1.4.2 Planning Policy Statement 25: Development and Flood Risk

PPS25 sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. A supporting Practice Guide is also available.

PPS25 sets out the vulnerability to flooding of different land uses. It encourages development to be located in areas of lower flood risk where possible, and stresses the importance of preventing increases in flood risk off site to the wider catchment area.

PPS25 also states that alternative sources of flooding, other than fluvial (river flooding), should also be considered when preparing a Flood Risk Assessment.

This Flood Risk Assessment is written in accordance with PPS25.

1.4.3 PPS25 Flood Zones and Vulnerability Classification

Flood Zone mapping prepared by the Environment Agency identifies areas potentially at risk of flooding from fluvial or tidal sources without taking into account the presence of flood defences or structures such as culverts or minor watercourses. An extract from the mapping is included as Figure 1.3.

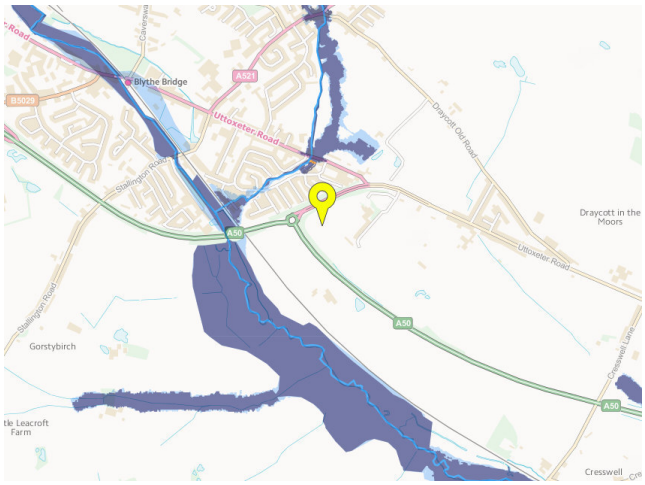

Figure 1.4 Environment Agency Flood Map, July 2017)

Figure 1.4 demonstrates that the site is situated entirely in Flood Zone 1 (Low Probability), land assessed as having a less than 1 in 1000-year annual probability of river or coastal flooding.

Table D2 of PPS25 classifies land use. Under these classifications the proposed development is considered to be "Less Vulnerable" to flood risk

1.4.4 Other Relevant Policy and Guidance

Further guidance on planning policy and flood risk is set out in the Staffordshire Moorlands Level 1 Strategic Flood Risk Assessment (October 2015). Reference has been made to this study and in particular the mapping contained therein in the preparation of this flood risk assessment.

2 Sources of Flood Risk

2.1 Potential Sources of Flood Risk

The table below identifies the potential sources of flood risk to the site. The significance of these sources is investigated further into section 3.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial			X		River Blithe off Southern boundary but site is FZ1
Tidal				X	No Risk, inland site
Canals				X	No canals in the proximity of the site
Ground Water		X			Ground conditions typically give rise to perched groundwater
Reservoirs				X	No reservoirs in the vicinity of the site
Sewers				X	No large diameter sewers in the site
Pluvial			X		Low risk of pluvial runoff in the event of failure of land drainage
Development Drainage	X				Intensive development on greenfield site – high risk of increasing drainage flows

2.1.1 Fluvial Flood Risk

Fluvial flood risk is presented to the site from the River Blithe, which flows in a south easterly direction 500m of the site's south-western boundary. Review of flood zone mapping in the Staffordshire Moorlands SFRA has confirmed that the modelled 1000 year return period flood on the River Blithe does not result in flooding of the proposed development site. The site is therefore considered to be at an acceptably low risk of flooding from the River Blithe and no flood risk mitigation measures are required in this respect

2.1.2 Groundwater

Geological records indicate that the site is underlain by the Upper Permian formation of clays and mudstones. The presence of such features is evidenced on site by the presence of several ponds and ditches. This presents the risk of perched groundwater and seasonal springs that need to be considered further in the flood risk assessment.

2.1.3 Pluvial Runoff

The site is not at significant risk of pluvial runoff flowing onto it over site boundaries, but the phased nature of developments and undulating landform is such that a risk may arise while the development is partially complete.

In addition, there are several features on the site that indicate the presence of land drainage. In the event that the existing systems of land drainage are exceeded, flooding of the site would present in localised low areas by pluvial flooding mechanisms. This risk of flooding is considered further in the flood risk assessment.

2.1.4 Development Drainage

The site in its existing form is greenfield and is used for animal grazing. Natural patterns of drainage will serve to limit runoff volume and peak flows that pass forward into the River Blithe.

The proposed development will cause the creation of extensive hard surfaces, including roofs and paved areas, which will have to be positively drained. Without mitigation, such development would result in a significant increase in both the volume of runoff and peak flows that would pass forward into the River Blithe resulting in increased flood risk along the river downstream of the site.

The effect of development drainage and associated mitigation is considered further in the flood risk assessment.

2.2 History of Flooding

Maps presented in the Staffordshire Moorlands Level 1 SFRA do not record historic flooding on the site.

3 PPS25 Sequential and Exception Tests

3.1 Sequential Test

The Sequential Test is a risk-based application intended to direct new development to areas of lowest possible flood risk and ensuring development is located within an appropriate Flood Zone. This is done by classifying land use according to its vulnerability to the potential impacts of flooding.

The proposed land use is Residential Use and is considered to be “Less Vulnerable” to flood risk.

The site is shown in the Staffordshire Moorlands Level 1 SFRA mapping to be situated in Flood Zone 1 at low risk of flooding. No further sources of flood risk have been identified in this assessment to change this flood zone categorisation.

Reference to Table D3 in PPS 25 demonstrates that the proposed development is appropriate to the flood zone. Since the site is situated in Flood Zone 1 throughout it is deemed to be sequentially preferable for the proposed development.

3.2 Exception Test

Reference to Table D3 of PPS25 demonstrates that the exception test is not required.

4 Flood Risk Assessment

4.1 Significant Sources of Flood Risk

A review of the potential sources of flood risk has identified the following significant sources of flood risk that need to be considered in the FRA:

- Localised flooding of low areas from perched groundwater
- Localised flooding of low areas of the site from pluvial runoff or the failure or exceedance of land drainage.
- Flood risk to others that could result from uncontrolled development drainage.

4.2 Groundwater Flooding

4.2.1 Groundwater Flood Risk

Geological records show that the site is underlain by the Upper Permian formation of clays and mudstones. This formation is generally of low permeability but the site is undulating and so it is anticipated that perched groundwater will be present in localised low lying areas. The source of this groundwater is likely to be from localised infiltration. There are not anticipated to be significant groundwater flows underlying the site.

4.2.2 Groundwater Mitigation

This risk is readily mitigated in the design of earthworks, within which appropriate land drainage should be provided to all embankments. This drainage should be discharged to the SUDS features proposed in the development or to retained water features and land drains.

4.3 Flood Risk from Pluvial Sources and Lane Drainage

4.3.1 Pluvial Flood Risk

Once the development is complete the majority of the site will be positively drained with the balance given over to designed landscaping and flood risk issues associated with pluvial sources and the capacity of land drainage will not be significant.

However, the large scale and phased nature of the development is such that it will be constructed in a number of phases over many years with new development situated alongside land that remains greenfield for a period.

In such circumstances, there will be areas of development that are situated down gradient from some of the slopes on the site and it is likely that development will also sever land drainage routes in some areas.

If uncontrolled, such circumstances present a risk of flooding to the proposed development prior to overall completion.

4.3.2 Pluvial Flood Risk Mitigation

This flood risk is readily mitigated with careful engineering design during phased construction. Particular attention needs to be provided to boundaries of plots or phases that are down gradient of significant hillsides on the site and temporary cut off ditches should be provided in such circumstances. These temporary ditches may be connected to the sustainable urban drainage systems (SUDS) features proposed to drain the site or to retained land drainage.

In the event that development plots sever existing land drainage, such drains should be temporarily diverted around the development plot to ensure continuity of drainage.

5 Ground Conditions / Groundwater

The site sub-strata consists of clays and mudstones, and with the presence of numerous overland ponds indicates perched groundwater and the possibly presence of seasonal springs.

This strongly suggests that the ground will be unsuitable for infiltration techniques. Further GI testing will confirm the presence of both groundwater and impermeable materials.

6 Drainage Outfall and Discharge Rates

The existing site is greenfield, and drains runoff through a series of open watercourses and culverts to the River Blithe to the south of the development.

Calculations have been undertaken to describe the runoff characteristics of the existing site conditions and are presented in the below table. The calculations establish the peak flow rates likely to discharge into the River Blithe from the site in storm events of 1 year, 30 year, and 100 year return periods.

Storm Period	Site Area	IH124 Runoff (l/s)	ICP SuDS Runoff (l/s)
1 Year	5.5299 hectares	32	24.8
30 Year	5.5299 hectares	75.5	58.5
100 Year	5.5299 hectares	99	76.7

While the above demonstrates that a peak flow rate of between 24.8 to 76.7 l/s could be adopted for the proposed development, limiting peak flow rates to their respective storm events, there is a further constraint on site that forces a restriction on the peak discharge.

An existing 300mm diameter culvert downstream of the proposed discharge point has a limited capacity to receive flows from a positive drainage system.

Therefore a maximum flow rate of 5.0 l/s per hectare is assumed for this development discharge.

With a site area of 5.53 hectares, this equates to a maximum discharge of 27.65 l/s under all rainfall return periods.

The site levels fall south westerly towards the A50 drainage ditch and associated culverts. The proposed development will make a new connection into this drainage ditch, with appropriate flow restrictors to limit the discharge to that noted above.

7 Drainage Strategy

A surface water discharge point is available into the existing drainage ditch along the south west corner, and peak runoff flows are restricted to greenfield discharge of 5.0 l/s per hectare.

This Phase 1 site has a development area of 5.5299 hectares. This equates to a maximum discharge rate of 27.65 l/s. This site thus requires to attenuate all flows that accumulate above this rate within the confines of the site boundary.

SuDS techniques are to be used on this site to reduce peak runoff at source and improve on the water quality leaving the site.

SuDS should be designed on a hierarchical approach with the most sustainable considered first

1 Basins and ponds
2 Swales
3 Infiltration into the ground
4 Permeable surfaces
5 Contained attenuation

Residential developments often pose constraints on space available to provide various SuDS types, another consideration for residential developments are future maintenance and Health and Safety of the local residents.

This development will control much of the rainfall as close to the point of impact as practical, by utilising permeable paving, this will not only slow the rate surface water enters the gravity drainage network but also provide the first treatment train though the permeable paving sub base. This will then enter the drainage network and flows downstream until it meets the flow restrictor.

Attenuated flows will then back up the oversized pipes and flow out towards an attenuation structure located under the open space. The attenuation structure itself has the benefit of a second treatment train, by way of utilising granular material surrounding the central void space. The granular material forms part of the attenuation volume and the attenuated water flows horizontally to fill this adjoining space.

The attenuation structure is designed to be adopted by Severn Trent Water, and as such is sized to accommodate flows up to the 1 in 30 year storm event. When a rainfall event exceeds this design parameter the attenuated volume will travel up though the attenuation structure and permeate though the bed of a detention basin, which is sized to accommodate flows up to and including the 1 in 100 year event, incorporating an addition 30% for climate change. If a storm event occurs above this, the detention basin has a 300mm freeboard before a minimum bank level. Any flows overtopping this are then directed directly downhill towards the existing drainage ditch.