Rossi Long Consulting

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Flood Risk Screening and Scoping Exercise

Land at Norwich Road

Morley St Peter

Norfolk

1.0 Introduction

This report has been prepared by Rossi Long Consulting Ltd to support proposals for development of land north of Norwich Road, Morley St Peter, Norfolk.

The site is to be promoted for residential development and a Flood Risk Screening and Scoping Exercise is required to provide a preliminary assessment of flood risk issues, foul and surface water drainage options for the site, and to make recommendations for any further investigations required to complete a Flood Risk Assessment and Drainage Strategy Report.

The site is referenced as SN4042 in the South Norfolk Village Clusters Housing Allocations Document. The site assessment form identifies the site as 3.3 hectares of Grade 3 agricultural 'greenfield' land. A location plan is shown below:

2.0 Site Description

The site is to the north of Norwich Road and west of Golf Links Road, situated to the north of Besthorpe village. Morley Village and Sports Hall is located to the north with Hill Road housing to the west. The Ordnance Survey grid reference at the centre of the site is TM 074 976.

Ordnance Survey contour mapping shows that the 40m AOD contour wraps around the northern boundary with ground levels falling towards the south-west. There is a natural valley occupied by an existing ditch that runs diagonally along the northern boundary from the north-east corner to north-west corner.

A topographical survey carried out by MJ Engineering and Surveying Ltd confirms that the general fall of the land is towards the north-west corner where levels are at approximately 39.000m AOD. Levels along the southern boundary range from 42.750m AOD in the south-east to 40.000m AOD in the south-west.

3.0 Ground Conditions

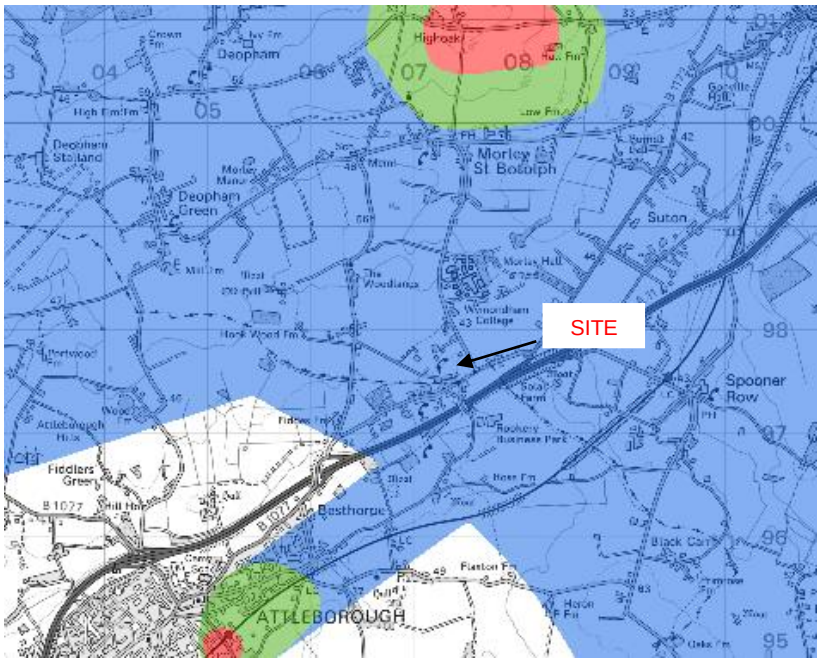
British Geological Survey (BGS) mapping shows that the site is mainly situated upon superficial deposits of Lowestoft Formation – Diamicton (chalky till, together with outwash sands and gravels, silts and clays):

There is a change to the Superficial deposits along the northern site boundary where Alluvium – Clay, Silt, Sand and Gravel is shown. Alluvium comprises loose soil or sediments deposited by the movement of water, and the area shown follows falling ground levels associated with the site boundary ditch that falls to the south-west.

The underlying bedrock geology is the Lewes Nodular and other Chalk Formations.

In terms of groundwater vulnerability, the Aquifer Designation Map shows the superficial drift as a Secondary (Undifferentiated) Aquifer and the bedrock geology as a Principal Aquifer.

The site is situated within a Groundwater Source Protection Zone, Zone III – Total Catchment, shown blue below:



Site investigation is required to establish ground conditions across the site and to advise on the potential for infiltration of surface water run-off into the subsoil. From information obtained from BGS mapping, the ground conditions comprising Lowestoft Formation are likely to comprise Boulder Clay / Till with low permeability. More permeable Sand and Gravels may be present on the north side of the site, although a BGS borehole record suggests that shallow perched groundwater may be associated with the ground conditions of sand overlying impermeable clay.

4.0 Flood Risk

Fluvial Flooding: Environment Agency flood risk mapping showing the risk to the site from fluvial flooding is shown overleaf. This confirms that the site is situated in Flood Zone 1. Flood Zone 1 is a 'low probability' flood zone comprising land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (<0.1%). All uses of land are appropriate in Zone 1 and the National Planning Policy Framework (NPPF) Sequential and Exception Tests are not required:

Likelihood of flooding in this area

This location is in an area with a low probability of flooding

FLOOD ZONE 1

Land and property in flood zone 1 have a low probability of flooding

More information about flood zones

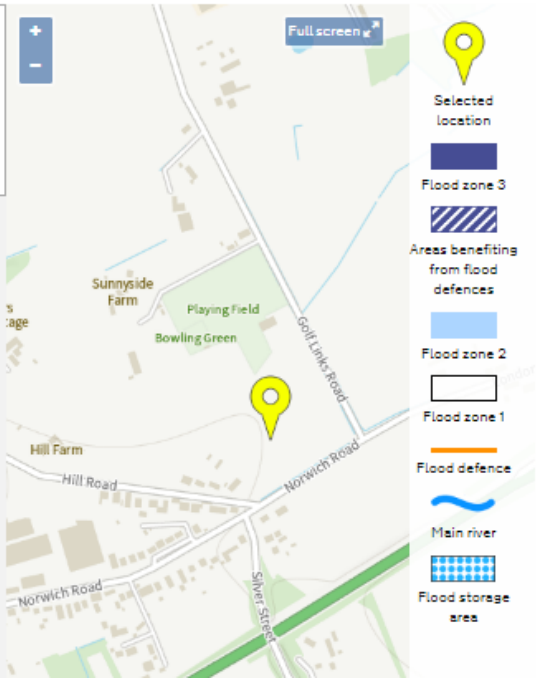
1 You don't need to do a flood risk assessment if your development is in flood zone 1 and:

- smaller than one hectare
- is not affected by sources of flooding other than rivers and the sea, for example surface water drains

2 If your development is in flood zone 1 and:

- larger than one hectare
- is affected by sources of flooding other than rivers and the sea, for example surface water drains

you can learn more about flood risk assessment in flood zone 1



For development of land greater than one hectare in Flood Zone 1, a Flood Risk Assessment is principally required to consider the management of surface water run-off together with flood risk from sources other than rivers and the sea. Surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.

Groundwater flooding occurs when water levels in the ground rise above surface elevations. BGS mapping includes historic information for a nearby borehole at Norwich Road, which indicates perched groundwater at 2.3m depth in the sand layer sitting above deeper clay soils. For an historic borehole south of the site, an "at rest" GWL of 40.2m below ground level (bgl) in the chalk bedrock was recorded. The risk of groundwater flooding occurring is 'low' but is subject to confirmation from a detailed site investigation.

Flooding from surface water sewers occurs when sewers are overloaded following heavy rainfall. There are no surface water sewers on the site and nothing shown on Anglian Water map records in the vicinity of the site. There are occasional gully and kerb off-lets shown along Norwich Road, but these appear to connect straight into adjacent roadside ditches with no formal highway drainage network. The risk appears to be 'low' but the Lead Local Flood Authority (LLFA) should be consulted regarding any record of flooding from highway drainage.

Flooding from Reservoirs and Other Artificial Sources: The Environment Agency publishes mapping that shows the extent of flooding from these sources and confirms the site is not at risk of flooding.

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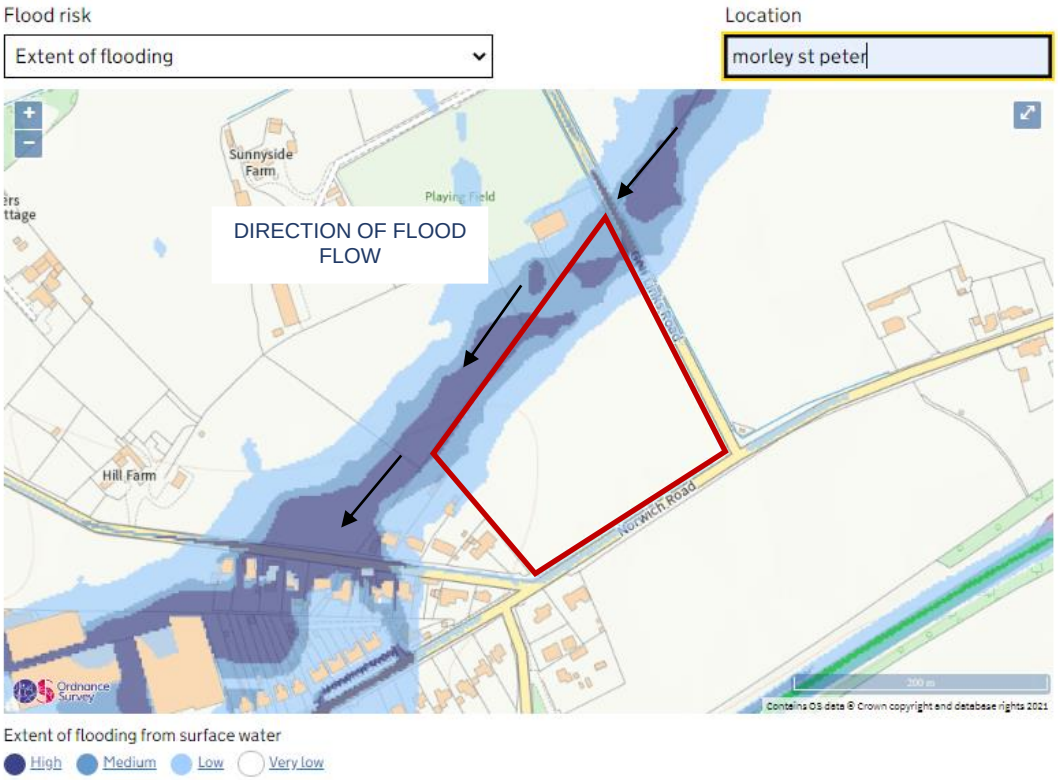
Surface water flooding occurs when intense rainfall is unable to soak into the ground or enter drainage systems but lies on or flows over the ground instead. The Environment Agency publishes mapping showing the risk of flooding from surface water; an extract of which is shown below. A more detailed copy of this map is shown on the drawings located in the Appendix:



The majority of the site is at 'very low' risk of surface water flooding:

> 'Very low' risk means that each year this area has a chance of flooding of less than 0.1% (< 1 in 1000).

The mapping shows an area of 'low' to 'high' risk of flooding that represents an area of flood flow originating from land to the north-east that is routed along the north boundary of the site. This flooded area follows the line of a ditch that is falling to the south-west towards Hill Road. The mapping indicates a potential flood depth of up to 900mm.

Norfolk County Council Lead Local Flood Authority (LLFA) considers the extent of 'low risk' flooding (1 in 1000 year AEP event) as a representation of the extent of the 1 in 100 year AEP event with allowance for future climate change. As such, they will recommend that all areas shown to be at 'low' to 'high' risk of surface water flooding (i.e. all of the blue areas shown on the mapping) are left free from development, unless a hydraulic assessment is carried out that can demonstrate properties are not at risk of flooding and the development does not increase the risk of flooding elsewhere.

The LLFA should be consulted regarding the location of ordinary watercourses and any history of flooding in this area.

5.0 Existing Drainage

The site is located within the Little Ouse and Thet Operational Catchment. The nearest main river is the River Thet to the south-west of Attleborough. The site is within the Thet catchment (upstream of Swangey Fen); the source of which is to the south-west of the site at Besthorpe:

Thet (US Swangey Fen)

Although subject to further investigation, the site ground conditions are largely expected to comprise low permeable clay soils with only limited infiltration of run-off into the ground. Overland flow is towards the north into the ditch running along the northern site boundary that flows towards the south-east and off-site into the River Thet catchment. Other ditches are located along the west and south site boundaries.

Although no records have been provided, it is likely the field is served by a land drainage system. This should be investigated further.

6.0 Surface Water Drainage

British Geological Survey (BGS) mapping indicates that site ground conditions may not be suitable for infiltration of surface water run-off. National Planning Policy requires that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate. Generally, the aim should be to discharge surface run-off as high up the following hierarchy of drainage options as reasonably practicable:

- Into the ground (infiltration);
- To a surface water body;
- To a surface water sewer, highway drain or another drainage system;
- To a combined sewer.

Site investigation is required to confirm ground conditions and should include infiltration testing in accordance with the requirements of BRE Digest 365. If infiltration of run-off is not feasible, an off-site discharge to a watercourse should be investigated. For any off-site discharge of surface water, run-off should be limited to the equivalent 'greenfield' run-off rate for the site for all storms up to and including the 1% AEP event plus allowance for climate change. This is to ensure that the development does not increase the risk of flooding on or off the site. Peak flows would need to be attenuated in a detention basin or below ground storage with the final discharge controlled by a flow limiting device

Guidance has been published on the use of Sustainable Drainage Systems (SuDS), which is an approach to managing surface water run-off which seeks to mimic natural drainage systems and retain water on or near the site, as opposed to traditional drainage approaches which involve piping water off-site as quickly as possible. SuDS involves a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands. SuDS offers significant advantages over conventional pipe drainage systems in reducing flood risk by attenuating the rate and quantity of surface water run-off from a site, promoting groundwater recharge and improving water quality and amenity.

The LLFA is a statutory consultee for planning and will encourage the use of surface level SuDS wherever possible.

7.0 Conclusions and Recommendations

With reference to Environment Agency flood zone mapping, it is demonstrated that the site is situated in Flood Zone 1. This is a "low probability" flood zone with a less than 1 in 1000 annual probability of flooding. The site is at 'low' risk of fluvial flooding both now and over the lifetime of any development, taking climate change into account.

The NPPF Sequential and Exception Tests are not required.

The site is generally at 'very low' risk of flooding from surface water; however, areas of 'high', 'medium' & 'low' risk flooding have been identified that are routed along the northern boundary of the site with predicted flooding to a depth of up to 900mm. This is in the vicinity of a ditch.

It is our opinion, and to satisfy the LLFA, the watercourse and the area around it should be left undeveloped with all housing, infrastructure and drainage features located in areas of the site at 'very low' risk of flooding. This should include any open basins used for the attenuation of surface water run-off. If, however, housing is required in this area, hydraulic modelling may be required to demonstrate that the development will remain safe throughout its lifetime, including exceedance events and will not increase flood risk elsewhere.

Site investigation is required to confirm ground conditions, but it is anticipated that infiltration of surface water run-off into the ground is unlikely to be a viable option for the site. Any off-site discharge will need to follow the fall of the land into the natural river catchments serving the site and be attenuated to 'greenfield' run-off rates. Off-site drainage routes and land ownership will need to be established, including any easement requirements for land in third party ownership. If an off-site route to a watercourse is not feasible, a discharge to the public surface water sewer should be considered.

In order to complete a Flood Risk Assessment and Surface Water Drainage Strategy for a planning application, additional information is required as follows:

- Geotechnical site investigation to include infiltration testing in various locations;
- Drainage survey to establish off-site drainage routes and how the site drainage connects into the wider drainage network;
- Development of a site layout to ideally place housing in areas at 'very low' risk of surface water flooding and to aid the provision of a Sustainable Drainage System including open space areas for locating surface level SuDS and attenuation features;
- Consultation with the LLFA regarding the location of local watercourses and any history of flooding in the area; and
- Consultation with the LLFA to discuss their requirements for development Sustainable Drainage.

Prepared by	Reviewed by
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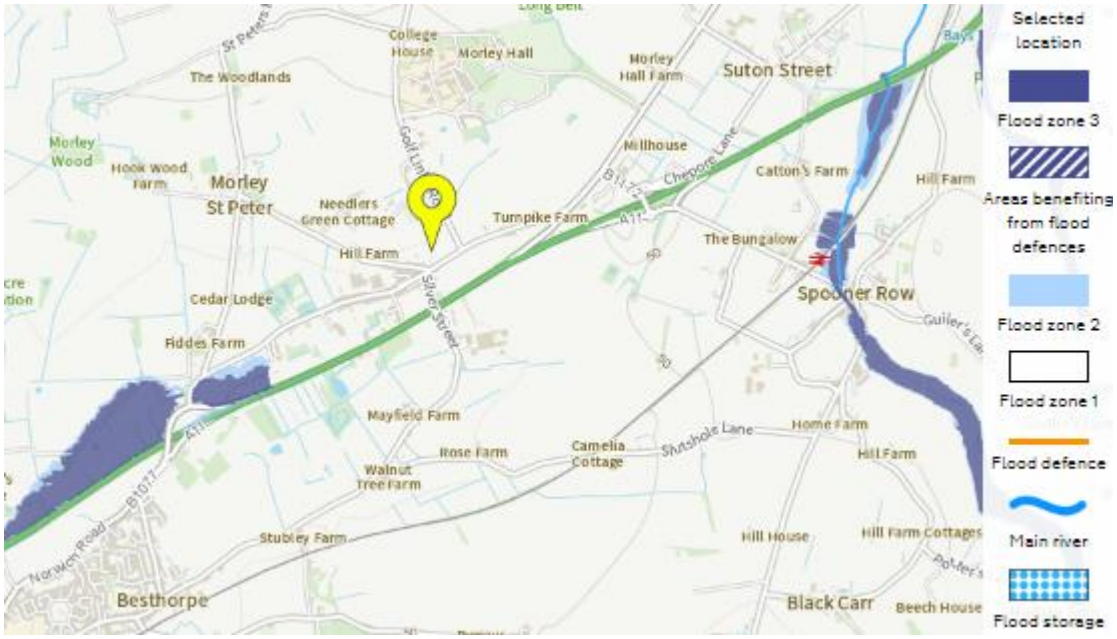
8.0 Appendix – Surface Water Flooding Plans



Flood risk

Extent of flooding

Location

morley st peter

Extent of flooding from surface water

High Medium Low Very low

Flood risk

Extent of flooding

Location

morley st peter

Extent of flooding from surface water

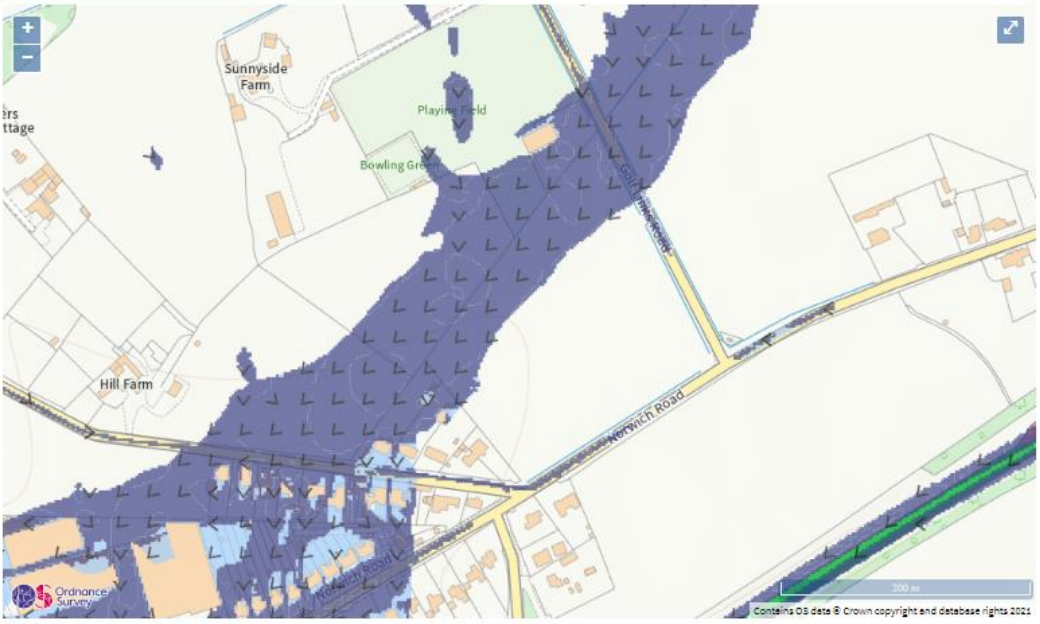
High Medium Low Very low

Flood risk

Low risk: velocity

Location

morley st peter



Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

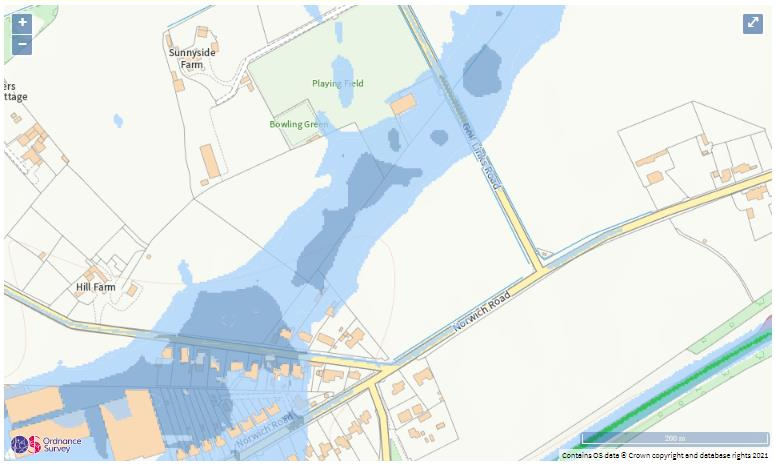
Over 0.25 m/s Less than 0.25 m/s Direction of water flow

Flood risk

Low risk: depth

Location

morley st peter



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Flood risk

Medium risk: depth

Location

morley st peter

Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Flood risk

High risk: depth

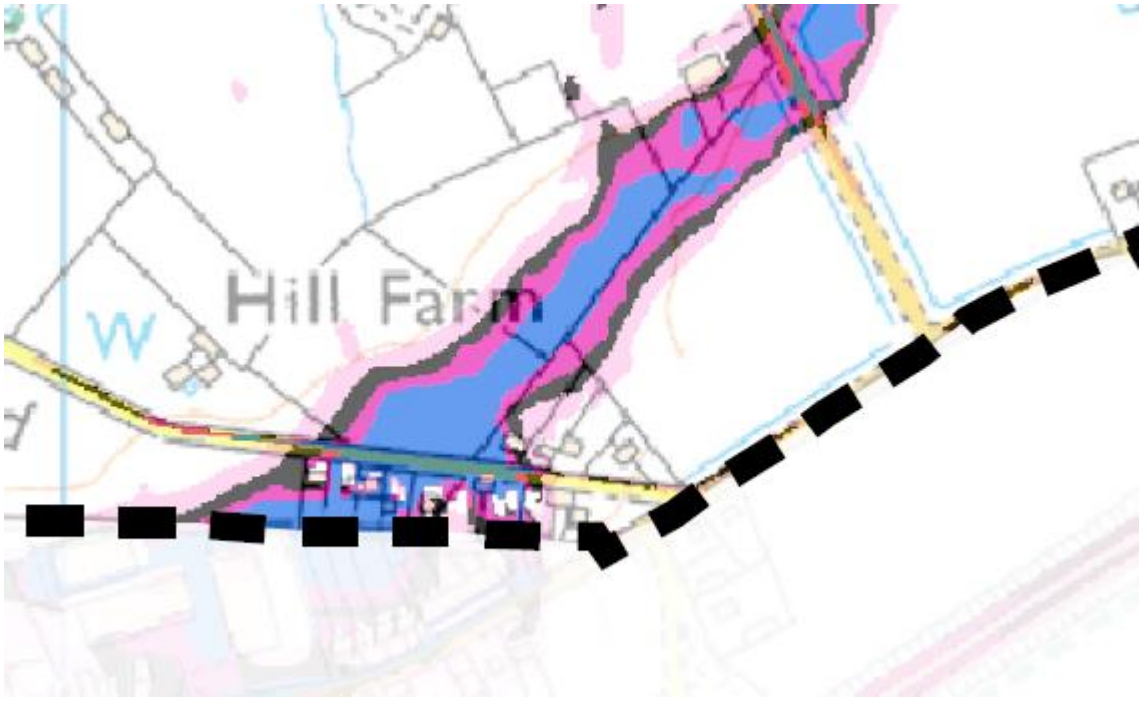
Location

morley st peter

Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm


Hill Farm
Surface Water
RoFfSW 3.3% AEP
RoFfSW 1% AEP
RoFfSW 0.1% AEP
Surface Water Climate Change
1% AEP with 40% Climate Change
Areas Susceptible to Groundwater Flooding
>= 75%
>= 50% <75%
>= 25% <50%
< 25%

SN SFRA