Solihull Metropolitan Borough Council Level 2 Strategic Flood Risk Assessment Flood Risk Assessment Detailed Site Summary Table

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="5">Site 4</td></tr>
<tr><td>Address</td><td colspan="5">West of Dickens Heath</td></tr>
<tr><td>Area</td><td colspan="5">Northern Site – 3.5 Ha Southern Site – 19.6 Ha</td></tr>
<tr><td>Current Land Use</td><td colspan="5">Greenfield/Agricultural, Recreational</td></tr>
<tr><td>Proposed Land Use</td><td colspan="5">Residential</td></tr>
<tr><td rowspan="3">Sources of flood risk</td><td>Location of site within catchment</td><td colspan="5">The site is made up of two parcels of land and is located to the west of Dickens Heath, on the eastern boundary of the River Cole catchment. The smaller site is located to the north of Tythe Barn Lane and the larger site is located to the south.
An unnamed tributary of the River Cole flows in the northernly direction along the western boundary of the larger southern site. The southern corner of this site is located in the River Blythe catchment and drains southwards.</td></tr>
<tr><td>Existing drainage features</td><td colspan="5">The upstream extent of an unnamed tributary of the River Cole flows in a northernly direction along the western extent of the larger southern site. Its confluence with the River Cole is approximately 1km downstream of the northern site boundary, north of Major’s Green. The smaller northern site is located approximately 180m to the east of the unnamed watercourse.
There are ponds located at the upstream extent of the watercourse, adjacent to the Old Yardleians Rugby Football Club just outside the western site boundary. There is a culvert in the north western corner of the larger site, where the watercourse flows under Tythe Barn Lane. This road runs from east to west, between the two sites. The watercourse is also culverted under the Stratford-Upon-Avon Canal, which runs along the northern boundary of the smaller site.
The watercourse flows immediately into a large pond to the north of the canal and is culverted again under the railway line just downstream of the pond.</td></tr>
<tr><td>Fluvial</td><td colspan="5">Proportion of Site at Risk</td></tr>
<tr><td>Site</td><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>Northern</td><td>0%</td><td>0%</td><td>0%</td><td>100%</td></tr>
<tr><td>Southern</td><td>0.37%</td><td>0.40%</td><td>0.40%</td><td>99.5%</td></tr>
<tr><td colspan="5">Highest Zone of Risk (Risk of Flooding from Rivers and Sea)</td></tr>
<tr><td colspan="5">Majority of site - Very Low
Area around unnamed tributary - Medium to High</td></tr>
<tr><td colspan="5">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%)</td></tr>
<tr><td colspan="5">Available Data:
As part of the Level 2 SFRA, detailed hydraulic modelling has been completed for the unnamed tributary of the River Cole to better understand fluvial flood risk. Survey of the channel and associated culverts was collected as part of this study and was used to develop the hydraulic model. Detailed information on the hydrology and hydraulic model can be found in the technical modelling report.
Flood Characteristics:
The smaller site north of Tythe Barn Lane is located 180m to the east of the watercourse and is not affected by fluvial flooding.
In all events, flood extents tightly follow the channel to the south of Tythe Barn Lane. Where the watercourse enters the culvert, just south of Tythe Barn Lane, an overflow pathway is shown to the west of the culvert. Here, flood water is shown to flow over the road, re-joining the watercourse just upstream of the culvert under the canal.
In the 20, 100 and 1000 year events, only the north western corner of the larger southern site and the adjacent portion of Tythe Barn Lane is shown to be impacted by fluvial flooding from the unnamed watercourse.
Flood depths are shown to reach around 0.1m to 0.2m in the northern western corner of the site in all flood events.</td></tr>
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Surface Water

Proportion of site at risk (RoFfSW)

Site	30-year High Risk	100-year Medium Risk	1,000-year Low Risk
Northern	1.2%	1.9%	5.3%
Southern	0.3%	0.4%	3.5%
Max depths (m)			
Northern	0.3 – 0.9m	0.3 – 0.9m	0.3 – 0.9m
Southern	0.3 – 0.9m	0.3 – 0.9m	0.3 – 0.9m
Max velocity (m/s)			
Northern	>0.25	>0.25	>0.25
Southern	>0.25	>0.25	>0.25

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 %).

Description of surface water flow paths:

There is one main surface water flow path associated with the unnamed tributary of the River Cole and hence the mapping is likely to be picking up the natural floodplain of this watercourse. There are some isolated surface water pooling shown across both the sites in the larger flood events.

In terms of the larger southern site, in the 30 and 100 year events, small areas of surface water flooding are seen in the north western corner and along the northern boundary adjacent to Tythe Barn Lane. Flood depths in these events are likely to be less than 0.3m.

In the 1000 year event, the flow pathway associated with the unnamed watercourse flows along the length of the western site boundary. However flood depths are shown to be less than 0.3m Surface water flooding is also seen in the north western corner of the site and in some isolated locations on the northern and eastern boundaries as well as in the centre of the site. Flood depths could reach up to 0.9m in these locations.

In terms of the smaller northern site, surface water flooding is seen in the western portion of the site in all flood events. Flood depths are largely below 0.3m but could reach up to 0.9m in the 1000 year event.

Reservoir

The sites are not shown to be at risk of reservoir flooding from the available online maps.

Groundwater

The EA 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:

- The entirety of the site has a >= 50% <75% susceptibility to groundwater flood emergence from superficial deposits.

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.

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	Flood History	There are no records of historic flooding from the Environment Agency within the recorded flood outlines dataset or historic flooding dataset. Datasets provided by SMBC shows two accounts of property flooding within the site boundary, both are located adjacent to Tythe Barn Lane. One account of property flooding is also identified just outside the eastern site boundary on Birchy Leasowes Lane which runs along the southern site boundary. SMBC also have record of highway flooding on Tythe Barn Lane adjacent to where the culvert under the road is located. One account of flooding has been recorded by Severn Trent Water in the western portion of the site. The event occurred in November 2012. No flood incidents have been recorded by the Canal and River Trust on the Stratford-Upon-Avon Canal to the north of the site.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		These sites are not protected by any formal flood defences.		
	Residual risk	There are three culverts on the unnamed watercourse within or downstream of the sites. One culvert is located under Tythe Barn Lane under the north western corner of the southern larger site. The second culvert is under the Stratford-Upon-Avon Canal on the northern site boundary and the third is under the railway line to the north of the site. If these structures were to become blocked, there is potential for increased surface water and fluvial flooding across the eastern portion of the site. JScreen, culvert blockage modelling software, was used in 2016 to look at the impact of culvert blockages on flood risk across the site. Only the culvert under Tythe Barn Lane was included in this study. Flood extents in the blocked and the unblocked scenarios are very similar in extent and impact the site north of Tythe Barn Lane. It is recommended that the potential for blockage on all culverts affecting the site should be considered as part of any future site-specific assessment.		
Emergency planning	**Flood warning**	The sites are not covered by an Environment Agency Flood Warning or Alert area.		
	Access and Egress	The smaller northern site can only be accessed from Tythe Barn Lane, which runs along the length of the site's southern boundary. The larger southern site can be accessed from Tythe Barn Lane to the north, Birchy Leasowes Lane to the south and Tilehouse Lane to the south west. In terms of fluvial flood risk, the centre of Tythe Barn Lane is shown to be affected by flooding in all events. As the northern site is located to the east of this flood risk area, access and egress to Tythe Barn Lane is unaffected by fluvial flooding. Access and egress from the southern site travelling eastwards on Tythe Barn Lane is unaffected by fluvial flood but access westwards to Tilehouse Lane is affected. Access to Birchy Leasowes Lane to the south is also unaffected by fluvial flooding. In terms of surface water flood risk, surface water flooding is only seen on Tythe Barn Lane adjacent to the northern site in the 1000 year event. In this event, flood depths on Tythe Barn Lane are shown to be below 0.3m, therefore access and egress should not be affected. When assessing access and egress for the southern site, although Birchy Leasowes Lane is affected by surface water flooding in all events, flood depths are shown to be less than 0.3m. Therefore access and egress to the south should not be affected. Surface water flood risk along Tythe Barn Lane makes access and egress to the north more challenging.		

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		In summary, the northern site is best accessed from Tythe Barn Lane to the south as there is no fluvial flood risk and surface water flood risk is minimal. The southern site is best accessed from Birchy Leasowes Lane to the south as there is no fluvial flood risk and surface water flood risk is minimal. The depths, velocities, hazards, durations and speeds of onset of surface water and fluvial flooding along access/ egress routes should be investigated further in a site-specific assessment, to confirm whether access for emergency vehicles could still be obtained.
Climate Change	**Implications for the site**	• Increased storm intensity and frequency due to climate change may increase the extent, depth, velocity, hazard and frequency of flooding from the unnamed watercourse and surface water flooding across the site. • As part of the modelling study completed for the Level 2 SFRA, climate change allowance have been considered. For the 1 in 100 year event, the 2080s period was used, and all three allowance categories were modelled (20%, 30% & 50%). When the climate change allowances were modelled, the results show a slight increase in flood extent on the site. There is a slightly greater increase in flood extent just upstream of the canal culvert on the northern site boundary when climate change is considered. • Climate change also needs to be considered for surface water events; at the site-specific stage. The 100-year event with a 40% allowance for climate change should be considered as part of surface water drainage strategies, or surface water modelling. • The current day 1,000-year surface water extent provides an indication of the likely increase in extent of the more frequent events. It is likely that, as a result of climate change, surface water flood risk across the site will increase, especially surrounding the unnamed watercourse and along Tythe Barn Lane and Tilehouse Lane. Despite greater surface water flood extents, flood depths show to be largely less than 0.3m across the site with isolated areas where 0.3 to 0.9m depth flooding could be expected. • The impact of climate change on surface water flood risk will require a detailed FRA to assess the site layout and design. • Developers should consider SuDS strategies to manage the impacts of climate change from surface water in a detailed site-specific FRA.

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	Geology of the site consists of:
		• Bedrock: Mercia Mudstone Group - Mudstone
		• Superficial:
		  o North: Alluvium - Clay, Silt, Sand & Gravel, Glaciofluvial Deposits & Till
		  o South: Till
		Soils at the site consist of: Slowly permeable seasonally wet acid loamy and clayey soils. The site is not located within an EA Source Protection Zone. This site has a small area within its boundary designated by the EA as being a landfill site. This is located at Whitlock's End Farm, in the south western portion of the site. A thorough investigation will be required as part of a detailed FRA to determine the extent of the contamination and the impact this may have on SuDS. Proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
		• Most source control techniques may be suitable. Permeable paving may have to use non-infiltrating systems given the possible groundwater risk.
		• 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.
		• Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required to prevent the egress of groundwater.

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		• All filtration techniques are likely to be suitable. A liner maybe required to prevent the egress of groundwater. • 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. A liner maybe required to prevent the egress of groundwater. • Site masterplans should be designed to ensure space is made for above ground SuDS features. • Developers should refer to Solihull Metropolitan Borough Council's **Guide to SuDS and Drainage in Solihull** document as well as the Level 1 SFRA, for information on suitable types of SuDS, the management train and opportunities and constraints in site master-planning.
NPPF and Planning Implications	**Exception Test Requirements**	The Local Authority have carried out the Sequential Test in line with national guidance. This has supported this site being taken forward for further consideration, including considering if the Exception Test would apply. Residential development is classified as 'More Vulnerable'. As the southern site is partially covered by Flood Zone 3 and is proposed for residential development, the Exception Test will need to be applied to the site. A sequential approach to site layout will contribute towards passing the flood risk element of the Exception Test, this means that the least vulnerable type of development (in terms of Table 2 of the Flooding section of the NPPG) should be located in the higher flood risk parts of the site. In no instances should highly vulnerable development be located in Flood Zones 3a and 3b. More vulnerable development (such as dwellings) should be located outside Flood Zone 3 whenever possible. Development in the high flood risk parts of the site should be designed such that it is flood resilient and resistant. It is anticipated that proposed development will be sequentially located within Flood Zone 1 on this site.
	Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific Flood Risk Assessment will be required if any part of the development is located within Flood Zones 2 or 3 or it is greater than one hectare. • The site-specific FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Solihull Council's Local Plan policies, and the LLFA's **Guide to SuDS and Drainage in Solihull**. • Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage. • All sources of flooding, particularly fluvial, surface water and groundwater flooding, should be considered as part of a site-specific FRA. • Although modelling has been completed as part of this SFRA, detailed modelling of the site will still be required as part of the site-specific FRA to confirm both fluvial and surface water flood risk and flow paths. Detailed modelling would require topographic survey of the site and well as any additional asset survey needed to refine the model further. In addition, the latest guidance on climate change allowances would need to be considered and any mitigation measures would need to be tested through modelling. • The development should be designed using a sequential approach. Development should be steered away from areas of fluvial flood risk and surface water flow routes, preserving these spaces as green infrastructure. Development must be in line with Table 3: flood risk vulnerability and flood zone compatibility of the NPPG. Development in FZ3b should be avoided unless appropriate use can be demonstrated in line with NPPF. • Development in FZ3 may require floodplain compensation and this should be confirmed with the EA at FRA stage.

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		Guidance for site design and making development safe: • 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). • Safe access and egress will need to be demonstrated in the 1 in 100-year plus climate change fluvial and rainfall events, using the depth, velocity and hazard outputs. Raising of access routes must not impact on surface water flow routes. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • The opportunity to raise parts of Tythe Barn Lane to ensure a dry access through the site should be explored in a site specific FRA. This presents the opportunity to replace the current culvert with a suitably sized bridge crossing. • Resilience measures will be required if buildings are situated in the flood risk area. Raising Finished Floor Levels above the 100 year event with allowance for climate change may remove the need for resilience measures. • Culverting should be avoided where at all possible and limited to short lengths for essential infrastructure. The need to ensure both fluvial and surface water flows can pass through the site is essential. • Deculverting of any watercourse assets is also considered a priority. • The impact of culvert blockage needs to be fully assessed. Any new culverts proposed as part of access improvements will need to be designed to ensure they do not increase flood risk up or downstream and will require a Land Drainage Consent outside of the planning process from the LLFA. • If existing culverts are to be kept, a full CCTV condition survey is required to ensure the culvert will be sound for the lifetime of the proposed development. Improvements should be sought, such as trash screens compliant with the latest Environment Agency guidance and relining where this is an appropriate and sustainable option. • For any culverts (old or new), the developer must set out who is adopting and maintaining those culverts throughout the lifetime of the development. The design of the development must consider the residual risk of blockage e.g. properties should not be placed in the area that could flood if a culvert blocks and the exceedance flows from such an event should be built into the site masterplan. • 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. • **Areas at risk from fluvial and surface water flooding should ideally be integrated into green infrastructure, which presents wider opportunities to improve biodiversity and amenity as well as climate change adaptation. An integrated flood risk management and sustainable drainage scheme for the site is advised.** This needs to be modelled to inform the design to ensure that surface water overland flows or fluvial flooding do not overwhelm 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. Assessment for runoff should include allowance for climate change effects.

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		• Betterment on the existing site runoff rate should be sought on the brownfield areas of the site to ensure that there is no increase in surface water flood risk elsewhere. Surface water runoff must be fully attenuated to the greenfield rate. • Developers should refer to **SMBC's Guide to SuDS and Drainage in Solihull** and the Level 1 SFRA for background information on SuDS.
Key Messages		The flood risk element of the Exception Test is likely to be passed if: • Development is limited to the 96.1% of the southern site located outside of the Environment Agency's Flood Zone 2 and 3. • Areas in Flood Zone 1 and then 2 are used for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. • If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another) • Space for green infrastructure should be considered in the areas of highest flood risk. • The **Solihull Feasibility Study** (AECOM, December 2020) identifies the importance of increased flood storage for flood risk management in the River Cole Corridor. There is therefore an opportunity for betterment at this site in terms of increased flood storage, contributing towards the wider strategy for the River Cole catchment. Developers should take account of this and demonstrate to the Council how the development of their site contributes towards the wider flood storage needs in the River Cole catchment. • New developments should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. Assessment for runoff should include allowance for climate change effects. • Betterment on the existing site runoff rate should be sought to ensure that there is no increase in surface water flood risk elsewhere. Surface water runoff must be fully attenuated to the greenfield rate. • Safe access and egress routes must not be in the areas of high surface water risk or the 100-year fluvial design flood event (taking into account climate change). The opportunity to raise parts of Tythe Barn Lane to ensure a dry access through the site should be explored in a site specific FRA. Refer to the detailed 'guidance for developers' section for further information on the measures that are appropriate for this site.

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Mapping Information

The key datasets used to make planning recommendations regarding this site were the outputs of the detailed hydraulic model developed as part of the Level 2 SFRA study 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 detailed 1D-2D hydraulic model developed as part of the Level 2 SFRA study. Detailed information regarding the model developed can be found in the technical model report.
Climate change	Environment Agency climate change allowances were modelled as part of detailed hydraulic modelling study completed for this Level 2 SFRA.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping has been taken from the detailed hydraulic model developed as part of the Level 2 SFRA. This information should be explored further at site-specific stage.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.