



Land South of Camp Road, Heyford Park

300 Dwellings Flood Risk Assessment

On behalf of **Dorchester Group**

Project Ref: 33374/4000 | Rev: B | Date: December 2016

Office Address: Lakeside House, Blackbrook Business Park, Blackbrook Park Avenue, Taunton TA1 2PX
T: +44 (0)1823 445 150 E: taunton@peterbrett.com



Document Control Sheet

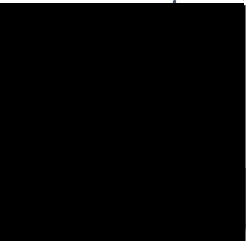
Project Name: Land South of Camp Road, Heyford Park

Project Ref: 33374/4000

Report Title: 300 Dwellings Flood Risk Assessment

Doc Ref: Revision B

Date: December 2016

| | Name | Position | Signature | Date |
|--|---------------|-------------------|--|------------|
| Prepared by: | Lewis Derrick | Graduate Engineer |  | 05.12.2016 |
| Reviewed by: | Andrew Johns | Associate | | 05.12.2016 |
| Approved by: | Paul Swindale | Equity Director | | 05.12.2016 |
| For and on behalf of Peter Brett Associates LLP | | | | |

| Revision | Date | Description | Prepared | Reviewed | Approved |
|----------|----------|-------------------------------|----------|----------|----------|
| A | 18.11.16 | DRAFT for client comment | LD | AJ | - |
| B | 05.12.16 | Amendments following comments | LD | AJ | PS |

Peter Brett Associates LLP disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence within the terms of the Contract with the Client and generally in accordance with the appropriate ACE Agreement and taking account of the manpower, resources, investigations and testing devoted to it by agreement with the Client. This report is confidential to the Client and Peter Brett Associates LLP accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

© Peter Brett Associates LLP 2016

Contents

| | | |
|----------|--|-----------|
| 1 | Executive Summary | 1 |
| 1.1 | Introduction | 1 |
| 1.2 | Flood Risk..... | 1 |
| 1.3 | Planning Policy | 1 |
| 1.4 | Drainage Strategy..... | 2 |
| 2 | Introduction | 3 |
| 2.1 | Planning..... | 3 |
| 2.2 | Peter Brett Associates | 3 |
| 3 | Proposed Development Site | 4 |
| 3.1 | Site Location | 4 |
| 3.2 | Development Proposals | 4 |
| 3.3 | Topography | 4 |
| 3.4 | Hydrological Setting..... | 4 |
| 3.5 | Existing Drainage Arrangements..... | 4 |
| 3.6 | Geology | 4 |
| 3.7 | Existing Flood Defences..... | 5 |
| 4 | Planning Policy | 6 |
| 4.1 | National Planning Policy and Legislation | 6 |
| 4.2 | Other National Guidance | 6 |
| 4.3 | Local Planning Policy | 7 |
| 4.4 | Guidance | 9 |
| 5 | Assessment of Flood Risk | 10 |
| 5.1 | Environment Agency Mapping | 10 |
| 5.2 | Groundwater Flooding | 11 |
| 5.3 | Historical Records of Flooding | 11 |
| 5.4 | Flood Risk Vulnerability..... | 11 |
| 5.5 | NPPF Sequential and Exception Tests | 11 |
| 6 | Surface Water Management | 12 |
| 6.1 | Surface Water Discharge Hierarchy..... | 12 |
| 6.2 | Proposed Surface Water Drainage Strategy..... | 12 |
| 6.3 | Adoption and Maintenance..... | 13 |
| 6.4 | Residual Risk..... | 13 |
| 7 | Conclusions | 14 |
| 7.1 | Planning Application | 14 |
| 7.2 | Flood Risk..... | 14 |
| 7.3 | Surface Water Drainage | 14 |

Tables

Table 1: Runoff Rates (l/s) for the Proposed Site 12

Appendices

Appendix A Figures
Appendix B EA Flood Maps
Appendix C Calculations
Appendix D Drainage Strategy

1 Executive Summary

1.1 Introduction

1.1.1 This Flood Risk Assessment (FRA) has been prepared by Peter Brett Associates LLP (PBA) to support a planning application for a residential development on Land South of Camp Road, Heyford. PBA has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering.

1.2 Flood Risk

1.2.1 In accordance with the fundamental objectives of the National Planning Policy Framework (NPPF), the FRA demonstrates that:

- i. The development is safe.
- ii. The development does not increase flood risk
- iii. The development does not detrimentally affect third parties.

1.2.2 The Environment Agency (EA) Flood Map for Planning shows the site lies wholly within Flood Zone 1 (as defined in the NPPF Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' Table 1).

1.2.3 The proposals for a residential development constitutes a 'More Vulnerable' land use as defined in Table 2 of the PPG. This land use is considered appropriate within Flood Zone 1 (PPG Table 3).

1.2.4 Given the location of the site within Flood Zone 1 and that there are no other known sources of flooding, there is no requirement for specific flood mitigation measures for the scheme.

1.3 Planning Policy

1.3.1 The site is wholly within Flood Zone 1; therefore, there is no requirement to apply the Sequential Test or Exception Test as defined in the NPPF

1.3.2 This FRA has been prepared in accordance with and taking cognisance of the relevant national, regional and local planning policy and statutory guidance as follows:

- National policy contained within the NPPF, dated March 2012.
- The NPPF PPG, dated March 2014.
- The Water Framework Directive, dated October 2000.
- The Flood and Water Management Act, April 2010.
- The Non-statutory Technical Standards for Sustainable Drainage, dated March 2015.
- The SuDS Manual 2015 (CIRIA C753), dated November 2015.
- Sewers for Adoption 7th edition, dated September 2013.
- Building Regulations Part H, dated October 2015.

- BS EN 752:2008 – Drain and Sewer Systems Outside Buildings, dated April 2008.
- Oxfordshire County Council Local Flood Risk Management Strategy, no date given.
- Cherwell District Council Local Plan, dated July 2015.
- Cherwell and West Oxfordshire Strategic Flood Risk Assessment, dated April 2009.
- Thames Catchment Flood Management Plan, dated December 2009.
- Thames River Basin Management Plan, dated December 2015.

1.4 Drainage Strategy

- 1.4.1 The drainage strategy for the proposed development has been prepared by Focus on Design.
- 1.4.2 The FRA demonstrates that the proposed development is safe, does not increase flood risk downstream and is in accordance with the requirements of national and local planning policy.

2 Introduction

2.1 Planning

- 2.1.1 Government policy with respect to development in flood risk areas is contained within the National Planning Policy Framework (NPPF), published in March 2012 by the Department for Communities and Local Government (DCLG).
- 2.1.2 The NPPF replaced Planning Policy Statement 25 (PPS25) 'Development and Flood Risk' along with the PPS25 Practice Guide. The NPPF is supported by the Planning Practice Guidance (PPG) website (<http://planningguidance.planningportal.gov.uk>) which was launched in March 2014 to provide more detailed guidance on applying the planning policy and supersedes the previously issued Technical Guidance to the NPPF. Section ID: 7 of the PPG deals with Flood Risk and Coastal Change.
- 2.1.3 The local planning authority will make decisions with regard to any planning application within any floodplain or flood risk area, although the Environment Agency (EA) is a designated statutory consultee and plays a key role in providing advice on development and flood risk issues. The Lead Local Flood Authority (LLFA) will be a statutory consultee on the planning application with regard to surface water drainage.
- 2.1.4 This Flood Risk Assessment has been prepared in accordance with the NPPF and Local Planning Policy. Any recommendations regarding floor levels are based on the relevant British Standards (BS8533), the standing advice provided by the EA or based on common practice. However, it should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencing development.
- 2.1.5 This FRA should be read in conjunction with other Planning Application supporting documents.

2.2 Peter Brett Associates

- 2.2.1 PBA has prepared this study in accordance with the NPPF and the PPG. PBA has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering.
- 2.2.2 PBA has been one of the EA's National Framework Consultants for flood risk mapping, a Term Consultant to the South West Region of the EA and has provided engineering services through the NEECA2 Framework Agreement. PBA has been involved in the assessment of both tidal and fluvial flooding and the design and implementation of flood defences on behalf of the EA as well as undertaking numerous FRAs to support planning application submissions.
- 2.2.3 PBA does not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

3 Proposed Development Site

3.1 Site Location

- 3.1.1 The proposed site comprises 12.04ha of land west of Heyford, with the centre of the site located at approximately National Grid Reference SP 504 257. The site lies 5.3 miles north-west of Bicester and within the administrative boundary of Cherwell District Council (CDC), itself within Oxfordshire.
- 3.1.2 Currently, the site is a pre-developed '*brownfield*' site, comprising a number of living quarters for the former personnel working at the airfield and associated infrastructure. The site is bounded to the north by Camp Road, the east by Izzard Road and sports pitches, the south by agricultural land and to the west by Kirtlington Road. Access to the site is via Camp Road.
- 3.1.3 A location plan is provided in **Appendix A**.

3.2 Development Proposals

- 3.2.1 The Dorchester Group is requesting detailed planning permission for the development of 300 residential dwellings within an area situated on the boundary of Camp Road.
- 3.2.2 The proposals include for the development of approximately 12.04ha of residential development along with public open space and associated infrastructure.
- 3.2.3 The development proposal can be found in **Appendix A**.

3.3 Topography

- 3.3.1 The topography of the area shows that the site falls generally from north to south towards a low point along the southern boundary of the proposed development. The average grade of the site is 1:70.
- 3.3.2 The highest point on the site is along the northern boundary at an approximate elevation of 125.0m AOD. The lowest point on the site is approximately 120.0m AOD.
- 3.3.3 Topographical information can be found in **Appendix A**.

3.4 Hydrological Setting

- 3.4.1 There are no existing watercourses within the proposed development boundary. However, the head of the Gallos Brook is located on the southern boundary.

3.5 Existing Drainage Arrangements

- 3.5.1 The proposed site currently appears to drain to the Gallos Brook, which originates along the southern boundary of the proposed site and flows south.

3.6 Geology

- 3.6.1 British Geological Survey (BGS) online mapping indicates that the site's underlying geology mainly comprises of '*Great Oolitic*' limestone and argillaceous rocks.

3.7 Existing Flood Defences

- 3.7.1 Review of site survey and EA online mapping confirms that there are no flood defence structures within the development area, nor does the site benefit from any.

4 Planning Policy

4.1 National Planning Policy and Legislation

National Planning Policy Framework and Planning Practice Guidance

- 4.1.1 The National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance (PPG) sets out the Government's policy on development and flood risk. The NPPF aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk. In exceptional circumstances where new development is necessary in flood risk areas the policy also aims to ensure it is safe, without increasing flood risk elsewhere, and where possible, reducing flood risk overall.
- 4.1.2 In February 2016, the Environment Agency (EA) updated its guidance on Climate Change. This included updating the guidance for peak river flow by river basin district, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height. For the individual river basin districts, the climate change allowance for peak river flows range from 10% to 70%, while peak rainfall intensity allowance ranges from 5% to 40%.
- 4.1.3 The 2015 updates to the PPG reflect the updated Non Statutory technical standards for sustainable drainage systems.

The Water Framework Directive

- 4.1.4 The Water Framework Directive (WFD) (Commission of the European Communities, 2000) (ref 13.2) establishes a framework for a European wide approach to action in the field of water policy, its ultimate aim is to ensure all inland and near shore watercourses and water bodies (including groundwater) are of 'Good' status or better, in terms of ecology, and also chemical, biological and physical parameters, by the year 2015. Therefore, any activities or developments that could cause detriment to a nearby water resource, or prevent the future ability of a water resource to reach its potential status, must be mitigated so as to reduce the potential for harm and allow the aims of the Directive to be realised.
- 4.1.5 Classifications for various water bodies are included as part of the River Basin Management Plan (RBMP) for the Severn River Basin District. The RBMP sets out a Programme of Measures (POM) which need to be undertaken in order for each water body to maintain or reach 'Good' status by 2015. The plan also sets out the various standards that each water body has to meet in order to be classified as having good status.

The Flood and Water Management Act

- 4.1.6 The Flood and Water Management Act 2010 implements several key recommendations of Sir Michael Pitt's Review of the summer 2007 floods, protects water supplies to consumers and protects community groups from excessive charges for surface water drainage. It gives the EA a strategic overview role for flood risk, and gives local authorities (known as Lead Local Flood Authorities, LLFAs) responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas. Oxfordshire County Council (OCC) is the LLFA in this area.

4.2 Other National Guidance

- The 'Non-statutory technical standards for sustainable drainage systems' (DEFRA, dated April 2015) should be used in conjunction with the NPPF and PPG. It provides planning guidance for the implementation of SuDS.

- SuDS techniques are described in CIRIA C753 guidance which outlines approaches to deal with surface water as close to the source as possible and reproduce natural drainage patterns to prevent an increase in the volume and peak discharge from development sites.
- Designing for exceedance in urban drainage (CIRIA C635) provides good practice guidance on the design and management of urban sewerage and drainage systems to reduce the impacts from drainage exceedance.
- Sewers for Adoption 7th Edition, provides guidance on the design, construction and maintenance of drains and sewers outside buildings which are to be adopted by a relevant public authority.
- Building Regulations Part H covers Drainage and waste disposal including foul water drainage, wastewater treatment systems, rainwater drainage, building over sewers and separate systems of drainage.
- BS EN 752:2008 – Drain and Sewer Systems Outside Buildings, provides a framework for the design, construction, rehabilitation, maintenance and operation of drain and sewer systems outside buildings.

4.3 Local Planning Policy

Oxfordshire County Council Local Flood Risk Management Strategy

4.3.1 The Oxfordshire Local Flood Risk Management Strategy sets out a series of objectives to ensure successful delivery of the strategy across the county:

- Objective 1 Improve Understanding – Understand the different sources of flooding and where flooding is likely to occur, how often and the impacts. An understanding will enable identification and implementation measures to reduce the consequences when flooding does occur.
- Objective 2 Taking a Collaborative Approach – The Oxfordshire Strategic Flooding Group includes representatives from the EA, District Councils, County Council, City Council and Thames Water. The partnership will enable liaison on flood management issues and projects in the area.
- Objective 3 Prevent an Increase in Flood Risk – Work collaboratively with partners to promote sustainable drainage on all proposed developments and redevelopments and invest in permanent and temporary flood alleviation measures.
- Objective 4 Taking a Sustainable and Holistic Approach – Take account of strategic development areas to identify opportunities for holistic approaches to managing flood risk achieving multiple benefits.

Cherwell District Council Local Plan (2006-2031)

4.3.2 Strategic objectives relating to flood risk are as follows:

- SO11 - To incorporate the principles of sustainable development in mitigating and adapting to climate change impacts including increasing local resource efficiency (particularly water efficiency), minimising carbon emissions, promoting decentralised and renewable or low carbon energy where appropriate and ensuring that the risk of flooding is not increased

4.3.3 Policies relating specifically to flood risk are as follows:

- ESD1 Mitigating and Adapting to Climate Change - ...Minimising the risk of flooding and making use of sustainable drainage methods
- ESD 6 Sustainable Flood Risk Management - The Council will manage and reduce flood risk in the district through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.
- In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.
- Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must allow for the maintenance and management of the defences and be designed to be resilient to flooding.
- Site specific flood risk assessments will be required to accompany development proposals in the following situations:
 - All development proposals located in Flood Zones 2 or 3
 - Development proposals of 1 hectare or more located in Flood Zone 1
 - Development sites located in an area known to have experienced flooding problems
 - Development sites located within 9m of any watercourses.
- Flood risk assessments should assess all sources of flood risk and demonstrate that:
 - There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)
 - Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.
- Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.
- ESD 7 Sustainable Drainage Systems (SuDS) – All developments will be required to use SuDS for the management of surface water run-off.
- Where site specific FRAs are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems.
- SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits.

Cherwell and West Oxfordshire Strategic Flood Risk Assessment (SFRA)

- 4.3.4 Cherwell and West Oxfordshire published a SFRA Level 1 in April 2009. The objective of the document was to “assess and map the different levels and types of flood risk in the study area for the land use planning process”.
- 4.3.5 The report includes overview maps showing flood risk information for the district as well as a more focussed assessment of key study areas. The Upper Heyford settlement is shown in Appendix B, page 92 and shows the site to be away from the Flood Zones associated with the River Cherwell and to be entirely within Flood Zone 1, land with the lowest probability of flooding.
- 4.3.6 A Level 2 SFRA was produced for Cherwell District Council in March 2012 and includes a detailed assessment of flood risk within the district. The key areas of assessment were for Banbury and Bicester, with four and eight strategic sites assessed respectively. The site does not feature specifically in the Level 2 SFRA.

Environment Agency Thames Catchment Flood Management Plan

- 4.3.7 The Thames Catchment Flood Management Plan (CFMP) published in 2009 outlines the sources and receptors of flooding in the Cherwell catchment and sets out the EA’s strategy for managing flood risk within the catchment.
- 4.3.8 The site lies within the upper northern area of the catchment. The CFMP highlights that for this area it will be important to utilise floodplains and to direct and manage run-off in locations that provide overall flood risk reduction or environmental benefits.

Environment Agency River Basin Management Plan – Thames River Basin District

- 4.3.9 The area of Upper Heyford is part of the Thames River Basin District. The purpose of the river basin management plan is to provide a framework for protecting and enhancing the benefits provided by the water environment. The plan sets objectives for each quality element in every water body, including an objective for the water body as a whole. For most water bodies, the default objective status is *Good*, however some water bodies a less stringent objective may have been set where natural conditions, technical feasibility or disproportionate cost make the improvement of the water body impractical.
- 4.3.10 The plan provides a framework for action and future regulation by summarising the existing mechanism that is used to manage the quality of the water environment. It also summarises the type of action and who needs to do this to achieve the statutory objectives.

4.4 Guidance

- 4.4.1 Technical guidance and calculations relating to surface water runoff can be found in DEFRA publication *Preliminary Rainfall Runoff Management* and design guidance on SuDS is available in *CIRIA Manual C753 – The SuDS Manual*.

5 Assessment of Flood Risk

5.1 Environment Agency Mapping

Flood Map for Planning (Rivers and Sea)

- 5.1.1 The first phase in identifying whether a site is potentially at risk of flooding is to consult the EA Flood Map for Planning (Rivers and Sea) maps, available online. This provides an initial indication of the extent of the Flood Zones, which is refined by the use of more detailed site-specific level survey and modelled flood levels, if required.
- 5.1.2 The flood extents received from the EA have demonstrated that the site lies wholly within **Flood Zone 1**.
- 5.1.3 Flood Zone definitions are set out in Table of the PPG (Paragraph: 065, Ref. ID: 7-065-20140306):
- **Flood Zone 1 – Low Probability:** This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
 - **Flood Zone 2 – Medium Probability:** This zone comprises land assessed as having between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1%).
 - **Flood Zone 3a – High Probability:** This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%).
 - **Flood Zone 3b – The Functional Floodplain:** This zone comprises land where water has to flow or be stored in times of flood.
- 5.1.4 Data received is included in **Appendix B**.

Flood Risk from Surface Water

- 5.1.5 The EA '*Surface Water*' map shows where areas could be potentially susceptible to surface water flooding in an extreme rainfall event.
- 5.1.6 The EA mapping indicates that the site is predominantly free from surface water flood risk.
- 5.1.7 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.
- 5.1.8 It should be noted that the maps are generated using a relatively coarse methodology whereby rainfall inflows are routed over a ground surface model. As such, the analysis does not take account of any below-ground drainage infrastructure or localised small depressions of vegetation, but does provide a guide to potentially vulnerable areas based on the general topography of an area.
- 5.1.9 The area of high risk identified on the far side of Camp Road corresponds with the headwall of a culverted watercourse. Therefore, it is likely that any surface water flooding indicated on the proposed development site would in fact be drained by the culverted watercourse.
- 5.1.10 Data received is included in **Appendix B**.

Flood Risk from Reservoirs

- 5.1.11 The EA provides maps showing the risk of flooding in the event of a breach from reservoirs. The maps confirm that the site lies outside of any flood risk from this source.

5.2 Groundwater Flooding

- 5.2.1 The EA state there are no groundwater flood alerts in Heyford Park and do not expect there to be any groundwater flooding in this area. There are no records of previous groundwater flooding in the area.

5.3 Historical Records of Flooding

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

5.4 Flood Risk Vulnerability

- 5.4.1 NPPF PPG '*Flood Risk and Coastal Change*' Table 2 (Paragraph: 066, Ref. ID: 7-066-20140306) confirms the '*Flood Risk Vulnerability Classification*' of a site, depending upon the proposed usage. This classification is subsequently applied to PPG Table 3 (Paragraph: 067, Ref. ID: 7-067-20140306) to determine whether:

- The proposed development is suitable for the Flood Zone in which it is located.
- Whether an Exception Test is required for the proposed development.

- 5.4.2 The proposed land uses of the development can be classified generally as follows:

- **More Vulnerable:** Residential uses.

5.5 NPPF Sequential and Exception Tests

- 5.5.1 The NPPF follows a sequential risk-based approach to determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas.

- 5.5.2 The site falls wholly within Flood Zone 1, where all forms of development are acceptable; therefore, the Sequential Test is passed and the Exception Test is not required.

6 Surface Water Management

6.1 Surface Water Discharge Hierarchy

- 6.1.1 A key requirement for proposed development is to ensure that off-site flood risk is not increased as a result of development. The potential increase is associated with additional runoff generated by the introduction of roofs and hard-paved surfaces as part of development which remove the natural depressions and vegetation which can collect and slow runoff in a 'greenfield' environment.
- 6.1.2 When draining a site, particular solutions will be more referable to others. Priority should be given to:
- infiltration drainage; over
 - controlled discharge to a watercourse; over
 - discharge to a sewer.

6.2 Proposed Surface Water Drainage Strategy

- 6.2.1 The surface water drainage strategy for the proposed development has been developed by Focus on Design.
- 6.2.2 PBA have provided Focus on Design with post-development discharge rates and indicative attenuation requirements. These are indicated below.
- 6.2.3 The greenfield runoff rate for the site has been calculated using the ICP SuDS method and WinDES MicroDrainage and is summarised in Table 1.

| | 1 Year Event | 30 Year Event | 100 Year Event |
|-------------------|--------------|---------------|----------------|
| Runoff Rate (l/s) | 4.2 | 9.9 | 12.9 |

Table 1: Runoff Rates (l/s) for the Proposed Site

- 6.2.4 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 in accordance with Soakaway Design (DG 365) 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 and the site will discharge to the Gallos Brook along the southern boundary of the site. This is to ensure the 'worst case' can be accommodated on site.
- 6.2.5 While attenuation storage manages the additional rate of runoff caused by paving over natural surfaces, a provision of 'long-term' storage is also required to cater for the additional runoff volume generated by new development, where infiltration is not a viable means of surface water discharge on site.
- 6.2.6 Typically, to manage this additional volume of runoff, the long term volume would be restricted down to 2 l/s/ha; this equates to 24l/s for the whole site. However, in matching the existing greenfield runoff rate shown in Table 1, the runoff rate will already be restricted to below 24l/s; therefore, additional storage for the volume of runoff is not required.

- 6.2.7 Based on the runoff rate outlined in Table 1 and assumed no infiltration capacity on site, the indicative attenuation requirement for the proposed development is calculated, using WINDES MicroDrainage, to be **910.7m³ per impermeable hectare of development (m³/ha)** for up to the 1 in 100 year storm event plus 30% allowance for climate change.
- 6.2.8 Supporting WinDES MicroDainage calculations produced by PBA are included in **Appendix C**.
- 6.2.9 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 Gallos Brook on the southern boundary.
- 6.2.10 The strategy plan and supporting WinDES calculations produced by Focus on Design can be found in **Appendix D**.

6.3 Adoption and Maintenance

- 6.3.1 Discussion will be held with the local authority as part of the detailed design stages to determine an agreed approach for adoption and future maintenance.
- 6.3.2 Options include:
- Adoption and maintenance by local/county council.
 - Adoption by water company.
 - Adoption by local/county council with maintenance undertaken by a private company.
 - Adoption/maintenance by private company.

6.4 Residual Risk

- 6.4.1 Two residual risks have been identified, namely potential blockage of drainage infrastructure and the occurrence of (rare) storm events which exceed the design conditions.
- 6.4.2 The risk associated with potential blockage is considered to be small. Routine inspection and maintenance procedures will minimise the risk of the accumulation of detritus and debris as well as ensuring that the drainage systems continue to operate efficiently.
- 6.4.3 In the event of a rare storm (beyond the design condition), the capacity of the drainage network could be temporarily exceeded and drainage inlets could be bypassed creating overland flow. All buildings should be provided with internal threshold levels raised above surrounding ground levels and designated flow paths created around the buildings to the lower lying levels. Localised grading may be required to achieve level access criteria. Exceedance flows would then naturally be directed around the buildings to lower ground.
- 6.4.4 An overland flow assessment should be carried out at detailed design stage once all construction information is available so that any hotspots can be identified and designed out.

7 Conclusions

7.1 Planning Application

7.1.1 This FRA has been prepared by PBA to support a planning application for a residential development at Land South of Camp Road, Heyford Park.

7.2 Flood Risk

7.2.1 Flood Map for Planning (Rivers and Sea) provided by the EA demonstrates that the site lies wholly within Flood Zone 1, outside the fluvial flood risk area. Therefore, the requirements of the Sequential and Exception Tests are met.

7.3 Surface Water Drainage

7.3.1 The surface water drainage strategy for the site has been prepared by Focus on Design.

7.3.2 Infiltration drainage may be possible on site. However, targeted in-situ soakage testing would be required to confirm this. Therefore, the drainage strategy has assumed that no infiltration will be possible on site.

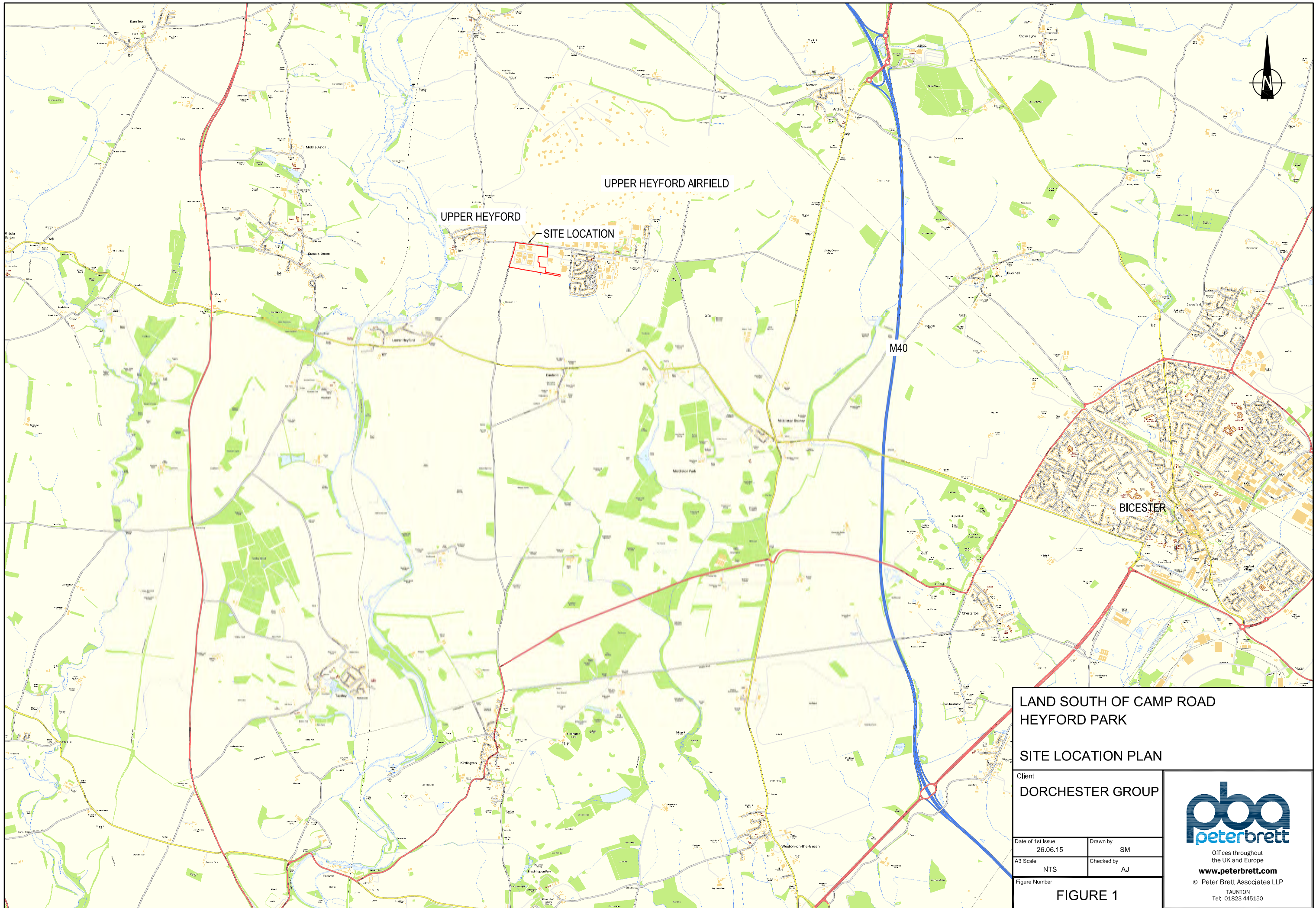
7.3.3 Discharge will be limited to existing greenfield runoff rates, which has been calculated to be 12.9l/s for the 1 in 100 year storm event. Based on this discharge rate, calculations show that 910.7m³/ha of attenuation will be required on site for up to the 1 in 100 year plus an allowance for climate change.

7.3.4 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 Gallos Brook on the southern boundary.

7.3.5 The future occupants and users of the proposed development will be safe from flooding and there will be no detrimental impact on third parties. The proposal complies with the NPPF and local planning policy with respect to flood risk and is an appropriate development at this location.

Appendix A Figures

- Figure 1: Site Location Plan
- Figure 2: Development Masterplan
- Figure 3: Topographical Information




**LAND SOUTH OF CAMP ROAD
HEYFORD PARK**

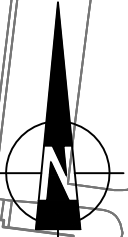
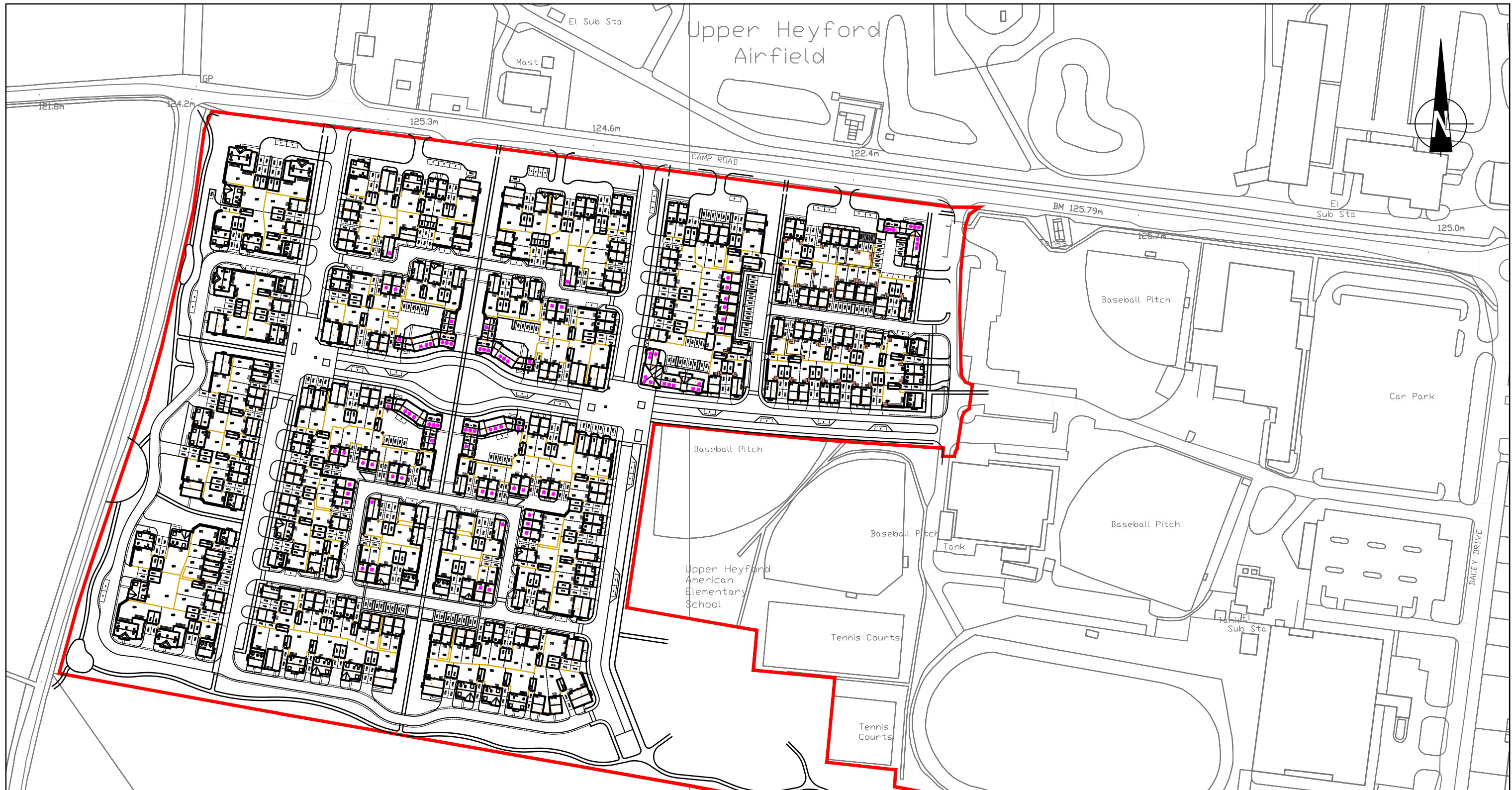
SITE LOCATION PLAN

Client
DORCHESTER GROUP

| | |
|----------------------------------|------------------|
| Date of 1st Issue 26.06.15 | Drawn by SM |
| A3 Scale NTS | Checked by AJ |
| Figure Number FIGURE 1 | |



Offices throughout
the UK and Europe
www.peterbrett.com
© Peter Brett Associates LLP
TAUNTON
Tel: 01823 445150



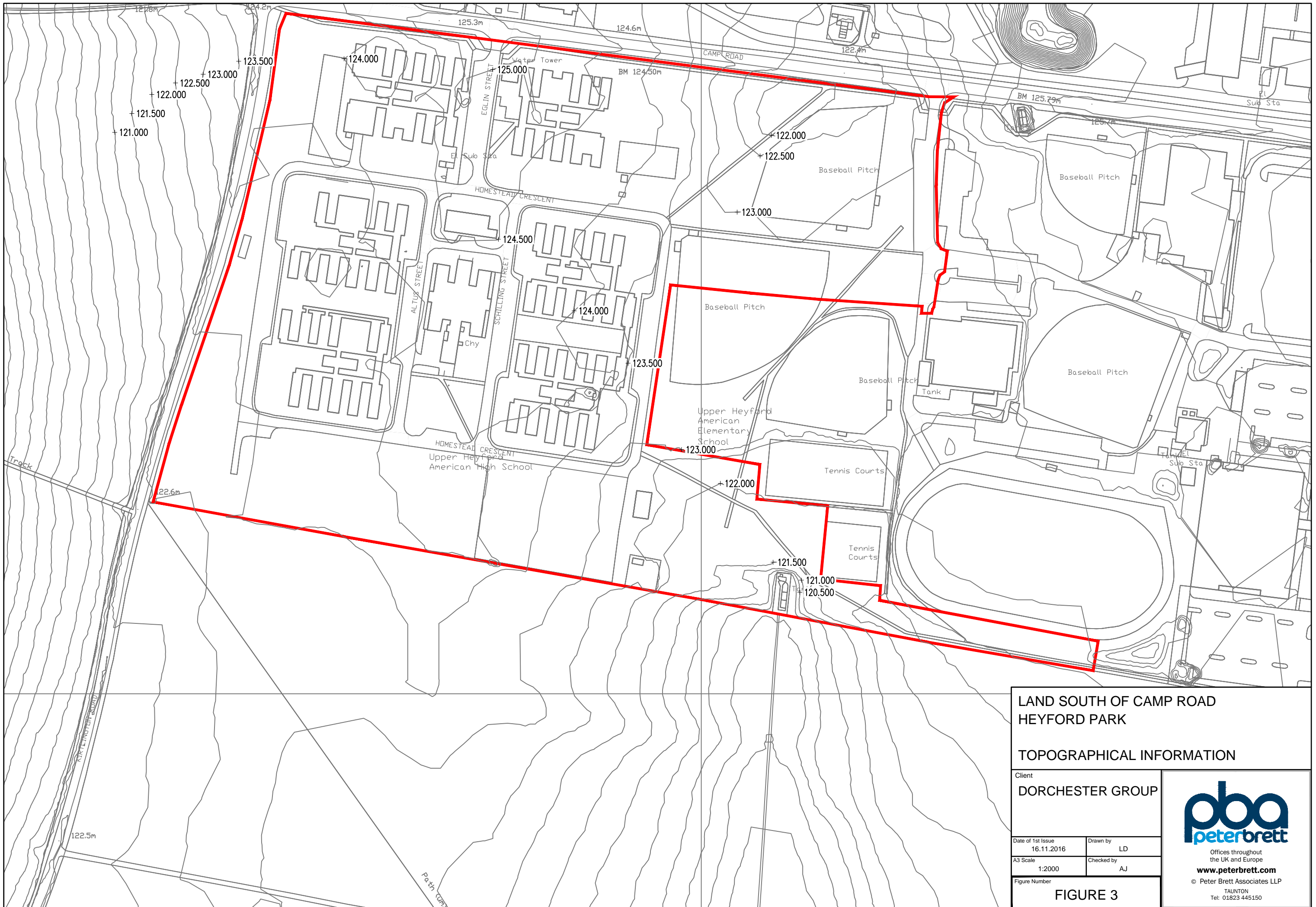
**LAND SOUTH OF CAMP ROAD
HEYFORD PARK
DEVELOPMENT MASTERPLAN**

| | |
|-----------------------------------|------------------|
| Client DORCHESTER GROUP | |
| Date of 1st Issue 16.11.2016 | Drawn by LD |
| A3 Scale 1:2000 | Checked by AJ |
| Figure Number | |

FIGURE 2




Offices throughout the UK and Europe
www.peterbrett.com
 © Peter Brett Associates LLP
 TAUNTON
 Tel: 01823 445150



**LAND SOUTH OF CAMP ROAD
HEYFORD PARK**

TOPOGRAPHICAL INFORMATION

| | |
|-----------------------------------|------------------|
| Client DORCHESTER GROUP | |
| Date of 1st Issue 16.11.2016 | Drawn by LD |
| A3 Scale 1:2000 | Checked by AJ |
| Figure Number FIGURE 3 | |



Offices throughout
the UK and Europe
www.peterbrett.com
© Peter Brett Associates LLP
TAUNTON
Tel: 01823 445150