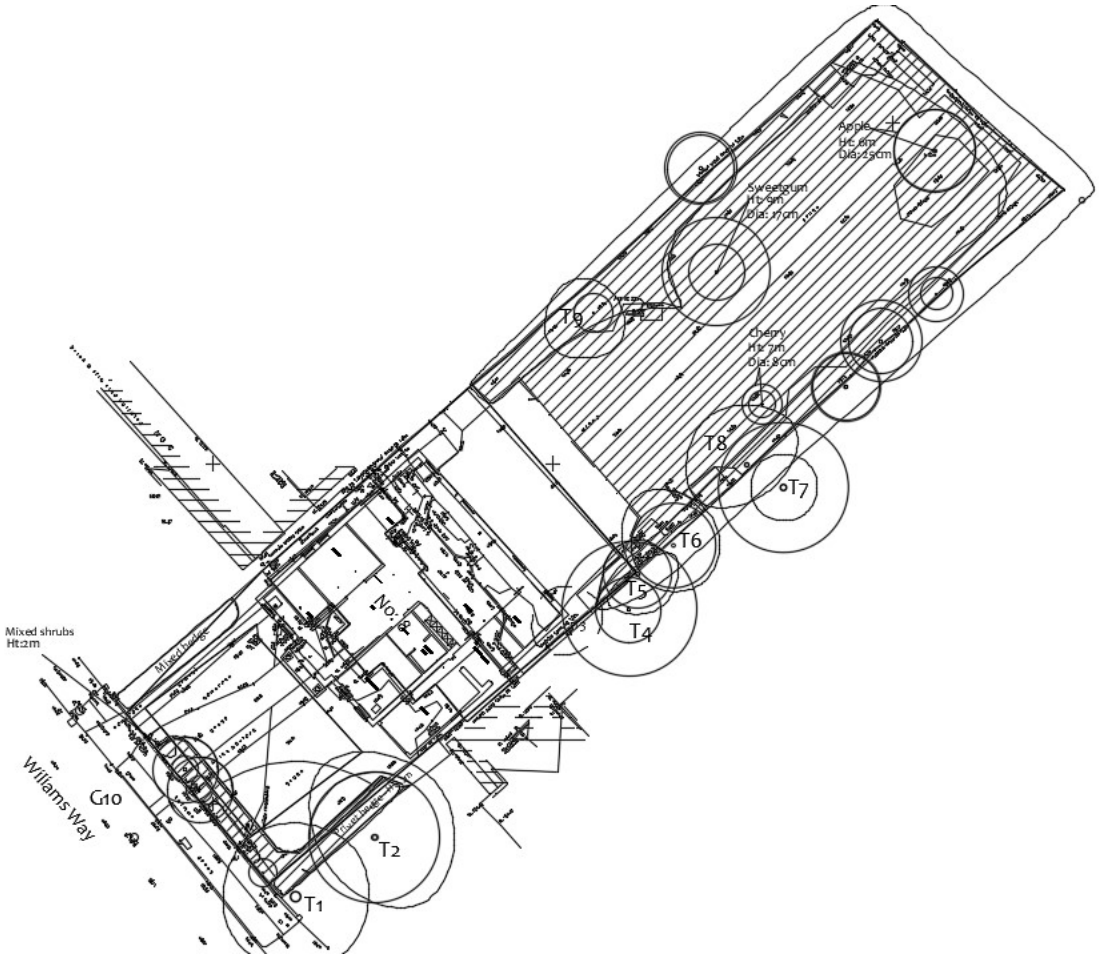
TAK STRUCTURES
SUITE 1 10 KENNINGTON PARK PLACE
LONDON SE11 4AS
+44 (0) 20 4530 8000 www.takstructures.co.uk

Project:	**8, Williams Way, Radlett, Herts WD7 7EZ**	**TAK Project Ref:**	**20925**
Document:	**SuDs Strategy and Flood Risk Management Document**	**Issue Date:**	22nd Jan 2024

SuDs STRATEGY AND FLOOD RISK MANAGEMENT FOR PROPOSED DEVELOPMENT AT 8, WILLIAMS WAY, RADLETT, HERTS WD7 7EZ.

JANUARY 2024



Basic Site Layout

SuDs STRATEGY

Drainage Hierarchy:

The Suds strategy for this refurbished property is based on the following SuDs Hierarchy:

It is assumed that the existing property already discharges its surface water to a Thames Water sewer within Williams Way

1. **Re-Use of Rainwater**
2. **Ground Infiltration**
3. **Discharge to Watercourse**
4. **Discharge to Surface Water Sewer**
5. **Discharge to Combined Sewer**

1. Re-Use of Rainwater:

The existing rainwater discharges to a surface water sewer within Williams Way and therefore this method of re-use has been discounted.

2. Ground Infiltration:

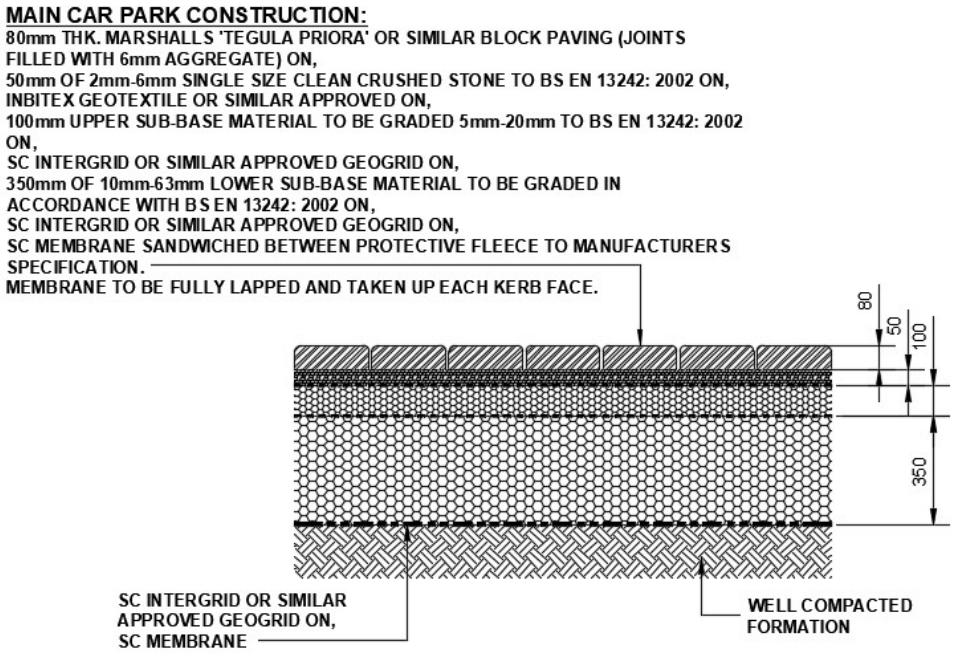
Using information taken from the British Geological Survey we have noted the underlying strata to 8, Williams way, to be 'Lambeth Groups' – which comprise Clays, Silts and Sands and are a series of impermeable, high volume change cohesive soils.

Soakaways/Infiltration –

Given the nature of the underlying sub-strata noted within the British Geological Survey information, discharge of surface water via any form of infiltration has been discounted.

Permeable Paving – From drawings provided it appears that the front area of the property is to be re-laid using herringbone pattern paving. It is therefore, proposed to construct these external areas using permeable paving construction. However, the paving will be lined to avoid any infiltration and provide an amount of storage which will then be discharged into the Thames Water Sewer in Williams Way via a new onsite manhole with a 'Hydrobreak' flow restrictor. The discharge rate into Willaims Way from the permeable paving storage is to be limited to **5.0 l/s.**

The make-up of the permeable paving is noted below:



LINED PERMEABLE PAVED CAR PARK CONSTRUCTION.
(1:20)

Proposed Storage Calculations:

From current preliminary information the area of permeable paving to the front of the property appears to be in the region of 135m^2.

The Storage zone within the permeable make-up is 450mm of sub-base material, therefore providing a storage volume of 135 x 0.45 = 60.75m^3
Assuming 30% voids within sub-base, actual storage quantity is 60.75 x 0.3 = 18.2m^3

We have utilised Micro Drainage Source Control facility to produce a storage requirement along with half drain times using the above information which show results for the following worst-case storm event of 1 in 100 +40%.

The area of hard surfaces including external parking within the site has been calculated at 600m^2 (0.06ha).

Therefore, when using the Micro Drainage software, we have used the following information to assess the storage capacity of the permeable paving.

Using a nominal depth of 0.45m the value of the tank area to use within Micro-drainage Calculations = 18.2/0.45 = **40.4m²**

Calculations are shown in Appendix-2.

Attenuation Tank Storage:
The existing property discharges its rainwater to the surface water sewer within Williams Way. This along with the likely undermining of existing foundations during the relevant excavations mean that the use of Attenuation Tank storage has been discounted.

3. Discharge to Watercourse
There are no public watercourses in close proximity to the site and therefore this method of discharge has been discounted.

4. Discharge to Surface Water Sewer
The existing property already discharges its rainwater to a surface water sewer In Williams Way and therefore this method of discharge is considered viable. The new permeable paving will discharge via a Manhole with a 'Hydrobreak' to restrict flow to **5.0 l/s**.

5. Discharge to Combined Sewer
There are no combined sewers in close proximity to the site and therefore this method of discharge has been discounted.

Flood Risk

Having reviewed the current information available form the Environment Agency, the property is noted as being within Flood Zone-1. Therefore, there is no requirement for a Flood Risk Assessment.

The maps within Appendix-1 show that there are no risks of flooding from:
(i) Rivers and Seas
(ii) Surface Water
(iii) Reservoirs.

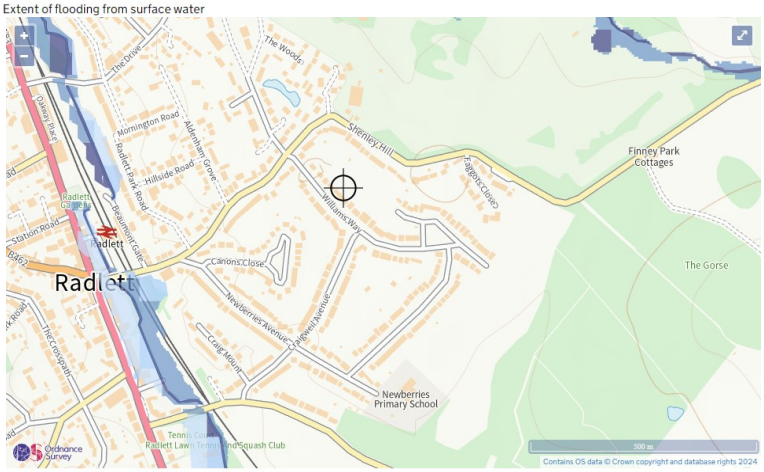
Appendix-1 shows the relevant maps taken from the Environment Agency website.

Thames Water Consent:

Thames Water Consent will be required for the connection of the permeable paving to the Surface Water sewer in Williams Way

Appendix-1:
Environment Agency Flood Maps

Extent of flooding from surface water



Extent of flooding from rivers or the sea

Maximum extent of flooding from reservoirs:

Appendix-2:
Micro Drainage Calculations for Storage and Half Drain Times based on: 1 in 100 Year Event +40%

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 33 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.724	0.324	0.0	5.0	5.0	12.9	Flood Risk
30 min Summer	99.769	0.369	0.0	5.0	5.0	14.8	Flood Risk
60 min Summer	99.765	0.365	0.0	5.0	5.0	14.6	Flood Risk
120 min Summer	99.708	0.308	0.0	5.0	5.0	12.3	Flood Risk
180 min Summer	99.648	0.248	0.0	5.0	5.0	9.9	O K
240 min Summer	99.594	0.194	0.0	5.0	5.0	7.8	O K
360 min Summer	99.518	0.118	0.0	5.0	5.0	4.7	O K
480 min Summer	99.478	0.078	0.0	4.9	4.9	3.1	O K
600 min Summer	99.461	0.061	0.0	4.3	4.3	2.4	O K
720 min Summer	99.449	0.049	0.0	3.8	3.8	2.0	O K
960 min Summer	99.435	0.035	0.0	3.1	3.1	1.4	O K
1440 min Summer	99.419	0.019	0.0	2.3	2.3	0.8	O K
2160 min Summer	99.407	0.007	0.0	1.7	1.7	0.3	O K
2880 min Summer	99.400	0.000	0.0	1.3	1.3	0.0	O K
4320 min Summer	99.400	0.000	0.0	0.9	0.9	0.0	O K
5760 min Summer	99.400	0.000	0.0	0.7	0.7	0.0	O K
7200 min Summer	99.400	0.000	0.0	0.6	0.6	0.0	O K
8640 min Summer	99.400	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.395	0.0	16.8	16
30 min Summer	96.547	0.0	21.7	30
60 min Summer	59.321	0.0	26.7	46
120 min Summer	35.196	0.0	31.6	78
180 min Summer	25.597	0.0	34.6	110
240 min Summer	20.306	0.0	36.5	142
360 min Summer	14.644	0.0	39.5	198
480 min Summer	11.605	0.0	41.8	252
600 min Summer	9.683	0.0	43.6	312
720 min Summer	8.348	0.0	45.1	370
960 min Summer	6.601	0.0	47.5	492
1440 min Summer	4.735	0.0	51.1	734
2160 min Summer	3.392	0.0	54.9	1100
2880 min Summer	2.675	0.0	57.8	0
4320 min Summer	1.912	0.0	61.9	0
5760 min Summer	1.505	0.0	65.0	0
7200 min Summer	1.250	0.0	67.5	0
8640 min Summer	1.073	0.0	69.5	0

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.400	0.000	0.0	0.5	0.5	0.0	O K
15 min Winter	99.774	0.374	0.0	5.0	5.0	14.9	Flood Risk
30 min Winter	99.832	0.432	0.0	5.0	5.0	17.3	Flood Risk
60 min Winter	99.824	0.424	0.0	5.0	5.0	16.9	Flood Risk
120 min Winter	99.738	0.338	0.0	5.0	5.0	13.5	Flood Risk
180 min Winter	99.642	0.242	0.0	5.0	5.0	9.7	O K
240 min Winter	99.563	0.163	0.0	5.0	5.0	6.5	O K
360 min Winter	99.476	0.076	0.0	4.8	4.8	3.0	O K
480 min Winter	99.453	0.053	0.0	4.0	4.0	2.1	O K
600 min Winter	99.439	0.039	0.0	3.4	3.4	1.6	O K
720 min Winter	99.431	0.031	0.0	2.9	2.9	1.2	O K
960 min Winter	99.420	0.020	0.0	2.3	2.3	0.8	O K
1440 min Winter	99.408	0.008	0.0	1.7	1.7	0.3	O K
2160 min Winter	99.400	0.000	0.0	1.2	1.2	0.0	O K
2880 min Winter	99.400	0.000	0.0	0.9	0.9	0.0	O K
4320 min Winter	99.400	0.000	0.0	0.7	0.7	0.0	O K
5760 min Winter	99.400	0.000	0.0	0.5	0.5	0.0	O K
7200 min Winter	99.400	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	99.400	0.000	0.0	0.4	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.943	0.0	71.3	0
15 min Winter	149.395	0.0	18.8	17
30 min Winter	96.547	0.0	24.3	30
60 min Winter	59.321	0.0	29.8	48
120 min Winter	35.196	0.0	35.4	86
180 min Winter	25.597	0.0	38.7	118
240 min Winter	20.306	0.0	40.9	148
360 min Winter	14.644	0.0	44.3	196
480 min Winter	11.605	0.0	46.8	254
600 min Winter	9.683	0.0	48.8	314
720 min Winter	8.348	0.0	50.5	370
960 min Winter	6.601	0.0	53.2	494
1440 min Winter	4.735	0.0	57.3	736
2160 min Winter	3.392	0.0	61.5	0
2880 min Winter	2.675	0.0	64.7	0
4320 min Winter	1.912	0.0	69.4	0
5760 min Winter	1.505	0.0	72.8	0
7200 min Winter	1.250	0.0	75.6	0
8640 min Winter	1.073	0.0	77.9	0

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.400	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.943	0.0	79.9	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.900	Shortest Storm (mins)	15
Ratio R	0.436	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.060

Time (mins) From:	To:	Area (ha)
0	4	0.060

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	40.0	0.0	0.451	0.0	0.0
0.450	40.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0111-5000-0600-5000
Design Head (m)	0.600
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	111
Invert Level (m)	99.350
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	5.0	Kick-Flo®	0.428	4.3
Flush-Flo™	0.193	5.0	Mean Flow over Head Range	-	4.2

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)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.9	1.200	6.9	3.000	10.6	7.000	15.9
0.200	5.0	1.400	7.4	3.500	11.4	7.500	16.5
0.300	4.9	1.600	7.9	4.000	12.2	8.000	17.0
0.400	4.5	1.800	8.4	4.500	12.9	8.500	17.6
0.500	4.6	2.000	8.8	5.000	13.6	9.000	18.1
0.600	5.0	2.200	9.2	5.500	14.2	9.500	18.6
0.800	5.7	2.400	9.6	6.000	14.8		
1.000	6.3	2.600	9.9	6.500	15.3		