

HEREFORDSHIRE TRAVELLER SITES

STRATEGIC FLOOD RISK ASSESSMENT



MARCH 2017

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Herefordshire Council

Final

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WSP | Parsons Brinckerhoff

Kings Orchard

1 Queen Street

Bristol

BS2 0HQ

Tel: 0117 930 6300

www.wsp-pb.com

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Prepared by	S. Haberfield	S. Haberfield	S. Haberfield	
Checked by	J. Goodwin	J. Goodwin	J. Goodwin	
Authorised by	J. Goodwin	J. Goodwin	J. Goodwin	
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

1.1.1 WSP | Parsons Brinckerhoff was appointed by Herefordshire Council to prepare a Level 2 Strategic Flood Risk Assessment (SFRA) of 10 traveller sites to inform the site allocation process. The assessment has been completed in accordance with the National Planning Policy Framework (NPPF) and the supporting Planning Practice Guidance 'Flood Risk and Coastal Change' and provides an assessment of the flood risk at the traveller sites identified by the Council.

1.1.2 The traveller sites identified by the Council within Herefordshire are:

- Openfields, Bromyard
- Pembridge
- Sutton St Nicholas
- Watery Lane
- Land adjacent to A49 roundabout
- Land at Waterworks Lane
- Land to the south-west of Wigmore
- Grafton
- Pontrilas Highways Depot
- Land adjacent to Whitfield Coppice
- Homs Road Car Park
- Land adjacent to Morrisons

1.1.3 This Level 2 SFRA for the traveller sites has been informed by the current Herefordshire SFRA was published in 2009. The current SFRA assesses the risk of flooding throughout the county of Herefordshire from all sources, now and in the future, taking account of climate change. The current SFRA provides the basis for the application of the Sequential Test and, where required, the Exception Test.

1.1.4 It is important to note that the current SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of any of the site-specific assessments completed for the traveller sites, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

1.2 THE NEED FOR THE SFRA

1.2.1 Herefordshire Council are required to prepare a SFRA in accordance with the NPPF to support their Local Plan and inform development control within the county. The Council are currently producing a Travellers' Sites Document as part of the Local Plan that will focus on the accommodation needs of the Traveller community.

- 1.2.2 The Level 2 SFRA traveller site assessments will inform this site allocation process and provide a detailed assessment of the flood risk at each potential traveller site identified by the Council. Each assessment provides advice on the requirements to apply the Sequential and Exception Tests, explained in more detail in Section 4, and the likely flood risk to the site after the potential effects of climate change and the protection served by flood defence infrastructure has been considered. Each assessment also provides advice on the requirements for a site-specific Flood Risk Assessment (FRA) to support the development of the site and the second part of the Exception Test.

1.3 **APPROACH TO COMPLETING THE LEVEL 2 SFRA TRAVELLER SITE ASSESSMENTS**

- 1.3.1 The site-specific traveller site assessments have been informed using the following datasets:
- Environment Agency (EA) indicative flood maps available through the EA and GOV.UK websites;
 - EA groundwater maps available through the EA website;
 - Cranfield University Soilscales mapping available online;
 - British Geological Society (BGS) Geology of Britain Viewer;
 - BGS Onshore GeoIndex;
 - Detailed hydraulic modelling studies completed for the River Wye, combined River Arrow and River Lugg, Ross-on-Wye flood alleviation scheme;
 - Ordnance Survey mapping;
 - Topography (LiDAR);
 - Strategic Flood Risk Assessment for Herefordshire (2009); and
 - Core Strategy 2011 - 2031.

2 THE SEQUENTIAL AND EXCEPTION TESTS

2.1.1 The risk of flooding is most effectively addressed and reduced through avoidance, which equates to guiding all future development, including regeneration, away from areas deemed to be at risk.

2.2 THE SEQUENTIAL TEST

2.2.1 The aim of the Sequential Test is to steer new development to areas with the lowest risk and probability of flooding. In summary, development should not be allocated if there are reasonably available sites that are appropriate for the proposed development and located in areas with a lower risk and probability of flooding. Development should be steered to Flood Zone 1 in the first instance, and only if there are no reasonably available sites located in Flood Zone 1 should sites be considered in Flood Zones 2 and 3. Within Herefordshire and in accordance with the forthcoming Level 1 SFRA due to be published in 2017, the potential effects of climate change should be considered when applying the Sequential Test.

2.2.2 The process for applying the Sequential Test to inform the preparation of the Local Plan is illustrated in Figure 2.1, recreated from the NPPF Planning Practice Guidance document.

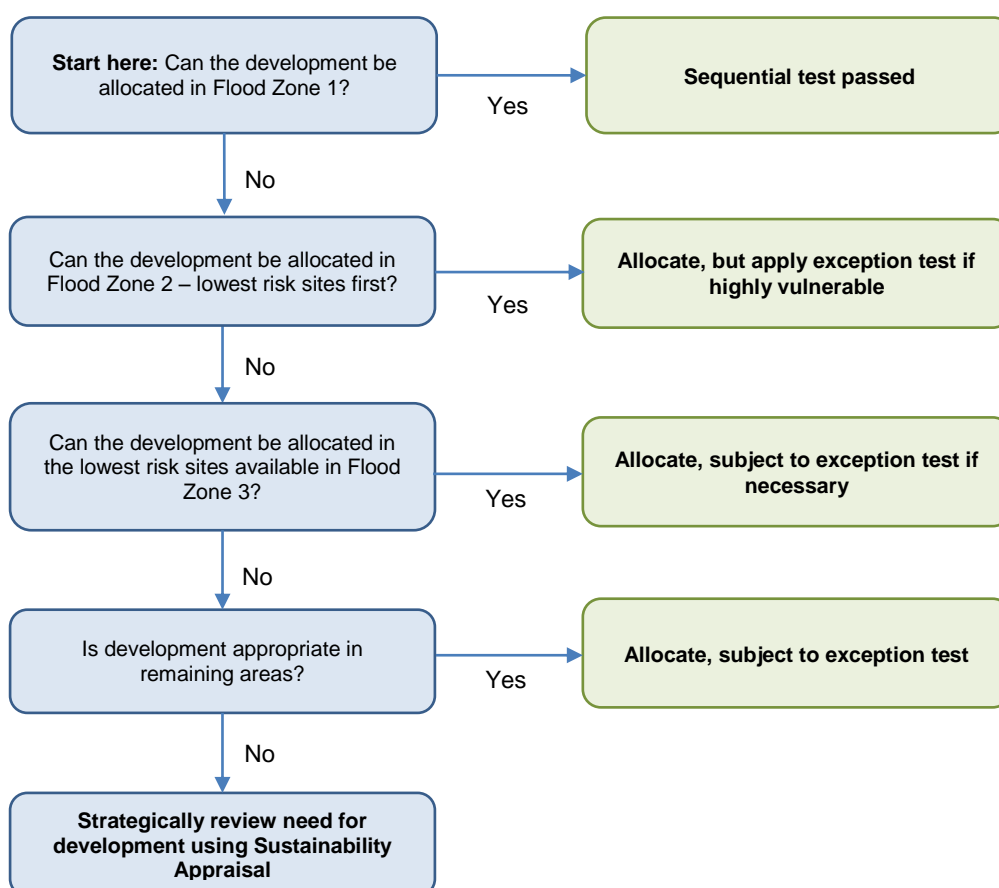


Figure 2.1 Application of the Sequential Test for Local Plan preparation

2.3 THE EXCEPTION TEST

2.3.1 If, following the application of the Sequential Test, it is deemed to not be possible for the proposed development to be located in Flood Zones with a lower probability and risk of flooding; the Exception Test can be applied if appropriate. Table 3 of the Planning Practice Guidance to NPPF provides recommendations on the compatibility of different types of development based on their vulnerability classification within each of the mapped Flood Zones and summaries where the Exception Test is required, as shown in Table 2.1. Within Herefordshire and in accordance with the forthcoming Level 1 SFRA due to be published in 2017, the potential effects of climate change should be considered when applying the Exception Test.

Table 2.1 Flood risk vulnerability and flood zone compatibility

EA Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More vulnerable	Less vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	✗	Exception test required	✓
Zone 3b	Exception test required	✓	✗	✗	✗

- ✓ Development considered acceptable
- ✗ Development considered unacceptable

2.3.2 The traveller sites comprise permanent residential sites and temporary stopping places. It is understood that the temporary stopping places will provide for the intermittent needs for site accommodation during times of increased demand and will be occupied for a maximum of 28 days at any one time. In accordance with Table 2 of the Planning Practice Guidance to NPPF, sites used for caravans intended for permanent residential use are typically classified as 'Highly Vulnerable' development, whereas sites used for temporary caravan accommodation are typically classified as 'More Vulnerable' development.

2.3.3 In summary:

- With reference to Table 3 of the Planning Practice Guidance, Highly Vulnerable development would be considered appropriate in Flood Zone 1, but would require the Exception Test to be passed if the site is located in Flood Zone 2. Highly Vulnerable development would not be considered appropriate in Flood Zone 3.
- With reference to Table 3 of the Planning Practice Guidance, More Vulnerable development would be considered appropriate in Flood Zone 1 and Flood Zone 2, but would require the Exception Test to be passed if the site is located in Flood Zone 3.
- No development would be considered appropriate in the functional floodplain Flood Zone 3b.

2.3.4 Figure 2.2, recreated from the NPPF Planning Practice Guidance, summarises the application of the Exception Test in the preparation of a Local plan.

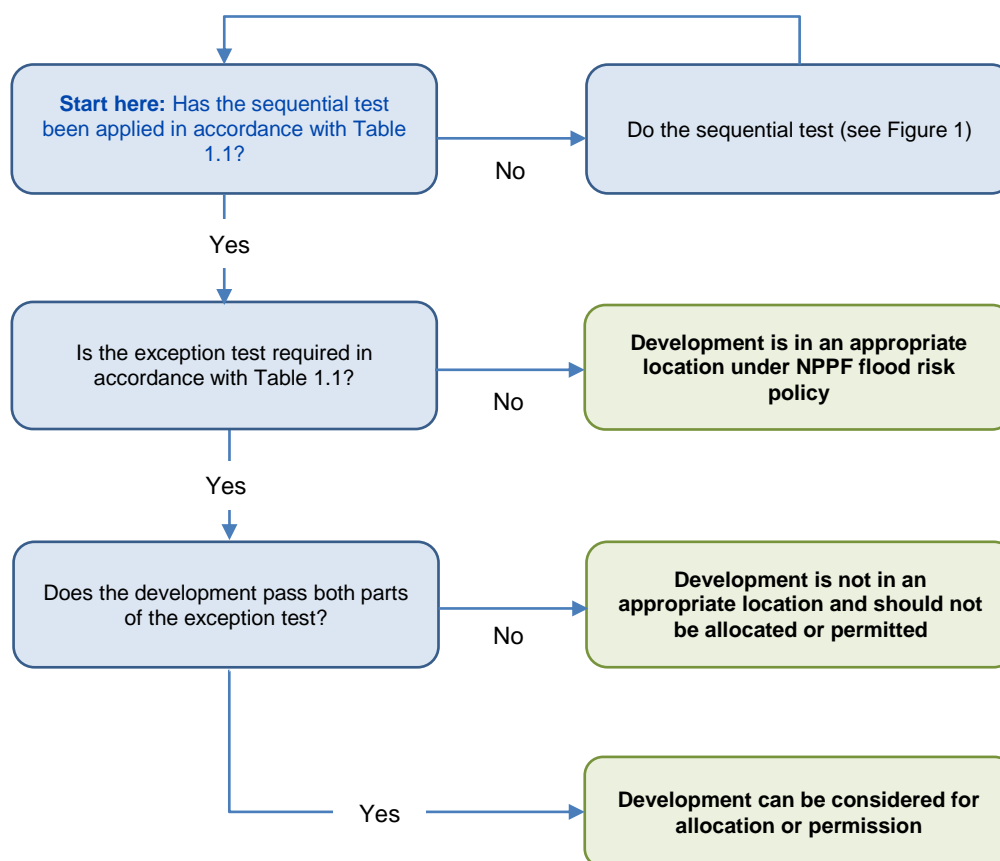


Figure 2.2 Application of the Exception Test for Local Plan preparation

3 CLIMATE CHANGE

3.1 IMPACTS OF CLIMATE CHANGE

3.1.1 All new developments in Herefordshire must consider the potential impacts of climate change on flood risk in accordance with the EA's updated climate change recommendations (published in March 2016) and local guidance for the Shropshire, Herefordshire, Worcestershire and Gloucestershire area over the lifetime of the development. The current Herefordshire SFRA includes an assessment of climate change effects. However it is important to note that studies completed prior to the publication of the updated EA climate change guidance used previous climate change recommendations as included with Planning Policy Statement 25 and, later, the NPPF Planning Practice Guidance. Of particular note is the potential increase in fluvial flood flows compared to previous recommendations that could significantly increase the mapped extents of fluvial flood risk during extreme events.

3.1.2 A summary of the updated climate change recommendations for peak river flow within the Herefordshire area is provided in Table 3.1. Herefordshire is within the Severn River Basin District. The Council has confirmed that a lifetime of 100 years is considered to be appropriate for the assessments, therefore the total potential change anticipated for the '2080s' (2070 to 2115) is considered appropriate.

Table 3.1 Peak river flow allowances¹

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	25%	40%	70%
Higher Central	15%	25%	35%
Central	10%	20%	25%

3.1.3 The EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team recommends that for Highly Vulnerable or More Vulnerable, the assessment of fluvial flood risk should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches and measures for the 'upper end' allowance (70%) where feasible.

3.1.4 In the absence of robust model data, the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team has provided guidance on the nominal increase in rivers levels that can be used to inform the assessment of future fluvial flood risk. These are generally considered appropriate for non-major developments such as the traveller sites and are summarised in Table 3.2.

¹ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Table 3.2 Nominal allowances peak river levels²

Watercourse	Change in peak flow		
	20 - 25%	35 - 40%	70%
River Wye	600mm	850mm	1500mm
River Teme			
River Avon			
Upper Severn (upstream of Lincomb weir, Worcestershire)			
Lower Severn	400mm	600mm	1000mm
Tributaries and ordinary watercourses	200mm	300mm	500mm

3.1.5

The EA has also provided updated climate change recommendations for rainfall intensity that are to be used within the assessment of surface water flood risk and drainage designs. These are generally applicable to small and urban catchments and are summarised in Table 3.3. For river catchments around or over 3 square kilometres, the peak river flow allowances are considered to be more appropriate. As discussed above, the Council has confirmed that a lifetime of 100 years is considered to be appropriate for the assessments, therefore the total potential change anticipated for 2060 to 2115 is considered appropriate.

Table 3.3 Peak Rainfall intensity allowance²

Allowance Category	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

² Flood Risk and Coastal Change: Climate change allowances for planning (SHWG area), Environment Agency, March 2016

4 SUSTAINABLE DRAINAGE SYSTEMS

- 4.1.1 The sustainable management of surface water runoff is an important consideration in the management of local flood risk and impacts to water quality. Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire. A summary of key recommendations is provided within each of the site assessments, in accordance with the general requirements summarised below.
- 4.1.2 As part of a planning application or detailed proposals put forward as part of the site allocation process, a surface water drainage strategy should be submitted detailing how surface water runoff will be appropriately managed. The strategy must demonstrate that there is no increase in flood risk to the site or to people and infrastructure elsewhere as a result of development between the 1 in 1 year event and up to the 1 in 100 year event and allowing for the potential effects of climate change.
- 4.1.3 In accordance with the NPPF, Non-Statutory Technical Standards for Sustainable Drainage Systems and Policy SD3 of the Core Strategy, the drainage strategy should incorporate the use of Sustainable Drainage (SUDS) where possible. The approach promotes the use of infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference): (i) a controlled discharge to a local watercourse, or (ii) a controlled discharge into the public sewer network (depending on availability and capacity).

Appendix A

OPENFIELDS, BROMYARD

Location: Openfields, Bromyard
Reference: GTAA/16/HC/O/12
Proposed Use: Additional two pitches within existing site boundary
Grid Reference: SO 66877 53925

Introduction

The Openfields site in Bromyard is located to the south-east of the town of Bromyard. The site comprises the addition of two residential pitches on an existing Council Traveller Site with 10 existing pitches. The total site area is approximately 1.6ha in size. The general topography of the site slopes from approximately 158.1mAOD in the south of the site to approximately 151.1mAOD in the north.

The site is bound to the north by Linton Trading Estate. The Bromyard and Linton Light Railway is located approximately 100m to the north-east of the site. A disused sandstone quarry and household waste site are located immediately to the west of the site. The surrounding area comprises relatively rural agricultural land and woodland.

The River Frome, designated as a main river, is located approximately 1km to the west of the site and flows in a general southerly direction. A small ordinary watercourse is located to the west of the site and flows in a northerly direction to discharge to the River Frome. The watercourse is connected to the disused sandstone quarry located immediately to the west of the site that has filled with water to form a lake.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the low risk Flood Zone 1, as shown in Figure 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the ordinary watercourse located to the west of the site. OS mapping indicates that the watercourse flows through a number of culverts, including underneath the A44 approximately 230m to the north of the site, through the Petty Bridge Sewage Works and discharges into the River Frome. It is considered highly unlikely that the site will be at risk of fluvial flooding from this watercourse.



Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Openfields site in Bromyard is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than a 0.1% (1 in 1000) annual probability of flooding from surface water.

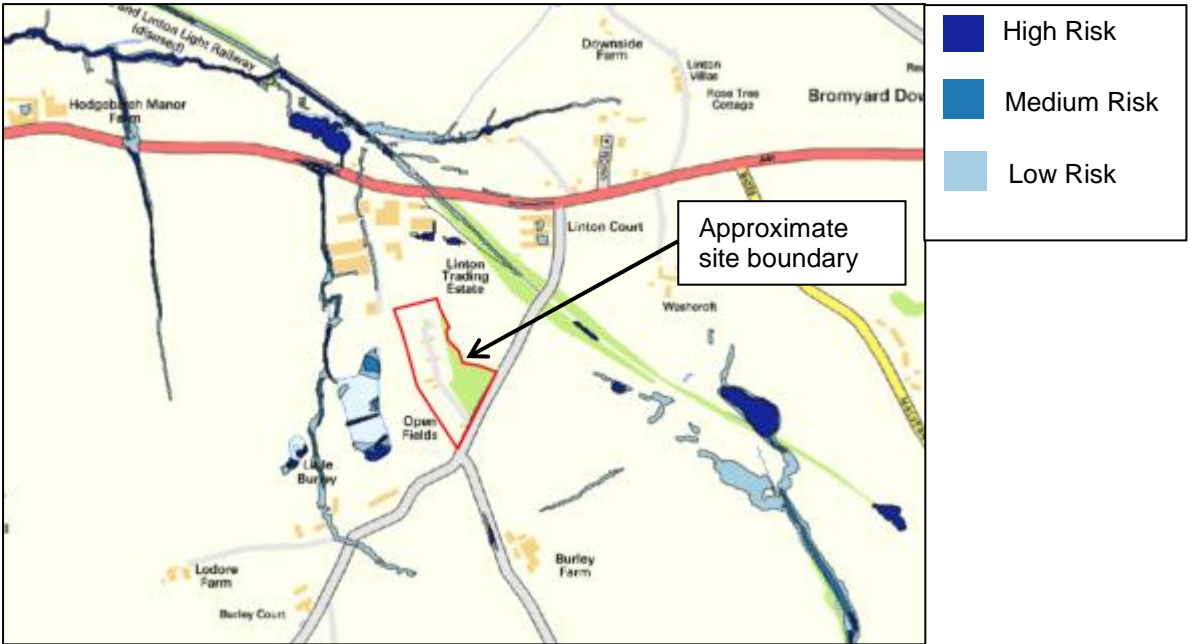


Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Openfields site in Bromyard is not located within or near to a designated groundwater Source Protection Zone (SPZ). The EA's Groundwater map also indicates that the underlying bedrock deposits are designated as a

'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain viewer indicates that bedrock geology comprises argillaceous rocks and sandstone of the Maughans Formation. There are no superficial deposits recorded. There are no known groundwater flood risks within the vicinity of the site.

The EA's Flood Risk from Reservoirs map indicates that the Openfields site in Bromyard is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Openfields site in Bromyard is indicated to be located in the low risk Flood Zone 1 and at very low risk of flooding from surface water. The site is located a considerable distance from areas that are deemed to be at flood risk and, as such, the site is not considered to be at risk when the potential effects of climate change are considered up to 2115.

Planning Recommendations

Spatial Planning and Development Control

Development of the Openfields site in Bromyard should be undertaken in accordance with the principles set out in the Strategic Flood Risk Assessment (SFRA) and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will provide an additional two permanent residential pitches, located within the existing site extent.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used as a traveller site where caravans are intended for permanent residential use are considered to be 'Highly Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1 and passes the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1% (1 in 100) annual probability fluvial and surface water event including an appropriate allowance for climate change.

In accordance with NPPF, the planning application or detailed proposals put forward as part of the allocation process should be accompanied by a site specific Flood Risk Assessment (FRA) as the total site area is greater than 1ha. However, as the area of the proposed development is minimal and will not have a significant effect on flood risk within the site boundary or elsewhere, it is recommended that a flood risk statement is prepared to support development of this site.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology may have insufficient permeability to support infiltration. Infiltration is likely to be suitable for smaller rainfall events or relatively small areas of impermeable surface, but an alternative method of surface water disposal may be required to drain large areas of impermeable surface or manage extreme rainfall events. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

The use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events. During larger rainfall events, discharge to a watercourse may be required. The rate and volume of discharge should be restricted to the pre-development greenfield values as far as practicable. Given the small size of the proposed development, it may be practicable to combine the proposed development with a site-wide drainage system that will enable better control of runoff prior to discharge. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Openfields site in Bromyard is located in the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. In accordance with NPPF, the site meets the requirements of the Sequential Test. As the area of proposed development is minimal, it is considered likely that a Flood Risk Assessment prepared in accordance with NPPF may not be appropriate and that, instead, a flood risk statement should be submitted to support the planning application or detailed proposals put forward as part of the site allocation process.

A surface water drainage strategy will be required to demonstrate how surface water runoff will be appropriately managed. It may be appropriate to combine this with the site-wide drainage strategy as infiltration of runoff may not be possible for larger rainfall events due to underlying soil permeability.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix B

PEMBRIDGE

Location: Pembridge
Reference: GTAA/16/HC/O/11
Proposed Use: Extension to existing site for four additional residential pitches
Grid Reference: SO 38940 59669

Introduction

The Pembridge site is approximately 0.5ha in size and is located to the north of the village of Pembridge. The site is an extension to an existing Council site which currently has six permanent residential pitches. The total area of the extended site will be approximately 0.75ha. The site that will form the extension is currently greenfield and has previously been used as agricultural land. The general topography of the site gently slopes from approximately 98.4mAOD in the west of the site to approximately 97.8mAOD in the east.

The site is bound to the west by an unnamed road that connects the site to the village of Pembridge. The surrounding area is largely rural comprising agricultural land and woodland. The nearest adjacent development is the Shobdon Industrial Estate located approximately 225m to the north-east of the site.

There are a number of small unnamed ordinary watercourses located approximately 120m to the east of the site and approximately 200m to the north of the site. These drain towards the south-east of the site and eventually discharge into the River Arrow. The River Arrow, designated as a main river, is located approximately 1km to the south of the site flowing in a general easterly direction.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the low risk Flood Zone 1, as shown in Figure 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding. It should be noted that the site is located in close proximity to the flood extents for the River Arrow located to the south of the site.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the small unnamed ordinary watercourses located to the north and east of the site. It is considered unlikely that the site will be at risk of fluvial flooding from these watercourses.

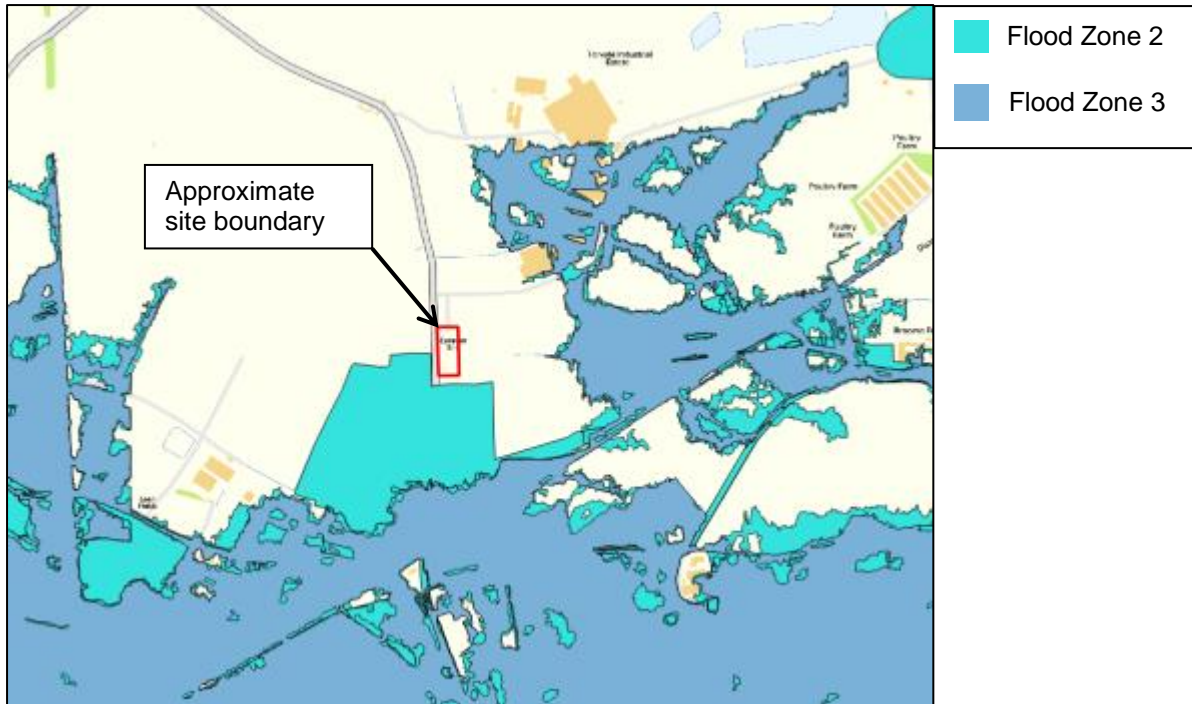


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Pembridge site is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than a 0.1% (1 in 1000) annual probability of flooding from surface water.

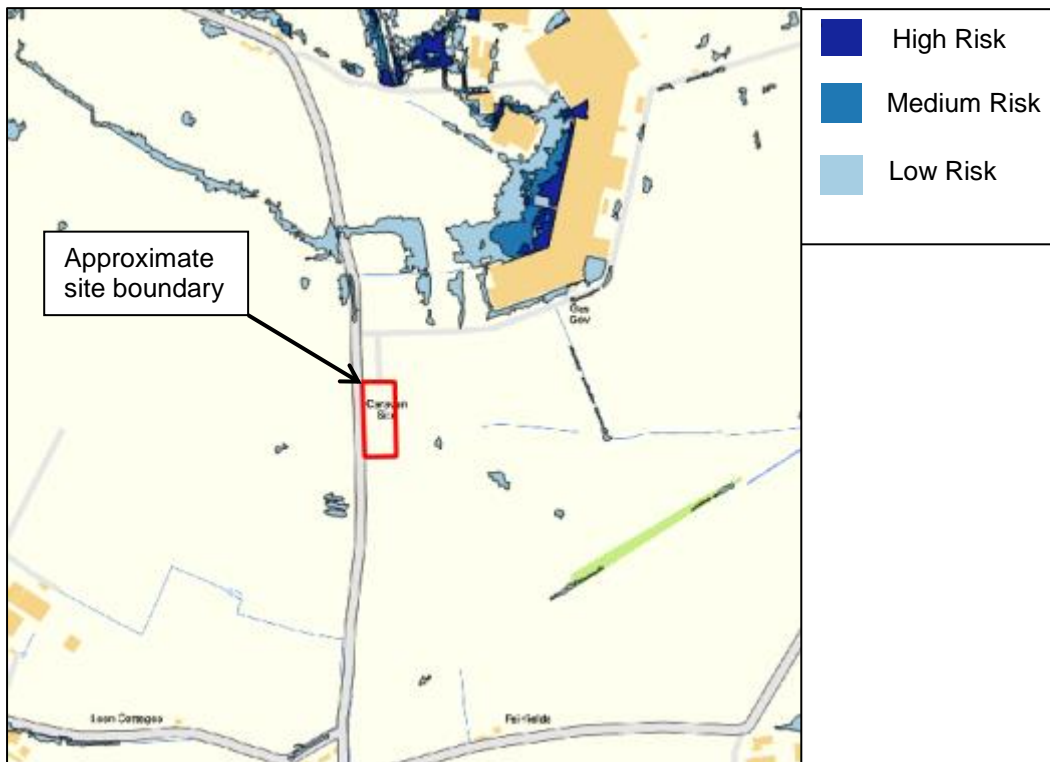


Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Pembridge site is not located within or near to a designated groundwater Source Protection Zone (SPZ). The EA's Groundwater map indicates that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain Viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation, with superficial Devensian glaciofluvial sheet deposits of sand and gravel. An adjacent borehole to north-east of the site suggests a standing groundwater level approximately 3m below ground level. There are no known records of groundwater flooding within Pembridge.

The EA's Flood Risk from Reservoirs map indicates that the Pembridge site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Pembridge site is indicated to be located in the low risk Flood Zone 1 but in close proximity to the medium risk Flood Zone 2. Latest EA guidance recommends that peak river flows are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. In the absence of robust model data for the River Arrow, guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 200mm to 500mm for the 1% (1 in 100) annual probability event.

The EA's combined hydraulic model of the River Arrow and River Lugg undertaken in 2013 indicates that the Pembridge site is located within the flood extent for the 1% (1 in 100) annual probability event and including a 20% increase in peak river flow to accommodate for climate change effects (noting that this modelling was completed prior to the EA's updated climate change recommendations). An extract from this model is provided in Figure 3.

Site topography slopes from approximately 98.2mAOD in the north to approximately 98.1mAOD in the south of the site. Applying the EA's updated nominal allowances for increased flood levels and considering the findings of the EA's combined hydraulic model of the River Arrow and River Lugg, it is considered highly likely that the whole of the Pembridge site will be at risk of flooding during the future 1% (1 in 100) annual probability event when an increase of 70% in peak river flow is considered. Flood depths during this event could be up to 500mm.

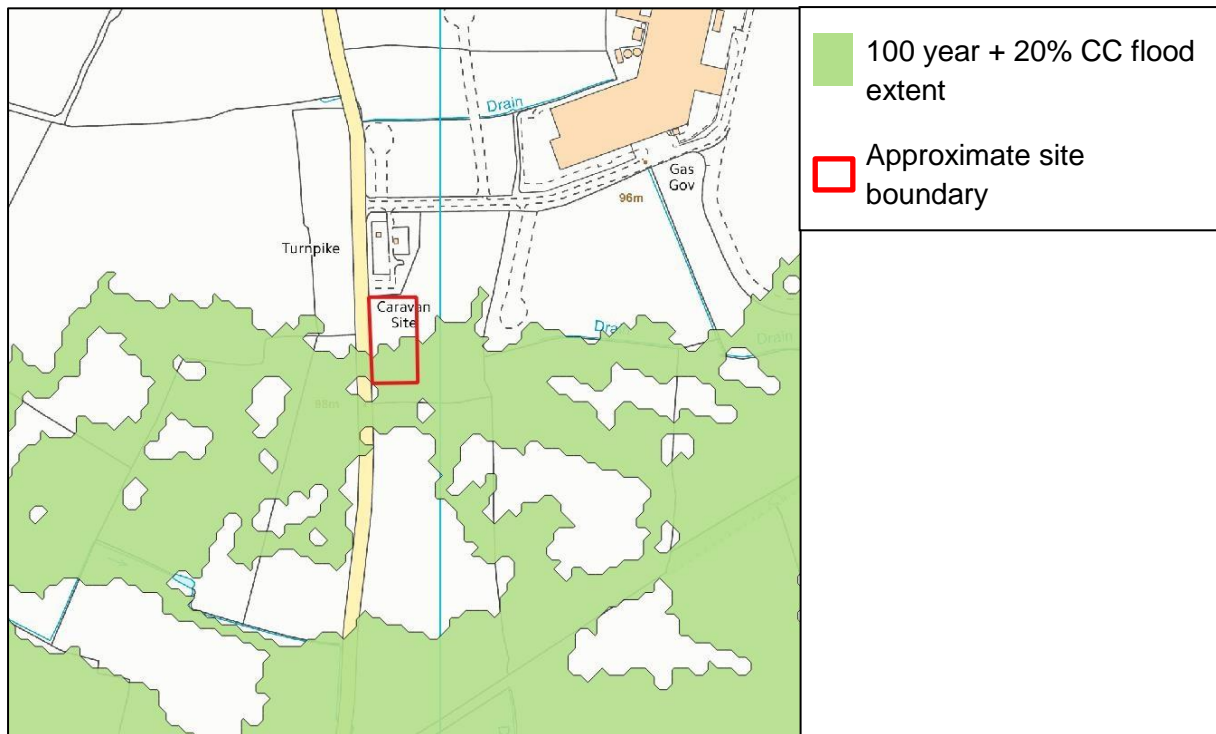


Figure 3 EA's River Arrow and River Lugg hydraulic model flood extent for the 1% annual probability event plus 20% climate change scenario¹

Planning Recommendations

Spatial Planning and Development Control

Development of the Pembridge site should be undertaken in accordance with the principles set out in the Herefordshire Strategic Flood Risk Assessment (SFRA) and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site is an extension of the current Pembridge traveller site providing an additional four residential pitches.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used as a traveller site where caravans are intended for permanent residential use are considered to be 'Highly Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1. However, consideration of climate change effects suggests that the site is likely to be at risk of flooding during the future 1% (1 in 100) annual probability event. It is therefore recommended that this is taken into account during the site allocation process and that the Sequential Test is applied to demonstrate that there are no other sites that are at lesser flood risk that would provide a reasonable alternative location.

In accordance with NPPF, the development of the site does not need to be accompanied by a site specific FRA as the site is less than 1ha, is located in Flood Zone 1, and is not

¹ Contains OS data © Crown copyright and database right (2017)

considered to be at significant risk from other sources of flooding. However, as the site is likely to be at risk of flooding during the future 1% (1 in 100) annual probability event it is recommended that a site-specific FRA is prepared to clarify the extent and depth of flood risk within the site boundary (considering the potential effects of climate change), and identify how flood risk to the proposed development has been minimised, how the development has been made safe, and how the impacts of the development on people and property elsewhere have been avoided. At minimum it is recommended that the underside of proposed caravans is raised a minimum of 300mm above the 1% (1 in 100) annual probability plus climate change flood level or 150mm above adjacent ground level, whichever is highest.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology may support infiltration but that an alternative method of surface water disposal may be required to drain significant areas of impermeable surface or manage extreme rainfall events. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

The use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events even in soils that are shown to have a lower-than-optimal permeability. During larger rainfall events, discharge to an adjacent watercourse may be required. The rate and volume of discharge should be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

Review of the EA's Flood Map for Planning indicates that the Pembridge site is located in the current extent of the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. However, review of climate change information indicates that the site is likely to be at risk during the future 1% (1 in 100) annual probability event when the potential effects of climate change are taken into consideration. It is therefore recommended that consideration is given to the application of the Sequential Test to demonstrate that there are no other sites that are at lesser flood risk that would provide a reasonable alternative location.

Although the site area is less than 1ha, it is also recommended that development of the site is informed by the preparation of a FRA that will clarify the extent and depth of flood risk within the site boundary and identify how flood risk to the proposed development has been minimised, how the development has been made safe, and how the impacts of the development on people and property elsewhere have been avoided.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to

demonstrate how surface water runoff will be appropriately managed. Infiltration may be possible and should be maximised where appropriate, but that an alternative method of surface water disposal may be required to drain significant areas of impermeable surface or manage extreme rainfall events.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix C

SUTTON ST NICHOLAS

Location: Sutton St Nicholas
Reference: GTAA/16/HC/O/7
Proposed Use: Residential pitches (maximum 10)
Grid Reference: SO 53876 44688

Introduction

The Sutton St Nicholas site is approximately 1.4ha in size and is located to the south-east of the village of Sutton St Nicholas. The site is currently greenfield and is currently used as agricultural land. The general topography of the site slopes from approximately 61.9mAOD in the north-west of the site to approximately 53mAOD in the south-west.

The site is bound to the north by Ridgeway Road that connects the site to the village of Sutton St Nicholas to the west. A public footpath forms the south-eastern and south-western site boundaries. The site is surrounded by rural agricultural land and woodland.

A small unnamed ordinary watercourse is located approximately 225m to the south-west of the site flowing in a general southerly direction and confluences with the Little Lugg approximately 1.2km to the south of the site. There is also a small unnamed ordinary watercourse located approximately 240m to the north-east of the site and drains towards the Little Lugg in a south-easterly direction. The River Lugg is located approximately 570m to the west of the site.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the low risk Flood Zone 1, as shown in Figure 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding. It should be noted that the site is located in close proximity to the flood extents of the River Lugg located to the west of the site.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the small unnamed ordinary watercourses located to the south-west and north-east of the site. It is considered highly unlikely that the site will be at risk of fluvial flooding from these watercourses.

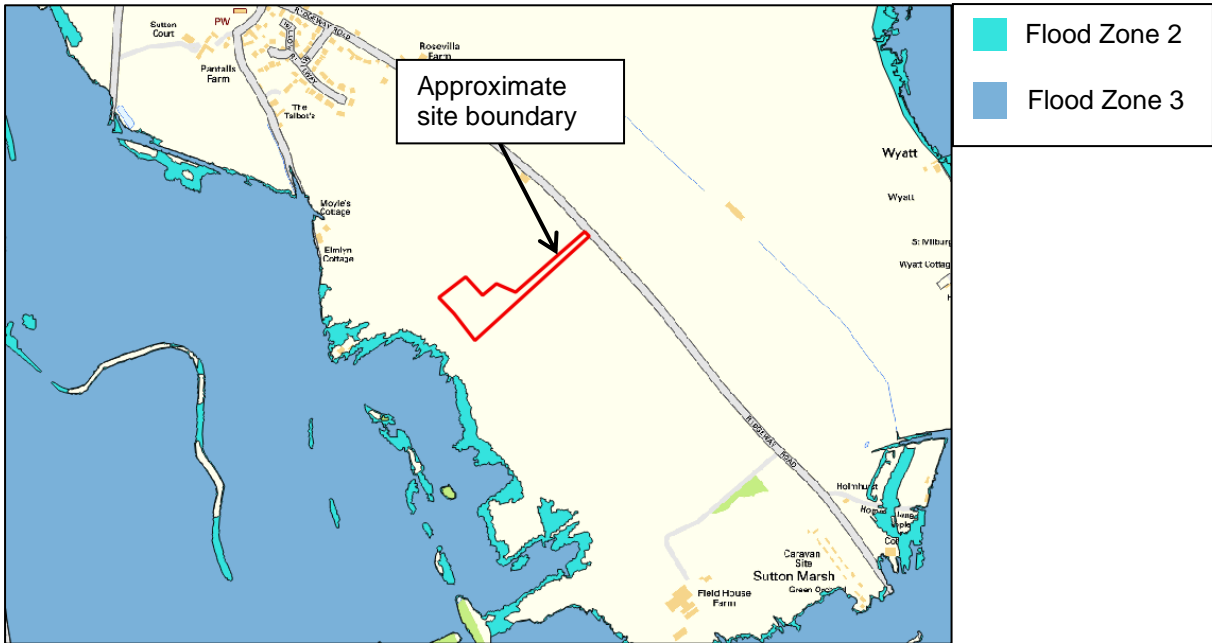


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Sutton St Nicholas site is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than a 0.1% (1 in 1000) annual probability of flooding from surface water.

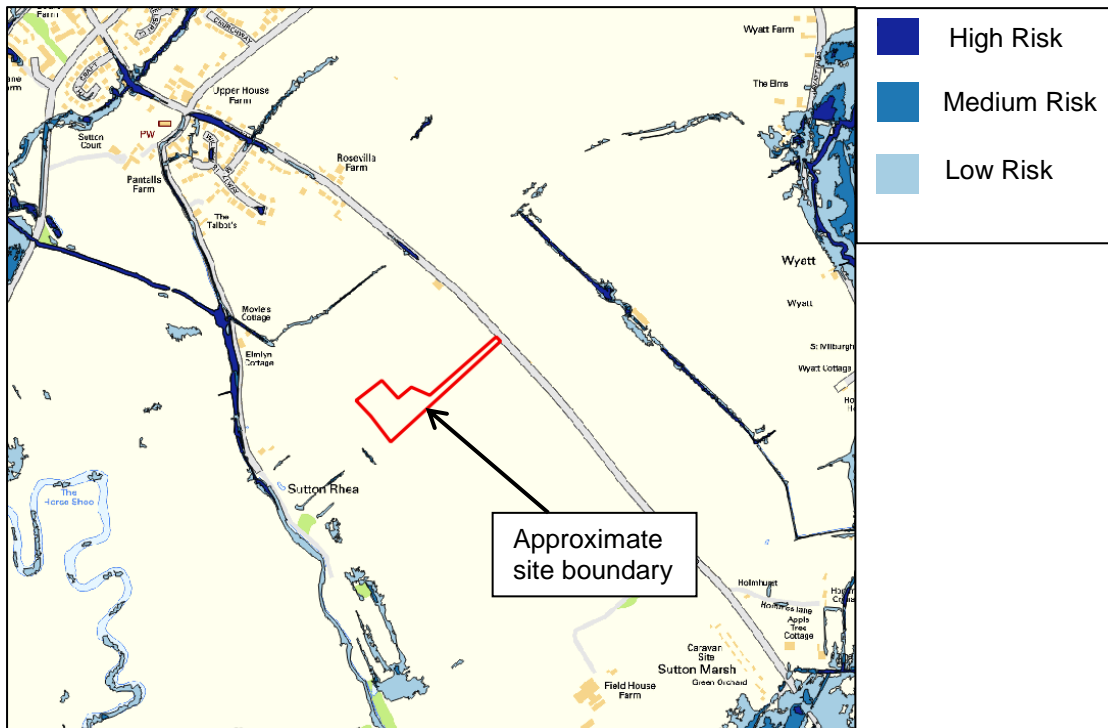


Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Sutton St Nicholas site is not located within or near to a designated groundwater Source Protection Zone (SPZ). The EA's Groundwater map indicates that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer.

Review of the British Geological Society (BGS) Geology of Britain Viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation, with superficial deposits of sand and gravel within river terrace deposits. There are no known records of groundwater flooding within Sutton St Nicholas.

The EA's Flood Risk from Reservoirs map indicates that the Sutton St Nicholas site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Sutton St Nicholas site is indicated to be located in the low risk Flood Zone 1 but in close proximity to the medium risk Flood Zone 2 and high risk Flood Zone 3. Latest EA guidance recommends that peak river flows are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. In the absence of detailed hydraulic model data for this section of the River Lugg, a qualitative approach has been applied to understand the potential effects of climate change on fluvial flood extents.

Guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 200mm to 500mm for the 1% (1 in 100) annual probability event. Similarly, the current extent of Flood Zone 2 can provide a good indication of the future extent of Flood Zone 3 up to 2115.

A review of 2m resolution LiDAR data for the site indicates a difference of approximately 1.2m between the estimated level of the present day 1% (1 in 100) annual probability extent (i.e. Flood Zone 3) and the lowest level of the site within the south-west of the site. A maximum predicted increase of c.500mm to account for future climate change effects over an approximate 100 year design life is therefore not likely to pose a risk to the Sutton St Nicholas site.

Planning Recommendations

Spatial Planning and Development Control

Development of the Sutton St Nicholas site should be undertaken in accordance with the principles set out in the Strategic Flood Risk Assessment (SFRA) and in accordance with

National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a permanent site with the creation of a maximum of ten new pitches.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used as a traveller site where caravans are intended for permanent residential use are considered to be 'Highly Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1 and passes the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1 in 100 annual probability event including an appropriate allowance for climate change.

In accordance with NPPF, the proposed development should be supported by a Flood Risk Assessment (FRA) as the site area is greater than 1ha. The assessment should clarify the flood risk at the site (taking the potential effects of climate change into account) as well as summarise the proposed surface water management strategy and demonstrate that flood risk to people elsewhere will not be increased.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology is likely to support infiltration but that an alternative method of surface water disposal may be required to drain significant areas of impermeable surface or manage extreme rainfall events. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

The use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events even in soils that are shown to have a lower-than-optimal permeability. The rate and volume of discharge should be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Sutton St Nicholas site is located in the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. In accordance with NPPF, the site meets the requirements of the Sequential Test. As the site is greater than 1ha in size, development of the site should be supported by a site-specific FRA.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. Infiltration should be promoted but an alternative strategy may be required to drain significant impermeable areas or manage larger rainfall events.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix D

WATERY LANE

Location: Watery Lane
Reference: GTAA/16/HC/O/2
Proposed Use: Extension to existing site for two residential pitches
Grid Reference: SO 52523 37562

Introduction

The Watery Lane site is approximately 0.09ha in size and is located to the south-east of Lower Bullingham. The site is an extension to an existing Council site which currently has 11 permanent residential pitches. The total area of the extended site will be approximately 0.4ha. The site that will form the extension is currently greenfield. The general topography of the site gently slopes from approximately 53.3mAOD in the south of the site to approximately 52.2mAOD in the north.

The site is bound to the south by Watery Lane that connects the site to Lower Bullingham and the centre of Hereford to the north, and to the B4399 to the south. The site is bound to the north by the Rotherwas Industrial Estate. The surrounding area is largely rural comprising agricultural land and woodland.

There is a small unnamed ordinary watercourse flowing through the site in a northerly direction that confluences with another small unnamed ordinary watercourse at the site boundary. This watercourse flows in a westerly direction and review of OS mapping indicates that sections of the watercourse are culverted approximately 45m and 212m to the north-west of the site. The watercourse confluences with the Red Brook, also classified as an ordinary watercourse, approximately 212m to the north-west of the site. The Red Brook discharges into the River Wye, designated as a main river, approximately 910m to the north-west of the site.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the low risk Flood Zone 1, as shown in Figure 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the small unnamed ordinary watercourses located within the site and along the site boundary. It is considered unlikely that the site will be at significant risk of fluvial flooding from these watercourses.

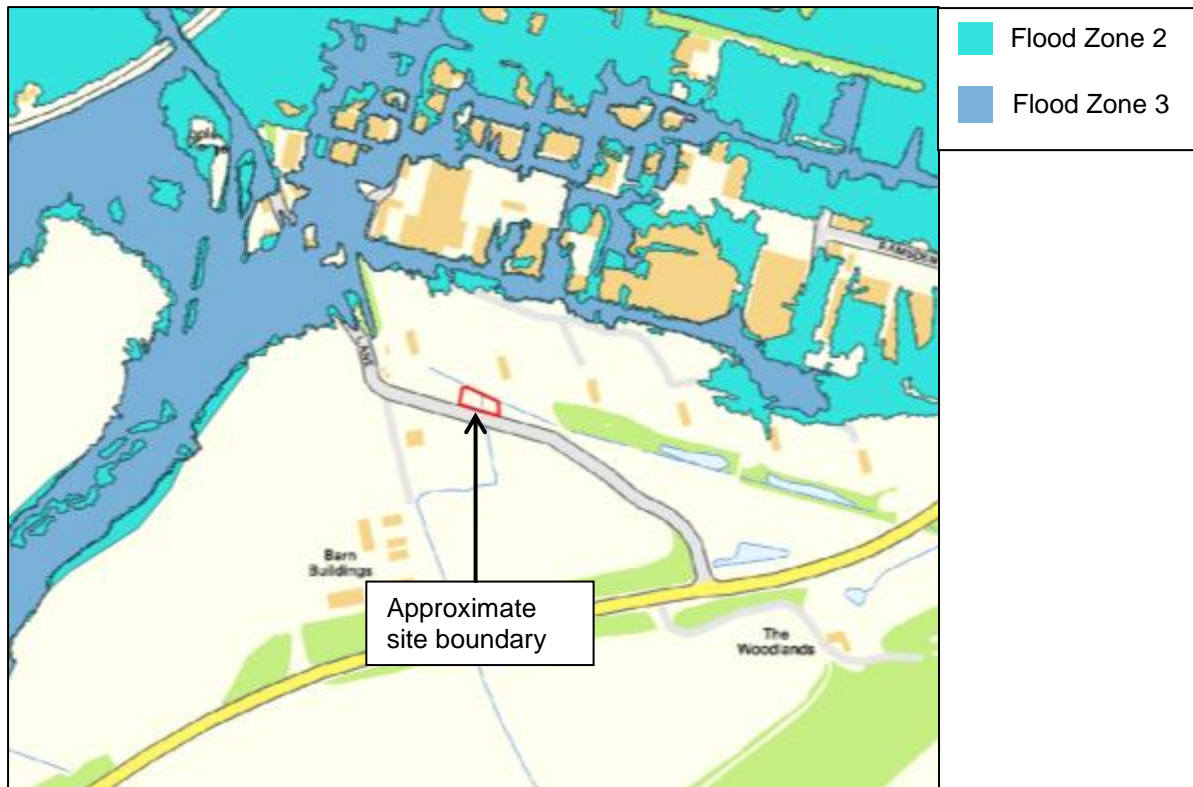


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Watery Lane site is at medium risk of surface water flooding, as shown in Figure 2. Medium risk is defined as having between 3.3% (1 in 30) and 1% (1 in 100) annual probability of flooding from surface water. Review of further data provided on the www.gov.uk website¹ indicates flood depths of up to 300mm. Topographic data suggests that there is a low point located within the Watery Lane site that may cause surface water to pond in the areas shown to be at risk.

¹ Long term flood risk information (<https://flood-warning-information.service.gov.uk/long-term-flood-risk>)

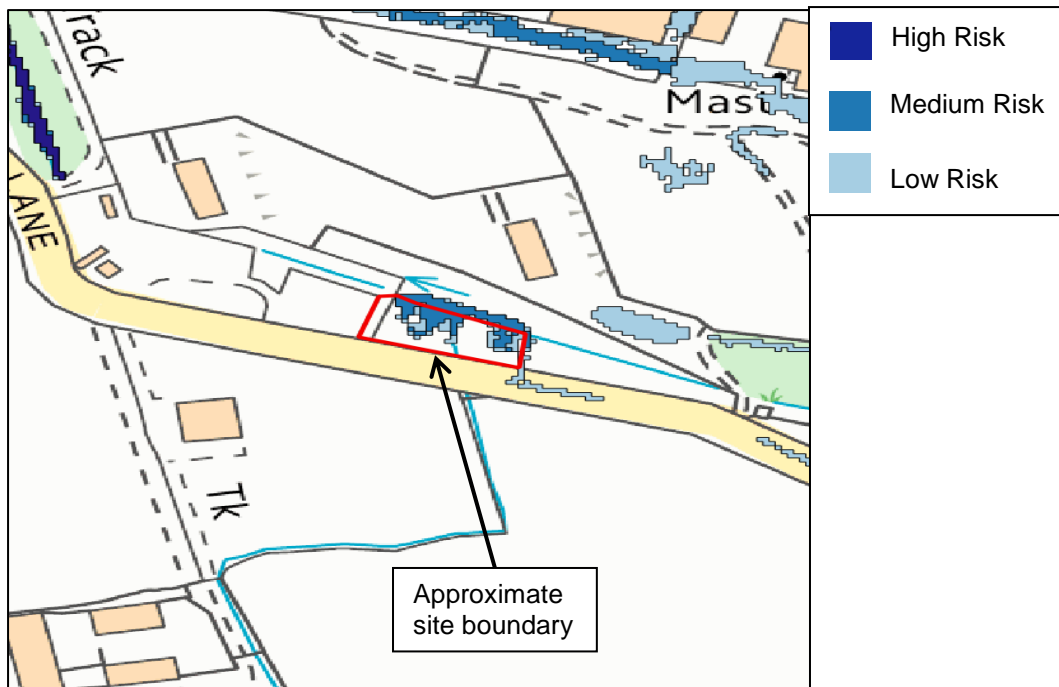


Figure 2 EA's Flood Risk from Surface Water map, January 2017²

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Watery Lane site is not located within or near to a designated groundwater Source Protection Zone (SPZ). The EA's Groundwater map indicates that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain Viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation, with superficial deposits of sand and gravel within river terrace deposits. An adjacent borehole to the south-east of the site suggests a standing groundwater level of approximately 4.1m below ground level. There are no known records of groundwater flooding within Lower Bullingham.

The EA's Flood Risk from Reservoirs map indicates that the Watery Lane site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Watery Lane site is indicated to be located in the low risk Flood Zone 1. The site is located a considerable distance from the mapped Flood Zone 2 and Flood Zone 3 and, as such, the site is not considered to be at risk of fluvial flooding when the potential effects of climate change are considered up to 2115.

² Contains OS data © Crown copyright and database right (2017)

Climate change could increase the identified surface water flood risk associated with increased rainfall intensity and, potentially, increased flow within the ordinary watercourses close to the site. Latest EA guidance recommends that rainfall intensity is increased by 20% to 40% to allow for potential climate change effects over a 100 year site design life.

It is recommended that consideration is given to the potential for more frequent flooding from surface water or greater depth of flooding. In the absence of robust model data it is recommended that current estimates of maximum flood depth are increased by approximately 300mm to account for the potential effects of climate change and that appropriate mitigation measures are incorporated into the development to manage these risks. As previously discussed, the site is indicated to have surface water flood depths of up to 300mm; this would increase to 600mm to account for climate change if a nominal allowance of 300mm is included.

Planning Recommendations

Spatial Planning and Development Control

Development of the Watery Lane site should be undertaken in accordance with the principles set out in the Strategic Flood Risk Assessment (SFRA) and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site is an extension of the current Watery Lane traveller site providing an additional two permanent residential pitches.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used as a traveller site where caravans are intended for permanent residential use are considered to be 'Highly Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1 and passes the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1% (1 in 100) annual probability event including an appropriate allowance for climate change.

In accordance with NPPF, it is recommended that the development of the site is accompanied by a site specific FRA; the site is less than 1ha and is located in Flood Zone 1, but is considered to be at significant risk from other sources of flooding (namely surface water). The FRA should provide an assessment of flood risk to the site and elsewhere as a result of site development whilst taking the potential effects of climate change in account. The FRA should also demonstrate that a sequential approach has been applied to the development layout and summarise the measures that will be implemented to manage the identified risks.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying superficial geology is likely to support infiltration during smaller rainfall events, but that an alternative method of surface water disposal may be required to drain significant areas of

impermeable surface or manage extreme rainfall events. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

The use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events even in soils that are shown to have a lower-than-optimal permeability. During larger rainfall events, discharge to the adjacent watercourses is likely to be the preferred solution. The rate and volume of discharge should be restricted to the pre-development Greenfield values as far as practicable. Where practicable it is recommended that surface water runoff is managed as part of a site wide system to assist in the use of flow control devices that are only likely to restrict flow to a minimum of 2l/s. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Watery Lane site is located in the low risk Flood Zone 1. In accordance with NPPF, the site meets the requirements of the Sequential Test.

The site is at medium risk of flooding from surface water. It is therefore recommended that development of the site is supported by a site-specific FRA and that a sequential approach is applied to the development layout.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. Infiltration should be promoted as far as practicable for smaller rainfall events, although discharge to a watercourse may be required for larger rainfall events.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix E

LAND ADJACENT TO A49 ROUNDABOUT

Location	Land adjacent to the A49 roundabout Site A
Reference	GTAA/16/HC/O/4
Proposed Use	Temporary stopping place
Grid Reference	SO 50418 58328

Introduction

The Land Adjacent to the A49 Roundabout site is approximately 0.8ha in size and is located in the east of Leominster. An access track connects the north of the site to the A49. The site is currently greenfield with a small area woodland to the west. The general topography of the site gently slopes from approximately 68.9mAOD in the west to approximately 67.7mAOD in the east.

The site is bound to the east by the A49, including the roundabout providing access to the A44, and to the south by Southern Avenue. The north of the site is bound by an unnamed road that provides access into the centre of Leominster. The west of the site is bound by the Leominster railway, a part of the Welsh Marches Line, with a small watercourse and footpath separating the railway from the site. The surrounding area is relatively rural to the north, east and south, and to the west the surrounding area is relatively urban.

As discussed above, there is a small unnamed ordinary watercourse located along the western site boundary flowing in a southerly direction, eventually discharging into the River Arrow approximately 1.4km to the south of the site. The River Lugg, designated as a main river, is located approximately 283m to the east of the site and flows in a generally southerly direction to confluence with the River Arrow approximately 1.7km to the south-east of the site.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning, as shown in Figure 1, indicates that the majority of the site is located within the high risk Flood Zone 3. Flood Zone 3 comprises land where the annual probability of flooding from fluvial sources is greater than 1% (1 in 100). The source of this flood risk is the River Lugg to the east of the site.

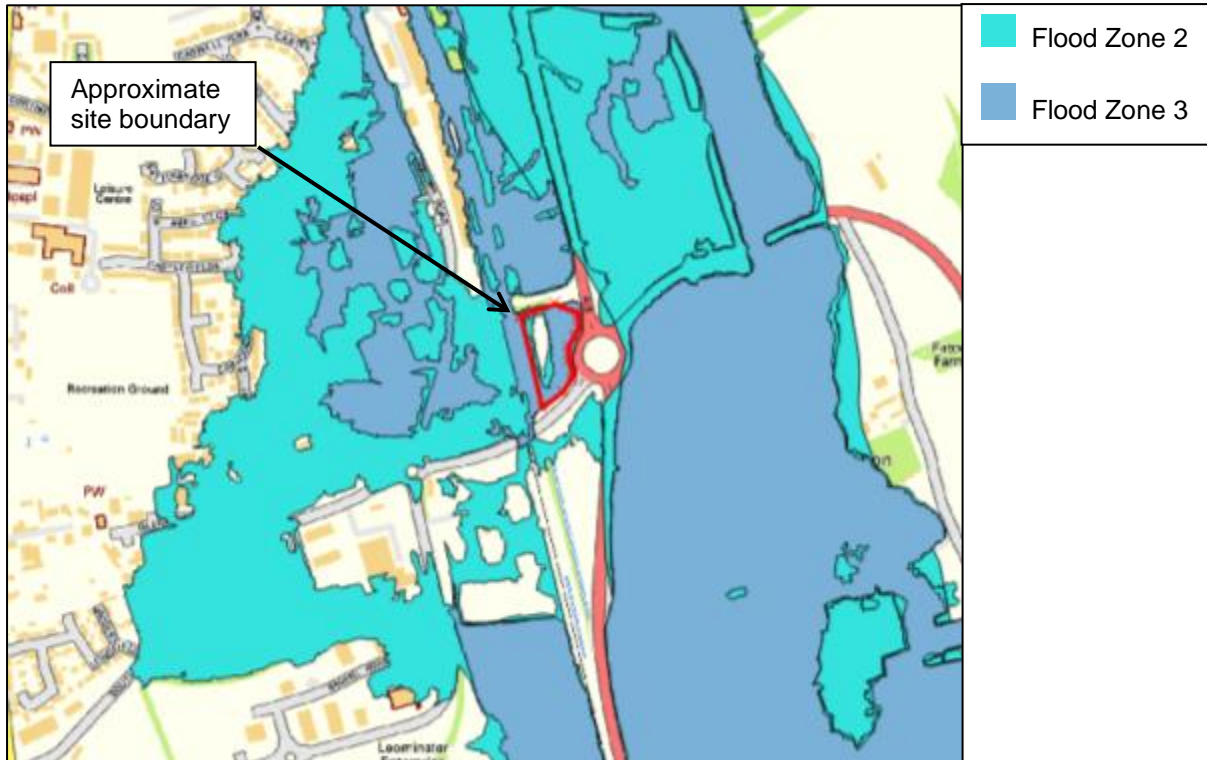


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Review of the combined River Arrow and River Lugg 1D/2D hydraulic model undertaken in 2013 indicates an approximate flood level of 68.8mAOD during the modelled 'present day' 1% (1 in 100) annual probability event at the model node located closest to the site boundary. As topography within the traveller site ranges from approximately 67.7mAOD to 68.9mAOD, this suggests that the site could be inundated by up to 1.1m during this event. However, review of 2m resolution LiDAR data indicates the height of the River Lugg river banks to be approximately 69mAOD within the vicinity of the site. This is supported by the 0.1% (1 in 1000) and 1% (1 in 100) annual probability event undefended flood extent generated by the combined River Arrow and River Lugg 1D/2D hydraulic model, as shown in Figure 2, and suggests that the EA's Flood Map for Planning does not accurately represent current flood extents.

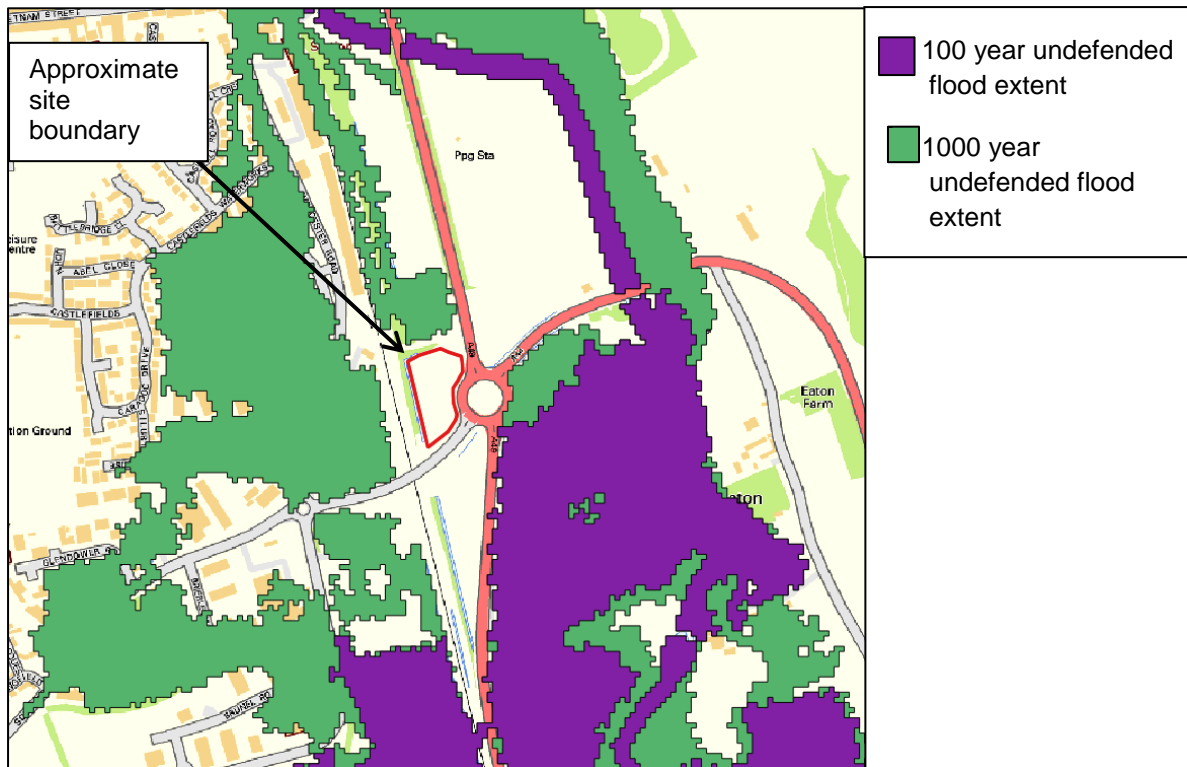


Figure 2 EA’s combined River Arrow and River Lugg hydraulic model undefended flood extents for the 1% and 0.1% annual probability events

Review of LiDAR data also indicates that the height of the A49 to the east of the site is at a minimum level of approximately 70mAOD within the vicinity of the site. This suggests that the A49 may provide a secondary defence should overtopping of the river banks occur.

Surface Water Flood Risk

The EA’s Flood Risk from Surface Water map indicates that the vast majority of the Land Adjacent to the A49 Roundabout site is at very low risk of surface water flooding, as shown in Figure 3. Very low risk typically defines areas that have a less than 0.1% (1 in 1000) annual probability of flooding from surface water sources.

A very small section of the site is indicated to be at low risk of surface water flooding, as shown in Figure 3. Low risk typically defines areas that have between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of flooding from surface water sources. This is likely to be formed by a local depression in topography and restriction to the flow of water off-site by the A49 roundabout.

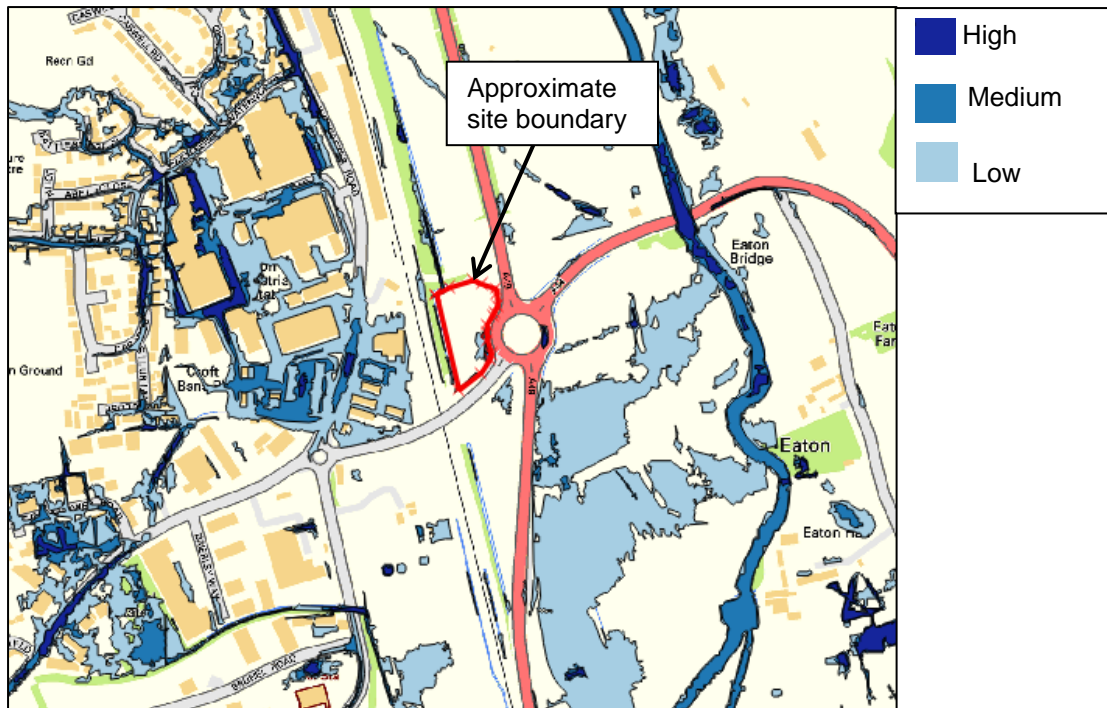


Figure 3 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater maps indicate that the Land Adjacent to the A49 Roundabout site is located within Zone 2 of a designated Source Protection Zone (SPZ) located to the east of Leominster. Zone 2 is described as the 'outer zone' and is defined as having a maximum 400 day travel time from any point below within the zone to the point of abstraction. The EA's Groundwater maps also indicate that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer.

Review of the British Geological Society (BGS) Geology of Britain viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation, with superficial deposits of Alluvium. An adjacent borehole to the north of the site indicates a groundwater level approximately 2m below the surface. There are no known records of groundwater flooding within Leominster.

The EA's Flood Risk from Reservoirs map indicates that the Land Adjacent to A49 Roundabout site is not at risk of flooding from potential reservoir failure.

Flood Defences

The centre of Leominster, to the north-west of the site, is protected by a flood alleviation scheme. Details of the scheme and the level of protection provided by the scheme were not available at the time of completing this assessment. However, review of available information suggests that the scheme comprises a series of measures located upstream of the Land Adjacent to the A49 Roundabout site. It is also understood there are future plans to understand and improve the level of protection provided by the flood alleviation scheme.

Review of available information suggests that the Land Adjacent to the A49 Roundabout site would not be at risk of inundation as a result of a flood defence breach or failure.

Impacts of Climate Change

Latest EA guidance recommends that peak river flows are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. In the absence of robust model data for the River Lugg, guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 200mm to 500mm for the 1% (1 in 100) annual probability event.

The EA's combined hydraulic model of the River Arrow and River Lugg undertaken in 2013 indicates that the Land Adjacent to the A49 Roundabout site is not located within the flood extent for the 1% (1 in 100) annual probability event and including a 20% increase in peak river flow to accommodate for climate change effects (noting that this modelling was completed prior to the EA's updated climate change recommendations). An extract from this model is provided in Figure 4.

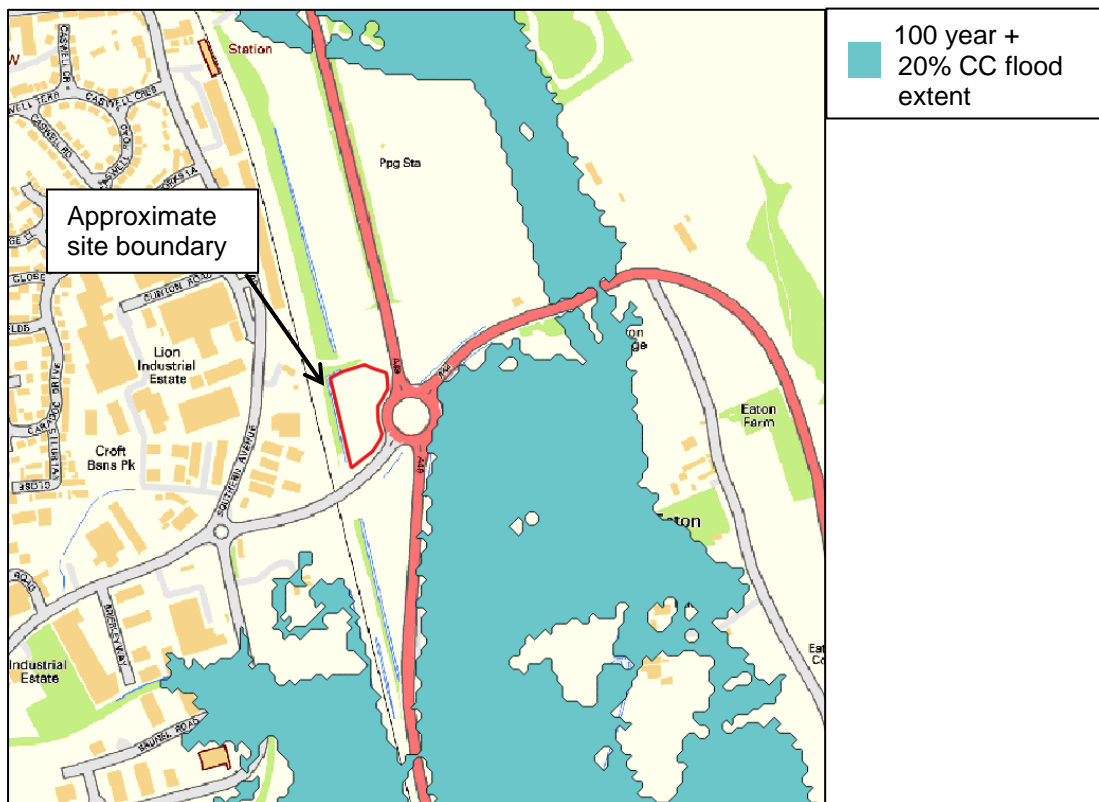


Figure 4 EA's River Arrow and River Lugg hydraulic model flood extent for the 1% annual probability event plus 20% climate change scenario

Review of the hydraulic model indicates a flood level of approximately 69mAOD for the 1% (1 in 100) annual probability event plus 20% climate change allowance at the model node located closest to the site. As site topography ranges from approximately 67.7mAOD to 68.9mAOD, this suggests that the site could be inundated by up to 1.3m during this event.

As previously discussed, LiDAR data indicates the height of the River Lugg river banks to be approximately 69mAOD within the vicinity of the site, indicating that peak flows within the River Lugg to the east of the site may be contained within the river channel when the potential effects of climate change are taken into account. This supports the mapping shown

in Figure 4. However, also as previously discussed, LiDAR data indicates the height of the A49 to be approximately 70mAOD and that the A49 will also act as a barrier to flood flow entering the site during this event.

Extrapolating this further to estimate a likely flood level for the 1% (1 in 100) annual probability event and including a 70% increase in peak river flow (i.e. by considering the EA's recommendation to increase flood levels by 500mm) suggests a future flood level of approximately 68.9mAOD over a 100 year site design life. This level exceeds the level of the River Lugg river banks and suggests that the site could be inundated by up to 1.2m. However this does not take into consideration the protection provided by the A49 and this would need to be assessed further.

Planning Recommendations

Spatial Planning and Development Control

Development of the Land Adjacent to the A49 Roundabout site should be undertaken in accordance with the principles set out in the Strategic Flood Risk Assessment (SFRA) and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a temporary stopping place which provides intermittent needs for site accommodation. It is understood that the site will not be occupied all year round but may be made available at times of increased demand.

The Environment Agency's Flood Map for Planning (Figure 1) must be used in the initial assessment of flood risk and to determine the need for further assessment. As Figure 1 identifies that the site is located within an area deemed to be at fluvial flood risk, the Council must apply the Sequential Test to steer new development to areas that are at a lower risk of flooding. This is supported by the potential risk of flooding to the site when the effects of climate change are taken into account. Only where there are no reasonably available sites at a lower risk of flooding should the suitability of sites at a higher risk be considered. The Council must therefore demonstrate that there are no other sites that are at a lower risk that would provide a reasonable alternative location.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for temporary caravan accommodation are considered to be 'More Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development requires the Exception Test to be passed prior to a development of this nature in Flood Zone 3. As the Flood Map for Planning identifies the site to be in Flood Zone 3 and as climate change impacts could also increase flood risk at this site the Exception Test is still a requirement.

For the Exception Test to be passed, a site-specific Flood Risk Assessment (FRA) must be prepared that demonstrates:

- It is not possible for the development to be located on land with a lower probability of flooding;

- The development provides wider sustainability benefits to the community that outweigh flood risk, and;
- The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The FRA will also need to clarify the extent and depth of flood risk within the site boundary (considering the potential effects of climate change), and identify how flood risk to the proposed development has been minimised, how the development has been made safe, and how the impacts of the development on people and property elsewhere have been avoided. Consideration must be given to the ability to provide safe access and egress as review of the EA's Flood Map for Planning indicates that the site may be located in a 'dry island'. The term 'dry island' refers to the inability to provide safe access and egress to key services without the need to need to pass through areas that are identified to be at significant flood risk.

A flood response plan will also be required to demonstrate the measures and procedures in place should an extreme flood event occur.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology is likely to support infiltration but that high groundwater levels may limit the suitability of this method. An alternative method of surface water disposal may therefore be required to drain impermeable surfaces. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development. If off-site discharge is required, the rate and volume of discharge should be restricted to the greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The EA's Flood Map for Planning indicates that the Land Adjacent to the A49 Roundabout site is located in the high risk Flood Zone 3. In accordance with NPPF, the Council are required to apply the Sequential Test. If the Sequential is passed, a site-specific FRA is required which demonstrates that the Exception Test has been passed.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. High groundwater levels may limit the suitability of infiltration techniques and discharge to a watercourse may therefore be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix F

LAND AT WATERWORKS LANE

Location	Land at Waterworks Lane, Leominster
Reference	GTAA/16/HC/O/3
Proposed Use	Temporary stopping place
Grid Reference	SO 50169 58708

Introduction

The Land at Waterworks Lane site is approximately 0.1ha in size and is located at the junction of Waterworks Lane and Worcester Road in the west of Leominster. The site is currently brownfield with the previous buildings having been demolished. The site was previously used for commercial use as a part of the Bramley Business Park. The general topography of the site is flat with levels sloping from approximately 68.5mAOD in the west to approximately 68.4mAOD in the east.

The site is bound to the south by Waterworks Lane and to the east by Worcester Road. Immediately to the north and west of the site is a residential area. The Leominster railway, a part of the Welsh Marches Line, is located approximately 88m to the east of the site. The surrounding land is relatively urban, with the Lion Industrial Estate located approximately 40m to the south of the site.

There is a small unnamed ordinary watercourse located approximately 135m to the east of the site flowing in a southerly direction alongside the A49, eventually discharging into the River Arrow approximately 1.9km to the south-east of the site. The River Lugg, designated as a main river, is located approximately 207m to the north-east of the site and flows in a generally southerly direction to confluence with the River Arrow approximately 2.2km to the south-east of the site.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning, as shown in Figure 1, indicates that the majority of the site is located within the high risk Flood Zone 3 and medium risk Flood Zone 2. Flood Zone 3 comprises land where the annual probability of flooding from fluvial sources is greater than 1% (1 in 100). Flood Zone 2 comprises land where the annual probability of flooding from fluvial sources is between 1% and 0.1% (1 in 100 and 1 in 1000). The source of this flood risk is the River Lugg to the east of the site.



Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Review of the combined River Arrow and River Lugg 1D/2D hydraulic model undertaken in 2013 indicates an approximate flood level of 69.3mAOD during the modelled 'present day' 1% (1 in 100) annual probability event at the model node located closest to the site boundary. As topography within the traveller site ranges from approximately 68.4mAOD to 68.5mAOD, this suggests that the site could be inundated by up to 0.9m during this event. However, review of 2m resolution LiDAR data indicates the height of the River Lugg river banks to be approximately 70.2mAOD within the vicinity of the site. This suggests that peak flows within the River Lugg would be contained within the river channel. This is supported by the 0.1% (1 in 1000) and 1% (1 in 100) annual probability event flood extents generated by the combined River Arrow and River Lugg 1D/2D hydraulic model, as shown in Figure 2, and suggests that the EA's Flood Map for Planning does not accurately represent current flood extents.

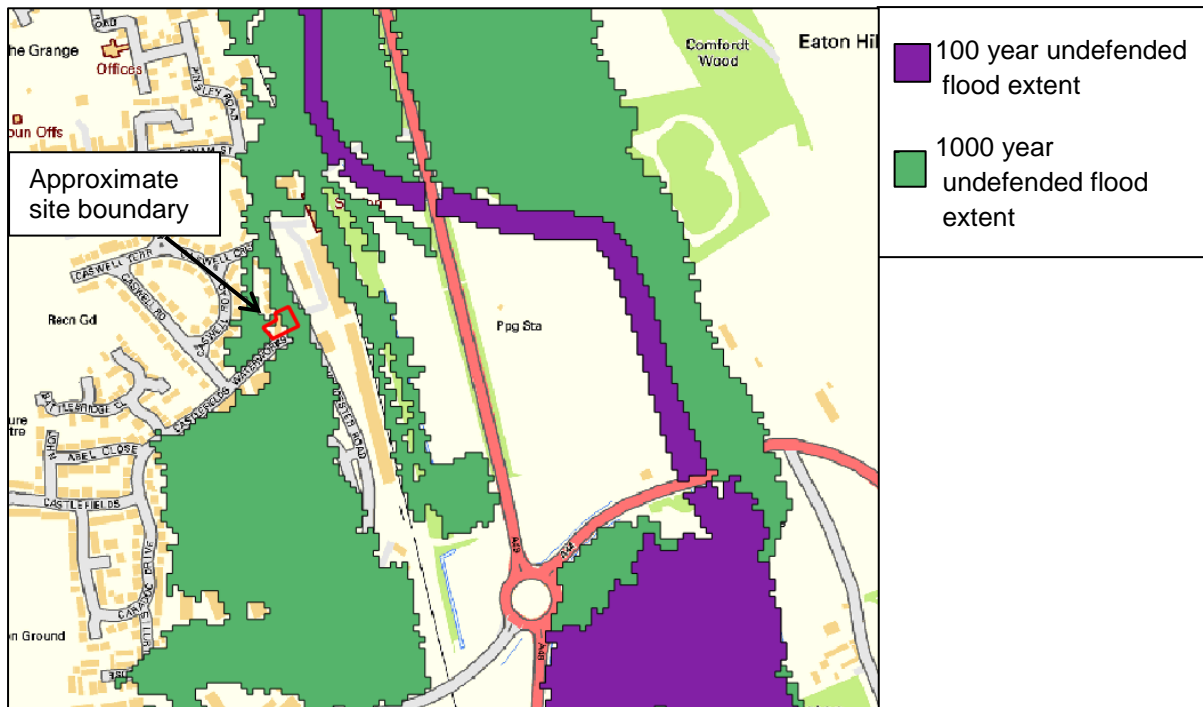


Figure 2 EA's combined River Arrow and River Lugg hydraulic model undefended flood extents for the 1% and 0.1% annual probability events

Review of LiDAR data also indicates that the height of the A49 to the east of the site is at a minimum level of approximately 70mAOD within the vicinity of the site. This suggests that the A49 may provide a secondary defence should overtopping of the river banks occur.

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the very north of the Land at Waterworks Lane site and Worcester Road immediately to the east are at high risk of surface water flooding, as shown in Figure 3. High risk typically defines areas that have a greater than 3.3% (1 in 30) annual probability of flooding from surface water sources. Review of further data provided on the www.gov.uk website¹ indicates flood depths of below 300mm within the site boundary. Topographic data suggests that Worcester Road is a low point in comparison to the surrounding area, allowing surface water to pond.

The rest of the site is at very low risk of surface water flooding, as shown in Figure 3. Very low risk typically defines areas that have less than a 0.1% (1 in 1000) annual probability of flooding from surface water sources.

¹ Long term flood risk information (<https://flood-warning-information.service.gov.uk/long-term-flood-risk>)

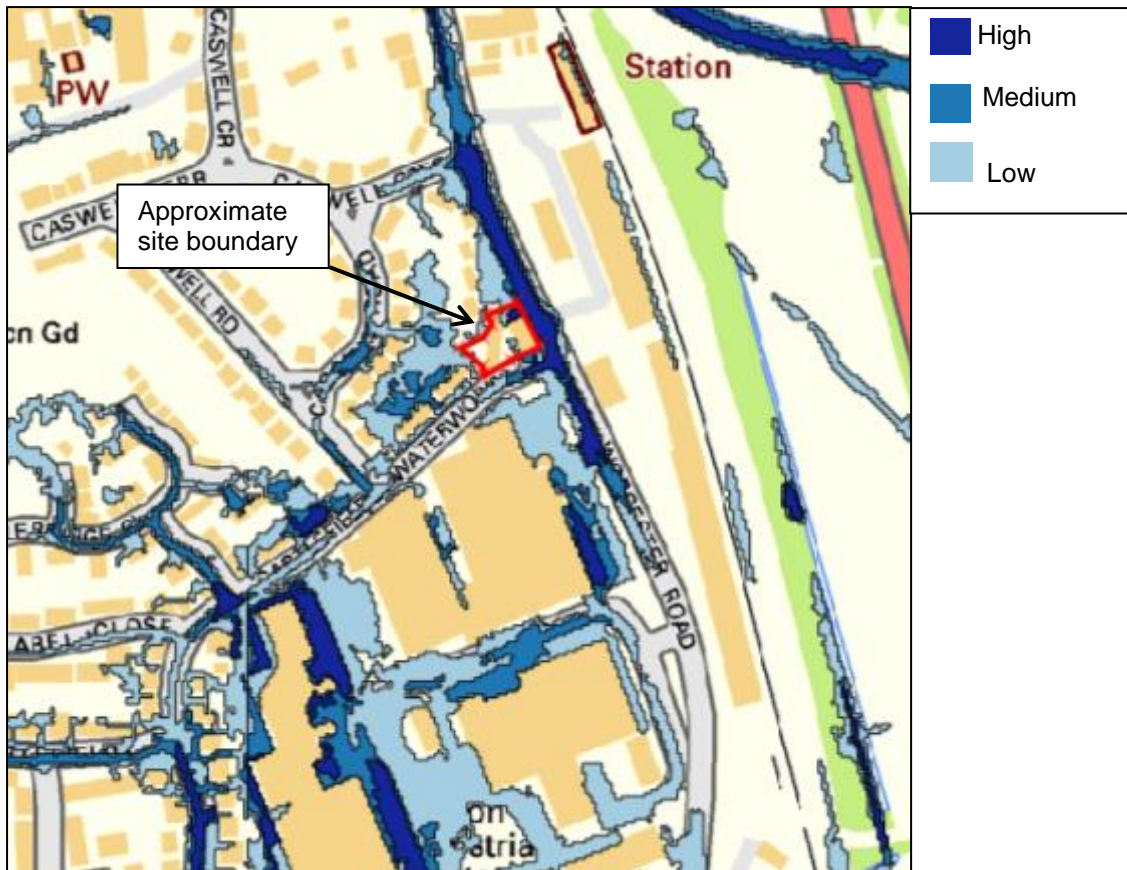


Figure 3 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater maps indicate that the Land at Waterworks Lane site is located just outside of a designated Source Protection Zone (SPZ). The EA's Groundwater maps also indicate that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer.

Review of the British Geological Society (BGS) Geology of Britain viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation, with superficial deposits of Alluvium. There are no known records of groundwater flooding within Leominster.

The EA's Flood Risk from Reservoirs map indicates that the Land at Waterworks Lane site is not at risk of flooding from potential reservoir failure.

Flood Defences

The centre of Leominster, to the north-west of the site, is protected by a flood alleviation scheme. Details of the scheme and the level of protection provided by the scheme were not available at the time of completing this assessment. However, review of available information suggests that the scheme comprises a series of measures located upstream of the Land at Waterworks Lane site. It is also understood there are future plans to understand and improve the level of protection provided by the flood alleviation scheme.

Review of available information suggests that the Land at Waterworks Lane site would not be at risk of inundation as a result of a flood defence breach or failure.

Impacts of Climate Change

Latest EA guidance recommends that peak river flows are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. In the absence of robust model data for the River Lugg, guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 200mm to 500mm for the 1% (1 in 100) annual probability event.

The EA's combined hydraulic model of the River Arrow and River Lugg undertaken in 2013 indicates that the Land at Waterworks Lane site is not located within the flood extent for the 1% (1 in 100) annual probability event and including a 20% increase in peak river flow to accommodate for climate change effects (noting that this modelling was completed prior to the EA's updated climate change recommendations). An extract from this model is provided in Figure 4.

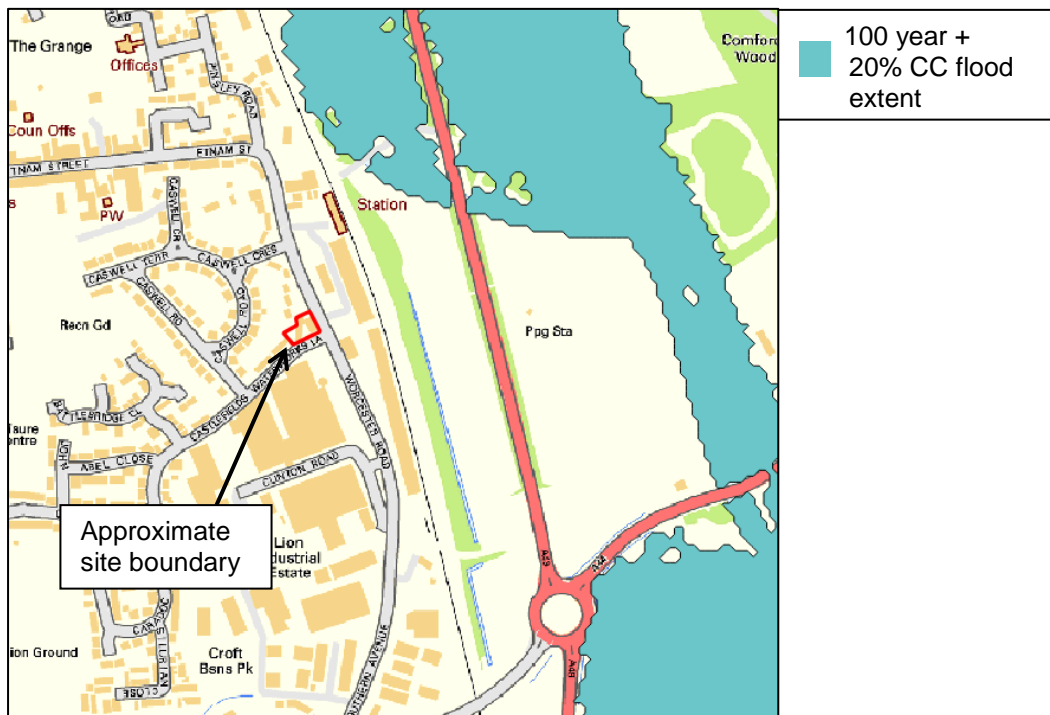


Figure 4 EA's River Arrow and River Lugg hydraulic model flood extent for the 1% annual probability event plus 20% climate change scenario

Review of the hydraulic model indicates a flood level of approximately 69.6m AOD for the 1% (1 in 100) annual probability event plus 20% climate change allowance at the model node located closest to the site. As site topography ranges from approximately 68.4m AOD to 68.5m AOD, this suggests that the site could be inundated by up to 1.2m during this event. However, as previously discussed, LiDAR data indicates the height of the River Lugg river banks to be approximately 70.2m AOD, indicating that peak flows within the River Lugg to the east of the site are likely to be contained within the river channel when the potential effects of climate change are taken into account. This supports the mapping shown in Figure 4.

Extrapolating this further to estimate a likely flood level for the 1% (1 in 100) annual probability event and including a 70% increase in peak river flow (i.e. by considering the EA's recommendation to increase flood levels by 500mm) suggests a future flood level of approximately 69.5mAOD over a 100 year site design life. This level exceeds the level of the River Lugg river banks and suggests that the site could be inundated by up to 1.1m.

Planning Recommendations

Spatial Planning and Development Control

Development of the Land at Waterworks Lane site should be undertaken in accordance with the principles set out in the SFRA and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a temporary stopping place which provides intermittent needs for site accommodation. It is understood that the site will not be occupied all year round but may be made available at times of increased demand.

The Environment Agency's Flood Map for Planning (Figure 1) must be used in the initial assessment of flood risk and to determine the need for further assessment. As Figure 1 identifies that the site is located within an area deemed to be at fluvial flood risk, the Council must apply the Sequential Test to steer new development to areas that are at a lower risk of flooding. This is supported by the potential risk of flooding to the site when the effects of climate change are taken into account. Only where there are no reasonably available sites at a lower risk of flooding should the suitability of sites at a higher risk be considered. The Council must therefore demonstrate that there are no other sites that are at a lower risk that would provide a reasonable alternative location.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for temporary caravan accommodation are considered to be 'More Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development requires the Exception Test to be passed prior to a development of this nature in Flood Zone 3. As the Flood Map for Planning identifies the site to be in Flood Zone 3 and as climate change impacts could also increase flood risk at this site the Exception Test is still a requirement.

For the Exception Test to be passed, a site-specific Flood Risk Assessment (FRA) must be prepared that demonstrates:

- It is not possible for the development to be located on land with a lower probability of flooding;
- The development provides wider sustainability benefits to the community that outweigh flood risk, and;
- The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The FRA will also need to clarify the extent and depth of flood risk within the site boundary (considering the potential effects of climate change), and identify how flood risk to the proposed development has been minimised, how the development has been made safe, and how the impacts of the development on people and property elsewhere have been avoided.

A flood response plan will also be required to demonstrate the measures and procedures in place should an extreme flood event occur.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology is likely to support infiltration but that high groundwater levels may limit the suitability of this method. An alternative method of surface water disposal may therefore be required to drain impermeable surfaces. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development. If off-site discharge is required, the rate and volume of discharge should strive to provide betterment of at least 20% when compared to pre-development runoff values, and be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The EA's Flood Map for Planning indicates that the Land at Waterworks Lane site is located in the high risk Flood Zone 3, and is partially at high risk of flooding from surface water. In accordance with NPPF, the Council are required to apply the Sequential Test. If the Sequential is passed, a site-specific FRA is required which demonstrates that the Exception Test has been passed.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. High groundwater levels may limit the suitability of infiltration techniques and discharge to a watercourse may therefore be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix G

LAND TO THE SOUTH-WEST OF WIGMORE

Location	Land to the south-west of Wigmore
Reference	GTAA/16/02
Proposed Use	Five pitches for either permanent residential sites or a temporary stopping place
Grid Reference	SO 40787 68887

Introduction

The Land to the south-west of Wigmore site is approximately 1.9ha in size and is located to the south-west of the village of Wigmore. The site is currently greenfield and is currently used as agricultural land. The general topography of the site slopes from approximately 215.6mAOD in the south-west to approximately 188.6mAOD in the north-east.

The site is bound to the south by Barnet Lane that connects the site to the village of Wigmore and the A4110. The surrounding area is largely rural and comprises agricultural land and woodland.

There is a small unnamed ordinary watercourse located approximately 130m to the north of the site flowing in an easterly direction. Another small unnamed ordinary watercourse is located approximately 330m to the south of the site flowing in an easterly direction. OS mapping identifies a spring located approximately 180m to the north-west of the site. The nearest watercourse designated as a main river is the River Lugg located approximately 3km to the south of the site near to the village of Aymestrey.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning, as shown in Figure 1, indicates that the site is located within the low risk Flood Zone 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding.

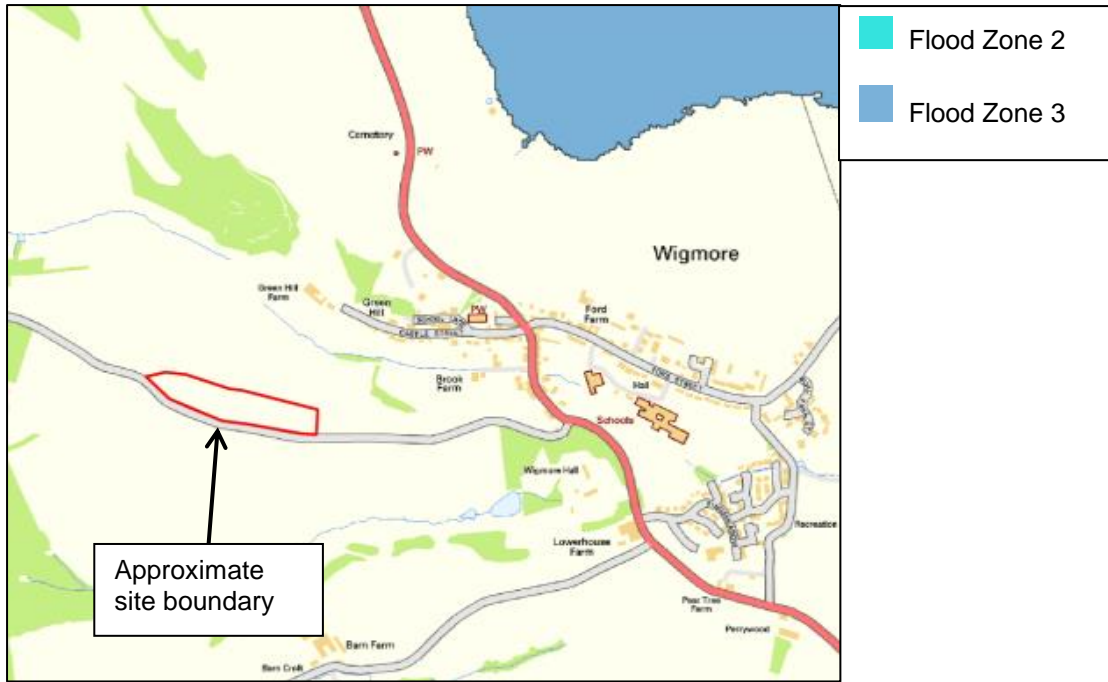


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Land to the south-west of Wigmore site is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than a 0.1% (1 in 1000) annual probability of flooding from surface water.

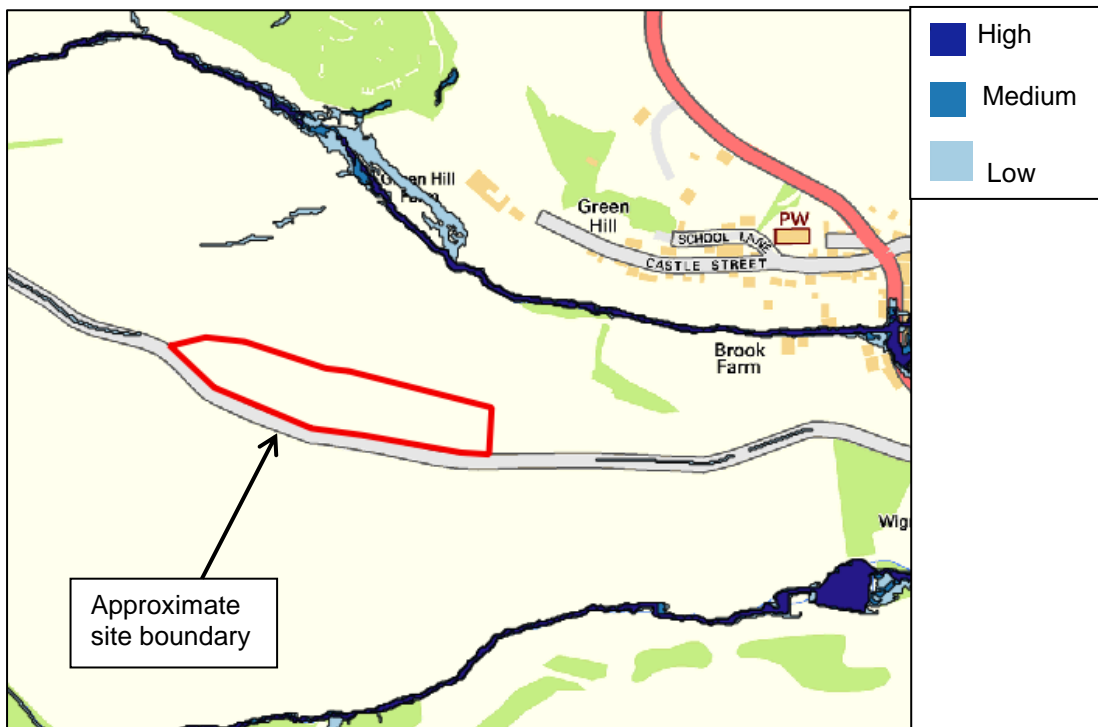


Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater maps indicate that the Land to the south-west of Wigmore site is not located within or near to a designated groundwater Source Protection Zone (SPZ).

The EA's Groundwater maps indicate that the underlying bedrock deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain viewer indicates that bedrock geology comprises limestone of the Much Wenlock Limestone Formation. There are no superficial deposits recorded. An adjacent borehole, at a ground level of approximately 164mAOD, located approximately 270m to the north of the site states that water was struck at a depth of approximately 13.7m. There are no known records of groundwater flooding within Wigmore.

The EA's Flood Risk from Reservoirs map indicates that the Land to the south-west of Wigmore site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Land to the south-west of Wigmore site is indicated to be in the low risk Flood Zone 1 and not at significant risk of surface water flooding. The site is located a considerable distance from areas deemed to be at flood risk and, as such, the site is not considered to be at risk when the potential effects of climate change are considered up to 2115.

Planning Recommendations

Spatial Planning and Development Control

Development of the Land to the south-west of Wigmore site should be undertaken in accordance with the principles set out in the Herefordshire SFRA and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It has not been confirmed if the five new pitches on the site will be used as a temporary stopping place or as a permanent site.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for temporary caravan accommodation are considered to be 'More Vulnerable'; and sites intended to be for permanent residential use are considered to be 'Highly Vulnerable'.

With reference to Table 3 of the Planning Practice Guidance, both vulnerability classifications are appropriate in Flood Zone 1 and pass the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1% (1 in

100) annual probability fluvial and surface water event including an appropriate allowance for climate change.

In accordance with NPPF, it is recommended that the development of the site accompanied by a site specific Flood Risk Assessment (FRA) as the total site area is greater than 1ha. The FRA should clarify the flood risk at the site (taking the potential effects of climate change into account) and summarise the proposed surface water management strategy, demonstrating that flood risk to people elsewhere will not be increased.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology may not support infiltration due to impeded drainage. An alternative method of surface water disposal is therefore likely to be required to drain impermeable surfaces. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development and infiltration promoted as far as practicable. The use of combined attenuation and infiltration features are promoted to maximise infiltration during smaller events and improve water quality.

If off-site discharge is required, the rate and volume of discharge should be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Land to the south-west of Wigmore site is located in the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. In accordance with NPPF, the site meets the requirements of the Sequential Test. As the site is greater than 1ha in size, development of the site should be supported by a site-specific FRA.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. Ground conditions are considered unlikely to support infiltration. Discharge to an adjacent watercourse may therefore be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix H

GRAFTON

Location	Grafton Caravan Site
Reference	GTAA/16/HC/O/13
Proposed Use	One additional pitch within the existing caravan site
Grid Reference	SO 50576 237698

Introduction

The Grafton site is approximately 0.05ha in size and is located to the south of Hereford within Redhill. The site is located within a Council owned traveller site which currently has nine permanent pitches. The general topography of the site is relatively flat sloping from approximately 75.2mAOD in the south to approximately 74.9mAOD in the north.

The site is bound to the west by Ross Road that connects the site to Lower Bullingham and the centre of Hereford. The Abergavenny to Hereford railway line is located approximately 55m to the north of the site. The surrounding area is largely rural and comprises agricultural land to the east, south and west of the site, with the urban area of Hereford to the north.

Withy Brook, an ordinary watercourse, is located approximately 515m to the south of the site flowing in a north-easterly direction to confluence with Norton Brook approximately 0.8km to the east of the site. The nearest watercourse designated as a main river is the River Wye located approximately 1.4km to the north-east of the site to the north of Lower Bullingham.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning, as shown in Figure 1, indicates that the site is located within the low risk Flood Zone 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the upstream extent of Withy Brook located to the south of the site. This is because the EA's Flood Map for Planning does not include smaller watercourses with a catchment of typically less than 3km². However, due to the distance between the watercourse and the site this does not increase flood risk to the site.

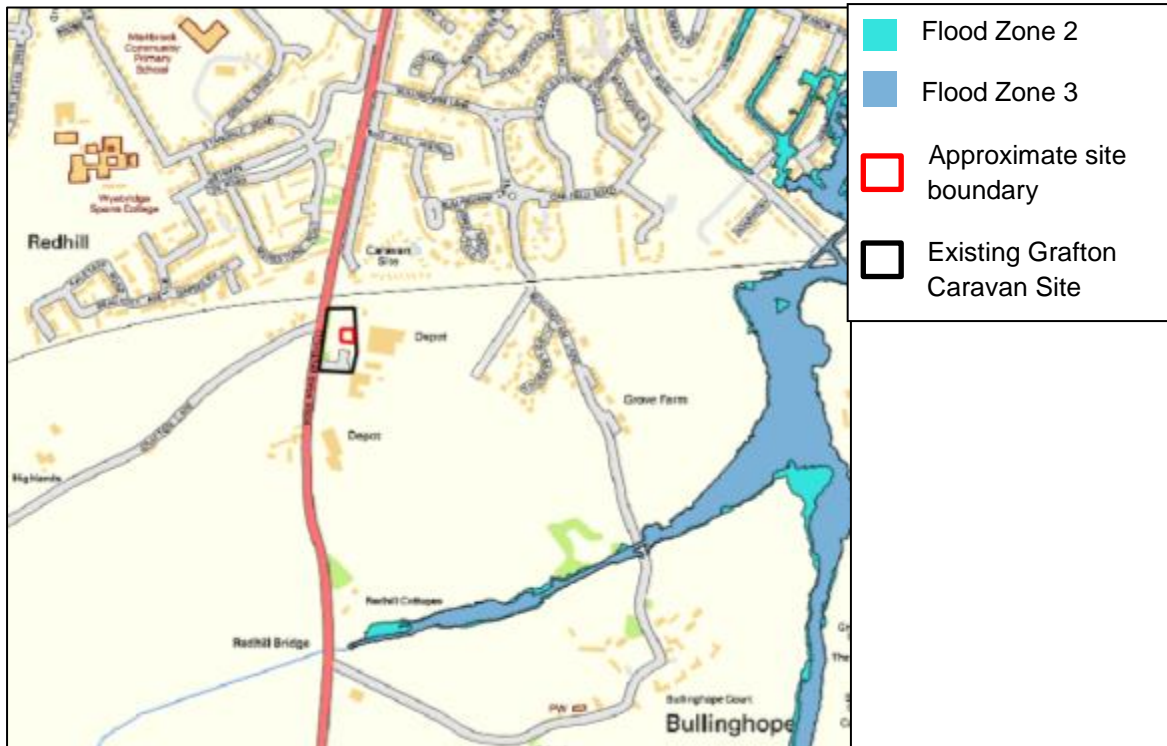


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Grafton site is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than a 0.1% (1 in 1000) annual probability of flooding from surface water.

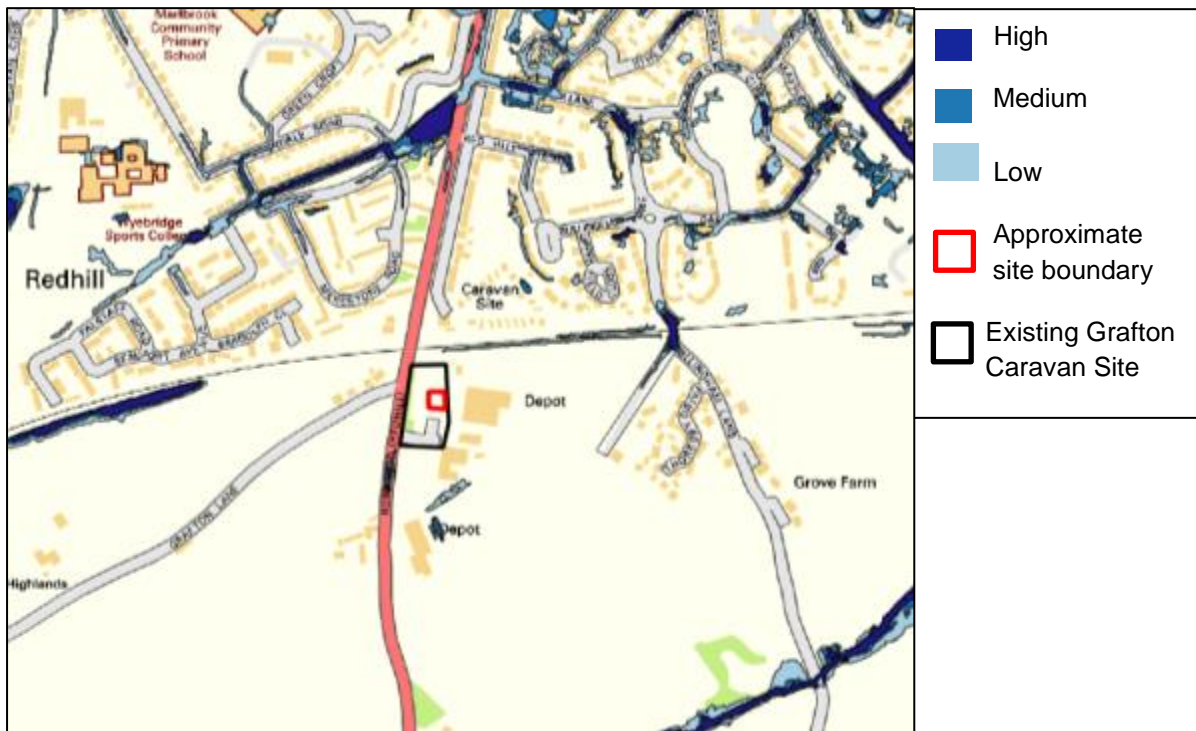


Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater maps indicate that the Grafton site is not located within or near to a designated groundwater Source Protection Zone (SPZ).

The EA's Groundwater maps indicate that the underlying bedrock deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain viewer indicates that bedrock geology comprises interbedded siltstone and mudstone of the Raglan Mudstone Formation, with superficial sand and gravel river terrace deposits. An adjacent borehole, at a ground level of 62.5mAOD, located approximately 170m to the north-east of the site states that water struck at a depth of approximately 5.1m. There are no known records of groundwater flooding within Grafton.

The EA's Flood Risk from Reservoirs map indicates that the Grafton site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Grafton site is indicated to be in the low risk Flood Zone 1 and not at significant risk of surface water flooding. The site is located a considerable distance from areas deemed to be at flood risk and, as such, the site is not considered to be at risk when the potential effects of climate change are considered up to 2115.

Planning Recommendations

Spatial Planning and Development Control

Development of the Grafton site should be undertaken in accordance with the principles set out in the Herefordshire SFRA and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a permanent site with the creation of one additional pitch within the boundary of the existing Council owned traveller site.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used as for caravans intended for permanent residential use are considered to be 'Highly Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1 and passes the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1% (1 in 100) annual probability fluvial and surface water event including an appropriate allowance for climate change.

In accordance with NPPF, the planning application or detailed proposals put forward as part of the site allocation process do not need to be accompanied by a site specific Flood Risk

Assessment (FRA) as the site is less than 1ha, is located in Flood Zone 1, and is not considered to be at significant risk from other sources of flooding.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying bedrock geology is unlikely to support infiltration. The superficial gravel deposits are likely to have higher permeability and support infiltration, although these are likely to be shallow and the potentially high groundwater levels may limit the suitability of this method. Where feasible the use of infiltration should be promoted and informed through on-site testing of infiltration potential in accordance with BRE365. However it is recognised that the proposals form part of a wider existing development and, therefore, it is likely that surface water will be discharged to the existing drainage system serving the site. Consideration should be given to the available capacity within this system and discharge should be attenuated as far as practicable.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Grafton site is located in the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. In accordance with NPPF, the site meets the requirements of the Sequential Test and does not need to be supported by a site-specific FRA.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. High groundwater levels may limit the suitability of infiltration techniques although it is anticipated that the existing drainage system will be used.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix I

PONTRILAS HIGHWAYS DEPOT

Location: Pontrilas Highways Depot
Reference: GTAA/16/HC/O/1
Proposed Use: Temporary stopping place
Grid Reference: SO 39976 27779

Introduction

The Pontrilas Highways Depot site is approximately 0.1ha in size and is located to the north-east of the village of Pontrilas within Pontrilas Business Park. The site is currently brownfield and was previously used as a Council highways depot primarily for salt storage. The general topography of the site slopes from approximately 72.5mAOD in the east of the site to approximately 71.5mAOD in the west.

The site is bound to the north by the A465. The Abergavenny to Hereford railway line is located approximately 30m to the south of the site. Residential properties are located immediately to the west of the site, with the surrounding area relatively rural comprising agricultural land and woodland.

The River Dore, designated as a main river, is located approximately 50m to the north of the site and flows in a general southerly direction. A small unnamed ordinary watercourse is located to the east of the site. Review of OS mapping indicates that the watercourse flows in an easterly direction towards the Pontrilas Highways Depot site but appears to enter a culvert to the east of the railway. Review of historical mapping dated 1963 indicates that the watercourse used to flow through the site; the culverted watercourse may also therefore flow beneath the site although review of surface water mapping (Figure 2) suggests an alignment further to the south of the site.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the low risk Flood Zone 1, as shown in Figure 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding. It should be noted that the site is located in close proximity to the flood extents for the River Dore located to the north of the site, although the flow of flood water appears to be constrained by the A465 which is at a slightly higher elevation than adjacent land.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the ordinary watercourse located to the east of the site. As discussed above the alignment of this watercourse in relation to the site is unclear from the mapping available. A more detailed assessment of the alignment of this watercourse should be undertaken as part of the detailed design. This is to ensure that the development of the site avoids building over the culverted watercourse and maintains an appropriate easement for maintenance access. It is, however, considered unlikely that the site will be at risk of fluvial flooding from this watercourse.

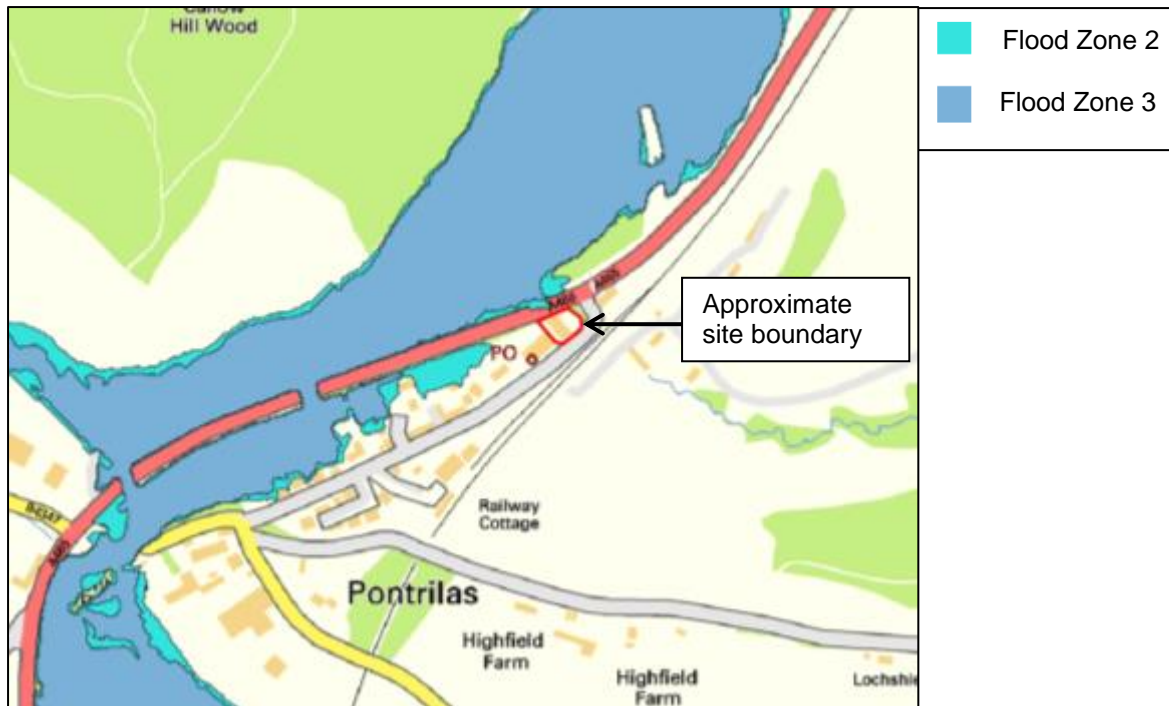


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Pontrilas Highways Depot site is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than 0.1% (1 in 1000) annual probability of flooding from surface water. A small area in the south-west of the site is considered to be at low risk of surface water flooding, with an annual probability of flooding from surface water of between 1% (1 in 100) and 0.1% (1 in 1000). This is likely to be associated with a localised depression in topography and will not pose a significant constraint to site development.

The railway embankment located to the south of the site appears to act as a barrier to surface water flows flowing towards the site from the south and east, including flows associated with the ordinary watercourse discussed above. This accumulation of surface water is not likely to pose flood risk to the development site.

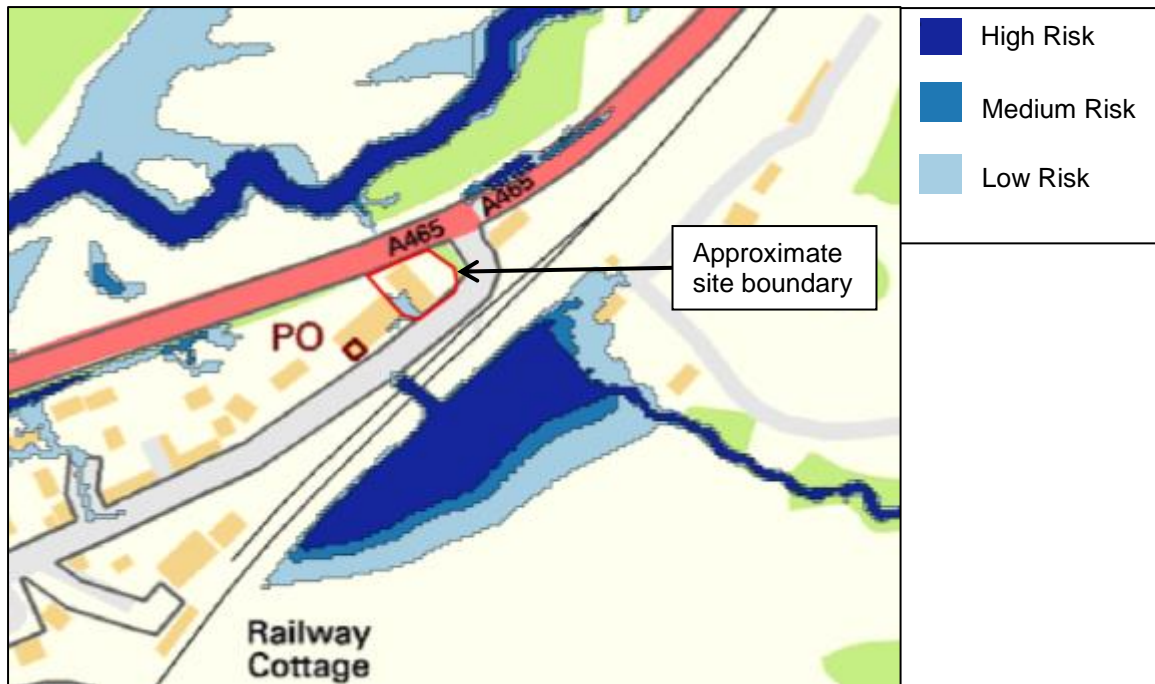


Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Pontrilas Highways Depot site is not located within a designated groundwater Source Protection Zone (SPZ); the nearest SPZ is located near St Weonards approximately 1km to the south-east of the site. The EA's Groundwater map also indicates that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain Viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation. There are no superficial deposits recorded. There are no known records of groundwater flooding within Pontrilas.

The EA's Flood Risk from Reservoirs map indicates that the Pontrilas Highways Depot site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure. The nearest flood defence is an EA flood bund located approximately 270m to the west of the site.

Impacts of Climate Change

As discussed above, the Pontrilas Highways Depot site is indicated to be located in the low risk Flood Zone 1 but in close proximity to the medium risk Flood Zone 2 and high risk Flood Zone 3. Latest EA guidance recommends that peak river flow rates are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. Hydraulic modelling of the River Dore has not been undertaken to accurately assess the potential impacts of climate change on current modelled flood extents. A qualitative approach has

therefore been applied to understand the likely future flood risk to the Pontrilas Highways Depot site and the need for further analysis.

Guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 200mm to 500mm for the 1% (1 in 100) annual probability event. Similarly, the current extent of Flood Zone 2 can provide a good indication of the future extent of Flood Zone 3 up to 2115.

A review of 2m resolution LiDAR data indicates a difference of approximately 0.6m between the lowest level of the site and the likely highest level of the present day 1% (1 on 100) annual probability event. An increase of c.500mm to account for future climate change effects over an approximate 100 year design life is therefore not likely to pose risk to the Pontrilas Highways Depot site.

Planning Recommendations

Spatial Planning and Development Control

Development of the Pontrilas Highways Depot site should be undertaken in accordance with the principles set out in the Strategic Flood Risk Assessment (SFRA) and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a temporary stopping place which provides intermittent needs for site accommodation. It is understood that the site will not be occupied all year round but may be made available at times of increased demand.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for temporary caravan accommodation are considered to be 'More Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1 and passes the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1% (1 in 100) annual probability event including an appropriate allowance for climate change.

In accordance with NPPF, the planning application or detailed proposals put forward as part of the site allocation process do not need to be accompanied by a site specific FRA as the site is less than 1ha, is located in Flood Zone 1, and is not considered to be at significant risk from other sources of flooding.

Due to the close proximity of the site to Flood Zone 2 and Flood Zone 3 associated with the River Dore, it is recommended that consideration is given to the potential for the site to flood even though an indicative review of topographic data suggests that this is unlikely. In the unlikely event of flooding during an extreme event it is recommended that the underside of the proposed caravans is raised a minimum of 300mm above the 1 in 100 annual probability plus climate change flood level or 150mm above adjacent ground level, whichever of these is the highest.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology may support infiltration but that an alternative method of surface water disposal may be required to drain significant areas of impermeable surface or manage extreme rainfall events. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

Where site conditions and groundwater levels permit, the use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events. During larger rainfall events, discharge to a watercourse or sewer may be required. The rate and volume of discharge should strive to provide betterment of at least 20% when compared to pre-development runoff values, and be restricted to the pre-development Greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Pontrilas Highways Depot site is located in the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. In accordance with NPPF, the site meets the requirements of the Sequential Test and does not need to be supported by a site-specific FRA.

The site is located in close proximity to Flood Zone 2 and Flood Zone 3 associated with the River Dore to the north of the site. Indicative review of site topography indicates that the site is unlikely to flood when the potential effects of climate change are taken into consideration. However, it is recommended that resilience measures are incorporated into the development such as raising caravan base levels above ground levels.

An ordinary watercourse is culverted to the south of the site and may flow through the site prior to confluencing with the River Dore. It is recommended that the alignment of this watercourse is considered as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. Underlying ground conditions may not support infiltration and discharge to a watercourse or sewer may be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix J

LAND ADJACENT TO WHITFIELD COPPICE

Location: Land Adjacent to Whitfield Coppice Trumpet
Reference: GTAA/16/O/1
Proposed Use: Seven residential pitches
Grid Reference: SO 65390 39333

Introduction

The Land Adjacent to Whitefield Coppice Trumpet site is approximately 0.46ha in size and is located to the west of the village of Trumpet approximately 4.9km to the north-west of Ledbury. The site is currently greenfield and was previously used as agricultural land. The general topography of the site slopes from approximately 88.8mAOD in the north-west of the site to approximately 86.9mAOD in the south-east.

The site is bound to the south by Whitfield Coppice and to the north by the A438. The surrounding area is largely rural comprising agricultural land and woodland. The Hereford to Worcester railway line is located approximately 820m to the north of the site.

There is small unnamed ordinary watercourse located approximately 250m to the south of the site flowing in an easterly direction. OS mapping identifies a number of springs approximately 270m to the north-west of the site near to Poolend Coppice. The nearest watercourse designated as a main river is the River Leadon located approximately 4.2km to the east of the site on the periphery of Ledbury.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the low risk Flood Zone 1, as shown in Figure 1. Flood Zone 1 comprises land in a low risk flood area with a less than 0.1% (1 in 1000) annual probability of fluvial flooding.

The EA's Flood Map for Planning does not illustrate a fluvial flood risk associated with the ordinary watercourse located to the south of the site. Given the distance between the site and this watercourse it is considered highly unlikely that the site will be at risk of fluvial flooding from this watercourse.



Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Land Adjacent to Whitfield Coppice Trumpet site is at very low risk of surface water flooding, as shown in Figure 2. Very low risk is defined as having less than a 0.1% (1 in 1000) annual probability of flooding from surface water.



Figure 2 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Land Adjacent to Whitfield Coppice Trumpet site is not located within or near to a designated groundwater Source Protection Zone (SPZ).

The EA's Groundwater map indicates that the underlying bedrock deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain Viewer indicates that bedrock geology comprises siltstone and mudstone of the Raglan Mudstone Formation. There are no superficial deposits recorded. An adjacent borehole to the north-east of the site states that water was struck at a depth of 48m. The site is also located at a higher elevation than the springs identified to the north of the site. The site is therefore not deemed to be at risk of flooding from groundwater.

The EA's Flood Risk from Reservoirs map indicates that the Land Adjacent to Whitfield Coppice Trumpet site is not at risk of flooding from potential reservoir failure.

Flood Defences

There are no known flood defences within the immediate vicinity of the site that provide protection to the site from flooding, and as a result there is no known risk of inundation occurring as a result of a flood defence breach or failure.

Impacts of Climate Change

As discussed above, the Land Adjacent to Whitfield Coppice Trumpet site is indicated to be located in the low risk Flood Zone 1 and not at significant risk of surface water flooding. The site is located a considerable distance from areas that are deemed to be at flood risk and, as such, the site is not considered to be at risk when the potential effects of climate change are considered up to 2115.

Planning Recommendations

Spatial Planning and Development Control

Development of the Land Adjacent to Whitfield Coppice Trumpet site should be undertaken in accordance with the principles set out in the Strategic Flood Risk Assessment (SFRA) and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a permanent site with the creation of seven new pitches.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for caravans intended for permanent residential use are considered to be 'Highly Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development is appropriate in Flood Zone 1 and passes the Sequential Test. The site is also served by safe access and egress routes located outside of the extent of the 1% (1 in 100) annual probability fluvial and surface water event including an appropriate allowance for climate change.

In accordance with NPPF, the planning application or detailed proposals put forward as part of the site allocation process do not need to be accompanied by a site specific FRA as the site is less than 1ha, is located in Flood Zone 1, and is not considered to be at significant risk from other sources of flooding.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology may not support infiltration. An alternative method of surface water disposal is therefore likely to be required to drain areas of impermeable surface. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

The use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events. During larger rainfall events, discharge to a watercourse may be required. The rate and volume of discharge should be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Land Adjacent to Whitfield Coppice Trumpet site is located in the low risk Flood Zone 1 and is not considered to be at significant risk from other sources of flooding. In accordance with NPPF, the site meets the requirements of the Sequential Test and does not need to be supported by a site-specific FRA.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. Infiltration may not be feasible and discharge to a watercourse may be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix K

HOMS ROAD CAR PARK

Location: Homs Road Car Park
Reference: GTAA/16/HC/O/10
Proposed Use: Temporary stopping place
Grid Reference: SO 59828 24562

Introduction

The Homs Road Car Park site is approximately 0.1ha in size and is located in the north-west of Ross-on-Wye. A parcel of land, referred to as the indicative transit area, is located immediately adjacent to the site and is also within Council ownership. This additional parcel of land measures approximately 0.3ha in size.

The site is brownfield and is currently used as a Council car park. A Severn Trent pumping station is located in the south-west of the transit area. A drop-shaft for the Ross-on-Wye flood alleviation scheme is located within the indicative transit area to the south. The general topography of the site gently slopes from approximately 32.4mAOD in the east of the site to approximately 32.1mAOD in the west.

The site is bound to the north by Homs Road that connects the site to the centre of Ross-on-Wye. Immediately to the east of the site is a leisure facility accessed from Trenchard Street. The site is surrounded by commercial and residential areas to the north and rural agricultural land and woodland to the south and west of the site.

The Rudhall Brook, designated as an ordinary watercourse, is located adjacent to the southern site boundary and flows in a westerly direction to confluence with the River Wye approximately 300m to the west of the site. The River Wye is designated as a main river and flows in a southerly direction through predominantly rural areas. Prior to discharging into the River Wye, a small unnamed ordinary watercourse conflues with the Rudhall Brook approximately 325m to the north-west of the site. The Chatterley Brook and another small unnamed ordinary watercourse also confluence with the Rudhall Brook approximately 340m to the east of the site. The syphon for the Ross-on-Wye flood alleviation scheme runs parallel with the Rudhall Brook in a westerly direction.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning indicates that the site is located within the medium risk Flood Zone 2, as shown in Figure 1, but in close proximity to the extents of Flood Zone 3. Flood Zone 2 comprises land where the annual probability of flooding from fluvial sources is between 1% and 0.1% (between 1 in 100 and 1 in 1000). Flood Zone 3 comprises land where the annual probability of flooding from fluvial sources is greater than 1% (1 in 100). The source of this flood risk is considered to primarily be the River Wye with the Rudhall Brook also affecting the site. The indicative transit area located immediately adjacent to this site is indicated to be located within the high risk Flood Zone 3.

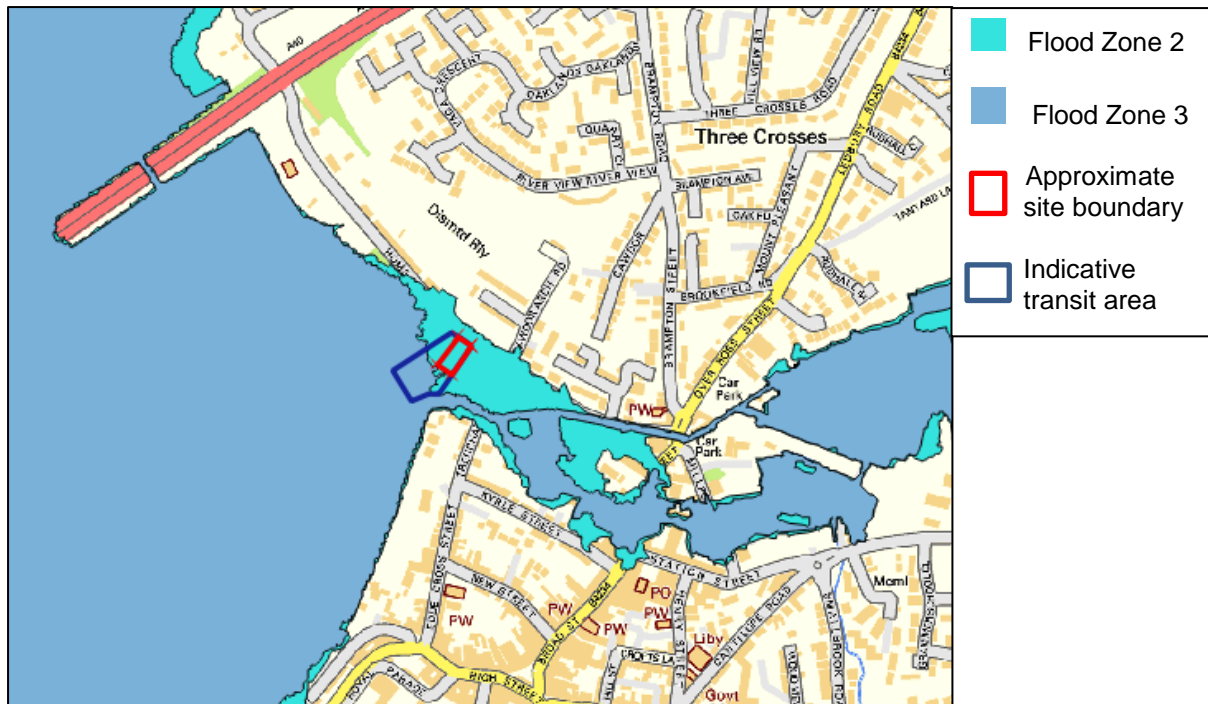


Figure 1 EA's Flood Map for Planning (Rivers and Sea), January 2017

Review of the River Wye 1D hydraulic model undertaken in 2012 indicates an approximate flood level of 33.8mAOD during the modelled 1% (1 in 100) annual probability event at the model node located closest to the site boundary. As site topography ranges from approximately 32.4mAOD to 32.1mAOD, this suggests that the site could be inundated by up to 1.7m during this event and that the site is located within the Flood Zone 3 extent. This is contradictory to the EA's Flood Map for Planning but it is noted that the Herefordshire Strategic Flood Risk Assessment (SFRA) states that the EA map is considered to be outdated and not truly representative of the local flood risk.

The Herefordshire SFRA indicates the site to be located within the functional floodplain Flood Zone 3b, as illustrated in Figure 2. Flood Zone 3b comprises land where water has to flow or be stored during a flood event, with an annual probability of flooding from fluvial sources of 5% (1 in 20) or greater. However, it is generally accepted that urban areas such as Ross-on Wye would not be classed as 'functional floodplain' and would instead be classed Flood Zone 3a.

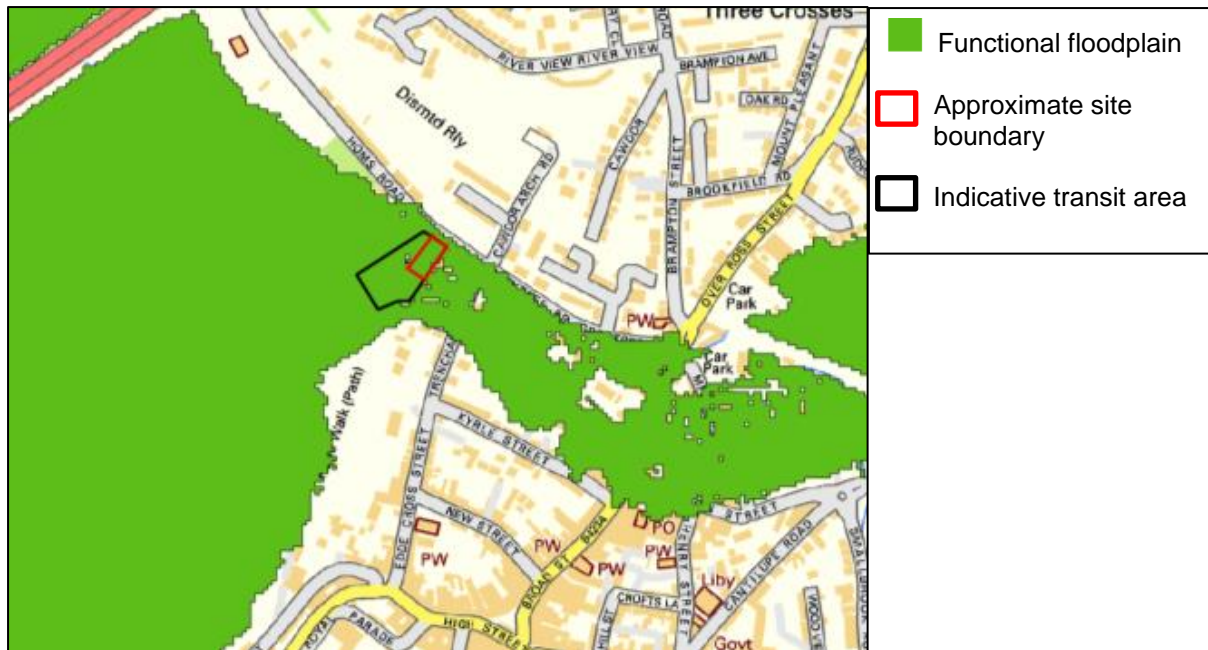


Figure 2 Herefordshire SFRA Functional Floodplain Assessment, 2009

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Homs Road Car Park site is partially at high risk of surface water flooding, as shown in Figure 3. High risk typically defines areas that have a greater than 3.3% (1 in 30) annual probability of flooding from surface water sources. Review of further data provided on the www.gov.uk website¹ indicates flood depths of between 300mm to 900mm. Topographic data suggests that there is a low point located along Homs Road allowing surface water to pond at this location.

The south-west of the site and the majority of the indicative transit area is at low risk of surface water flooding. Low risk typically defines areas that have between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of flooding from surface water sources.

¹ Long term flood risk information (<https://flood-warning-information.service.gov.uk/long-term-flood-risk>)

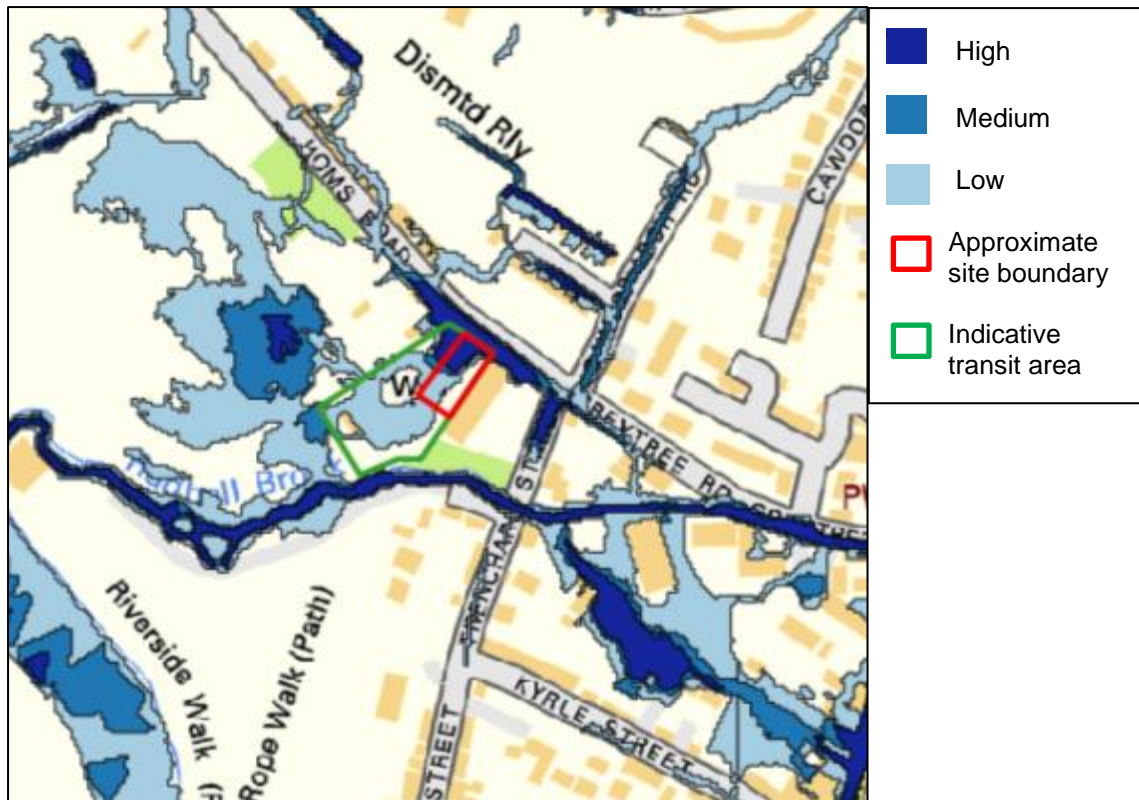


Figure 3 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater map indicates that the Homs Road Car Park site is not located within a designated groundwater Source Protection Zone (SPZ); the nearest SPZ is located in the centre of Ross-on-Wye approximately 750m to the south-east of the site.

The EA's Groundwater map also indicates that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain Viewer indicates that bedrock geology comprises sandstone of the Brownstones Formation, with superficial deposits of Alluvium. There are no known records of groundwater flooding within Ross-on-Wye.

The EA's Flood Risk from Reservoirs map indicates that the very south of the site and the south of the indicative transit area are at risk of flooding from potential reservoir failure from the Hartleton Water reservoir located approximately 4.6km to the north-east of the site. As only a small proportion of the site is located with the reservoir flood extent and the likelihood of reservoir failure is considered to be very small, the risk to the site is not deemed to be significant.

Flood Defences

The site is located in close proximity to the area protected by the Ross-on-Wye flood alleviation scheme that was constructed in 2008 as a result of a severe flood event in 2000. The scheme protects Ross-on-Wye from flooding associated with the Rudhall Brook and comprises an inverted flood relief siphon, improved culvert and channel capacities for the Rudhall Brook and Chatterley Brook, and a flood storage area upstream of Ross-on-Wye to

the east of the A40. During periods of high flows within the Rudhall Brook, excess water is diverted away from the culverted section of Rudhall Brook located beneath Greytrees Road into an inverted siphon that flows between the Kings Acre and Homs Road Car Park to convey flow back into Rudhall Brook downstream of Ross-on-Wye after flood waters subside.

The SFRA states that the flood alleviation scheme provides 1% (1 in 100) annual probability standard of protection to the areas served by the scheme. Figure 4 provides an extract from the SFRA indicating the area protected by the scheme and indicates that the site may be located just outside of this area. Further analysis of the hydraulic model of the Ross-on-Wye flood alleviation scheme also suggests that the site is not likely to be protected.

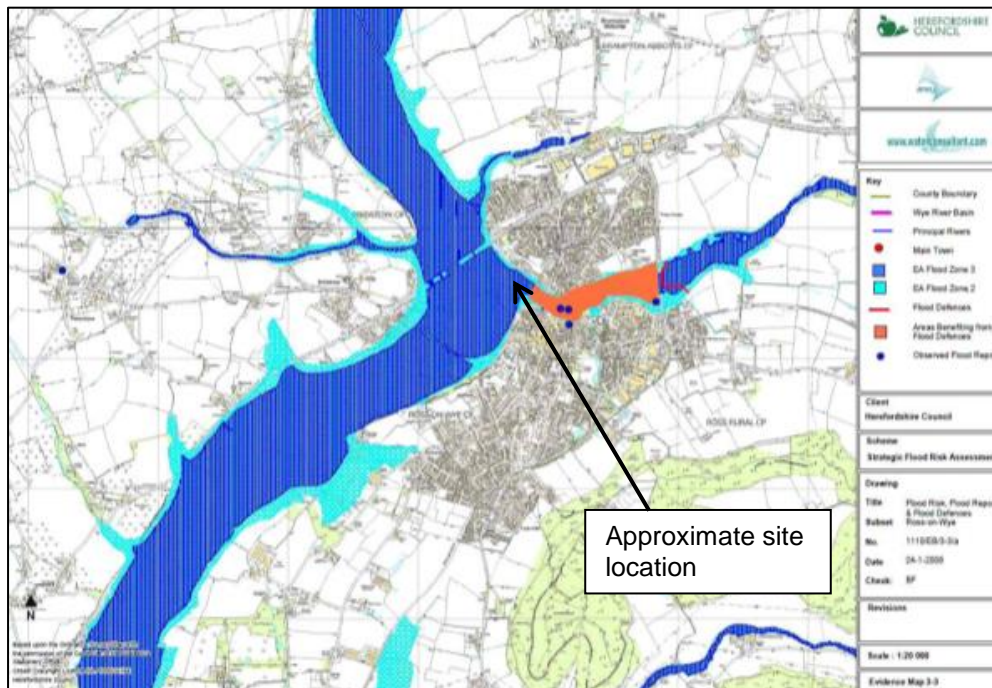


Figure 4 Extract from the SFRA indicating the extent of flood protection provided by the Ross-on-Wye flood alleviation scheme

Impacts of Climate Change

As discussed above, the Homs Road Car Park site is indicated to be located within the high risk Flood Zone 3. Latest EA guidance recommends that peak river flows are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. In the absence of robust model data, guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 600mm to 1500mm for the 1% (1 in 100) annual probability event.

Review of the River Wye 1D hydraulic model undertaken in 2012 indicates an approximate flood level of 34.4mAOD during the modelled 1% (1 in 100) annual probability event and including a 20% increase in peak river flow to accommodate for climate change effects (noting that this modelling was completed prior to the EA's updated climate change recommendations). As site topography ranges from approximately 32.4mAOD to 32.1mAOD, this suggests that the site could be inundated by up to 2.3m during this event. Extrapolating this further to estimate a likely flood level for the 1% (1 in 100) annual

probability event and including a 70% increase in peak river flow (i.e. by considering the EA's recommendation to increase flood levels by 1500mm) suggests a future flood level of approximately 35.3mAOD over a 100 year site design life, with the potential for the site to be inundated by 3.2m.

An extract from the River Wye 1D hydraulic model undertaken in 2012 for the 1% (1 in 100) annual probability event and including a 20% increase in peak river flow is provided below for information.



Figure 5 EA's River Wye hydraulic model flood extent for the 1% annual probability event plus 20% climate change scenario

Planning Recommendations

Spatial Planning and Development Control

Development of the Homs Road Car Park site should be undertaken in accordance with the principles set out in the Herefordshire SFRA and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a temporary stopping place which provides intermittent needs for site accommodation. It is understood that the site will not be occupied all year round but may be made available at times of increased demand.

As the site is located within an area deemed to be at flood risk, the Council must apply the Sequential Test to steer new development to areas that are at a lower risk of flooding. Only where there are no reasonably available sites in a lower flood zone should the suitability of sites within a higher flood zone be considered. The Council must therefore demonstrate that there are no other sites that are in a lower flood zone that would provide a reasonable alternative location.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for temporary caravan accommodation are considered

to be 'More Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development would be considered appropriate in Flood Zone 2, but would require the Exception Test to be passed as the site is considered to be located in Flood Zone 3.

For the Exception Test to be passed, a site-specific Flood Risk Assessment (FRA) must be prepared that demonstrates:

- It is not possible for the development to be located on land with a lower probability of flooding;
- The development provides wider sustainability benefits to the community that outweigh flood risk, and;
- The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The FRA will also need to clarify the extent and depth of flood risk within the site boundary (considering the potential effects of climate change), and identify how flood risk to the proposed development has been minimised, how the development has been made safe, and how the impacts of the development on people and property elsewhere have been avoided. Consideration must also be given to the identified risk from surface water sources and the ability to provide safe access and egress.

A flood response plan will be required to demonstrate the measures and procedures in place should an extreme flood event occur.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology is likely to support infiltration but that high groundwater levels may limit the suitability of this method. An alternative method of surface water disposal is therefore likely to be required to drain impermeable surfaces. On-site testing of infiltration potential should still be undertaken in accordance with BRE365 prior to development.

Where site conditions and groundwater levels permit, the use of combined attenuation and infiltration features are promoted to provide treatment and reduce runoff during smaller rainfall events. During larger rainfall events, discharge to a watercourse or sewer may be required. If off-site discharge is required, the rate and volume of discharge should strive to provide betterment of at least 20% when compared to pre-development runoff values, and be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

Review of information provided within the SFRA and the River Wye hydraulic model indicates that the Homs Road Car Park site is located within the high risk Flood Zone 3 and is at high risk of surface water flooding. In accordance with NPPF, the Council are required to apply the Sequential Test. If the Sequential Test is passed, a site-specific FRA is required which demonstrates that the Exception Test has been passed and has taken into consideration the potential effects of climate change.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. High groundwater levels may limit the suitability of infiltration techniques and discharge to a watercourse or sewer may therefore be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.

Appendix L

LAND ADJACENT TO MORRISONS

Location	Land adjacent to Morrisons
Reference	GTAA/16/HC/O/9
Proposed Use	Temporary stopping place
Grid Reference	SO 60340 24391

Introduction

The Land Adjacent to Morrisons site is approximately 0.13ha in size and is located off Station Road in central Ross-on-Wye. The site is currently brownfield with the majority of the site comprising hard standing with a small woodland area in the north. The site was previously used as a construction parking area. The general topography of the site is flat with levels sloping from approximately 35.1mAOD in the east to approximately 35.0mAOD in the west.

The site is located immediately to the east of an existing Morrisons supermarket, separated from the supermarket by an unnamed ordinary watercourse and public footpath. The site is bound to the north by a dismantled railway embankment and to the east by an unnamed road that provides access to the site and serves the Broadmeadow Caravan and Camping Park further north. The site is surrounded by commercial and industrial areas to the north, east and west, and by residential areas to the south.

The Rudhall Brook, designated as an ordinary watercourse, is located approximately 120m to the north of the site and flows in a westerly direction, and review of OS mapping indicates that the Rudhall Brook is culverted approximately 130m to the north-west of the site. The Rudhall brook confluences with the River Wye approximately 650m to the west of the site. An unnamed ordinary watercourse forms the eastern site boundary and flows in a northerly direction to confluence with the Rudhall Brook approximately 110m to the north-west of the site. The Chatterley Brook, also designated as an ordinary watercourse, is located approximately 75m to the north of the site and flows in a westerly direction to confluence with the Rudhall Brook approximately 110m to the north-west of the site. The River Wye is designated as main river and flows in a southerly direction through predominantly rural areas.

Description of Flood Risk

Fluvial Flood Risk

Review of the EA's Flood Map for Planning, as shown in Figure 1, indicates that the site is located within the high risk Flood Zone 3. Flood Zone 3 comprises land where the annual probability of flooding from fluvial sources is greater than 1% (1 in 100). The source of this flood risk is the River Wye and the ordinary watercourses located in close proximity to the site.

The Strategic Flood Risk Assessment (SFRA) for Herefordshire states that the majority of Ross-on-Wye is elevated above the River Wye and that, as such, the direct impact of flooding from the River Wye is considered to be relatively low. However, as the Rudhall Brook and Chatterley Brook both discharge into the River Wye, high water levels within the River Wye can lead to flooding within the centre of Ross-on-Wye as a result of the two brooks backing up and overtopping their banks.

and the SFRA functional floodplain assessment do not take the Ross-on-Wye flood alleviation scheme and the protection it provides into consideration. The SFRA states that the EA map is considered to be outdated and not truly representative of the local flood risk.

Surface Water Flood Risk

The EA's Flood Risk from Surface Water map indicates that the Land Adjacent to Morrisons site is generally at low risk of surface water flooding, as shown in Figure 3. Low risk typically defines areas that have between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of flooding from surface water sources. The dismantled railway embankment located to the north of the site appears to act as a barrier to surface water flowing north. As a result, ponding of surface water occurs within the site. Review of further data provided on the www.gov.uk website¹ indicates flood depths of between 300mm to 900mm. The area of high risk of flooding from surface water along the eastern site boundary is associated with the ordinary watercourse adjacent to the site, and appears to be mostly contained within the channel.

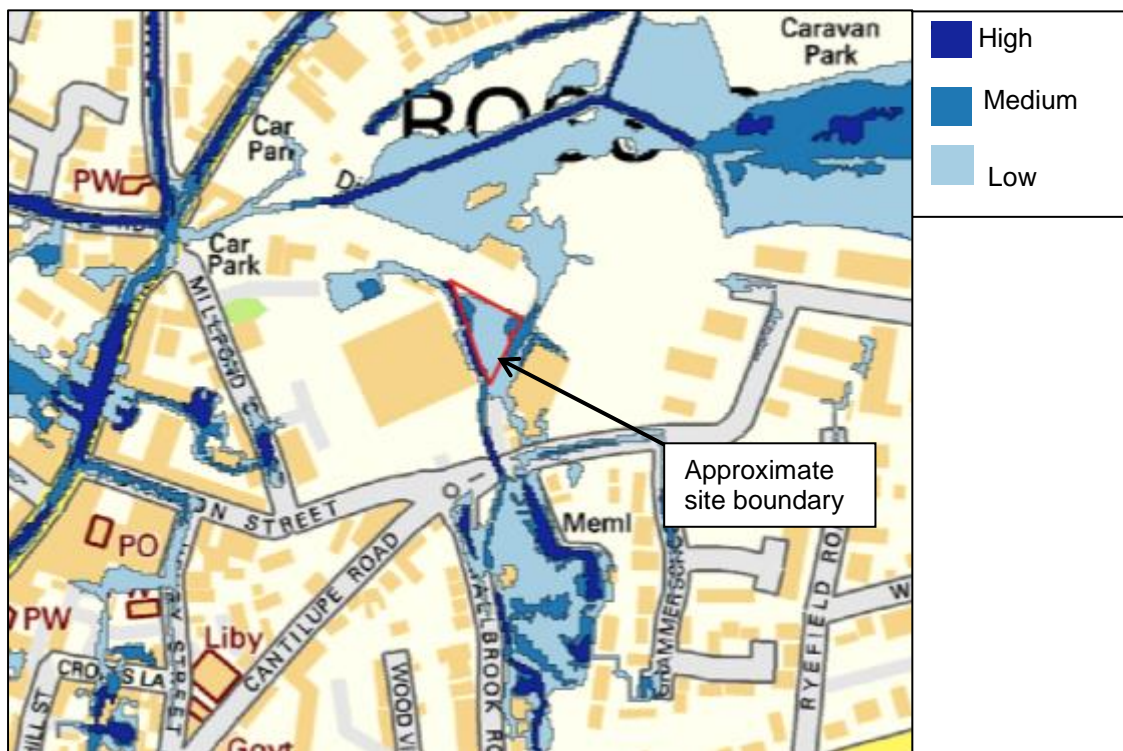


Figure 3 EA's Flood Risk from Surface Water map, January 2017

Other Sources of Flood Risk and Considerations

The EA's Groundwater maps indicate that the Land Adjacent to Morrisons site is located within Zone 2 of a designated Source Protection Zone (SPZ). Zone 2 is described as the 'outer zone' and is defined as having a maximum 400 day travel time from any point below within the zone to the point of abstraction.

¹ Long term flood risk information (<https://flood-warning-information.service.gov.uk/long-term-flood-risk>)

The EA's Groundwater maps indicate that the underlying bedrock and superficial deposits are designated as a 'Secondary A' aquifer. Review of the British Geological Society (BGS) Geology of Britain viewer indicates that bedrock geology comprises sandstone of the Brownstones Formation, with superficial deposits of Alluvium limited to the approximate alignment of the ordinary watercourses and River Wye. An adjacent borehole to the west of the site suggests a standing groundwater level approximately 2.5m below ground level. There are no known records of groundwater flooding within Ross-on-Wye.

The EA's Flood Risk from Reservoirs map indicates that the very north of the site is at risk of flooding from potential reservoir failure from the Hartleton Water reservoir located approximately 4.1km to the north-east of the site. As such as a small proportion of the site is located within the reservoir flood extent and the likelihood of reservoir failure is considered to be very small, the risk to the site is not deemed to be significant.

Flood Defences

The site is located within the area protected by the Ross-on-Wye flood alleviation scheme that was constructed in 2008 as a result of a severe flood event in 2000. The scheme protects Ross-on-Wye from flooding associated with the Rudhall Brook and comprises an inverted flood relief siphon, improved culvert and channel capacities for the Rudhall Brook and Chatterley Brook, and a flood storage area upstream of Ross-on-Wye to the east of the A40. During periods of high flows within the Rudhall Brook, excess water is diverted away from the culverted section of Rudhall Brook located beneath Greytree Road and into an inverted siphon that flows between the Kings Acre and Homs Road Car Park. The flood flow is conveyed back into Rudhall Brook downstream of Ross-on-Wye after the flood waters subside.

The SFRA states that the scheme provides a 1% (1 in 100) annual probability standard of protection. Figure 4 provides an extract from the SFRA and shows the areas protected by the flood alleviation scheme. The map indicates that the site is located within the area protected by the flood alleviation scheme up to the 1% (1 in 100) annual probability, but that the site may still be at risk during events of a greater magnitude – i.e. the site may still be located within the medium risk Flood Zone 2 where the annual probability of flooding is between 1% (1 in 100) and 0.1% (1 in 1000).

The standard of protection provided by the scheme was corroborated by analysis of the hydraulic model of the Ross-on-Wye flood alleviation scheme. This indicated that the site is likely to be protected by the scheme, with the results of the 1% (1 in 100) annual probability event plus a 20% climate change allowance indicating that the flows are largely contained within the river channel at the approximate location of the proposed traveller site. It should be noted, however, that there is no evidence indicating that any blockage scenarios were assessed and, as such, it is recommended that further analysis is undertaken to inform the development of the site to account for potential impacts associated with partial or full culvert blockage or reduced capacity of watercourse channels. This will inform the mitigation and resilience measures that can subsequently be incorporated into the development layout and design.

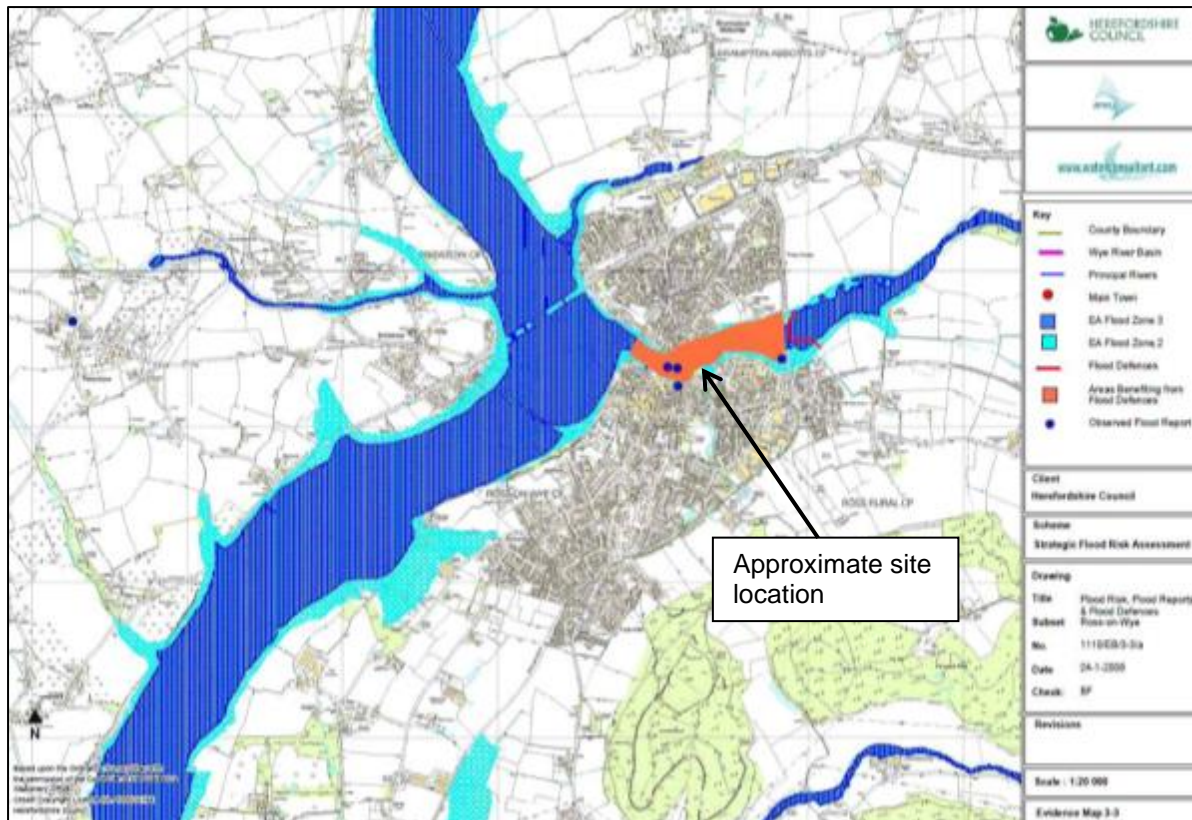


Figure 4 Extract from the Herefordshire SFRA indicating the extent of flood protection provided by the Ross-on-Wye flood alleviation scheme

Flood History

The SFRA states that the Herefordshire flood database has logged reported flooding from the Rudhall Brook at the Broadmeadows Industrial Estate located to the east of the site in February 2000, and flooding from the River Wye of 20 properties in Brookend Street located approximately 220m to the west of the site in August 2006. It is worth noting that these flood records occurred prior to the completion of the Ross-on-Wye Flood Alleviation Scheme.

Impacts of Climate Change

As discussed above, the Land Adjacent to Morrisons site is indicated to be located in the high risk Flood Zone 3 but is protected by the Ross-on-Wye flood alleviation scheme. The flood alleviation scheme is reported to provide a 1% (1 in 100) annual probability standard of protection and has included the potential effects of climate change, accounting for a 20% increase in peak river flows.

Latest EA guidance recommends that peak river flows are increased by 25% to 70% to allow for potential climate change effects over a 100 year site design life. In the absence of robust model data, guidance provided by the EA's Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team in March 2016 recommends a nominal increase of between 600mm to 1500mm for the 1% (1 in 100) annual probability event. However, given the nature of the flood alleviation scheme the inclusion of additional flood depth is unlikely to provide a realistic indication of future flood extents.

If the proposed traveller site is intended to be used beyond c.2040 (upper end allowance comparable to the current climate change estimates used within the existing flood alleviation scheme model) it is recommended that a more detailed assessment of the flood alleviation scheme and the standard of protection provided is undertaken to provide a more robust assessment of future flood risk and inform the need for site specific mitigation. It is also recommended that consideration is given to any residual risk assessments (such as blockage analysis) as these may provide an indication of potential resilience within the scheme to cater for increased flow or reduced channel capacity.

Planning Recommendations

Spatial Planning and Development Control

Development of the Land Adjacent to Morrisons site should be undertaken in accordance with the principles set out in the Herefordshire SFRA and in accordance with National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'. It is understood that the site will be used as a temporary stopping place which provides intermittent needs for site accommodation. It is understood that the site will not be occupied all year round but may be made available at times of increased demand.

As the site is located within an area deemed to be at flood risk, the Council must apply the Sequential Test to steer new development to areas that are at a lower risk of flooding. Only where there are no reasonably available sites in a lower flood zone should the suitability of sites within a higher flood zone be considered. The Council must therefore demonstrate that there are no other sites that are in a lower flood zone that would provide a reasonable alternative location.

The Planning Practice Guidance identifies five classifications of flood risk vulnerability and provides recommendations on the compatibility of each vulnerability classification within each of the Flood Zones. Sites used for temporary caravan accommodation are considered to be 'More Vulnerable'. With reference to Table 3 of the Planning Practice Guidance, the development requires the Exception Test to be passed prior to a development of this nature in Flood Zone 3.

For the Exception Test to be passed, a site-specific Flood Risk Assessment (FRA) must be prepared that demonstrates:

- It is not possible for the development to be located on land with a lower probability of flooding;
- The development provides wider sustainability benefits to the community that outweigh flood risk, and;
- The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The FRA will also need to clarify the extent and depth of flood risk within the site boundary (considering the potential effects of climate change), and identify how flood risk to the

proposed development has been minimised, how the development has been made safe, and how the impacts of the development on people and property elsewhere have been avoided.

The protection provided by the flood alleviation scheme demonstrates that the site is not likely to be at risk of flooding during fluvial events up to and including the 1% (1 in 100) annual probability event. The current hydraulic model of the flood alleviation scheme includes a 20% allowance in peak river flow to account for climate change effects, which is comparable to a design life of up to c.2040 (upper end allowance) when compared to updated EA climate change guidance. If the site is not likely to be allocated beyond c.2040 and/or further analysis of the flood alleviation scheme demonstrates that the site is at an acceptable risk, it is likely that the requirements of the Exception Test can be passed subject to appropriate demonstration that there are no other suitable sites that are located in an area of lower flood risk.

A flood response plan will also be required to demonstrate the measures and procedures in place should an extreme flood event occur.

Sustainable Drainage Systems

Review of readily available desk based sources of data indicates that the underlying geology is likely to support infiltration but that ground contamination risks and high groundwater levels may limit the suitability of this method. An alternative method of surface water disposal may therefore be required to drain impermeable surfaces. On-site testing of infiltration potential should be undertaken in accordance with BRE365 prior to development.

If off-site discharge is required, the rate and volume of discharge should strive to provide betterment of at least 20% when compared to pre-development runoff values, and be restricted to the pre-development greenfield values as far as practicable. Reference should be made to The SUDS Manual (CIRIA C753, 2015) for guidance on calculating runoff rates and volumes.

Herefordshire Council is due to publish a local SuDS guidance document in 2017 that sets out the Council's aspirations for surface water management within Herefordshire.

Overall Comment

The Land Adjacent to Morrisons site is located in the high risk Flood Zone 3 and is considered to be at a medium risk of flooding from surface water. In accordance with NPPF, the Council are required to apply the Sequential Test. If the Sequential Test is passed, a site-specific FRA is required which demonstrates that the Exception Test has been passed and has taken into consideration the protection provided by the Ross-on-Wye flood alleviation scheme.

A surface water drainage strategy will be required as part of any subsequent planning application or detailed proposals put forward as part of the site allocation process to demonstrate how surface water runoff will be appropriately managed. Ground conditions are considered likely to be support infiltration, but ground contamination risks and high groundwater levels may limit the suitability of this method. Discharge to an adjacent watercourse may therefore be required.

The SFRA will be updated in 2017. Whilst it is unlikely that the revised SFRA will change the findings of this assessment, consideration should be given to the assessment of flood risk and development control recommendations as set out within the revised SFRA.