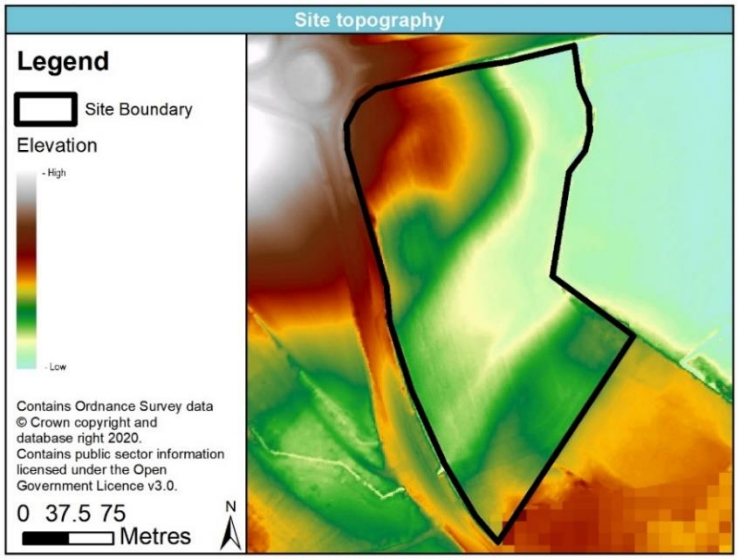
Charnwood Borough Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="4">PSH343</td></tr>
<tr><td>Address</td><td colspan="4">Loughborough Road</td></tr>
<tr><td>Area</td><td colspan="4">5.70 ha</td></tr>
<tr><td>Current land use</td><td colspan="4">Greenfield</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="4">Sources of flood risk</td><td>Topography</td><td colspan="4"> 

The site generally slopes from a high elevation in the north west corner of the site into a topographic depression the centre of the site.
• The south of the site also slopes towards this location.
• The ground slope across the site generally has a gradient of less than 5%.
• There are no existing buildings located within the site.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">An unnamed drainage feature tracks north along the north eastern boundary and is culverted under the A6 just outside the north east corner of the site. This unnamed watercourse drains into the Grand Union Canal and River Soar 1.6km north east of the site. The Poultney Brook also flows shortly south of the site after turning 90 degrees from north to east, flowing into the Quorn Brook and River Soar. The site is located between these two floodplains.</td></tr>
<tr><td rowspan="4">Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>33%</td><td>33%</td><td>47%</td><td>53%</td></tr>
<tr><td colspan="4">Highest zone of risk (Risk of Flooding from Rivers and Sea)</td></tr>
<tr><td colspan="4">High</td></tr>
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		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%)
		Available data: The site is in the vicinity of the Environment Agency's Upper Lower Soar (2012) and Loughborough Tributaries (2017) hydraulic models and 2D generalised modelling along the unnamed watercourses and Poultney Brook. The extent of the Flood Zones predicted by the flood model are different to the extent of the actual flood risk, as there are flood risk management features that change the risk. **Flood characteristics:** The Environment Agency's Flood Map for Planning shows the east of the site and across the centre towards the south west corner to be located within Flood Zone 3a. This is further increased for Flood Zone 2 with extents increasing towards the north west of the site. Fluvial risk to the site originates from a combination and interaction of the Poultney Brook and the outer River Soar floodplains. There is also a small drain which enters a culvert under Loughborough Road and reappears along the site's north-eastern boundary. When flood risk management features are applied and the defended Upper Lower Soar and Loughborough Tributaries model results are inspected, fluvial risk associated with the River Soar becomes negligible for the defended 100-year extent; it does not reach the site. For the defended 1,000-year reaches up to the A6, bounding the north of the site. Regarding Flood Zone 3b, this has been assumed to be Flood Zone 3a in this assessment, due to the presence of generalised outputs at this location as the Poultney Brook modelled 20-year is not present until further downstream; however, the 20-year River Soar flood extents do not affect the site and in reality, there may not be the flow path interaction between the Soar and Poultney floodplains as shown in the EA's Flood Map for Planning, as the Loughborough Road is embanked. Flood risk from the drain along the boundary should be investigated though, as this may help link local drains to these larger floodplains. It is recommended that a more detailed hydraulic model is constructed or extended along the Poultney Brook or to investigate the connections of these small, localised drains at the site-specific Flood Risk Assessment stage, to confirm fluvial flood risk and the functional floodplain at the site.

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<tr><td rowspan="10"></td><td rowspan="9">Surface Water</td><td colspan="3">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td>30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td><1%</td><td>1%</td><td>21%</td></tr>
<tr><td colspan="3">Max depths (m)</td></tr>
<tr><td>0.3-.0.6</td><td>0.3-0.6</td><td>0.3-0.6</td></tr>
<tr><td colspan="3">Max velocity (m/s)</td></tr>
<tr><td>N/A</td><td>0-0.25</td><td>1-2</td></tr>
<tr><td colspan="3">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 %)</td></tr>
<tr><td colspan="3">Description of surface water flow paths:
The site experiences small areas of surface water ponding, in areas of a topographic depression, for 100-year and 1,000-year events. Additionally, there is a significant surface water flow path expanding across the southern half of the site for the 1,000-year event.
There is a significant build-up of surface water ponding shortly west of the site, up against the embanked Loughborough Road.
Depths are shallow in all events, event the 1,000-year where the expanse is larger.
RoFSW takes account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575.</td></tr>
<tr><td>Groundwater</td><td colspan="3">The Areas Susceptible to Groundwater Flooding dataset shows the site is located within a 1 km grid square where >=75% of the area is predicted to be at risk of groundwater flooding.
The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. Ground investigations at the site.</td></tr>
<tr><td>Reservoir</td><td colspan="3">The available online maps show that the maximum extent from reservoir flooding has a significant reach into the site.</td></tr>
</table>

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	Address	Loughborough Road		
	Area	5.70 ha		
	Current land use	Greenfield		
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	Flood history	There are no records of historic flooding at this site from the Environment Agency. No recorded historical flood incidents occurred within 550m of the proposed development site. Leicestershire County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		N/A	N/A	N/A
		This site is not protected by any formal flood defences.		
	Residual risk	There is an unnamed ordinary watercourse which flows along the north-east site boundary and is culverted under the A6 to the north of the site. If the entrance to this culvert becomes blocked water is likely to back up, causing increased surface water ponding in an area already susceptible to risk. The culvert entrance is in a topographic depression where it is unlikely water will escape from but the depth of water at this location will likely increase if the culvert is blocked. This should be investigated further in a site-specific FRA.		
Emergency planning	**Flood warning**	The site is situated within the Environment Agency's Lower River Soar in Leicestershire Flood Alert area (034WAF428) and River Soar at Quorn Flood Warning area (034FWFSOQUORN).		
	Access and egress	Access and egress to the site can be gained from the north west of the site via Loughborough Road and Terry Yardley Way (A6004) for all fluvial and surface water events. Access is also possible to the south-east onto Loughborough Road. It should be noted that the surface water and fluvial extents are shown to bisect the site and therefore consideration is needed regarding access to the north-eastern portion of the site. 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.		

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Site details	**Site Code**	**PSH343**
	Address	Loughborough Road
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Climate Change	**Implications for the site**	• Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard and frequency of both fluvial and surface water flooding. • There are detailed modelling outputs from the Upper Lower Soar and Loughborough Tributaries modelling studies, located to the east of the site. Outputs from these models predict an increase in flood risk compared to the 100-year (Flood Zone 3). The extents are shown to encroach into the central portion of the site. Risk associated with the unmodelled watercourses will need to be considered as part of a site-specific Flood Risk Assessment, latest EA climate change allowances will need to be considered in a detailed hydraulic model, to confirm the impact in the site. • Climate change also needs to be considered for surface water events; at the site-specific stage, the 100-year +40% event is 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. This would require a detailed FRA to assess the site layout and design. • Developers should consider SuDS strategies to reduce the impacts of climate change from surface water in a detailed site-specific FRA.
Requirements for drainage control and impact mitigation	**Bedrock Geology**	The entire site's bedrock geology consists of the Wealden Group (mudstone, siltstone and sandstone).
	Superficial Geology	The site is underlain with Alluvium deposits consisting of clay, silt and sand.
	Soils	Mostly loamy and clayey floodplain soils with naturally high groundwater however, the NW corner has slightly acid loamy and clayey soils with impeded drainage.
	Source Protection Zone	The site is not located within any Environment Agency designated Source Protection Zone.

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	Historic Landfill Site	The site is not designated by the Environment Agency as previously being a landfill site.
	Broad scale assessment of possible SuDS	Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider 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. 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. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints. The following techniques are considered suitable for the site: • 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 from groundwater. • Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration. • This option may be feasible provided site slopes are < 5% at the location of the detention feature. A liner maybe required to prevent the egress of groundwater. • This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. 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.

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NPPF and planning implications	**Exception Test requirements**	The Local Authority have carried out the Sequential Test in line with national guidance. The Sequential Test will need to be satisfied based on fluvial and other sources of flood risk before the Exception Test is applied. Residential development is classified as 'More Vulnerable'. It is recommended that proposed development will be sequentially located within Flood Zone 1 areas of the site, which may need to be confirmed through a site-specific assessment. It should be noted that fluvial flood risk is high at this site, which may pose difficulties for the development, though more detailed investigations may show the site is at lower flood risk than the Flood Map for Planning shows. The Exception test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. Development will not be permitted for the following scenario: • Highly vulnerable development within FZ3a. • Highly vulnerable, More vulnerable and / or Less vulnerable development within FZ3b.

	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 for this site as development is located within Flood Zone 2 and may be subject to other sources of flooding and the development may introduce a more vulnerable use. It will also be required where development sites:
		  ○ are 1 hectare or more in size;
		  ○ contain land which has been identified by the Environment Agency as having critical drainage problems; or
		  ○ contain land identified in the strategic flood risk assessment as being at increased flood risk in future.
		• Other sources of flooding must be considered as part of any site-specific Flood Risk Assessment, including surface water and groundwater.
		• Consideration should be given to the potential effects of climate change, particularly with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in the predicted surface water flood risk at existing development.
		• A more detailed hydraulic model may be required at Flood Risk Assessment stage, to confirm flood risk and flow paths, FZ3b and climate change extents from the unmodelled parts of local watercourses. The EA may have some concerns about flood flow routes into this site.
		• Where there is a reasonable likelihood of multiple sources of flood risk having significant impact in combination it is recommended that consideration is given to assessing the combined risks of these.
		• Any FRA should be carried out in line with the National Planning Policy Framework, Flood Risk and Coastal Change Planning Practice Guidance, Charnwood Council's Local Plan policies and the LLFA's SuDS guidance.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• 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.
		
		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. • Resilience measures will be required if buildings are situated in the flood risk area. Raising Finished Floor Levels above the design event may remove the need for resilience measures. • 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 placing 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 the current greenfield rates. • On site attenuation schemes would need to be tested against the watercourse to ensure flows are not exacerbated downstream within the catchment. • New or re-development 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. • New development must seek opportunities to reduce overall level of flood risk at the site, for example by: o Reducing volume and rate of runoff o Relocating development to zones with lower flood risk o Creating space for flooding. • All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff. • SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc. Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving. • Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space. • Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
Key messages		The flood risk element of the Exception Test is likely to be passed if: • Development is limited to the 79% of the site outside of the Risk of Flooding from Surface Water zones and within Flood Zone 1. Therefore, development should be steered towards the north west and towards the southern site boundary. • It should be noted that the surface and fluvial flood water is shown to bisect the site and therefore consideration is needed regarding access from either side, avoiding areas of highest risk. • Detailed hydraulic modelling may need to be conducted for the unnamed watercourse that intersects the site to assess the present and future fluvial risk to the site. • Areas in Flood Zone 2 are used for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. No residential development is permitted in Flood Zone 3 and no development at all is permitted in Flood Zone 3b.

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		• 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. Refer to the 'detailed guidance for developers' section (above) for further information on the measures that are appropriate for this site.

Mapping Information

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

Flood Zones	The Flood Zone data is based on the Environment Agency's Flood Map for Planning. The site is in the vicinity of the Environment Agency's Upper Lower Soar (2012) and Loughborough Tributaries (2017) hydraulic models and 2D generalised modelling along the unnamed watercourses and Poultney Brook. The extent of the Flood Zones predicted by the flood model are different to the extent of the actual flood risk, as there are flood risk management features that change the risk.
Climate change	Climate change was based the Environment Agency's Upper Lower Soar (2012) and Loughborough Tributaries (2017) hydraulic models, which extend to the site. Where there is no modelling, Flood Zone 2 can be used as a proxy. Investigation of climate change impacts specifically from the Poultney Brook/ unmodelled drains in this area may be required at site-specific stage.
Fluvial depth, velocity and hazard mapping	The modelled outputs used to assess depth, velocity and hazard are from the detailed Environment Agency Upper Lower Soar (2012) and Loughborough Tributaries (2017) hydraulic models, though these do not impact the site. Depth, velocity and hazard outputs of fluvial risk associated with the unnamed watercourse which flows through the site are not available, therefore, the Risk of Flooding from Surface Water mapping can be used as this represents the floodplains of small watercourses. This should be explored further at the site-specific stage.

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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 30-year (high risk), 1 in 100-year (medium risk) and 1 in 1,000-year (low risk) events is taken from the Environment Agency's Risk of Flooding from Surface Water mapping.