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Flood risk, water and environment

Flood Risk Assessment AEG02735_SY5_Shrewsbury_01

Site Address: Denver House

Acton Burnell

Shrewsbury

Shropshire

SY5 7PQ

UK Experts in Flood Modelling, Flood Risk
Assessments, and Surface Water Drainage Strategies

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Prepared for: Simon White

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Summary

Development Description	Existing	Proposed
Development Type	Agricultural land and residential	<ul style="list-style-type: none"> • Conversion of Barns 1 and 2 into residential dwellings; • Conversion and extension of the Old Butchers Shop into a single storey residential dwelling and • Conversion of the Dutch Barn 1 into a residential dwelling
EA Vulnerability Classification	More Vulnerable	More Vulnerable
Ground Level	<p>Based on the LiDAR data, the ground elevation varies between approximately:</p> <ul style="list-style-type: none"> • 106.71m AOD and 114.67m AOD for the Site In General • 109.16m AOD and 109.49m AOD for the Old Butchers Shop • 108.82m AOD and 109.83m AOD for the Dutch Barn 1 • 109.38m AOD and 110.51m AOD for the U Shaped Barn 1 • 109.90m AOD and 111.75m AOD for the U Shaped Barn 2 	Dutch Barns FFLs to be raised 600mm or more and Old Butchers Shop FFLs to be raised 300mm or more.
Level of Sleeping Accommodation	N/A ¹	All sleeping accommodation of the new dwellings will be at the ground floor level
Surface Water Drainage	N/A ¹	Surface Water Drainage Strategy recommended inclusive of appropriate SuDS features
Site Size	Approximately 30305m ²	No change
Risk to Development	Summary	Comment
EA Flood Zone	Flood Zones 1, 2, and 3	U Shaped Barn 1 and Barn 2 Old Butchers Shop (majority) are in Flood Zone 1. A small section to south of

Flood Source		the Old Butchers Shop is in Flood Zone 2. Majority of Dutch Barn 1 is in Flood 3 and Flood Zone 2
	Fluvial and Pluvial	
	SFRA Available	Shropshire Level 1 Strategic Flood Risk Assessment (Shropshire Council, 2018)
Management Measures	Summary	Comment
Ground floor level above extreme flood levels	No	Please refer to section 5 of this FRA
Safe Access/Egress Route	No	Safe access/ egress is possible up to the 1 in 100 years even. Occupants should travel to Frodesley.
Flood Resilient Design	Recommended	See section 5
Site Drainage Plan	N/A ¹	Surface Water Drainage Strategy recommended inclusive of appropriate SuDS features
Flood Warning & Evacuation Plan	Recommended	The owner/ residents of the site should sign up to the Rea Brook and Cound Brook EA flood alert service. Recommend also to sign up to receive Met Office Severe Weather warnings.
Offsite Impacts	Summary	Comment
Displacement of floodwater	Negligible	The proposed development is mostly change of use with the butcher shop proposing a change of use and extension. The extension is viewed to be a minor development.
Increase in surface run-off generation	No change in impermeable area.	Surface Water Drainage Strategy recommended inclusive of appropriate SuDS features

<p>Impact on hydraulic performance of channels</p>	<p>No</p>	<p>An unknow watercourse flowing through the site adjacent to the south/ southeast boundary of the site. The watercourse is approximately 15m east of the Old Butchers Shop, 38m east of Dutch Barn 1 and 28m eat of U Shaped Barn 1 and Barn 2.</p>
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¹ not required for this assessment. ² data not available.

1. Introduction

- 1.1. Aegaea were commissioned by Simon White to undertake a Flood Risk Assessment (FRA) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

- 1.3. The site of the proposed development is Denver House, Acton Burnell, Shrewsbury, Shropshire, SY5 7PQ (Figure 1)



Figure 1: Site Location (Source: Base map and data from Google Satellite Imagery © Contains public sector information licensed under the Open Government Licence v3.0)



Figure 2: Site Location Plan with Buildings Identified by name (Source: Batch Valley Design)

- 1.4. The existing site comprising an agricultural land and a number of residential dwellings including barns and an old butchers shop. The proposed development is for the conversion of barn 1 and barn 2 into residential dwellings, a conversion and extension of the Old Butchers Shop into a single storey residential dwelling, and a conversion of the Dutch barn 1 into residential dwelling.
- 1.5. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has been used to review the topography of the site (Figure 3). Analysis of the 1m LiDAR data shows that the ground elevation varies between approximately (AOD Above Ordinance Datum):
 - 106.71m AOD and 114.67m AOD for the Site In General
 - 109.16m AOD and 109.49m AOD for the Old Butchers Shop
 - 108.82m AOD and 109.83m AOD for the Dutch Barn 1
 - 109.38m AOD and 110.51m AOD for the U Shaped Barn 1
 - 109.90m AOD and 111.75m AOD for the U Shaped Barn 2

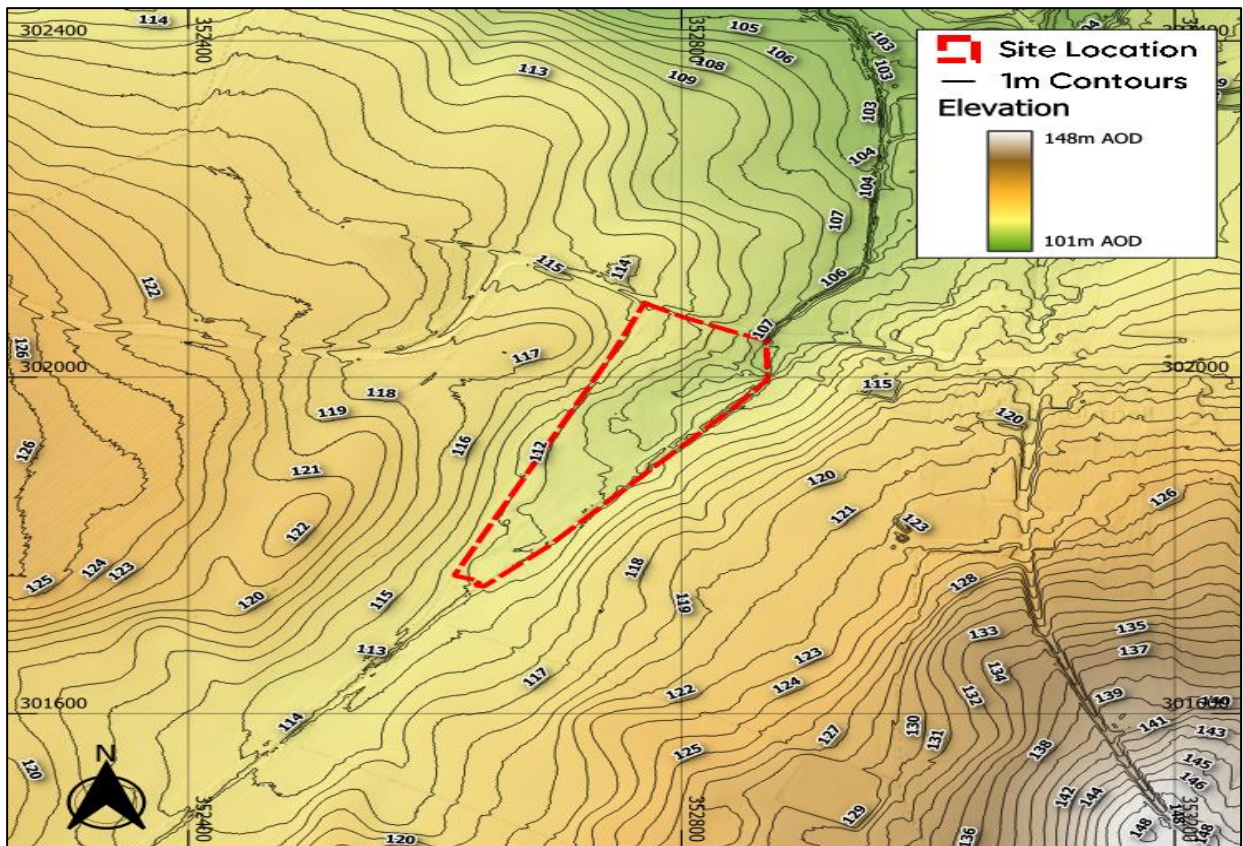


Figure 3: Site Topography (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 1.6. Shropshire Council is the Local Planning Authority (LPA) for the site, and also the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's West Midlands region.

Planning Policy and Guidance

- 1.7. UK government planning guidance states¹ that an FRA is required for developments which are:

- *in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*

¹ <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment>

- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)*
- *in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency*

1.8. The site is located within Flood Zone 3 and therefore an FRA is required in accordance with the NPPF.

1.9. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial/ Tidal flood risk
- Surface water flood risk
- Risk of flooding from other sources

2. Planning Policy

2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

National Planning Policy Framework (NPPF)

2.2. The National Planning Policy Framework² (NPPF) (DLUHC, 2021) which includes UK Government policy on development and flood risk states:

“159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*

² <https://www.gov.uk/guidance/national-planning-policy-framework>, last updated July 2021

- d) *any residual risk can be safely managed; and*
- e) *safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

2.3. Footnote 55 of the NPPF states:

“A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.”

2.4. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	<p>This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:</p> <p>land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or</p> <p>land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).</p> <p>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)</p>

- 2.5. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.
- 2.6. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

Shropshire Core Strategy

- 2.7. The Core Strategy Adopted in March 2011 prepared by the Local Planning Authority, Shropshire Council, sets out the policies for development in the local area. The proposed site lies under the jurisdiction of this LPA and therefore will be required to adhere to the local plan policies. The policy related to flood risk is replicated below:

CS18: Sustainable Water Management

Developments will integrate measures for sustainable water management to reduce flood risk, avoid an adverse impact on water quality and quantity within Shropshire, including groundwater resources, and provide opportunities to enhance biodiversity, health and recreation, by ensuring that:

- Planning applications and allocations in the Site Allocations and Management of Development (SAMDev) DPD, are in accordance with the tests contained in PPS25, and have regard to the SFRA's for Shropshire;*
- New development is designed to be safe, taking into account the lifetime of the development, and the need to adapt to climate change. Proposals should have regard to the design guidance provided in the SFRA's for Shropshire;*
- All development within local surface water drainage areas, as identified by the Water Cycle Study, and any major development proposals, demonstrate that surface water will be managed in a sustainable and coordinated way. Proposals will be supported by either a Surface Water Management Statement or Plan, depending on the scale of the development;*
- All developments, including changes to existing buildings, include appropriate sustainable drainage systems (SUDS) to manage surface water. All developments should aim to achieve a reduction in the existing runoff rate, but must not result in an increase in runoff;*
- New development improves drainage by opening up existing culverts where appropriate;*
- Proposals within areas of infrastructure capacity constraint, as identified by the Water Cycle Study and the Implementation Plan, and any major development,*

demonstrates that there is adequate water infrastructure in place to serve the development;

- New development enhances and protects water quality, including Shropshire's groundwater resources;*

- New development, including changes to existing buildings, incorporate water efficiency measures, in accordance with the sustainability checklist in Policy CS6, to meet the water efficiency objectives within the Shropshire Water Cycle Study to protect water resources and reduce pressure on wastewater treatment infrastructure.*

Sequential and Exception Tests

2.8. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.

Sequential Test

2.9. The Sequential Test is to be completed, if deemed necessary, by the client.

2.10. The majority of the Old Butchers Shop is located in Flood Zone 1 with only small section to the south is located in Flood Zone 2.

2.11. Dutch Barn 1 is located in Flood Zone 3 and 2 as such it may need to be relocated to a lower risk area (Flood Zone 1). However, given the proposed is a conversion of the existing building and its heritage value, relocating it to a lower risk area may not be appropriate.

2.12. U Shaped Barn 1 and Barn 2 are located in Flood Zone 1 and at low risk of flooding from surface water as such it is considered to be sequentially located.

Exception Test

2.13. The Exception Test is applied to sites based on the Flood Zone and the nature of the development. As the proposed development consists of a number of residential dwellings it would be classed as 'More Vulnerable' in line with government development use classes.

- 2.14. The Flood Risk Vulnerability Classification table³ provided below in Table 2 shows which vulnerabilities are appropriate in each Flood Zone.
- 2.15. The proposed development sits within Flood Zone 1, 2 and 3 and the proposed development consists of 'More Vulnerable' uses. Table 2 shows that Flood Zone 1, 2 and 3 is an appropriate location for 'More Vulnerable' uses without the implementation of the Exception Test.

Table 2: Flood Risk Vulnerability Classification

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	x	✓	✓	✓
Zone 3b	Exception Test required	x	x	x	✓

Summary

- 2.16. This flood risk assessment has been prepared with due consideration to the above local and national policy.

³ <https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2>

3. Consultation and Review

Consultation

- 3.1. The site is within the remit of Shropshire Council as Lead Local Flood Authority (LLFA).
- 3.2. The applicant has undertaken a pre-application PREAPP/22/00599. Within the pre-application drainage and flood risk is discussed. It is acknowledged that the development is shown to be in an area of fluvial and pluvial flooding. As this is a small development, a simple Flood Risk Assessment should be carried out to include:
 - i. What is the flood level, if known
 - ii. The existing ground levels and the finished floor levels
 - iii. Extents of flooding on the site, details of any flood defences protecting the site and to what level, contingency and evacuation procedures in the event of a flood.
 - iv. Flood resilience measures such as concrete floor tiles, raising electrical sockets, air brick covers, flood door guards, etc should be considered.
- 3.3. A consultation has been undertaken with the Environment Agency's West Midlands region to provide detailed flood risk modelling data for the site in form of Product 4. The EA responded with the following:

We are unable to provide you with a full product response because:

- *There is no detailed modelled information available for this site.*
- *We do not have any records of flooding in this area*

- 3.4. As such, RoFSW dataset will be used to analyse the risk of flooding from the watercourse in the pluvial section of this report.

Documents and Online Mapping

- 3.5. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.

3.6. The following sources of information have been reviewed for this assessment:

- Flood Map for Planning on the Environment Agency website <https://flood-map-for-planning.service.gov.uk/>
- Long Term Flood Risk Information on the Environment Agency website <https://www.gov.uk/check-long-term-flood-risk>
- National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021)
- Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
- Geoindex Onshore (British Geological Survey, 2022)
- Adopted Core Strategy⁴ (Shropshire Council, 2011)
- Preliminary Flood Risk Assessment⁵ (Shropshire Council, 2011)
- Shropshire Level 1 Strategic Flood Risk Assessment⁶ (Shropshire Council, 2018)
- Shropshire Local Flood Risk Management Strategy Summary⁷ (Shropshire Council, 2015)

Preliminary Flood Risk Assessment (PFRA)

3.7. The PFRA, published in 2011, is a high-level appraisal of flood risk across Lead Local Flood Authority Shropshire Council. The flood risk from all sources, including fluvial, surface water, groundwater and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.

3.8. The PFRA summarises historical flood incidents in Shropshire Council. The site is not recorded as having been affected by any flood event.

⁴ <https://www.shropshire.gov.uk/media/8534/core-strategy.pdf>

⁵ <https://www.shropshire.gov.uk/media/5939/preliminary-risk-assessment.pdf>

⁶ <https://www.shropshire.gov.uk/media/15667/shropshire-level-1-sfra-final-report.pdf>

⁷ <https://www.shropshire.gov.uk/drainage-and-flooding/policies-plans-reports-and-schemes/local-flood-risk-management-strategy/>

Strategic Flood Risk Assessment (SFRA)

- 3.9. The SFRA, published in 2018, provides the evidence base for the Local Planning Authority Shropshire Council Local Plan and guidance for consideration when determining planning applications. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.
- 3.10. The SFRA mapping provided by Shropshire Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

Local Flood Risk Management Strategy (LFRMS)

- 3.11. The Local Flood Risk Management Strategy sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives and actions of the Lead Local Flood Authority. The Shropshire Council LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

4. Sources of Flood Risk

Fluvial

4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.

Main Rivers and Ordinary Watercourses

4.2. There is an unknown watercourse flowing through the site adjacent to the south/ southeast boundary of the site. The watercourse is approximately 15m east of the Old Butchers Shop, 38m east of Dutch Barn 1 and 28m east of U Shaped Barn 1 and Barn 2.

4.3. There are no other mapped watercourses within the vicinity of the site.

4.4. The EA Flood Map for Planning (Figure 4) shows the site is located within Flood Zones 3, Flood Zone 2 and Flood 1. The Flood Zones are defined as follows;

- Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100 (1%).
- Flood Zone 2 is denoted as land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.
- Flood Zone 1 is denoted as land having less than 1 in 1,000 (0.1%) annual probability of river or sea flooding.

4.5. Based on the EA Map for planning, U Shaped Barn 1 and Barn 2 and the majority of the Old Butchers Shop are located in Flood Zone 1 with only a small section to south of the Old Butchers Shop is located in Flood Zone 2.

4.6. However, the majority of Dutch Barn 1 is located in Flood 3 and Flood Zone 2 with a small section to north of the building is located in Flood Zone 1.

4.7. Note that a Product 4 was requested from the EA. However, according to the EA there is no detailed modelled information available for this site and there are no records of flooding in this area. In absence of the EA detailed flood data to ascertain levels. A review of the Flood Zone 3 extent against LiDAR has been conducted to understand the flood level at the maximum elevation. The maximum elevation where the Dutch Barn 1 is located equates to 109.38m AOD. It can therefore be presumed that the 1 in 100 year flood level is equal to 109.38m AOD. Figure 5 below shows the maximum elevation with 1m LiDAR underlain and flood zone 3 atop.

4.8. As such, RoFSW dataset will be used to analyse the risk of flooding from the watercourse in the pluvial section of this report.

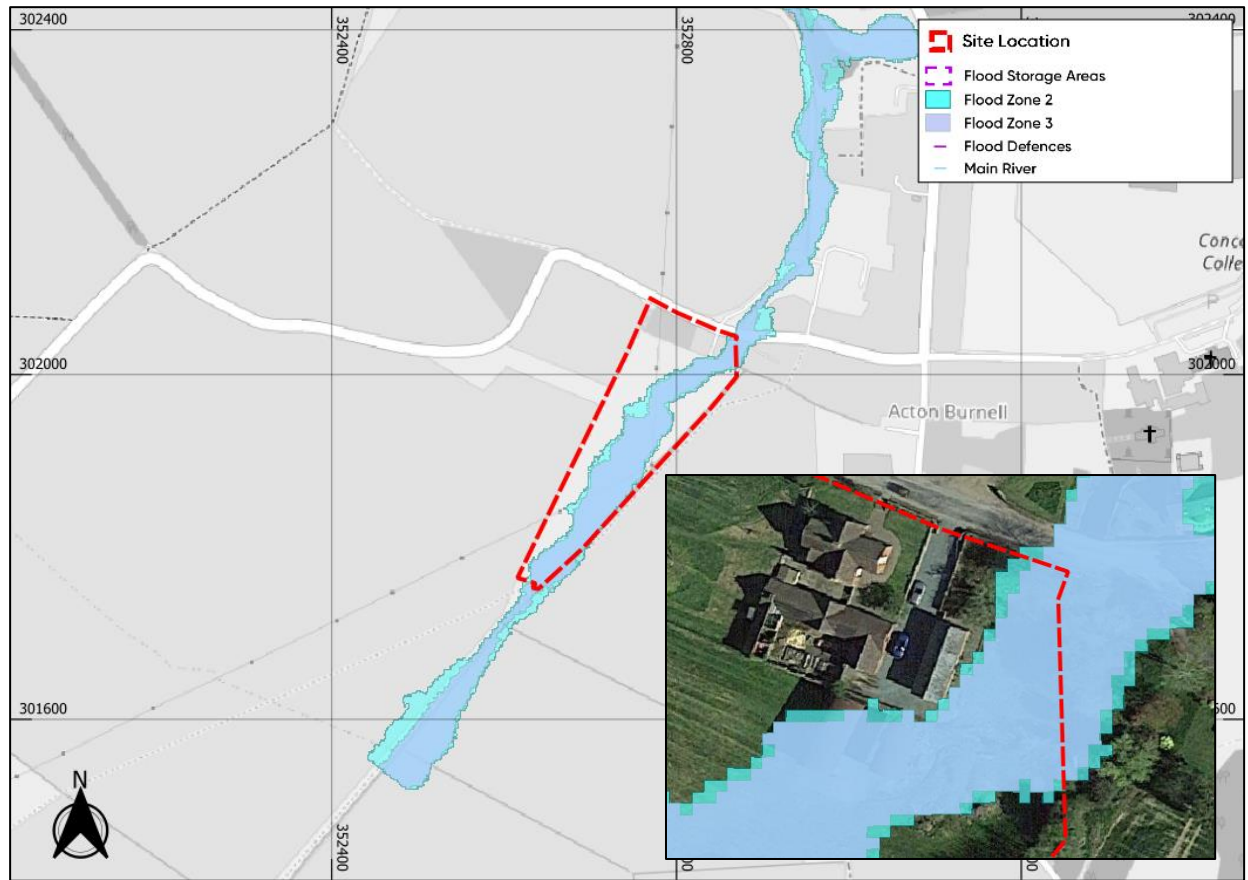


Figure 4: EA Flood Map for Planning (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

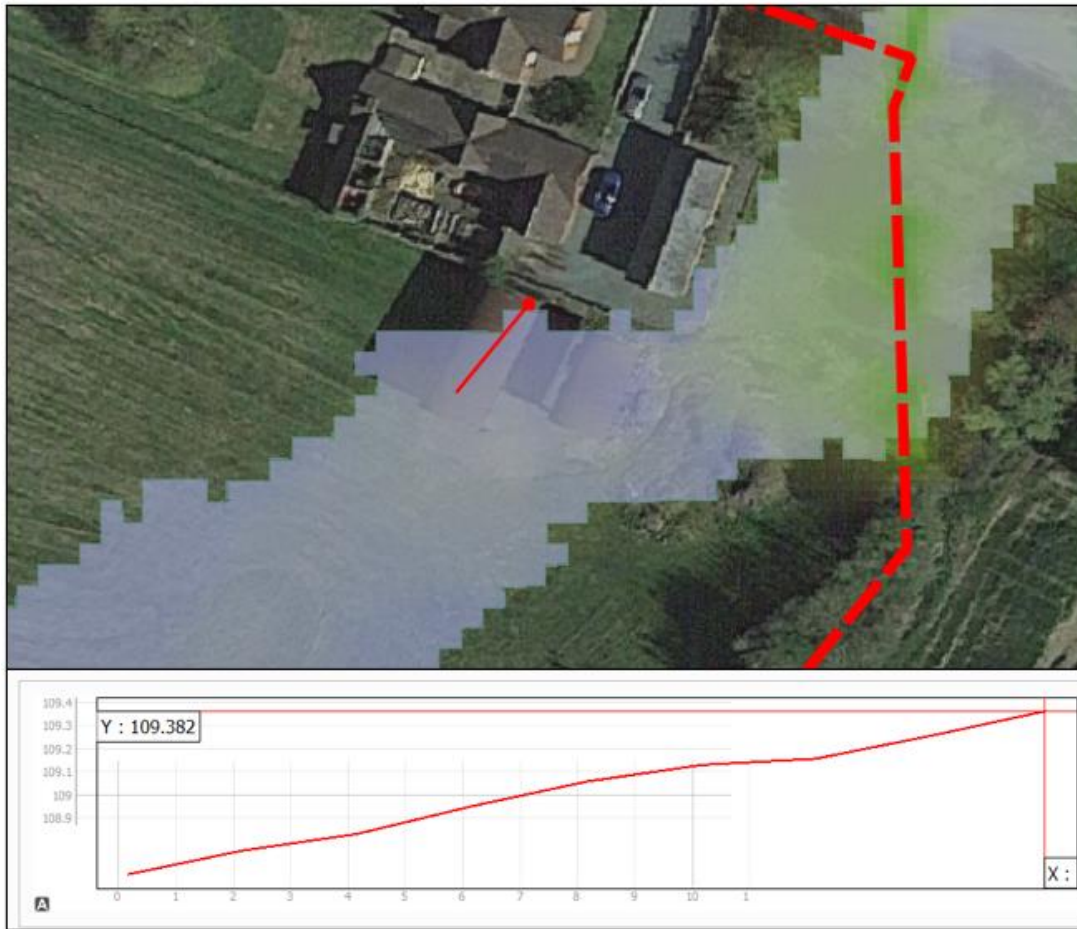


Figure 5: EA Flood Map for Planning with EA LiDAR underlain to obtain a maximum elevation of Flood Zone 3 (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Historical Fluvial Flooding

- 4.9. The EA Recorded and Historical Flood Outlines shows that there is no record of historical fluvial flooding on-site (Figure 6).

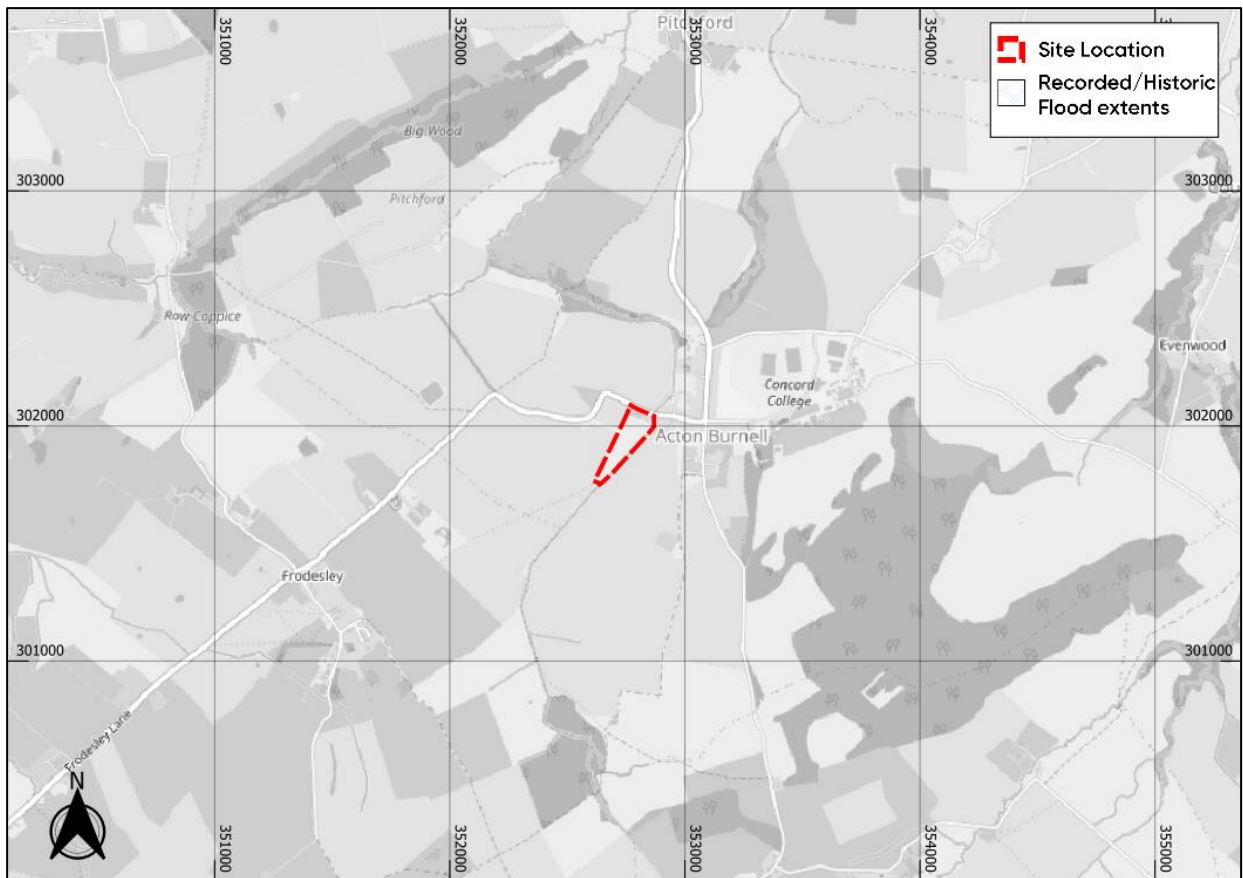


Figure 6: EA Historic Flood Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.10. Based on the information above, the proposed devolvement at:

- The U Shaped Barns 1 and 2 are considered to be at low risk of flooding from fluvial source.
- The Old Butchers Shop is considered to be at low (majority) to moderate risk of flooding from fluvial source.
- The Dutch Barn 1 is considered to be at high risk of flooding from fluvial source.

4.11. However, as previously discussed, the risk of flooding from fluvial source will be represented by the surface water mapping for this assessment.

Tidal

- 4.12. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the riverbank or river defences when tide levels are high.
- 4.13. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change. The risk of flooding from tidal sources is low.

Canals

- 4.14. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.
- 4.15. Flooding can also occur where a canal is impounded above surrounding ground levels, and the retaining structure fails.
- 4.16. There are no CRT canals identified within 1000m of the site.
- 4.17. The risk of flooding to this site from canals is considered to be low.

Pluvial

- 4.18. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.19. As discussed in the fluvial section, considering that there is no fluvial modelled data for the site, the surface water data will be used to assess the risk of flooding to the site.
- 4.20. Annual surface water flood risk is labelled by the EA as:
- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).

- 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
- 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
- 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).

4.21. Examination of the EA's Flood Risk from Surface Water mapping (Figure 7) for High Risk, Medium Risk, and Low Risk AEP flood events shows the site is affected by surface water flooding in each of the modelled surface water flood events.



Figure 7: EA Surface Water Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.22. In this section, the flood risk at each of the proposed development at U Shaped Barns 1 and 2, Old Butchers Shop and Dutch Barn will be analysed considering all the modelled surface water flood events (1:30 year, 1:100 year and 1:1000 year pluvial events). The flood depths at each of the proposed development are presented in the table below, Table 3.

Table 3: Pluvial/ fluvial flood risk at each of the proposed development

Dwellings	1:30 year (3.3%AEP)	1:100 year (1.0%AEP)	1:1000 year (0.1%AEP)
	Flood Depths (mm)		
U Shaped Barn 1	Not affected	Not affected	300-600
U Shaped Barn 2	Not affected	Not affected	Not affected
Old Butchers Shop	Not affected	Below 150	300-600
Dutch Barn 1	600-900	900-1200	Over 1200

Analysis of the 1 in 30

- 4.23. Analysis of flood depths during the modelled 'High' risk event (equivalent to the 1 in 30 year scenario – 3.3%AEP) (Figure 8) shows the site in general and the proposed development at Dutch Barn 1 could be affected by surface water flooding. The proposed development at U Shaped Barns 1 and 2 and Old Butchers Shop remains unaffected by surface water flooding in this event.
- 4.24. The proposed development at **Dutch Barn 1** could experience flood depths between 300mm and 600mm. Based on the lowest ground levels (EA LiDAR) at the location of the proposed development at Dutch Barn 1 (108.82m AOD), the maximum flood levels is estimated to be 109.98m AOD which implies the flood level is above the ground level. As such the proposed development at Dutch Barn 1 could be affected by flooding in the modelled 1:30 year (3.3%AEP) pluvial event.
- 4.25. The EA hazard rating/level of the flood extent on access road/ track is shown to be 'Low'. However, access/ egress might not be possible due the higher hazard in the wider network. As such safe refuge should be south on site/ to Flood Zone 1 area.

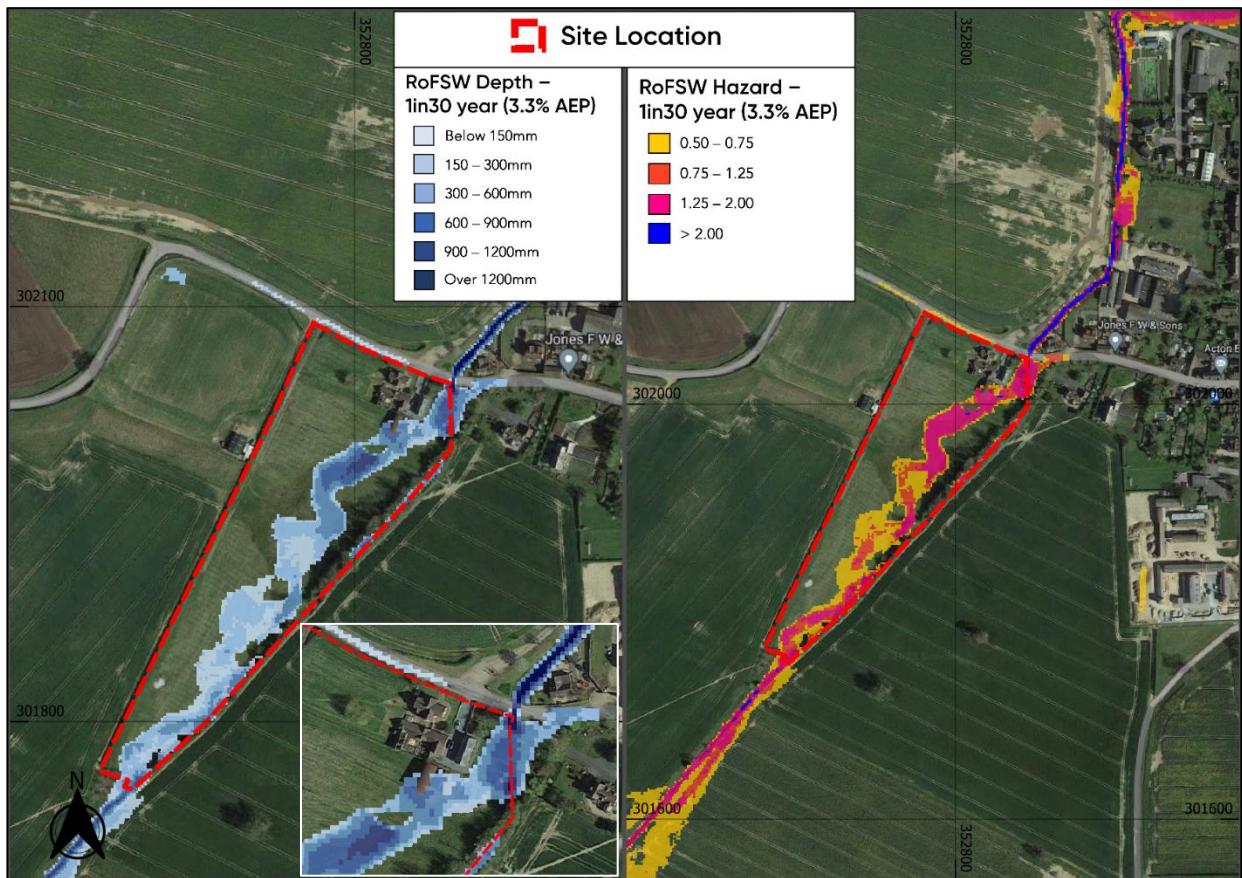


Figure 8: EA Surface Water Flood Risk Mapping 3.3% AEP (Source: Base map and data from Google Satellite Imagery © Contains public sector information licensed under the Open Government Licence v3.0)

Analysis of the 1 in 100

- 4.26. Analysis of flood depths during the modelled 'Medium' risk event (equivalent to the 1 in 100 year scenario – 1.0%AEP) (Figure 9) shows the site in general and the proposed development at Dutch Barn 1 and Old Butchers Shop could be affected by surface water flooding. The proposed development at U Shaped Barns 1 and 2 remains unaffected by surface water flooding in this event.
- 4.27. The proposed development at Dutch Barn 1 could experience flood depths between 900mm and 1200mm. Based on the lowest ground levels (EA LiDAR) at the location of the proposed development at Dutch Barn 1 (108.82m AOD), the maximum flood levels is estimated to be 110.02m AOD which implies the flood level is above the ground level. As such the proposed development at Dutch Barn 1 could be affected by flooding in the modelled 1:100 year (1.0%AEP) pluvial event.

- 4.28. The proposed development at Old Butchers Shop could experience flood depths below 150mm. Based on the lowest ground levels (EA LiDAR) at the location of the proposed development at Old Butchers Shop (109.16m AOD), the maximum flood levels is estimated to be 109.31m AOD which implies the flood level is slightly above the ground level. As such the proposed development at Dutch Barn 1 and Old Butchers Shop could be affected by flooding in the modelled 1:100year (1.0%AEP) pluvial event.
- 4.29. The EA hazard rating/level of the flood extent on access road/ track is shown to be 'Low'. However, access/ egress might not be possible due the higher hazard in the wider network. As such safe refuge should be south on site/ to Flood Zone 1 area.

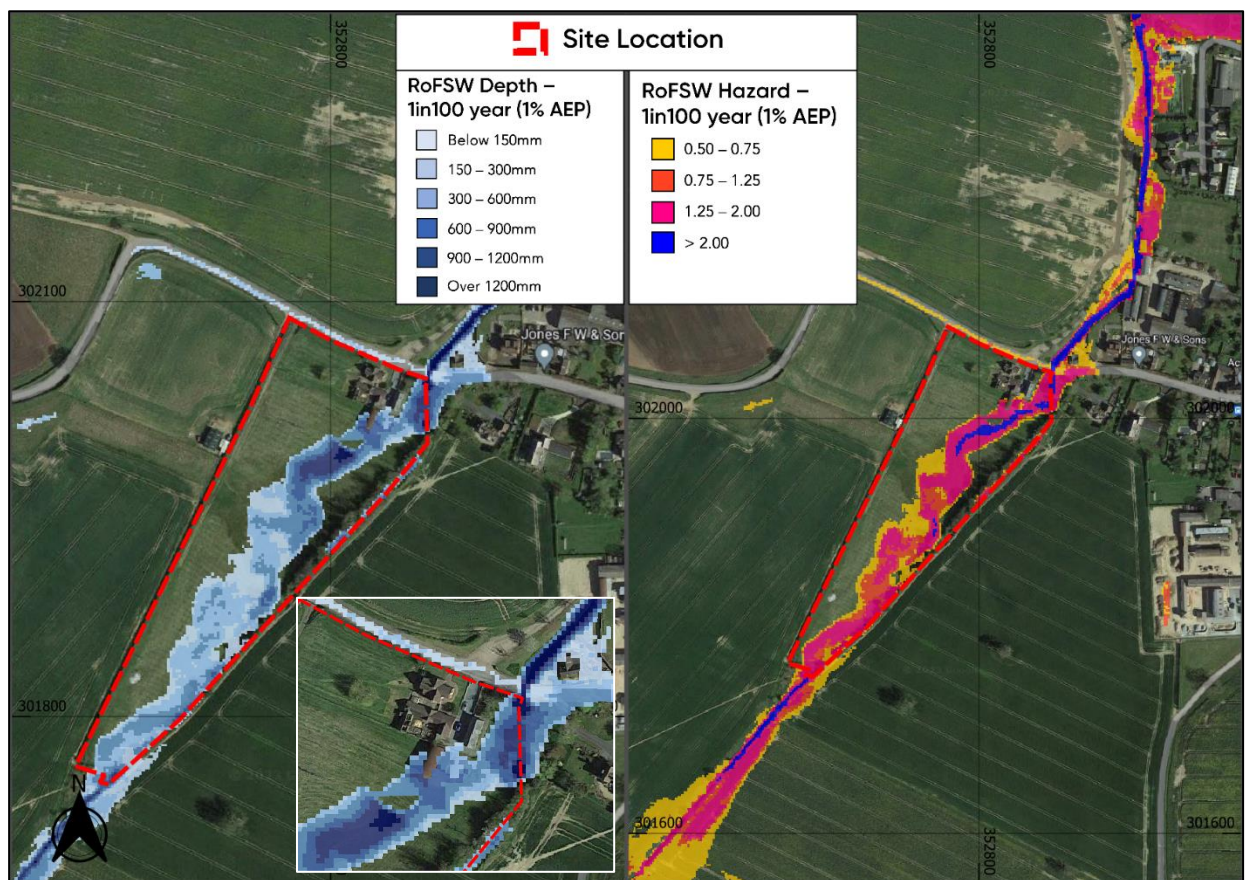


Figure 9: EA Surface Water Flood Risk Mapping 1.0% AEP (Source: Base map and data from Google Satellite Imagery © Contains public sector information licensed under the Open Government Licence v3.0)

Analysis of the 1 in 1000

- 4.30. Analysis of flood depths during the modelled 'Low' risk event (equivalent to the 1 in 1000 year scenario – 0.1AEP) (Figure 10) shows the site in general and the proposed development at Dutch Barn 1, Old Butchers Shop and U Shaped Barn 1 could be affected by surface water flooding. The proposed development at U Shaped Barns 2 remains unaffected by surface water flooding in this event.
- 4.31. The proposed development at Dutch Barn 1 could experience flood depths over 1200mm. Based on the lowest ground levels (EA LiDAR) at the location of the proposed development at Dutch Barn 1 (108.82m AOD), the maximum flood levels is estimated to be 110.12m AOD which implies the flood level is above the ground level. As such the proposed development at Dutch Barn 1 could be affected by flooding in the modelled 1:1000 year (0.1%AEP) pluvial event.
- 4.32. The proposed development at Old Butchers Shop could experience flood depths between 300 and 600mm. Based on the lowest ground levels (EA LiDAR) at the location of the proposed development at Old Butchers Shop (109.16m AOD), the maximum flood levels is estimated to be 109.76m AOD which implies the flood level is slightly above the ground level. As such the proposed development at Old Butchers Shop could be affected by flooding in the modelled 1:1000year (0.1%AEP) pluvial event.
- 4.33. The proposed development at U Shaped Barn 1 could experience flood depths between 300 and 600mm. Based on the lowest ground levels (EA LiDAR) at the location of the proposed development at Old Butchers Shop (109.38m AOD), the maximum flood levels is estimated to be 109.98m AOD which implies the flood level is above the ground level. As such the proposed development at Dutch Barn 1, Old Butchers Shop and U Shaped Barn 1 could be affected by flooding in the modelled 1:1000year (0.1%AEP) pluvial event.
- 4.34. Safe access/ egress might not be possible during this event as such safe refuge should be sought on site.

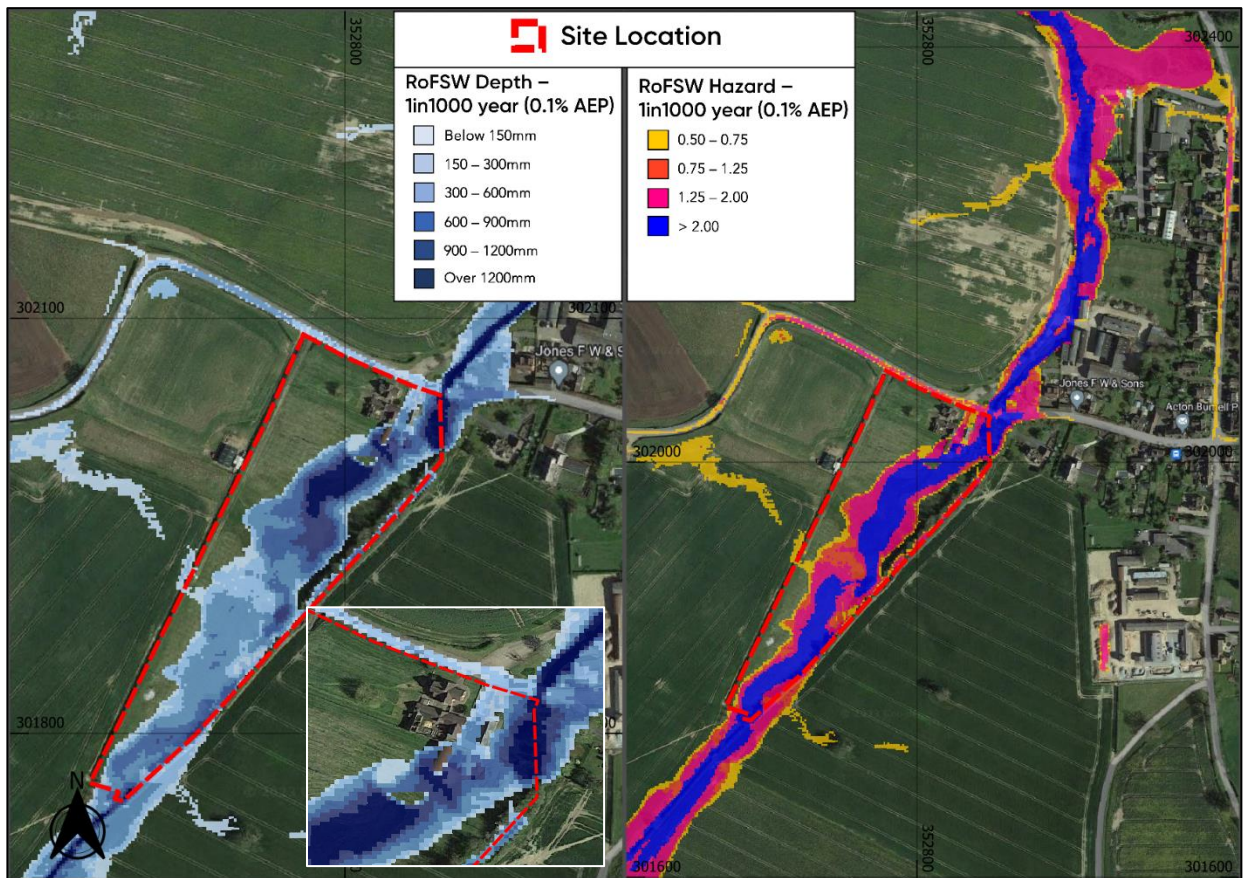


Figure 10: EA Surface Water Flood Risk Mapping 0.1% AEP (Source: Base map and data from Google Satellite Imagery © Contains public sector information licensed under the Open Government Licence v3.0)

4.35. Based on the analysis above:

- The proposed development at U Shaped Barns 1 and 2 is considered to be at low risk of surface water flooding.
- The proposed development at Dutch Barn 1 is considered to be at high risk of surface water flooding.
- The proposed development at Old Butchers Shop is considered to be at low (majority) to moderate risk of surface water flooding.

Reservoirs

- 4.36. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 4.37. According to the EA's Flood Risk from Reservoirs mapping (Figure 11) the site is outside flood extents in the event of reservoir flooding.

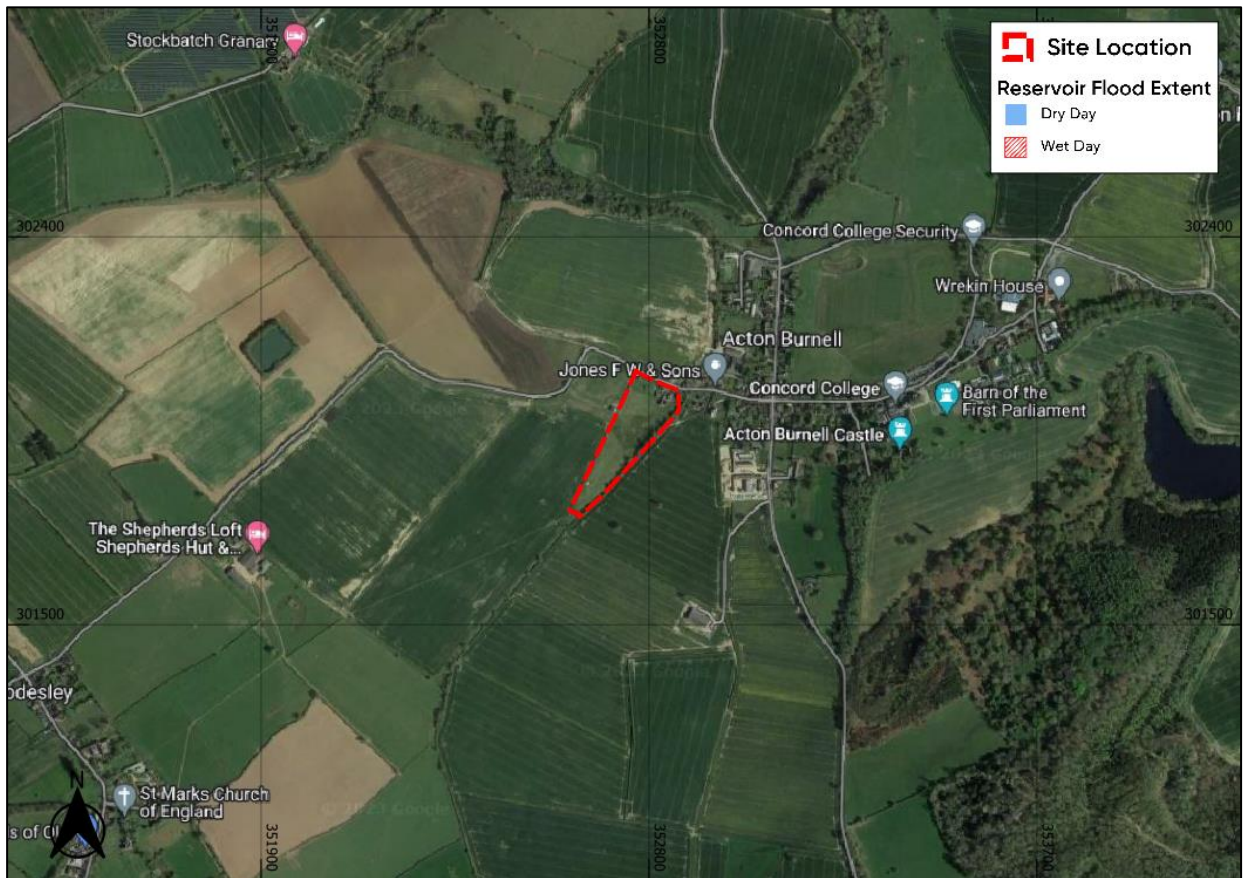


Figure 11: EA Reservoir Flood Risk Mapping Source: Base map and data from Google Satellite Imagery © Contains public sector information licensed under the Open Government Licence v3.0)

- 4.38. Based on the information above, the site is at low risk of flooding from reservoirs sources.

Groundwater

- 4.39. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.
- 4.40. The British Geological Survey's (BGS) mapping shows superficial deposits of Till, Devensian comprising diamicton underlying the site. The bedrock underlying the site is Salop Formation comprising mudstone, sandstone and conglomerate.
- 4.41. Historical BGS borehole (Ref: SJ50SW6,) is located approximately 109m east of the site. The record confirms that the geology at this location composed of clay and sandstone. Groundwater was identified as being struck at around 19.81m below well top.
- 4.42. Shropshire Council SFRA (2018) states the following in regard to groundwater flooding across Shropshire district:

The Areas Susceptible to Groundwater Flooding map shows that in general, the south of Shropshire is within the <25% susceptible classification, therefore is at a lower risk of groundwater flooding. Parts of the north of Shropshire fall within higher susceptibility classifications and are therefore at higher risk from groundwater flooding.

- 4.43. The SFRA presents the EA's Areas Susceptible to Groundwater Flooding mapping (Figure 12). The site is within a 1km cell of which 75% or more is considered susceptible to groundwater flooding.
- 4.44. There are no recorded historic groundwater flood incidents within the vicinity of the site and the development proposals do not include any proposed basements, as such the risk from groundwater to the development is considered to be relatively low.

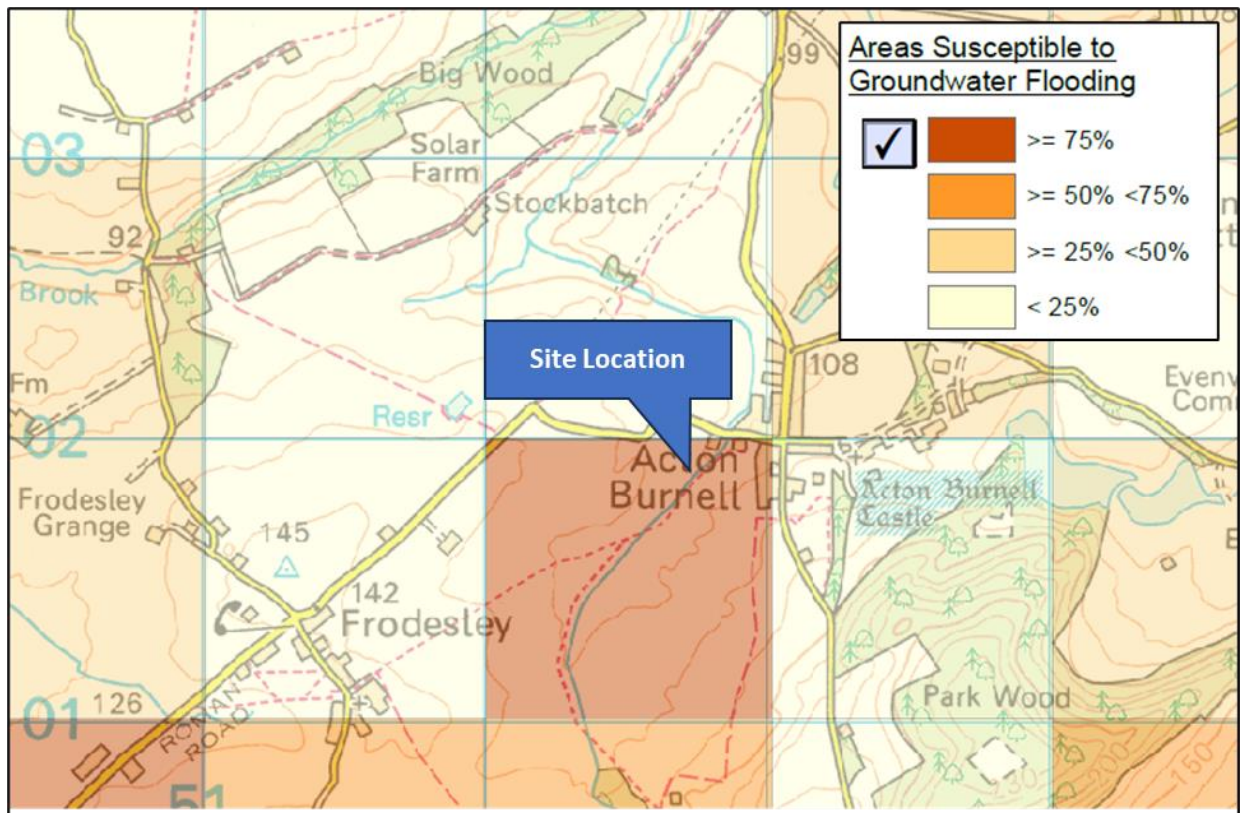


Figure 22: Area Susceptible to Groundwater Flood © Environment Agency (Shropshire Council SFRA, 2018)

Sewers

- 4.45. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.46. The SFRA provides mapping of historical sewer flood incident records kept by the local authority. No historical sewer surcharging incidents have been recorded in the vicinity of the site.
- 4.47. Local policy documentation does not identify the site as being in a Critical Drainage Area.
- 4.48. Based on the information above and as the site is located in a rural area, the risk of flooding from sewers sources is considered to be low.

5. Flood Risk Mitigation

Fluvial/ Pluvial

5.1. Based on the analysis within this report:

5.2. Dutch Barn 1:

- As discussed in paragraph 4.7, analysis of the greatest topographic level where flood zone 3 overlays on the Dutch Barn 1 is 109.38m AOD, adopting a conservative approach a freeboard of 600mm could be applied resulting in FFL of 109.98m AOD. Additional analysis of the pluvial extents has been conducted too this is discussed below.
- The proposed development at Dutch Barn 1 is considered to be at high risk of flooding from pluvial and fluvial.
- Of the modelled 1:30 year (3.3%AEP) pluvial event, the proposed development at Dutch Barn 1 could experience flood depths between 300mm and 600mm. Based on the lowest ground levels at its location (108.82m AOD), the maximum flood levels are estimated to be 109.98m AOD.
- Of the modelled 1:100 year (1.0%AEP) pluvial event, the proposed development at Dutch Barn 1 could experience flood depths between 900mm and 1200mm. Based on the lowest ground levels at its location (108.82m AOD), the maximum flood levels are estimated to be 110.02m AOD.
- Of the modelled 1:1000 year (0.1%AEP) pluvial event, the proposed development at Dutch Barn 1 could experience flood depths over 1200mm. Based on the lowest ground levels at its location (108.82m AOD), the maximum flood levels are estimated to be 110.12m AOD.
- Finished Floor Levels (FFLs): It is recommended that FFLs to be raised to at least 0.6m above the topographic level of 109.38mA OD (109.38mAOD + 600mm = 109.98m AOD).
- It is further recommended to provide additional flood resistance measures in the form of a flood door or flood barrier. It should be noted that depths greater than 600mm should not be promoted. However, if the FFL and entry threshold is 109.98m AOD plus a barrier of 600mm this would mitigate up to a flood level of 110.58m AOD which is greater than the 1 in 1000 surface water event by 0.46m.

5.3. Old Butchers Shop

- The proposed development at Old Butchers Shop is considered to be at low to moderate risk of flooding from pluvial and fluvial.
- Of the modelled 1:100 year (1.0%AEP) pluvial event, the proposed development at Old Butchers Shop could experience flood depths below 150mm. Based on the lowest ground levels at its location (109.16m AOD), the maximum flood levels are estimated to be 109.31m AOD.
- Of the modelled 1:1000 year (0.1%AEP) pluvial event, the proposed development at Old Butchers Shop could experience flood depths between 300 and 600mm. Based on the lowest ground levels at its location (109.16m AOD), the maximum flood levels are estimated to be 109.76m AOD.
- Finished Floor Levels (FFLs): FFLs are recommended to be raised 300mm above the 1 in 100 year surface water flood risk calculated level of 109.61m AOD.

5.4. U Shaped Barns 1 and 2

- The proposed development at U Shaped Barns 1 and 2 is considered to be at low risk of both pluvial and fluvial flooding.
- In the modelled 1:1000 (0.1%AEP) pluvial event, The proposed development at U Shaped Barn 1 could experience flood depths between 300 and 600mm. Based on the lowest ground levels at its location (109.38m AOD), the maximum flood levels are estimated to be 109.98m AOD.
- As such mitigation measures are not recommended.

5.5. Adopting a conservative approach, it is recommended that flood resilience measures are incorporated into the ground floor of the affected development to minimise the cost and time of recovery. The mitigation measures are recommended in accordance with the CLG Report, *Improving the Flood Performance of New Buildings - Flood Resilient Construction (2007)* including, where practical, measures such as the below:

- Solid (i.e. concrete floors) with waterproof screed.
- Raising wiring and power outlets at ground level
- Units to be raised on legs above the plinth.
- Air brick covers to be installed (if applicable).
- Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors.

- Any PVC window/door sills should be adequately sealed. Double glazing should be used to provide resistance against external flood water pressure.
- Seal holes and joints with mortar/silicone.

Tidal, Canal, Reservoirs, Groundwater and Sewers

- 5.6. Flood risk from other the above sources is deemed to be low, therefore mitigation is not required.
- 5.7. It is recommended that all new drainage associated with the scheme be fitted with non-return valves and that any new plumbing should be constructed in a closed-cell design.

Increase to Flood Risk Elsewhere

- 5.8. The proposed development is for the conversion of barn 1 and barn 2 into residential dwellings, a conversion and extension of the Old Butchers Shop into a single storey residential dwelling, and a conversion of the Dutch barn 1 into residential dwelling.
- 5.9. The butchers shop conversion and extension should be viewed as a minor development.
- 5.10. As such, the proposed development in isolation should have a negligible impact on flood risk elsewhere.

EA Flood Alert Service

- 5.11. As a further precaution and risk reduction, the owner of the site should sign up to the Rea Brook and Cound Brook EA flood alert service. This service allows site owners to register an address, which is at risk of flooding, along with contact details so that in the event of a flood being forecast, the site owner will be sent an alert directly to their chosen method of contact.
- 5.12. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g., proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g., bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g., communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.

Met Office Weather Warnings

- 5.13. Met Office is the national meteorological service for the UK; they issue weather warnings up to 5 days in advance, through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. It is also possible to stay up to date with weather warnings through the Met Office app (available on both Android and Apple), social media (Twitter, Facebook) or email alerts.
- 5.14. During periods of bad weather, owners/ residents should monitor local weather reports and sign up for the Met Office UK weather warnings. Warnings can be monitored through an Apple/Android app, Twitter or directly via emails.

6. Conclusions

- 6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at Denver House, Acton Burnell, Shrewsbury, Shropshire, SY5 7PQ. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 6.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

Source of Flooding	Flood Risk Summary
Fluvial/ Pluvial	<u>The site has been identified to be of low to high risk from both mechanisms of flooding. Mitigation measures are discussed in Section 5 of this FRA.</u>
Tidal Reservoirs Groundwater Sewers Canals	The site is at low risk from other sources. It is recommended that all new drainage associated with the scheme be fitted with non-return valves and that any new plumbing should be constructed in a closed-cell design.

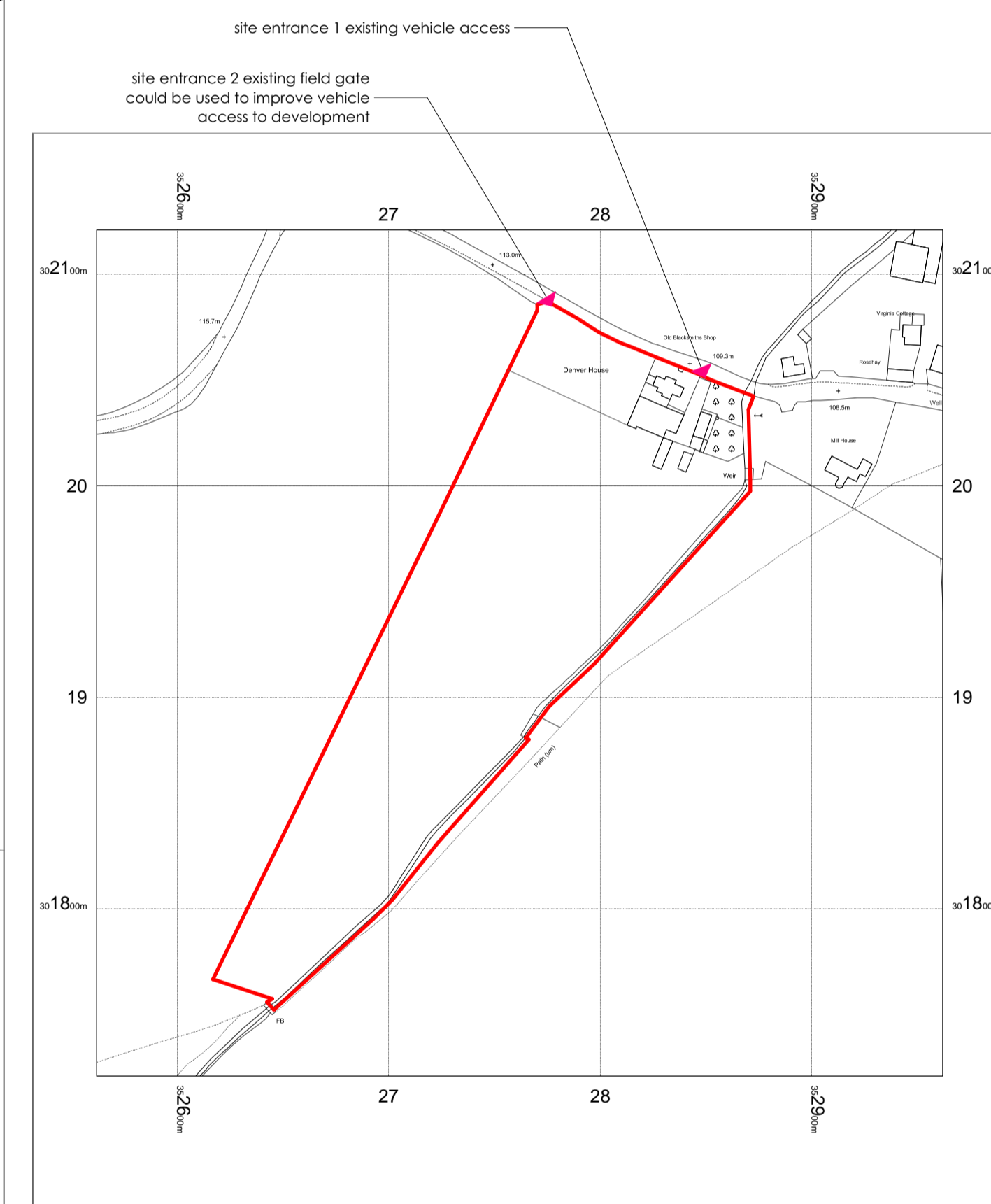
- 6.3. The FRA supports the planning application and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area.
- 6.4. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A - Development Proposals



PROPOSAL

1. Conversion of barns 1 and 2 into dwellings
2. New build to replace Old Butchers Shop
3. Conversion of larger Dutch barn 1 into dwelling



SITE PLAN

BATCH VALLEY DESIGN
ARCHITECTURAL SERVICES

job title
Residential Development
Denver House
Acton Burnell
SY5 7PQ

client
Davies

drawing
SITE PLAN

PREAPP PLANNING

drawing scale
1 : 200

paper size

job. num. rev.
805.01

date
AUG 2022

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