Camp Road, Upper Heyford
Phase 9

Flood Risk Assessment and Drainage Strategy Compliance Note

May 2021

Version 3

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Contents

Appendix

Appendix A	Location plan
Appendix B	Proposed level and drainage layouts
Appendix C	Existing Microdrainage Calculations
Appendix D	Proposed Microdrainage Calculations
Appendix E	Residual Flooding Masterplan
Appendix F	SUDS Maintenance Regime

Report Reference 16871/FRA-C-PH9

Revision History

Version	Amendments	Prepared By	Checked By	Date
1	Initial issue	AT	JF	20.11.2020
2	Updated to suit LLFA comments	AT	JF	08.04.2021
3	Removed southern basin infiltration from Section 3.2.12 & associated calcs	AT	JF	20.05.2021

Introduction

Woods Hardwick

Architecture | Engineering | Planning | Surveying

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 the new dwellings on phase 9 located south of Camp Road, Upper Heyford.

1.2 The purpose of this report is to demonstrate that the proposed drainage design complies with the approved Flood Risk Assessment (FRA) carried out by Peter Brett Associates dated December 2016 (Ref 33374/4000 Rev B).

1.3 This report is intended to assist in the discharge of any planning conditions that requires the developer to demonstrate compliance with the approved FRA.

Overview of Approved Flooding Risk Assessment

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Overview of Approved FRA

2.1 The proposed site comprises 12.04ha of land to be used for the construction of 300 new dwellings.

2.2 The entire site is located within Flood Zone 1.

2.3 The EA mapping indicates that the site is predominantly free from surface water flood risk with a small section lying in the north-east of the site, along Camp Road, is shown to have a localised area at high risk of surface water flooding. A review of the topographical information shows this area to correspond with lower lying areas on both sides of Camp Road.

2.4 The EA state there are no groundwater flood alerts in Heyford Park.

2.5 The EA does not hold any records of the site flooding from watercourses found close to the site.

2.6 Pre-development, the site currently drains to the existing brook, which originates along the southern boundary of the proposed site and flows south.

2.7 The underlying geology, as indicated by BGS online mapping, has the potential to provide infiltration as a means of discharging surface water. However, targeted in-situ infiltration testing will be required to determine the latent infiltration capacity of the site. Until the infiltration potential has been established, the proposed drainage strategy has assumed that no infiltration can be achieved.

2.8 The proposed surface water drainage strategy developed by Focus on Design consists of a conventional drainage network and SuDS, using the natural topography of the site to convey surface water runoff to a strategically placed attenuation basin located adjacent to the existing outfall to the existing brook on the southern boundary.

2.9 An overland flow assessment should be carried out at detailed design stage once all construction information is available.

2.10 Discharge will be limited to existing greenfield runoff rates, which has been calculated to be 12.9l/s for the 1 in 100 year storm event. Based on this discharge rate, calculations show that 910.7m cu/ha of attenuation will be required on site for up to the 1 in 100 year plus an allowance for climate change.

Proposed Surface Water Drainage Strategy

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Proposed Surface Water Drainage Strategy

3.1 General Philosophy

3.1.1 The Phase 9 development is located south of Camp Road, Upper Heyford.

3.1.2 This phase is a Dorchester Group development and comprises of 300 new. Refer to **Appendix B** for proposed layout.

3.2 Surface Water Disposal and Attenuation Strategy

3.2.1 The Microdrainage model includes this phase as well as the upstream existing system and the downstream network outfalling into the existing brook. The network is contained within **Appendix D**. The existing version of this network is contained within **Appendix C**.

3.2.2 The original FRA shows the proposed site discharging into the existing (diverted) system at the south east of the development which in turn outfalls into the existing brook.

3.2.3 The detailed design also outfalls into the existing (diverted) system.

3.2.4 The outfall point shown in the FRA remains suitable for the majority of the development, however due to unacceptably large conveyance pipework and convoluted crossing arrangements, the north eastern area of the site discharges into this system further north at an additional two locations as shown on the drainage layouts.

3.2.5 The Microdrainage calculations have been expanded to consider the existing system to a much greater degree to ensure that there are no negative impacts of this which would bring it into conflict with the FRA summary.

3.2.6 The original FRA states a 1 in 100 year discharge rate of 12.9ls.

3.2.7 The detailed design not only retains this maximum permitted discharge rate (split via the 3 Hydrobrakes), but also considers the greenfield rates for lower intensities:

Storm return period 1 in …	Greenfield rate L/s	PBA design L/s	Detailed design L/s
1 year	4.2	10.1*	4.3
30 year	9.9	12.9*	9.4
100 year (proposed includes 30% CC)	12.9	12.9	12.9

*Not visible in the approved FRA without recreating and testing the calculation in the FRA appendix.

3.2.8 The original FRA states a likely pond volume of 910.7m cu/ha which based on the detailed design catchment would equate to the following:

- 1.641ha x 910.7m cu/ha = 1494 m cu
- 0.147ha x 910.7m cu/ha = 134 m cu
- 3.726ha x 910.7m cu/ha = 3393 m cu

3.2.9 The detailed design splits the storage and locates it above each hydrobrake as follows:

- Upstream of Hydrobrake1- An attenuation basin of 1449m cu
- Upstream of Hydrobrake2- A storage tank of 30m cu
- Upstream of Hydrobrake3- An attenuation basin of 3739m cu

3.2.10 Each of the volumes is close to the anticipated volumes lead by the original FRA's rate per impermeable hectare.

3.2.11 Both ponds ensure a minimum of 300mm freeboard for the 100 year event +30% allowance for climate change.

3.2.12 The original FRA noted that infiltration testing should be carried out at the detailed design stage. These were carried out in September 2020 and November 2020 by Jomas Associates. The results showed that whilst the majority of the site was unsuitable for infiltration, incidental infiltration does occur through the base of the northern pond at a rate of 3.49E-05 m/sec (0.12564m/hr).

3.3 System Performance & Compliance

3.3.1 Detailed Microdrainage models have been simulated to assess the performance of the systems and to determine compliance with the approved FRA for storm events up to and including a 1 in 100 year event plus climate change. The results indicate that the drainage within the phase does not result in any flooding or flood risk to dwellings.

3.3.2 The results also indicate that development does not lead to an increase in flood risk to the surrounding area of Heyford Park.

3.4 Climate Change

3.4.1 The Approved FRA includes a 30% allowance for climate change which has been included in the detailed design.

3.4.2 Both basins have been tested against a 40% climate change allowance too.

3.5 Pollution Control

3.5.1 All gullies are to be trapped.

3.5.2 The permeable paving and gravel systems will ensure water pollutants are removed on larger parking areas.

3.5.3 The use of balancing ponds, a proposed swale and rain garden system will provide water quality and pollution control benefits as follows based on Ciria C697 section 16:

Balancing pond pollutant removal: Suspended solids – Medium Heavy metals – Medium

Swale/ rain garden pollutant removal: Suspended solids – High Heavy metals – Medium

3.5.4 The replacement of the downstream primary petrol interceptor will provide a final levels of treatment from this development and upstream network before outfalling into the existing brook.

3.6 Exceedance

3.6.1 If an area of the drainage network was to become blocked or in instances where a storm in excess of the designated storm occurs, there is the potential for the storage structures and drainage system to be overwhelmed, leading to flooding. Finished floor levels and external levels have been designed in consideration of these, so that during these periods flood water will be directed away from the proposed building entrances and into the roads and soft landscaping areas.

3.6.2 The existing flood route indicates that water would flow to soft landscaping or towards the main drainage run through the development running north-south. The proposals do not alter this extreme event flood route, although flooding from on parcel sources for storm events up to and including a 100 year event have been carefully considered and designed out with the exception of a small amount of water at manhole S240.

3.6.3 Refer to the residual flooding and flood routing plan contained with **Appendix E**.

3.7 Maintenance and Inspection

3.7.1 The primary drainage under the roads are proposed for adoption by the Water Company under a Section 104 application.

3.7.2 The downstream balancing ponds will be maintained by the Water Company or a management company.

3.7.3 The swale will be maintained by Oxfordshire County Council under a Section 38 application.

3.7.4 The raingardens and all private drainage to be maintained by the homeowners or a management company.

3.7.5 Inspections will be required regularly in order to assess their performance and to schedule any required maintenance. These will consist of:

- Routine Inspections to assess the need for maintenance and checking the functionality of the drainage system.
- Engineering Inspections to assess engineering aspects of the drainage that are not likely to be picked up during a routine inspection such as manhole damage, concrete deterioration and pipe blockages.

3.7.6 Routine inspections may comprise, but is not limited to:

Routine Inspections for Maintenance shall be carried out over the life of the development and on a monthly basis during the construction period and three months afterward. Thereafter, inspections shall continue on a six monthly basis and after heavy rainfall (i.e. greater than 100mm over 48 hours) to ensure they are free of debris and litter.

3.7.7 As routine inspections are to establish the need for basic maintenance, such inspections do not necessarily require professional engineering knowledge and may be carried out by a responsible person.

3.7.8 Engineering Inspections are primarily concerned with checking engineering aspects of the drainage that are not likely to be picked up during a routine inspection such as manhole damage, concrete deterioration and pipe blockages.

3.7.9 The purpose of the Engineering Inspections is to:

- Provide supplementary advice with regard to items requiring Routine Maintenance.
- Check that the routine inspections and maintenance activities have been carried out.
- Re-assess the required frequency of routine and engineering inspections based on results of previous inspections and current drainage performance.
- Identify if any repairs are required where the integrity of the system is compromised, or if the element is likely to deteriorate without repair.

3.7.10 Engineering Inspections may comprise, but not limited to:

- Manholes will require to be inspected externally and internally. External inspections will determine the overall condition and should record deterioration of exposed concrete, access lids, restricted access due to overgrown vegetation/debris.
- Flow control inspections will determine the condition to ensure it is working efficiently.
- Headwall inspections will determine the overall condition of the headwalls & flap valves and record deterioration of exposed concrete, evidence of exposed reinforcement or concrete staining due to deteriorating reinforcement below the surface. Restricted access/flow due to overgrown vegetation/debris should also be recorded.

3.7.11 Prior to undertaking an Engineering Inspection, the Engineer should become familiar with the drainage design, construction records and review previous inspection reports.

3.7.12 Engineering Inspections shall be carried out over the life of the development.

3.7.13 Engineering Inspections are required to establish the need for engineering maintenance, on this basis, such inspections should be carried out by a qualified Civil Engineer. Routine Inspections may also be completed by the engineer.

3.7.14 For further details please refer to the SUDs Maintenance Regime contained within **Appendix F**.

Summary & Conclusions

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Summary & Conclusions

4.1 This report has been prepared to allow discharge of the relevant Flood Risk and Drainage Strategy Planning Conditions for Phase 9 which require evidence of compliance with the approved Flood Risk Assessment.

4.2 The FRA requires surface water runoff from new developments to be restricted to the existing 100 year runoff rate whilst including a 30% allowance for climate change. This FRAC additionally demonstrates consideration for the 1 year and 30 year runoff rates.

4.3 Both attenuation basins have been tested against the 40% allowance for climate change.

4.4 It is proposed to discharge surface water by means of a piped network including attenuation basins, swales, tanks, permeable stone systems and rain gardens. This system includes flow control devices to maintain the permitted discharge rate.

4.5 From the above it can be seen that the site can be drained effectively and in accordance with the approved documents.

Appendix A

Appendix B

Appendix C

Appendix D

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Appendix E

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Appendix F

Woods Hardwick

Architecture | Engineering | Planning | Surveying

Woods Hardwick

Architecture | Engineering | Planning | Surveying

BEDFORD : HEAD OFFICE
15-17 Goldington Road
Bedford MK40 3NH
T : +44 (0) 1234 268862

BIRMINGHAM
Fort Dunlop, Fort Parkway
Birmingham B24 9FE
T : +44 (0) 0121 6297784

ONLINE
mail@woodshardwick.com
woodshardwick.com