



Dwyer Road Drainage Strategy Report

For Reading Borough Council

Date: 21 April 2023

Doc ref: DWY-HYD-XX-XX-RP-C-7000

DOCUMENT CONTROL SHEET

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Client	Reading Borough Council	
Project name	Dwyer Road	
Title	Drainage Strategy Report	
Doc ref	DWY-HYD-XX-XX-RP-C-7000	
Project no.	26888	
Status	S2	
Date	21/04/2023	

Document Production Record		
Issue Number	P04	Name
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Approved by	Jason Magee	

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	S2	27/03/23	Issued for Planning
P02	S2	11./04/23	Issued for planning
P03	S2	18/04/23	Issued for planning
P04	S2	21/04/23	Issued for planning

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1. INTRODUCTION

Hydrock have been appointed by Reading Borough Council to provide a Drainage Strategy report for the approval of Reading Council Lead Local Flood Authority.

The proposed drainage strategy will be in accordance with both national guidelines and will incorporate a 'best practise' approach in reducing the impact of the flooding caused by the new development.

The report is based upon sewer asset information provided by the sewerage undertakers Thames Water in relation to assets within the vicinity of the development site.

The report highlights the key stakeholders in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can quickly be rectified thereby reducing the impact of potential damaged caused by flooding.

The information received is summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Hydrock Consultants Ltd accepts no responsibility for any direct and/or consequential loss that may occur as a result.

Appendices

Appendix A: Topographical Survey.

Appendix B: Architects Layout.

Appendix C: Sewer Asset Map.

Appendix D: Existing Drainage Strategy Layout - 26888 -HYD-00-ZZ-SK-C-7700_P01.

Appendix E: Pre / Post Development Catchments - 26888 -HYD-00-ZZ-SK-C-7710 & 7720_P01.

Appendix F: Micro Drainage Calculations (North and South Parcels).

Appendix G: Overland Flow Routes - 26888-HYD-00-ZZ-SK-C-7730_P01.

Appendix H: Drainage Strategy Layout - 26888-HYD-00-ZZ-DR-C-7000_P03.

Post Development Surface and Foul Water Management Summary

The stormwater drainage system has been designed to be split between north and south areas of the site. This is due to a tree root protection zone which is situated to the east of the terraced housing to the centre of the site which restricts potential for drainage runs to be installed through this narrow corridor. To avoid this constraint, two outfalls have been proposed for this site. One flow control is proposed to be positioned east of the access road into site and to other is positioned to the south east of the site within a private drive. Both of these flow controls have been designed with a 2 l/s discharge rate based on greenfield runoff rates, therefore a cumulative site discharge rate of 4 l/s at the 1 in 100 year + 40% climate change storm event (based on greenfield run-off rates). The chosen method for managing surface water run-off will involve directing it to a dedicated surface water sewer, as agreed with Thames Water.

The sustainable drainage system (SuDS) components in this design will incorporate Permeable Paving wherever feasible, to improve water quality and reduce the need for below-ground crated solutions. Attenuation crates have also been specified to meet the requirements for permitted discharge rates.

For foul water, the design will accommodate a peak flow rate of 2.4 l/s. Two methods of calculation were used, namely the Sewer Sector Guidance and the 'Estimated' Peak method. As a conservative estimate the larger value from the two methods will be used, resulting in a design foul flow rate of 2.4 l/s as calculated by the 'Estimated' Peak method.

References / Design Codes

- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Building Regulations Approved Document Part H - Drainage and waste disposals.
- Sewers for Adoption (where applicable).
- Local Authority Guidance.
- CIRIA C753 - SuDS Manual.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.

2. SITE INFORMATION

2.1 Site Location

The site is located approximately 2.5km West of Reading centre in the Southcote ward, Berkshire. The Ordnance Survey National Grid Reference for the site is SU 68070 71822. The postcode to the site is RG30 3PB.

Table 2.1: Site Referencing Information

Site Address	Dwyer Road
	Dwyer Road
	Postcode: RG30 3PB
	National Grid Reference SU 68070 71822



Figure 1: Site Location with Approximate Red Line Boundary

The site comprises an area of land of approximately 0.49 Ha in size, as shown on Figure 3. It was previously used as the Alice Burrows Care House; the services were closed in 2007 and the building demolished nearly 15 years ago. It is bound by low-rise residential properties to the South, East and West and some ground + 3 storeys flats to the North.

The site is accessed from Burghfield Road connecting with Dwyer Road, Appleford Road into a proposed new road Mews Street for the development.

2.2 Topography

The topographical survey indicates that the existing ground level within the development is generally flat and is approximately at 49m Above Ordnance Datum (AOD) sloping slightly North to South from 51.26 to 48.69. Being 83m the longest part of the site and 94m the widest part.

See **Appendix A** for Topographical Survey.

2.3 Development Proposals

The current development consists of developing 31 new homes:

- 1 No. apartment block with 15 No. 1 bed flats for council tenants wishing to downsize
- 16 No. Dwellings (9x3b, 6x4b, 1x5b)
- 27 external parking spaces (ratio 0.87), 1 to 1 parking for houses

The proposed houses are two and three storeys, the flat building is Ground + 3 Storeys high.

See **Appendix B** for Architect's Layout.

2.4 Geology

At the timing of this report, a Phase 1 Geo-Environmental Desk Study and a Geotechnical Scope and Specification are currently being carried out in order to validate the assumptions made in this report and to provide value engineering opportunities in the ground works package.

The Superficial Geology is the Lambeth Group up to 39m deep in the West of the London Basin. Underlaid by Seaford Chalk Formation.

There is borehole information available on the British Geological Society website 1200m to the East of the site approximately showing 1m depth of Made ground which is underlain by dark brown silty sandy topsoil over orange brown clayey silty sand which is all above the Reading Beds finishing at 5.00m below ground level

2.5 Hydrology & Hydrogeology

At the timing of this report, a Phase 1 Geo-Environmental Desk Study and a Geotechnical Scope and Specification are currently being carried out in order to validate the assumptions made in this report and to provide value engineering opportunities in the ground works package.

2.6 Flood Risk

The EA floodplain map indicates that the level of flood risk to the site corresponds to a Flood Zone 1 – Low Probability in Table 1 of NPPF Planning Practice Guidance. This zone has less than a 1 in 1000-year annual probability of flooding.

3. SURFACE WATER MANAGEMENT STRATEGY

3.1 Pre-Development Surface Water Drainage

Public: Sewer asset maps have been obtained from Thames Water which show no surface water sewers within the site boundary. There are 225mm dia sewers running within 3rd party residential gardens on both the eastern and western boundary, which both ultimately connect into a 375mm dia along Holybrook Crescent. It is noted gully connections are present close to the western and southern site boundary.

See **Appendix D** for Sewer Asset Map.

Private: A utilities survey undertaken by Survey Solutions shows existing gullies within the hardstanding turning head which look to enter a combined network (see foul). There is also an existing chamber which is confirmed to be blocked and heavily silted up, it is unknown what this served.

See **Appendix E** for Existing Drainage Layout.

3.2 Pre-Development Surface Water Catchments

The table below indicates each catchment type area, pre-development:

Table 3.1: Pre-Development Catchment Areas

Pre-Development Catchment	Area (m2)
Building / Roof	0
Roads / Hardstanding	270
Soft Landscaping	4680
Total Area	4950

See **Appendix F** for Pre-Development Catchment Plan.

3.3 Pre-Development Surface Water Run-Off

In order to determine the post-development surface water flows, an assessment has been carried out on the pre-development to ensure that the run-off from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

3.3.1 Greenfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 (Peak Flow Control):

It is a requirement that on new developments that consideration be given to limit discharge as close as reasonably practical to the equivalent 'Greenfield' rate for the corresponding storm event. The following table considers what the maximum surface water discharge from the site would be if the site was 'Greenfield' i.e., not developed:

Table 3.2: Pre-Development Run-Off Rates

Storm Event	Maximum discharge rate (l/s) Greenfield
1 in 1 Year	0.03
1 in 30 Year	0.09
1 in 100 Year	0.13
QBAR	0.04

3.3.2 Brownfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S3 (Peak Flow Control):

Should the site not be suitable to discharge as close as reasonably practical to the equivalent 'Greenfield' rate, Brownfield should be considered with a % betterment on the flow.

As the site is Greenfield this method has not been considered.

3.3.3 Capacity of Existing Drainage System

Further assessment has been carried out to determine the capacity of the connection point and its potential for re-use as part of the surface water drainage strategy for the new development:

Reference	Pipe Diameter (mm)	Length (m)	Gradient	Capacity (l/s)
Connection - MH2853	375	75 (TBC)	1 in 38 (TBC)	231.2 (TBC)
Connection - MH2852	TBC by survey	TBC by survey	TBC by survey	TBC by survey

- Capacity values taken from 'Tables for hydraulic design of pipes, sewers and channels' HR Wallingford and D.I.H Barr.
- Ks roughness value of 1.50 for existing clay pipes.

3.4 Pre-Development Flood Exceedance Flows

Topographical survey information indicates that prior to demolition the site will flood locally within the centre of the extent, due to no fall across the site. Areas will mainly pond southwest to the main building and gullies to the north.

3.5 Run-off Destinations

An appraisal should be undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in Part H of Building Regulations and the National Planning Policy Framework (NPPF):

1. Infiltration to the ground using a sustainable drainage system.
2. If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
3. Discharge at a controlled rate to a surface water sewer or drain.
4. Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.
5. Only if the above have all been investigated and it has been proved that none of these options are suitable will discharge at a controlled rate to a foul sewer system, with the approval from the Water Authority.

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

Table 3.3: SuDS Hierarchy

Method	Reasoning	
Infiltration	As there are no superficial soils, the chalk is likely to be poor quality and dissolution present in Reading, soakaways have not been considered	X
Surface water body	There are no surface water bodies within the vicinity of the site.	X
To dedicated surface water sewer (public, highways or otherwise)	As there are potential connection points to the east, west and southern boundary this option will be considered.	✓
To a combined sewer	As there is a dedicated surface water system this has been discounted.	X
To a foul sewer	As there is a dedicated surface water system this has been discounted.	X

3.6 Suitability of SuDS Components

The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity.

The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability of SuDS components has been assessed as follows:

Table 3.4: Suitability of SuDS Components

Hierarchy	Description	Setting	Required area	Implemented	
Green roofs 	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.	No. Not within architects keeping with the building proposals	X
Rainwater harvesting 	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (Underground or above ground).	No. Lack of space on site has meant that this was not feasible to be included within SUDS for this site.	X
Soakaway 	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependent on runoff volumes, water table and soils.	No. Ground Investigation report has confirmed that infiltration rates are too poor to consider this as an option.	X
Filter strip 	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Open space	Minimum length 5m.	No. There is insufficient space on this site to install filter strips. Other forms of surface water runoff collection have been implemented in drainage design.	X
Permeable paving 	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / open space	Can typically drain double its area.	Yes. This has been implemented wherever possible. Permeable Tarmac has also been implemented in effort to improve water quality and reduce requirement for below ground crated solutions.	✓
Bioretention area 	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be	Street / open space	Typically, surface area is 5-10% of drained area with storage below.	No. Ground Investigation report has confirmed that infiltration rates are too poor to consider this as an option.	X

	conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.				
Swale 	Swales are shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street / open space	Account for width to allow safe maintenance typically 2–3 metres wide.	No. This has not been implemented on this site as there is insufficient space	X
Hardscape storage 	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Street / open space	Could be above or below ground and sized to storage need.	No. Other more sustainable forms of SUDS have been identified.	X
Pond / Basin 	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open space	Dependent on runoff volumes and soils.	No. This has not been implemented on this site as there is insufficient space	X
Wetland 	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open space	Typically, 5–15% drainage area to provide good treatment.	No. This has not been implemented on this site as there is insufficient space	X
Underground storage 	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open space	Dependent on runoff volumes and soils.	Yes. Attenuation crates have been specified to satisfy excess requirement to meet permitted discharge rates.	✓

3.7 Post-Development Surface Water Drainage

The below ground surface drainage system will connect all new rainwater pipes, channels and gullies at ground floor level and discharge at the southern boundary to the nearest Thames Water asset to which the site levels are feasible.

Due to requirements to have the road adopted, the drainage within the road will need to be a Thames Water asset. Drainage within the road has been indicated as a Thames water adoptable asset at this stage as this proposed sewer is receiving flows from private dwellings to the south, (As indicated on drainage layout drawing 7010). As the site also needs to accommodate private housing, it is proposed to adopt the road drainage under a Section 104 (Thames) and keep the houses drainage private, as there will need to be a separate system to take the run off from these areas.

Attenuation requirements for the northern parcel of the development is proposed to be stored within a series of underground tanks beneath permeable paving areas within the private parking bays. Cellular storage proposed here has been designed to attenuate storms for up to and including the 100yr plus 40% Climate change.

Due to the location of a Tree root protection zone located to the east of the site. drainage excavations are required to be kept to a minimum to mitigate potential damage to the existing tree. This risk has been reduced in this area by only permitting a single drainage run excavation through this area to pass to the southern parcel. For this reason, the surface water drainage strategy for this development has been split into 2 areas.

Attenuation requirements for the southern parcel of the development has been proposed to be provided through within a series of underground tanks beneath permeable paving areas within the private parking areas adjacent to plots. Cellular storage proposed here has been designed to attenuate storms for up to and including the 100yr plus 40% Climate change.

In summary:

- Discharge location will be to the east across Burghfield Road (MH2853) and to the south across Dwyer Road (MH2852). Both are subject to agreement with Thames water.
- SuDS will be in the form of permeable paving (storage and conveyance). As the space is limited this is the only suitable sustainable system for the site.
- Attenuation will be provided in the form of attenuation tanks 1-5 (AT1-AT5) to attenuate up to and including the 1 in 100yr storm plus 40% CC.

Due to limited locations a standard cellular tank has been proposed, Thames Water / Local Highway will need to agree the type of storage structure and where it is cited if not in agreement.

It will be a gravity system without the need for pumping.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) which does not adversely impact on flood risk either within the site or beyond the development boundary.

3.8 Post-Development Surface Water Catchments

The table below indicates each catchment type area, post-development:

Table 3.5: Post-Development Catchment Areas

Post-Development Catchment	Area (m2)
Building / Roof	1419
Roads / Hardstanding - Permeable	476
Roads / Hardstanding – Impermeable	1212
Soft Landscaping	2356
Total Area	5463

See **Appendix F** for Post-Development Catchment Plan.

3.9 Post-Development Surface Water Run-Off

In order to determine the post-development surface water flows an assessment has been carried out to ensure that the flows from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

3.9.1 Greenfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 Cont. (Peak Flow Control):

Due to the nature of the development and its current arrangement, it is considered feasible for this site to reduce to Greenfield Run-off Rates and restricting to **4l/s**. (2l/s for each flow control device)

3.9.2 Brownfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S3 Cont. (Peak Flow Control):

As the site is Greenfield this method has not been considered.

3.9.3 Capacity of Existing Drainage System

The proposed flows have then been checked against the anticipated capacity of the existing downstream pipe:

Reference	Catchment Area (m2)	Storm Event	Post-development rate	Capacity of pipe (l/s)	Check OK
Connection Point MH2853	2110	1 in 1 Year	2l/s	231.2	✓
		1 in 30 Year	2l/s		
		1 in 100 Year	2l/s		

Reference	Catchment Area (m2)	Storm Event	Post-development rate	Capacity of pipe (l/s)	Check OK
Connection Point MH2852	920	1 in 1 Year	2l/s	TBC (CCTV)	
		1 in 30 Year	2l/s		
		1 in 100 Year	2l/s		

3.9.4 Summary of Post-Development Flows

It has been determined that the post-development surface water flow rates have been restricted to **4l/s** for the development (**2l/s discharge rate from each flow control**). This is in accordance with national guidelines and non-statutory technical standards so as to not adversely impact downstream flooding of the site as a result of the new development.

3.10 Interception Storage

Interception can be defined as the capture and retention on site of the first 5mm of the majority of all rainfall events. Interception mechanisms have been assessed to show the site is compliant for zero run-off from the first 5mm for 80% of events during the summer and 50% in winter. (Ciria)

Systems	Reasoning	
Green roofs	All surfaces that have green / blue roofs	X
Rainwater harvesting	All surfaces drained to RWH systems designed whether for surface water management or just water supply, provided the RWH system design is based on regular daily demand for non-potable water	X
Soakaways / infiltration	Areas of the site drained to systems that are designed to infiltrate run-off for events greater than a 1 month return period.	X
Permeable pavements	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement.	✓
Filter strips / swales	Roads drained by filters strips / swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for interception delivery for impermeable areas up to 5 times the base of the vegetated surface area receiving the runoff.	X
Infiltration trenches	Roads drained by infiltration trenches can be considered to provide interception	X
Detention basins	Areas of the site drainage to detention basin with a flat base can be assumed to comply. The area of the basin that is assumed to contribute to interception of run-off should be below the outlet of the basin.	X
Bioretention / rain gardens	Areas of the site drainage to unlined bioretention components can be assume to comply where the impermeable area is less than 5 times the vegetated surface area receiving run-off/ They can be designed to deliver interception for larger areas, where suitable infiltration capacity is available.	X
Ponds	Areas drained by ponds (with a permanent water pool that is effectively maintained by the outlet structure) are not assumed to deliver interception	X

3.11 Urban Creep

Urban Creep Factor (UCF) is defined as any increase in the impervious area that is drained to an existing drainage system without planning permission being required, such as the construction of patios, small extensions, etc.

As the footprint of the site has been set which includes patios etc, this factor is not applied.

3.12 Post-Development Surface Water Volume

In line with the Non-Statutory Technical Standard for Sustainable Drainage S4 & S5 (Volume Control):

In accordance with current guidance where reasonably practicable, for Greenfield developments the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6-hour rainfall event should never exceed the Greenfield Run-Off Volume for the same event.

Where there is an increase in the volume of run-off as a result of the development, infiltration or other SuDS techniques should be considered to mitigate volume run-off. However due to the soil type onsite, minimal infiltration will occur therefore infiltration techniques are considered unsuitable for the site.

In line with the Non-Statutory Technical Standard for Sustainable Drainage S6 (Flood Risk):

Where it has not been possible to reduce all of the additional volume by infiltration or other SuDS techniques, the volume of run-off should be discharged in accordance with one of the following rates of run-off, whichever is the higher.

Volume requirements	
The peak discharge rate has been reduced to pre-development 1-year peak flow rate	X
The peak discharge rate has been reduced to the site's estimated mean annual flood flow rate (Qbar). OR	X
The peak discharge rate has been reduced to 2l/s/ha.	
The limiting discharge rate requires a flow rate of less than 2l/s at a discharge point, therefore up to 2l/s	✓

The proposed SUD's treatment train for the site includes filter strips and permeable paving which further assists in reducing the peak volume of runoff discharging from the site.

See **Appendix G** for Calculations.

3.13 Post-Development Surface Water Storage

In line with the Non-Statutory Technical Standard for Sustainable Drainage S7 & S8 (Flood Risk):

Attenuation flood storage will be distributed across the development with filter strips, permeable paving and crates attenuating at source. In the event that one part of the system fails through blockage the remainder of the system will still be able to function effectively.

See **Appendix G** for Calculations.

3.14 Post-Development Flood Exceedance Flows

In line with the Non-Statutory Technical Standard for Sustainable Drainage S9 (Flood Risk):

In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away buildings and/or critical infrastructure.

See **Appendix H** for Overland Flow Routes.

3.15 Water Quality Treatment

The simple index approach has been used as the approach to water quality risk management on this project.

The pollution hazard indices identified for land use classifications within this project (as identified in table 26.2 of Ciria C753 - The SuDS Manual) are as follows;

Table 3.6: Pollution hazard indices

Pollution hazard indices for different land use classifications in accordance with CIRIA C753 - The SuDS Manual. Table 26.2				
Land Usage	Level	TSS	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., <300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads / motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

The indicative SuDS mitigation indices for discharges to surface for this project (as identified in table 26.3 of The SuDS Manual), are as follows;

Table 3.7: SuDS pollution mitigation for discharge to surface waters

Indicative SuDS mitigation indices for discharge of surface water			
Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately 1 in 1 year return period event, for inflow concentration relevant to the contributing drainage area		

Refer to below tables for a summary comparing the mitigation and pollution indices for each identified land usage classification.

Residential Roofs	TSS	Metals	Hydrocarbons
Pollution Index	0.2	0.2	0.05
Mitigation Index	0	0	0
Net Pollution	0.2	0.2	0.05
Comments	Due to very low risk of pollution from residential roofs, no mitigation solution proposed.		

Low Traffic Road	TSS	Metals	Hydrocarbons
Pollution Index	0.5	0.4	0.4
Mitigation Index (Permeable Paving)	0.7	0.7	0.7
Net Pollution	-0.2	-0.3	-0.3
Comments	Permeable paving effectively mitigates the pollution risk from the low traffic road.		

Residential Carpark	TSS	Metals	Hydrocarbons
Pollution Index	0.5	0.4	0.4
Mitigation Index (Permeable Paving)	0.7	0.6	0.7
Net Pollution	-0.2	-0.2	-0.3
Comments	Permeable paving effectively mitigates the pollution risk from the residential car park.		

Based on the above tables the water quality criteria of document Ciria C753 - The SuDS Manual is satisfied.

Consideration will be given to both during construction and post-development water quality treatment to ensure that water quality is not impacted during the construction works:

3.15.1 Quality of Surface Water Run-off: Post-Development

In accordance with Environment Agency Document PPG3 (now withdrawn but considered best practice guidance) the proposed as the car park is less than 50 spaces or 800m² it is considered to be 'low risk' in terms of pollution to the surface water network and as such an oil interceptor is deemed to be required.

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

3.15.2 Quality of Surface Water Run-off: During Construction

It is anticipated that the during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

3.16 Design Standards

All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

In accordance with best practice storm drainage will be designed to the following performance criteria:

Pipes running under full conditions with no surcharge	-	1 in 2-year storm return period
No flooding	-	1 in 30-year storm return period
Extreme flooding to be retained on site	-	1 in 100-year storm return period.

See **Appendix J** for Drainage Strategy.

4. FOUL WATER MANAGEMENT STRATEGY

4.1 Pre-Development Foul Water Drainage

Public: Sewer asset maps have been obtained from Thames Water which shows a 225mm dia sewer running north to south along the eastern boundary. This sewer is expected to have a 3m easement to it. It is also noted there is a foul water sewer leaving the site boundary and connecting to the sewer in Holybrook Crescent.

Private: A utilities survey undertaken by Survey Solutions shows existing gullies within the hardstanding turning head which look to enter a combined network. The combined network connects into the foul sewer noted on the asset map. The run continues north halfway into the site, where it is noted as blocked. It is assumed this pipe was present to accommodate the previous development and therefore can be confirmed as redundant.

4.2 Post-Development Foul Water Drainage

The below-ground foul drainage system will connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge to a chamber outside each plot. The drainage will then fall south of the site and discharge into the combined network, the other side of Dwyer Road.

It is intended that only waste flows considered to be 'Domestic' shall be discharged into the foul drainage system. If the site wishes to discharge 'Trade Effluent' into the foul drainage system then will be required to make a formal application to the Sewerage Undertaker accordingly.

It will be a gravity system without the need for pumping.

The design of all foul sewers and lateral drains must conform to BS EN 752, BS EN 16933, Building Regulations 2010 Part H, planning policy and best practice guidelines (such as Sewers for Adoption 7th Edition) wherever applicable. Sanitary systems within building should be designed in accordance with BS EN 12056-2.

4.3 Post-Development Foul Water Flow Rates

The assessment of the proposed foul flow rates takes into account both daily average volumes and estimated peak flow rates.

4.3.1 Average daily flow volume

The estimate daily average foul flows have been estimated from the advice given in Loads and Flows, published by British Water.

Site Usage = Residential

Population = 78 approx.

Daily usage = $78 \times 150 = 11700$ litres/day = 0.125 litres/second

4.3.2 Peak flow rate

The peak design flow rates should be calculated using one of the below methods

Method 1 – Sewerage Sector Guidance

In the Sewerage Sector Guidance, Appendix C, B3.1 the below values are given to calculate the development peak flow rate:

Flow per dwelling = 0.05 litres per second per dwelling. (4000 litres/day)

Number of dwellings on site = 16 dwellings plus 6 respites

Design Flow rate = $0.05 \times 22 = 1.1$ litres/s

Method 2 – 'Estimated' Peak

It is widely used practice to estimate the peak flows by concentrating the average daily usage over an 8-hour period (i.e., assuming total daily flows from a school only happen during the day), and applying an additional multiplier.

Daily usage (as above) = 11700 litres/day

Flow rate over 8 hours = $11700 / (8 \times 60 \times 60) = 0.406$ litres/s

Additional multiplier = 6

Design Flow rate = $0.406 \times 6 = 2.4$ litres/s

Proposed peak rate

For conservatism, the larger of the values above will be used. Therefore, design foul flows = 2.4 l/s.

Further assessment will have to be carried out by the offsite consultant to determine the capacity of the connection point and its potential for connection as part of the foul water drainage strategy for the new development.

5. OWNERSHIP AND MAINTENANCE

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance.

The proposed SuDS features will require maintenance including litter and debris removal, sediment removal, vegetation maintenance and remediation to any damaged structures.

The maintenance requirements will be the responsibility of a private maintenance company.

Table 5.1: Proposed Schedule of Maintenance for Below Ground Drainage

Permeable Paving - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most Sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm 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 material.	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 installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.
Reference should be made to the manufacturer recommendations where applicable		

Underground Cellular Tanks - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually.
	Remove sediment from pre-treatment structures and / or internal forebays.	Annually, or as required.
Remedial actions	Repair / rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.
Reference should be made to the manufacturer recommendations where applicable		

Filter Strip - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain 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 filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils).	Monthly (at start, then half yearly).
	Check flow spreader and filter strip surface for evens gradients.	Monthly (at start, then half yearly).
	Inspect gravel flow spreader upstream of filter strip for clogging.	Monthly (at start, then half yearly).
	Inspect silt accumulation rate and establish appropriate removal frequencies.	Monthly (at start, then half yearly).
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseed.	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 at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Other Drainage Items - Ownership & Maintenance Responsibility Matrix		
Feature	Maintenance	Frequency
Private Drains	Inspection	CCTV survey every 5-10 years.
	Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey is)
	Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
Discharge orifice manholes/flow control devices	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.
Gully / Drainage Channels	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis:

Table 5.2: Proposed Operational Schedule for Below Ground Drainage

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

6. CONSENT / PLANNING

Summary of expected consents required:

- Ordinary Watercourse Consent – Not required.
- **Sewerage Undertaker Consent – Required.**
- **Section 104 / 106 Drainage Adoption - Required.**
- Build Over / Build Near - Required (Existing Water main crosses site North to South).

In addition to the above it is anticipated that details of the drainage scheme will need to be approved by Reading Borough Council Lead Local Flood Authority (LLFA) through a formal planning application.

7. CONCLUSION

This report concludes that the foul and surface water drainage strategy for the development will be designed accordance with both national and local standards and best practice. The following key items have been summarised below:

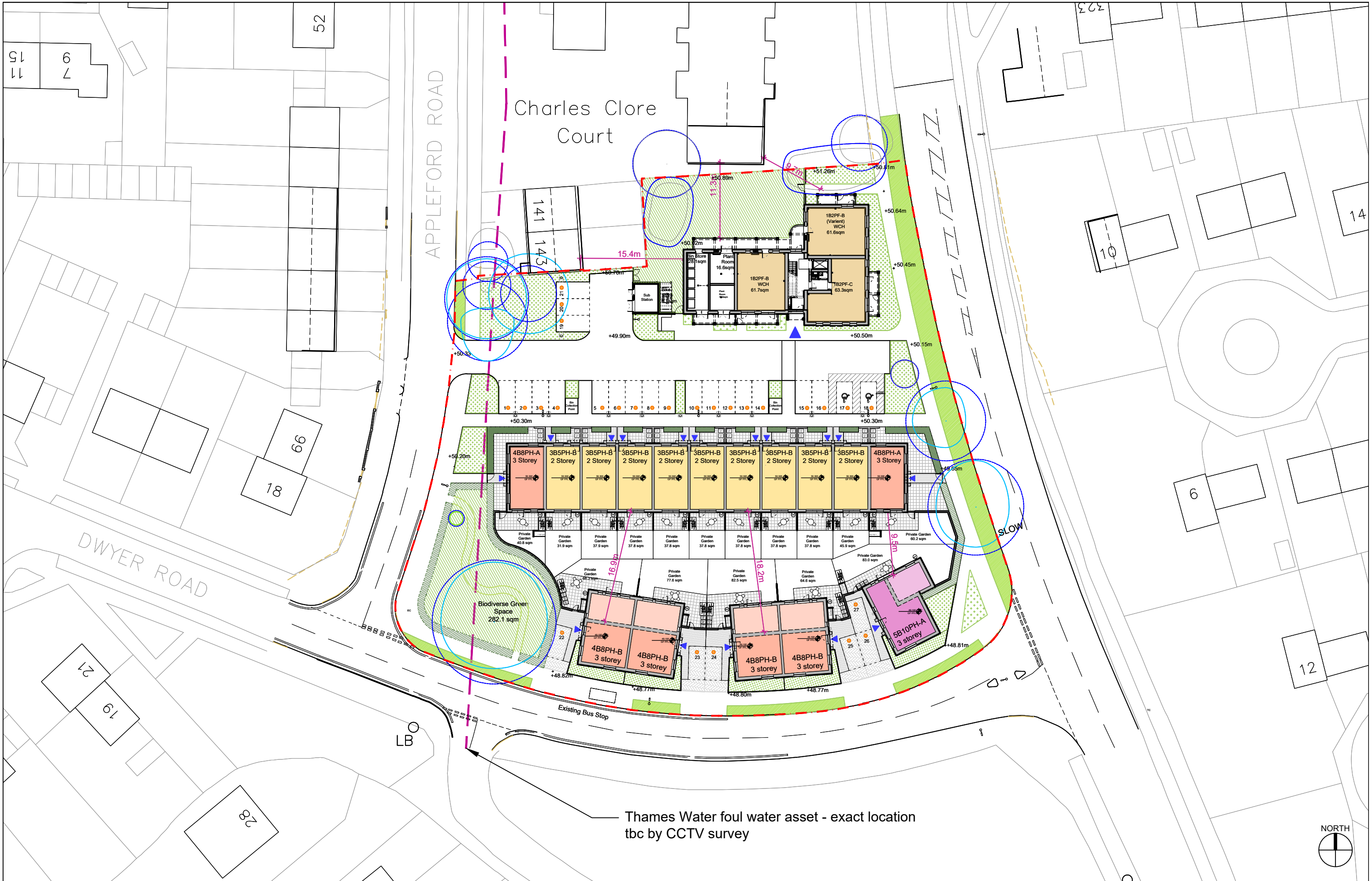
- The foul and surface water drainage systems for the new development will be designed to accommodate the required flows for the lifetime of the development.
- All surface water run-off from storm events up to and including the 100-year plus 40% climate change will be retained within the overall site.
- Attenuation provided 'at source' by way of permeable paving and crates prior to discharging into the main drainage system in the road to meet the required flow rates for the whole site.
- Ownership and maintenance liabilities for the foul and surface water drainage system will be clearly defined so that in the event of failure the drainage system appropriate action can be taken to ensure that the drainage system continues to work efficiently.
- The use of permeable paving for rainwater run-off mitigation, satisfies the water quality criteria of document Ciria C753 - The SuDS Manual.
- In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away buildings and/or critical infrastructure.

Appendix A

Topographical Survey

Appendix B

Architects Layout



Rev	Date	Drawn	Description
-	31.10.22	KDU	Initial Issue
A	10.11.22	KDU	Layout Updated (Mix, GA)
B	01.12.22	KDU	Layout Updated (Setting Out, Site Access)
C	06.01.23	KDU	Parking Ratio, Flat Block Amends
D	10.01.23	KDU	Removal of 1 no. house on Dwyer Road, Flat Block update
E	19.01.23	KDU	House Typology Footprint Update
F	03.02.23	KDU	House Typology Footprint Update
G	14.02.23	DEG	5Bed House Type, Garden setting out updated
H	06.03.23	KDU	DRAFT PLANNING ISSUE
J	xx.xx.xx	KDU	

Notes:

Do not scale from drawings unless by agreement with HTA. Use figured dimensions only. Check all dimensions on site prior to commencing the works. Drawing to be read in conjunction with other relevant consultant information.

This drawing is the copyright of HTA Design LLP and must not be copied or reproduced in part, or in whole, without the express permission of HTA Design LLP. Drawing to be read in conjunction with specification.

Legend

- Site Boundary
- Existing Tree - Cat A
- Existing Tree - Cat B
- Existing Tree - Cat C
- Existing Tree Removed
- RPA
- RPA Removed
- Proposed Tree

- 1B2P Flat*
- 3B5P House
- 4B8P House
- 5B10P House

* M43 wheelchair adaptable homes at ground floor, or oversized homes for council tenants wishing to downsize

- Active Charging Spaces
- Building Entrance
- Green verge
- Hedge planting
- Biodiverse Planting
- Amenity / Play / Biodiverse Planting

Proposed Site Plan

drawing title: Proposed Plan

Reading Borough Council

Dwyer Road

client / project

HTA-A_DR_0100

drawing number

1:500

scale @ A3

HTA Design LLP

www.hta.co.uk

London | Edinburgh | Manchester | Bristol

J

revision

RBC-DRR

project number

KDU

originated by

hta

FOR PLANNING

status

Appendix C

Sewer Asset Map

National One Call Plan To Dig
Mill Place
1Mill Road Industrial Estate
WEST LOTHIAN
EH49 7TL

Search address supplied Dwyer Road
Reading
RG30 3PN

Your reference NOC/XJSUM949

Our reference ALS/ALS Standard/2022_4735243

Search date 17 October 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



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



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



0800 009 4540

Search address supplied: Dwyer Road, Reading, RG30 3PN

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.

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

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



For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

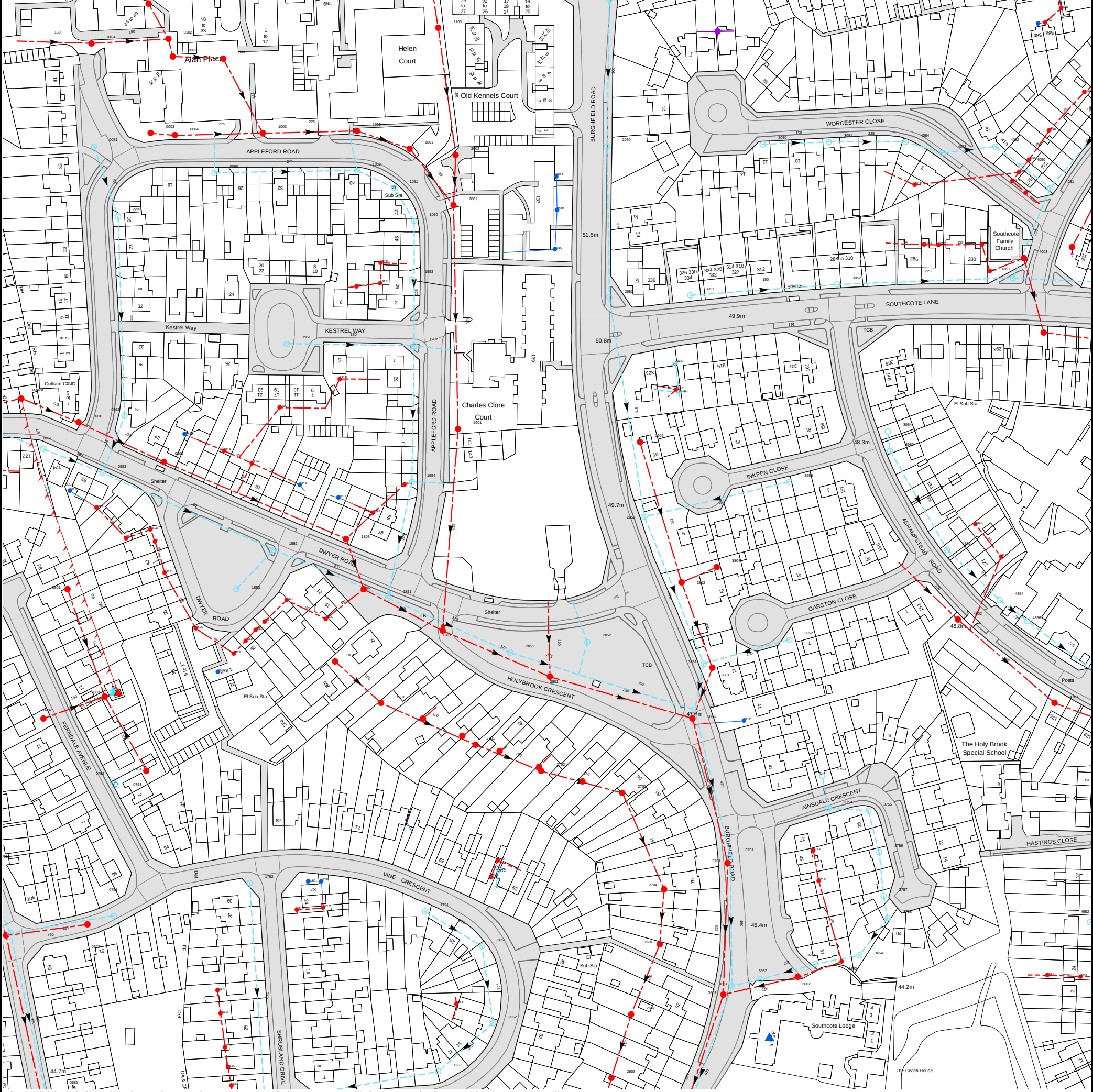
Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2022 4735243



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 468244,171872
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
401J	n/a	n/a
491A	n/a	n/a
4003	48.41	46.73
411J	n/a	n/a
411A	n/a	n/a
411B	n/a	n/a
3601	44.97	42.41
3651	45.05	42.44
3652	n/a	n/a
3602	45.7	42.79
4601	43.4	41.76
461A	n/a	n/a
3653	45.4	43.28
3603	n/a	n/a
3654	n/a	n/a
4652	44.25	43.01
3758	45.14	n/a
3757	45.31	43.91
371B	n/a	n/a
3701	46.23	42.94
3751	46.3	43.4
3756	45.7	n/a
371A	n/a	n/a
3755	45.97	n/a
3754	46.31	44.81
3753	46.37	45.09
371C	n/a	n/a
4701	46.25	44.5
4851	46.4	44.15
3852	47.51	45.52
4856	n/a	n/a
4802	47.29	45.36
4854	47	45.24
3804	47.93	46.8
481B	n/a	n/a
4852	47.7	45.7
481A	n/a	n/a
2603	45.09	43.22
1651	45.5	43.54
2652	45.45	43.82
2602	n/a	n/a
261A	n/a	n/a
2651	45.77	44.23
2601	n/a	n/a
1751	n/a	n/a
171D	n/a	n/a
171C	n/a	n/a
2704	n/a	n/a
271D	n/a	n/a
171A	n/a	n/a
171B	n/a	n/a
271B	n/a	n/a
271C	n/a	n/a
271A	n/a	n/a
2703	n/a	n/a
27MK	n/a	n/a
2702	n/a	n/a
27ML	n/a	n/a
27ME	n/a	n/a
2701	n/a	n/a
27ND	n/a	n/a
3702	47.49	44.2
17NK	n/a	n/a
3752	47.55	44.75
1701	n/a	n/a
2801	n/a	n/a
3801	47.84	44.67
3851	47.91	45.02
1804	n/a	n/a
2851	48.57	45.64
2852	n/a	n/a
1801	48.29	45.2
181G	n/a	n/a
181F	n/a	n/a
1851	48.88	45.98
1802	48.87	45.66
3802	48.52	45.42
1852	48.68	46.35
1803	49	45.83
2853	49.44	n/a
181B	n/a	n/a
081B	n/a	n/a
181D	n/a	n/a
081A	n/a	n/a
0851	n/a	n/a
181A	n/a	n/a
181C	n/a	n/a
0953	49.81	47.72
191A	n/a	n/a
0909	n/a	n/a
091A	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0951	n/a	n/a
091B	n/a	n/a
0910	50.08	47.5
0952	n/a	n/a
191C	n/a	n/a
0902A	n/a	n/a
191B	n/a	n/a
1951	50.18	48.98
191D	n/a	n/a
191E	n/a	n/a
9601	45.24	42.83
9651	45.25	43.78
0602	45.46	43.09
0751	45.5	44.11
1752	46.05	43.82
0753	n/a	42.27
0752	n/a	40.77
0701	n/a	n/a
0702	42.43	n/a
0803	42.78	40.85
081H	n/a	n/a
081F	n/a	n/a
181H	n/a	n/a
181E	n/a	n/a
081G	n/a	n/a
181I	n/a	n/a
0801	n/a	n/a
1853	48.37	46.85
081E	n/a	n/a
081J	n/a	n/a
081C	n/a	n/a
081D	n/a	n/a
061A	n/a	n/a
061D	n/a	n/a
061B	n/a	n/a
061C	n/a	n/a
161A	n/a	n/a
3954	48.48	47.78
3953	48.42	n/a
4054	49.66	48.37
401F	n/a	n/a
401D	n/a	n/a
401E	n/a	n/a
4053	49.08	48.05
4052	49.46	47.46
401H	n/a	n/a
4951	48.11	45.89
401G	n/a	n/a
4050	n/a	n/a
401I	n/a	n/a
401C	n/a	n/a
4901	47.9	46.25
401B	n/a	n/a
4051	48.74	46.88
4002	n/a	n/a
401A	n/a	n/a
1954	50.6	47.96
3955	48.59	n/a
2902	n/a	n/a
2901	51.02	48.04
391B	n/a	n/a
391C	n/a	n/a
391A	n/a	n/a
1952	50.81	48.39
2951	51.29	49.1
3951	50.27	n/a
3952	n/a	n/a
1953	50.97	49.52
201C	n/a	n/a
1050	51.32	49.32
201B	n/a	n/a
2001	51.41	49.62
201A	n/a	n/a
2002	51.82	49.92
2050	52.49	50.39
3050	51.59	49.79
3051	50.68	49.08
311A	n/a	n/a
1103	52.7	50.51
2151	54	51.76
0104	54.05	52.55
0051	52.78	n/a
0052	51.7	n/a
0103	53.97	52.67
0003	52.67	50.43
0102	53.13	52.17
0002	52.97	51.93
0004	52.52	50.36
0050	52.02	n/a
0001	52.52	51.21
1003	52.29	50.15
1052	n/a	n/a
1002	52.1	49.9

Manhole Reference	Manhole Cover Level	Manhole Invert Level
191F 1051 1001	n/a 51.46 51.94	n/a 49.62 49.76
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 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

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.

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.

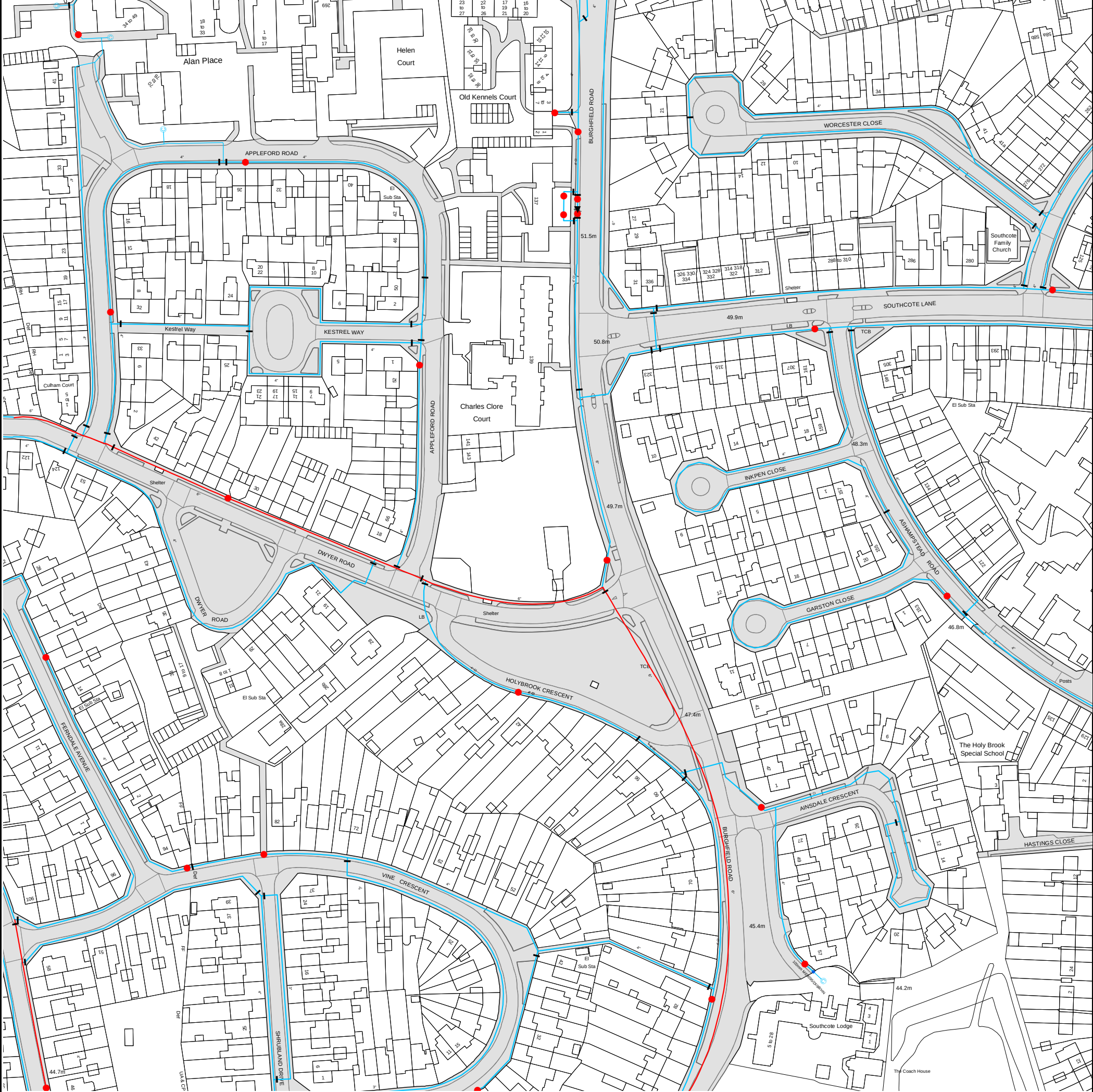
	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

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.



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 468244, 171872.
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.



Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

- Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
- Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
- Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.
- Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
- Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
- Transmission Tunnel:** A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
- Proposed Main:** A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger
- Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

- Other Water Company Main:** Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
- Private Main:** Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

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

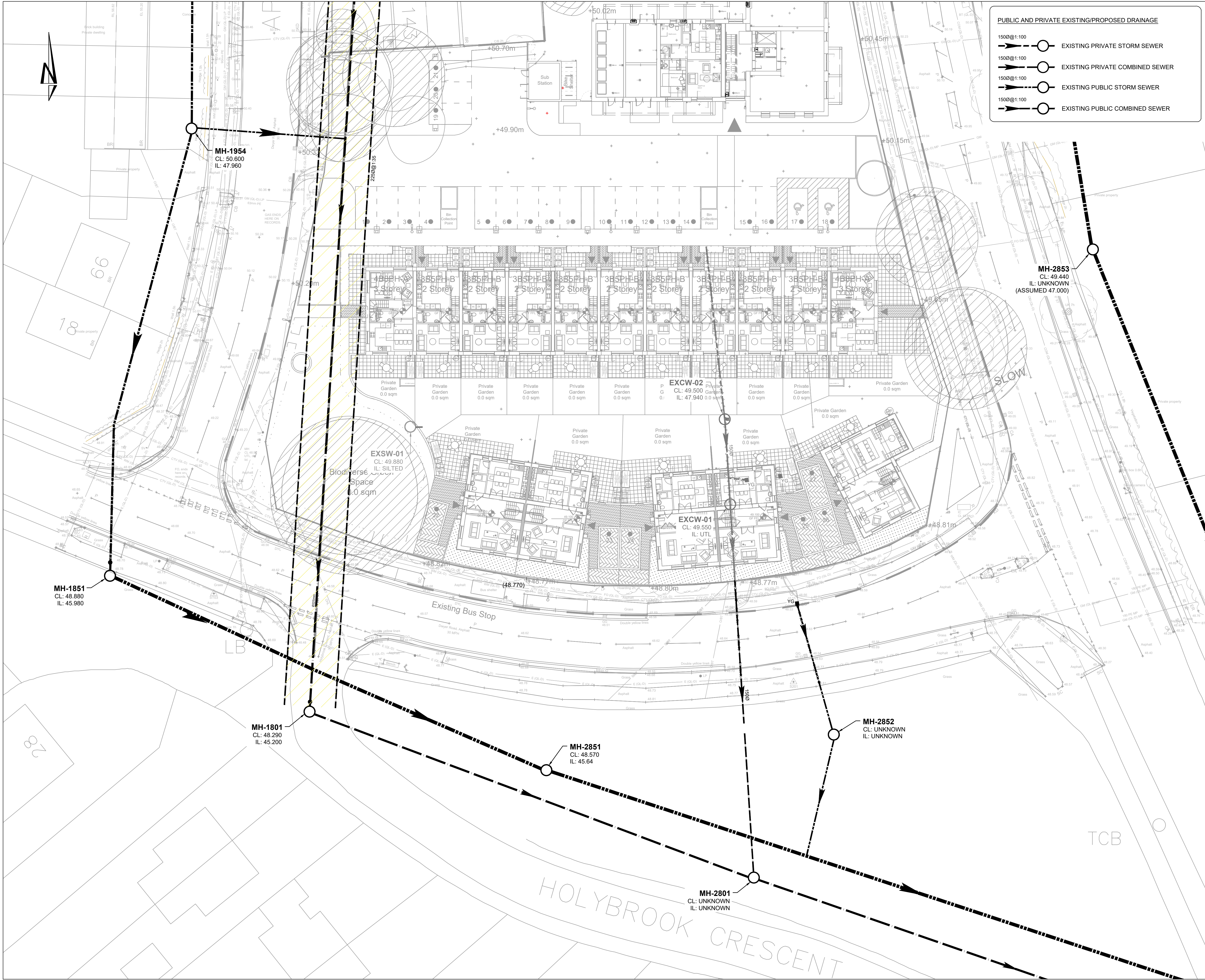
Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0800 009 4540 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

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

Appendix D

Existing Drainage Layout



PUBLIC AND PRIVATE EXISTING/PROPOSED DRAINAGE

1500@1:100 EXISTING PRIVATE STORM SEWER

1500@1:100 EXISTING PRIVATE COMBINED SEWER

1500@1:100 EXISTING PUBLIC STORM SEWER

1500@1:100 EXISTING PUBLIC COMBINED SEWER

KEY PLAN

NOTES

- All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
- The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
- Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
- All levels are shown in metres above Ordnance Datum (m AOD).

POZ	UPDATED TO SUIT UPDATED LAYOUT	D.WEBB	18/04/23	J.MAGEE	18/04/23	J.MAGEE	18/04/23
P01	PRELIMINARY ISSUE	J.NEAL-LONG	22/02/23	J.MAGEE	22/02/23	J.MAGEE	22/02/23
REV	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

CLIENT
READING BOROUGH COUNCIL

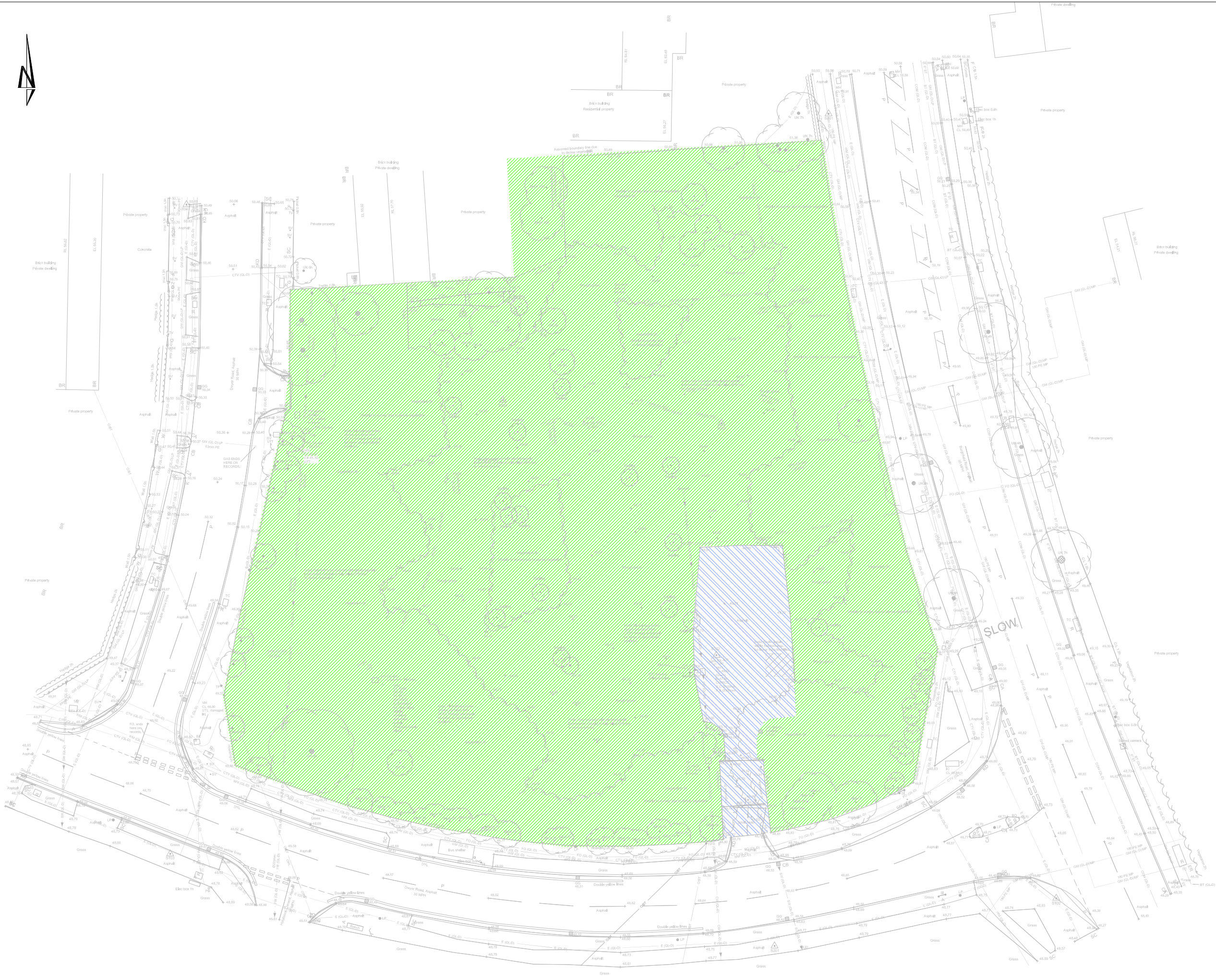
PROJECT
DWYER ROAD

TITLE
EXISTING DRAINAGE LAYOUT

HYDROCK PROJECT NO.	SCALE @ A1	STATUS
C-26888-C	1:200	S2
STATUS DESCRIPTION PLANNING		REVISION P02
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 26888-HYD-00-ZZ-SK-C-7700		

Appendix E

Pre / Post Development Catchments



KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.

3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.

4. All levels are shown in metres above Ordnance Datum (m AOD).

LEGEND

BUILDING / ROOF

= 0m²

HARDSTANDING

= 270m²

SOFT LANDSCAPING

= 4680m²

TOTAL

= 4950m²

P01	PRELIMINARY ISSUE					
	J.MAL/ALONG	22/02/23	J.MAGEE	22/02/23	J.MAGEE	22/02/23
REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
Hydrock Merchants' House North Wapping Road Bristol BS1 4BW t: +44 (0)117 945 9125 e: bristolcentral@hydrock.com						
CLIENT						
READING BOROUGH COUNCIL						
PROJECT						
DWYER ROAD						
TITLE						
PRE-DEVELOPMENT CATCHMENT PLAN						
HYDROCK PROJECT NO.				SCALE @ A1		
C-26888-C				1:200		
STATUS DESCRIPTION						STATUS
PLANNING						S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)						REVISION
26888-HYD-00-ZZ-SK-C-7710						P01



KEY PLAN

NOTES

1.

All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2.

The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.

3.

Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.

4.

All levels are shown in metres above Ordnance Datum (m AOD).

CATCHMENT 1

BUILDING / ROOF

= 1419m²

PERMEABLE PAVING

= 476m²

HARDSTANDING

= 1212m²

TOTAL

= 3107m²

OTHER

SOFT LANDSCAPING

= 2356m²

TOTAL

= 5463m²

P03

UPDATED TO SUIT NEW SITE LAYOUT

D.WEBB

18/04/23

J.MAGEE

18/04/23

J.MAGEE

18/04/23

P02

UPDATED TO SUIT NEW SITE LAYOUT

J.SHIMMIN

27/03/23

J.MAGEE

27/03/23

J.MAGEE

27/03/23

P01

PRELIMINARY ISSUE

J.NEAL-LONG

22/02/23

J.MAGEE

22/02/23

J.MAGEE

22/02/23

REV

REVISION NOTES/COMMENTS

DRAWN BY

DATE

CHECKED BY

DATE

APPROVED BY

DATE

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e: bristolcentral@hydrock.com

CLIENT

READING BOROUGH COUNCIL

PROJECT

DWYER ROAD

TITLE

POST-DEVELOPMENT CATCHMENT PLAN

HYDROCK PROJECT NO.

C-26888-C

SCALE @ A1

1:200

STATUS DESCRIPTION

PLANNING

STATUS

S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)

26888-HYD-00-ZZ-SK-C-7720

REVISION

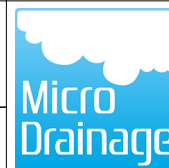
P03

Appendix F

Calculations

-
-
-

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Source Control 2020.1.3

Half Drain Time : 583 minutes.

	Storm	Max	Max	Max	Max	Max	Max	Status
	Event	Level	Depth	Infiltration	Control	Σ	Outflow	Volume
		(m)	(m)	(l/s)	(l/s)		(l/s)	(m³)
15 min	Summer	48.872	0.977	0.0	1.8		1.8	61.3
30 min	Summer	49.026	1.131	0.0	1.8		1.8	79.9
60 min	Summer	49.166	1.271	0.0	1.9		1.9	98.4
120 min	Summer	49.293	1.398	0.0	2.0		2.0	115.1
180 min	Summer	49.350	1.455	0.0	2.0		2.0	122.7
240 min	Summer	49.379	1.484	0.0	2.0		2.0	126.5
360 min	Summer	49.392	1.497	0.0	2.0		2.0	128.1
480 min	Summer	49.382	1.487	0.0	2.0		2.0	126.8
600 min	Summer	49.364	1.469	0.0	2.0		2.0	124.5
720 min	Summer	49.345	1.450	0.0	2.0		2.0	122.0
960 min	Summer	49.304	1.409	0.0	2.0		2.0	116.6
1440 min	Summer	49.234	1.339	0.0	1.9		1.9	107.4
2160 min	Summer	49.146	1.251	0.0	1.9		1.9	95.7
2880 min	Summer	49.066	1.171	0.0	1.9		1.9	85.2
4320 min	Summer	48.927	1.032	0.0	1.8		1.8	67.0
5760 min	Summer	48.733	0.838	0.0	1.7		1.7	52.6
7200 min	Summer	48.548	0.653	0.0	1.6		1.6	40.9
8640 min	Summer	48.395	0.500	0.0	1.5		1.5	31.4
10080 min	Summer	48.270	0.375	0.0	1.4		1.4	23.5
15 min	Winter	48.872	0.977	0.0	1.8		1.8	61.3

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	127.583	0.0	62.7	19
30 min Summer	83.871	0.0	82.9	34
60 min Summer	52.595	0.0	104.3	64
120 min Summer	31.922	0.0	126.8	122
180 min Summer	23.544	0.0	140.4	182
240 min Summer	18.869	0.0	150.1	242
360 min Summer	13.701	0.0	163.4	360
480 min Summer	10.923	0.0	173.8	476
600 min Summer	9.157	0.0	182.1	520
720 min Summer	7.925	0.0	189.2	582
960 min Summer	6.304	0.0	200.5	706
1440 min Summer	4.560	0.0	217.5	980
2160 min Summer	3.293	0.0	235.5	1384
2880 min Summer	2.611	0.0	248.7	1788
4320 min Summer	1.880	0.0	268.1	2552
5760 min Summer	1.488	0.0	282.2	3336
7200 min Summer	1.240	0.0	293.8	4040
8640 min Summer	1.069	0.0	303.0	4760
10080 min Summer	0.942	0.0	311.1	5456
15 min Winter	127.583	0.0	62.7	19

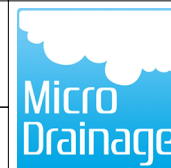
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Date 20/04/2023 09:42	Designed by DanWebb																																		
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<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.950</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.950</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.600</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.211 <table> <tr> <th colspan="2">Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> <tr> <td>0</td> <td>4</td> <td>0.211</td> </tr> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.950	Region	England and Wales	Cv (Winter)	0.950	M5-60 (mm)	18.600	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)		Area	From:	To:	(ha)	0	4	0.211
Rainfall Model	FSR	Winter Storms	Yes																																
Return Period (years)	100	Cv (Summer)	0.950																																
Region	England and Wales	Cv (Winter)	0.950																																
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Hydrock Consultants Ltd		Page 4																																	
																																			
Date 20/04/2023 09:42	Designed by DanWebb																																		
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Model Details Storage is Online Cover Level (m) 49.895 Complex Structure Cellular Storage Invert Level (m) 47.895 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>66.0</td><td>0.0</td><td>1.501</td><td>0.0</td><td>0.0</td></tr><tr><td>1.500</td><td>66.0</td><td>0.0</td><td>2.000</td><td>0.0</td><td>0.0</td></tr></table> Porous Car Park Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 10.0 Membrane Percolation (mm/hr) 1000 Length (m) 23.0 Max Percolation (l/s) 63.9 Slope (1:X) 0.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 48.895 Membrane Depth (m) 100 Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0055-2000-2224-2000 Design Head (m) 2.224 Design Flow (l/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 55 Invert Level (m) 47.171 Minimum Outlet Pipe Diameter (mm) 75 Suggested Manhole Diameter (mm) 1200 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>2.224</td><td>2.0</td></tr><tr><td>Flush-Flo™</td><td>0.242</td><td>1.2</td></tr><tr><td>Kick-Flo®</td><td>0.495</td><td>1.0</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>1.5</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	66.0	0.0	1.501	0.0	0.0	1.500	66.0	0.0	2.000	0.0	0.0	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	2.224	2.0	Flush-Flo™	0.242	1.2	Kick-Flo®	0.495	1.0	Mean Flow over Head Range	-	1.5
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																														
0.000	66.0	0.0	1.501	0.0	0.0																														
1.500	66.0	0.0	2.000	0.0	0.0																														
Control Points	Head (m)	Flow (l/s)																																	
Design Point (Calculated)	2.224	2.0																																	
Flush-Flo™	0.242	1.2																																	
Kick-Flo®	0.495	1.0																																	
Mean Flow over Head Range	-	1.5																																	
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Source Control 2020.1.3

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.1	1.200	1.5	3.000	2.3	7.000	3.4
0.200	1.2	1.400	1.6	3.500	2.5	7.500	3.5
0.300	1.2	1.600	1.7	4.000	2.6	8.000	3.6
0.400	1.2	1.800	1.8	4.500	2.8	8.500	3.7
0.500	1.0	2.000	1.9	5.000	2.9	9.000	3.8
0.600	1.1	2.200	2.0	5.500	3.0	9.500	3.9
0.800	1.3	2.400	2.1	6.000	3.2		
1.000	1.4	2.600	2.1	6.500	3.3		

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File Dwyer Road - South.SRCX	Checked by																																		
Innovyze		Source Control 2020.1.3																																	
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.950</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.950</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.600</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.092 <table> <tr> <th colspan="2">Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> <tr> <td>0</td> <td>4</td> <td>0.092</td> </tr> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.950	Region	England and Wales	Cv (Winter)	0.950	M5-60 (mm)	18.600	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)		Area	From:	To:	(ha)	0	4	0.092
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©1982-2020 Innovyze																																			

Hydrock Consultants Ltd		Page 4																																	
																																			
Date 18/04/2023 18:01	Designed by DanWebb																																		
File Dwyer Road - South.SRCX	Checked by																																		
Innovyze	Source Control 2020.1.3																																		
Model Details Storage is Online Cover Level (m) 48.920 Complex Structure Cellular Storage Invert Level (m) 47.420 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>60.0</td><td>0.0</td><td>0.751</td><td>0.0</td><td>0.0</td></tr><tr><td>0.750</td><td>60.0</td><td>0.0</td><td>1.500</td><td>0.0</td><td>0.0</td></tr></table> Porous Car Park Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 10.0 Membrane Percolation (mm/hr) 1000 Length (m) 18.0 Max Percolation (l/s) 50.0 Slope (1:X) 0.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 48.920 Membrane Depth (m) 100 Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0066-2000-1057-2000 Design Head (m) 1.057 Design Flow (l/s) 2.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 66 Invert Level (m) 47.113 Minimum Outlet Pipe Diameter (mm) 100 Suggested Manhole Diameter (mm) 1200 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.057</td><td>2.0</td></tr><tr><td>Flush-Flo™</td><td>0.291</td><td>1.9</td></tr><tr><td>Kick-Flo®</td><td>0.592</td><td>1.5</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>1.7</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	60.0	0.0	0.751	0.0	0.0	0.750	60.0	0.0	1.500	0.0	0.0	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.057	2.0	Flush-Flo™	0.291	1.9	Kick-Flo®	0.592	1.5	Mean Flow over Head Range	-	1.7
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Mean Flow over Head Range	-	1.7																																	
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Designed by DanWebb
Checked by

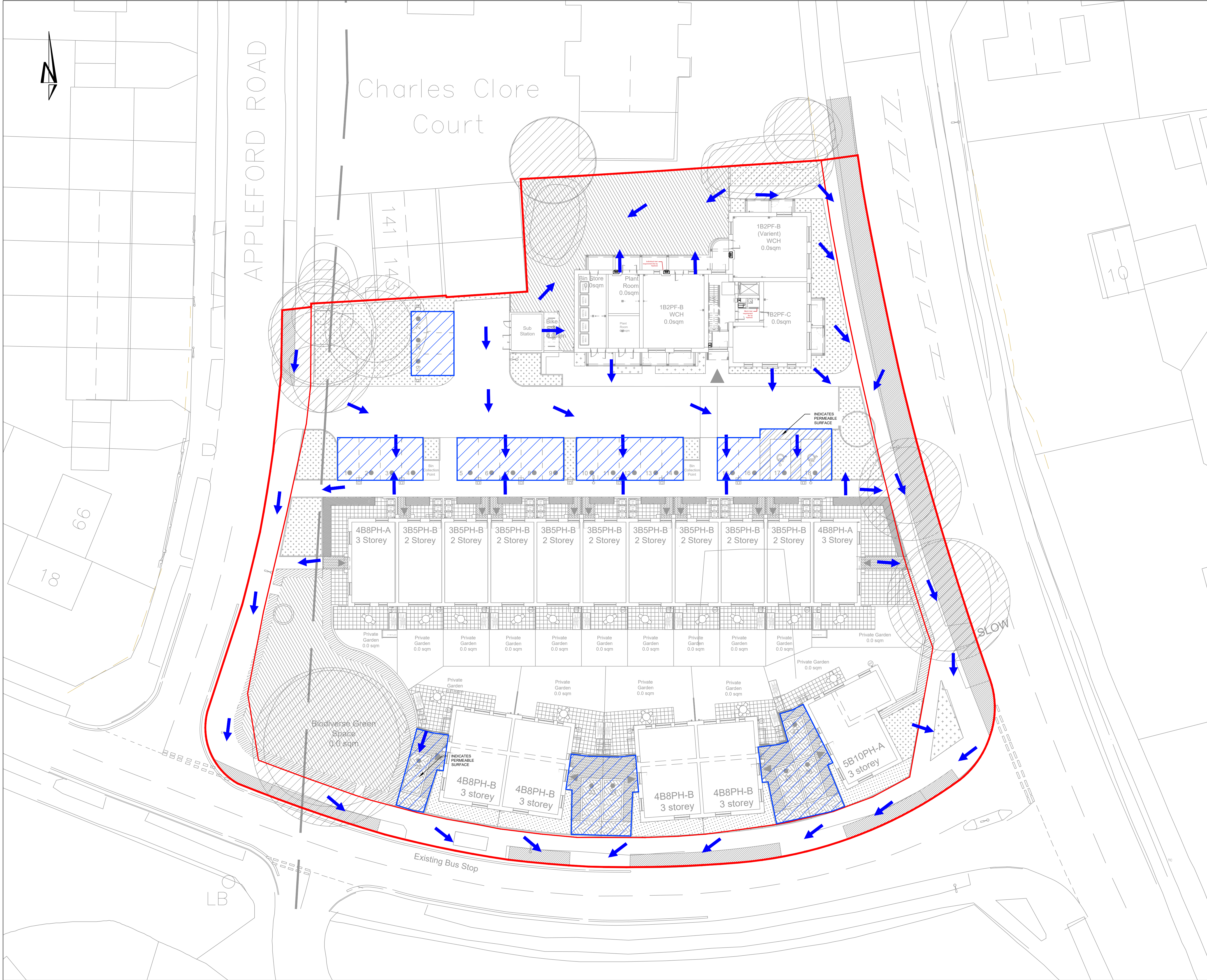


Source Control 2020.1.3

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.1	3.000	3.2	7.000	4.8
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.0
0.300	1.9	1.600	2.4	4.000	3.7	8.000	5.1
0.400	1.9	1.800	2.6	4.500	3.9	8.500	5.3
0.500	1.8	2.000	2.7	5.000	4.1	9.000	5.4
0.600	1.5	2.200	2.8	5.500	4.3	9.500	5.5
0.800	1.8	2.400	2.9	6.000	4.5		
1.000	2.0	2.600	3.0	6.500	4.6		

Appendix G

Overland Flow Routes



KEY PLAN

NOTES

LEGEND

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.

3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.

4. All levels are shown in metres above Ordnance Datum (m AOD).

PO2	PRELIMINARY ISSUE					
	D.WEBB	18/04/23	J.MAGEE	18/04/23	J.MAGEE	18/04/23
PO1	PRELIMINARY ISSUE					
	O.LAINEHURRY	27/03/23	J.MAGEE	27/03/23	J.MAGEE	27/03/23
REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock

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CLIENT

READING BOROUGH COUNCIL

PROJECT

DWYER ROAD

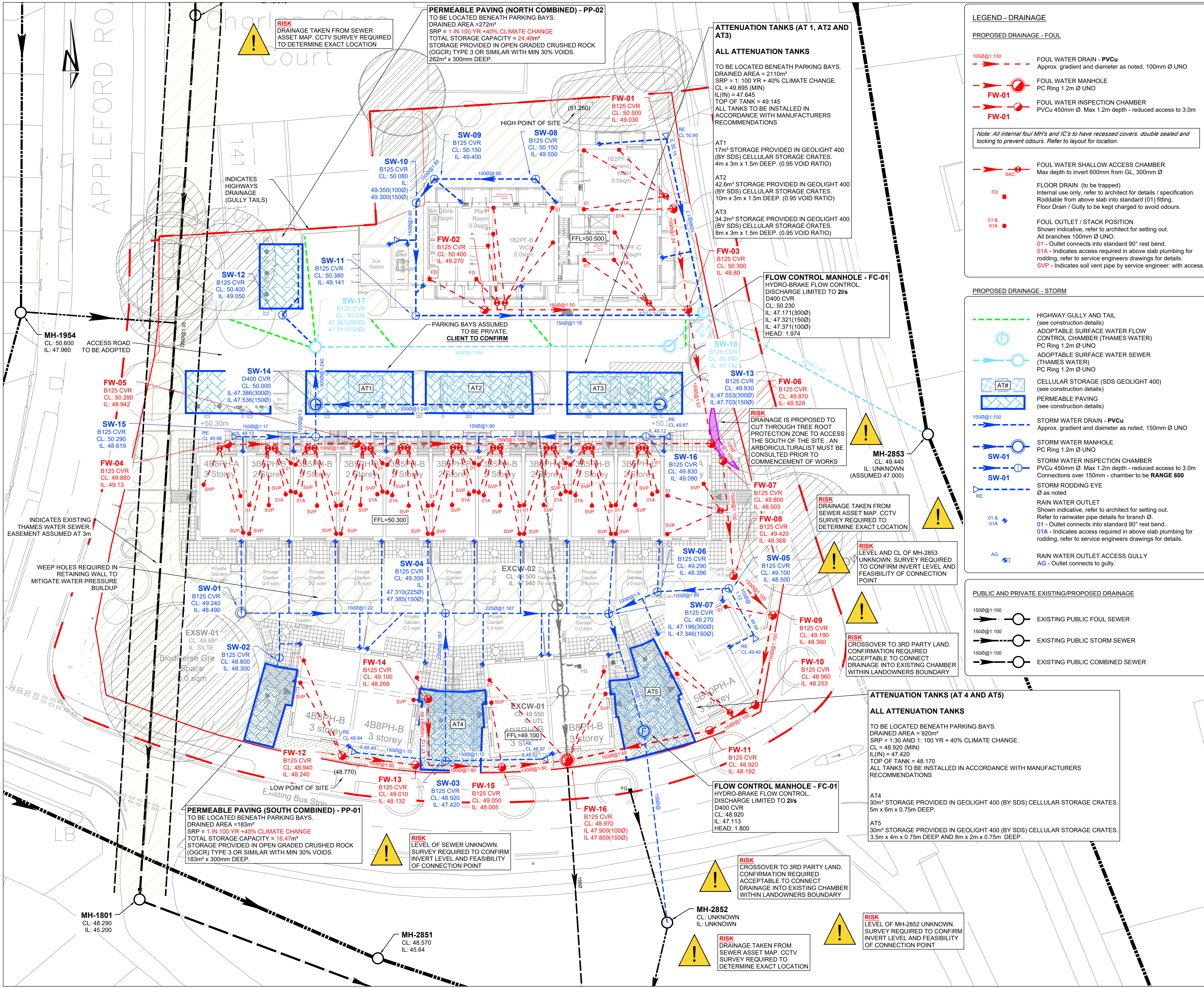
TITLE

OVERLAND FLOW ROUTES

HYDROCK PROJECT NO.	SCALE @ A1
C-26888-C	1:200
STATUS DESCRIPTION	STATUS
PLANNING	S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
26888-HYD-00-ZZ-SK-C-7730	P02

Appendix H

Drainage Strategy Layout



LEGEND - DRAINAGE
PROPOSED DRAINAGE - FOUL
1000@1:100
FW-01
FW-01
FOUL WATER DRAIN - PVCu
Approx. gradient and diameter as noted, 100mm Ø UNO
FOUL WATER MANHOLE
PC Ring 1.2m Ø UNO
FOUL WATER INSPECTION CHAMBER
PVCu 450mm Ø. Max 1.2m depth - reduced access to 3.0m
Note: All internal foul MH's and IC's to have recessed covers. double sealed and locking to prevent odours. Refer to layout for location.
SAC
FD
01 & 01A
FOUL WATER SHALLOW ACCESS CHAMBER
Max depth to invert 600mm from GL, 300mm Ø
FLOOR DRAIN (to be trapped)
Internal use only, refer to architect for details / specification.
Roddable from above slab into standard (01) fitting.
Floor Drain / Gully to be kept charged to avoid odours.
FOUL OUTLET / STACK POSITION
Shown indicative, refer to architect for setting out.
All branches 100mm Ø UNO.
01 - Outlet connects into standard 90° rest bend.
01A - Indicates access required in above slab plumbing for rodding, refer to service engineers drawings for details.
SVP - Indicates soil vent pipe by service engineer, with access.

PROPOSED DRAINAGE - STORM
1500@1:100
SW-01
SW-01
HIGHWAY GULLY AND TAIL
(see construction details)
ADOPTABLE SURFACE WATER FLOW CONTROL CHAMBER (THAMES WATER)
PC Ring 1.2m Ø UNO
ADOPTABLE SURFACE WATER SEWER (THAMES WATER)
PC Ring 1.2m Ø UNO
CELLULAR STORAGE (SDS GEOLIGHT 400)
(see construction details)
PERMEABLE PAVING
(see construction details)
STORM WATER DRAIN - PVCu
Approx. gradient and diameter as noted, 150mm Ø UNO
STORM WATER MANHOLE
PC Ring 1.2m Ø UNO
STORM WATER INSPECTION CHAMBER
PVCu 450mm Ø. Max 1.2m depth - reduced access to 3.0m
Connections over 150mm - chamber to be **RANGE 600**
STORM RODDING EYE
Ø as noted
RAIN WATER OUTLET
Shown indicative, refer to architect for setting out.
Refer to rainwater pipe details for branch Ø.
01 - Outlet connects into standard 90° rest bend.
01A - Indicates access required in above slab plumbing for rodding, refer to service engineers drawings for details.
RAIN WATER OUTLET ACCESS GULLY
AG - Outlet connects to gully.

PUBLIC AND PRIVATE EXISTING/PROPOSED DRAINAGE
1500@1:100
1500@1:100
1500@1:100
EXISTING PUBLIC FOUL SEWER
EXISTING PUBLIC STORM SEWER
EXISTING PUBLIC COMBINED SEWER

KEY PLAN																											
NOTES																											
1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing. 2. The DWG file is issued for the purposes of coordination only and does not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets. 3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately. 4. Levels shown in metres above Ordnance Datum (mAOD). 5. All private drainage to comply with current Building Regulations, BS EN-752 Drain and Sewer systems outside Buildings and other relevant British Standards and Codes of Practices. 6. All external drainage within trafficked areas with less than 1.2m cover to have type Z concrete bed and surround. All external drainage within landscaped areas with cover less than 0.6m to have type Z concrete bed and surround. All drainage with greater cover than the minimum required to have type S bed and surround. 7. All drainage to be laid soffit to soffit unless otherwise shown. 8. The Contractor is to verify the line, level and diameter of existing sewers before commencing drainage works. 9. All foul drainage to be minimum 100mm diameter, all surface water drainage to be minimum 150mm diameter unless otherwise shown. 10. Cover levels shown on this drawing refer to approximate surface levels. It is the contractors responsibility to ensure that access covers and frames are set at the final surface levels. 11. Where possible the contractor is to orientate manhole biscuits and covers to locate them parallel to kerbs and paving. 12. The Contractor should comply with hse(g) 47 "Avoiding Danger from Underground Services" when excavating around existing services. 13. It is the contractors responsibility to determine the location and depth of all existing services, mains and cables prior to construction. 14. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements. 15. All in-situ concrete and precast concrete components to be manufactured using Sulphate Resisting Portland Cement, (SRPC) to BS 4027, if required, subject to soil conditions. Manhole components to be to BS EN 1917:2002. 16. All ironwork to be kite marked by BSI or certified by equal inspection authority. 17. All redundant connections to be capped off and grouted from the down stream manhole. 18. All new drainage pipes to be jetted. CCTV surveyed with DVD recording and any defects highlighted to the supervising officer. Following the rectification of any defects, the drain is to be re-surveyed with CCTV and the recordings made available to the project manager/engineer. 19. Prior to commencing the works the contractor is to confirm details of the existing drainage system as noted on the drawing. 20. Prior to commencing the works the contractor is to undertake the drainage investigation work as noted on the drawing.																											
P04	UPDATED TO SUIT LATEST MASTERPLAN																										
	D. WEBB	18.04.23	J.MAGEE	18.04.23	J.MAGEE	18.04.23																					
P03	SUITABLE FOR STAGE 3																										
	D. WEBB	06.04.23	J.MAGEE	06.04.23	J.MAGEE	06.04.23																					
P02	STRATEGY UPDATED TO SUIT NEW SITE LAYOUT																										
	J. NEAL-LONG	NYI	J.MAGEE	NYI	J.MAGEE	NYI																					
REV	REVISION NOTES/COMMENTS																										
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE																					
Merchants' House North Wapping Road Bristol BS1 4RW t: +44 (0)117 945 9225 e: bristolcentral@hydrock.com Hydrock CLIENT READING BOROUGH COUNCIL PROJECT DWYER ROAD TITLE DRAINAGE STRATEGY <tr><td colspan="4">HYDROCK PROJECT NO. C-26888-C</td><td colspan="3">SCALE @ A1 1:200</td></tr> <tr><td colspan="5">STATUS DESCRIPTION SUITABLE FOR STAGE 3</td><td colspan="2">STATUS S3</td></tr> <tr><td colspan="5">DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 26888-HYD-00-ZZ-DR-C-7010</td><td colspan="2">REVISION P04</td></tr>							HYDROCK PROJECT NO. C-26888-C				SCALE @ A1 1:200			STATUS DESCRIPTION SUITABLE FOR STAGE 3					STATUS S3		DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 26888-HYD-00-ZZ-DR-C-7010					REVISION P04	
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DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 26888-HYD-00-ZZ-DR-C-7010					REVISION P04																						