

**Bassetlaw Level 2
Strategic Flood
Risk Assessment
Detailed Site
Summary Tables**



Site details

Site Code	HS2
Address	Former Bassetlaw Pupil Referral Centre, Newgate St, Worksop, S80 2LJ. Grid Reference: SK 58978 78467
Area	0.76ha
Current land use	Pupil referral centre and associated landscaping and car parking facilities
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is within the catchment of the River Ryton. The River Ryton is an Environment Agency designated main river and flows in an easterly direction through Worksop towards its confluence with the River Idle.
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Existing drainage features	The site is located 470m south of the River Ryton. An unnamed tributary of the River Ryton is located 440m north of the site. It flows in an easterly direction before splitting into two distributaries, the first flowing back into the main River Ryton channel and the second feeding the Chesterfield Canal. The Chesterfield Canal is located 725m north of the site.
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Fluvial	<p>The proportion of site at risk: FZ3b – 0% FZ3a – 0% FZ2 – 0% FZ1 – 100%</p> <p><i>The % Flood Zones quoted show the % of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone, e.g. FZ2 includes the FZ3 %. FZ1 is the remaining area outside FZ2 (FZ2 + FZ1 = 100%).</i></p> <p>Available data: The Environment Agency's Flood Zone mapping and detailed modelling undertaken in 2009 has been used in this assessment. The River Ryton Flood Zones through Worksop are based on a 1D only model undertaken in 2008 so depths are not available. We understand that the Environment Agency is currently updating this modelling. Modelling of the 1% AEP and 1% plus climate change scenarios was undertaken as part of the Level 1 SFRA in 2009. These outputs have been used to understand the risk of flooding during this scenario.</p> <p>Flood characteristics: The site is not at risk of fluvial flooding from the River Ryton.</p>
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Coastal and Tidal	The site is not at risk of coastal or tidal flooding.
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Surface Water	<p>Proportion of site at risk (RoFfSW): 3.3% AEP – 5% Max depth 0.3-0.6m Max velocity 0.25-0.5m/s 1% AEP – 13% Max depth 0.3-0.6m Max velocity 0.5-1m/s 0. AEP – 35% Max depth 0.3-0.6m Max velocity 1-2m/s</p>
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	<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. 100-year includes the 30-year %)</i></p> <p>Description of surface water flow paths:</p> <p>In the 3.3% AEP flood event, two areas of surface water ponding are present on the site. The first is a small area of surface water in the north of the site. The second is located in the south-east of the site, around the existing building. Both are shallow in-depth and do not exceed 0.3m. These areas have a flood hazard rating of 'caution' with a small area rated as 'dangerous for some'.</p> <p>In the 1% AEP flood event, there is a surface water flow path flowing northwards along the western edge of the site. There is also surface water flooding around the perimeter of the existing building. Surface water ponding also ponds in the topographic depression in the centre of the site. Flood depths across the flow site are predominantly between 0.15m-0.3m, with some localised areas of deeper flooding, between 0.3m-0.6m. The flow path velocities on the site range between 0.25-1m/s. Flood hazard ratings on the site are predominantly rated as 'caution' with localised areas of higher risk defined as 'dangerous for some'.</p> <p>In the 0.1% AEP flood event, the extent of the flooding increases, most notably in the south and centre of the site. Flood depths along the southern edge of the existing building and in the site's centre are between 0.15m-0.6m. Flood velocities on the site significantly increase to 0.5-1m/s across a large part of the site. The majority of the site has a flood hazard rating of 'caution', with some areas having a higher flood hazard rating of 'dangerous for some' and 'dangerous for most'.</p>
Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps.
Canals	The site is a significant distance from the Chesterfield Canal and would be unlikely to be affected if the canal was to breach.
Groundwater	<p>The Environment Agency's Areas Susceptible to Groundwater Flooding dataset, provided as 1km grid squares, shows an area's susceptibility to groundwater flood emergence. The following comments can be made about groundwater flood risk:</p> <ul style="list-style-type: none"> The majority of the site has a >50% - <75% susceptibility to groundwater flood emergence from superficial deposits. <p>This assessment does not negate the requirement that an appropriate groundwater regime assessment should be carried out at the site-specific FRA stage.</p>
Sewers	The Level 1 SFRA indicates that six incidences of sewer flooding have occurred in the S80 2 postcode area.
Flood history	The Environment Agency's historic flooding map does not hold a record of flooding at the site. NCC has two records of flooding within 100m of the site. The source of flooding is unknown.
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	The site is not located in an Environment Agency flood warning or flood alert area.
Access and egress	<p>Access to the site is currently available from Newgate Street, where an access road leads to the main building.</p> <p>Surface water flooding affects the access road to the main building and a large area of the site in the 100-year and 1000-year modelled event.</p> <p>In the 1% AEP and the 0.1% AEP flood event, access and egress may be affected by significant surface water flows along Newgate Street. The majority of the access road has a flood hazard rating of 'dangerous for some'; therefore, access may be impeded.</p>
Climate change	
Implications for the site	Detailed modelling from the 2009 Level 1 SFRA was available for the River Ryton for the 1% plus 30% climate change scenario. The site is not at risk of flooding during this scenario. The significant increase in risk between a 1% and 0.1% AEP surface water flood event suggests that the site is sensitive to climate change. Flood depths on the site are predominantly between 0.15m-0.3m, with

	some small areas up to 0.6m in depth. The flow path velocities are between 0.25m/s and 2m/s across the site. The flow path has a flood hazard rating of 'caution' to 'dangerous for most people.'
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Requirements for drainage control and impact mitigation

<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- Lenton Sandstone Formation- Sandstone. ○ Superficial- none recorded. • Soils at the site consist of: <ul style="list-style-type: none"> ○ Freely draining slightly acid loamy soils. <p>SuDS</p> <ul style="list-style-type: none"> • 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 is not appropriate at this site. • BGS data indicates that the underlying geology is sandstone which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy. • The entire site is mainly located within Groundwater Source Protection Zone 1 (SPZ), and infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage, a hydrogeological risk assessment should be undertaken to ensure that the system does not pose an unacceptable risk to the supply source. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints. • The site is not located within a historic landfill site. • Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation 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 Risk of Flooding from Surface Water (RoFSW) mapping indicates surface water flow paths during the 0.1% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. Care should be taken to ensure that SuDS is not at risk of being overwhelmed during a surface water flood event. • If it is proposed to discharge runoff to a watercourse or sewer system, the receiving watercourse or asset's condition and capacity should be confirmed through surveys, and the discharge rate agreed with the asset owner.
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<p>Opportunities for wider sustainability benefits and integrated flood risk management</p>	<ul style="list-style-type: none"> • Implementation of SuDS at the site could provide opportunities to deliver multiple benefits, including volume control, water quality, amenity and biodiversity. This could provide more comprehensive sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Site masterplans should be designed to ensure space is made for above-ground SuDS features. • Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, the primary source of runoff and the likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753). • Development at this site should not increase flood risk either on or off-site. The design of the surface water management proposals should consider the impacts of future climate change over the projected lifetime of the development.
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NPPF and planning implications

<p>Exception Test requirements</p>	<p>The Local Authority will need to confirm that the sequential test has been carried out. As the site is entirely with Flood Zone 1, the Exception test is not required.</p>
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Residential development is classified as 'More Vulnerable'. No part of the site is within the national Flood Zones that show river flooding in the Borough. However, there is a significant risk of surface water flooding that must be considered further to ensure the development can be made safe from flooding and not increase flood risk elsewhere.

Requirements and guidance for site-specific Flood Risk Assessment

Flood Risk Assessment:

- It is recommended that a site-specific Flood Risk Assessment is completed at the planning application stage to assess the risk of surface water flooding and ensure there is no increase to flooding elsewhere.
- All flooding sources, particularly the risk of surface water, should be considered part of a site-specific flood risk assessment.
- The site-specific FRA should be carried out according to the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance, Bassetlaw Council's Local Plan policies, and the Nottinghamshire County Council Lead Local Flood Authority's Statutory Consultee for Planning Guidance Document.

Guidance for site design and making development safe:

- The risk of flooding should be quantified as part of the site-specific FRA, including detailed surface water flooding modelling and the existing drainage system using topographical and asset survey data. To further determine the site's risk and ensure that runoff from the development is not increased by development across any surface water flow routes. A drainage strategy should help inform site layout and design to ensure no increase in runoff beyond current rates. Surface water mitigation measures should be designed for the 1% plus climate change event.
- Areas at risk from surface water flooding should ideally be integrated into green infrastructure, presenting wider opportunities to improve biodiversity and amenity and climate change adaptation. An integrated flood risk management and sustainable drainage scheme for the site is advised. A detailed surface water flooding model using the existing drainage system, topographical and asset survey must be constructed at the FRA stage. This will further determine the risk from surface water flooding and ensure that overland flows do not overwhelm future sustainable drainage features.
- New developments should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. This should include allowance for climate change.
- Betterment on the existing site runoff rate should be sought to ensure no increase in surface water flood risk elsewhere. Ideally, surface water runoff should be fully attenuated to the greenfield rate.
- Developers should refer to Nottinghamshire County Council's 'Nottinghamshire County Council's Guidance Note on the Validation Requirements for Planning Applications and the Level 1 SFRA for information on SuDS for guidance on the information required by the LLFA from applicants to enable it to respond to planning applications.

Key messages

The site is located entirely within Flood Zone 1 and therefore the Exception test need not be applied. However, there is a significant risk of surface water flooding, particularly when considering climate change, that must be considered further to ensure the development can be made safe from flooding and that it will not increase flood risk elsewhere.

The development is likely to be able to proceed if:

- Development is located outside of areas at risk of flooding.
- A site specific FRA, including a detailed model of surface water flooding and the existing drainage system using topographical and asset survey, is undertaken to further determine the risk from surface water to the site and ensure surface water flows do not overwhelm any planned SuDS features.
- Space for surface water to be stored on the site is provided, and rainwater harvesting should be considered. Given the degree of surface water flood risk and the location of the surface water flow path crossing the site, the density of the development may need to be lowered to make space for water.
- New developments should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. This should include allowance for climate change.

Mapping Information

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

Flood Zones	The Environment Agency's Flood Zone mapping has been used in this assessment. The River Ryton Flood Zones through Worksop are based on a 1D only model so depths are not available.
Climate change	Climate change modelling outputs were not available for this site. Climate change has been assessed using Flood Zone 2 as a proxy for Fluvial flooding and the 0.1% AEP event as a proxy for surface water flooding.
Fluvial depth, velocity and hazard mapping	Results from this assessment are based on 1D modelling undertaken by the Environment Agency in 2008.
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 from the Environment Agency's Risk of Flooding from Surface Water mapping.