

2.6 Existing Site Foul and Surface Water Drainage

As discussed above, the development site comprises the disused Telecomms Building and Friars Walk Shopping Centre, including several small retail outlets. The shopping centre is currently being used as a leisure destination (Zombie experience).

From Thames Asset maps, included in Appendix 4, and a separate report discussing existing drainage systems, several existing drainage sewers were identified in Garrard Street, Merchants Place and Friar Street. The demolition of the existing buildings is covered under a separate application.

A large diameter foul water sewer north of Garrard Street is noted on the Thames Water Asset Plan as 1100 x 750, depth and condition unknown. The foul water sewer in Friar Street and Merchants Place are noted as 225mm diameter and 150mm diameter, respectively.

The existing surface water sewers in Garrard Street and Friar Street is noted on the Thames Water asset plans as 375mm diameter and 225mm diameter, respectively, depth and condition unknown.

The site-wide drainage assessments and recommendations of this report are based on the information provided below;

- Architectural General Arrangements by CallistonRTKL

2.7 Existing Drainage Consideration

The existing foul and surface water drainage from the proposed development site is assumed to discharge into below ground public sewers within Garrard Street and Friar Street. A conditional site investigation and associated CCTV survey works were undertaken to validate and identify the existing utility sewage drainage infrastructure on, and adjacent to, the site, particularly to identify the location of discharge points for both Foul and Surface Water systems. The findings of this survey are included in a separate report entitled Party Wall Below Ground Drainage Report (ref. SHR-RAM-XX-XX-RP-C-000001), dated 28 February 2019.

The total development comprising Phase 1 and Phase 2 is circa 2.56 ha, of which the northern site, identified as Phase 2, will be developed under a separate planning application. The Phase 1 application site boundary includes an area to the south of Garrard Street approximately 0.9 ha. 0.9 ha was used for all hydraulic network calculations and greenfield/brownfield run-off estimates.

The existing peak foul water discharge rate from existing buildings are not known. For the purpose of this Drainage Strategy report, peak flow discharge was estimated based on the gross internal floor area (GIA). Estimating a GIA circa 25,680 m² for assumed office and amenity use, the existing peak flow discharge was estimated.

Existing Land-use	No. Floors (Approx.)	Area (m ²)	Land Use	Approx. Peak Foul Water Discharge (l/s)
Telecoms House	Basement Level 1	1,510	Office	1.75
	Basement Level 2	1,370	Office	
	Ground Floor	1,570	Office	
	First Floor	1,840	Office	
	Basement	4,730	Retail	2.69

Existing Land-use	No. Floors (Approx.)	Area (m ²)	Land Use	Approx. Peak Foul Water Discharge (l/s)
Friars Walk Shopping Centre	Ground Floor	5,270	Retail	
	First Floor	5,190	Retail	
	Second Floor	2,290	Retail	
	Third Floor	1,360 (350 + 1,010)	Office	
	Fourth Floor	550	Office	
Total (l/s)				4.44

The existing peak foul water discharge rate into the public sewer from the site has been calculated as 4.4l/s, based on GIA in accordance with Sewers for Adoption (7th Edition).

- Surface Water - The greenfield run-off calculated using Micro-Drainage Quick Storage calculation returned a surface water discharge from the site (area 0.9 ha) approximately 0.3l/s. Given the extent of the development site located on brownfield site, it is not considered feasible using the calculated greenfield run-off rate. Therefore, the discharge from the site will be limited as discussed in Section 2.10 of this report.

For reference, brownfield run-off was estimated using Modified Rational Method for 0.9 ha site and rainwater intensity of 76mm/hr. The calculated runoff is 190 l/s:

$Q = 2.78 CiA$, where

C = permeable coefficient, taken as 1

i = rainfall intensity (mm/hr), taken as 76mm/hr

A = area (ha), taken as 0.9 ha

2.8 Existing Site Constraints with Public Sewers

Existing drainage connections with public sewers will be retained and utilised where possible to avoid the need for any excavation near existing services and in public highway. The precise size, location and levels are subject to verification and confirmation from intrusive CCTV survey investigations.

The ability and suitability of on-site infiltration of surface water was discounted given the extent of development proposed, which includes a podium level with two levels of basement car park below that. It is intended that surface water run-off from the development site would be attenuated in below ground storage tanks.

2.9 Stakeholder Consultations

Thames Water

Following initial communication with Thames Water, a Pre-Planning application was submitted detailing the potential outfall locations to the existing Thames Water drainage network. The application enables Thames Water to carry out a capacity assessment of the connections proposed from the development to the existing Thames Water sewers adjacent to the proposed development site. The pre-planning application included options to re-use existing connections into the public sewer network where such arrangements are found to be of a suitable size, location, condition and level for re-use, as well as new connection to existing Thames Water

sewers. The purpose of this application is to verify and establish capacity available in the existing public sewers to accommodate the proposed discharge from the development site.

In a previous section of this report, assessing the greenfield run-off rate at the proposed development site, it was not considered feasible to restrict the surface water discharge from the development site to greenfield rates. It is proposed that surface water run-off is restricted to the proposed pre-development run-off rates agreed in the Storm Water Drainage Strategy prepared by Hoare Lea, dated 13 July 2015. Surface water run-off will be attenuated on-site prior to discharging, at the restricted peak discharge rate, into the existing Thames Water outfalls.

The foul water drainage from the development site is proposed to be discharged unattenuated into existing Thames Water outfalls.

The proposed surface water and foul water connections to the Thames Water sewers will need to be confirmed with the Lead Local Flood Authority and Thames Water, NPPF guidelines and referenced within Reading Borough Council guidance on flooding and climate change. Confirmation of the public sewer for capacity to cater for the proposed foul and surface water rates from the proposed development is required.

2.10 Proposed Surface Water Drainage

The proposed drainage strategy is based on the discharge rates agreed in the Storm Water Drainage Strategy produced by Hoare Lea, dated 13 July 2015; Block E 42.47 l/s and Block F 20.16 l/s. It is proposed that the surface water run-off is attenuated in below ground cellular storage tanks prior to discharging into the existing Thames Water sewerage network. The discharge from the attenuation structures will be restricted prior to discharge.

The precise outfall locations and connection details, where and if new outfalls are required, will be agreed with Thames Water as part of the detailed design stages as necessary.

The peak discharge rate for the proposed development for 1 in 100-year return period will include an allowance for climate change in accordance with the guidance published in NPPF 2012. The considered national standard approach of 40% allowance due to climate change has been considered in the design at this stage

The Industry standard Micro-Drainage software, version 2018.1, has been used to model the site in its geographical location. Refer to Appendix 3 for the relevant calculation reference documents.

Please refer to the table below for the proposed surface water flow rates.

Storm Event	Q _{1 year}	Q _{bar}	Q _{30 year}	Q _{100 year}
Discharge Rates (l/s)	0.3	0.3	0.8	1.1
Block E Quick Storage Estimate (m ³) = 223				
Block F Quick Storage Estimate (m ³) = 94				

The proposed attenuation storage systems located at the northern and southern parts of the development site will collect water from rain water pipes and external landscaped areas. Where found as part of the assessment carried out to produce the Party Wall Below Ground Drainage Report (ref. SHR-RAM-XX-XX-RP-C-000001), surface water drainage from identified existing adjacent structures will be considered as part of the development site drainage strategy.

For proposed connections into the existing public sewers, application will be made to Thames Water under a Section 106 Consent to Discharge application of the Water Industry Act 1991, at later detail design stage.

The Sustainable Design and Construction Supplementary Planning Document, adopted July 2011, does not specifically advise a value for climate change and instead advocates climate change principles in accordance with the NPPF – 40% climate change was used as per flood risk assessment guidance.

Following hydraulic modelling, no surcharging occurs in the 1:5 storm event, and no flooding occurs for 1:30, 1:100 and 1:100+40% CC storms.

The hydraulic surface water and storm analysis undertaken ensures that the Non-Statutory Standards for Sustainable Drainage Systems and flood risk on the site are satisfied and adhered to.

2.11 Proposed Foul Water Drainage

The proposed foul water drainage strategy assumes unrestricted discharge from the development into existing Thames Water sewers in Garrard Street, Friar Street and Merchants Place. The precise location and discharge rate will be confirmed with Thames Water as part of the pre-development enquiry and application, at later detail design stages.

Based on the layout, the peak foul water discharge was calculated in accordance with BS EN 12056 Part 2, for residential units in the table below. The calculations were undertaken by others as part of the above ground drainage design. At the time of writing this report, the same for the retail component was not known, and an assessment made based on the area of retail space and anticipate use. An unattenuated foul water discharge rate was assumed, based on the information provided in the Waterman FRA (Ref. CIV13174 ES 003) dated 2013. Refer to Appendix 2 for the foul discharge calculation reference documents.

	Plot E	Plot F
Residential Units	370	168
Commercial Uses	Flexible Retail (Class A1-A5)	Flexible Retail (Class A1-A5) and Assembly & Leisure (Class D2)

It is envisaged that all building drainage will discharge to ground level, via gravity, to private external foul water networks, prior to discharging via gravity off site to the existing Thames Water public sewers.

2.12 SuDS Analysis

Surface water drainage systems need to be developed in line with sustainable development collectively referred to as Sustainable Urban Drainage Systems (SuDS). The objective of SuDS is to minimise the impact of the development on the quantity and quality of site run-off and maximise amenity and biodiversity opportunities. Surface water sustainable drainage systems will be designed and installed in accordance with current National Planning Policy Frameworks (NPPF) requirements and Planning Policy Statement 25 (Note: Retracted, but still referenced PPS25) and associated CIRIA 521, 522, 523, 625, 626, 609, 697 and 753, and associated reference documents.

It has been calculated that the proposed combined attenuation system will require circa 317m³ of attenuation storage volume design to contain a 1 in 100 year 24hr storm event (including 40% allowance for climate change) without causing any flooding on site. The attenuation volume is based on the proposed hardstanding areas being drained at a restricted discharge rate (as agreed in the Hoare Lea Storm Water Drainage Strategy dated 13 July 2015). The required storm water attenuation storage can be provided by means of pipework/manhole chambers and attenuation tanks. The following attenuation medium and volumes have been identified;

- Below ground attenuation tanks (3no. tanks proposed)
- Oversized pipes (supplementing the attenuation tanks), where required

Phase 1 Development Site	Attenuation Storage Type	Attenuation Storage Volume (m ³) ²
Block E (North), including external area	Storage tank (cellular units, or similar)	107
Block E (South), including part of Friars Walk and external area	Storage tank (cellular units, or similar)	116
Block F, including part of Friars Walk and part of external area	Storage tank (cellular units, or similar)	94

The gravity drainage system will convey surface water to the storm water management and attenuation systems. These systems will manage the flow which will be restricted by means of a control device, such as an orifice plate, prior to discharging off-site by gravity into the Thames Water public sewerage network.

The total impermeable area for the site identified in the SuDS analysis report is 0.9 ha. Further hydraulic modelling in the following design stages is required to determine the precise network capacity and surface water attenuation volumes. The hydraulic analysis and modelling criteria for the surface water drainage design to be undertaken at detailed design stage is;

- FSR Rainfall Data
- M5-60(mm) – 18.9
- Ration (R) – 0.40
- Climate Change (CC) – 40% for 1 in 100-year return period
- Area (ha) – 0.9ha (planning area with 100% PIMP)
- Maximum Allowable Discharge – Block E 42.47 l/s and Block F 20.16l/s

The above criteria are to be input into the industry standard, MicroDrainage hydraulic modelling Software;

- To achieve the pre-development run-off rates previously agreed, a sustainable urban drainage system is proposed, and drainage hierarchy is followed as outlined in the Lead Local Flood Authority's guidance. Current SuDS measures include attenuation tanks. The benefit of the tank system is mainly a flood reduction. This clearly is in line with Sustainable Design and Construction Supplementary Planning Guidance.

² Subject to detail design at following works stage

3. LEGISLATION

Design Standards and Criteria

It is proposed that all below ground surface and foul water drainage from the development site will be collected in separate gravity drainage networks and discharged off site to the existing Thames Water sewerage network in Garrard Street (for Block E (north) and Block F (north)), Friar Street (for Block E (south)), and Merchants Place (Block F (south)). The precise location and levels of the existing sewerage network and outfall systems are subject to verification and confirmation from intrusive CCTV survey investigations.

The proposed surface water and foul water drainage networks will be designed and installed to achieve self-cleaning velocity. Flows will generally be kept above 0.75m/s and 1 m/s, respectively, within the pipelines to ensure that self-cleaning velocities are achieved. This is subject to the condition, location and level of the existing off-site below ground drainage and sewerage network.

The development will be drained by dedicated and fully segregated surface and foul water systems designed in accordance with the following documents (where appropriate);

- Building Regulations - Approved Document Part H;
- BS EN 12056: Parts 1-5: Gravity Drainage Systems Inside Buildings
- BS EN 752: Drain and Sewer Systems outside buildings
- Sustainable Drainage Systems - Design manual for England and Wales (CIRIA)
- Sewers for Adoption - 7th edition
- BS 8000-14: Workmanship on Building Sites: Code of Practice for Below Ground Drainage
- The Local Authorities guidelines, rules and regulations (such as Lead Local Flood Authority Representative (LLFA)).
- Sustainable Design and Construction Supplementary Planning Guidance, April 2014
- Non-statutory Technical Standards for Sustainable Drainage Systems, S5 and S6
- Reading Borough Council (Lead Local Flood Authority) requirements.

To give a long design life, with minimum embodied energy, the buried pipework will generally be;

- Vitrified clay, where possible; and
- Cast iron when laid below or cast within or through foundations or building structures.

Chambers will generally be either (subject to availability of space);

- Polypropylene inspection chambers (if less than 1.2m to invert level), or
- Pre-cast manholes (if deeper than 1.2m to invert and in areas subject to vehicle over-run)
- In-situ concrete manholes (cast within the basement slab in basement car parking level)
- Non-entry polypropylene inspection chamber will be used, where required, up to a depth of 3.0m.

Pipe diameters will generally be as follows;

- Foul water drainage – DN150 to minimise the risk of blockage; and
- Connections from appliances and stacks – DN100 to maintain self-cleansing flows.

The actual below ground drainage sizes will be determined once the flow rates are available from building services engineers, during the design development stages.

4. SITE AND PROJECT CONSTRAINTS

Table 4.1 below, details the site-specific constraints which have been evaluated in order to determine the most appropriate drainage solution. Where elements are yet to be fully considered, this is noted alongside any additional comments. If the constraints lead to a specific risk, this have been highlighted and transferred to the Risk Register within Section 6.

Table 4.1 – Site and Project Constraints

Site / Project Constraints	Potential Impact on Development	Considered in Current Drainage Strategy	Comments	Linked to Risk Register
Environment				
Sensitive environmental receptors	Restrictions on foul and surface water discharge location and quality; inclusion of additional polishing techniques such as separators, reed beds etc.	Yes/No	Discharge is to local utility sewerage systems.	Yes/No
Presence of contamination	Restricts the use of infiltration for surface water disposal	Yes/No	Proposed drainage strategy comprises attenuation storage – no infiltration considered.	Yes/No
Presence of shallow aquifers	Restricts the use of infiltration for surface water disposal	Yes/No	Shallow groundwater in some locations of the site are present.	Yes/No
Presence of nearby watercourses	Restrictions on discharging water quality	Yes/No	Discharge to nearby watercourses not considered. Discharge to existing Thames Water sewers	Yes/No
Flood zone/flood relief areas	Limitations on SUDS systems that can be used (retention of attenuation capacity during flood events)	Yes/No	Known high water table and sensitivity requires significant storm water management and control.	Yes/No
Ground Conditions				

Site / Project Constraints	Potential Impact on Development	Considered in Current Drainage Strategy	Comments	Linked to Risk Register
Infiltrations rates (at required location/depth)	Applicability of infiltration devices for surface water disposal; size of infiltration devices	Yes/No	Proposed drainage strategy comprises attenuation storage – no infiltration considered.	Yes/No
Groundwater level	Restricts infiltration potential; authorities may prevent discharge from potential sources of pollution, i.e. paved areas. Pumping in excavations.	Yes/No	High water table. Location/depth of proposed attenuation structures located above ground water level.	Yes/No
Buried obstructions	May require localised removal within drainage locations or drainage to be re-routed around obstruction	Yes/No	Existing obstructions to be surveyed and where applicable grubbed out and removed.	Yes/No
Existing Infrastructure				
Foul water discharge point locations and invert levels	May require pumping; restrictions on pipe routing (shortest length); additional protection to shallow drains	Yes/No	Levels subject to survey works to be defined during detailed design for the drainage systems.	Yes/No
Surface water discharge point locations and invert levels	May require pumping; restrictions on pipe routing (shortest length); additional protection to shallow drains	Yes/No	Pumping station may be required/proposed. Levels subject to survey works to be defined during detailed design for the drainage systems	Yes/No
Availability of foul water infrastructure nearby	May require 'self sufficiency' i.e. packaged treatment units, reed beds etc.	Yes/No	Existing drainage outfall systems to be utilised for disposal to utility sewerage systems.	Yes/No
Off-site drainage infrastructure capacity	Upgrading of water company assets; use of flow restrictors; additional storage/attenuation	Yes/No	Existing drainage outfall systems to be utilised for disposal to utility sewerage systems. Flows thus assumed capacity is available.	Yes/No
Authority Requirements				
Allowable discharging flow rates	Impacts on volume of attenuation required	Yes/No	Pre-development discharge rates agreed in FRA by Waterman dated March 2013 used (use of greenfield rates not considered feasible for development site) to calculate proposed storm water flows and attenuation capacity. It is proposed that foul flows will discharge off-site unattenuated.	Yes/No

Site / Project Constraints	Potential Impact on Development	Considered in Current Drainage Strategy	Comments	Linked to Risk Register
Allowable discharging flow volumes	Allowable impermeable area/volume of long-term attenuation	Yes/ No	Pre-development discharge rates agreed in FRA by Waterman dated 2013 proposed for storm water flows and attenuation capacity.	Yes/ No
Specific authority requirements	Limits SUDS systems/materials specifications that can be used	Yes/ No	Not advised as any specific requirements from Local Authority.	Yes /No
Easements for services, rivers, critical infrastructure	Reduces available space; restricts drainage element locations	Yes/ No	Known service routes and existing infrastructure does not affect the drainage systems.	Yes/ No
BREAAM/CfSH credit requirement	Enhanced restriction of surface water discharge requiring additional controls and increased attenuation	Yes/ No	Attenuation and surface water management targeted for BREEAM Excellent.	Yes/ No
Site Requirements				
Available external area (space for SUDS)	Limits SUDS systems that can be used (low land take)	Yes/ No	Attenuation tanks located below the proposed building.	Yes/ No
Land use (appropriateness for open water)	Limits SUDS systems that can be used (health and safety)	Yes /No	Not considered within development site.	Yes/ No
Traffic level type/volume	Pervious paving foundation thickness	Yes/ No	Infrequent use by traffic; i.e. maintenance and or fire tender access, usage. Loading for access and manoeuvring requires suitable surface and sub-grade arrangements.	Yes/ No
Construction phasing	Position of attenuation; pipe routing; temporary oversizing of elements due to temporary retention of buildings	Yes/ No	Not anticipated as required. Works contractor to programme drainage installations as required.	Yes/ No
Construction hoarding lines/access routes	Position of attenuation; pipe routing	Yes/ No	Not anticipated as required. Works contractor to programme drainage installations as required.	Yes/ No
Future development (i.e. extensions)	Oversizing of elements to provide additional capacity	Yes /No	Proposed development occupies the total site available.	Yes/ No
Need for new outlets/headwalls to watercourses	Additional correspondence (fees) with authorities; construction of headwall to approved standards; issues relating to banks/bed (scour)	Yes/ No	Not applicable.	Yes/ No

Site / Project Constraints	Potential Impact on Development	Considered in Current Drainage Strategy	Comments	Linked to Risk Register
Abnormal foul water discharge requirements (i.e. laboratories)	Separate laboratory waste; chemically and temperature resistant pipework; inclusion of sample chambers; inclusion of grease separators.	Yes/No	Not applicable, domestic foul waste water discharge only.	Yes/No
Retained trees	Limitation in excavation location/depth to prevent root damage	Yes/No	Not applicable, brownfield site (100% impermeable). Details covered in appropriate report with the Application.	Yes/No
Maintenance requirements	Required maintenance regime is not acceptable to client requiring amendments to proposed drainage scheme	Yes/No	Maintenance of drainage and pumping systems (where required) and storm water attenuation tanks required.	Yes/No