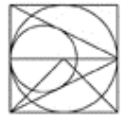




Woods Hardwick

Infrastructure LLP

Civil Engineering Consultants



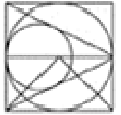
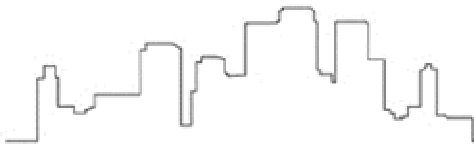
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Flood Risk Assessment Compliance

**For
Camp Road, Upper Heyford
Phase 5c (Parcel D2e)**

**Version 2
January 2019**

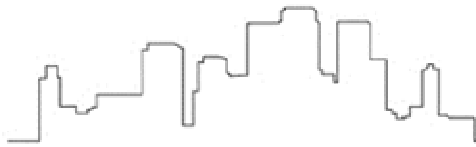


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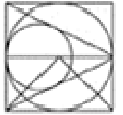
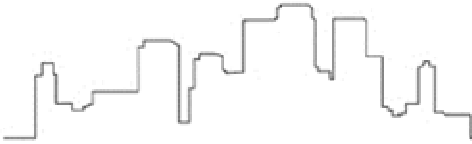
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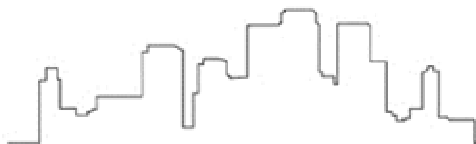
1.0 **Introduction**

- 1.1 This Flood Risk Assessment Compliance report has been prepared on behalf of the Dorchester Group in support of their Reserved Matters application for Parcel D2e (now referred to as Phase 5c) and the replan to a small adjacent area of Phase 5 within the redevelopment off Camp Road, Upper Heyford.
- 1.2 The purpose of this report is to demonstrate that the proposed drainage design for phase 5c complies with the approved Flood Risk Assessment (FRA) carried out by Waterman dated October 2010 (Ref C11234 ES 001).
- 1.3 Phase 5c is part of the Dorchester Group development located to the South of Camp Road and north of Phase 5 (refer to the Site Residential Parcel Plan given in **Appendix A**).
- 1.4 This report is intended to assist in the discharge of any planning conditions that requires the developer to demonstrate compliance with the approved FRA.



2.0 Overview of Approved FRA

- 2.1 The entire site is located within Flood Zone 1.
- 2.2 The FRA sets out a detailed approach to attenuation across the Upper Heyford site which comprises of areas identified for retention, areas for refurbishment and areas for redevelopment to provide new residential dwellings.
- 2.3 The Environment Agency (EA) has confirmed that areas identified solely for retention and refurbishment do not require attenuation of existing surface water discharge.
- 2.4 The fundamental principle of the FRA is that runoff from proposed areas of redevelopment should be attenuated to existing 1 in 100 year flows with a 30% allowance for climate change.
- 2.5 Attenuation is to be provided through the use of balancing ponds, permeable paving and attenuation tanks where necessary. Swales will be incorporated through the site where appropriate.
- 2.6 The FRA splits the development into four main catchment areas and provides a series of calculations for each.
- 2.7 The FRA also requires a 10% betterment of existing flows entering the eastern tributary of the Gallos Brook.



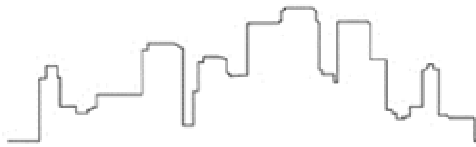
3.0 Proposed Development

- 3.1 Phase 5c (parcel D2e) in its newly expanded form comprises 30 dwellings. Refer to **Appendix B** for proposed layout.
- 3.2 Phases 5c is located within Catchment Area 2 as identified in the approved FRA figure 5.
- 3.3 Extensive intrusive site investigations have been undertaken which covered the entire site. The general ground conditions comprise of layers of silt and clay underlain by weathered limestone bedrock at an average depth of 1.5m.
- 3.4 The Indicative Surface Water Drainage Layout within the approved FRA suggests attenuation of surface water for Catchment 2 is provided by the use of attenuation tanks, permeable paving and oversized pipes. Phase 5 (previously approved) sets out the overall attenuation strategy including attenuation tanks, oversized pipes and flow control devices upstream of and connecting to, the approved phase 4 network which in turn connects to the existing network leading to the existing outfall. Phase 5 was designed with an allowance from phase 5c.

Discharge Strategy

- 3.5 Paragraph 3.20 of the FRA states: "In accordance with PPS25, local policy and EA guidance the rate of surface water runoff from new development would be controlled so that it does not increase over the existing situation for the 1 in 100 year event, while taking climate change into account".
- 3.5 Phase 5c had been allowed for in the phase 3-5 network and is therefore not subject to any additional restriction providing it can be demonstrated that once the refined/ expanded phase 5c network is included, there is no additional flooding generated within the phase 3-5 network and that the discharge rate out of the phase 3-5 network is not increased beyond the allowance rate.
- 3.6 It is proposed to connect the phase 5c network to the approved phase 5 network at manhole S20 as per the approved strategy.
- 3.7 Slight restrictions on the discharge rate will be required to ensure no flooding to the downstream system as the impermeable area has increased from the designed allowance of 0.142ha to 0.230ha. An orifice and upstream "crate" type attenuation is proposed to mitigate this.
- 3.8 The catchment of the replanned area of Phase 5 remains the same as the previously approved figures.
- 3.9 The phase 3-6 network then connects to the existing "central" network via an appropriately sized flow control device. The existing system conveys both existing and new development flows to the central outfall. The discharge rate out of this is covered in detail in the approved phase 3-5 FRA Compliance note and Phase 6 Flood Risk Assessment. A duplicate of previous overall summary table is shown below:

Total flow from phases 3, 4, 5, 5b, 5c and 6	
	1 in 100yr Discharge (l/s)
Total allowable rate for phases 3-6	585.4 l/s
Actual rate from phases into existing network (runs 21.020, 43.000 and 44.005 in the calculations)	117.7 + 3.3 + 91.1 = 212.1 l/s



Attenuation Strategy and SUDS elements

- 3.10 The parcels contain attenuation in the form of an underground tank which caters for the additional attenuation required due to the new flow restriction on the outfall from this phase into the Phase 5 network. It will either be maintained by the Water Company or a management company.
- 3.11 Living roofs have been discounted as they are not in keeping with the strict urban planning requirements within a conservation area. Rain water harvesting has also been discounted due to ongoing maintenance issues and integration into domestic plumbing.
- 3.12 The use of porous paving or other infiltration devices have been discounted due to the lack of infiltration as confirmed via BRE complaint soakaway tests within the Phase 4 and 5 areas on 13th May 2016 which were abandoned when the water did not drain away and was noted as standing at a fixed level for 2-6 hours.
- 3.13 It is noted that the approved treatments plan for the overall planning layout which dictates the road class and amount of porous paving per phase does not have any requirements for porous paving in this area.

4.0 Hydraulic Performance

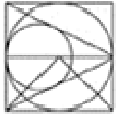
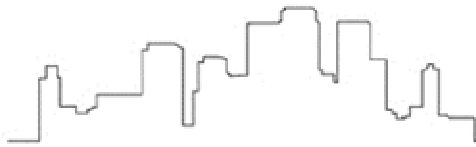
- 4.1 A detailed Microdrainage model has been constructed to simulate the 1 in 100 year (plus climate change) storm for the proposed systems.
- 4.2 The Microdrainage model (refer to **Appendix C**) demonstrates that the total proposed 1 in 100 year (plus climate change) from the Phase 3-6 area remain as per the previous approvals and that there is no flooding within the Phase 5c area.
- 4.3 The achieved overall discharge rate remains are significantly lower than the allowable discharge rates.

Exceedance

- 4.4 During storms in excess of the designated storm, there is the potential for the storage structures and drainage system to be overwhelmed, leading to flooding. Indicative finished levels have been designed so that during these periods, flood water will be directed away from the proposed building entrances and into the roads and soft landscaping areas then follow the routes defined in the previous approved Phase 3-6 strategies.

Pollution prevention

- 4.5 As the parking areas (excluding the access roads) are smaller than 800m sq, PPG3 states that trapped gullies will provide suitable protection against contamination.
- 4.6 It is noted that the downstream sewer passes through a petrol interceptor before discharge into the existing watercourse which meets the requirements of PPG3.



Maintenance

- 4.7 Private drainage serving multiple dwellings or located within shared areas will be maintained by the maintenance company.
- 4.8 Adoptable drainage will be maintained by the water company.
- 4.9 SUDS features (such as storage tanks) contributing to the overall drainage strategy will be maintained by the maintenance company.
- 4.10 Refer to “SUDS Maintenance Regime” report dated May 2016 which covers Phases 4, 5b and 5 for further details. This document along with relevant designer’s risk assessments, calculations and drawings will be made available to the maintenance company.

5.0 Summary and Conclusions

- 5.1 This report has been prepared to allow discharge of any planning conditions which require evidence of compliance with the approved Waterman Flood Risk Assessment.
- 5.2 The FRA confirms no attenuation is required for areas being refurbished or retained.
- 5.3 The FRA requires surface water runoff from new development to be restricted to existing 1 in 100 year runoff rates, and flows attenuated including a 30% allowance for climate change.
- 5.4 A Microdrainage model has been created and the results demonstrate a significant betterment in discharge rates as per the previous approvals.
- 5.5 The Microdrainage model also demonstrates no flooding during events up to and including a 1 in 100 year return period including a 30% allowance for climate change within the parcel or increasing the risk of flooding within the Phase 3-6 network which is being connected to.

APPENDIX A

Residential Parcel Plan

APPENDIX B

Proposed levels and drainage layouts

APPENDIX C

Proposed Microdrainage Calculations- Central network

Note: The calculations include the entire network including existing areas downstream of this phase in Phases 3-6. The runs numbers which relate to this phase (in the order shown in the calculations) are:

Pipe ref

29.000

29.001

29.002

APPENDIX D

Residual Flooding Masterplan