

**Chatham Street
Reading
RG1 7JE**

RADIAN HOMES

SUD's Drainage Statement

KTG/23/SWS/6678
11th April 2023

Revision .

MJA Consulting have been appointed by Radian Homes to undertake the detailed surface water drainage design for 54 new apartments at the above. This drainage statement is in support of the Surface Water Drainage Strategy prepared by Water Environment Limited for Archel Homes dated February 2021.

Surface Water Drainage Strategy:

The storm/SUD's drainage from the 54 apartments will follow the requirements of The Building Regulations Document H (2015) and The SuDS Manual CIRIA 753 (2015). These documents detail the appropriate hierarchy of potential methods for disposing of surface water from a development:

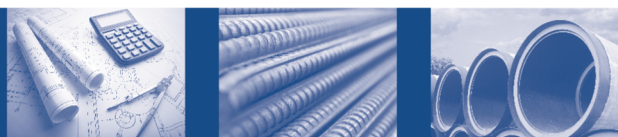
1. Discharge to ground via a soakaway or some other infiltration system.
2. Discharge to a surface water body such as a watercourse.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

The original Surface Water Drainage Strategy therefore proposed the following:

- *The proposed site layout is that shown on the drawings provided by DHA Architecture, Drawing numbers 022014-ARC-E1, 022014-ARC-APT-P1, 022014-ARC-01 (Appendix A).*
- *The site levels are assumed to be those presented in the topographic survey provided completed by Warner Surveys dated May 2020, Drawing number RT/220/0534/P/000/1*
- *There is sufficient capacity in the Thames Water Sewer which runs under Chatham Street to accommodate the additional flow of 2l/s from the site. This has been confirmed by Thames Water.*

Based on these design principles and constraints a strategic design has been completed in line with the SuDS hierarchy. The proposed SuDS strategy can be seen within the drawings in Appendix A and includes the following proposed measures:

- *Porous asphalt or permeable block paving, with an associated porous sub-base, is suggested for use on the shared parking area, eliminating the need for road gullies and*



reducing maintenance requirements. The area for the suggested permeable paving is approximately 264 m²;

- All surface water drainage from the proposed roof area, amenity gardens and shared parking area will be collected and conveyed into the proposed underground geocellular attenuation storage unit with a base area of 120m². For the purpose of this strategy, and to demonstrate feasibility, it has been assumed that the ACO Strombrixx 19 system will be used, with a depth of 0.914m and a void ratio of 0.97, to give a total storage volume of 106.4m³. The geocellular storage unit will be lined with an impermeable material on its sides and base.*
- The invert level of the storage unit will be approximately 42.09m AOD, 1.51m below ground level to ensure the appropriate level of cover and sufficient self-cleansing gradients for all incoming and outgoing pipes.*
- The storage unit will connect to the surface water sewer under Chatham Street via a gravity connection to the TW manhole 8553, which has an invert level of 41.78m AOD. The storage unit outflow will be fitted with a flow control device such that stormwater from the proposed development will be discharged at a rate of 2l/s, the lowest practical rate for the use of flow controls.*

The design principles set out above are subject to review at the detailed design stage but serve to demonstrate a feasible drainage solution for the purpose of this assessment.

Appendix B includes a detailed MicroDrainage analysis of the proposed surface water sewer system, which demonstrates how flows can be attenuated through the use of a buried geocellular storage tank. In the 100 year plus 40% climate change surface water flood event flows will be fully contained in the storage tank and the half drain time of the storage tank has been calculated as 454 minutes.

The suggested permeable paving area has not been included in the MicroDrainage model. This is a conservative approach to sizing the buried geocellular storage tank, as any additional storage provided by the porous paving and its associated sub-base is omitted in the analysis. Further, the potential reduction in surface volume discharging from the site due to potential infiltration has conservatively not been considered in the calculations.

The surface water runoff of runoff criterion, which requires no increase in total runoff volumes from the site post-development, is satisfied by providing long-term storage to enable flows to be discharged at the minimum acceptable runoff rate ("trickle rate").

Permeable surfaces are also recommended for use at the front of the property and in the Amenity Gardens area. The exact area of these permeable surfaces will be dependent on the final landscaping design. SuDS Management and Maintenance

The detailed Surface Water/ SUD's design utilised and expanded upon the above strategy and further calculations were undertaken to prove the validity of the strategy and the proposed SUD's design. In the revised calculations the permeable paving was taken into consideration rather than omitted to reflect the final constructed scenario. These calculations are appended to this statement. The revised calculations, including the permeable paving, allowed the storage tank volume to be reduced from the 106m³ proposed to 80m³ as shown in the appended calculations and that no flooding occurs up to and including the 1 in 100 year event +40% climate change allowance.

The proposed surface water drainage strategy offers a sustainable, safe and robust system which will afford complete flood risk protection to the occupants of the proposed dwellings and the existing properties and land within the vicinity of the site. This strategy replicates the natural drainage regime for the greenfield site and ensuring that the peak rate and volume of surface water runoff will be no greater than the existing greenfield runoff rate for the site for all rainfall events up to the 100 year +40% rainfall event. All areas of shared permeable paving, the attenuation tanks and flow control chambers will be maintained by a management company, funded through an annual maintenance fee levied against all residents.

Karl Gebhart
MJA Consulting

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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 236 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>99.412</td><td>0.412</td><td>0.0</td><td>2.0</td><td>2.0</td><td>31.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.532</td><td>0.532</td><td>0.0</td><td>2.0</td><td>2.0</td><td>40.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.637</td><td>0.637</td><td>0.0</td><td>2.0</td><td>2.0</td><td>48.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.709</td><td>0.709</td><td>0.0</td><td>2.0</td><td>2.0</td><td>53.9</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.721</td><td>0.721</td><td>0.0</td><td>2.0</td><td>2.0</td><td>54.8</td><td>O K</td></tr><tr><td>240 min 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Summer</td><td>99.199</td><td>0.199</td><td>0.0</td><td>2.0</td><td>2.0</td><td>15.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.109</td><td>0.109</td><td>0.0</td><td>1.8</td><td>1.8</td><td>8.3</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.081</td><td>0.081</td><td>0.0</td><td>1.6</td><td>1.6</td><td>6.2</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.069</td><td>0.069</td><td>0.0</td><td>1.3</td><td>1.3</td><td>5.2</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.061</td><td>0.061</td><td>0.0</td><td>1.2</td><td>1.2</td><td>4.6</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.055</td><td>0.055</td><td>0.0</td><td>1.0</td><td>1.0</td><td>4.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.412</td><td>0.412</td><td>0.0</td><td>2.0</td><td>2.0</td><td>31.3</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 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Innovyze	Source Control 2020.1	

Rainfall Details

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.100

Time (mins)		Area
From:	To:	(ha)
0	4	0.100

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Monarch House Barton Lane OX14 3NB	1000m2 @ 2.0 l/s	
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Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	80.0	80.0	0.751	0.0	108.8
0.750	80.0	108.8			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0071-2000-0750-2000
Design Head (m) 0.750
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 71
Invert Level (m) 99.000
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	2.0
Flush-Flo™	0.225	2.0
Kick-Flo®	0.480	1.6
Mean Flow over Head Range	-	1.7

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	1.8	1.200	2.5	3.000	3.8	7.000	5.6
0.200	2.0	1.400	2.7	3.500	4.1	7.500	5.8
0.300	2.0	1.600	2.8	4.000	4.3	8.000	6.0
0.400	1.9	1.800	3.0	4.500	4.6	8.500	6.2
0.500	1.7	2.000	3.1	5.000	4.8	9.000	6.4
0.600	1.8	2.200	3.3	5.500	5.0	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.2		
1.000	2.3	2.600	3.5	6.500	5.4		

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