



REUBY & STAGG LTD.

CONSULTING CIVIL & STRUCTURAL ENGINEERS

Hampshire Office:

Dewey House, 55 High Street, Ringwood, Hampshire BH24 1AE

PLANNING CONDITIONS 20 AND 22

SURFACE WATER STRATEGY,

CONVALESCENT SITE, RUSTINGTON, LITTLEHAMPTON

EXISTING LAUNDRY, HOUSE AND DAIRY

Reuby & Stagg Ltd. has been instructed to provide a surface water drainage strategy for Phase 1 of the development at Rustington Convalescent Home, in line with the requirements of Conditions 20 and 22 of planning permission R/187/16/PL. This Strategy should be read in conjunction with the following documents that are included in the Appendices.

- Flood Risk Assessment and Surface Water Drainage Strategy – 14-185-05 – January 2015 – Odyssey Markides
- GE16334 Rustington Soakage Test Letter JT01 180228 - 28th February 2018 – Geo – Environmental.

CONDITION

20. Prior to the commencement of development of each phase full details of the proposed surface water drainage scheme for the relevant phase shall be submitted to and approved in writing by the Local Planning Authority.

The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, the recommendations of the SUDS Manual produced by CIRIA.

Winter groundwater monitoring to establish highest annual ground water levels and Percolation testing to BRE 365, or similar approved, will be required to support the design of any Infiltration drainage.

No unit shall be occupied until the complete surface water drainage system serving the property has been implemented in accordance with the agreed details and the details so agreed shall be maintained in good working order in perpetuity.

Reason: To ensure that the proposed development is satisfactorily drained in accordance with policies GEN7 and GEN9 of the Arun District Council Local Plan.

Revision D 12th April 2018

Registered Office:

St. James House, 8 Overcliffe, Gravesend, Kent DA11 0HJ
Registered England & Wales No: 5084692

M E Reuby, RR Stagg, G Bedford, A V Gadd, R Barclay

Kent Office:

The Studio Morphews Farm Teston Road
Offham, Maidstone, Kent ME19 5NE
Telephone: 01732 841812

Email: admin@reuby-stagg.co.uk

22. Prior to the commencement of each phase of development full details of the maintenance and management of the SUDs system is set out in a site-specific maintenance manual and submitted to, and approved in writing, by the Local Planning Authority. The manual is to include details of financial management and arrangements for the replacement of major components at the end of the manufacturers recommended design life. Upon completed construction of the SuDs System, the owner or management company shall strictly adhere to and implement the recommendations contained within the manual.

Reason: To ensure the efficient maintenance and on going operation of the SuDs system and to ensure the best practice in line with guidance set out in 'The SuDs Manual' CIRIA publication ref: C697 Chapter 22.

EXISTING CONDITION

Phase 1 of the development includes the conversion of three existing two-storey buildings with impermeable roofs and permeable landscaped external areas.

The current impermeable surfaces of the site either discharge to an existing soakaway or are directly connected to the adjacent Boating lake. The existing surface water does not discharge into the local Southern Water surface water system.

DESIGN

As outlined in the Flood Risk Assessment, the site is mainly situated within Flood Zone 1 (based upon Environment Agency Flood mapping). All existing and proposed buildings are situated within Flood Zone 1.

An infiltration test has been undertaken in accordance with BRE365; the results of which are included as an appendix. The testing concluded that the sub-strata's encounter a worst-case soakage rate of 1.4×10^{-5} , which provides a suitable medium for infiltration.

Ground water monitoring was undertaken between 19th April 2017 and 1st February 2018, which concluded the highest ground water level to be 2.26m below ground level. Soakaways have therefore been designed to be no deeper than 1.26m below ground level.

The redevelopment of the site will increase the impermeable area. Although the discharge flow and volume of water shall be greater as a result, the proposed soakaways have been designed in line with guidance set out in policy GEN7 and GEN9 of the Arun District Council Local Plan. The soakaways and associated drainage system have been designed and shall be constructed in accordance with Approved Document H of the Building Regulations and the recommendations of the SUDS Manual.

In brief, the proposed external paving construction will be of a porous nature and the new soakaways have been designed to accommodate the 100 Year storm event inclusive of climate change without flooding. All storm durations have been designed for, with the 120min duration storm being the worst case. The MicroDrainage WinDes calculations and design drawing are included in the appendices.

In the event of sewer exceedance or drainage failure, the soakaways are situated in areas lower than the finished floor levels of the buildings and therefore the properties are not at risk of flooding. Flood water from sewer exceedance or drainage failure will flow south towards the proposed carriageway which will provide above ground storage.

MAINTENANCE AND MANAGEMENT OF SUDS SYSTEM

The following table sets out the maintenance regime specific to each element of the drainage system. This regime should be followed throughout the lifetime of the development, to ensure proper functioning of the system and to limit the risk of flooding due to poor operation.

The financial management and arrangements for the replacement of major components at the end of the manufacturers recommended design life will be dealt with by the management company with ground rents collected from the owners to cover the replacement costs

Drainage Element	Inspection / Maintenance	Frequency	Remedial Action	Responsible Party
Roof Drainage	Clean gutters and downpipes	Annually	Repair as necessary	Home owners for dwellings, Management Company for flats
Below ground drainage runs and chambers	CCTV drain runs and jet wash. Inspect chambers for debris	Every 5 years	Repair as necessary	Home owners for dwellings, Management Company for flats
		Annually	Remove debris and sediment as required	
Silt Traps	Inspect silt traps	Monthly for 1 st year of operation and then annually thereafter	Remove sediment and debris as required	Home owners for dwellings, Management Company for flats
Permeable Paving	Sweep and vacuum paving Inspect for evidence of poor performance	End of winter, mid-summer and end of autumn. 48hrs following heavy rainfall	Take up defective area of block paving and replace bedding layer and geotextile	Management Company

Produced by
Chris Vivian
BSc.(Hons) C.Eng MIMStructE
Director
For And On Behalf Of Reuby & Stagg Ltd.

APPENDIX

Carpenters House

Reuby & Stagg Ltd		Page 1																																																																																				
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<u>Model Details</u> Storage is Online Cover Level (m) 3.850 <u>Cellular Storage Structure</u> Invert Level (m) 2.600 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.05040 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.50400 <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;">Depth (m)</th> <th style="text-align: left;">Area (m²)</th> <th style="text-align: left;">Inf. Area (m²)</th> <th style="text-align: left;">Depth (m)</th> <th style="text-align: left;">Area (m²)</th> <th style="text-align: left;">Inf. Area (m²)</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>0.0</td><td>0.0</td><td>5.200</td><td>0.0</td><td>9.1</td></tr> <tr><td>0.400</td><td>0.0</td><td>0.0</td><td>5.600</td><td>0.0</td><td>9.1</td></tr> <tr><td>0.800</td><td>8.0</td><td>2.3</td><td>6.000</td><td>0.0</td><td>9.1</td></tr> <tr><td>1.200</td><td>8.0</td><td>6.8</td><td>6.400</td><td>0.0</td><td>9.1</td></tr> <tr><td>1.600</td><td>0.0</td><td>9.1</td><td>6.800</td><td>0.0</td><td>9.1</td></tr> <tr><td>2.000</td><td>0.0</td><td>9.1</td><td>7.200</td><td>0.0</td><td>9.1</td></tr> <tr><td>2.400</td><td>0.0</td><td>9.1</td><td>7.600</td><td>0.0</td><td>9.1</td></tr> <tr><td>2.800</td><td>0.0</td><td>9.1</td><td>8.000</td><td>0.0</td><td>9.1</td></tr> <tr><td>3.200</td><td>0.0</td><td>9.1</td><td>8.400</td><td>0.0</td><td>9.1</td></tr> <tr><td>3.600</td><td>0.0</td><td>9.1</td><td>8.800</td><td>0.0</td><td>9.1</td></tr> <tr><td>4.000</td><td>0.0</td><td>9.1</td><td>9.200</td><td>0.0</td><td>9.1</td></tr> <tr><td>4.400</td><td>0.0</td><td>9.1</td><td>9.600</td><td>0.0</td><td>9.1</td></tr> <tr><td>4.800</td><td>0.0</td><td>9.1</td><td>10.000</td><td>0.0</td><td>9.1</td></tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	0.0	0.0	5.200	0.0	9.1	0.400	0.0	0.0	5.600	0.0	9.1	0.800	8.0	2.3	6.000	0.0	9.1	1.200	8.0	6.8	6.400	0.0	9.1	1.600	0.0	9.1	6.800	0.0	9.1	2.000	0.0	9.1	7.200	0.0	9.1	2.400	0.0	9.1	7.600	0.0	9.1	2.800	0.0	9.1	8.000	0.0	9.1	3.200	0.0	9.1	8.400	0.0	9.1	3.600	0.0	9.1	8.800	0.0	9.1	4.000	0.0	9.1	9.200	0.0	9.1	4.400	0.0	9.1	9.600	0.0	9.1	4.800	0.0	9.1	10.000	0.0	9.1
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2880 min Summer	1.693	0.0	1528																																																																																																																																																																																																																				
4320 min Summer	1.242	0.0	2208																																																																																																																																																																																																																				
5760 min Summer	0.996	0.0	2944																																																																																																																																																																																																																				
7200 min Summer	0.839	0.0	3672																																																																																																																																																																																																																				
8640 min Summer	0.730	0.0	4400																																																																																																																																																																																																																				
10080 min Summer	0.648	0.0	5104																																																																																																																																																																																																																				
15 min Winter	68.836	0.0	17																																																																																																																																																																																																																				
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Reuby & Stagg Ltd				Page 3	
Dewey House 55 High Street Ringwood BH24 1AE		Rustington Convalesent Home Carpenters House Reuby & Stagg 10379			
Date April 2018 File 10379 Carpenters House ...		Designed by PJ Checked by RHB			
Elstree Computing Ltd		Source Control 2015.1			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	3.507	0.907	0.2	1.8	O K
60 min Winter	3.541	0.941	0.3	2.1	O K
120 min Winter	3.554	0.954	0.3	2.2	Flood Risk
180 min Winter	3.550	0.950	0.3	2.2	O K
240 min Winter	3.539	0.939	0.3	2.1	O K
360 min Winter	3.515	0.915	0.3	1.9	O K
480 min Winter	3.492	0.892	0.2	1.7	O K
600 min Winter	3.471	0.871	0.2	1.6	O K
720 min Winter	3.454	0.854	0.2	1.4	O K
960 min Winter	3.423	0.823	0.2	1.2	O K
1440 min Winter	3.371	0.771	0.1	0.8	O K
2160 min Winter	3.308	0.708	0.1	0.5	O K
2880 min Winter	3.260	0.660	0.1	0.3	O K
4320 min Winter	3.198	0.598	0.1	0.1	O K
5760 min Winter	3.160	0.560	0.1	0.1	O K
7200 min Winter	3.135	0.535	0.1	0.0	O K
8640 min Winter	3.118	0.518	0.0	0.0	O K
10080 min Winter	3.105	0.505	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	45.828	0.0	31		
60 min Winter	29.238	0.0	58		
120 min Winter	18.112	0.0	92		
180 min Winter	13.534	0.0	132		
240 min Winter	10.952	0.0	168		
360 min Winter	8.106	0.0	242		
480 min Winter	6.544	0.0	312		
600 min Winter	5.539	0.0	380		
720 min Winter	4.832	0.0	448		
960 min Winter	3.892	0.0	580		
1440 min Winter	2.866	0.0	836		
2160 min Winter	2.108	0.0	1188		
2880 min Winter	1.693	0.0	1528		
4320 min Winter	1.242	0.0	2208		
5760 min Winter	0.996	0.0	2936		
7200 min Winter	0.839	0.0	3672		
8640 min Winter	0.730	0.0	4400		
10080 min Winter	0.648	0.0	5104		
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Dewey House 55 High Street Ringwood BH24 1AE		Rustington Convalesent Home Carpenters House Reuby & Stagg 10379																																																																																																																																																																																																																					
Date April 2018 File 10379 Carpenters House ...		Designed by PJ Checked by RHB																																																																																																																																																																																																																					
Elstree Computing Ltd		Source Control 2015.1																																																																																																																																																																																																																					
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 104 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 Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>3.579</td><td>0.979</td><td>0.3</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.665</td><td>1.065</td><td>0.4</td><td>3.0</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.728</td><td>1.128</td><td>0.4</td><td>3.5</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.761</td><td>1.161</td><td>0.4</td><td>3.8</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>3.764</td><td>1.164</td><td>0.4</td><td>3.8</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>3.756</td><td>1.156</td><td>0.4</td><td>3.7</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>3.731</td><td>1.131</td><td>0.4</td><td>3.5</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>3.704</td><td>1.104</td><td>0.4</td><td>3.3</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>3.679</td><td>1.079</td><td>0.4</td><td>3.1</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>3.656</td><td>1.056</td><td>0.4</td><td>3.0</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>3.617</td><td>1.017</td><td>0.3</td><td>2.7</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>3.557</td><td>0.957</td><td>0.3</td><td>2.2</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>3.495</td><td>0.895</td><td>0.2</td><td>1.7</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>3.451</td><td>0.851</td><td>0.2</td><td>1.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>3.389</td><td>0.789</td><td>0.2</td><td>0.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>3.337</td><td>0.737</td><td>0.1</td><td>0.6</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>3.297</td><td>0.697</td><td>0.1</td><td>0.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>3.266</td><td>0.666</td><td>0.1</td><td>0.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>3.240</td><td>0.640</td><td>0.1</td><td>0.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>3.618</td><td>1.018</td><td>0.3</td><td>2.7</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>32</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>60</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>90</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>124</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>158</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>226</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>294</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>360</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>426</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>552</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>808</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>1172</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>1552</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>2292</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>3000</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>3680</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>18</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	3.579	0.979	0.3	2.4	Flood Risk	30 min Summer	3.665	1.065	0.4	3.0	Flood Risk	60 min Summer	3.728	1.128	0.4	3.5	Flood Risk	120 min Summer	3.761	1.161	0.4	3.8	Flood Risk	180 min Summer	3.764	1.164	0.4	3.8	Flood Risk	240 min Summer	3.756	1.156	0.4	3.7	Flood Risk	360 min Summer	3.731	1.131	0.4	3.5	Flood Risk	480 min Summer	3.704	1.104	0.4	3.3	Flood Risk	600 min Summer	3.679	1.079	0.4	3.1	Flood Risk	720 min Summer	3.656	1.056	0.4	3.0	Flood Risk	960 min Summer	3.617	1.017	0.3	2.7	Flood Risk	1440 min Summer	3.557	0.957	0.3	2.2	Flood Risk	2160 min Summer	3.495	0.895	0.2	1.7	O K	2880 min Summer	3.451	0.851	0.2	1.4	O K	4320 min Summer	3.389	0.789	0.2	0.9	O K	5760 min Summer	3.337	0.737	0.1	0.6	O K	7200 min Summer	3.297	0.697	0.1	0.4	O K	8640 min Summer	3.266	0.666	0.1	0.3	O K	10080 min Summer	3.240	0.640	0.1	0.2	O K	15 min Winter	3.618	1.018	0.3	2.7	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	18	30 min Summer	83.789	0.0	32	60 min Summer	53.779	0.0	60	120 min Summer	33.337	0.0	90	180 min Summer	24.832	0.0	124	240 min Summer	20.006	0.0	158	360 min Summer	14.706	0.0	226	480 min Summer	11.818	0.0	294	600 min Summer	9.966	0.0	360	720 min Summer	8.665	0.0	426	960 min Summer	6.943	0.0	552	1440 min Summer	5.071	0.0	808	2160 min Summer	3.696	0.0	1172	2880 min Summer	2.949	0.0	1552	4320 min Summer	2.142	0.0	2292	5760 min Summer	1.705	0.0	3000	7200 min Summer	1.427	0.0	3680	8640 min Summer	1.235	0.0	4408	10080 min Summer	1.093	0.0	5144	15 min Winter	124.633	0.0	18
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
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Reuby & Stagg Ltd				Page 5	
Dewey House 55 High Street Ringwood BH24 1AE		Rustington Convalesent Home Carpenters House Reuby & Stagg 10379			
Date April 2018 File 10379 Carpenters House ...		Designed by PJ Checked by RHB			
Elstree Computing Ltd		Source Control 2015.1			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	3.717	1.117	0.4	3.4	Flood Risk
60 min Winter	3.791	1.191	0.5	4.0	Flood Risk
120 min Winter	3.826	1.226	0.5	4.2	Flood Risk
180 min Winter	3.824	1.224	0.5	4.2	Flood Risk
240 min Winter	3.806	1.206	0.5	4.1	Flood Risk
360 min Winter	3.765	1.165	0.4	3.8	Flood Risk
480 min Winter	3.726	1.126	0.4	3.5	Flood Risk
600 min Winter	3.690	1.090	0.4	3.2	Flood Risk
720 min Winter	3.659	1.059	0.4	3.0	Flood Risk
960 min Winter	3.607	1.007	0.3	2.6	Flood Risk
1440 min Winter	3.532	0.932	0.3	2.0	O K
2160 min Winter	3.460	0.860	0.2	1.5	O K
2880 min Winter	3.412	0.812	0.2	1.1	O K
4320 min Winter	3.328	0.728	0.1	0.6	O K
5760 min Winter	3.269	0.669	0.1	0.3	O K
7200 min Winter	3.228	0.628	0.1	0.2	O K
8640 min Winter	3.199	0.599	0.1	0.1	O K
10080 min Winter	3.176	0.576	0.1	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	83.789	0.0	31		
60 min Winter	53.779	0.0	58		
120 min Winter	33.337	0.0	94		
180 min Winter	24.832	0.0	132		
240 min Winter	20.006	0.0	170		
360 min Winter	14.706	0.0	242		
480 min Winter	11.818	0.0	312		
600 min Winter	9.966	0.0	380		
720 min Winter	8.665	0.0	448		
960 min Winter	6.943	0.0	578		
1440 min Winter	5.071	0.0	836		
2160 min Winter	3.696	0.0	1212		
2880 min Winter	2.949	0.0	1588		
4320 min Winter	2.142	0.0	2292		
5760 min Winter	1.705	0.0	3000		
7200 min Winter	1.427	0.0	3680		
8640 min Winter	1.235	0.0	4408		
10080 min Winter	1.093	0.0	5136		
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Laundry and Dairy Building with Associated Car Park

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Dewey House 55 High Street Ringwood BH24 1AE	Rustington Convalescent Home Laundry & Dairy Reuby & Stagg 10379	
Date April 2018 File 10379 Laundry Dairy & C...	Designed by PJ Checked by RHB	
Elstree Computing Ltd Source Control 2015.1		

Model Details

Storage is Online Cover Level (m) 3.750

Cellular Storage Structure

Invert Level (m) 2.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.05040 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.50400

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	0.0	0.0	1.300	0.0	12.0
0.100	0.0	0.0	1.400	0.0	12.0
0.200	0.0	0.0	1.500	0.0	12.0
0.300	0.0	0.0	1.600	0.0	12.0
0.400	0.0	0.0	1.700	0.0	12.0
0.500	0.0	0.0	1.800	0.0	12.0
0.600	0.0	0.0	1.900	0.0	12.0
0.700	0.0	0.0	2.000	0.0	12.0
0.800	36.0	1.2	2.100	0.0	12.0
0.900	36.0	3.6	2.200	0.0	12.0
1.000	36.0	6.0	2.300	0.0	12.0
1.100	36.0	8.4	2.400	0.0	12.0
1.200	36.0	10.8	2.500	0.0	12.0

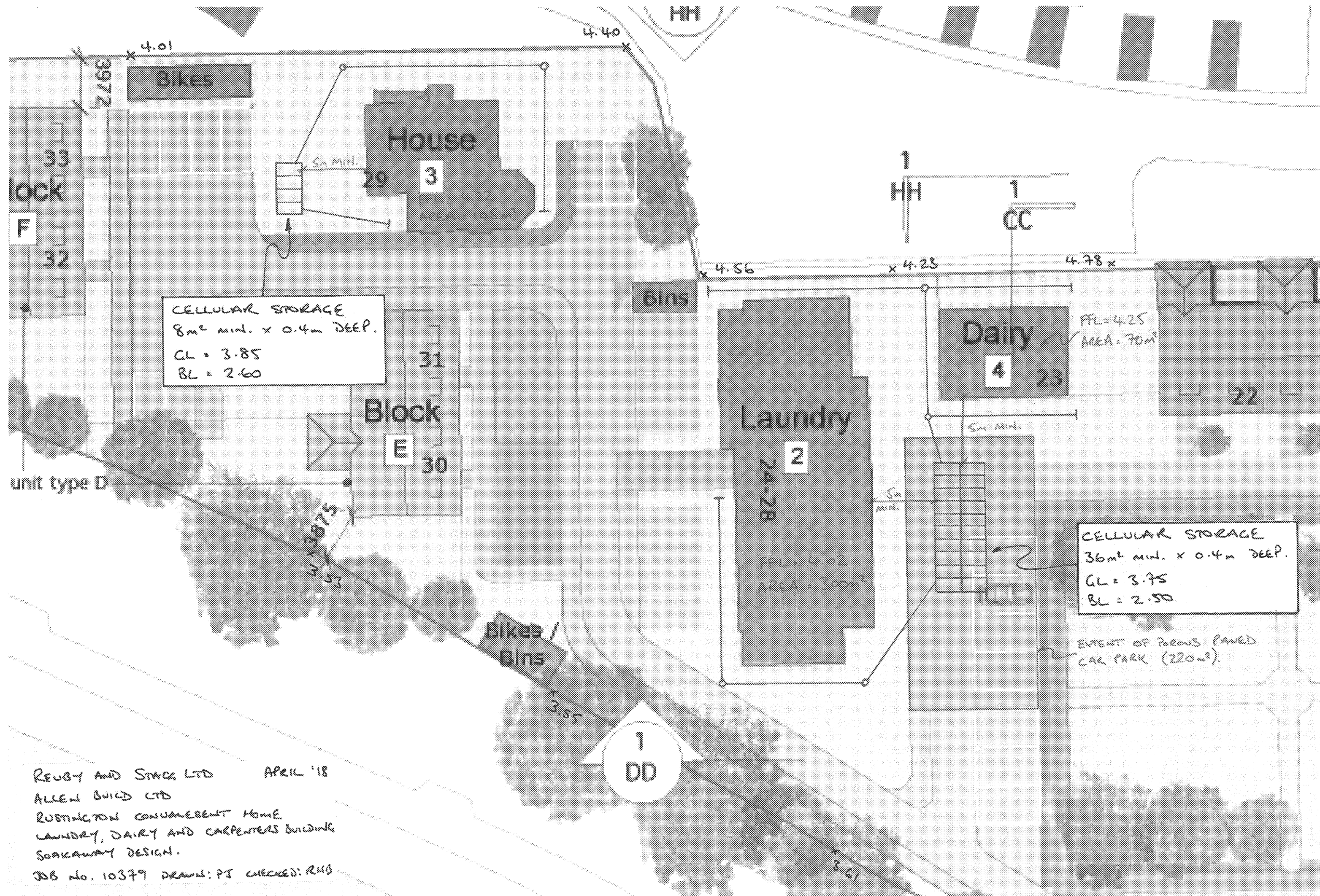
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Date April 2018 File 10379 Laundry Dairy & C...		Designed by PJ Checked by RHB																																																																																																																																																																																																																					
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<u>Summary of Results for 30 year Return Period</u> Half Drain Time : 226 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 Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>3.482</td><td>0.982</td><td>0.4</td><td>7.4</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.548</td><td>1.048</td><td>0.5</td><td>9.6</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.609</td><td>1.109</td><td>0.6</td><td>11.7</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.655</td><td>1.155</td><td>0.7</td><td>13.3</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>3.670</td><td>1.170</td><td>0.7</td><td>13.8</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>3.677</td><td>1.177</td><td>0.7</td><td>14.0</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>3.683</td><td>1.183</td><td>0.7</td><td>14.3</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>3.683</td><td>1.183</td><td>0.7</td><td>14.2</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>3.678</td><td>1.178</td><td>0.7</td><td>14.1</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>3.672</td><td>1.172</td><td>0.7</td><td>13.9</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>3.657</td><td>1.157</td><td>0.7</td><td>13.3</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>3.625</td><td>1.125</td><td>0.6</td><td>12.3</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>3.584</td><td>1.084</td><td>0.6</td><td>10.8</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>3.551</td><td>1.051</td><td>0.5</td><td>9.7</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>3.503</td><td>1.003</td><td>0.4</td><td>8.1</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>3.470</td><td>0.970</td><td>0.4</td><td>6.9</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>3.445</td><td>0.945</td><td>0.3</td><td>6.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>3.426</td><td>0.926</td><td>0.3</td><td>5.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>3.411</td><td>0.911</td><td>0.3</td><td>4.9</td><td>O K</td></tr><tr><td>15 min Winter</td><td>3.509</td><td>1.009</td><td>0.4</td><td>8.3</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>68.836</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>45.828</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>29.238</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>18.112</td><td>0.0</td><td>120</td></tr><tr><td>180 min Summer</td><td>13.534</td><td>0.0</td><td>152</td></tr><tr><td>240 min Summer</td><td>10.952</td><td>0.0</td><td>182</td></tr><tr><td>360 min Summer</td><td>8.106</td><td>0.0</td><td>248</td></tr><tr><td>480 min Summer</td><td>6.544</td><td>0.0</td><td>316</td></tr><tr><td>600 min Summer</td><td>5.539</td><td>0.0</td><td>386</td></tr><tr><td>720 min Summer</td><td>4.832</td><td>0.0</td><td>454</td></tr><tr><td>960 min Summer</td><td>3.892</td><td>0.0</td><td>588</td></tr><tr><td>1440 min Summer</td><td>2.866</td><td>0.0</td><td>852</td></tr><tr><td>2160 min Summer</td><td>2.108</td><td>0.0</td><td>1232</td></tr><tr><td>2880 min Summer</td><td>1.693</td><td>0.0</td><td>1612</td></tr><tr><td>4320 min Summer</td><td>1.242</td><td>0.0</td><td>2336</td></tr><tr><td>5760 min Summer</td><td>0.996</td><td>0.0</td><td>3064</td></tr><tr><td>7200 min Summer</td><td>0.839</td><td>0.0</td><td>3816</td></tr><tr><td>8640 min Summer</td><td>0.730</td><td>0.0</td><td>4504</td></tr><tr><td>10080 min Summer</td><td>0.648</td><td>0.0</td><td>5248</td></tr><tr><td>15 min Winter</td><td>68.836</td><td>0.0</td><td>18</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	3.482	0.982	0.4	7.4	Flood Risk	30 min Summer	3.548	1.048	0.5	9.6	Flood Risk	60 min Summer	3.609	1.109	0.6	11.7	Flood Risk	120 min Summer	3.655	1.155	0.7	13.3	Flood Risk	180 min Summer	3.670	1.170	0.7	13.8	Flood Risk	240 min Summer	3.677	1.177	0.7	14.0	Flood Risk	360 min Summer	3.683	1.183	0.7	14.3	Flood Risk	480 min Summer	3.683	1.183	0.7	14.2	Flood Risk	600 min Summer	3.678	1.178	0.7	14.1	Flood Risk	720 min Summer	3.672	1.172	0.7	13.9	Flood Risk	960 min Summer	3.657	1.157	0.7	13.3	Flood Risk	1440 min Summer	3.625	1.125	0.6	12.3	Flood Risk	2160 min Summer	3.584	1.084	0.6	10.8	Flood Risk	2880 min Summer	3.551	1.051	0.5	9.7	Flood Risk	4320 min Summer	3.503	1.003	0.4	8.1	Flood Risk	5760 min Summer	3.470	0.970	0.4	6.9	Flood Risk	7200 min Summer	3.445	0.945	0.3	6.1	O K	8640 min Summer	3.426	0.926	0.3	5.4	O K	10080 min Summer	3.411	0.911	0.3	4.9	O K	15 min Winter	3.509	1.009	0.4	8.3	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	68.836	0.0	18	30 min Summer	45.828	0.0	33	60 min Summer	29.238	0.0	62	120 min Summer	18.112	0.0	120	180 min Summer	13.534	0.0	152	240 min Summer	10.952	0.0	182	360 min Summer	8.106	0.0	248	480 min Summer	6.544	0.0	316	600 min Summer	5.539	0.0	386	720 min Summer	4.832	0.0	454	960 min Summer	3.892	0.0	588	1440 min Summer	2.866	0.0	852	2160 min Summer	2.108	0.0	1232	2880 min Summer	1.693	0.0	1612	4320 min Summer	1.242	0.0	2336	5760 min Summer	0.996	0.0	3064	7200 min Summer	0.839	0.0	3816	8640 min Summer	0.730	0.0	4504	10080 min Summer	0.648	0.0	5248	15 min Winter	68.836	0.0	18
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Dewey House 55 High Street Ringwood BH24 1AE		Rustington Convalesent Home Laundry & Dairy Reuby & Stagg 10379			
Date April 2018 File 10379 Laundry Dairy & C...		Designed by PJ Checked by RHB			
Elstree Computing Ltd		Source Control 2015.1			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	3.582	1.082	0.6	10.8	Flood Risk
60 min Winter	3.652	1.152	0.7	13.2	Flood Risk
120 min Winter	3.706	1.206	0.8	15.0	Flood Risk
180 min Winter	3.729	1.229	0.8	15.5	Flood Risk
240 min Winter	3.745	1.245	0.8	15.8	Flood Risk
360 min Winter	3.753	1.253	0.8	15.8	FLOOD
480 min Winter	3.734	1.234	0.8	15.6	Flood Risk
600 min Winter	3.715	1.215	0.8	15.3	Flood Risk
720 min Winter	3.700	1.200	0.8	14.8	Flood Risk
960 min Winter	3.675	1.175	0.7	14.0	Flood Risk
1440 min Winter	3.628	1.128	0.6	12.4	Flood Risk
2160 min Winter	3.572	1.072	0.5	10.5	Flood Risk
2880 min Winter	3.531	1.031	0.5	9.0	Flood Risk
4320 min Winter	3.475	0.975	0.4	7.1	Flood Risk
5760 min Winter	3.438	0.938	0.3	5.9	O K
7200 min Winter	3.413	0.913	0.3	5.0	O K
8640 min Winter	3.394	0.894	0.2	4.3	O K
10080 min Winter	3.379	0.879	0.2	3.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	220m sq. Porous paved car park with 250mm stone layer with 40% void ratio provides a storage volume of 22m cu. capable of storing flood volumes	
30 min Winter	45.828	0.0	32		
60 min Winter	29.238	0.0	60		
120 min Winter	18.112	0.0	116		
180 min Winter	13.534	0.0	168		
240 min Winter	10.952	0.0	188		
360 min Winter	8.108	0.0	268		
480 min Winter	6.544	0.0	342		
600 min Winter	5.539	0.0	416		
720 min Winter	4.832	0.0	486		
960 min Winter	3.892	0.0	626		
1440 min Winter	2.866	0.0	896		
2160 min Winter	2.108	0.0	1296		
2880 min Winter	1.693	0.0	1672		
4320 min Winter	1.242	0.0	2420		
5760 min Winter	0.996	0.0	3168		
7200 min Winter	0.839	0.0	3888		
8640 min Winter	0.730	0.0	4584		
10080 min Winter	0.648	0.0	5344		
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Dewey House 55 High Street Ringwood BH24 1AE		Rustington Convalesent Home Laundry & Dairy Reuby & Stagg 10379			
Date April 2018 File 10379 Laundry Dairy & C...		Designed by PJ Checked by RHB			
Elstree Computing Ltd		Source Control 2015.1			
Summary of Results for 100 year Return Period (+40%)					
Half Drain Time : 339 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	3.658	1.158	0.7	13.4	Flood Risk
30 min Summer	5.002	2.502	0.8	17.6	FLOOD
60 min Summer	5.006	2.506	0.8	22.0	FLOOD
120 min Summer	5.010	2.510	0.8	25.8	FLOOD
180 min Summer	5.011	2.511	0.8	27.4	FLOOD
240 min Summer	5.012	2.512	0.8	27.9	FLOOD
360 min Summer	5.012	2.512	0.8	28.2	FLOOD
480 min Summer	5.012	2.512	0.8	28.2	FLOOD
600 min Summer	5.012	2.512	0.8	28.0	FLOOD
720 min Summer	5.012	2.512	0.8	27.6	FLOOD
960 min Summer	5.011	2.511	0.8	26.7	FLOOD
1440 min Summer	5.008	2.508	0.8	24.3	FLOOD
2160 min Summer	5.005	2.505	0.8	20.8	FLOOD
2880 min Summer	5.002	2.502	0.8	17.9	FLOOD
4320 min Summer	3.687	1.187	0.7	14.4	Flood Risk
5760 min Summer	3.627	1.127	0.6	12.3	Flood Risk
7200 min Summer	3.583	1.083	0.6	10.8	Flood Risk
8640 min Summer	3.548	1.048	0.5	9.6	Flood Risk
10080 min Summer	3.522	1.022	0.5	8.7	Flood Risk
15 min Winter	3.706	1.206	0.8	15.0	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	220m sq. Porous paved car park with 250mm stone layer with 40% void ratio provides a storage volume of 22m cu. capable of storing flood volumes	
15 min Summer	124.633	0.0	18		
30 min Summer	83.789	1.8	33		
60 min Summer	53.779	6.2	62		
120 min Summer	33.337	10.0	122		
180 min Summer	24.832	11.5	180		
240 min Summer	20.006	12.1	240		
360 min Summer	14.706	12.4	294		
480 min Summer	11.818	12.4	358		
600 min Summer	9.966	12.2	422		
720 min Summer	8.665	11.8	492		
960 min Summer	6.943	10.8	626		
1440 min Summer	5.071	8.5	896		
2160 min Summer	3.696	5.0	1276		
2880 min Summer	2.949	2.1	1644		
4320 min Summer	2.142	0.0	2336		
5760 min Summer	1.705	0.0	3064		
7200 min Summer	1.427	0.0	3816		
8640 min Summer	1.235	0.0	4504		
10080 min Summer	1.093	0.0	5248		
15 min Winter	124.633	0.0	18		
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Dewey House 55 High Street Ringwood BH24 1AE			Rustington Convalesent Home Laundry & Dairy Reuby & Stagg 10379			
Date April 2018 File 10379 Laundry Dairy & C...			Designed by PJ Checked by RHB			
Elstree Computing Ltd			Source Control 2015.1			
Summary of Results for 100 year Return Period (+40%)						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
30 min Winter	5.004	2.504	0.8	19.8	FLOOD	
60 min Winter	5.009	2.509	0.8	24.8	FLOOD	
120 min Winter	5.013	2.513	0.8	29.3	FLOOD	
180 min Winter	5.015	2.515	0.8	31.2	FLOOD	
240 min Winter	5.016	2.516	0.8	32.0	FLOOD	
360 min Winter	5.016	2.516	0.8	32.0	FLOOD	
480 min Winter	5.016	2.516	0.8	32.0	FLOOD	
600 min Winter	5.016	2.516	0.8	31.6	FLOOD	
720 min Winter	5.015	2.515	0.8	31.0	FLOOD	
960 min Winter	5.013	2.513	0.8	29.4	FLOOD	
1440 min Winter	5.010	2.510	0.8	25.6	FLOOD	
2160 min Winter	5.004	2.504	0.8	20.3	FLOOD	
2880 min Winter	5.000	2.500	0.8	16.3	FLOOD	
4320 min Winter	3.638	1.138	0.7	12.7	Flood Risk	
5760 min Winter	3.572	1.072	0.5	10.4	Flood Risk	
7200 min Winter	3.527	1.027	0.5	8.9	Flood Risk	
8640 min Winter	3.493	0.993	0.4	7.7	Flood Risk	
10080 min Winter	3.468	0.968	0.4	6.9	Flood Risk	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
30 min Winter	83.789	4.0	33			
60 min Winter	53.779	9.0	62			
120 min Winter	33.337	13.5	120			
180 min Winter	24.832	15.4	176			
240 min Winter	20.006	16.2	232			
360 min Winter	14.708	16.5	338			
480 min Winter	11.818	16.2	384			
600 min Winter	9.966	15.8	458			
720 min Winter	8.665	15.2	536			
960 min Winter	6.943	13.6	684			
1440 min Winter	5.071	9.8	968			
2160 min Winter	3.696	4.5	1360			
2880 min Winter	2.949	0.5	1696			
4320 min Winter	2.142	0.0	2420			
5760 min Winter	1.705	0.0	3168			
7200 min Winter	1.427	0.0	3888			
8640 min Winter	1.235	0.0	4584			
10080 min Winter	1.093	0.0	5344			
220m sq. Porous paved car park with 250mm stone layer with 40% void ratio provides a storage volume of 22m cu. capable of storing flood volumes						
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 ALLEN BUILD LTD
 RUSTINGTON CONVENIENT HOME
 LAUNDRY, DAIRY AND CARPENTERS BUILDING
 SOAKAWAY DESIGN.
 JOB No. 10379 DRAWN: PJ CHECKED: RUS



RUSTINGTON, LITTLEHAMPTON, WEST SUSSEX

**FLOOD RISK ASSESSMENT AND
SURFACE WATER DRAINAGE STRATEGY**

**Report No. 14-185-05
January 2015**

RUSTINGTON, LITTLEHAMPTON, WEST SUSSEX

**FLOOD RISK ASSESSMENT AND
SURFACE WATER DRAINAGE STRATEGY**

Client: Daniel Watney

**Odyssey Markides
Elizabeth House
39 York Road
London
SE1 7NQ
Tel: 020 7620 2444
Fax: 020 7620 1168
enquiries@odysseymarkides.com**

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EXECUTIVE SUMMARY

- This report investigates flood risk to the proposed development located at the Rustington Convalescent Home in Rustington, Littlehampton, West Sussex.
- The development proposals include the retention of the existing care home, demolition of some existing buildings, redevelopment of other existing buildings to form seven new homes and the construction of 26 new dwellings for residential use. The housing mix is to include 29 market sales (private) houses and 4 'flexible tenure' bungalows.
- The site currently forms part of the existing convalescent home and is accessed from the B2140 Sea Road. The site area is approximately 3.0ha.
- This report aims to investigate the potential of the site to support the proposed development with regard to surface and foul water drainage and flood risk.
- Based upon Environment Agency flood mapping, the site is located mainly within Flood Zone 1 with a smaller amount in Zones 2 and 3. As the proposed development buildings have been located outside Flood Zone 3, the requirements for the Sequential Test are met and the Exception Test is not required.
- The proposed storm water drainage strategy will form a Sustainable Drainage System to help minimise the effect of run-off volume and flow rate and to maximise the potential for improved bio-diversity, aesthetics and amenity. The surface water will either discharge into the existing Boating Lake or infiltrate into the ground. Soakage tests are required to determine if infiltration is possible, however due to the extensive clay strata, infiltration is not expected to be a viable option.

- In the case of discharging to the lake, storm water discharge rates are limited to the existing Pre-development run-off rates as advised by the Environment Agency.
- Foul water will discharge to an existing public sewer, but its capacity is required to be investigated by Southern Water.
- The proposed Rustington development will therefore achieve the aims as set out by National Planning Policy Framework 2012 and The Flood Risk Regulations 2009.

1.0 INTRODUCTION

1.1. Odyssey Markides has been commissioned by Daniel Watney on behalf of the Worshipful Company of Carpenters to investigate flood risk associated with the proposed residential redevelopment in grounds of the Rustington Convalescent Home in Rustington, Littlehampton, West Sussex.

1.2. The site is located on the south coast of the United Kingdom in Rustington, District of Arun, West Sussex County and is situated along the B2140 Sea Road approximately 2km south east of Littlehampton train station as shown in **Figure 1**. The site is centred on OS grid reference 504320, 101489 (TQ04320 01489).



Figure 1: Site Locality Plan

1.3. To support the Planning Application for the proposed development, this Flood Risk Assessment (FRA) and drainage strategy have been prepared in accordance with the Flood and Water Management Act 2010, National Planning Policy Framework and the National Standards for Sustainable Drainage Systems (NSSDS).

1.4. In addition, consultation has been undertaken with the Environment Agency (EA), West Sussex County Council (WSCC) and Southern Water (SW).

2.0 FLOOD RISK LEGISLATION AND POLICY

Flood and Water Management Act 2010

2.1. The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with the UK Government's response to Sir Michael Pitt's Review of the summer 2007 floods.

2.2. Relevant to development sites, the FWMA is intended to encourage the application of Sustainable Drainage Systems (SuDS) by removing the automatic right to connect to sewers (under Section 106 of the Water industry Act 1991) and providing for Unitary and County Councils to adopt SuDS for new developments.

National Planning Policy Framework 2012

2.3. Upon publication in March 2012, The National Planning Policy Framework 2012 (NPPF) replaced all planning policy statements, including Planning Policy Statement 25: Development and Flood Risk (PPS25).

2.4. The NPPF sets out the Government's planning policies for England and how these policies should be applied. The National Planning Practice Guidelines (NPPG) provide additional guidance of the use of the NPPF.

2.5. The NPPF states that *"inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."*

2.6. Furthermore, The NPPF identifies that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) taking account of advice from the Environment Agency (EA) and other relevant flood risk management bodies.

2.7. When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider appropriate development in areas at risk of flooding where, informed by a site-specific flood risk assessment (FRA) following the Sequential Test (and in some circumstances, the Exception Test) it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and,
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems (NPPF, 2012).

2.8. Table 1 of the NPPG identifies and describes the EA Flood Zones:

- Flood Zone 1: Low Probability defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (<0.1%),
- Flood Zone 2: Medium Probability defined as land assessed as having between 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%),
- Flood Zone 3a: High Probability defined as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of sea flooding (>0.5%),
- Flood Zone 3b: The Functional Floodplain defined as land where water has to flow or be stored in times of flood (as identified by local planning authorities in their SFRAs).

2.9. The NPPF requires a site-specific FRA for the following:

- Proposals of 1 hectare or greater in Flood Zone 1,
- All proposals for development in Flood Zones 2 and 3,
- An area within Flood Zone 1 which has critical drainage problems,
- Development or change of use to a more vulnerable class that may be subject to other sources of flooding.

2.10. As the site is located within Flood Zones 2 and 3 and is greater than 1 hectare in size, a site specific flood risk assessment will be required for the proposed development.

The Flood Risk Regulations 2009

2.11. The Flood Risk Regulations came into force on 10th December 2009. Its purpose is to transpose the EU Floods Directive into domestic law and to implement its provisions.

2.12. The regulations:

- Give responsibility to the EA to prepare deliverables of the directive (Preliminary Flood Risk Assessments, flood risk maps etc.);
- Give responsibility to Local Lead Flood Authorities (LLFA) to do the same for all other forms of flooding (excluding sewer flooding);
- Require PFRAs to be prepared, significant areas of risk to be identified, the production of hazard maps and flood risk management plans.

National Standards for Sustainable Drainage Systems 2011

2.13. The National Standards for Sustainable Drainage Systems (NSSDS) was published in draft format in December 2011. The Department for Environment, Food and Rural Affairs (DEFRA) document provides guidance on designing, constructing, operating and maintaining drainage for surface run-off.

2.14. The standards are to be used in order to manage surface run-off in accordance with Schedule 3 of the FWMA.

2.15. The standards state the run-off destination should be considered in the following order of preference:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer;
- Discharge to a combined sewer.

2.16. Although yet to be formally adopted, the NSSDS provides guidance on run-off destination, peak flow rate, volume and control of water quality and function.

2.17. The NSSDS sets out the requirements in order to obtain approval from the SuDS Approving Body (SAB) for operating and maintaining SuDS. In addition to the standards, the Local Planning Authority may set local requirements for planning permission that have the effect of more stringent requirements than that of the standards.

The West Sussex County Council Local Flood Risk Management Strategy, 2014;

2.18. The West Sussex County Council Local Flood Risk Management Strategy (LFRMS) is a tool created to better understand the risks of flooding within the county and provide guidance on how to manage the flood risk.

2.19. West Sussex County Council are the Lead Local Authority and as such are only responsible for local flood risk. Local flood risk can be attributed to the sea, rivers, watercourses, ditches, sewers (foul water, surface water and combined), groundwater and from surface water. The LFRMS only addresses local flood risk but provides information regarding other types of flooding and the organisations responsible.

2.20. The advice given for site specific actions is general in nature and provides high level guidance for implementing drainage strategies.

2.21. The LFRM provides advice on approval and adoption of SuDS and provides and interim policy to cover this until the new Flood and Water Management Act is put into force. This interim policy states the following:

'The Local Flood Risk Management Strategy focuses on local flood risk from surface water, groundwater and ordinary watercourses, but also considers flooding from rivers and the sea. It identifies the responsibilities for flooding within the county and enables a range of organisations to work together to improve the management of flood risk. It also defines West Sussex County Council's new role as a Lead Local Flood Authority'.

The Arun District Council Strategic Flood Risk Assessment prepared by Capita Symonds, 2008

2.22. The Strategic Flood Risk Assessment (SFRA) is a planning tool used by the council to select sustainable site allocations away from vulnerable flood risk areas. The SFRA focuses on existing development proposals and provides advice on assessing future proposals.

2.23. The SFRA examined existing information and further modelling and identified that Arun District is affected to varying degrees by all six sources of flooding (river, sea, land, groundwater, sewer and artificial sources), although the sources affecting most land are from rivers, the sea and groundwater. Flooding from artificial sources is relatively low risk, as no sources of flooding were identified at the strategic level.

2.24. The SFRA also contains recommended policies to councils, requirements for preparing detailed FRAs and advice on SuDS.

The West Sussex County Council Sustainable Drainage Systems Design and Adoption Guide

2.25. West Sussex County Council, alongside their partner local authorities is working to produce SuDS design guidance for developers in the South East of England.

2.26. Included within the guide will be local design principles and standards which should be followed when designing SuDS systems.

2.27. The guides will explain the SuDS approvals and adoption processes.

2.28. West Sussex County Council has no duty to adopt SuDS until the enactment of Schedule 3 of the Flood and Water Management Act which makes West Sussex County Council the SuDS Approval Body.

Other Documents

2.29. Further to the documents listed above the following have been consulted during the preparation of this FRA:

- The Environment Agency Pollution Prevention Guideline 3.
- Planning Policy Statement 25 Practice Guide.
- The Government's water strategy for England, Future Water, 2008.

3.0 BASELINE CONDITIONS

Sources of Information

3.1. The baseline conditions for the site have been established using the following sources and references:

- British Geological Survey (BGS) online mapping and borehole records.
- Topographical Survey provided by MBP Architects, August 2014.
- The Arun District Council Strategic Flood Risk Assessment prepared by Capita Symonds, 2008.
- Southern Water Asset Location Maps (September 2014).
- Sewers Survey by Cloaca Surveys LTD (October 2014).

The Site

3.2. The site is located on the south coast of the United Kingdom in Rustington, District of Arun, West Sussex County and is situated along the B2140 Sea Road approximately 2km south east of Littlehampton train station as shown in the Site Location Plan in **Appendix A**.

3.3. There are no watercourses within the vicinity of the site (the River Arun is located approximately 1.5 kilometres to the West). However the site is in close proximity to the English Channel to the south and a Boating Lake to the north-west of the site.

3.4. The existing site currently is occupied by the Rustington Convalescent Home situated in the centre of the site. The area is triangular in shape bounded by the B2140 Sea Road and the English Channel to the south, The Martlets to the east and Hendon Avenue and The Boating Lake to the west as shown in **Figures 2, 3 and 4**. The site area is approximately 3.0 hectares in total.



Figure 2 – Southern Side (Sea Road)



Figure 3 – Eastern Side (The Martlets)



Figure 4 – Western Side (Hendon Avenue)

Site Topography

3.5. A detailed topographical survey was provided by MBP Architects and is shown in **Appendix B**.

3.6. The survey shows that the site varies in level from approximately 5.72m AOD at the high point near the centre of the site to 3.06m AOD along the northwest boundary of the site. The Rustington Convalescent Home site generally slopes towards the north-west boundary and overall levels fall towards the Boating Lake adjacent to the site.

Hydrology

3.7. Flood mapping supplied by the Environment Agency (EA) shows the site is predominantly located within Flood Zone 1, being defined as the lowest risk of flooding from rivers or sea.

3.8. The northern and north-western perimeter sides fall in Zone 2 with the western side in Zone 3. The flooding appears to be a result of wave overtopping from the sea and the Boating Lake.

3.9. Refer to the EA Flood Mapping in **Appendix G**.

3.10. To provide a more detailed picture of the site flood zoning, EA Flood level data was obtained and a site specific model has been produced as shown in **Appendix H**.

Geology and Hydrogeology

3.11. The British Geological Survey (BGS Sheet 332) indicates that the underlying geology of the application site is largely Brickearth River Deposits (sand, silt and clay) underlain by Upper Chalk.

3.12. The Environment Agency confirms that the River Terrace Deposits are classified as a Minor Aquifer and the Upper Chalk stratum is classified as a Major Aquifer.

3.13. The Environment Agency's website shows that the site does not lie within a defined Groundwater Source Protection Zone. There are no active licensed groundwater abstractions within a 1 km radius of the site.

3.14. BGS borehole logs located near the site are as follows:

Borehole TQ00SW181 – 150m West of site

Firm stony clay to depth of 1.4m, overlying loose grey/brown sandy silt (to 1.8m), overlying medium dense grey sand and coarse gravel (to 3.3m), overlying very soft grey silty clay (to 10.2m), overlying medium dense medium to coarse chalk gravel with flints (to 18.2m).

Borehole TQ00SW60 – 100m East of site

Clay, stones and marl to depth of 6.7m, overlying chalk to depth 61.0m.

3.15. Due to the underlying geology of the site, it is anticipated that infiltration devices most probably cannot be utilised onsite to effectively manage the surface water generated by the proposed development. The soakage rate should be confirmed by testing to BRE 365.

3.16. Refer to **Appendix C** for a copy of the borehole logs.

Hydrogeology

3.17. Environmental Agency's online mapping indicates that no source protection zones are located in the vicinity of the site.

3.18. As shown in **Figure 5**, the site overlies a major aquifer designated as high groundwater vulnerability zone (purple shading).

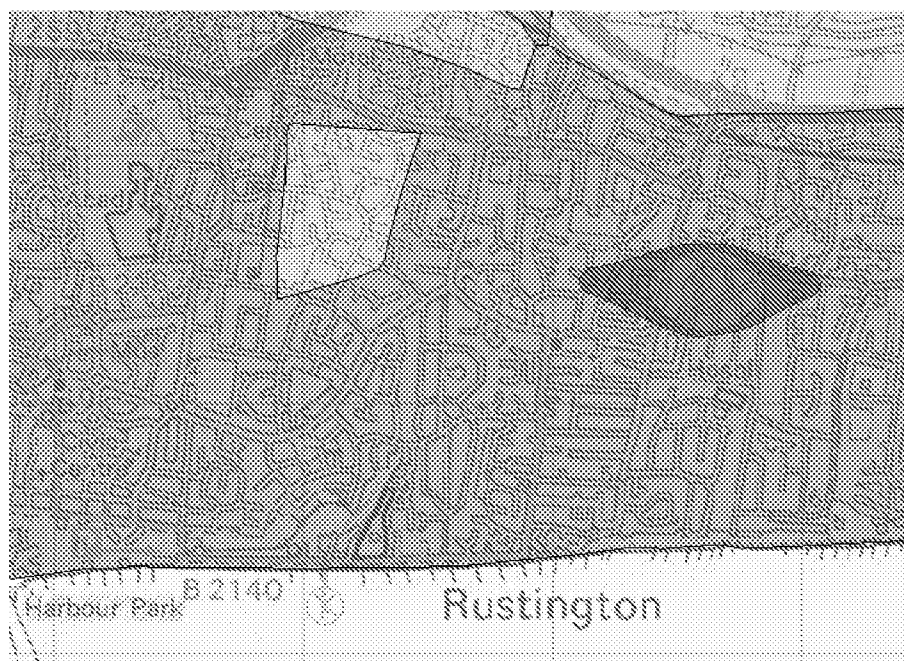


Figure 5: EA Ground Water Map (with Indicative Site Boundary)

3.19. The site is in the Secondary A Superficial Deposits Designation area (as shown orange shading in **Figure 6**) and in the Principal Bedrock Designation area (as shown purple shading in **Figure 7**).

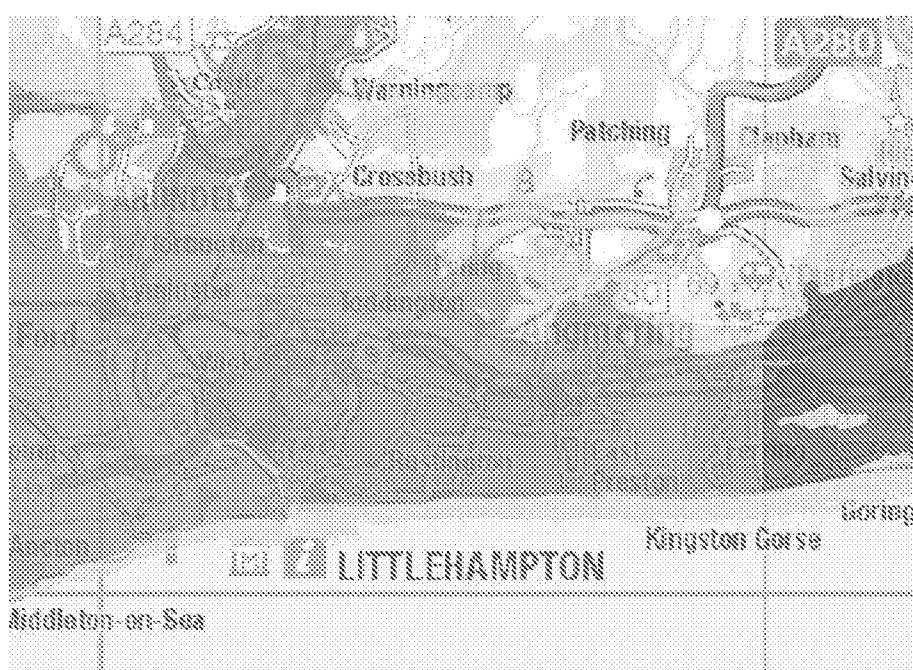


Figure 6: EA Aquifer Superficial Deposits Designation Map