

**Greater Norwich
Level 2
Strategic Flood
Risk Assessment
Detailed Site
Summary Tables**



Site details

Site Code	R38
Address/Grid Ref.	Three Score, Bowthorpe/ 618220,308921
Area	25.29ha
Current land use	Greenfield
Proposed land use	Carried forward residential allocation (Urban Extension)

Sources of flood risk

Location of site within catchment	<p>The River Yare rises near Garvestone and flows eastward, around the southern edge of Norwich, towards it's confluence with the River Wensum just downstream of the city centre.</p> <p>The Site is located on the North bank of the River Yare, approximately 9km upstream of it's confluence with the River Wensum.</p>
Existing drainage features	<p>The site is located on the north bank of the river Yare, the southern edge of the site following the curve of the river approximately 30-100m from the river. There are no other watercourses in the vicinity of the site.</p>
Fluvial	<p>Proportion of site at risk: FZ3b – 0% FZ3a – 0% FZ2 – <1% FZ1 – >99%</p> <p>Available data: Modelling has been completed for the River Yare using TUFLOW. Both defended and undefended scenarios have been modelled and the defended scenarios have been used to assess the risk of flooding to the site. Limitations of the modelling are summarised in the Mapping Information section at the end of this table. Further modelling was undertaken to apply recent climate change uplifts to the fluvial model of the Wensum.</p> <p>As the site is considered for significant urban extension, the extreme H++ climate change scenario has been applied to the existing River Yare model. An 80% increase was applied to existing model flows.</p> <p>Flood characteristics:</p> <p>The site is not at significant risk of fluvial flooding as it is significantly raised above the river level. A very small area of the site is it risk of flooding during the 0.1% AEP event, on the southern edge.</p>
Coastal and Tidal	<p>The site is not at risk from coastal or tidal flooding.</p>
Surface Water	<p>Proportion of site at risk (RoFfSW): 3.3% AEP – 0% 1% AEP – 2% Max depth 0.15-0.3m Max velocity >0.25m/s</p>

	<p>0.1% AEP – 8% Max depth 0.6-0.9m Max velocity >0.25m</p> <p><i>The % SW extents quoted show the % 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 %)</i></p> <p>Description of surface water flow paths:</p> <p>The site is not at risk of surface water flooding during the 3.3% AEP event.</p> <p>During the 100 and 0.1% AEP events, there is a significant surface water flow path crossing the site diagonally in a band approximately 75m wide, from the western edge to the southern edge. During the 1% AEP event, the modelled hazard indicates that the risk across this band is 'Dangerous to some, particularly children', with fast flows and depths up to 0.3m. Depths are greater during the 0.1% AEP event, up to 0.9m, and the modelled flood hazard indicates that the flow is 'Dangerous for most'.</p>
Reservoir	The site is not shown to be at risk of flooding from reservoirs from available online mapping.
Groundwater	<p>The Environment Agency Areas Susceptible to Groundwater Flooding dataset, provided as 1km grid squares, shows the susceptibility of an area to groundwater flood emergence. The following comments can be made about groundwater flood risk:</p> <ul style="list-style-type: none"> The entire site is shown to have a >=50%, <75% susceptibility to groundwater flood emergence. <p>This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site specific FRA stage.</p>
Flood history	<p>The Environment Agency's historic flooding and recorded flood outlines dataset has no record of flooding on the site.</p> <p>The site is not in a postcode that has previously experienced sewer flooding (as identified in the level 1 SFRA)</p>
Flood risk management infrastructure	
Defences	This site is not protected by any formal flood defences.
Residual risk	There is no residual risk to the site from flood risk management structures.
Emergency planning	
Flood warning	<p>The site is not in a flood warning area, however it is adjacent to the Environment Agency's 'River Yare from Barham Broom to the A11 at Cringleford' Flood Warning Area.</p> <p>Small areas of the site along the southern edge are within the Environment Agency's 'The Upper Rivers Yare, Tiffey, Tas, and Wacton' Flood Alert area.</p>
Access and egress	<p>The site has one access road, Saxoncote Avenue, which crosses the site from north to south. This road is not affected by fluvial flooding during the 0.1% AEP event. This remains the case even in the most extreme 0.1% AEP plus 85% (H++) climate change scenario.</p> <p>The road may be impacted by surface water flooding during the 100 and 0.1% AEP events, however access and egress will still be possible either side of the surface water flow. Surrounding roads are not likely to be affected by surface water or fluvial flooding.</p>
Dry islands	The site is not located on a dry island.
Climate change	
Implications for the site	The site is not sensitive to climate change as it is sufficiently raised above the river level. Even in the most extreme 0.1% AEP plus 85% (H++) scenario, only a very small band along the southern edge of the site is at risk, comprising less than 1% of the site. There is no significant change in the extent of Flood Zone 2 on the site.

	<p>Proportions of the site in Future Flood Zones can be found in Table 6-2 of the Greater Norwich Level 2 SFRA Report</p>
<p>Requirements for drainage control and impact mitigation</p>	
<p>Broad scale assessment of possible SuDS</p>	<p>Geology & Soils</p> <ul style="list-style-type: none"> • Geology at the site consists of: <ul style="list-style-type: none"> ○ Bedrock – Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation, Portsdown Chalk Formation (undifferentiated) – Chalk; Crag Group - Sand and Gravel. ○ Superficial – River Terrace Deposits - Sand and Gravel (in south); Sheringham Cliffs Formation - Sand and Gravel (northern tip). <p>SuDS</p> <ul style="list-style-type: none"> • Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk both to and from groundwater. • Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. As the site is located within a Source Protection Zone, infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Detention may be feasible where site slopes are <5% at the location of the detention feature. If the site has contamination or groundwater issues, a liner will be required. In the northern third of the site, mapping suggests slopes are >5% therefore detention is unlikely to be feasible here. Feasibility should be assessed as part of a site-specific assessment. • Filtration is probably suitable where site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required. In the northern third of the site, mapping suggests slopes are >5% therefore filtration is unlikely to be feasible here. • All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination or groundwater issues, a liner will be required. • Developers should investigate and consider in full all SuDS options and demonstrate that SuDS are not appropriate where they are not implemented. • The site is not designated by the Environment Agency as previously being a landfill site.
<p>Opportunities for wider sustainability benefits and integrated flood risk management</p>	<ul style="list-style-type: none"> • Due to the size and greenfield nature of the site, there are likely to be many opportunities to install green infrastructure and preserve existing natural features. This could include features such as rain gardens, wild verges and the preservation of existing mature trees. The natural surface water flow path should be integrated into the green infrastructure of the site. • A drainage strategy should look to use the topography, existing features and surface water flow path of the site to dictate the site layout to maximise wider benefits.
<p>NPPF and planning implications</p>	
<p>Exception Test requirements</p>	<ul style="list-style-type: none"> • The Exception Test does not apply because the site is not in Flood Zone 3. • Given the low risk to the site, the site is likely to be suitable for development with some mitigation. • The site is however in close proximity to existing flood zones and it is recommended that a precautionary approach is taken. Any developer should undertake a site-specific flood risk assessment including surface water modelling to demonstrate that the change in land use does not increase the risk of surface water on the site and to nearby properties.
<p>Requirements and guidance for site-</p>	<p>Flood Risk Assessment:</p>

specific Flood Risk Assessment	<ul style="list-style-type: none"> As the site is not located in a Flood Zone, no site-specific Flood Risk Assessment is required at application stage. However, owing to the sites close proximity to existing flood zones and the high probability of groundwater flooding it is recommended that a precautionary approach is taken and a site specific flood risk assessment undertaken, including an assessment of future flood risk accounting for climate change. The site-specific FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance, Norwich City Council's Local Plan policies, and the Norfolk County Council Lead Local Flood Authority's Statutory Consultee for Planning Guidance Document. Consultation with the Local Authority, Lead Local Flood Authority and the Environment Agency should be undertaken at an early stage. <p>Guidance for site design and making development safe:</p> <ul style="list-style-type: none"> The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, to ensure that runoff from the development is not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond current greenfield rates. Mitigation measures for the significant surface water flow path across the site should be included as part of any proposed development on the site. This natural surface water flow path should be integrated into the green infrastructure of the site. Developers should refer to Norfolk County Council's 'Norfolk County Council Lead Local Flood Authority Statutory Consultee for Planning Guidance Document' and the Level 1 SFRA for information on SuDS for guidance on the information required by the LLFA from applicants to enable it to provide responses to planning applications.
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Key messages

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward.
- A site specific Flood Risk Assessment demonstrates that the site is not at an increased risk of flooding in the future, and that the development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond current greenfield rates. The natural surface water flow path should be integrated into the green infrastructure of the site.

Mapping Information

The key datasets used to make planning recommendations regarding this site were the broadscale 2D modelling outputs from the Environment Agency's Flood Map for Planning, River Yare Flood Model and the Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning mapping.
Climate change	Climate change was modelled as part of Level 2 SFRA strategic 2D modelling. Climate change uplifts for +25%, +35%, and +65% scenarios were applied to existing EA models and new 2d models.
Fluvial depth, velocity and hazard mapping	Depth, velocity and hazard data was taken from new 2d modelling undertaken for the purposes of this assessment.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, and hazard mapping for the 1 in 0.1% AEP event is taken Environment Agency's Risk of Flooding from Surface Water mapping.