Level 2 Strategic Flood Risk Assessment - Site AB33

A1-C01

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Prepared for:

Newcastle-under-Lyme Borough Council

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Contents

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for AB33. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'Newcastle-under-Lyme Level 1 SFRA' and read the 'Newcastle-under-Lyme Level 2 SFRA Main Report' and is therefore familiar with the terminology used in this report.

1.1 Site details

- **Location:** Land off Nantwich Road/Park Lane, Audley.
- **Site area:** 2.74 ha.
- **Existing site use:** Greenfield.
- **Proposed site use:** Residential.

1.2 Topography

The Environment Agency's (EA) 1m resolution LiDAR indicates that the eastern extent of the site is located on higher ground than the western extent. The lowest elevation is located in the northern extent of the site at 116.96mAOD and the highest elevation is located in the south-eastern extent at 123.76mAOD. However, there is not a continuous slope upwards from north to south-east. The elevation in the centre of the site is lower than the surrounding land. The elevation immediately east of the site continues to rise.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock made up of Helesowen Formation consisting of mudstone, siltstone and sandstone.
- Superficial deposits comprising diamicton.

Soils at the site consist of:

- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is within the eastern, upstream reach of the Englesea Brook Catchment which drains an area of approximately 20.76km². The catchment is predominantly rural, with Englesea Brook originating in Blaterly Green approximately 3.40km west of the site and flowing northwest towards Crewe where it joins the River Weaver.

2.2 Existing drainage features

There are no existing drainage features within or in the immediate vicinity of the site.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment.

2.3.2 Description of risk to the site

The EA FMfP does not show the site to be at fluvial flood risk. As shown in Table 2-1, the entire site is located within Flood Zone 1.

Table 2-1: Existing fluvial flood risk*.

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

2.4 Surface water

2.4.1 Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

2.4.2 Description of risk to the site

Table 2-2 shows the extent of the site at risk in the 3.3%, 1%, and 0.1% AEP events, and the maximum depths, velocities, and hazards within the site boundary.

In the 3.3% AEP event, two small areas of surface water are shown to pond around the central point of the site. However, the centre of the site is not completely surrounded, and most of the site is not shown to be at surface water risk. Depths are mainly between 0.15m

and 0.60m, with velocity mostly remaining below 0.25m/s. The hazard classification for the floodwater ranges from 'Very Low Hazard' on the edges of the areas of flooding to 'Danger for Most' in the centre of the areas flooding.

In the 1% AEP event, most of the site is still shown to remain free from surface water risk, however the northern extents of the two flooded areas connect to make one area. This area of risk also increases in size to the west, with the emergence of a new flow path into the existing area of risk. Another small area of surface water risk emerges in the southeast of the site. More of the central area of ponding is shown to be between 0.60m and 0.90m deep, however, the newly emerged areas are shown to be less than 0.15m in depth. More of the central area of ponding has a velocity of between 0.25m/s and 0.50m/s and between 0.50m/s and 1.00m/s, but the majority is still less than 0.25m/s. The new area of risk in the southeast of the site is shown to have velocities between 0.50 and 1.00m/s. Slightly more of the central area of ponding has a hazard classification of 'Danger for Most'. The newly emerged areas of flooding have hazard classification of 'Very Low Hazard'.

In the 0.1% AEP event, there is a considerable increase in the area of the site at surface water risk. The southern extent of the central area of flooding connects, creating a very small dry island in the centre of the site. However, it should be noted that the surface water risk shown in the RoFSW mapping in this area does not appear to be representative of the topography of the site, shown in the EA LiDAR. This shows that the elevations in the centre of the site are lower than the area of surface water ponding, so it would be expected that the surface water would pool within this central area of the site, rather than around it.

In the 0.1% AEP event, the western flow path into the central area of flooding also extends much further to the west, beyond the site boundary. The area of flooding in the southeast also extends by a large amount, becoming another flow path into the central area of flooding. New, smaller, flow paths into this central area of flooding also emerge from the northeast and the south. There is also a new flow path into the site from Nantwich Road at the southeast site extent. Surface water risk along the newly emerged flow paths is mostly shown to remain less than 0.15m deep, with a small area in the west shown to be between 0.15m and 0.30m deep, including on Park Lane. There are now areas of risk within the site boundary with velocities between 1.00m/s and 2.00m/s, mostly in the southeast, as well as on the southern extent of Park Lane. The areas with hazard classification of 'Danger for Some' and 'Danger for Most' increase in the central area of the site. The majority of the newly emerged flow paths are classed as 'Very Low Hazard'.

Table 2-2: Existing surface water flood risk based on the RoFSW map.

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	5	7	27
Maximum depth (m)	0.60 to 0.90	0.60 to 0.90	0.60 to 0.90
Maximum velocity (m/s)	0.50 to 1.00	0.50 to 1.00	1.00 to 2.00

Event	3.3% AEP	1% AEP	0.1% AEP
Maximum hazard classification	Danger for Most	Danger for Most	Danger for Most

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

2.5 Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

2.6 Groundwater

The EA Areas Susceptible to Groundwater Flooding (AStGWF) dataset (1km resolution) suggests that the northern extent of the site has between 50% and 75% susceptibility to groundwater flooding, and the southern extent of the site has less than 25% susceptibility to groundwater flooding. In contrast, the JBA Groundwater Emergence Map (5m resolution) classifies the entire site as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

Based on the RoFSW and topography of the site, it is likely that any groundwater that emerges will either pool or flow into the central and western low-lying areas of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

2.7 Sewers

The site is located in a postcode area (ST7) with 41 recorded sewer flooding incidents, according to United Utilities' incident records (for the period from September 2010 to May 2024). 10 of these incidents occurred along Alsager Road. United Utilities has confirmed that there have been hydraulic flooding incidents from the public sewer in the wider vicinity of the site.

2.8 Flood history

The EA's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 3.5 of the main Level 2 SFRA report for information on fluvial models and climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and escape routes must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

In the absence of detailed hydraulic modelling with climate change uplifts, the FMfP Flood Zone 2 extent (0.1% AEP) has been used as an indicative 1% AEP event plus climate change flood extent. This can be compared within Flood Zone 3a (1% AEP) to give an indication of areas most sensitive to the impacts of climate change.

3.1.2 Description of risk to the site

The site is not shown to be sensitive to climate change for fluvial risk as the site is located entirely within Flood Zone 1.

3.2 Surface water

3.2.1 Available data

The latest climate change allowances have been applied to the RoFSW map to indicate the impact on pluvial flood risk.

The design event for rainfall intensities is the 1% AEP event with the upper end climate allowance for the 2070s epoch, which is the 1% AEP plus 45% climate change for the Weaver and Gowy Management Catchment which this site falls within.

3.2.2 Description of risk to the site

The site is shown to be highly susceptible to increased surface water risk as a result of climate change, with a large area of surface water risk along the southwestern half of the site.

The 1% AEP plus 45% climate change event largely reflects the extent of the 0.1% AEP event. The greatest depth is 0.83m in the central area of flooding, however, the majority of the flooding remains below 0.60m. The highest velocity is 1.74m/s in the southeast flow

path into the central area of flooding. The highest hazard classification remains 'Danger for Most' in the central area of flooding.

Table 3-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP 2070s Upper End climate change extents.

Event	1% AEP	1% AEP plus 45% climate change
Percentage of site at risk (%)	7	37
Maximum depth (m)	0.60 to 0.90	0.83
Maximum velocity (m/s)	0.50 to 1.00	1.74
Maximum hazard classification	Danger for Most	Danger for Most

4 Flood risk management infrastructure

4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

4.2 Residual risk

There is no residual risk to the site from flood risk management structures.

5 Emergency planning

5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

5.2 Access and escape routes

Safe access and escape routes will need to be demonstrated in the 1% AEP plus climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

5.2.1 Existing access

Existing access to the site is from Park Lane which borders the entire south-western border of the site. Park Lane joins the main road, Nantwich Road (B5500), which also briefly borders the southern site extent.

5.2.2 Fluvial

Safe access and escape routes are shown to be maintained at this location in all available fluvial events.

5.2.3 Surface water

Park Lane is not shown to be affected by surface water flood risk during the 3.3% AEP event.

During the 1% AEP event, only small areas of surface water ponding form along Park Lane within the vicinity of the site. Depths are shown to remain below 0.15m, with velocities predicted to remain below 1.00m/s in the west and range between 0.50m/s and 2.00m/s in the south. They are classified as 'Very low hazard'.

In the 0.1% AEP surface water event, there is a flow path along the entirety of Park Avenue, and Nantwich Road, bordering the site. The depth of the flow path is indicated to be mainly less than 0.15m, however depths of between 0.15m and 0.30m occur to the north-west of the site. The hazard rating is shown to remain predominantly classified as 'Very low hazard'.

Predicted surface water depths on Park Lane during the 1% AEP plus 45% climate change event are largely shown to remain below 0.15m, with a hazard classification of 'Very low hazard'. Therefore, it is likely that safe access and escape routes to the site along Park Lane can be maintained in the 1% AEP plus 45% climate change event.

5.2.4 Dry islands

The RoFSW mapping shows that the centre of the site is located on a dry island during the 0.1% AEP event as well as in the 3.3% AEP and 1% AEP plus 45% climate change events. However, as discussed in Section 2.4.2 the surface water mapping in the centre of the site is not representative of the underlying topography of the site, as shown in the EA LiDAR.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

- The EA AStGWF map shows the site is considered to have a moderate susceptibility to groundwater. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
- BGS data indicates that the underlying geology is comprised of a combination of mudstone, siltstone, and sandstone which is likely to have variable permeability. The local soils are identified to be slowly permeable seasonally wet acid loamy and clayey soils which may limit infiltration potential within the winter months. Infiltration potential at the site should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is located within a Nitrate Vulnerable Zone. Therefore, early engagement with the LLFA and the EA is recommended to determine requirements for the site to manage the impact to surrounding watercourses. Consideration of water quality is likely to be of high importance and demonstrated through the use of the Simple Index Approach.
- The site is not located within a historic landfill site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The RoFSW mapping indicates the presence of surface water flow paths during the 1% AEP plus 45% climate change and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, helping meet requirements for the Nitrate Vulnerable Zone. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and EA) at an early stage to understand possible constraints.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. The surface water risk to the site is shown to increase considerably with climate change in the south of the site.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

7 NPPF and planning implications

7.1 Exception test requirements

The Local Planning Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The sequential test will need to be passed before the exception test is applied.

The NPPF classifies residential development as 'More vulnerable'.

The exception test is not required for this site because it is entirely located within Flood Zone 1.

7.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Is one hectare or greater in Flood Zone 1.
- Is subject to surface water flooding.
- Is identified as being at increased flood risk in the future, due to climate change.

The existing surface water mapping at the site is not representative of the underlying topography. Further assessment of the surface water risk to the site should be undertaken as part of an FRA to quantify the volume of surface water risk at the site and ensure that any modification of ground levels required as part of the site design will not displace surface water and increase flood risk off the site.

All sources of flooding should be considered as part of a site-specific FRA. This should include confirming the risk of groundwater flooding at the site.

Guidance on the requirements for site-specific FRAs can be found in the accompanying Level 2 SFRA report.

7.3 Guidance for site design and making development safe

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Any raising of ground levels at the site should ensure that flood risk elsewhere is not increased through displacement of floodwater.

Arrangements for safe access and escape routes will need to be provided for the 1% AEP surface water event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and escape routes should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

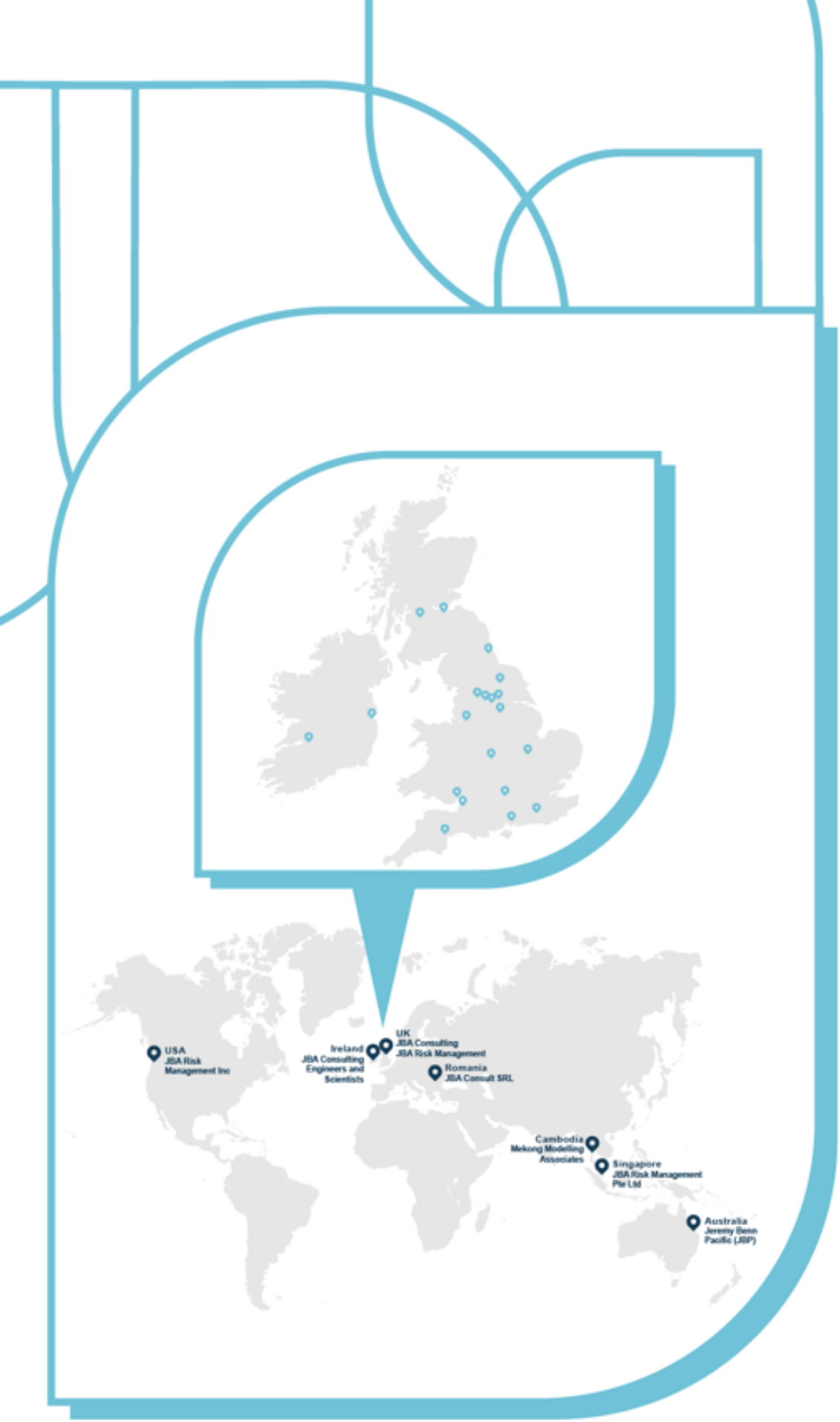
8 Conclusions

The site is affected by surface water flooding in all modelled surface water events. Although the risk is minimal and confined to the centre of the site in the 3.3% and 1% AEP events, flow paths from the southeast and western site extents emerge in the 0.1% and 1% AEP plus climate change events.

The exception test is not required for this site because the entire site is located in fluvial Flood Zone 1. However, a site-specific FRA will be required, because the proposed development site is one hectare or greater in Flood Zone 1, subject to surface water flooding, and identified as being at increased flood risk in the future.

The following points should be considered in development of this site:

- Further assessment of the surface water risk to the site should be undertaken as part of a site-specific FRA to quantify the volume of surface water risk at the site and ensure that any modification of ground levels required as part of the site design will not displace surface water and increase flood risk off the site.
- A site-specific FRA should demonstrate that site users will be safe in the 1% AEP surface water event including an allowance for climate change.
- Safe access and escape routes should be demonstrated in the 1% AEP surface water event with an appropriate allowance for climate change.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site.
- United Utilities should be consulted at an early stage regarding the proposed site drainage due to the sewer flooding incidents recorded within the vicinity of the site.



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