APPENDIX 2.4
FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

Flood Risk Assessment and Drainage Strategy

Richmond College – Residential Development Zone

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1 Introduction

Sweco UK Ltd (formerly MLM Consulting Engineers Limited) has been appointed by Clarion Housing Group (Clarion) to undertake a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed redevelopment at Richmond upon Thames College, Egerton Road, Twickenham TW2 7SJ.

The site forms the residential zone of a wider redevelopment of the whole site, which was granted planning permission 2016 (DC/JEF/15/3038/OUT/OUT). The wider development includes a new secondary school, new main college building, STEM building and a technical hub.

Clarion received permission for the details of the residential zone in 2019. Clarion is now looking to make some updates to the scheme and will submit a new Detailed Planning Application for the site to the London Borough of Richmond Upon Thames Council. The revised proposals maintain the parameters set as part of the outline permission. These updates are designed to increase the number of affordable homes, to include some zero carbon elements and to improve the access arrangements. The revised proposals will also make changes to the layouts of some of the homes, which is especially important following COVID-19 and the emerging changes in working habits.

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This report has been completed in accordance with the National Planning Policy Framework (NPPF) and its accompanying Planning Practice Guidance (PPG). The report contains information on the proposed drainage strategy and an assessment of flood risk to the development of the site.

The site is shown on the Environment Agency (EA) Flood map for planning (see Figure 1) to lie in Flood Zone 1 (low risk). Flood Zone 1 is the area described as having a less than 0.1 % annual probability (AEP) of river or sea flooding. All classes of land use are considered acceptable in this flood zone.

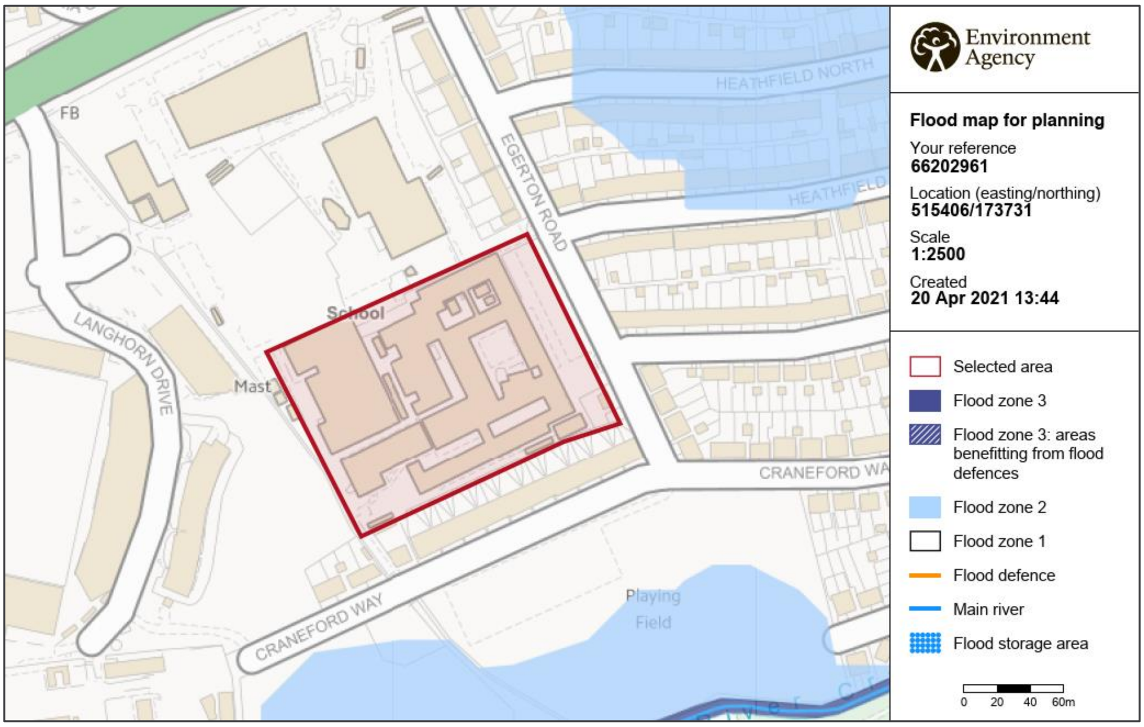

Figure 1 - EA Flood map for planning

The Sequential Test, the aim of which is to steer new development to the areas with the lowest probability of flooding is met and the Exception Test is not required as the site is located within Flood Zone 1.

This report includes a surface water drainage strategy for the site which sets out how the proposals will not increase off-site flood risk. The report also discusses the use of sustainable drainage systems (SuDS) for the attenuation and removal of pollutants prior to discharge. The surface water drainage strategy has been prepared in accordance with the guidelines set out in the Department for Environment, Food and Rural Affairs (DEFRA) publication *Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems* dated March 2015, CIRIA 753 *The SuDS Manual* (C753), the London Borough of Richmond upon Thames (RBRT) Surface Water Management Plan (SWMP) and The London Plan policies SI 12 Flood risk management and SI 13 Sustainable drainage.

This report concludes that in flood risk context, the design proposals are safe and appropriate for the site and its occupants and do not increase the risk of off-site flooding.

2 Site Description

2.1 Existing site

The site covers an area of 1.9 hectares (ha) and comprises part of Richmond upon Thames College with mixed commercial or education buildings and access roads. The site is located between Marsh Farm Lane to the west and Egerton Road to the east; the remainder of the college (both existing building and a new build college) and a school lies to the north and residential properties are located to the south. The site is centred on approximate Ordnance Survey (OS) grid reference 515400,173756. See Figure 1 and Appendix A.

Figure 2 - Existing site location plan - Site boundary shown in red

Current access to the site can be gained directly from Egerton Road to the east, from a path extending from Craneford Way in the south-west, from Marsh Farm Lane to the west, and from the existing college which extends off-site to the north.

2.2 Topography

The topographical levels are shown on the Site Plan in Appendix A. This shows that the site is fairly flat with ground levels of circa 9.0 metres Above Ordnance Datum (mAOD).

2.3 Geology

British Geological Survey (BGS) mapping shows the site is underlain by London Clay Formation bedrock comprising Clay and Silt (Figure 4), and Kempton Park Gravel Member superficial deposits formed of sand and gravel (Figure 5).

2.4 Hydrology

There are three watercourses located within a 500m radius of the site. These include the Duke of Northumberland's River located approximately 200m west of the site, the River Crane located approximately 170m south of the site, and a tributary of the River Crane located approximately 480m north east of the site.

2.5 Proposed site

It is proposed to demolish the existing college buildings, removal of hard-surfacing, site clearance and groundworks together with the redevelopment of the site to provide 212 residential units across a collection of buildings up to 5 storeys in height; together with associated parking for 110 vehicles, cycle parking, open space and landscaping. (see proposed plans in Appendix B). The proposed main access to the site is from the north-western and south-eastern corner.

The proposed residential site is classified as 'More Vulnerable' in accordance with *Table 2: Flood Risk Vulnerability Classification* of the PPG. As the site is located in Flood Zone 1 the development is shown to be appropriate in accordance with *Table 3: Flood risk vulnerability and flood zone 'compatibility'* of the PPG. The Sequential Test is met and no Exception Test is required because the site is located in Flood Zone 1.

3 Flood Risk

The NPPF requires flood risk from the following sources to be assessed:

- Tidal and fluvial sources (sea and river flooding);
- Pluvial sources (flooding resulting from overland flows);
- Groundwater sources;
- Artificial sources, canals, reservoirs etc., and;
- Increases in surface water discharge.

Each of the sources are addressed separately below.

3.1 Tidal and fluvial

Tidal flooding is typically the result of extreme tidal conditions caused by severe weather which may cause a storm surge where water is pushed onshore through elements such as high winds and other storms.

Fluvial flooding occurs when excessive rainfall over an extended period or heavy snow melt causes a river to exceed its capacity.

The site is shown on the EA Flood map for planning (see Figure 1 above) to lie in the low probability flood zone (Flood Zone 1). The EA Extent of flooding from rivers or the sea shows that the site is at a very low risk of flooding from tidal/fluvial sources (see Figure 3).

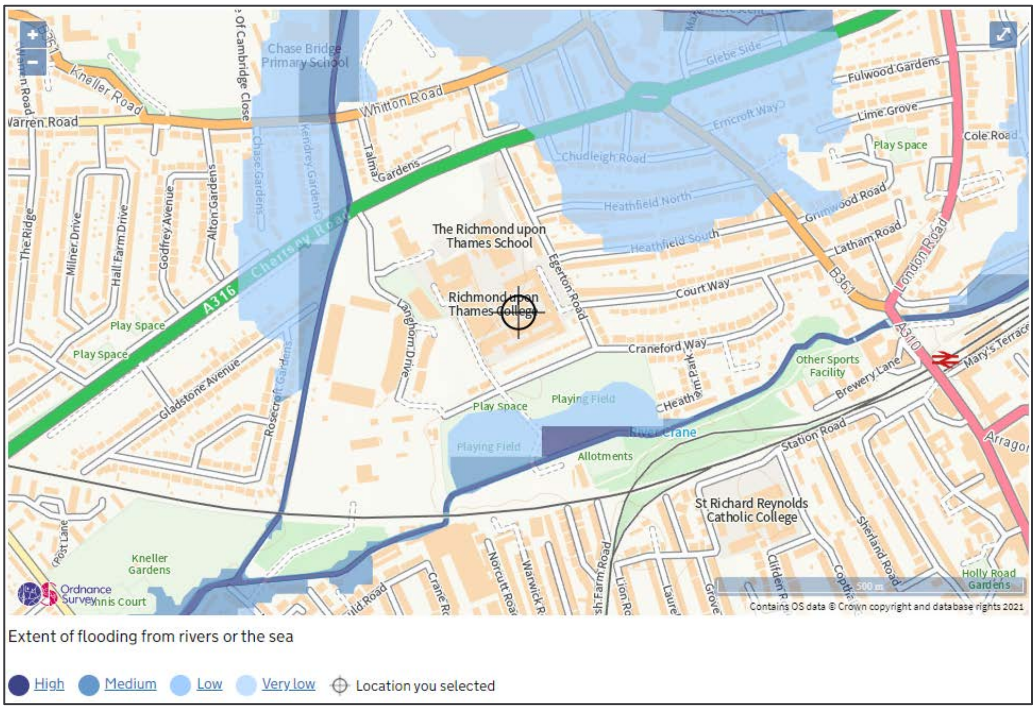

Figure 3 - EA Extent of flooding from rivers or the sea

The site and immediately adjoining access roads are not at any significant risk of flooding from either a tidal or fluvial source.

3.2 Pluvial

There is always a potential risk of surface water flooding from very high intensity rainfall events exceeding the capacity of drainage systems and causing flooding, especially in urban areas. Surface water run-off can be channelled either by natural features such as valley lines or by artificial features such as highways, towards low points in the topography. If surface water is not able to flow away from the low points then pluvial flooding can occur as a result of pooling surface water.

According to SWMP mapping the site is located within Critical Drainage Area Group8 _001. However, the SWMP provides no specific evidence to suggest that the site would be affected by any of the specific factors expected to raise the risk of surface water flooding within certain parts of this CDA.

OS mapping shows ground levels to rise towards the west and as such surface water could be shed towards the site from this direction, however, as the land is developed in this location it is most likely that surface water would be intercepted by the drainage systems prior to reaching the site.

The GOV.UK *Extent of flooding from surface water map* (see Figure 4) shows that the majority of the site is at a very low risk of surface water flooding, with some small localised areas in the north at a low risk of surface water flooding . Areas at very low risk have less than a 0.1% annual probability of flooding. Areas at low risk have between a 0.1 % and 1% annual probability of flooding. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast, and local features can also greatly affect the chance and severity of flooding. In addition, this surface water mapping does not take account of any drainage features in the area.

Figure 4 - GOV.UK Extent of flooding from surface water map

Part of the area at risk appears to be located in an enclosed courtyard which is being demolished as part of the proposal. Since there will no longer be an enclosed courtyard, the associated surface water flood risks should also be removed.

To mitigate against any residual surface water flood risks, where possible, finished floor levels of the buildings should be raised above the surrounding ground levels with falls away from buildings. This design measure should mitigate against any residual risk of localised ponding or overland surface water flow from entering the proposed buildings.

Assuming the above mitigation advice is implemented, the buildings proposed at the site will not be at any significant risk of flooding from pluvial flooding.

3.3 Infrastructure

Thames Water (TW) sewer records as shown in Figure 5 (see Appendix C for the full version) show that combined and surface water sewer mains are located along Egerton Road to the east of the site and Craneford Way to the south of the site. In addition, the topographical and utilities survey of the site (Appendix A) shows a site internal network of foul and surface water drainage servicing the existing buildings.

If surcharging or blockage of the sewers/drains did occur on or in proximity to the site, it is possible that there may be localised surface water flooding at or surrounding the site. However, the probability of sewer flooding occurring is typically low.

As discussed above in Section 3.2, design of ground levels with falls away from buildings should mitigate the residual risk of sewer flooding at the site.

Figure 5 - Thames Water Sewer Records Extract

The site is considered to be at a low risk of flooding from infrastructure.

3.4 Groundwater

Groundwater flooding can be defined as the emergence of groundwater at the ground surface away from perennial river valleys or the rising of groundwater into man-made ground under conditions where the 'normal' range of groundwater levels and groundwater flows is exceeded. Periods of abnormally high rainfall can result in groundwater flooding of basements and the emergence of groundwater at the ground surface, causing damage to property and infrastructure. Local knowledge of groundwater flooding is patchy and can be unreliable, and often groundwater flooding is not identified as a distinct event, being masked by surface water floods.

Groundwater flooding susceptibility mapping from BGS as contained within the SFRA shows where groundwater flooding could occur but does not indicate the relative risk or likelihood that it will occur. Figure 12 below shows the site is located within an area where there is the potential for groundwater flooding to occur at the surface.

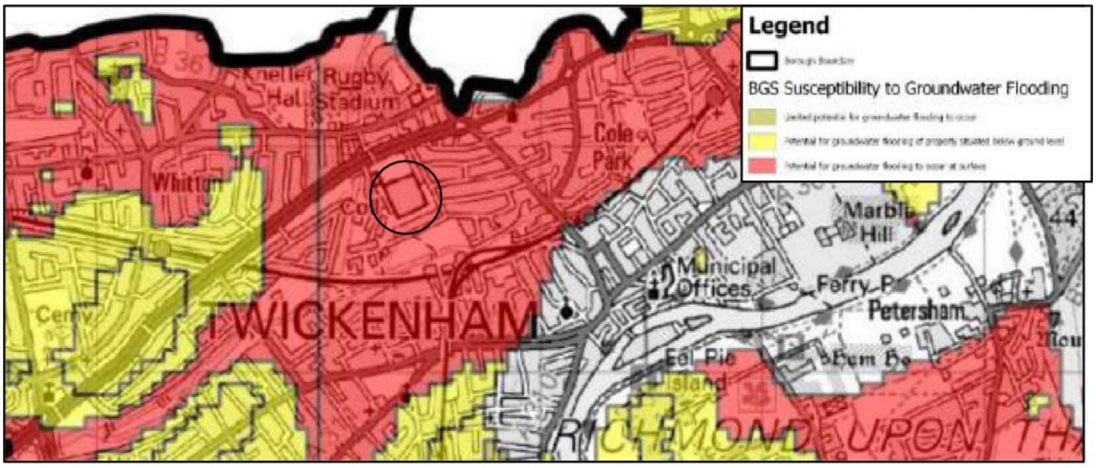

Figure 6 - BGS / SFRA Susceptibility to Groundwater Flooding Map

The MAGIC *Groundwater Vulnerability Map* provides an assessment of the vulnerability of groundwater in overlying superficial rocks, and those that comprise the underlying bedrock, to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. The mapping provides some further indication as to whether the site is likely to be at risk of groundwater flooding. Figure 7 shows the site is in a medium to low risk area.

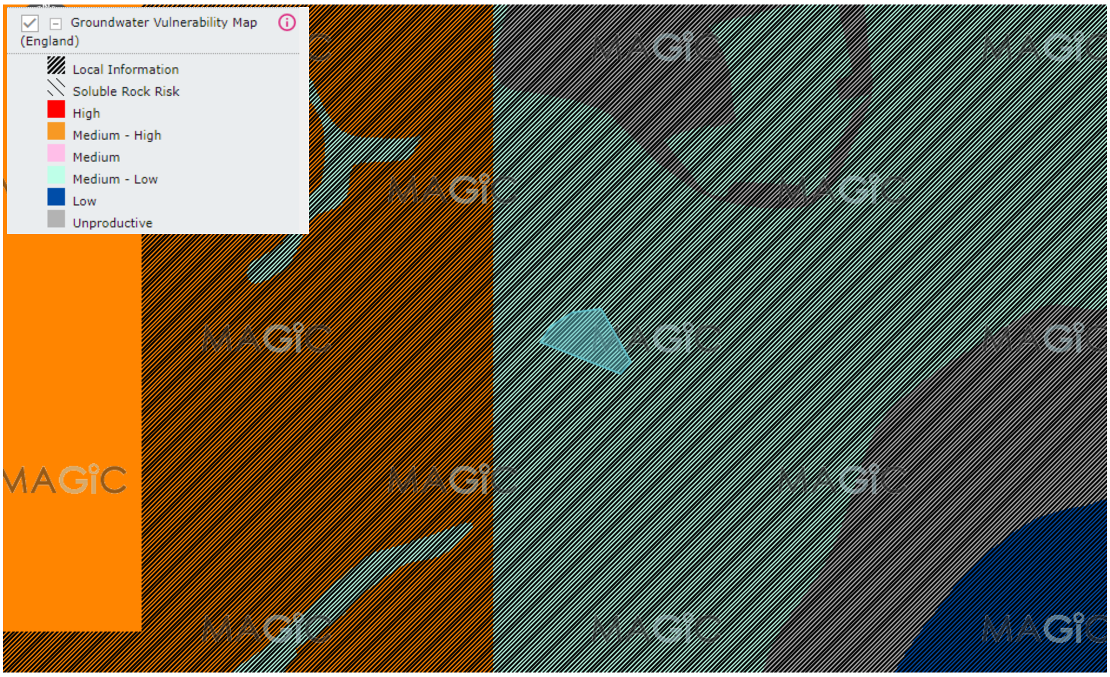

Figure 7 - MAGIC: Groundwater Vulnerability Map

In the event that groundwater were to express at the surface then certain design measures could reduce the risk of groundwater at the surface flooding buildings, which would reduce the severity of flooding to buildings and the risks posed to occupants from this source.

Levels at the site should be designed carefully to direct any overland flows away from and around buildings, entrances and access routes where possible. Design measures are likely to include falls away from buildings, and design ensuring that any low ground levels adjacent to the building have a suitable overland flood flow route and do not rely entirely on piped drainage systems.

3.5 Water bodies

There are no water bodies (lakes, large ponds, reservoirs etc.) within the immediate vicinity of the site that appear likely to pose a risk to the site.

The GOV.UK *Extent of flooding from reservoirs map* (see Figure 8) shows that the site is not at risk of flooding from reservoir failure.

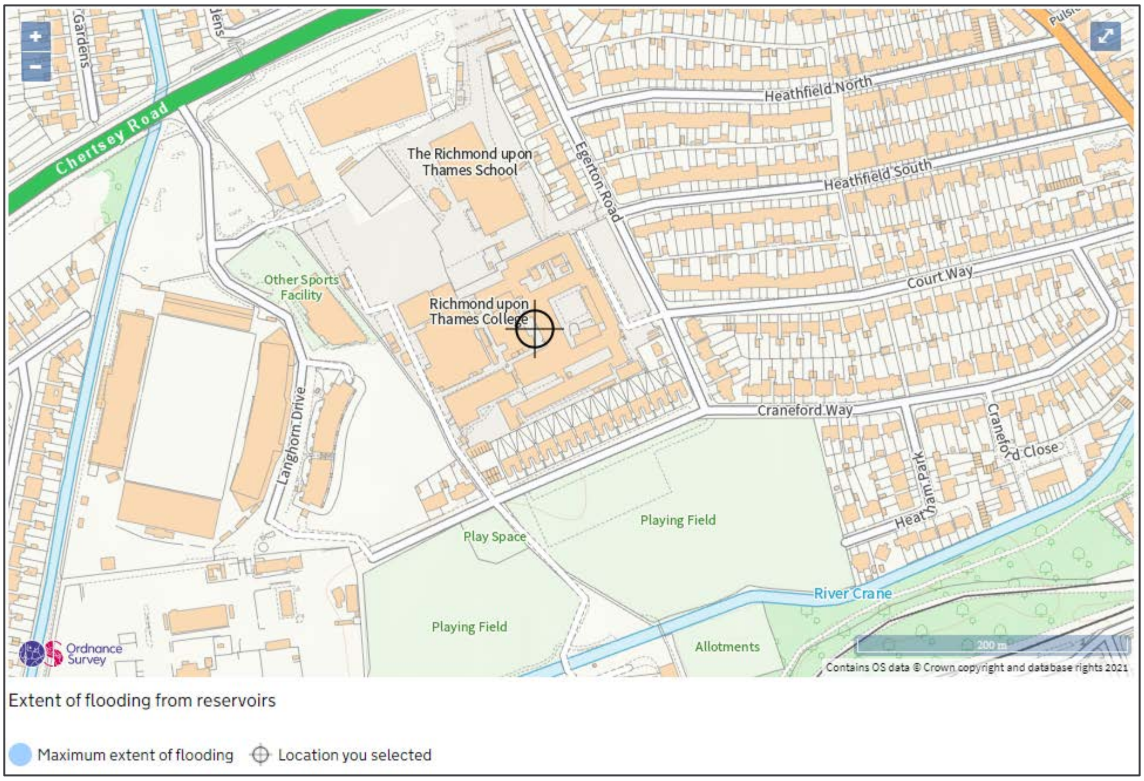

Figure 8 - GOV.UK Extent of flooding from reservoirs map

The site is considered to be at low risk of flooding from water bodies.

3.6 Surface Water from On-site

The proposed development of the site will decrease the impermeable surfacing at the site. The decrease in impermeable area provides betterment on the existing situation by the reduction in volume of surface water run-off.

It is proposed that on-site surface water will be collected and intercepted by utilising permeable paving for the access roads and parking areas with traditional roof drainage discharging direct to a below ground pipe system. Surface water will then be directed to underground attenuation and will be discharged from the site at a restricted rate, providing betterment on the current situation. See Section 4 for further information on the surface water drainage strategy. There will be no uncontrolled off-site discharge in the design event.

Mitigation techniques such as careful design of levels should still be undertaken to ensure that any overland flows are directed around the proposed buildings, and by ensuring that any low ground levels adjacent to the buildings have a suitable overland flood flow route and do not rely entirely on piped drainage systems.

Assuming the advice given above is carried out in the design, the site is considered to be at a low risk of flooding from this source.

3.7 Flood risk summary

The site has been assessed as not being at any significant risk of flooding from river and tidal sources, water bodies, and infrastructure. The site has been assessed as being at some minor potential risk of flooding from surface water and groundwater flooding.

To mitigate against the risk of surface water flooding and groundwater flooding, finished floor levels should be raised above surrounding ground levels with falls away from the buildings and entrances, and suitable overland flood flow routes around buildings.

4 Surface Water Drainage Strategy

4.1 Existing surface water drainage

The existing site is brownfield land and covered in majority by hardstanding and buildings, with some of soft landscaping in the southern and eastern peripheries.

Existing surface water run-off from the roof and hardstanding areas is collected via a series of rain water pipes and gullies and it appears to be directed to the TW surface water sewer located on Egerton Road at an unrestricted rate as there is no evidence of flow balancing or control measures.

The existing surface water run-off rate has been calculated using the Modified Rational Method (see Brownfield Calculations in Appendix E) and are based on the existing impermeable area of the site (1.523 ha). The pre-development discharge rates for the site are summarised in Table 1 below.

Table 1 - Brownfield rates (1.523 ha)

AEP Event	Brownfield Discharge Rate (l/s)
100%	165.6
3.3%	526.2
1%	797.3

AEP = Annual Exceedance Probability

4.2 Proposed surface water drainage

The proposed development is a residential phase of the redevelopment of Richmond upon Thames College. The development will lead to a 28% decrease in impermeable area at the site, and as such will decrease the volume and rate of surface water run-off from the site.

The London Plan Policy SI 13 states that there should be preference for green over grey SuDS features for proposed developments, in line with the following drainage hierarchy; Table 3 discusses how this development complies. Further information on the SuDS selected for the site is shown in Table 2.

Table 2 – The London Plan drainage hierarchy compliance

The London Plan Drainage Hierarchy	Compliance
1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)	• The scheme has been designed to the requirements as set out in the Richmond Surface Water Management Plan. The presence of brown roofs will reduce the volume of water available for collection and reuse and as such the use of rainwater harvesting is not considered suitable for this scheme. Brown roofs have been specified for the wider environmental benefits to the site (see no.3 below).
2. rainwater infiltration to ground at or close to source	• The site is underlain by clay geology and therefore is considered unsuitable for the use of shallow soakaways.
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)	• Brown roofs are proposed on some buildings. This is balanced with competing demands for energy efficient plant and PV's.
4. rainwater discharge direct to a watercourse (unless not appropriate)	• There are no nearby watercourses suitable for the discharge of surface water run-off.
5. controlled rainwater discharge to a surface water sewer or drain	• It is therefore proposed to ultimately discharge surface water from the site using a new connection to the TW sewer located along Chertsey Road. Some existing adopted sewers will require abandoning/diverting. The proposed surface water drainage strategy is shown on drawing 66202961-SWE-ZZ-XX-DR-C-0110 in Appendix D.
6. controlled rainwater discharge to a combined sewer.	• Not required.

The Richmond SuDS Proforma is provided in Appendix E to support the proposed drainage strategy.

It is therefore proposed to ultimately discharge surface water run-off from the site using a new connection to the TW sewer located along Chertsey Road to the north of the site, via a proposed surface water network through phases located to the north of the site as outlined by the Atkins Drainage Strategy Note (Appendix D).

The surface water drainage strategy drawing is provided in Appendix F. Rainwater pipes and permeable paving convey the surface water run-off to underground crates located beneath car parking areas across the site. Surface water will be attenuated on-site prior to a restricted off-site discharge which provides betterment on the existing regime.

4.2.1 Proposed discharge rate

The assumed greenfield discharge rate has been calculated by Atkins and is provided in their Drainage Strategy Note (Appendix D) and the design discharge rate from this site to the site-wide system is 5 l/s as specified in the Atkins strategy. The proposed discharge rate from the site has been restricted to 5 l/s in line with the strategy drawing for the wider masterplan area, see Atkins drawing 5137894-ATK-00-XX-SK-C-0010 in Appendix D.

The greenfield run-off discharge rates have been calculated using the ICP SuDS method in MicroDrainage with FEH data, and are based on the proposed impermeable area of the site (1.090 ha) (see Greenfield Calculations in Appendix F). The greenfield rates for the site are summarised in Table 3 below.

Table 3: Greenfield discharge rates

AEP Event	Greenfield Discharge Rate (l/s)
100%	1.4
Qbar	1.7
3.3%	3.8
1%	5.3

The 5 l/s discharge rate proposed for the site therefore provides betterment on the 1% AEP greenfield run-off rate and is substantially better than the existing brownfield run-off rates being discharged from the site.

4.2.2 Attenuation

The attenuation has been sized to attenuate the flows from the site in the 1% AEP rainfall event inclusive of 40% climate change allowance (see MicroDrainage Calculations in Appendix E). The volume of attenuation required for the site is 732 m^3.

Brown roofs are proposed on some buildings which can provide benefits in terms of reducing peak flow rates to the site drainage system for small and medium-sized events, as well as biodiversity benefits. As described in C753, their impact tends to be most significant in summer, where intense short duration events may generate very little run-off from the roof. However, the reduction in the volume of run-off from a green roof for an extreme event is unlikely to impact on downstream attenuation storage requirements. Additional temporary storage is also provided by the bioretention measures proposed across the site, however, the reduction in the volume of run-off in an extreme event is unlikely to impact on the downstream attenuation storage requirements and therefore the attenuation crates have been designed to hold flows in the worst case rainfall event.

4.3 Surface water treatment

Legislation requires that surface water drainage systems are designed to provide an adequate level of treatment pollution. The level of treatment required depends on the pollution hazard indices for the land uses; it must be demonstrated that the proposed pollution mitigation indices exceed the required pollution hazard indices in accordance with C753. Table 4 below assesses suitability of SuDS features for the site based upon C753.

Table 4 - SuDS site suitability

SuDS Component	Suitability	Description
Brown roofs	✓	Proposed on some roof areas.
Soakaways	✗	Not suitable due to ground conditions.
Rainwater harvesting systems	✓	Could be utilised for WC flushing etc. to reduce the use of potable water for the development, subject to financial viability.
Filter strips	✓	Could be used depending on space requirements.
Filter trench/drain	✓	Could be used depending on space requirements.
Infiltration trenches	✗	Not suitable due to ground conditions.
Swales	✗	Not suitable due to space restrictions.
Bioretention	✗	Not suitable due to space restrictions.
Permeable paving	✓	Proposed across the site.

Geocellular systems	✓	Proposed for the temporary storage of surface water run-off.
Infiltration basins	✗	Not suitable due to space restrictions.
Attenuation basins	✗	Not suitable due to space restrictions.
Ponds	✗	Not suitable due to space restrictions.
Stormwater wetlands	✗	Not suitable due to space restrictions.
Proprietary devices	✓	Proposed to provide final treatment stage.
Rain gardens	✗	Not suitable due to space restrictions.

The final selection of SuDS will be decided at detailed design. By implementing measures such as brown roofs and permeable paving, run-off is reduced and multiple benefits are provided to London's amenity, biodiversity and better water quality in line with the London Plan.

An example of how treatment will work at this site, in line with Chapter 26 of C753, is provided below.

The site is proposed for residential use; the appropriate pollution hazard indecies for the land uses from Table 26.2 of C753 are shown in Figure 7 below:

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	**Pollution hazard level**	**Total suspended solids (TSS)**	**Metals**	**Hydro-carbons**
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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg 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[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 9 – Table 26.2 of C753

The maximum pollution hazard indices are therefore:

- 0.5 for TSS,
- 0.4 for Metals and
- 0.4 for Hydrocarbons.

Mitigation should be achieved through the use of SuDS and based on the SuDS Mitigation Indices given in Table 26.3 of C753 (see Figure 8). Green roofs and permeable paving are proposed on parts of the site which will provide additional treatment to some surface water run-off, however, not all surface water will pass through these SuDS features (i.e. highway run-off) and as such a proprietary device is proposed at each outfall to provide sufficient treatment.

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TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	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[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 10 - Table 26.3 of C753

A proprietary device (Hydro Downstream Defender) data sheet is provided in Appendix D which gives an example of the mitigation indecies provided by such a device. These are:

- 0.5 for TSS,
- 0.4 for Metals and
- 0.8 for Hydrocarbons.

The proposed mitigation therefore provides a sufficient level of treatment from the sources identified in Table 26.2.

4.4 Management & Maintenance

It is expected that the SuDS measures included within the development will remain private; maintenance of the SuDS will therefore be the responsibility of a management company.

5 Foul Water Drainage Strategy

5.1 Existing foul water drainage

A review of the topographical/utilities survey and TW asset maps suggests that foul from the site currently drains to the TW foul manhole (MH 5701B) on Egerton Road to the east of the site.

5.2 Proposed foul water drainage

The proposed foul water drainage strategy is shown on drawing 0100 in Appendix F.

Separate foul water networks have been designed for the east and west of the development due to the constraints of site levels and meeting an existing outfall. The foul network to the east of the site drains via gravity and re-uses the existing foul connection point in the south east of the site (as shown on the drawing in Appendix E). The foul network to the west of the site drains via gravity to a pumping station located to the north west of the site (see Appendix D for pumping station location) which Atkins states is to be adopted by TW.

6 Conclusions

According to the Environment Agency the site is shown to lie in the low probability flood risk area from rivers and seas (Flood Zone 1), and no historical flood events have been recorded from these sources as affecting the site or immediately surrounding area .

The site has been assessed as not being at any significant risk of flooding from river and tidal sources, water bodies, and infrastructure. The site has been assessed as being at some risk of flooding from surface water and groundwater flooding.

To mitigate against any possible residual risks of surface water flooding in the north east of the site in the post development scenario, where possible, finished floor levels should be raised above surrounding ground levels. To mitigate against the risk of groundwater flooding at the site, development of basements should generally be avoided, however if basements are proposed then further assessment should be undertaken and special design measures such as tanking should be implemented in their design. The site should be designed with falls away from the buildings and entrances, and suitable overland flood flow routes around buildings.

The underlying ground conditions of clay are not likely to be suitable for the use of infiltration drainage and there are no watercourses in the immediate vicinity of the site to discharge surface water to. It is therefore proposed to ultimately discharge surface water to the TW sewer located along Chertsey Road to the north of the site, through a proposed surface water network north of the site which has been designed by others. Surface water will be intercepted and collected on site via permeable paving and rainwater pipes and attenuated on-site using attenuation crates prior to a restricted off-site discharge which provides betterment on the existing situation.

The surface water drainage for the site is proposed to discharge at a maximum of 5l/s for the 1 in 100 year +40% climate change rainfall event, to the proposed surface water network which serves the development to the north. Microdrainage calculations have been undertaken to determine the attenuation volume for the 1% AEP rainfall event inclusive of 40% climate change.

Opportunities should be investigated to incorporate SuDS into the development where practicable.

Separate foul water networks have been designed for the east and west of the development due to the constraints of site levels and meeting an existing outfall. The foul network to the east of the site drains via gravity and re-uses the existing foul connection point in the south east of the site (as shown on the drawing in Appendix E). The foul network to the west of the site drains via gravity to a pumping station located to the north west of the site (see Appendix D for pumping station location) which Atkins states is to be adopted by TW.

Careful thought should be given to level design on the site in accordance with normal good practice to ensure that there is no likely flooding caused by overland flow and that any overland flow is directed around buildings in the event of a failure of the piped drainage system.

The site is located in Flood Zone 1 and is suitable for development. The surface water can be collected and attenuated on-site and discharged to the existing sewer at no increased off-site flood risk

Appendix A – Existing Site

Site Location Plan

3 Sixty Measurement drawing 07404-01 - Site Plan


HEATHFIELD SOUTH
COURT WAY
EGERTON ROAD
LANGHORN DRIVE
MARSH FARM LANE
CRANEFORD WAY
CRANE
AM
IS

Rev	Date	By	Amendment
A	02/08	SAB	SURVEY AREA EXTENDED
B	04/08	EDL	UNDERGROUND SERVICES INFORMATION ADDED (PRELIMINARY)
C	04/08	SAB	SURVEY AREA EXTENDED
D	04/08	SAB	SURVEY AREA EXTENDED & UNDERGROUND SERVICES INFORMATION COMPLETED
E	07/15	GAJ	SURVEY AREA EXTENDED & GENERAL UPDATE PLEASE NOTE THIS IS DATA AS SURVEYED IN OCT 2014

LEGEND

ABBREVIATIONS

B	BOLLARD	MH	MANHOLE
BOE	BRICK ON EDGE	O/H	OVER HEAD
BOX.	BOXING	P	POST
BT	BRITISH TELECOM	P/L	PAVEMENT LIGHT
B/W	BRICK WALL	RAD	RADIATOR
CATV	CABLE TELEVISION	RE	RODDING EYE
CF	CEILING FALL	RS	ROAD SIGN
CL	COVER LEVEL	RSJ	ROLLED STEEL JOIST
CONC	CONCRETE FINISH	RSS	ROLLED STEEL STANCHION
COU	COVER ORIGIN UNKNOWN	RWP	RAIN WATER PIPE
CPD	CUPBOARD	SC	STOP COCK
DK	DROP KERB	SP	SIGN POST
DL	DERIVED LEVEL	SVP	SOIL VENT PIPE
ELEC.	ELECTRICAL	TL	TRAFFIC LIGHT
ER	EARTHING ROD	TN	TREE NUMBER
F/B	FLOWER BED	TP	TELEPHONE POLE
FAR	FLAT ASPHALT ROOF	UTL	UNABLE TO LIFT
G	GULLY	VP	VENT PIPE
GV	GAS VALVE	VTF	VINYL TILED FLOOR
HLW	HIGH LEVEL WINDOW	WC	WATER CLOSET
IC	INSPECTION COVER	WHB	WASH HAND BASIN
LC	LIGHTING COLUMN	WV	WATER VALVE
LP	LAMP POST	ø	DIAMETER

OVERHEAD DETAIL

BARRIER OR FENCE

CHANGE IN SURFACE

GATE

SURVEY STATION

HEIGHTS

C	HEIGHT FROM FLOOR TO CILL
H	HEIGHT FROM CILL TO HEAD
SP	HEIGHT FROM FLOOR TO SPRING OF ARCH
AH	HEIGHT FROM FLOOR TO HEAD OF ARCH
2890	HEIGHT TO CEILING, BEAM OR DOOR
S/C	STRUCTURAL CEILING HEIGHT
F/C	FALSE CEILING HEIGHT

TREES

ø DIAMETER(mm)
S SPREAD(mm) diameter
H HEIGHT(mm)

ALL TREE HEIGHTS SHOWN IN (mm)

SERVICE ABBREVIATIONS

(AC)	Assumed Connection
(AR)	Assumed Route but proved connection
BdL	Backdrop Level
BT	British Telecom
CL	Cover Level
cog	cable on ground
CR	Cable Riser
d	depth of service (approx)
Dd	Depth to top of Duct
DP	Down Pipe
DT	Disconnecting Trap
(e)	empty duct
ECR	Electric CR
(ET)	Electronically Traced
G	Gully
GPR	Gas pipe riser
GV	Gas Valve
HV	High Voltage
IC	Inspection Chamber
IL	Invert Level
Ltg	Lighting
LV	Low Voltage
MH	Manhole
MP	Medium Pressure
(NFI)	No Further Information
(NPV)	No Pipes Visible
Pd	Depth to top of pipe
Pe	Polyethylene
PM	Pumped Main
(R)	From Records
RE	Rodding Eye
RWP	Rain Water Pipe
Sd	Sump depth
SI	Spun Iron
SL	Sump Level
(UTL)	Unable to Lift without damage
(UTT)	Unable to Trace
VP	Vent Pipe
WD	Way Duct
WL	Water Level
WPR	Water Pipe Riser

SERVICE LEGEND

FOUL DRAINAGE
SURFACE WATER DRAINAGE
WATER
GAS
ELECTRICITY
TELEPHONE
CABLE TV
FIBRENET
CLOSED CIRCUIT TV
UNKNOWN SERVICE
UNDERGROUND CHAMBER

CAUTIONARY NOTES

ELECTRO-DETECTION TECHNIQUES HAVE BEEN USED IN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS MUST BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED.

Note: Pipe sizes in mm
All drainage 100 unless otherwise stated

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE ACCOMPANYING WRITTEN REPORT

LEVELS ARE RELATED TO ORDNANCE SURVEY BENCH MARK

LOCATED ON THE MAIN CAMPUS BUILDING

VALUE : 9.78m

3sixty measurement

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Client: RICHMOND UPON THAMES COLLEGE

Project: RICHMOND UPON THAMES COLLEGE

Drawing: SITE PLAN

Date	Scale	Drawn by	Checked by
FEB 2008	A1@1:1000	SAB	CAM

Project No	Drawing No	Revision
07404	-01	E

Appendix B – Proposed Site

Levitt Bernstein drawing 3775-LB-ZZ-ZZ-DP-C-200000 – Landscape GA Plans