole	sv	stop valve
ESS	Elec. Sub-Station	svp	soil vent pipe
fb	flower bed	sw	stone wall
fh	fire hydrant	s/w	stay wire
fl	floor level	sws	storm water sewer
fws	foul water sewer	tcb	telephone callbox
g	gully	tl	traffic light
gsv	gas valve	tp	telegraph pole
h/r	hand rail	utr	unable to raise
ic	inspection cover	vp	vent pipe
il	invert level	w'lap	woodlap fence
irf	iron railing fence	wm	water meter
jb	junction box	wp	wood post

Notes

1. This survey has been computed and drawn "true to scale" and relates to the OSTN15 GPS National Grid at a single point.
2. All levels are in metres and relate to the mean of the nearest five Ordnance Survey active GPS stations (OSGM15).
3. This survey was measured for a scale of 1:500, any subsequent enlargements should be verified on site.

Revisions

Anthony Brookes Surveys Ltd
LAND, GPS, BUILDING & ENGINEERING SURVEYORS

Unit 2 Thornbury Office Park
Midland Way
Thornbury
Bristol
BS35 2BS
TEL: (01454) 419 133

e-mail: info@anthonybrookes.com
web: www.anthonybrookes.com

THE SURVEY ASSOCIATION
Regulated by RICS
Certificate Number 15302
ISO 9001, ISO 14001

Surveyed	C Langslow	Date	October 2024
Drawn	C Langslow	Checked	October 2024

Drawing Title: Topographical Survey
Carpenders Park Dairy
Oxhey Lane
Watford, WD19 5RJ

Client: Burlington Property Group
Foresters Hall
25-27 Westow Street
Upper Norwood
London, SE19 3RY

Drawing No.	Rev	Scale A0 @
B452/13367/1A		1:500

193500.00 N

193400.00 N

193300.00 N

193200.00 N

512700.00 E

512800.00 E

512900.00 E

513000.00 E

513100.00 E

APPROX.

STANDARD REFERENCES

ABBREVIATIONS

bb	bellsha beacon	ko	kerb outlet
bl	bollard	lb	light bollard
brw	brick ret. wall	lp	lamp post
bs	bus stop	mh	manhole
bt	telecoms cover	mk	marker post
bw	brick wall	mp	metal post
catv	cable TV cover	np	nameplate (road)
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cl	cover level	ret.	retaining wall
clf	chainlink fence	re	rodding eye
conc	concrete	rg	road gully
cp	concrete post	rs	road sign
cw	concrete wall	rwp	rainwater pipe
cws	combined sewer	sp	signpost
dk	drop kerb	srw	stone ret. wall
ep	electricity pole	sv	stop valve
ESS	Elec. Sub-Station	svp	soil vent pipe
fb	flower bed	sw	stone wall
fh	fire hydrant	s/w	stay wire
fl	floor level	sws	storm water sewer
fws	foul water sewer	tcb	telephone callbox
g	gully	tl	traffic light
gov	gas valve	tp	telegraph pole
h/r	hand rail	utr	unable to raise
ic	inspection cover	vp	vent pipe
il	invert level	w'lap	woodlap fence
irf	iron railing fence	wm	water meter
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Notes

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Revisions

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Bristol
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Client: Burlington Property Group
Foresters Hall
25-27 Westow Street
Upper Norwood
London, SE19 3RY

Drawing No.	Rev	Scale A0 @
B452/13367/1B		1:500

Appendix C

Thames Water Wastewater Asset Plan

Asset Location Search

Thames Water Property Searches

Ardent Consulting Engineers
The Hallmark Building
52-56 Leadenhall Street
LONDON
EC3M 5JE

Search address supplied WD19 5RJ

Your reference Carpenders Park Watford WD19

Our reference ALS/ALS/24/2024_5081442

Search date 15 November 2024

Notification of Price Changes

From 1st April 2024 Thames Water Property Searches will be increasing the prices of its CON29DW Residential and Commercial searches along with the Asset Location Search. Costs will rise in line with RPI as per previous years, which is sat at 6%.

Customers will be emailed with the new prices by February 28th 2024.

Any orders received with a higher payment prior to the 1st April 2024 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk.

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

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

0800 009 4540

Asset Location Search

Property Searches

Search address supplied: WD19 5RJ

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 search provides 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 0800 009 4540, 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

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

TQ1293SE
TQ1293NE

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.

The following quartiles have not been printed as they contain no assets:

TQ1393NW
TQ1393SW

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.

Following examination of our statutory maps, Thames Water has been unable to find

any plans of water mains within this area. If you require a connection to the public water supply system, please write to:

New Connections / Diversions
Thames Water
Network Services Business Centre
Brentford
Middlesex
TW8 0EE

Tel: 0845 850 2777
Fax: 0207 713 3858
Email: developer.services@thameswater.co.uk

The following quartiles have not been printed as they are out of Thames' water catchment area. For details of the assets requested please contact the water company indicated below:

TQ1393NW Affinity Water
TQ1293SE Affinity Water
TQ1393SW Affinity Water
TQ1293NE Affinity Water

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ

Tel: 0345 3572401

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

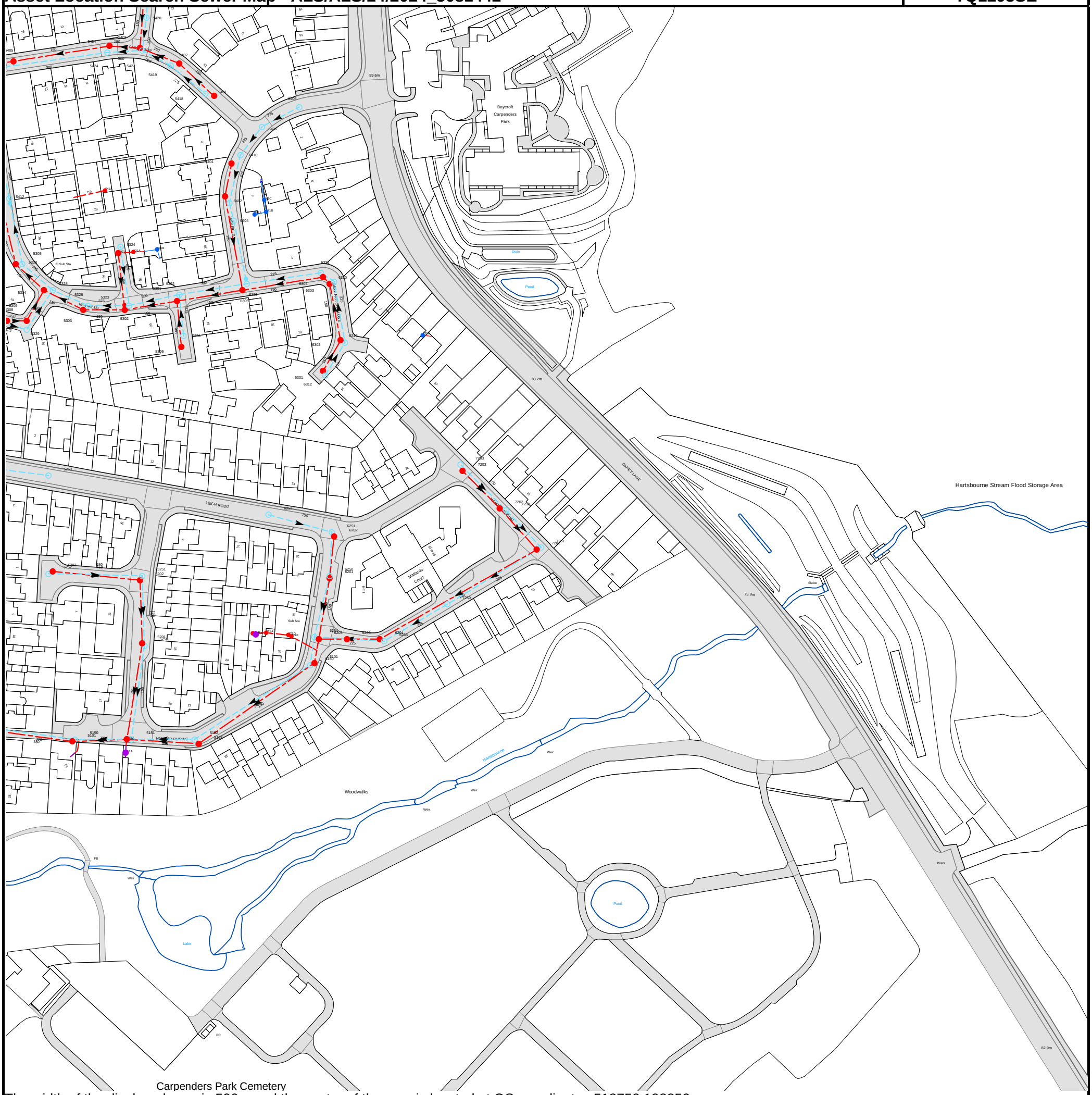
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

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/24/2024_5081442

TQ1293SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 512750,193250

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

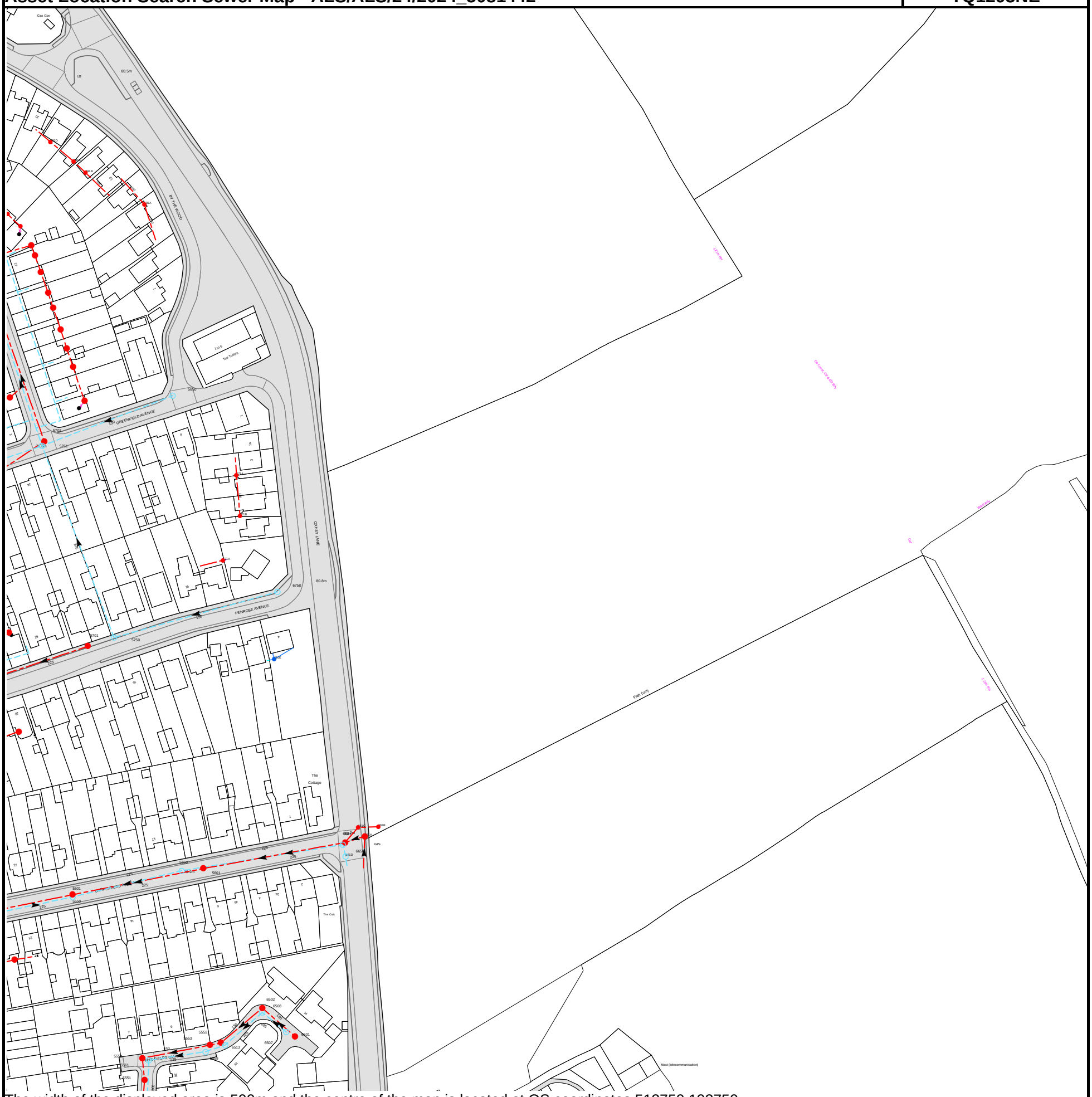
Manhole Reference	Manhole Cover Level	Manhole Invert Level
641A	n/a	n/a
641B	n/a	n/a
641C	n/a	n/a
621C	n/a	n/a
621A	n/a	n/a
6252	80.73	79.46
621D	n/a	n/a
621E	n/a	n/a
6254	n/a	n/a
6205	n/a	n/a
6301	83	81.15
6312	82.95	81.47
6250	79.47	77.49
6201	79.4	77.1
6303	8495	80.72
6251	80.17	78.87
6202	80.13	78.51
6302	83.76	81.07
6313	83.63	81.06
6203	77.96	75.14
6204	77.87	75.24
6253	77.87	75.67
631A	n/a	n/a
7250	78.11	75.84
7253	792.7	78.01
7203	79.31	77.75
7202	78.47	76.67
7252	78.42	77.04
7201	77.87	75.86
7251	77.81	76.26
6320	84.9	80.87
6304	85.11	80.64
6321	85.06	80.83
5305	81.56	79.56
5333	81.64	78.72
5307	83.1	81.3
531A	n/a	n/a
531B	n/a	n/a
5324	83.12	81.06
6404	85.26	83.64
6412	85.47	83.81
5412	80.71	75.45
6402	85.55	82.34
541A	n/a	n/a
6401	85.93	83.87
6410	86.05	84.37
6406	86.53	84.79
6405	87.91	86.28
5401	84.71	82.54
5418	84.5	82.66
5419	83.08	81.21
5402	83.29	81.08
5405	79.01	77.08
5424	81.12	78.79
5422	82.1	78.81
5403	81.97	78.47
5404	81.19	78.29
5428	81.97	79.37
5308	81.33	79.98
5309	81.63	79.92
5329	81.55	79.46
5304	82.17	79.78
5253	80.18	78.82
5252	79.36	77.81
5328	82.23	79.05
5203	79.37	77.47
5303	82.61	79.94
5326	82.68	80.08
5302	83.14	80.02
5323	83.21	80.21
5202	79.65	76.98
5251	79.53	77.07
5301	83.78	80.78
5322	n/a	n/a
5306	83.58	81.42
5336	83.62	82.02
6305	84.71	80.19
6323	84.82	80.58
621B	n/a	n/a
511A	n/a	n/a
5103	75.85	74.19
5101	76.01	73.65
5151	76.11	74.25
5150	76.01	74.01
5102	76.11	73.01
5152	75.81	74.51
6150	77.23	75.12
6101	77.19	74.7
5250	78.11	75.99
5201	78.14	74.79

Manhole Reference	Manhole Cover Level	Manhole Invert Level

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

Asset Location Search Sewer Map - ALS/ALS/24/2024_5081442

TQ1293NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 512750,193750

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 512750,193750

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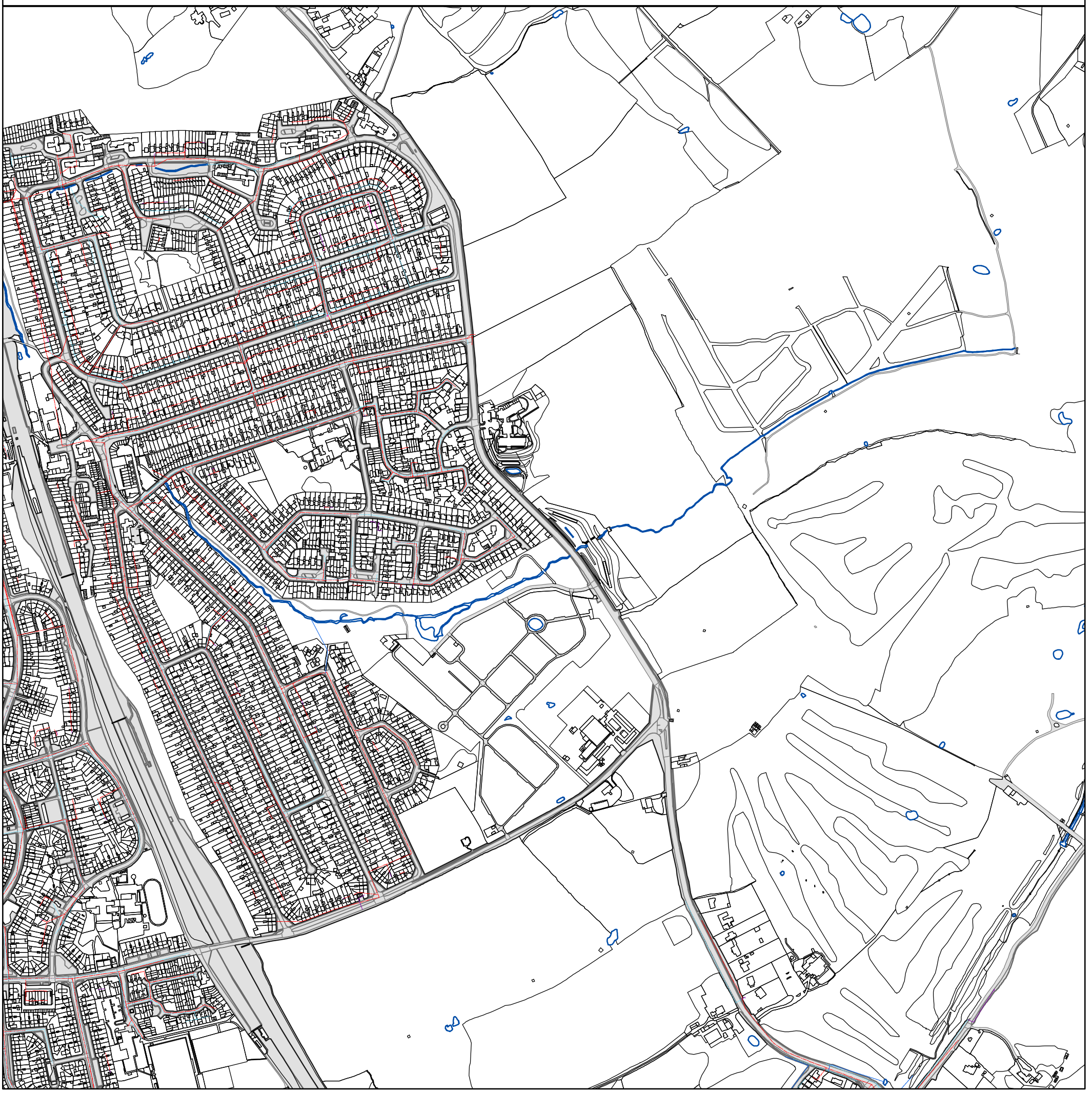
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
661E	n/a	n/a
571A	n/a	n/a
5752	n/a	n/a
5501	n/a	n/a
5651	n/a	n/a
5501	77.89	75.84
5550	77.89	76.32
5701	78.66	77.21
5750	78.62	76.64
5650	79.93	78.73
5601	79.96	78.36
6750	79.94	77.81
6650	83.35	81.6
6601	83.37	81.17
661D	n/a	n/a
661C	n/a	n/a
661A	n/a	n/a
661B	n/a	n/a
5901	n/a	n/a
5862	n/a	n/a
591D	n/a	n/a
591C	n/a	n/a
591B	n/a	n/a
591A	n/a	n/a
5551	81.19	78.75
5561	80.85	79.31
5554	80.66	78.86
5559	81.83	80.14
6513	82.15	80.56
5553	81.9	80.05
5552	82.08	80.26
6501	83.89	82.04
6507	83.7	82.14
6508	83.14	81.59
6502	83.1	81.31
5852	n/a	n/a
5851	n/a	n/a
5850	79.42	78.21
5853	n/a	n/a
5854	n/a	n/a
5856	n/a	n/a
5857	n/a	n/a
5858	n/a	n/a
5859	n/a	n/a
5860	n/a	n/a
5861	n/a	n/a
671B	n/a	n/a
671A	n/a	n/a
5751	76.4	73.72
5702	n/a	n/a

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS/24/2024_5081442



0 45 90 180 270 360
Meters

Scale:	1:7160
Width:	2000m
Printed By:	SEswara1
Print Date:	15/11/2024
Map Centre:	512797,193228
Grid Reference:	TQ1293SE

Comments:

ALS/ALS/24/2024_5081442

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
391D		
621A		
931B		
621C		
621E		
3201	83.7	82.47
251C		
811C		
3902	70.89	69.1
3863		
3662		
4770		
4550	76.35	74.53
4655		
2050	69.83	67.71
2568		
5303	82.61	79.94
5701	78.66	77.21
8702	66.51	59.84
3856		
3752	79.36	78.16
3802	77.92	75.57
4801	76.38	74.14
4652		
4872		
3701	78.83	74.83
3750	78.86	74.02
3851	79.13	77.76
4860		
8769		
4601	80.22	77.31
8301	79.29	76.38
9402	64.4	61.91
9602		
4955		
5551	81.19	78.75
8757		
3651		
4554		
4875		
5559	81.83	80.14
1450	73.94	71.29
1305		77.77
8609		
8351	80.15	77.79
2301	87.71	85.03
1101	67.96	65.09
2850	75.47	73.8
2501	74.5	71.63
3501	75.07	72.62
1604		
8770		
5403	81.97	78.47
5201	78.14	74.79
5422	82.1	78.81
5152	75.81	74.51
8608		
8768		
9605		
9607		
4768		
0450	71.22	69.16
7202	78.47	76.67
9906	67.98	66.44
9903	65.93	65.02
9601	75.57	72.39
9002	71.48	67.83
0514		
5601	79.96	78.36
8606		
8618		
8701	67.94	66.09
1517		
2601	83.17	79.55
0902	66.89	64.89
1301		77.63
1509		
3663		
4758		
4654		
2502	74.81	72.87

REFERENCE	COVER LEVEL	INVERT LEVEL
391E		
931A		
621B		
621D		
2203	84.12	81.88
251B		
251A		
251A		
3858		
3767		
3655		
4870		
4501	76.35	74.21
2550	74.49	72.16
2001	69.8	67.13
1605		
5326	82.68	80.08
5802	78.86	76.46
3664		
3769		
3850	77.86	75.32
4685		
4558		
4658		
2455		
3760		
3671		
4901	76.05	73.7
4686		
4762		
7250	78.11	75.84
8756		
9902	65.76	64.86
9907	71	69.23
5250	78.11	75.99
5561	80.85	79.31
3853		
4802	78.3	74.9
4855		
5418	84.5	82.66
0505		
1401	73.95	70.97
1302		77.49
8610		
1507		
9515		
1150	68	66.21
2801	75.48	73.83
3550	75.07	72.88
1002	71.96	70.31
1510		
5202	79.65	76.98
5803	79.38	77.61
5251	79.53	77.07
5554	80.66	78.86
5103	75.85	74.19
8751	70.83	
8702	70.82	67.11
9614		
4252	77.31	75.43
9601	73.09	71.41
0506		
8758		
9611		
9650	75.57	72.69
9612		
9905	67.68	65.56
5336	83.62	82.02
8617		
8750	67.93	66.18
8607		
1801	76.95	75.26
1850	76.94	75.23
9453	64.42	63.16
0504		
1902	67.99	66.1
3768		
3654		
4769		
4871		
2554		

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REFERENCE	COVER LEVEL	INVERT LEVEL
2551	74.77	73.15
1351	67.83	65.75
1601		
7253	792.7	78.01
9401	80.43	75.38
9603		
3102	70.71	69.09
3801	76.92	74.18
3871		
9850	76.49	72.08
9701	72.96	70.54
9452	64.92	63.39
9510		
8762		
9604		
5322		
5306	83.58	81.42
7201	77.87	75.86
0522		
0401	71.1	68.74
9101		
0350	65.61	64.53
9301	81.5	78.71
9502		
9759		
6404	85.26	83.64
1903	68.12	66.27
2560		
8801	75.53	71.01
6321	85.06	80.83
6312	82.95	81.47
6250	79.47	77.49
5252	79.36	77.81
5328	82.23	79.05
2651		
051A	0	0
1456	80.11	77.73
9551	77.38	74.27
8615		
9606		
9506		
0901	65.66	64
5553	81.9	80.05
5552	82.08	80.26
9802	72.93	71.77
9910	65.49	63.8
9301	65.65	63.5
0513		
0501	73.63	72.58
0502		
2456		
3670		
3250	76.22	74.62
3801	73.81	72.16
3501	80.82	79.49
4859		
4750	77.6	76.11
3901	70.8	68.69
8759		
3854		
4874		
4653		
0750	76.01	72.6
0701	76.02	72.11
0651	82.97	81.38
9758		
9757		
9403	64.84	62.26
8350	70.04	68.51
3753	80.11	78.75
3202	73.98	71.94
3402	74.71	72.45
3451	74.75	72.77
4454	78.88	76.88
4802	74.96	72.59
3764		
4761		
4456	77.13	75.45
2559		
6507	83.7	82.14
4250	77.95	76.36

REFERENCE	COVER LEVEL	INVERT LEVEL
3902	73.47	68.74
1511		
9750	72.99	70.89
7203	79.31	77.75
9613		
5419	83.08	81.21
3773		
3857		
7251	77.81	76.26
0515		
9405	64.94	62.56
9750	74.48	73.15
9801	72.35	71.1
9909	64.25	62.41
5301	83.78	80.78
5402	83.29	81.08
5650	79.93	78.73
0331		
0330		
1450	80.14	78
9106		
8605		
9454	64.64	62.79
9350	81.54	79.18
6401	85.93	83.87
3653		
1302	67.84	65.46
9804	64.11	62.19
5701	81.23	75.68
6301	83	81.15
6201	79.4	77.1
6303	8495	80.72
5203	79.37	77.47
5302	97.06	95.77
2564		
0507		
1502		
1515		
9904	65.84	65
9901	72.86	69.88
9450	64.64	62.93
0401	82.08	76.04
5401	84.71	82.54
9450	77.98	
9511		
9102		
9608		
0202	67.06	64.66
0601	77.13	74.7
2801	73.43	70.94
3855		
0519		
3201	76.24	74.46
3850	74.56	72.89
3761		
4450	76.02	74.15
3759		
8760		
3758		
3666		
4555		
4876		
0450	82.06	76.48
0520		
9503		
9550	77.39	73.91
9501	77.4	73.54
8402	77.48	73.69
3755		
3151	72.59	70.88
3252	75.13	73.93
3251	73.92	72.17
4766		
4462	78.06	75.27
3950	74.01	68.85
4777		
4953		
0521		
6750	79.94	77.81
4660		
4201	77.97	76.18

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REFERENCE	COVER LEVEL	INVERT LEVEL
4901	71.86	70.23
5329	81.55	79.46
5861		
3150	70.19	60.22
5854		
2201	85.99	84.29
0451	80.86	77.06
0402	86.75	82.51
4760		
4556		
4463	76.49	75.16
2902	69.57	67.23
4951		
4671		
4460	78.97	75.37
5860		
4869		
4861		
4687		
0502		
0517		
0508		
5201	92.36	88.64
0201	66.69	64.5
9765		
4153	74.19	72.07
5424	81.12	78.79
5601	79.54	76.7
8802	64.16	61.48
3762		
3763		
2662		
2701	77.53	75.52
2667		
1514		
2901	73.87	71.91
2565		
0751	75.62	73.22
1350	66.96	64.71
4667		
4755		
8601		
8603		
4251	79.13	77.59
6513	82.15	80.56
5324	83.12	81.06
5323	83.21	80.21
4557		
0151		
0503		
2204	82.06	80.04
8501	74.54	71.36
8450	69.92	67.96
1701	79.29	77.5
1304		77.52
4751		
4455	78.11	76.25
4151	75.04	73.25
4851	74.96	72.67
8850	75.48	71.44
4670		
5901		
5851		
5405	79.01	77.08
5305	81.56	79.56
4676		
4854		
4673		
1506		
1508		
2202	86.19	83.98
3660		
6406	86.53	84.79
6502	83.1	81.31
9201	83.06	80.82
8401	63.56	61.54
8752		
5857		
9908	71.39	69.64
0801	75.92	73.61
8903	67.96	66.63

REFERENCE	COVER LEVEL	INVERT LEVEL
5333	81.64	78.72
5309	81.63	79.92
3701	81.15	79.08
4862		
1051	71.96	70.27
0802	79.13	77.96
0307		77.33
4202	78.92	76.95
4651		
4954		
2202	70.26	68.06
3652		
4152	75.67	74.27
4764		
4803	75.03	72.73
6251	80.17	78.87
4656		
4801	72.65	70.77
0301		77.11
0230	66.83	65.84
1402	89.93	88.53
1401		
0512		
9001	68.69	65.56
4101	74.14	71.67
4102	74.98	72.87
5750	78.62	76.64
8763		
8851	64.07	62.58
3665		
4401	76.21	74.26
2454		
2251	70.26	68.06
1503		
2950	73.84	71.97
2652		
0452		
1301	66.84	65.14
6305	84.71	80.19
4690		
8401	78.9	75.23
8616		
8450	78.88	75.48
6402	85.55	82.34
6412	85.47	83.81
5302	83.14	80.02
4873		
0650	77.25	75.34
0701		
0302		77.01
8350	78.8	76.19
8302	78.79	75.69
1801	84.08	83.09
5301		
4205	84.58	81.58
4601	78.78	76.8
4650	78.79	76.9
4552		
6323	84.82	80.58
4452	80.88	79.29
5308	81.33	79.98
5412	80.71	75.45
5801	78.46	76.1
5501		
4674		
4776		
4952		
4553		
0303		76.79
1603		
2601	80.29	77.24
3657		
6508	83.14	81.59
9501	69.75	68.39
8551		
8751		
8752		
5856		
1303		77.22
2567		
9451	65.21	62.65

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REFERENCE	COVER LEVEL	INVERT LEVEL
9507		
6253	77.87	75.67
2665		
2557		
2458		
3869		
2901	68.73	66.73
8503	64.57	60.95
9801	76.51	71.65
4865		
4301	81.28	79.54
6405	87.91	86.28
6101	77.19	74.7
8550		
5859		
6601	83.37	81.17
7351	78.26	75.88
7302	78.25	75.46
9404	65.2	62.47
8950	68.13	65.15
8003	70.53	63.93
8854		
2101	69.22	66.87
0451		
9508		
8101	73.06	63.5
8451	77.48	74.13
2903	69.65	67.31
2558		
2751	77.51	75.46
1453	80.1	77.4
2450	71.25	68.08
0650	76.07	74.52
3901	73.97	68.26
4773		
2650	80.26	77.56
2250	68.95	66.83
3656		
3859		
3861		
0308	82.5	77.13
5501	77.89	75.84
9514		
8501	65.89	61.07
6320	84.9	80.87
9753		
5150	76.01	74.01
8251	80.05	78.14
2051	71.68	68.29
3672		
3852		
6302	83.76	81.07
8951	68.64	65.67
3679		
3450	72.76	70.54
3553		
3751	81.17	79.6
2750	85.09	83.32
3771		
4657		
9250	83.03	80.37
0326	82.7	80.21
0454		
0150	67.65	66.59
3770		
5702		
0501	88.59	87.32
9509		
1512		
0509		
1901	67.27	65.19
1901	74.07	72.58
1950	74.06	72.59
1250	67.24	65.37
3673		
4765		
4453	79.61	78.06
3750	79.9	77.73
4772		
8050	70.92	69.09
3903	74.33	72.07

REFERENCE	COVER LEVEL	INVERT LEVEL
6204	77.87	75.24
8801	63.73	59.43
2668		
2904	67.74	67.36
2666		
2566		
8619		
8612		
4103	75.17	72.94
4150	75.23	73.48
6501	83.89	82.04
6150	77.23	75.12
6254		
4863		
6313	83.63	81.06
6203	77.96	75.14
7552	74.53	71.8
7101	74.19	71.75
0332		
8901	68.12	64.55
8858		
8604		
0304	82.5	76.68
9850	71	67.48
9901	64.7	63.16
8201	80.03	77.59
8701	69.94	66.32
2451	72.69	70.16
2457		
5303	99.4	98.25
2150	69.18	67.16
4204	84.95	83.47
2750	81.13	78.74
4867		
4864		
2201	68.93	66.52
3101	70.16	68.77
3870		
3751	81.14	79.11
0327		
5550	77.89	76.32
1303	90.29	85.68
0903	66.79	64.14
6202	80.13	78.51
8902	67.24	65.67
5853		
0702	75.63	72.75
8750	70.01	66.82
2664		
3103	72.49	70.49
4763		
6650	83.35	81.6
8902	68.58	65.21
3502	81.37	80.4
3401	72.78	70.34
3702	81.16	79.63
4661		
2701	85	83.25
3766		
4866		
0101	67.4	65.36
0301	65.89	63.85
0318	82.9	80.51
2653		
3658		
1304	90.56	89.45
1301	90.44	89.24
1750	79.26	77.37
0523		
0453		
1504		
1052		
0325		
3601	78.2	75.75
4853		
4501	79.42	77.66
3552		
3765		
4502	80.26	78.53
3754		
3950	70.9	70.16

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REFERENCE	COVER LEVEL	INVERT LEVEL
4950	71.86	70.42
4754		
8001	71.04	68.57
8803	63.7	61.81
8853		
951A		
3202	83.81	81.5
261B		
001I		
5307	83.1	81.3
071A		
451A		
4688		
4771		
4551		
4868		
5404	81.19	78.29
3772		
3203	84.2	83.15
6304	85.11	80.64
8611		
8301	70.09	68.1
6410	86.05	84.37
8901	63.73	62.04
5202	91.87	90.63
9505		
8857		
5428	81.97	79.37
1306		77.86
9401	64.54	61.79
661B		
661D		
921B		
0306		77.28
8253	81.05	79.09
4857		
1454	79.76	77.92
1451	79.82	77.59
141A		
0511		
1513		
0457	82.1	80.75
8767		
9609		
0652		
3864		
5852		
3860		
5862		
2562		
8859		
4683		
3669		
9610		
1505		
4668		
5651		
661A		
391B		
141H		
481A		
301B		
191B		
191D		
191F		
151A		
351D		
171C		
401A		
191H		
191J		
191L		
191N		
831B		
841A		
841C		
831A		
9203		
9205		
9201		
271A		

REFERENCE	COVER LEVEL	INVERT LEVEL
4689		
8601	71.92	68.09
8650	71.85	68.65
8856		
8002	71.06	63.67
141D		
261A		
261C		
261D		
971E		
951B		
5304	82.17	79.78
6252	80.73	79.46
7252	78.42	77.04
0518		
6205		
5151	76.11	74.25
2002	71.69	67.71
0351	65.87	65.06
3862		
4672		
7402	69.94	67.56
4451	76.21	74.49
4856		
4775		
9615		
2401	712.5	69.03
2553		
5858		
3659		
661C		
921A		
3851		
0305		77.18
5751	76.4	73.72
1455	79.78	77.92
1452	80.08	77.47
4759		
4852		
9764		
9760		
0319	82.9	82.47
9105		
4753		
1501		
4756		
3756		
3661		
2561		
8855		
4682		
4675		
0153		
1516		
3867		
5752		
9504		
391A		
291C		
141I		
301A		
191A		
191C		
191E		
191G		
351C		
351A		
171D		
101A		
191I		
191K		
191M		
191O		
831C		
841B		
841D		
9207		
9204		
9206		
9202		
271B		

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REFERENCE	COVER LEVEL	INVERT LEVEL
271C		
4850	72.64	71.02
3551		
5850	79.42	78.21
881B		
861B		
291A		
801A		
921E		
061A		
041B		
971A		
0602	82.94	81.29
0053		
0352	65.47	64.49
0051		
0510		
1001	69.4	67.52
221A		
531B		
0157		
0159		
0252		
011A		
991A		
2655		
2657		
2658		
2661		
021A		
131A		
9108		
121A		
0158		
121B		
291A		
981A		
391B		
871A		
561A		
091B		
091C		
141C		
391C		
971D		
001D		
671A		
0001	70.77	69.25
071A		
201B		
201D		
871A		
131D		
911A		
131A		
341B		
001F		
001E		
031A		
141B		
921C		
041C		
041A		
301G		
301E		
301A		
301D		
411A		
921D		
511A		
171E		
271G		
991B		
011C		
761D		
361A		
131C		
121D		
941A		
401A		
471C		

REFERENCE	COVER LEVEL	INVERT LEVEL
271D		
5101	76.01	73.65
0454		77.32
5253	80.18	78.82
861A		
281A		
811A		
001A		
351B		
041A		
041C		
971B		
9803	70.98	69.15
0353		
0052		
001K		
1050	69.4	67.53
921A		
221B		
0156		
0161		
0160		
0163		
531A		
921B		
2663		
2659		
2660		
2656		
021B		
9107		
121C		
971C		
0155		
211A		
291B		
8761		
211B		
881A		
091E		
091A		
091D		
881C		
951B		
8766		
001B		
671B		
0050	70.78	69.26
201A		
201C		
201E		
471A		
131E		
131B		
341A		
001H		
001G		
131G		
0302	65.61	64.06
591A		
0453		77.05
491A		
041B		
301C		
301F		
301B		
401B		
9751		
271E		
5102	76.11	73.01
271F		
811B		
011B		
981A		
761C		
301C		
221C		
8502	63.2	61.32
4902	73.29	70.91
471B		
471D		

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REFERENCE	COVER LEVEL	INVERT LEVEL
401C		
851A		
451B		
321A		
221B		
921H		
921J		
401C		
861C		
631A		
951A		
361B		
9502	77.4	73.84
031E		
021C		
031G		
031D		
921G		
131F		
121E		
261A		
261B		
111B		
111C		
591B		
591D		
341C		
851C		
891A		
131I		
971F		
351B		
351C		
201F		
881D		
221D		
181A		
451E		
981C		
131J		
241A		
921L		
131B		
031I		
031J		
351F		
941A		
941B		
181B		
081B		
641B		
451D		
981E		
121H		
121J		
321I		
321K		
191Q		
181D		
281C		
921M		
211D		
251E		
081D		
081E		
441I		
441J		
441E		
251B		
441G		
341E		
981G		
421A		
421B		
951C		
191S		
091B		
091C		
851E		
391F		
991E		

REFERENCE	COVER LEVEL	INVERT LEVEL
401D		
451A		
451C		
221A		
141F		
921I		
401B		
401D		
851A		
291E		
361A		
541A		
391A		
031F		
141G		
291D		
921F		
3650	78.18	75.59
131H		
261D		
001L		
261C		
851B		
111A		
591C		
121F		
341D		
851D		
891B		
971G		
351A		
261E		
041D		
201G		
881E		
221E		
451D		
981B		
981D		
031H		
921K		
141J		
131C		
991A		
351E		
831A		
041E		
031A		
081A		
641A		
641C		
451E		
121G		
121I		
981F		
321J		
281A		
181C		
281B		
191P		
211C		
251D		
971A		
081C		
181E		
441F		
441M		
441H		
441L		
031K		
031L		
571A		
421C		
231A		
191R		
091A		
191T		
461A		
101B		
391G		
391D		

ALS/ALS/24/2024_5081442

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
291F		
381B		
961A		
661E		
491B		

REFERENCE	COVER LEVEL	INVERT LEVEL
201H		
381A		
031N		
491A		
491C		

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

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

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

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

Sewer Fittings

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

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

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

- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Payment 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 within 14 days of the 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. 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'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. 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 980 8800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

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 0300 034 2222 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**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number

Appendix D

Greenfield Run-off Calculations

Descriptor	Value
NGR	TQ 12836 93526
BFIHOST	0.175
BFIHOST19	0.217
BFIHOST19SCALED	0.217
PROPWET	0.29
SAAR6190	677 mm
SAAR9120	691 mm

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Neil Chalmers
Site name:	2403160
Site location:	Carpenders Park

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.

Site Details

Latitude:	51.62912° N
Longitude:	0.37043° W
Reference:	1424968717
Date:	Mar 07 2025 14:14

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 1

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	.217
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics

	Default	Edited
SAAR (mm):	680	677
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

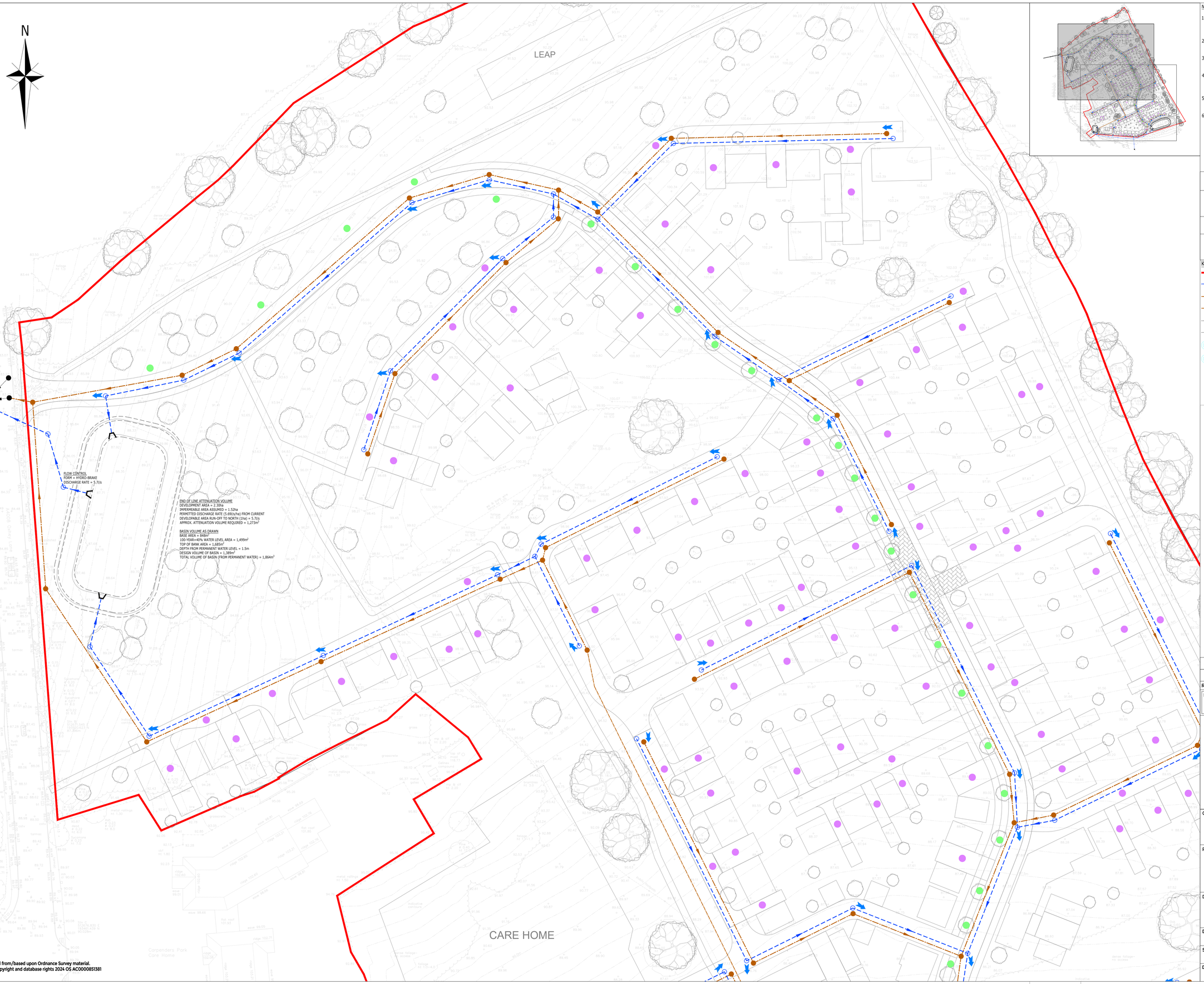
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):		5.69
1 in 1 year (l/s):		4.83
1 in 30 years (l/s):		13.08
1 in 100 year (l/s):		18.14
1 in 200 years (l/s):		21.27

Appendix E

Drainage Strategy Drawing



NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, INC. RISK ASSESSMENTS AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
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INFORMATION SUMMARY

INFORMATION TYPE	SOURCE	REFERENCE	REVISION & DATE
SITE LAYOUT	PEGASUS	P24-2204-DE_003-A-01	18/02/25 Rev. -
TOPOGRAPHICAL SURVEY	ANTHONY BROOKS SURVEYS LTD	B452/13367/1B	Oct 24 Rev. -

KEY

- SITE BOUNDARY
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER RISING MAIN
- EXISTING FOUL WATER SEWER & MANHOLE
- EXISTING SURFACE WATER SEWER & MANHOLE
- PROPOSED DETENTION (DRY) BASIN
- PROPOSED RETENTION (WET) BASIN
- PROPOSED GENERAL AREA OF PERMEABLE PAVING
- PROPOSED GENERAL AREA OF SWALE OR BIO-RETENTION
- EXCEEDANCE FLOW ROUTE

0m 5m 25m

Scale: 1:500 @A1

Rev	Description	Drn	Chk	App	Date
A	UPDATED FURTHER TO LLFA COMMENTS	TP	NC	DM	17.09.25
-	ISSUED FOR PLANNING	TP	NC	DM	25.03.25

Purpose: PRELIMINARY

Status: NOT YET APPROVED

ARDENT | CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY
Third Floor
The Hallmark Building
52-56 Leadenhall Street
London
EC3M 5JE
Tel: 020 7680 4088
Web: www.ardent-ce.co.uk
E-mail: enquiries@ardent-ce.co.uk

Client: BURLINGTON GROUP

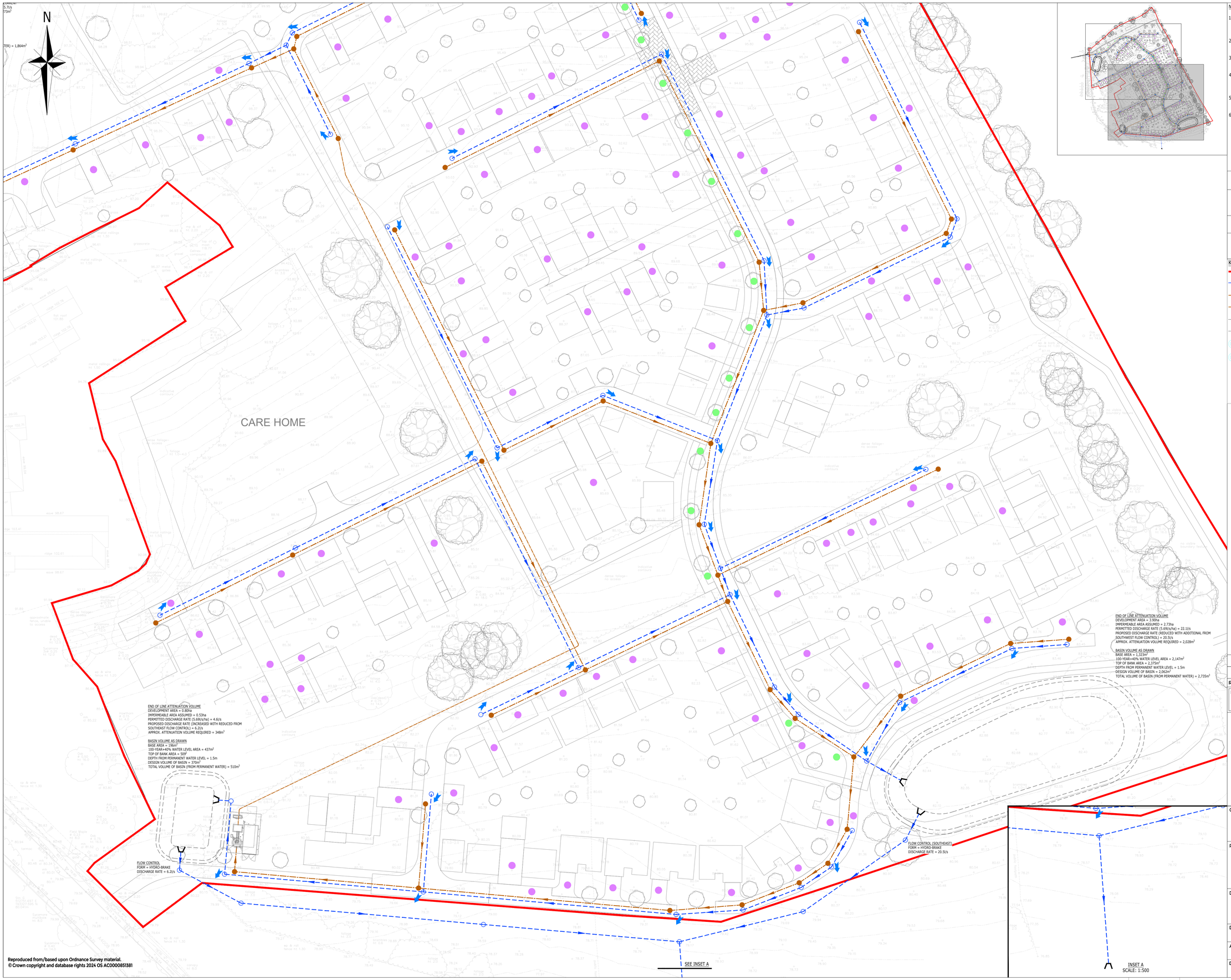
Project Title: CARPENDERS PARK, WATFORD WD19

Drawing Title: DRAINAGE STRATEGY (SHEET 1)

Drawn by	Checked by	Approved by	Revision
TP	NC	DM	A

Scale	Date
1:500	12.03.25

Drawing Number: 2403160-ACE-XX-XX-DR-C-0601



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INFORMATION SUMMARY

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- PROPOSED DETENTION (DRY) BASIN
- PROPOSED RETENTION (WET) BASIN
- PROPOSED GENERAL AREA OF PERMEABLE PAVING
- PROPOSED GENERAL AREA OF SWALE OR BIO-RETENTION
- EXCEEDANCE FLOW ROUTE

0m 5m 25m
Scale: 1:500 @ A1

Rev	Description	Drn	Chk	App	Date
A	UPDATED FURTHER TO LLFA COMMENTS	TP	NC	DM	17.09.25
-	ISSUED FOR PLANNING	TP	NC	DM	25.03.25

Purpose: PRELIMINARY

Status: NOT YET APPROVED

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E-mail: enquiries@ardent-ce.co.uk

Client: BURLINGTON GROUP

Project Title: CARPENDERS PARK, WATFORD WD19

Drawing Title: DRAINAGE STRATEGY (SHEET 2)

Drawn by	Checked by	Approved by	Revision
TP	NC	DM	A

A1 Scale	Date
1:500	12.03.25

Drawing Number: 2403160-ACE-XX-XX-DR-C-0602

Appendix F

Flow Storage Calculation

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Storage	1.520	5.00	100.000	1500	1.200

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	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	0.0		

Storm Durations

60	180	360	600	960	2160	4320	7200	10080
120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	35	0	0
100	40	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	98.800	Product Number	CTL-SHE-0109-5700-1200-5700
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.7	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	98.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	848.0	0.0	1.200	1499.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	368	98.994	0.194	22.3	174.5253	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	5.4	161.8

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	392	99.072	0.272	30.5	251.1284	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	5.6	182.0

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Storage	600	99.637	0.837	72.8	899.8956	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Storage	Hydro-Brake®	5.7	215.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Storage	720	99.908	1.108	85.3	1273.0260	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Storage	Hydro-Brake®	5.7	271.6

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Storage	2.730	5.00	100.000	1500	1.200

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	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	0.0		

Storm Durations

60	180	360	600	960	2160	4320	7200	10080
120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	35	0	0
100	40	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	98.800	Product Number	CTL-SHE-0198-2050-1200-2050
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	20.5	Min Node Diameter (mm)	1800

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	98.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1322.0	0.0	1.200	2145.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	256	98.993	0.193	49.3	268.2774	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	18.0	317.7

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	264	99.068	0.268	68.4	378.2646	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	20.1	446.2

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	352	99.679	0.879	202.5	1427.2280	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	20.5	560.1

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	472	99.975	1.175	216.2	2027.6700	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	20.5	733.9

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Storage	0.530	5.00	100.000	1500	1.200

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	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	0.0		

Storm Durations

60	180	360	600	960	2160	4320	7200	10080
120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	35	0	0
100	40	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	98.800	Product Number	CTL-SHE-0114-6200-1200-6200
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.2	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	98.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	196.0	0.0	1.200	437.0	0.0

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
240 minute winter	Storage	164	98.969	0.169	12.4	36.0107	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	5.7	67.1

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
180 minute winter	Storage	136	99.051	0.251	20.9	55.6259	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	6.1	84.7

Results for 30 year +35% 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	Storage	236	99.661	0.861	53.9	243.3623	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	6.2	141.0

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
360 minute winter	Storage	352	99.927	1.127	53.3	348.4462	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	6.2	190.6

Appendix G

Simple Index Approach Treatment Assessment

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Residential roofing				
Pollution Hazard Level	Very low				
Pollution Hazard Indices					
TSS	0.2				
Metals	0.2				
Hydrocarbons	0.05				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.5	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.5				
Hydrocarbons	0.6				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Individual driveway				
Pollution Hazard Level	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.5	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.5				
Hydrocarbons	0.6				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)				
Pollution Hazard Level	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.5	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.5				
Hydrocarbons	0.6				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Roads (excluding low traffic roads, highly frequented lorry approaches to industrial estates, trunk roads/motorways)				
Pollution Hazard Level	Medium				
Pollution Hazard Indices					
TSS	0.7				
Metals	0.6				
Hydrocarbons	0.7				
SuDS components proposed					
Component 1	Swale	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.75				
Metals	0.85				
Hydrocarbons	0.9				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.75	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.85				
Hydrocarbons	0.9				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

Appendix H

SuDS Maintenance Schedule

OPERATION AND MAINTENANCE REQUIREMENTS BASED ON C753 THE SuDS MANUAL 2015

Inlets, Outlets, Controls and Inspection Chambers	
Regular Maintenance	**Typical Frequency**
Inlets, outlets and surface control structures Inspect surface structures, removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
Inspection chambers and below-ground control chambers Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn.	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage.	As necessary
Remedial Work	**Frequency**
Repair physical damage if necessary	As Required

Operation and Maintenance Requirements for Pervious Pavements		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduce frequency as required, based on site-specific observations of clogging or manufacture's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is the most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than a spray.	As required – once per a year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing materials.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection.	Monthly for three months after instillation.

Operation and Maintenance Requirements for Pervious Pavements		
Maintenance Schedule	**Required Action**	**Typical Frequency**
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 hours after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.

Operation and Maintenance Requirements for Bio-Retention Features		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time and assess water levels in underdrain (if appropriate) to determine any maintenance need.	Quarterly
	Check performance of underdrains by inspection of flows after rain.	Annually
	Assess plants for disease infection, poor growth, invasive species etc. and replace as necessary.	Quarterly
	Inspect inlets and outlets for blockage.	Quarterly
Regular Maintenance	Remove litter (including leaf litter), surface debris and weeds.	Quarterly or more frequently as required for aesthetic reasons.
	Replace any plants, to maintain planting density.	As required.
	Remove sediment, litter and debris build-up from around inlets or from forebays.	Quarterly to bi-annually.
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if necessary.	As required.
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch.	As required.
Remedial Actions	Remove and replace filter medium and vegetation above.	As required, but expectancy of >20 years.

Operation and Maintenance Requirements for Swales		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Remove litter (including leaf litter) and debris.	Monthly or as required.
	Cut grass – to retain grass height within specified design range.	Monthly (during growing season) or as required.
	Manage other vegetation and remove nuisance plants.	Monthly at start, then as required.
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours.	Monthly or as required.
	Inspect vegetation coverage.	Monthly for six months, quarterly for two years, then half yearly.
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.	Half yearly.
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Relevel uneven surfaces and reinstate design levels.	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break-up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or top of soil surface.	As required.

Operation and Maintenance Requirements for Swales		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Remedial Actions	Remove and dispose of oil and fuel residues using safe standard practices.	As required.

Operation and Maintenance Requirements for Detention Basin		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Remove litter (including leaf litter) and debris.	Monthly or as required.
	Cut grass – for spillways and access routes.	Monthly (during growing season) or as required.
	Cut grass – meadow grass in and around basin.	Half yearly (spring – before nesting season, and autumn).
	Manage other vegetation and remove nuisance plants.	Monthly at start, then as required.
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect bankside, structures, pipework etc. for evidence of physical damage.	Monthly.
	Inspect inlets and facility surface for silt accumulation and establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required.
	Check any penstocks and other mechanical devices.	Annually.
	Tidy all dead growth before start of growing season.	Annually.
	Remove sediment from inlets, outlets and forebay.	Annually (or as required).
	Manage wetland plants in outlet pool – where provided.	Annually.
Occasional Maintenance	Reseed areas of poor vegetation growth.	As required.
	Prune and trim any trees, remove cuttings.	Every two years, or as required.
	Remove sediment from inlets, outlets, forebay and main basin when required.	Every five years, or as required.
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing.	As required.
	Realignment of rip-rap.	As required.

Operation and Maintenance Requirements for Detention Basin		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Remedial Actions	Repair/rehabilitation of inlets, outlets and overflows.	As required.
	Relevel uneven surfaces and reinstate design levels.	As required.