TN01 – Water Cycle Strategy

Site:	Sipson Centre of Excellence, Sipson
Prepared by:	Phil Allen MCIWEM C.WEM
Approved by:	Neil Jaques
Date:	22nd December 2023

motion
232 High Street
Guildford
Surrey
GU1 3JF

Tel: 01483 531000
http://www.motion-uk.co.uk

1.0 Introduction

1.1 This Water Cycle Strategy (WCS) has been produced by Motion to consider how the proposed development at the former Sipson Garden Centre may impact flood risk, water supply infrastructure, wastewater infrastructure, surface water drainage, water quality, and hydrogeology and groundwater. Where solutions to minimise the impact on the water cycle can be integrated for holistic solutions (water recycling, for example) this will be highlighted.

1.2 This will allow Hillingdon Borough Council as the Local Planning Authority to better understand the impact the proposed development will have on local resources and the environment. This is required because of the particular challenges facing communities in the South East of England. The Environment Agency highlights that the South East uses more water than any other part of the country, despite the fact that there is less water available per person than in many Mediterranean countries.

1.3 Although the responsibility of addressing these challenges is primarily that of the Environment Agency and local water suppliers, Hillingdon Borough Council as the LPA can play a significant role in regulating and reviewing the WCS's of upcoming developments so that the impacts of the development can be minimised.

1.4 Therefore, this WCS will discuss how the proposed development at the former Sipson Garden Centre will use and manage water as a resource. This WCS will show how the proposed development will minimise the impact of the development on the local environment and how it intends to consume and manage water sustainably.

1.5 This document should be read in conjunction with the Flood Risk Assessment (FRA) and Drainage Strategy for the development, which discusses many of the themes of this WCS in detail and also presents much of the geo-environmental constraints that inform how water will be managed on the development.

2.0 Flood Risk

2.1 An FRA has been carried out for the proposed development. This FRA evaluated flood risk on site from all sources and this document should be referenced for the full review of flood risk on the former Sipson Garden Centre site and how future flood risk will be managed.

2.2 However, a summary of flood risk on the site is as follows:

- The Environment Agency's Flood Map for Planning shows that the entire site and its environs are within Flood Zone 1. Therefore, the site is at very low risk of fluvial flooding. The NPPF states that 'less vulnerable' development is appropriate in Flood Zone 1, thus the proposed development is appropriate in this location with the current and future level of flood risk.

- The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map for the site shows that there are isolated patches of low, medium and high surface water flood risk on the site. This elevated risk is primarily as a result of the way that the national scale RoFSW has been produced and is known to have inaccuracies that make it unsuitable for site-specific assessment. JBA's Flood Map was also reviewed, and this provides a much more conservative view of surface water flood risk. It shows that the overall pluvial flood risk to the site is very low in the 1 in 100-year 'design' rainfall event. Future, residual surface water flood risk will also be low due to the effect that the surface water drainage strategy will have on surface water management on the developed site.

- Groundwater susceptibility mapping places the site in an area where there appears to be a low to negligible susceptibility to groundwater flooding and the local borehole records did not encounter groundwater. Therefore, groundwater flood risk on the site is very low.
- The site is not in an area at risk of flooding from reservoirs, canals or any other artificial (man-made) water bodies.
- The proposed development's drainage system will be designed to attenuate the 1 in 100-year + climate change rainfall event so that flood risk from a lack of capacity in the drainage infrastructure is minimised. A drainage management and maintenance plan will also be provided, which will prescribe how the onsite drainage infrastructure should be looked after so that it works at optimum capacity. This will ensure that residual flood risks to the site due to failure from internal drainage systems will be minimised.

3.0 Water Supply Infrastructure

3.1 Water will be supplied to the site from mains water, which is provided by Affinity Water.

3.2 Where the supply of wholesome water is required to the development, water efficient fixtures and fittings should be used so that the development can minimise its overall water consumption.

3.3 The development's fixtures and fittings should be designed in accordance with the BREEAM Wat01 method and should seek to provide the maximum possible percentage improvement over the 'baseline' water consumption level to achieve the maximum number of BREEAM credits. Table 39 of the Wat01 assessment guidance details the different performance levels (Base and 1 – 5) and the minimum performance levels of each fixture and fitting should be targeted. The following components are included in the assessment:

- WC's
- Urinals
- Taps (wash hand basins and where specified kitchen taps and waste disposal unit)
- Showers
- Baths
- Dishwashers (domestic and commercial sized)
- Washing machines (domestic and commercial or industrial sized)

3.4 Where possible, rainwater and greywater harvesting systems that allow the consumption of wholesome water to be offset should be considered.

3.5 It would be beneficial for the site's private water supply infrastructure (from the public main in Sipson Road) to undergo a survey to understand its present condition and whether there are any leaks. Leaks should be fixed so that the water supply to the site wastes the minimum amount of water.

3.6 An awareness of how to use water efficiently should be communicated to all users of the building and an increase in the knowledge of how to use water wisely should be shared.

4.0 Wastewater Infrastructure and Capacity

4.1 Asset location plans were obtained from Thames Water, who are the local sewerage operator in the area, and these can be seen in the FRA and Drainage Strategy for the development. The asset location plans show that there are no public surface water sewers in the local area. It is assumed that the former Sipson Village Garden Centre allowed surface water to runoff to the surrounding land whereby vegetation and natural soakage absorbed surface water runoff. It is also possible that surface water would have connected to the foul sewer in Sipson Road. There are no records of the existing private on-site drainage, thus it is unsure how surface water currently is discharged from the site.

4.2 The proposed development, as will be discussed below, will not seek to use an off-site surface water discharge, thus surface water cannot have an impact on the local sewerage infrastructure and there will be no requirement for an off-site surface water sewer as a result of the development. Therefore, the impact of the development in this regard is zero.

4.3 A 525mm public foul sewer is indicated to pass the site on Sipson Road. It flows north to south and the nearest manhole to the site (node 0302), which is upstream of the site entrance, has an invert level of 23.10 mAOD. It is uncertain whether the existing site has a connection to the public foul sewer in Sipson Road, but noting that the foul sewer is at least five metres below ground level, it will be possible to connect to this foul sewer by gravity.

4.4 The diameter of the foul sewer at 525mm means it has a very large capacity. The foul waste from the former Sipson Garden Centre may have been significant. The calculated design foul flow from the proposed development is 0.03 l/s. It is expected that the 525mm foul sewer in Sipson Road will have capacity for this, but this will be checked with Thames Water in due course via a capacity check and Section 106 connection application.

5.0 Surface Water Drainage

5.1 The drainage strategy for the proposed development has been prepared in accordance with the drainage hierarchy and utilises the highest available tiers (in respect of the local geo-environmental constraints) to ensure that the drainage strategy is as sustainable as possible.

5.2 Source control, green roofs and open SuDS features have all been specified to ensure that the four pillars of SuDS (quantity, quality, amenity and biodiversity) are all represented within the development.

5.3 For full details of the drainage strategy, please refer to the FRA and Drainage Strategy, which discusses the proposals in full. However, a summary of the drainage strategy is below.

5.4 The office building will have an extensive green roof. This will be used in the areas not set aside for the photovoltaic units. The area available for green roofs covers approximately 570m^2.

5.5 During low intensity rainfall events these green roofs will intercept, store, filter and provide potential for the evaporation and evapotranspiration of roof water prior to it reaching the downpipes.

5.6 Green roofs can also provide small amounts of surface water storage and can often assist in achieving zero discharge for rainfall depths up to 5mm, which covers 50% of annual rainfall events (according to the EA's Rainfall Runoff Management for Developments report – SC030219).

5.7 The proposed drainage strategy is for surface water to be positively drained to two separate SuDS Basins. These will provide attenuation for rainfall events up to and including the 1 in 100-year + climate change rainfall event. Each SuDS basin will drain at a restricted rate to a geocellular soakaway set at a depth within the river terrace gravels that are present in the area and will allow the drainage strategy to use infiltration to discharge the site's surface water.

5.8 The proposed drainage strategy for the site uses the most sustainable forms of drainage available to the development and sustainably discharges surface water on site using SuDS methods and infiltration. This ensures that the predevelopment hydrological cycle is preserved, and that groundwater recharge is maintained.

5.9 The drainage strategy also ensures that the development does not increase flood risk in the local area or create pressure on the local drainage infrastructure. It also provides water quality and pollution mitigation benefits.

6.0 Water Quality

6.1 Hillingdon has separate systems of drainage, so all surface water ends up in the local rivers. Appropriate controls should be included to capture and manage pollution. The NPPF states that developments should not have a detrimental impact on the environment, including the water environment. The PPG to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.

6.2 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the proposed development, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from roof water runoff as 'very low'. The only requirement for roof water runoff is the removal of gross solids and sediments, which would largely be achieved by the green roof, but would be 'topped up' by the settling out of sediments that would occur in the SuDS Basins.

6.3 With regards to the roads and parking areas, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from commercial yards and delivery areas as 'medium'. To mitigate a 'medium' pollution hazard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.

6.4 Table 26.2 of the CIRIA SuDS Manual provides pollution hazard indices for different land use classifications. The land use classification that requires consideration for the commercial yard and delivery areas on the site is in Table 6.1 below.

Table 6.1: Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Commercial yard and delivery areas	Medium	0.7	0.6	0.7

6.5 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

6.6 Table 26.15 of the CIRIA SuDS Manual provides SuDS mitigation indices for detention basins. Table 6.2, below, which is an excerpt from Table 26.15, shows the mitigation indices for detentions basins.

Table 6.2: Excerpt from Table 26.3 of CIRIA SuDS Manual

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Detention Basin	0.7	0.6	0.7

6.7 The mitigation indices for a detention basin match those of the highest pollution hazard index figures from Table 6.1. Therefore, the drainage strategy specified for the Sipson Centre of Excellence development can fully mitigate the expected pollution hazards that will be created on site. This ensures that water quality levels are not impacted and that the discharge of surface water to ground does not result in any unsustainable pollution hazards.

7.0 Hydrogeology and Groundwater

7.1 Groundwater Source Protection Zones (SPZ's) are defined around groundwater abstraction sources such as wells, boreholes and springs that are used for public drinking water supply.

7.2 SPZ's show the risk of contamination to groundwater from any activities that might cause pollution in the area. The closer the activity to the source of abstraction, the greater the risk. The maps show three main zones; inner – Zone 1; outer – Zone 2 and; total catchment – Zone 3.

7.3 Defra's Magic Map was reviewed and the site is not within in any SPZ's.

7.4 The site is not within a bedrock aquifer location (London Clay is hydraulically unproductive). The drift geology is also not listed as an aquifer.

7.5 An on-site BGS borehole record (TQ07NE337) provided water level depth observations during boring. The borehole was drilled between the 23rd and 24th November 1989, thus within the autumn-winter period and showed that the borehole remained dry from surface down to the base of the borehole at -2.00mAOD. Figure 7.1, below, is an excerpt of the borehole record TQ07NE337 showing this information.

Figure 7.1: Water Level Observations During Boring

Water Level Observations During Boring					
Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1989 23.11	–	3.00	3.00	DRY	Falling head test
23.11	–	6.50	6.50	DRY	
23.11	–	20.00	6.50	DRY	End of shift
24.11	–	20.00	6.50	DRY	Start of shift
24.11	–	30.50	6.50	DRY	End of borehole

7.6 This confirms that there is not groundwater close to the surface in the location of the development and this is confirmed by groundwater vulnerability risk mapping on Defra' Magic Map, which states that groundwater vulnerability is negligible and unproductive.

7.7 Hillingdon Council's Sustainable Drainage and SuDS guidance states:

"*In order to inform the right choice of sustainable drainage system, a suitable on-site investigation must be provided including information on groundwater levels, not just a desktop study using nearby Borehole information*."

7.8 To that end, site-specific BRE365 compatible infiltration testing is currently being carried out, which will also return observations of the local groundwater levels. Results are pending and will be submitted to the LPA in support of the Drainage Strategy.

7.9 Assumed infiltration rates have been used to represent the soakage potential of the River Terrace Gravels for the purposes of the drainage strategy.

7.10 Table 2 of BS 7533-13:2009 lists 'well-graded sandy gravel' as having infiltration coefficients of between 1×10^{-5} and 1×10^{-3}. Furthermore, Table 25.1 of the C753 CIRIA SuDS Manual lists gravel as good infiltration media and states that sandy gravel would yield a typical infiltration coefficient of between 3×10^{-4} and 3×10^{-2}.

7.11 Therefore, there is confidence that the River Terrace Gravels observed in the BGS borehole log will be suitable for infiltration and that good infiltration coefficients of at least 1×10^{-5} will be returned from the BRE365 soakage testing.

7.12 Notwithstanding this, and to provide a conservative approach during the development of the drainage strategy, an assumed infiltration rate of 1×10^{-6} has been used in the hydraulic modelling so that the attenuation structures are not under designed. If the BRE365 soakage testing returns more favourable infiltration coefficients than those assumed, then the hydraulic models will be updated, and the size of the attenuation structures reduced accordingly.

8.0 Environmental Constraints and Opportunities

8.1 The geo-environmental constraints and opportunities of the site are detailed in full in the FRA and Drainage Strategy.

8.2 The drainage strategy for the development has been developed to fully work within the constraints and opportunities encountered on site and provides the most sustainable forms of surface water discharge available.

8.3 By using a green roof and SuDS basins as part of the surface water management train, surface water quantities are managed, pollution hazards are mitigated, and amenity and biodiversity opportunities are maximised.

8.4 The SuDS basins will complement the landscaping and ecological strategies that sit outside of the drainage infrastructure and will help add to the overall biodiversity and aesthetic and amenity value of the development.

9.0 Summary and Conclusions

9.1 This document has summarised the aspects of the development that will affect the water cycle. It has defined how water will be managed on site, from surface water runoff to the consumption of wholesome water. It has shown that the proposed development will look to provide the most sustainable and efficient solutions to surface water management and water supply. The impact on the hydraulic system will be negligible and it is considered that where existing infrastructure is required to support the development, that there will be a minimal impact that may be less than that of the former Sipson Garden Centre.