



Flood Risk Assessment for Planning

Prepared for:

S. L. Hall

September 2021

Our reference:

90968-RobsonArch-WestMeadows

Location:

West Meadows

West End

Driffield

YO25 4RR



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1. Key Facts

1.1 Flood Risk Posed:

- The site is situated entirely within Flood Zones 1, 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea).
- Modelled flood levels and flood extents have been requested from the EA as part of a Product 4 data request. No modelled flood data available.
- EA Surface Water Flood Map suggests that the site lies partially within an area of “Low” risk of flooding from surface water.
- It is understood that Kilham has experienced groundwater flooding previously. No records of groundwater flooding at the site previously have been provided however, and no basements are proposed as part of the change of use development.

1.2 Flood Risk Mitigation:

- It is recommended that the finished ground floor level is raised as much as feasible given the constraints of the existing building.
- Due to the nature of the development, existing drainage arrangements will be retained.
- Flood proofing of the development will be incorporated as appropriate.
- A flood warning and evacuation plan will be implemented post development.
- The applicant will register with the free Environment Agency Floodline Alert Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

2. Introduction

Unda Consulting Limited have been appointed by S. L. Hall (hereinafter referred to as “the applicant”) to undertake a Flood Risk Assessment for the proposed development at West Meadows, West End, Driffield YO25 4RR hereinafter referred to as “the site”). The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance.

The purpose of the study is to support a planning application for the proposed development.

The site appears to be located within Flood Zones 1, 2 and 3 as defined by the Environment Agency (EA) on their Flood Map for Planning. Under the National Planning Policy Framework (NPPF), a FRA is required if a proposed development:

- includes building or engineering works in Flood Zone 2 or 3;
- includes building or engineering works on land classified by the Environment Agency as having critical drainage problem;
- changes the use of land or buildings in a location at risk of flooding from rivers or the sea, or with critical drainage problems;
- changes the use of land or buildings in a way that increases the flood vulnerability of the development where it may be subject to other sources of flooding;
- is larger than 1 hectare.

The assessment should demonstrate to the Local Planning Authority (LPA) and EA how flood risk will be managed now and over the development’s lifetime, taking climate change into account, and with regard to the vulnerability of its potential users.

- whether the proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate.

3. Existing Situation

3.1 Site Usage:

The proposed application is for the change of use from a barn to residential. Existing site plans are provided in the report Appendix.

3.2 Geography:

The site is located approximately 60m north of West End road.

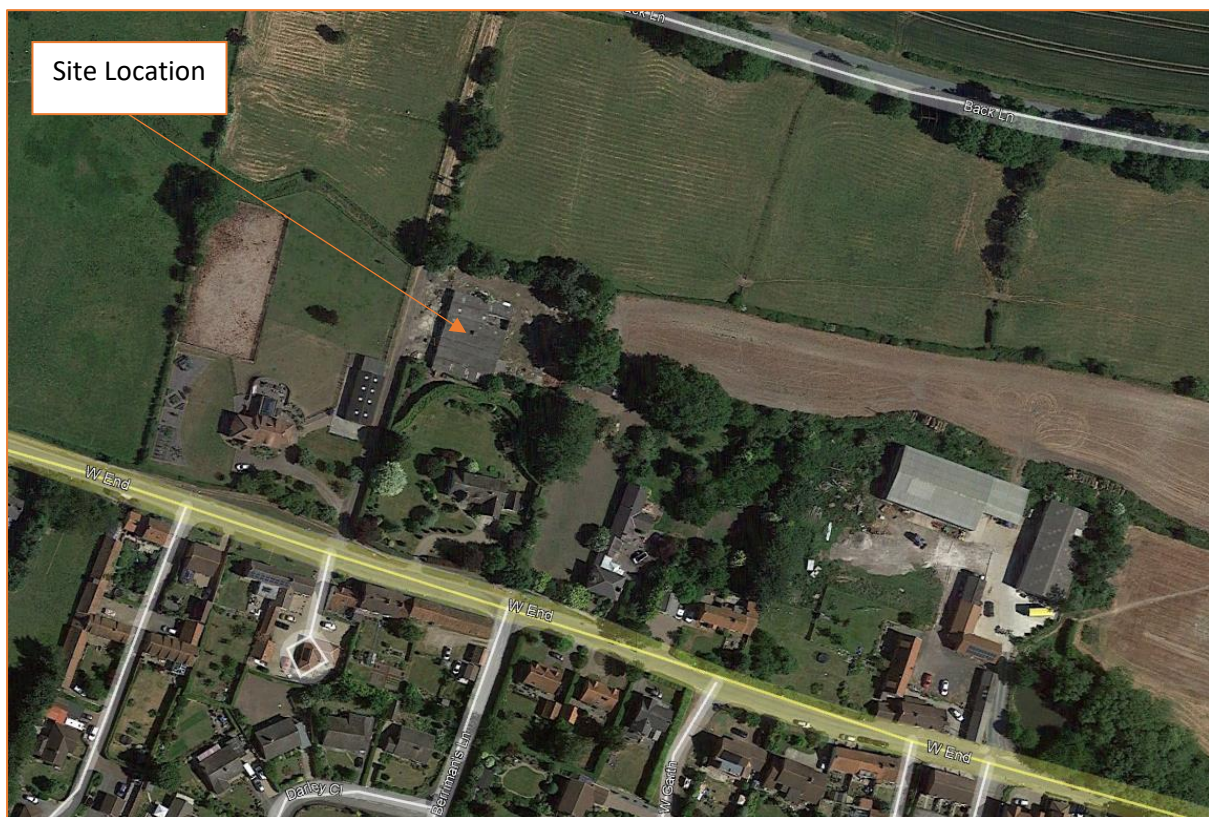


Figure 1: Aerial photograph of site and surrounding area (Source: Google Earth)

3.3 Topography:

Environment Agency LiDAR has been used to assess the topography across the site and wider area. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground surface. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at high spatial resolutions. The EA's LiDAR data archive contains digital elevation data derived from surveys carried out by the EA's specialist remote sensing team. Accurate elevation data is available for over 70% of England. The LiDAR technique records an elevation accurate to

+0.3m every 2m. This dataset is derived from a combination of the full dataset which has been merged and re-sampled to give the best possible coverage. The dataset can be supplied as a Digital Surface Model (DSM) produced from the signal returned to the LIDAR (which includes heights of objects, such as vehicles, buildings and vegetation, as well as the terrain surface) or as a Digital Terrain Model (DTM) produced by removing objects from the Digital Surface Model. 1.0m horizontal resolution DTM LiDAR data has been used for the purposes of this study.

LiDAR remotely sensed digital elevation data suggests that the ground topography on site ranges from approximately 29.65mAOD to 29.95mAOD.

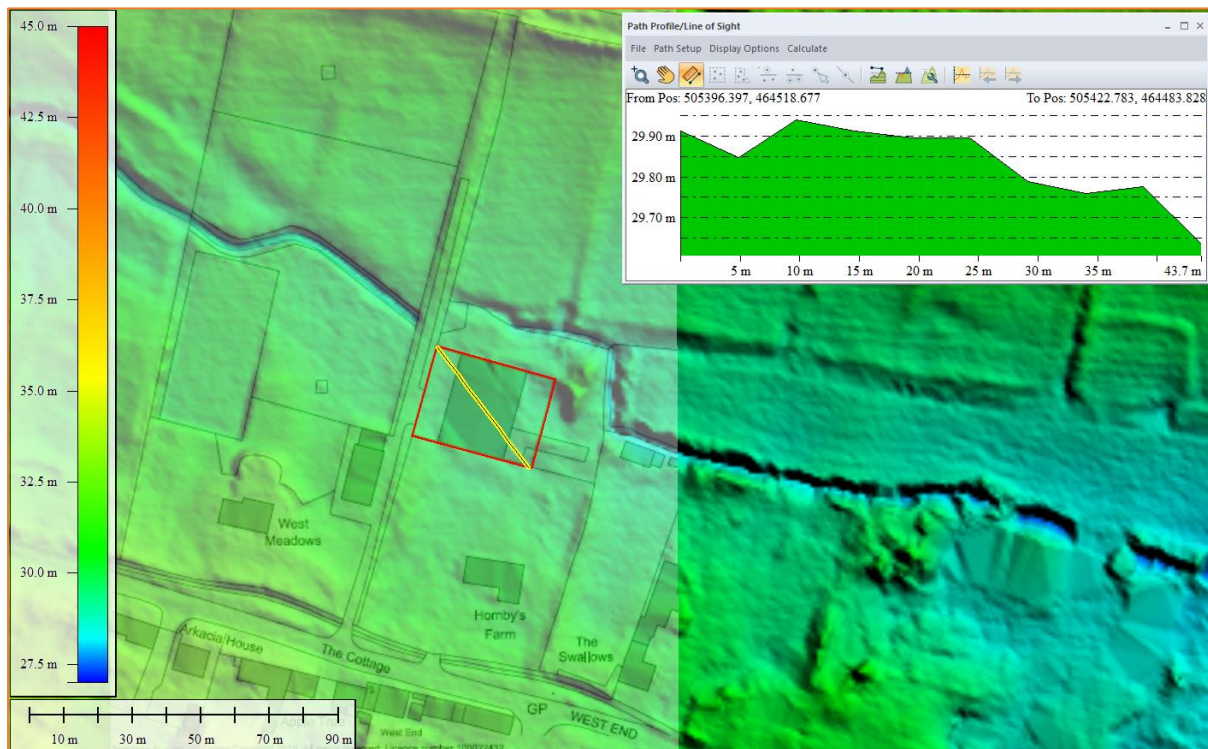


Figure 2: 1m EA LiDAR DTM showing topographic levels across the site. Transect inset runs from northwest to southeast (Source: EA LiDAR, OS Mapping)

3.4 Geology and Soil:

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site is Flamborough Chalk formation - Chalk.

The British Geological Survey (BGS) Map indicates the superficial deposits underlying the site are Sand and Gravel of Uncertain Age and Origin – Sand and Gravel.

The soil type taken from the UK Soil Observatory website is relatively deep soils from floodplain sand / gravel soil parent material. The soil has a sand to sandy loam soil texture.

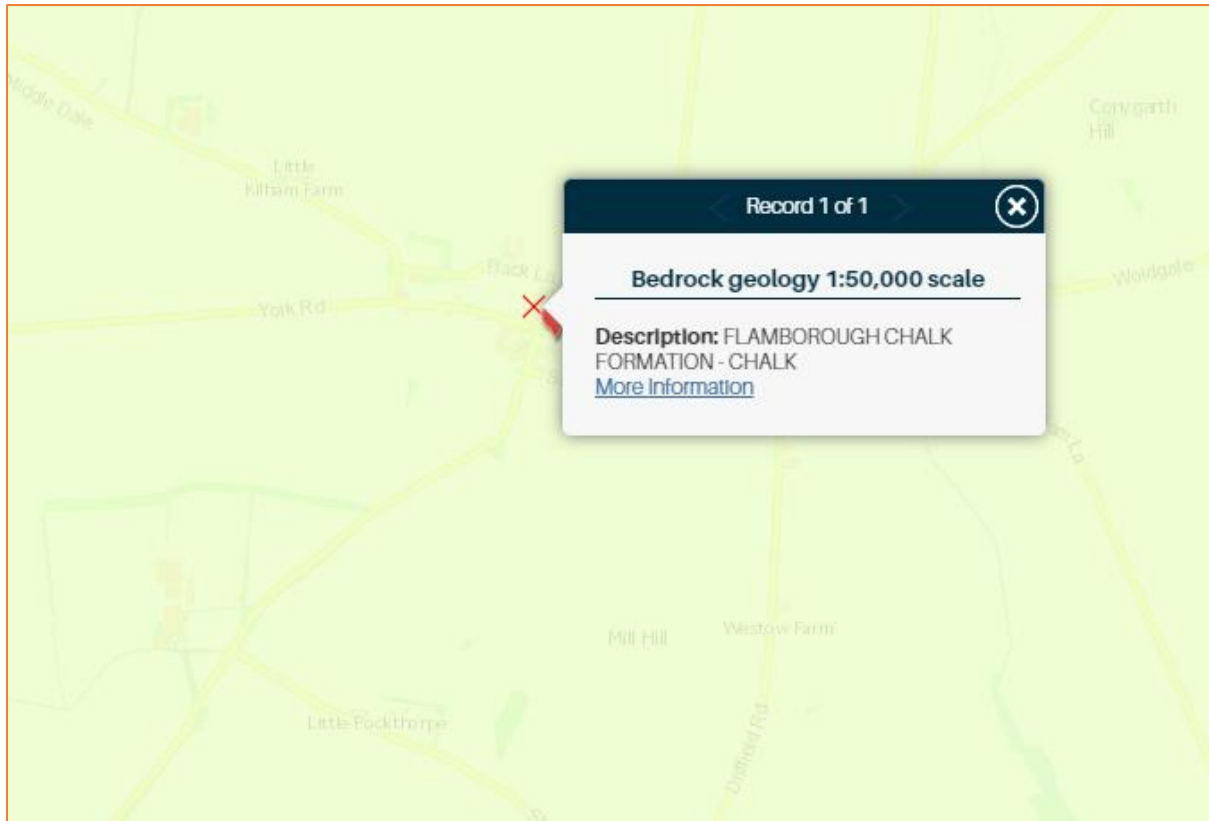


Figure 3: Local bedrock geology (Source: BGS)

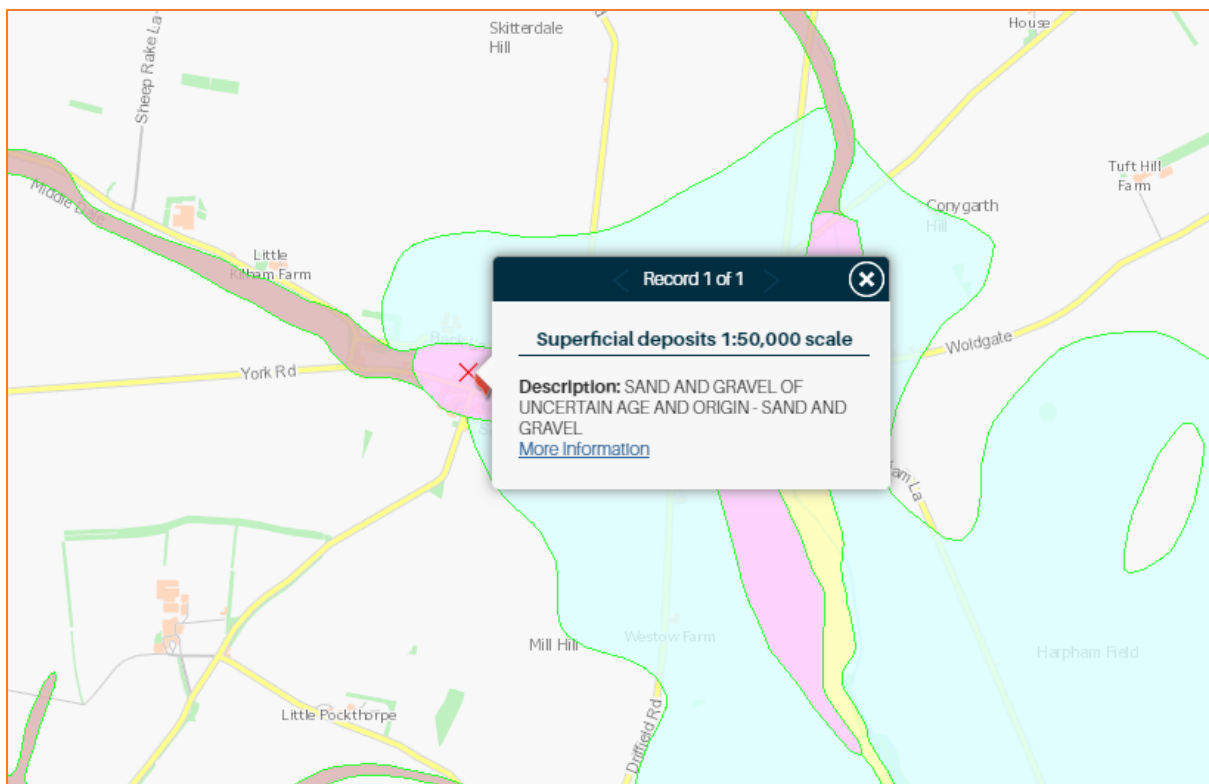


Figure 4: Superficial deposits geology (Source: BGS)

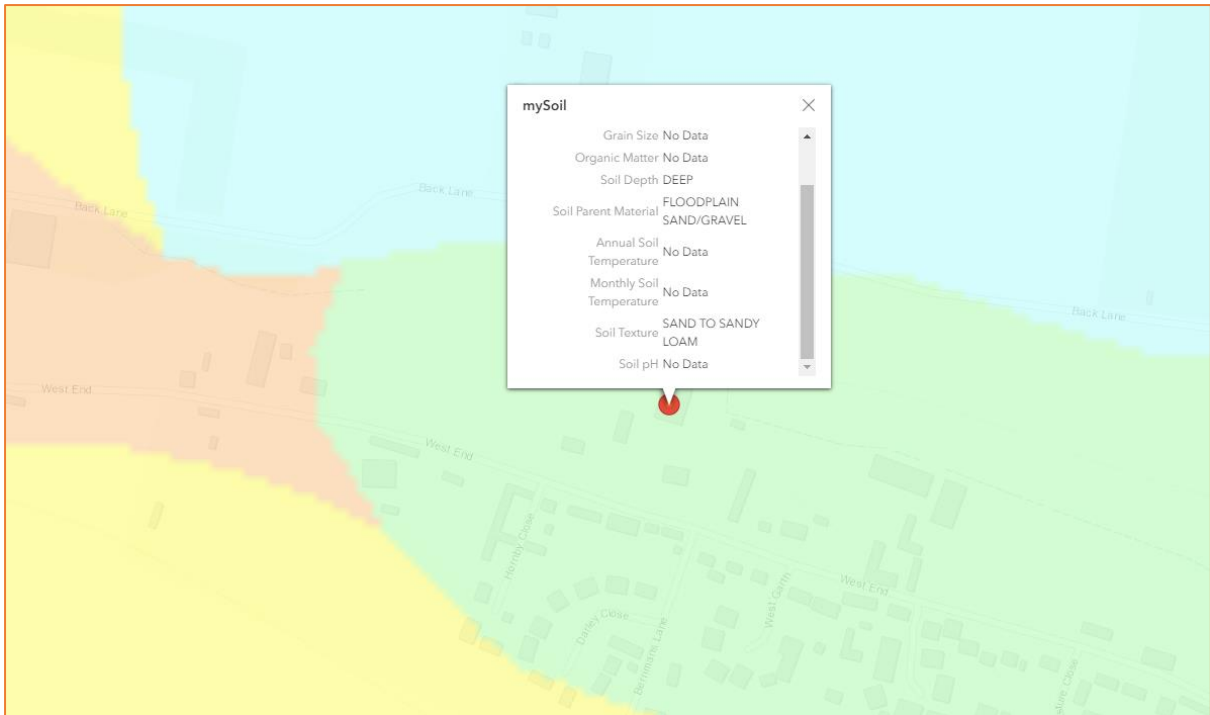


Figure 5: Local soil types (Source: UKSO)

4. Development Proposal

The proposed application is for the conversion of the existing barn to residential accommodation.



Figure 6: Proposed development plan (Source: Robson Architecture)

5. Assessment of Flood Risk

5.1 Flood Zones:

Within planning, Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's website.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – 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. (Land shown in light blue on the Flood Map)
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. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. 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)

Table 1: Flood Zones

The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

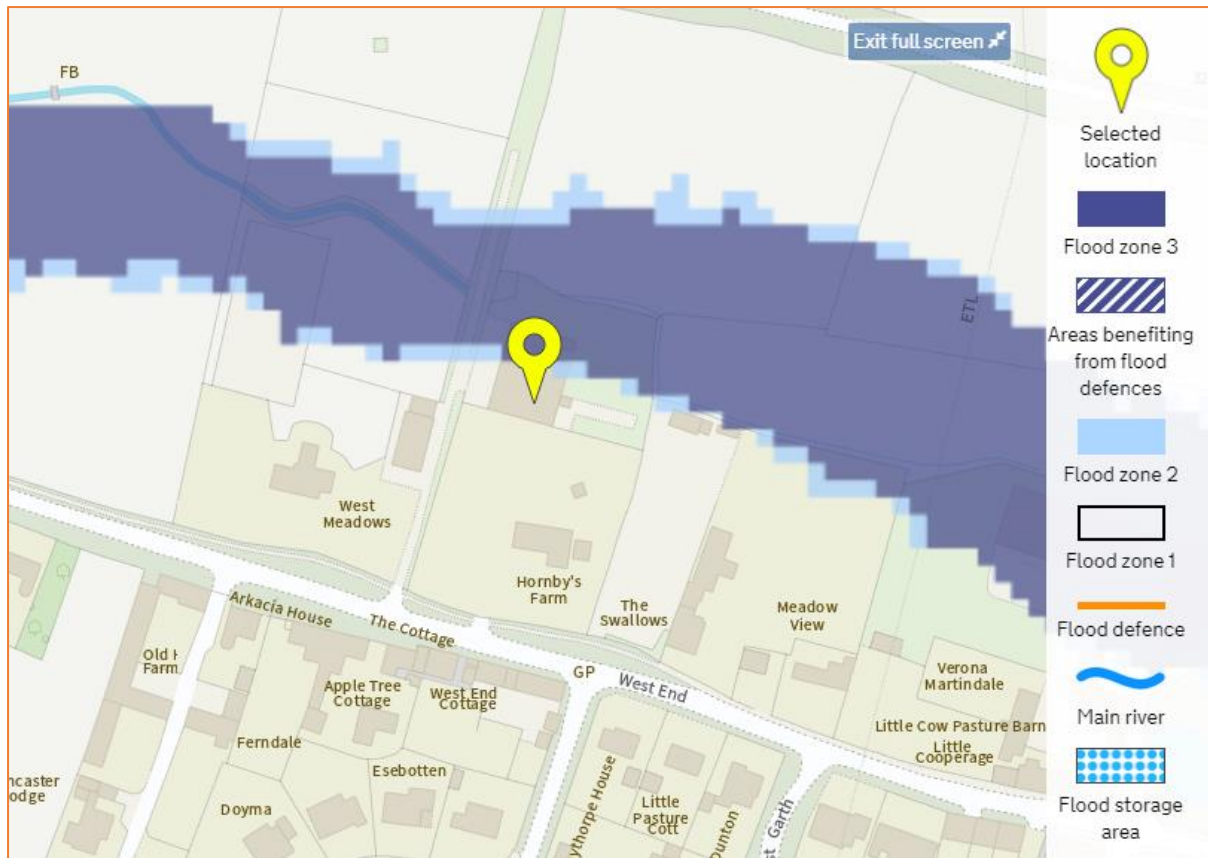


Figure 7: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

The site is located partially within Flood Zones 3a (High Probability), which means it is defined as 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 (Land shown in dark blue on the Flood Map), Flood Zone 2 (Medium Probability), which is defined as 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 (Land shown in light blue on the Flood Map), and Flood Zone 1 (Low Probability), which means it is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding.

The risk would appear to be predominantly fluvial and originate from a drain / tributary of the Lowthorpe Beck.

5.2 Fluvial (Lowthorpe Beck):

The drain / watercourse which flows along the northern site boundary (sometimes referred to as the Kilham Beck), is the primary watercourse and method of surface water disposal within the village. The beck runs from west to east and is fed by a spring at West End Farm, at the far western end of the village. The beck is generally dry during the summer, while elevated groundwater levels feed the beck during the winter months.

The beck is also culverted along a number of sections, beneath Chapel Lane and Church Street, effectively restricting the flow of the watercourse at these points. The beck then flows into Bakehouse Drain at the end of Church Street, a short length of watercourse which then discharges into Lowthorpe Beck.

5.2.1 Modelled flood levels and events:

Product 4 modelled flood levels and extents have been requested from the Environment Agency for use within this report. The EA has confirmed that the site is located in an area of Flood Zones 1, 2 & 3 where they do not have modelled flood levels.

The area is covered by national generalised modelling which is only suitable for Flood Zone extent visualisation, not levels or depths data. In 2004 the EA completed national generalised modelling to produce catchment scale Flood Zones (using JFLOW modelling techniques), the calculation process produced water depths as a by-product. Since the modelling methods used were developed, tested and reviewed to produce Flood Zone extents only, the EA currently have no information on the accuracy of the depth data.

To carry out additional surveying, hydrological calculations and hydraulic calculations or hydraulic modelling to calculate a flood level for the site would be a very costly and time consuming exercise for the client, and we strongly feel that this would not be proportionate to the nature or scale of the development (conversion of an existing building to residential).

The East Riding of Yorkshire Council SFRA shows an indicative climate change extent for areas not covered by detailed modelling, this equates to the extent of Flood Zone 2. Flood Zone 3 with an allowance for climate change is therefore shown to be equivalent to Flood Zone 2.

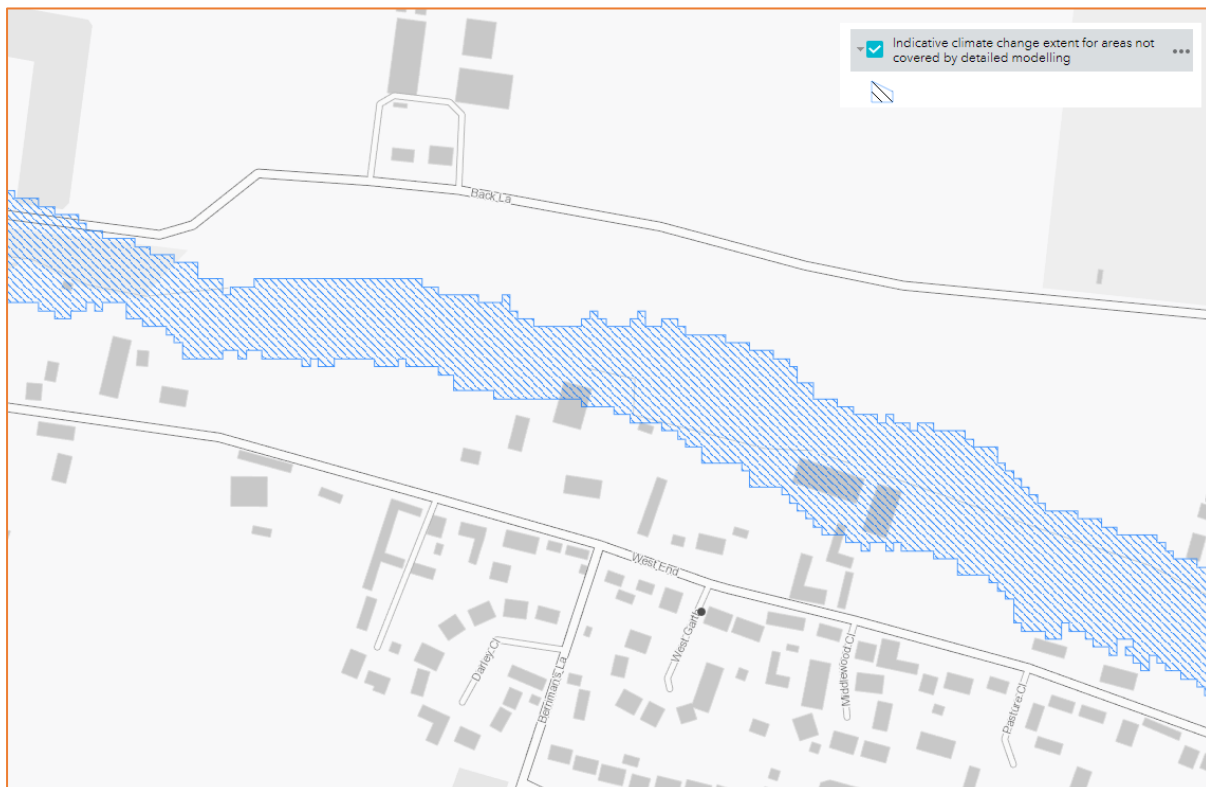


Figure 8: Indicative Flood Zone 3a climate change extent for areas not covered by detailed modelling
(Source: East Riding of Yorkshire Council SFRA)

5.2.2 Flood Storage Areas:

Flood Storage Areas are areas that act as a balancing reservoir, storage basin or balancing pond. Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. Flood storage areas do not completely remove the chance of flooding and can be overtopped or fail in extreme weather conditions.

According to Environment Agency data, there are no Flood Storage Areas located in close proximity to the site.

5.2.3 Flood Defences:

A flood defence or EA Asset is any man-made or natural feature – such as a raised defence, retaining structure, channel, pumping station or culvert – that performs a flood defence or land drainage function.

The EA has confirmed that there are no formal flood defences or flood alleviation works identified in the area.

5.2.5 Residual risk (breach or overtopping of flood defences):

Breaching of flood defences can cause rapid inundation of areas behind flood defences as flow in the river channel discharges through the breach. A breach can occur with little or no warning, although they are much more likely to concur with extreme river levels or tides when the stresses on flood defences are highest. Flood water flowing through a breach will normally discharge at a high velocity, rapidly filling up the areas behind the defences, resulting in significant damage to buildings and a high risk of loss of life. Breaches are most likely to occur in soft defences such as earth embankments although poorly maintained hard defences can also be a potential source of breach.

Overtopping of flood defences occurs when water levels exceed the protection level of raised flood defences. The worst case occurs when the fluvial or tidal levels exceed the defence level as this can lead to prolonged flooding. Less severe overtopping can occur when flood levels are below defence levels, but wave action causes cyclic overtopping, with intermittent discharge over the crest level of the defence. Flood defences are commonly designed with a freeboard to provide protection against overtopping from waves. The risk from overtopping due to exceedance of the flood defence level is much more significant than the risk posed by wave overtopping. Exceedance of the flood defence level can lead to prolonged and rapid flooding with properties immediately behind the defences at highest risk.

Flood defences act to defend the site from direct inundation, but there is residual risk from each (failure) and overtopping (exceedance) of flood defences.

5.2.6 Historical flood events:

The EA has no records of historical flooding recorded for the site. The East Riding of Yorkshire Council SFRA shows no records of flooding at the site.

5.3 Pluvial (Surface Water):

Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.

The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- 1:30 (3.3%)
- 1:100 (1%)
- 1:1000 (0.1%)

The mapping below shows the Risk of Flooding from Surface Water centred on the postcode. Please note that the EA do not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.

The EA Risk of Flooding from Surface Water Map suggests that the site lies partially within an area of "low" risk of flooding from surface water.

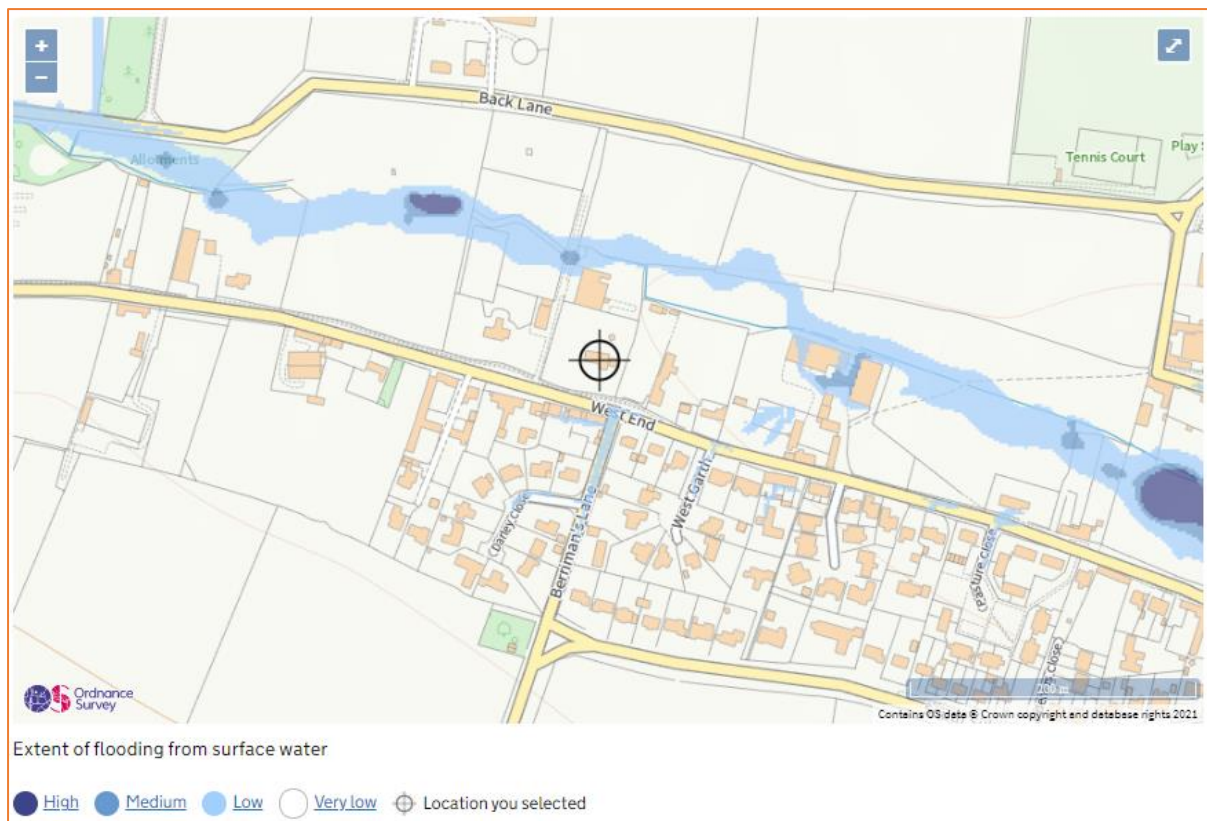


Figure 9: Extract from Environment Agency Surface Water Flood Map (Source: EA)

Closer inspection of the EA's Risk of Flooding from Surface Water data, shows that for the 1:1000 year event (Low Risk), the maximum depth of flooding at the location of the existing building is 0.30m.

It is recommended that the finished ground floor level of the proposed development is raised as much as feasible given the constraints of the existing building. It is therefore recommended that the finished ground floor level is raised 300mm above adjacent ground levels – if feasible given the constraints of the existing building.

A flood proof door should be installed for all external ground floor level doors, or 600mm demountable flood defence barriers to defend external doors if flood proof doors are not practical or other planning constraints prevent it.

5.4 Groundwater:

Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.

The East Riding of Yorkshire Council SFRA shows the site to fall within an area with a <25% susceptibility to groundwater flooding. No records of groundwater flooding at the site previously have been provided however, and no basements are proposed as part of the change of use development.

It is understood however that the watercourses in the vicinity of the site are likely to be spring fed. Incidents of property flooding as a result of elevated groundwater levels were recorded in Kilham in November 2000 and late 2012/early 2013. While parts of West End to the east of the site are shown have been affected by this flooding, the site itself (and West End adjacent to the site) is shown to be unaffected.

If the finished ground floor level can be raised 300mm above adjacent ground levels (if feasible given the constraints of the existing building), this would act to mitigate any potentially elevated groundwater levels.

5.5 Sewer Surcharge:

Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface

water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

In 2003, it is understood that the foul water sewer in Kilham was inundated by groundwater. Sewer flooding occurred in Kilham again in 2013 where properties in the western/central areas of the village and along Church Street suffered restricted toilet use at various points during the period of flooding.

5.6 Other Sources:

Reservoirs with an impounded volume in excess of 25,000 cubic metres (measured above natural ground level) are governed by the Reservoirs Act and are listed on a register held by the Environment Agency. The site lies outside the maximum inundation extent on the EA Reservoir Inundation Map. The EA also advise on their website that reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. All major reservoirs have to be inspected by specialist dam and reservoir Engineers. In accordance with the Reservoirs Act 1975 in England, these inspections are monitored and enforced by the EA themselves. The risk to the site from reservoir flooding is therefore minimal and is far lower than that relating to the potential for fluvial / tidal flooding to occur. The Environment Agency Reservoir Flood Map illustrated below, illustrates the largest area that might be flooded if the storage area were to fail and release the water it is designed to hold during a flood event.

Records of flooding from reservoirs and canals are erratic as there is no requirement for the Environment Agency to provide information on historic flooding from canals and raised reservoirs on plans. In particular, the NPPF does not require flood risk from canals and raised reservoirs to be shown on the Environment Agency flood zones.

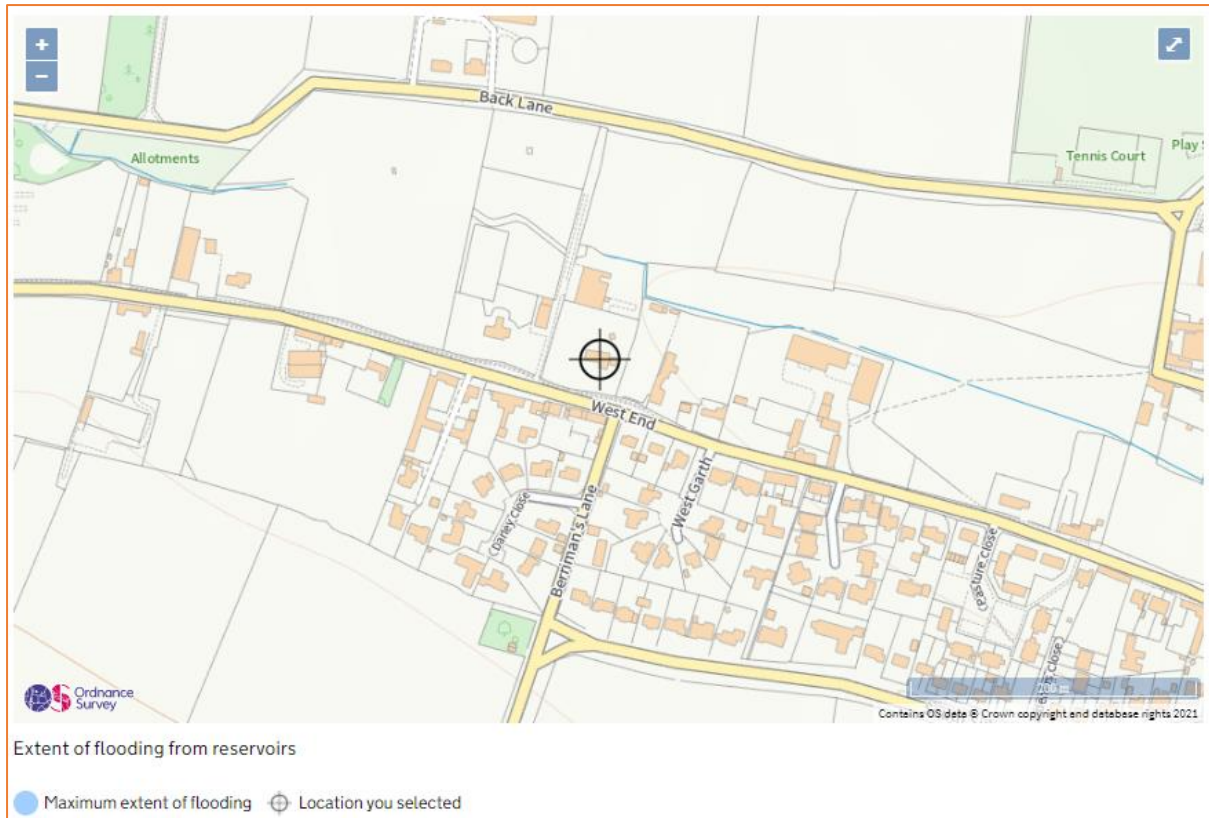


Figure 10: Extract from Environment Agency Reservoir Flood Map (Source: EA)

6. Flood Risk Management

6.1 Vulnerability to flooding:

The NPPF classifies property usage by vulnerability to flooding.

The existing site usage is classified as “less vulnerable” throughout, as it is a barn.

Post development, the site will become “more vulnerable”, as the application is for the conversion of the barn to residential accommodation.

Accordingly, it is considered that the vulnerability of the site as a whole will be increased post development.

6.2 EA Standing Advice:

The EA Standing Advice guidance is for domestic extensions and non-domestic extensions where the additional footprint created by the development does not exceed 250m². It should not be applied if an additional dwelling is being created, e.g. a self-contained annexe or additional commercial unit.

The proposed application is for the Change of a barn to residential accommodation.

6.3 Physical Design Measures:

The application is for the change of use of existing building.

It is recommended that the finished ground floor level of the proposed development is raised as much as feasible given the constraints of the existing building. It is therefore recommended that the finished ground floor level is raised 300mm above adjacent ground levels – if feasible given the constraints of the existing building.

A flood proof door should be installed for all external ground floor level doors, or 600mm demountable flood defence barriers to defend external doors if flood proof doors are not practical or other planning constraints prevent it.

To mitigate against ingress of floodwater, it is suggested the applicant implement flood resistant design measures into the ground floor in consultation with the Local Authority building control department. The following measures are recommended:

- Waterproof screed used on ground floor;
- Closed-cell foam used in wall cavities;
- Waterproof internal render at ground floor level;
- Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Plumbing insulation of closed-cell design;
- Non-return valves fitted to all drain and sewer outlets;
- Manhole covers secured;

- Anti-syphon fitted to all toilets;
- New kitchen units of solid, water resistant material;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at ground floor level;
- All external doors to be flood proof / flood defence doors;
- New wiring or electrical circuit run from ceiling, with raised sockets at least 600mm above ground level.

It is recommended that the finished ground floor level of the proposed development is raised as much as feasible given the constraints of the existing building. It is therefore recommended that the finished ground floor level is raised 300mm above adjacent ground levels – if feasible given the constraints of the existing building.

A flood proof door should be installed for all external ground floor level doors, or 600mm demountable flood defence barriers to defend external doors if flood proof doors are not practical or other planning constraints prevent it.

6.4 Safe Escape and Flood Action Plan:

The NPPF requires a route of safe escape for all residents and users to be provided from new residential properties in Flood Zone 3. Safe escape is usually defined as being through slow moving flood water no deeper than 25cm.

The site is situated partially within Flood Zones 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea).

As such, safe escape will be provided by a flood warning and evacuation plan, which will be prepared in liaison with the Council's Emergency Planners and tied in with the existing emergency plans for the area.

Residents and users should follow the warning and evacuation procedure detailed in the following section.

The southern half of the site, and West End to the south of the site is shown to be entirely within Flood Zone 1. A route of escape away from the source of flooding, and into an area entirely within Flood Zone 1 can be provided, by travelling south along the site access to reach West End, and then travelling west along West End.

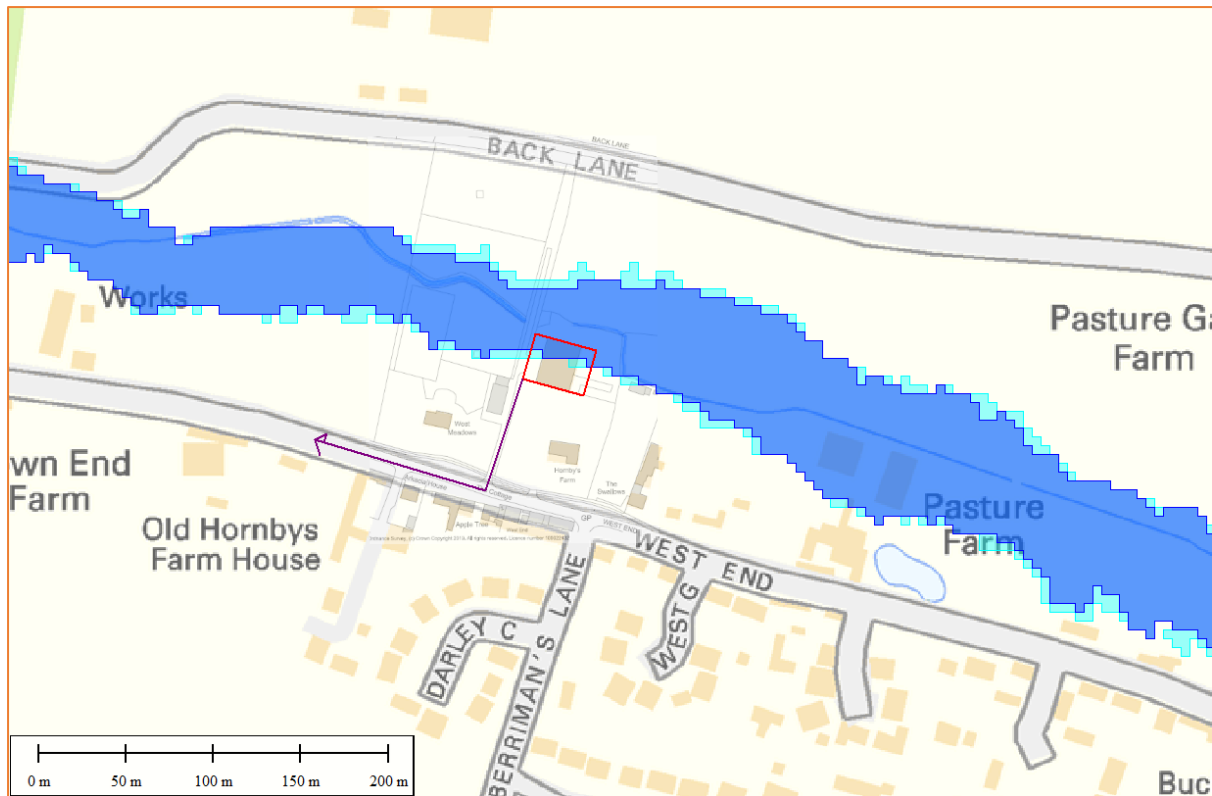


Figure 11: Environment Agency Flood Zones overlain onto OS Mapping, showing proposed escape route by purple line (Source: EA)

6.5 Flood Warning:

The EA is responsible for issuing flood warnings. Flood warnings are issued to the emergency services and local authorities. Both private individuals and organisations can sign-up to receive warnings via phone, text or email. This system of receiving warnings is currently voluntary.

Advice regarding severe flood warnings will generally be given during weather forecasts on local radio and TV. In the case of extreme events, warnings can also be disseminated via door to door visits by the police or locally appointed flood wardens.

The EA issue flood warnings/alerts to specific areas when flooding is expected. It is recommended that the applicant registers online with the free Environment Agency Floodline Warnings/Alert Direct service at www.gov.uk/sign-up-for-flood-warnings to receive flood warnings by phone, text or email.

The applicant has agreed to subscribe to the EA's flood alert/warning service.

The site falls partially within the Upper River Hull catchment Flood Alert Area.

The flood warning service has three types of warnings that will help you prepare for flooding and take action:




Flood Warning	Flood Alert	Flood Warning	Severe Flood Warning
			
What it means?	Flooding is possible. Be prepared.	Flooding is expected. Immediate action required.	Severe flooding. Danger to life.
When it's used?	Two hours to two days in advance of flooding.	Half an hour to one day in advance of flooding.	When flooding poses a significant threat to life.
What to do?	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.

Table 2: EA Flood Warning Service

6.6 Flood Plan:

It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

Before a flood:

- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood.
- Know how to turn off electricity and water supplies to the site.
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.

During a flood:

- Activate the evacuation plan and evacuate the site.
- Remove cars from the site if there is sufficient warning and the water levels are not rising rapidly.
- Switch off water and electricity for the site.
- Tune into your local radio station on a battery or wind-up radio.
- Listen to the advice of the emergency service and evacuate if told to do so.

- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

After a flood:

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you don't have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics and water checked by qualified engineers before switching them back on.

6.7 Off-Site Impacts:**6.7.1 Fluvial floodplain storage:**

The NPPF requires that where development is proposed in undefended areas of floodplain, which lie outside of the functional floodplain, the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain. Flood storage capacity can be maintained by lowering ground levels either within the curtilage of the development or elsewhere in the floodplain, in order to maintain at least the same volume of flood storage capacity within the floodplain.

In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.

For development in a defended flood risk area, the impact on residual flood risk to other properties needs to be considered. New development behind flood defences can increase the residual risk of flooding if the flood defences are breached or overtopped by changing the conveyance of the flow paths or by displacing flood water elsewhere. If the potential impact on residual risk is unacceptable then mitigation should be provided.

The site is situated partially within Flood Zones 1, 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea). The proposed development is for conversion of the existing barn into residential, as such there will be no unacceptable loss of flood storage post development.

6.7.2 Surface Water Drainage:

It is understood that there will be no increase in built footprint or impermeable surfacing post development. As such, there will be no need for additional surface water drainage features. The proposed development will utilise the existing drainage arrangements on site.

7. Sequential and Exception Test

The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

The site is situated partially within Flood Zones 1, 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea).

Post development, the site will become “more vulnerable”, as the application is for the change of use from a barn to residential.

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	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Table 3: Flood risk vulnerability and flood zone ‘compatibility’

Using the table above, the proposed application is considered to be suitable within Flood Zones 1, 2 and 3a. The Sequential and Exception Tests do not need to be applied to minor developments and changes of use. The proposed application is considered to be a change of use.

8. Discussion and Conclusions

Unda Consulting Limited have been appointed by S. L. Hall (hereinafter referred to as “the applicant”) to undertake a Flood Risk Assessment for the proposed development West Meadows, West End, Driffield YO25 4RR. The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance.

The purpose of the study is to support a planning application for the proposed development.

The existing site usage is classified as “less vulnerable” throughout, as it is a barn. Post development, the site will become “more vulnerable”, as the application is for the conversion of the barn to residential accommodation.

The site is located partially within Flood Zones 3a (High Probability), which means it is defined as 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 (Land shown in dark blue on the Flood Map), Flood Zone 2 (Medium Probability), which is defined as 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 (Land shown in light blue on the Flood Map), and Flood Zone 1 (Low Probability), which means it is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding.

The risk would appear to be predominantly fluvial and originate from a drain / tributary of the Lowthorpe Beck.

Product 4 modelled flood levels and extents have been requested from the Environment Agency for use within this report. The EA has confirmed that the site is located in an area of Flood Zones 1, 2 & 3 where they do not have modelled flood levels.

The area is covered by national generalised modelling which is only suitable for Flood Zone extent visualisation, not levels or depths data. In 2004 the EA completed national generalised modelling to produce catchment scale Flood Zones (using JFLOW modelling techniques), the calculation process produced water depths as a by-product. Since the modelling methods used were developed, tested and reviewed to produce Flood Zone extents only, the EA currently have no information on the accuracy of the depth data.

To carry out additional surveying, hydrological calculations and hydraulic calculations or hydraulic modelling to calculate a flood level for the site would be a very costly and time consuming exercise for the client, and we strongly feel that this would not be proportionate to the nature or scale of the development (conversion of an existing building to residential).

The EA has no records of historical flooding recorded for the site.

The East Riding of Yorkshire Council SFRA shows the site to fall within an area with a <25% susceptibility to groundwater flooding. No records of groundwater flooding at the site previously have been provided however, and no basements are proposed as part of the change of use development.

It is understood however that the watercourses in the vicinity of the site are likely to be spring fed. Incidents of property flooding as a result of elevated groundwater levels were recorded in Kilham in November 2000 and late 2012/early 2013. While parts of West End to the east of the site are shown have been affected by this flooding, the site itself (and West End adjacent to the site) is shown to be unaffected.

If the finished ground floor level can be raised 300mm above adjacent ground levels (if feasible given the constraints of the existing building), this would act to mitigate any potentially elevated groundwater levels.

The EA Risk of Flooding from Surface Water Map suggests that the site lies partially within an area of "low" risk of flooding from surface water.

Closer inspection of the EA's Risk of Flooding from Surface Water data, shows that for the 1:1000 year event (Low Risk), the maximum depth of flooding at the location of the existing building is 0.30m.

It is recommended that the finished ground floor level of the proposed development is raised as much as feasible given the constraints of the existing building. It is therefore recommended that the finished ground floor level is raised 300mm above adjacent ground levels – if feasible given the constraints of the existing building.

A flood proof door should be installed for all external ground floor level doors, or 600mm demountable flood defence barriers to defend external doors if flood proof doors are not practical or other planning constraints prevent it.

Safe escape entirely within Flood Zone 1 can be provided from the site. Safe escape will be provided by a flood warning and evacuation plan, which will be prepared in liaison with the Council's Emergency Planners and tied in with the existing emergency plans for the area.

The site is situated partially within Flood Zones 1, 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea). The proposed development is for conversion of the existing barn into residential accommodation, as such there will be no unacceptable loss of flood storage post development.

It is understood that there will be no increase in built footprint or impermeable surfacing post development. As such, there will be no need for additional surface water drainage features. The proposed development will utilise the existing drainage arrangements on site.

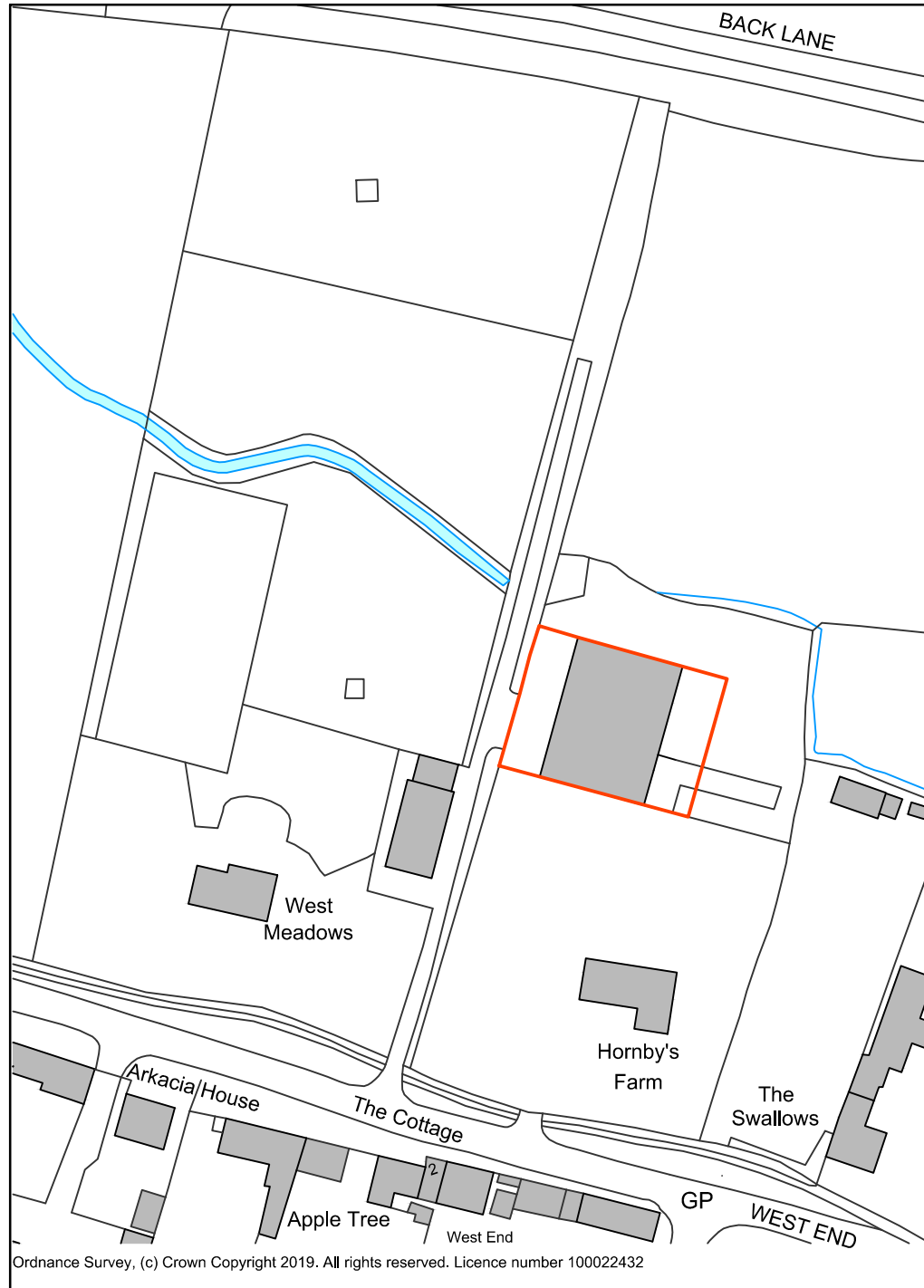
In summary:

- It is recommended that the finished ground floor level is raised as much as feasible given the constraints of the existing building.
- Due to the nature of the development, existing drainage arrangements will be retained.
- Flood proofing of the development will be incorporated as appropriate.
- A flood warning and evacuation plan will be implemented post development.
- The applicant will register with the free Environment Agency Floodline Alert Direct service.

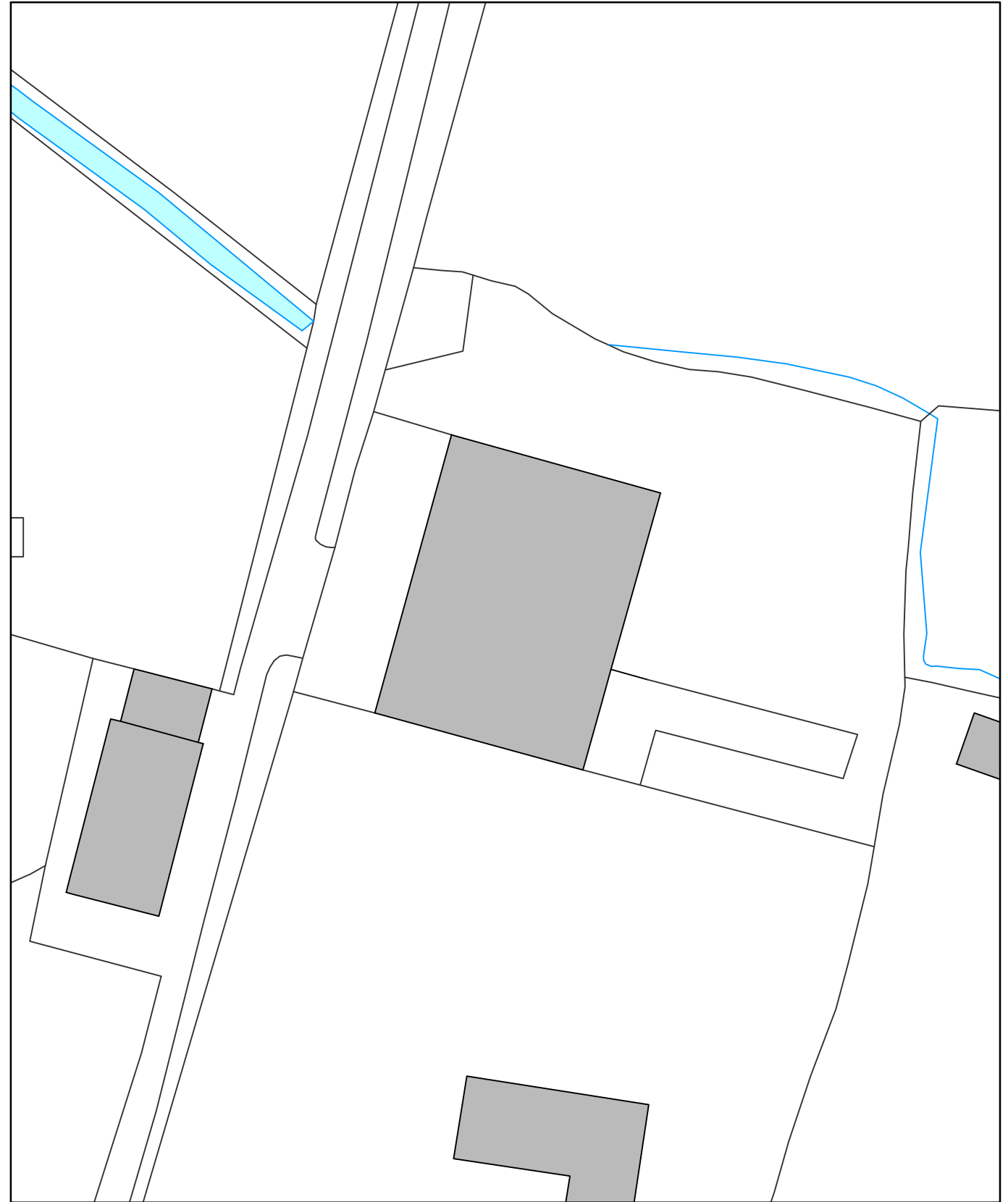
Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

Appendix

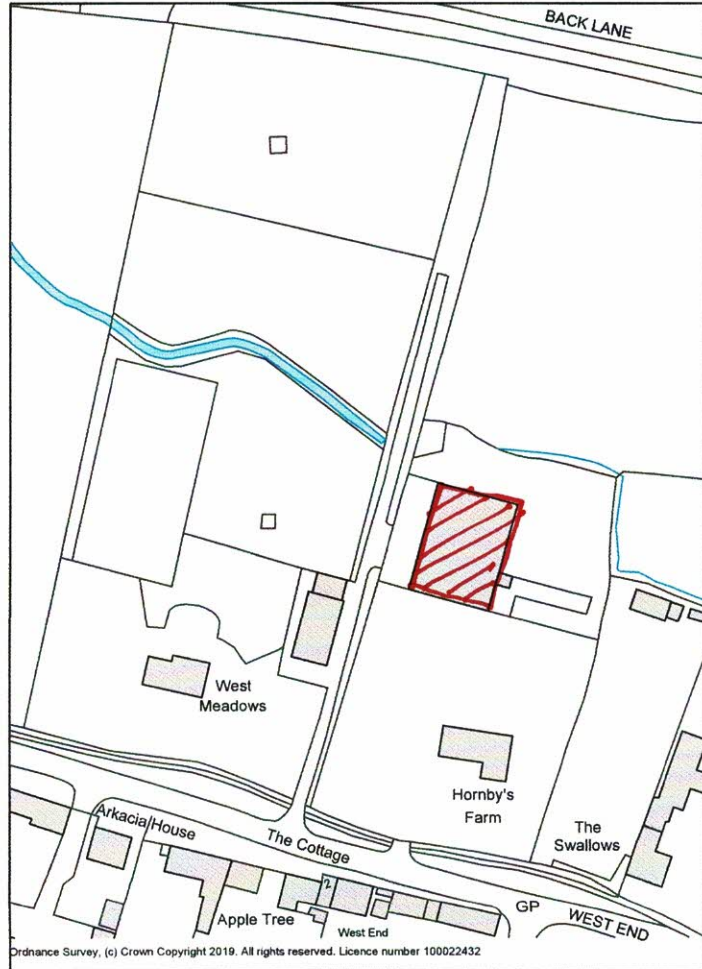
- Plans and drawings.



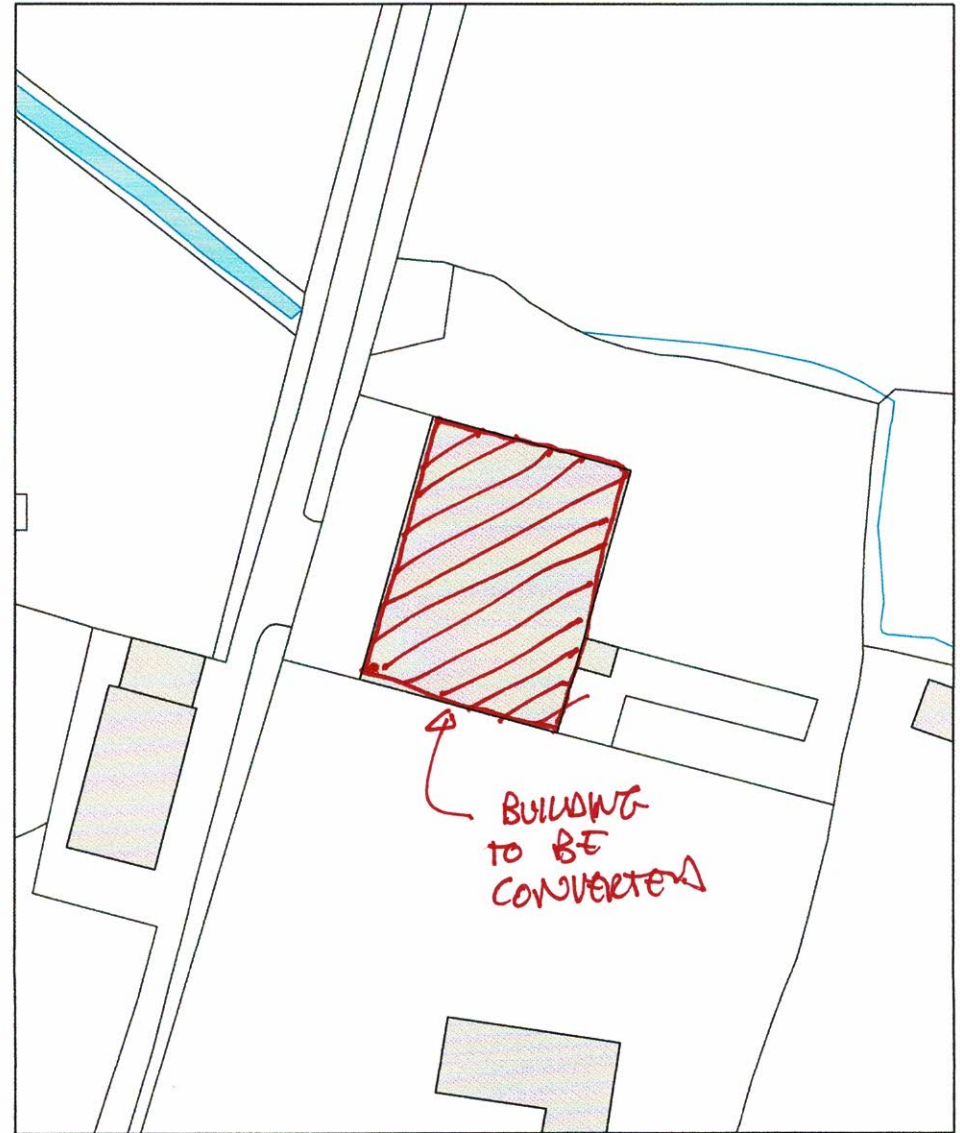
01 LOCATION PLAN
1:1250



02 EXISTING SITE PLAN
1:500



01 LOCATION PLAN
1:1250



02 EXISTING SITE PLAN
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