Welwyn Hatfield Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**Cuf16**
	Address	Northaw Pumping Station
	Area	2.67ha
	Current land use	Greenfield
	Proposed land use	Residential
Sources of flood risk	**Existing drainage features**	The Hempshill Brook, a tributary of Cuffley Brook flows along the western border of the site in a southerly direction.
	Fluvial	**Proportion of site at risk**

FZ3b	**FZ3a**	**FZ2**	**FZ1**
5%	15%	35%	65%
Max depths (m) (out of bank)			
0.34	0.44	0.68	n/a
Max velocity (m/s) (out of bank)			
0.43	0.48	1.04	n/a
Max hazard rating (out of bank)			
Danger for some	Danger for most	Danger for most	n/a

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:

This watercourse is represented in the EAs Flood Zones, but 2D generalised modelling has been undertaken for the SFRA in 2015 to obtain more flood risk information, and this has been used to assess flood risk. A more detailed model of the channel using survey would need to be undertaken at site-specific stage.

Flood characteristics:

The fluvial flood risk to the site is associated with the Hempshill Brook. The area immediately along the site's western boundary is within FZ2 and FZ3 with FZ2 extending further into the site. The north-western corner of the site and the narrow portion of the site along the existing track road is the most impacted. FZ3b is largely in-bank, with a small portion spilling on to the road where this meets Northaw Road East.

Looking at the interactive mapping of the 100-year event, outside of the river channel, the maximum hazard rating is 'Danger for most'; this is isolated to a small portion of road at the Northaw Road East corner. Danger for most is also shown along the river channel which is excluded from this analysis. Most of the site is 'Very low danger'. Velocities are predominantly low away from the channel, between 0.2-0.5m/s, and flood depths are fairly low in the majority of the site at <0.5m, with small areas of deeper ponding near the channel edge and the southern tip of the access road. Developers should steer development away from the western edge of the site where it is bounded by the watercourse, where the risk is highest.

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	Surface Water	**Proportion of site at risk (RoFfSW)**		
		30-year	**100-year**	**1,000-year**
		6%	26%	53%
		Max depths (m) (out of bank)		
		0.3-0.6	0.3-0.6	0.9-1.2
		Max velocity (m/s) (out of bank)		
		1.0-2.0	1.0-2.0	>2.0
		Max hazard rating (out of bank)		
		Danger for most	Danger for most	Danger for all
		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 %). The % given are indicative only and more detailed work to refine this at a site-specific scale may be required.		
		Description of surface water flow paths: The surface water flooding that affects the site is shown to relate to flows towards the Hempshill Brook. The 1,000-year extents cover approximately half of the site, with the 100-year event also encroaching onto approximately a quarter of the site. The 30-year event has a smaller impact, mostly impacting the access and egress along the narrow width of the access road. Outside of the river channel, looking at the 100-year surface water event in the interactive mapping, velocities are quite high nearest the channel at 1.0-2.0m/s, and in the most southerly corner of the site where the road meets Northaw Road East. The deepest areas of the surface water extent (0.3-0.6m) is in the middle of the out of bank extents, and in the most southerly corner of the site. Hazard is predominantly 'Very low'/ 'Danger for some', but isolated pockets following the same pattern as depth and velocity, near the channel and at the southern site end, are 'Danger for most'. Developers should steer development away from the western edge of the site where risk is greatest.		
	Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps.		
	Flood history	The Environment Agency's historic flood map shows no history of flooding at the site.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		This site is not protected by any formal flood defences.		

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	Residual risk	The long thin portion of the site parallel with the Hempshill Brook abuts the Northaw Road East, which could be further impacted if this were to block. However, this part of the site is already impacted in all events, so the change is unlikely to be significant.
Emergency planning	**Flood warning**	The site is not covered by the Environment Agency's Flood Warning Service but is within the Flood Alert area.
	Access and egress	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. The flood risk is along the site's western boundary, which lies adjacent and parallel with the Hempshill Brook. Access and egress towards Northaw Road East, via a small road from the site, is restricted by both fluvial and surface water flooding due to its proximity to the channel. The Flood Zones from the 2D generalised mapping shows that access is restricted from the 100-year flood event. Hazard is high in the channel itself, and low in the floodplain where water is out of bank. Surface water hazard is a little higher than fluvial hazard, though is mostly low in/ adjacent to the site. The depths of flooding along the access/ egress route should be investigated in a site-specific assessment, to confirm whether access for emergency vehicles could still be obtained. Consideration could be given to developing a community flood plan for sites Cuf14, Cuf15 and Cuf16.
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. • 2D generalised modelling of the 100-year +20% shows a slightly larger flood extent than FZ3, but smaller than FZ2. Climate change impacts should be investigated at the site as part of a site-specific assessment, using detailed hydraulic modelling. • 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 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.

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Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Lambeth Group: Clay, Gravel, Sand and Silt.
		  ○ Superficial – Sand and Gravel (northern part of the site).
		• The site is not located within a Groundwater Source Protection Zone.
		• Source control techniques are likely to be suitable for this site.
		• Infiltration is likely to be suitable. Mapping suggests a low risk of ground water flooding; however, site investigations should be carried out to assess potential for drainage by infiltration.
		• Detention features may be feasible providing site slopes are <5% at the location of the detention feature. If groundwater is a risk to the site, then a liner may be required to mitigate against potential contamination issues.
		• Filtration systems are unlikely to be suitable as the majority of slopes are >5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible it should be located where the depth to the water table is >1m. If the site is at risk from groundwater, then a liner will be required.
		• All forms of conveyance features are likely to be suitable. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
		• The site is not designated by the Environment Agency as previously being a landfill site.
		• Developers should refer to Hertfordshire County Council's SuDS Design Guidance and SuDS Policy Statement, 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. The Sequential and Exception Test document (November 2019) provides the detail on how this has been undertaken and can be found on the Local Authority website. The Sequential Test will need to be passed before the Exception Test is applied. Residential development is classified as 'More Vulnerable'. It is anticipated that proposed development will be sequentially located within Flood Zone 1. 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.

	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 development is located within Flood Zones 2 or 3 or is greater than one hectare. • All sources of flooding, particularly the risk of surface water and groundwater flooding, should be considered as part of a site-specific flood risk assessment. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Welwyn Hatfield Council's Local Plan policies, and the LLFA's SUDS guidance and Policy Statement. • 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. • Betterment on the existing site runoff rate should be sought to ensure that there is no increase in surface water flood risk elsewhere. Ideally, surface water runoff should be fully attenuated to the greenfield rate.

		• Developers should refer to Hertfordshire County Council's SuDS Design Guidance, SuDS Policy Statement and the Level 1 SFRA for information on SuDS.
		• 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.
		• 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.

Mapping Information		
Flood Zones		Flood Zones 2 and 3 have been taken from the 2D generalised modelling undertaken for the SFRA (2015-2016). The extents may vary slightly from the original Environment Agency's Flood Map for Planning Flood Zones (shown in the L1 SFRA), due to more recent ground level data or hydrology being used.
Climate change		Climate change modelling was taken from modelled 2D generalised Jflow extents. The mapping provides a strategic assessment of climate change risk – developers should undertake detailed modelling of climate change allowances as part of a site-specific FRA.
Fluvial depth, velocity and hazard mapping		Depth, velocity and hazard mapping for the 1 in 100-year event have been taken from 2d generalised modelling techniques.
Surface Water		The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding. This dataset is not suitable for identifying whether an individual property will flood. It is based on the confidence in the modelling at that location; because of the way the mapping has been produced and is indicative, the maps are not appropriate to act as the 'sole evidence' for any specific planning or regulatory decision or assessment of risk in relation to flooding without further supporting studies or evidence. Please consult all layers and outputs provided on the RoFfSW mapping for further details.
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.