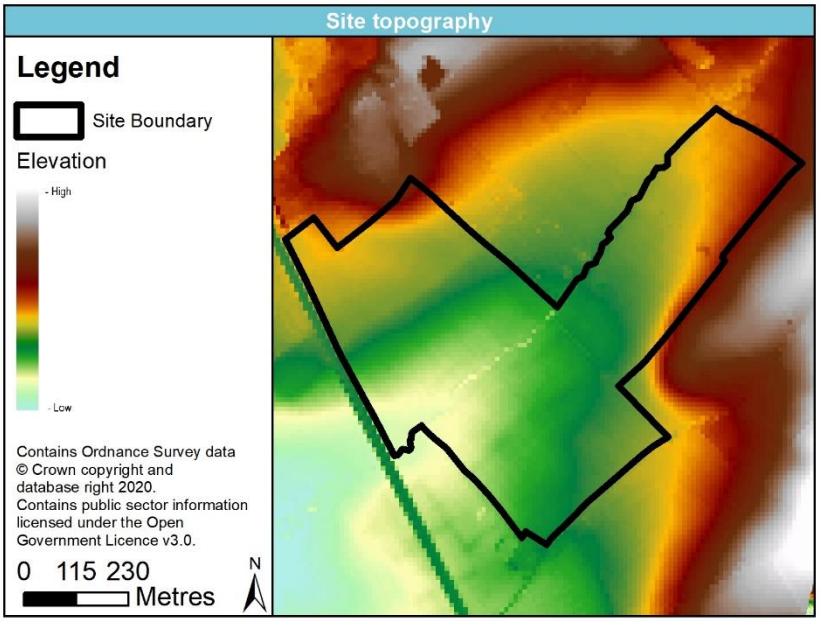
Charnwood Borough Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**PSH493**
	Address	Ratcliffe Road
	Area	45.15 ha
	Current land use	Greenfield
	Proposed land use	Residential
Sources of flood risk	**Topography**	 The site generally slopes from the north east towards the west of the site. • There are no existing buildings located within the site. • The ground slope across the site generally has a gradient of less than 5%.
	Existing drainage features	There is an unnamed ordinary watercourse which enters the site from the south east, following a boundary line before it meets a second ordinary watercourse flowing from the east. Both watercourses drain to the west site boundary where it is culverted under the railway line. The watercourse eventually drains 1400m west and into the River Soar.
	Fluvial	**Proportion of site at risk**

FZ3b	**FZ3a**	**FZ2**	**FZ1**
3%	3%	4%	96%

Highest zone of risk (Risk of Flooding from Rivers and Sea)
High

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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 covered by the Environment Agency's Flood Map for Planning, which uses 2D generalised modelling data. This only commences halfway down the ordinary watercourse, partway through the site, because further upstream, the catchment is less than 3km^2, which is not represented in the EA's Flood Zones.

Flood characteristics:
The Environment Agency's Flood Map for Planning displays a very minor difference between Flood Zone 3 and 2, but the site is bisected by the channel and flood risk. As mentioned above, the Flood Zones only commence part-way through the site due to catchment size, so the entire length of the watercourse through the site and along its north-eastern boundary is not represented. The surface water mapping can be used to infer flood risk along the remaining reach in the absence of detailed data.
As this is 2D generalised modelling in the Flood Zones, there is no backing up shown at the rail embankment, which in reality in a detailed model, there would be some representation of this structure.

It is recommended that a more detailed hydraulic model is constructed at the site-specific Flood Risk Assessment stage, to confirm fluvial flood risk to the site for the entire channel extent.

Surface Water

Proportion of site at risk (RoFfSW)		
30-year	**100-year**	**1,000-year**
3%	5%	19%
Max depths (m)		
>1.2	>1.2	>1.2
Max velocity (m/s)		
1-2	1-2	>2

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 %)

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		Description of surface water flow paths: Surface water flow follows the watercourse tracking south-west (following the point where the watercourses merge) for all events. There is surface water flooding at this eastern boundary, with a wider extent for the lower probability events. There is evidence of surface water ponding and backing up against the railway embankment in all events, extending more significantly in the 1,000-year event. The site is bisected by surface water risk in the middle of the site. Depths are significant due to it picking up the maximum depth along the watercourse topography. RoFfSW 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.		
	Groundwater	The Areas Susceptible to Groundwater Flooding dataset shows the site is located within a 1 km grid square where >=25% <50% 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 may be required at the site.		
	Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps.		
	Flood history	There are no records of historic flooding at this site from the Environment Agency. No recorded historical flood incidents occurred within 550km 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 manageme	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		N/A	N/A	N/A

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nt infrastructu re		This site is not protected by any formal flood defences.
	Residual risk	The unnamed watercourse which flows through the centre of the site is culverted under the railway close to the west site boundary. If the entrance to this culvert were to become blocked, water could back up and cause flooding within the site. It is likely this embankment will cause an impoundment. The site is therefore considered to be at a residual risk from this culvert and should be investigated further in an FRA.
Emergency planning	**Flood warning**	A small area of the site is situated within the Environment Agency's Leicester River Soar Flood Alert area (034WAF428). The site is not situated within an Environment Agency Flood Warning area.
	Access and egress	Safe access and egress is available for the site via Blackberry Lane to the south for all fluvial and surface water events. Due to the ordinary watercourses present, consideration is required regarding access from both the eastern and western boundaries of the site. Ratcliffe Road is accessible in a south-easterly direction except for in the 1,000-year surface water event, where a large flow path crosses the road to meet the watercourse. Access considerations are needed for the north-western portion of the site, north of the watercourse where there are no roads present (unless extending from an existing housing estate) and a railway embankment.

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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 is no detailed fluvial modelling available at the site to indicate fluvial flood risk at the site due to climate change. 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. • Using Flood Zone 2 (1,000-year) as a proxy for climate change, there is only a small increase in flood extent. Therefore, the site is predicted to be at an increase in flood risk in the future. • 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 mudstone, siltstone and sandstone).
	Superficial Geology	The south-east half of the site is underlain by River Terrace Deposits (undifferentiated) consisting of sand and gravel whilst the other half is underlain by Till deposits, consisting of diamicton.
	Soils	Slightly acid loamy and clayey soils with impeded drainage and the NE edge has lime-rich loamy and clayey soils with impeded drainage.
	Source Protection Zone	The site is not located within any Environment Agency designated Source Protection Zone.
	Historic Landfill Site	The site is not designated by the Environment Agency as previously being a landfill site.

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	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. • 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. • 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.

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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 using detailed modelling. 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 3b 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 watercourse, using channel topographic survey.
		• Climate change modelling should be undertaken using the relevant allowances for the type of development and level of risk.
		• 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, and 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:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ 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 81% of the site outside of the Risk of Flooding from Surface Water zones and within Flood Zone 1. Development should therefore be steered towards the western and eastern sides of 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. • Detailed hydraulic modelling will need to be conducted for the unnamed watercourse that intersects the site to assess the present and future fluvial risk to the site. • 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).

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		• Space for green infrastructure should be considered in the areas of highest flood risk. • Due to the ordinary watercourses present, access considerations are needed for the north-western portion of the site, north of the watercourse where there are no roads present (unless extending from an existing housing estate) and a railway embankment. 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	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Zones (2020) and detailed modelling where present for Flood Zone 3b. In the absence of modelling, Flood Zone 3a has been used as an indication of Flood Zone 3b. It is recommended that a more detailed hydraulic model is constructed at the site-specific Flood Risk Assessment stage, to confirm flood risk.
Climate change	Climate change was based on Flood Zone 2 to serve as an indication of possible extents. It is recommended that the latest EA's climate change allowances are modelled in a detailed hydraulic model as part of a site-specific Flood Risk Assessment.
Fluvial depth, velocity and hazard mapping	There is no available corresponding fluvial modelling data from the generalised 2D model; 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.
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.