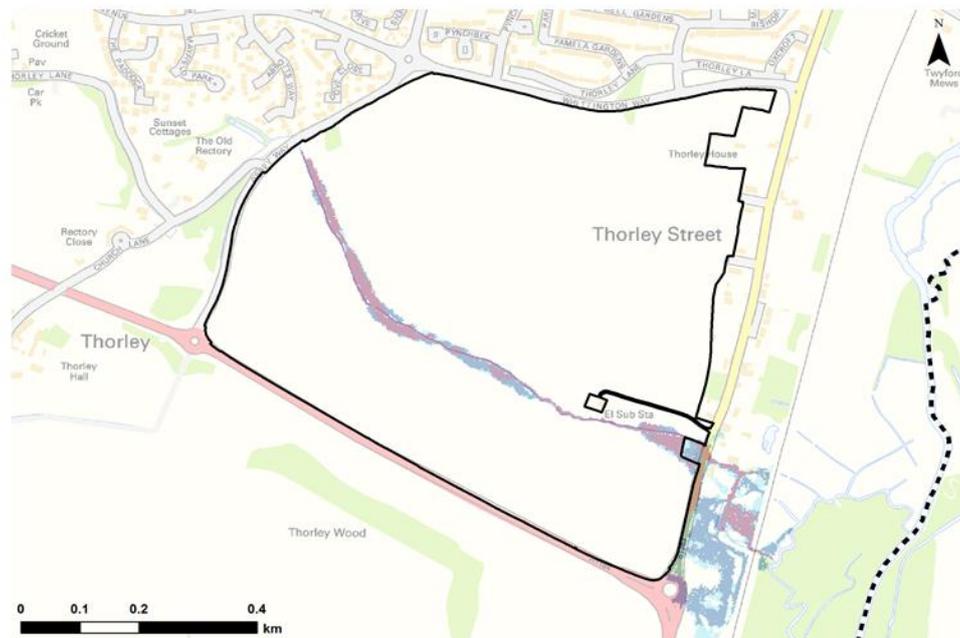


EH1 - BISH7, Bishops Stortford, South, + Employment Land				
OSNGR:	548480,218967	Area: 54.30ha		Greenfield
Flood Zone Coverage:		FZ3b	FZ3a	FZ2
<small>*based on 2D Jflow modelling</small>		2.03%*	2.85%*	3.13%*
Proposed Development Details:				
750 homes, primary and secondary education, 4-5 hectares of employment land and green space				
Exception Test Required?				
Likely, as the flood risk from the unnamed watercourse intersects the site which may constrain where development can be placed.				
The Exception test is needed if:				
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.				
"Essential Infrastructure" development in FZ3b will also require the Exception Test.				
"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.				
"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b				
NPPF Guidance:				
<ul style="list-style-type: none"> • For development proposals on sites comprising one hectare or above in Flood Zone 1, the vulnerability of flooding from other sources as well as from river flooding should be considered in a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques. 				
Sources of Flood Risk:				
The primary flood risk to the potential development site is fluvial from the unnamed drain which flows through the centre of the site. Water is mainly confined to the channel and areas immediately adjacent, flood hazard is mainly classed as very low outside of these areas. Factoring in climate change at 25%, 30% and 70% does not significantly affect the area at risk of fluvial flooding. Parts of the site are also shown to be affected by surface water flooding; these areas tend to correspond with the watercourse but also pockets form in the north east.				

Flood Zone Map



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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.



Climate Change Map

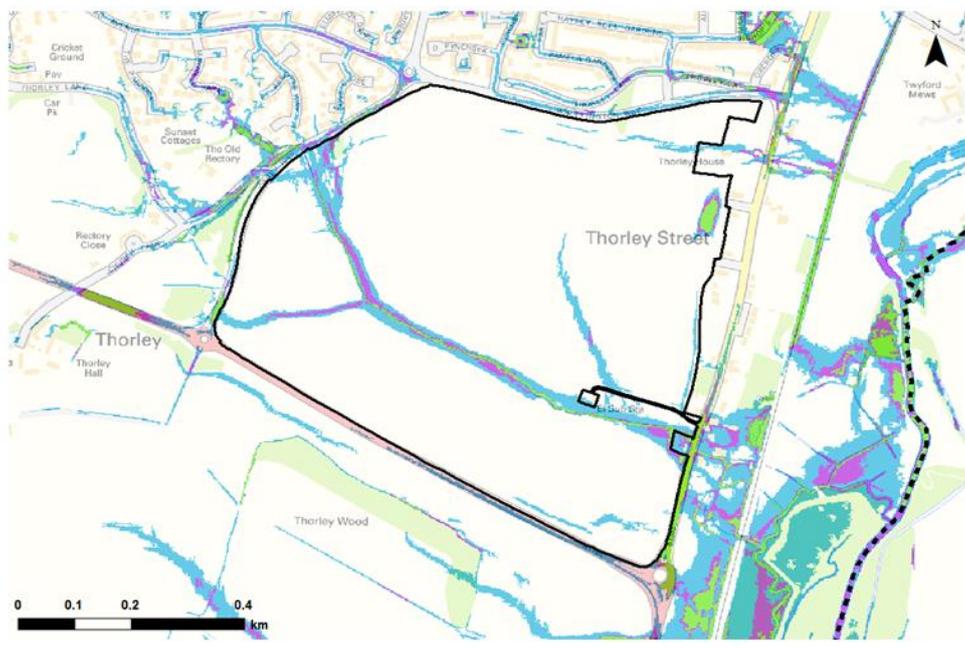


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.



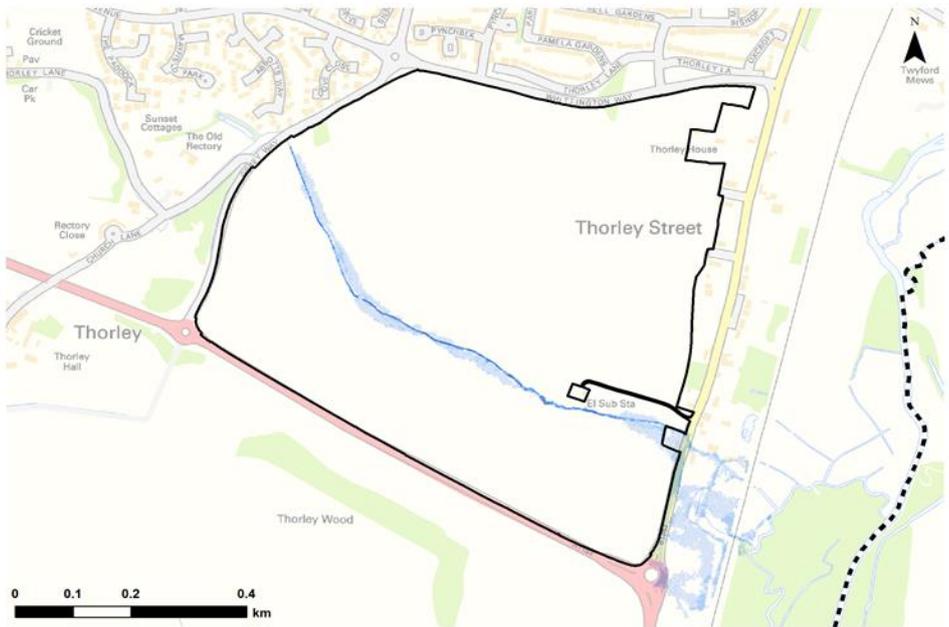
Surface Water Map



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Depth Map



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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations	Depth (m)	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
Council boundary	0 - 0.10	1.00 - 1.50	2.50 - 3.00	>4.00
	0.10 - 0.50	1.50 - 2.00	3.00 - 3.50	

Velocity Map



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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations	Velocity (m/s)	0.2 - 0.5	1.0 - 2.0
Council boundary	0 - 0.2	0.5 - 1.0	> 2.0

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		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. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located with a Source Protection Zone.
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has groundwater issues, a liner may be required.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has groundwater issues, a liner will be required.
Conveyance		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. If the site has groundwater issues, a liner will be required.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		
<p>Flood Defences: There are no flood defences at this site.</p>		
<p>Flood Warning: There are currently no flood warning areas or flood alerts covering this site.</p>		
<p>Access & Egress: Access and egress to the site can be achieved via a number of roads around the majority of the site boundary. Many of these routes are impacted by surface water, with the B1383 impacted by fluvial flooding, shown in Flood Zone3b of the indicative Flood Zones. Consideration should be given to the safest route to and from the site in times of flood to ensure safe access and egress can be achieved at all times. Fluvial flood risk divides the site into two; it is important that development on both sides of the watercourse have safe access and egress in times of flooding.</p>		
<p>Climate Change: Climate change mapping indicates the following impacts for the future:</p> <ul style="list-style-type: none"> • Increased storm intensities. • The increase in Flood Zone 3a outline with differing climate change allowances is minimal • The floodplain of the unnamed drain appears to be fairly constrained within this area; with the 70% climate change allowance being similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected. • Climate change may also increase the extent, depth and frequency of surface water flooding. 		

Implications for Development:

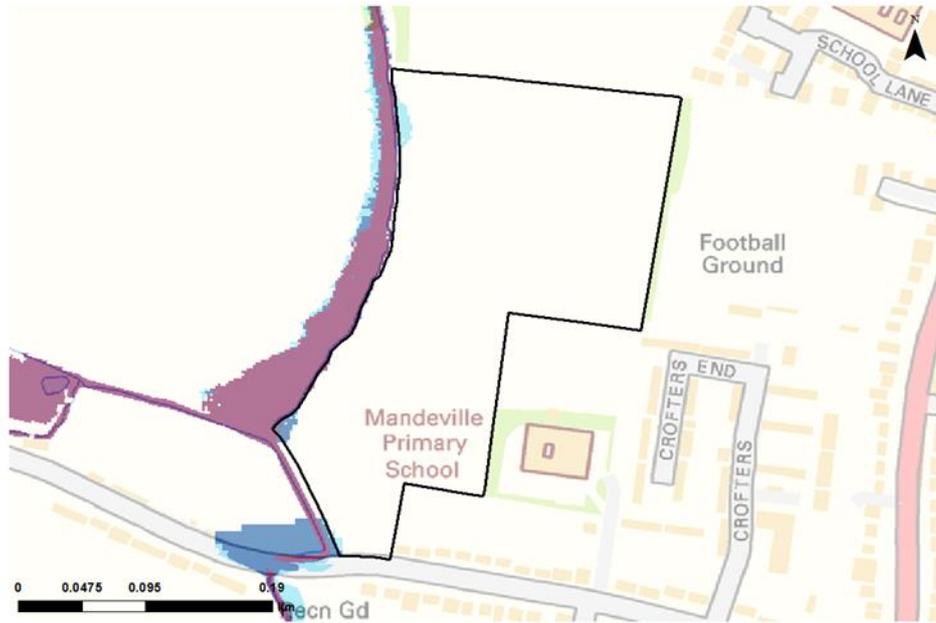
- Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- Access and egress routes are at risk from both fluvial and surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and egress can be provided for the lifetime of the development.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes
- Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
- The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk in the urban areas downstream; development should consider the feasibility of including any green corridors or strategic flood risk solutions, depending on the land available.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from a 20-year event.
- Assessment for surface water runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed hydraulic modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH2 - SAWB2, Sawbridgeworth West: North West Road				
OSNGR:	547887,215500	Area: 5.91ha		Greenfield
Flood Zone Coverage:		FZ3b	FZ3a	FZ2
<small>*based on 2D Jflow modelling</small>		0.44%*	0.79%*	1.59%*
Proposed Development Details:				
125 homes, expansion of existing primary school and green space				
Exception Test Required?				
Unlikely, as the majority of the site is located within Flood Zone 1. Less than 1% of the site is located in the Flood Zones.				
The Exception Test is required if:				
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.				
"Essential Infrastructure" development in FZ3b will also require the Exception Test.				
"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.				
"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b				
NPPF Guidance:				
<ul style="list-style-type: none"> • For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques. 				
Sources of Flood Risk:				
A very small area of the site is at risk of fluvial flooding from two unnamed watercourses located just outside of the southern and western site boundaries. The vast majority of the site is on higher ground located in Flood Zone 1 and therefore is at little risk of fluvial flooding. Factoring in climate change allowances does not significantly affect the area at risk of fluvial flooding. The site is at limited risk of surface water flooding adjacent to the unnamed watercourse along the western site boundary.				

Flood Zone Map



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The Flood Zones in this map are derived from two different sources of data. The drain along the site's western boundary is represented by 2D generalised modelling using Jflow software, to obtain indicative flood extents where a drain was shown on OS mapping. The extent for the unnamed watercourse along the site's southern boundary is derived from existing model results from the Stort Tributaries modelling (Sawbridgeworth Brook). They use the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.

The Jflow extent has been trimmed to where it meets the Sawbridgeworth Brook so that detailed modelling takes precedence, though the flood extent at the confluence may therefore be conservative.

Developers may need to consider undertaking more detailed hydraulic modelling of the western boundary drain as part of a site-specific FRA.



Climate Change Map - to be updated when modelling completed

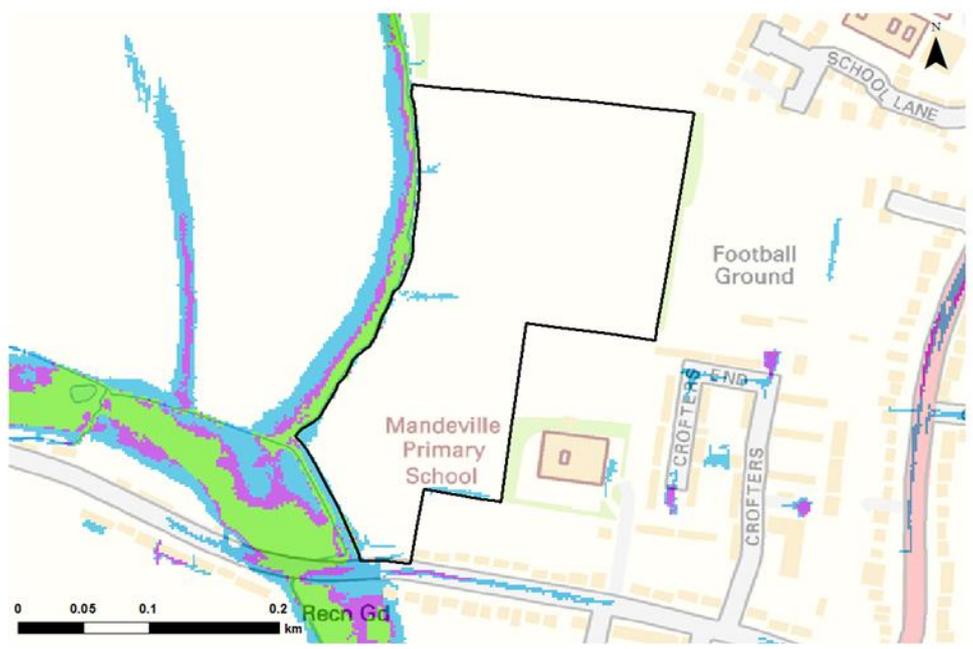


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%. The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

	Potential Site Allocations		Flood Zone 3 with Climate Change
	Council boundary		

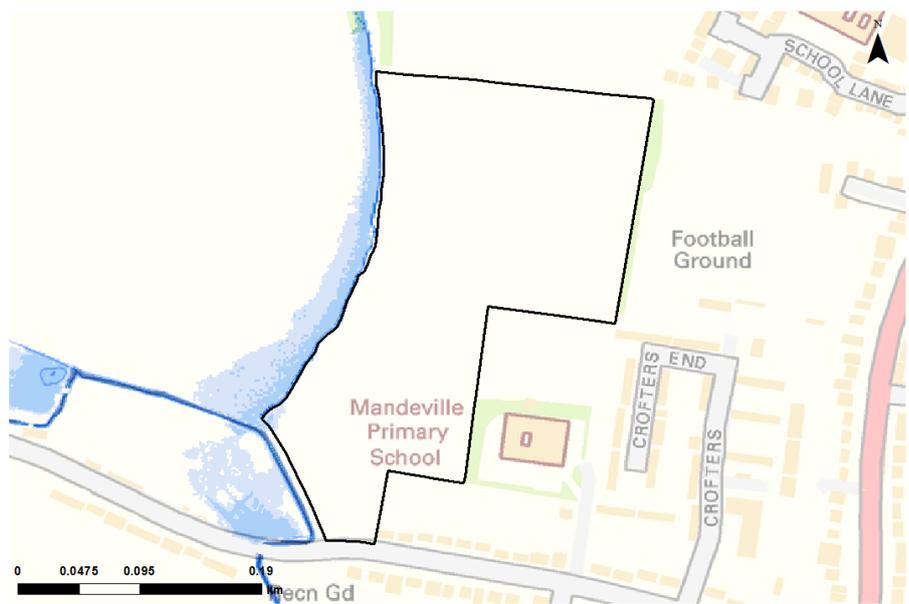
Surface Water Map



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	Potential Site Allocations		uFMfSW* 30-year Extent		uFMfSW* 1,000-year Extent
	Council boundary		uFMfSW* 100-year Extent		

Depth Map

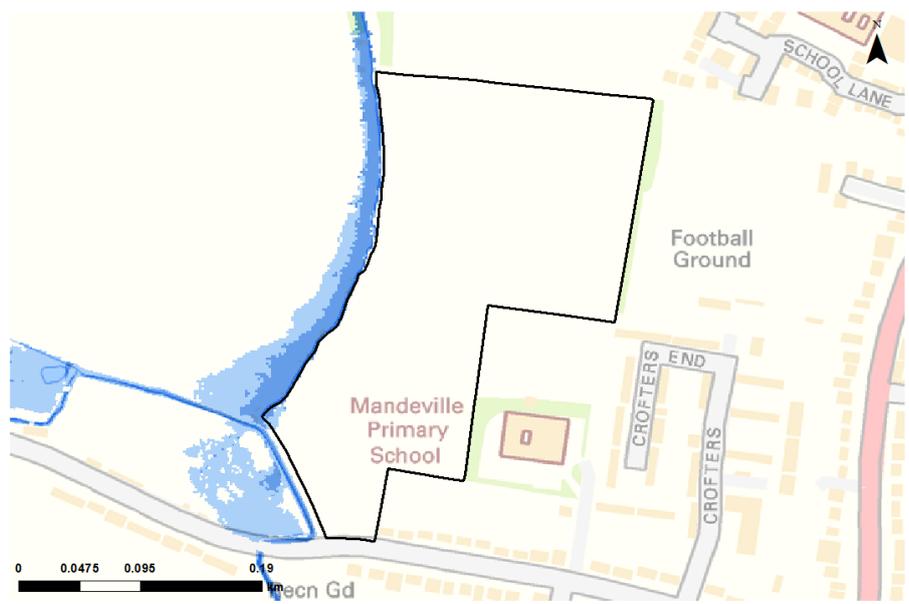


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This depth map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain, and represents the 100-year event

	Depth (m)	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
	0 - 0.10	1.00 - 1.50	2.50 - 3.00	>4.00
	0.10 - 0.50	1.50 - 2.00	3.00 - 3.50	

Velocity Map

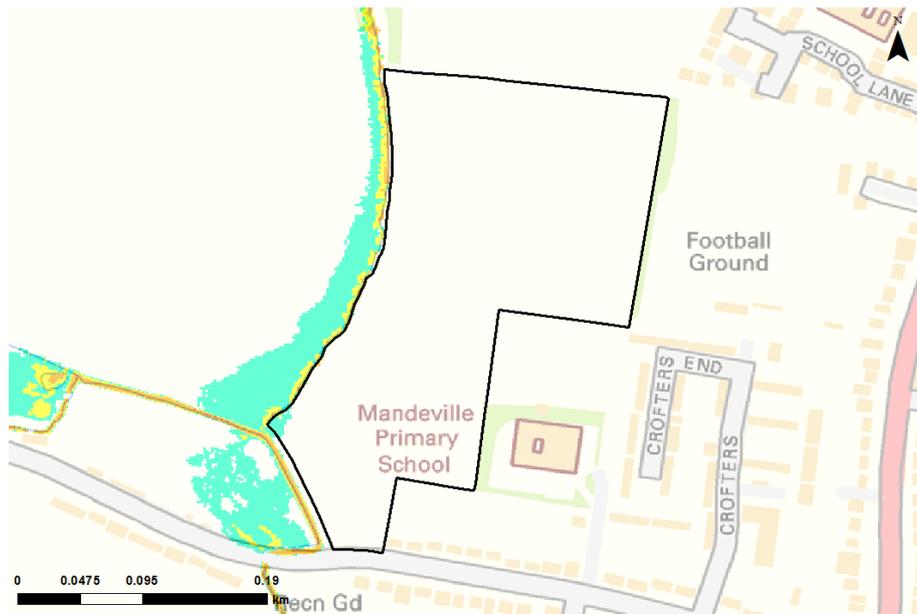


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This velocity map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain, and represents the 100-year event

	Velocity (m/s)	0.2 - 0.5	1.0 - 2.0
	0 - 0.2	0.5 - 1.0	> 2.0

Hazard Map



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This hazard map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain, and represents the 100-year event

 Potential Site Allocations	Hazard Rating	 Danger for some	 Danger for all
 Council boundary	 Very low hazard - caution	 Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most forms of source control are likely to be suitable.
Infiltration		Mapping suggests medium permeability at the site consequently infiltration is likely to be suitable. A site investigations 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.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required to prevent the egress of groundwater.
Filtration		All filtration techniques are likely to be suitable. A liner maybe required to prevent the egress of groundwater.
Conveyance		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.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

There are no flood defences at this site.

Flood Warning:

This site is partly covered by 'The River Lee at Hertford and Ware including Stanstead Abbots' Flood warning Area, and partly covered by 'The River Lee at Hertford including Lemsford, Hatfield, Ware and Stanstead Abbots' Flood Alert Area (062WAF46MidLee).

Access & Egress:

Access to and egress from the site is possible via West Road. The possibility for access and egress may be limited in the event of fluvial flooding with much of the road affected by surface water flooding and sections are located within Flood Zone 3a. Consideration is needed to how safe access and egress can be achieved in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- Access and egress routes are at risk from both fluvial and surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and egress can be provided for the lifetime of the development.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes
- The site is partially covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to the Flood Warning Service would not be required.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment. This could be investigated further at site-specific level.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from a 100-year event.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed hydraulic modelling of the unnamed watercourse along the western boundary to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH3 - HERT2, Hertford, Mead Lane North

OSNGR: 533258,213225	Area: 4.19ha		Brownfield	
Flood Zone Coverage:	FZ3b 0.5%	FZ3a 8%	FZ2 27%	FZ1 64.5%

Proposed Development Details:

193 homes and employment land

Exception Test Required?

Yes, if "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.

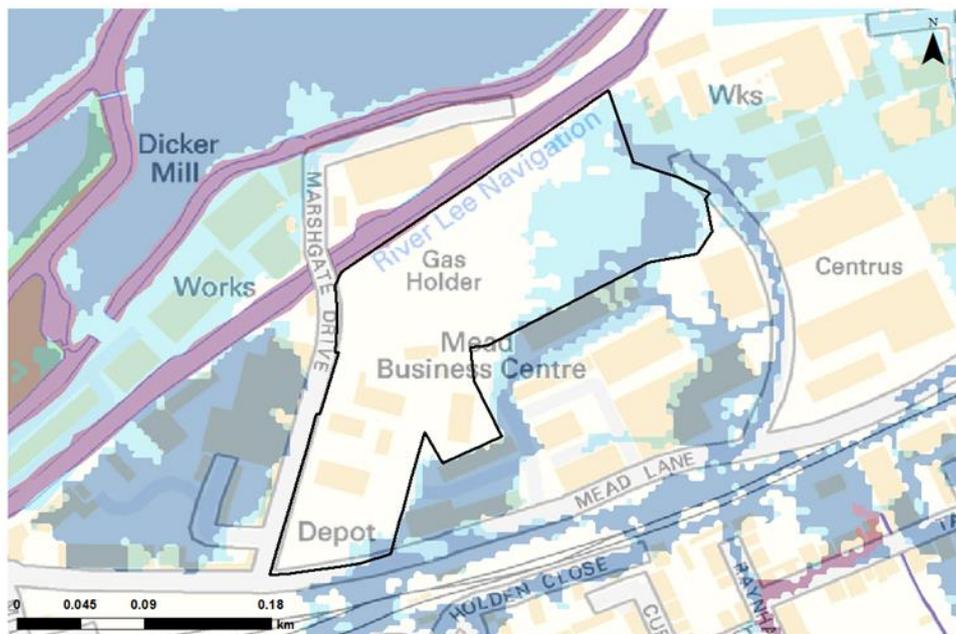
NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

The site is bounded by the River Lee Navigation to the north. In addition, there are two drains situated to the south of the site; The Gulphs and Rowleys Road Drain. Fluvial flooding from these drains means almost 30% of the site is within Flood Zone 2 and a smaller proportion in Flood Zone 3; the areas affected being in the eastern corner of the site. Extensive surface water flooding is shown to occur in the eastern half of the site.

Flood Zone Map

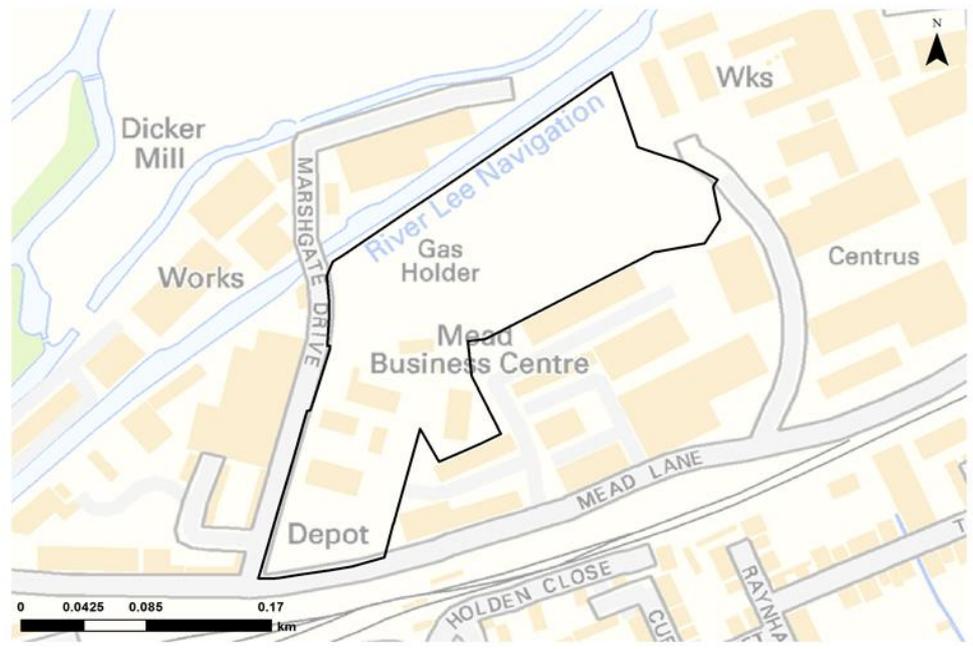


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The Flood Zone maps above are derived from the existing Environment Agency hydraulic model of the River Lee, using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.



Climate Change Map - to be updated when modelling completed

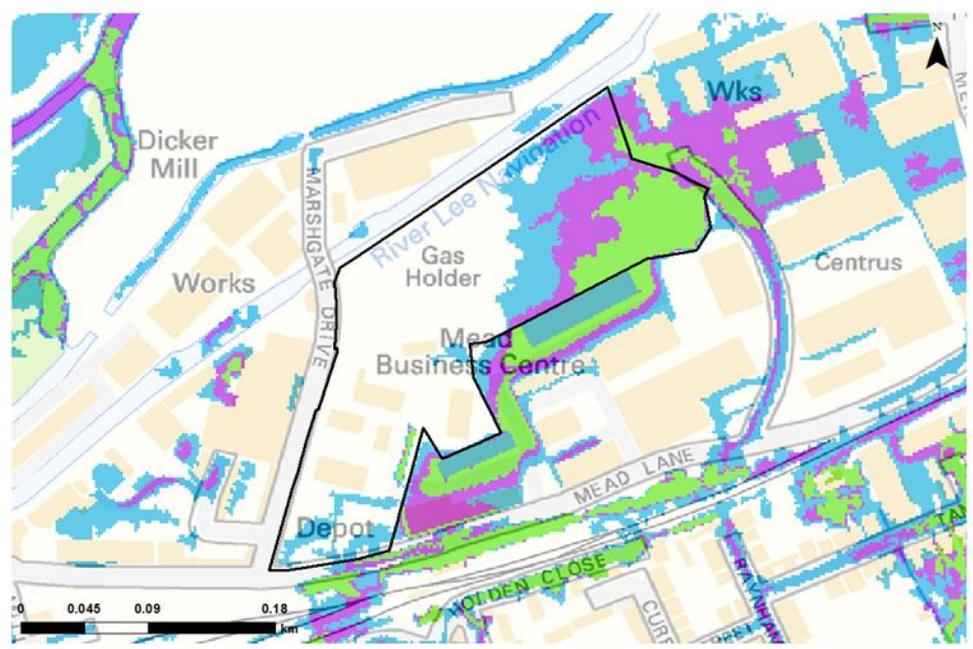


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

- Potential Site Allocations
- Flood Zone 3 with Climate Change
- Council boundary

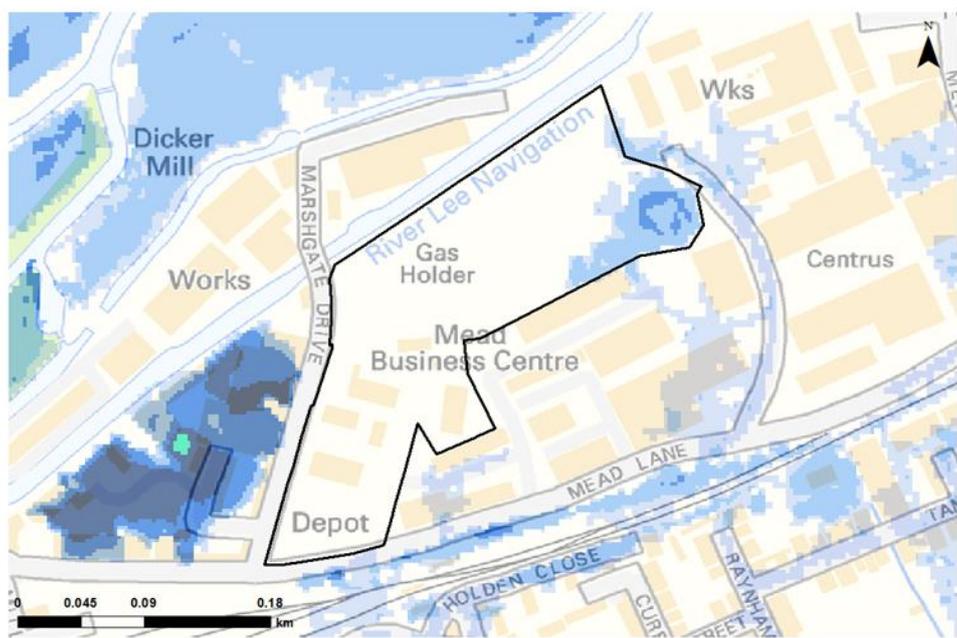
Surface Water Map



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- Potential Site Allocations
- uFMfSW* 30-year Extent
- uFMfSW* 1,000-year Extent
- Council boundary
- uFMfSW* 100-year Extent

Depth Map

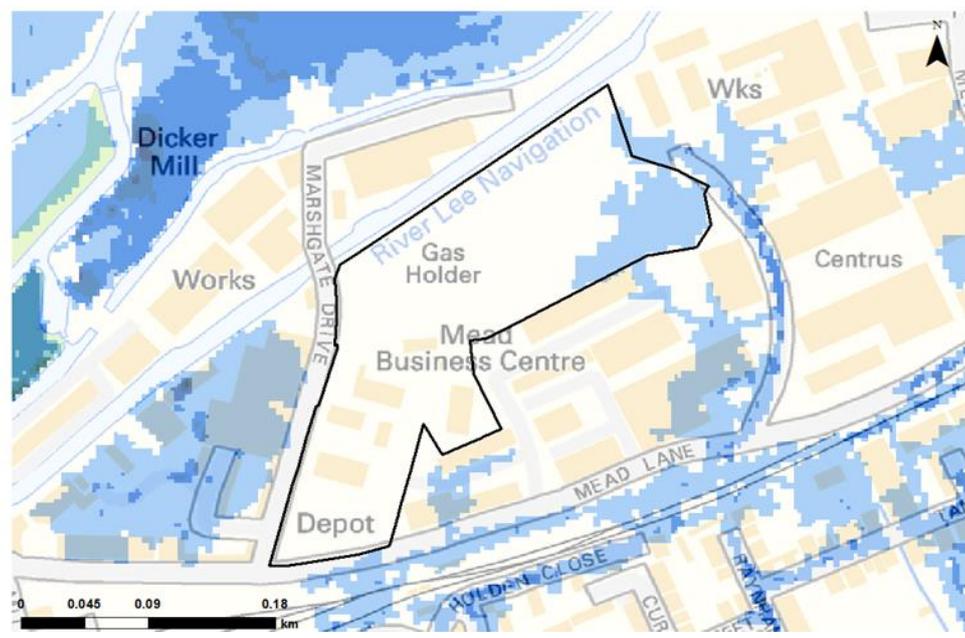


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This depth map is derived from the existing Environment Agency River Lee modelling and represents the 100-year event

Potential Site Allocations	Depth (m)	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
Council boundary	0 - 0.10	1.00 - 1.50	2.50 - 3.00	>4.00
	0.10 - 0.50	1.50 - 2.00	3.00 - 3.50	

Velocity Map

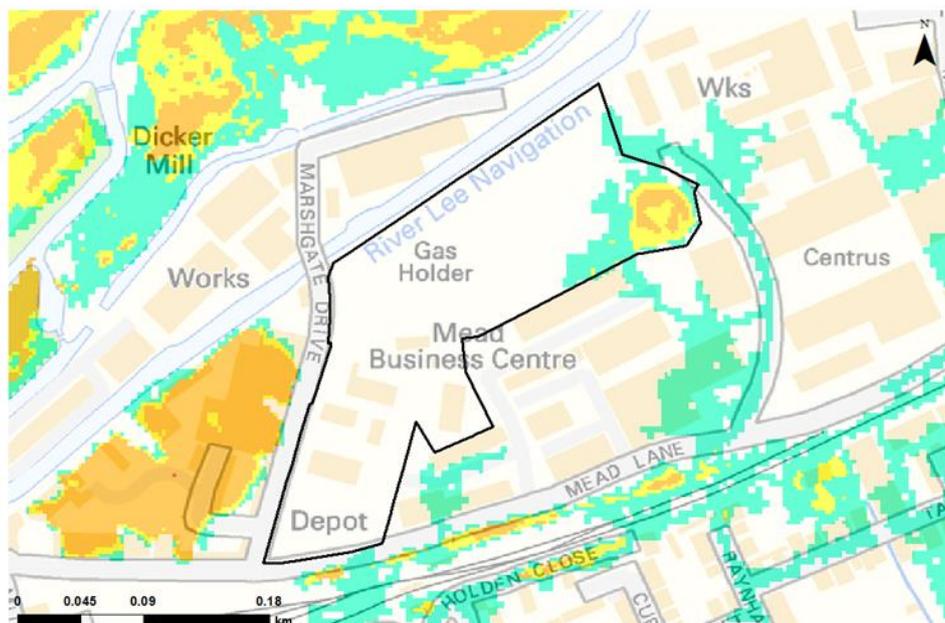


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This velocity map is derived from the existing Environment Agency River Lee modelling and represents the 100-year event

Potential Site Allocations	Velocity (m/s)	0.2 - 0.5	1.0 - 2.0
Council boundary	0 - 0.2	0.5 - 1.0	> 2.0

Hazard Map



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This hazard map is derived from the existing Environment Agency River Lee modelling and represents the 100-year event



SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		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. If possible, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located within a Source Protection Zone.
Detention		This should be investigated with more detailed site specific data as this option may be feasible provided slopes are <5% at the location of the detention feature. A liner maybe required to prevent the egress of groundwater and if there are any contamination issues with the site being brownfield.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
Conveyance		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. If the site has contamination or groundwater issues, a liner will be required
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		
<p>Flood Defences:</p> <p>The site is not formally defended; however, there is a flood defence present on the opposite bank (right hand bank).</p>		
<p>Flood Warning:</p> <p>This site is not covered by a Flood Warning Area; however, it is partly covered by the River Stort and Stansted Brook Catchment Flood Alert Area (062WAF51Stort).</p>		
<p>Access & Egress:</p> <p>Primary access and egress to the site is via Mead Lane and Marshgate Drive. Mead Lane is shown to be affected by Flood zone 3b and in the 100-year surface water event. Alternatively Marshgate Drive is shown to be largely unaffected by both surface water and fluvial flooding.</p>		
<p>Climate Change:</p> <p>Climate change mapping indicates the following impacts for the future:</p> <ul style="list-style-type: none"> • Increased storm intensities. • Increased water extent, depth, velocity and hazard in the watercourse. • Climate change may also increase the extent, depth and frequency of surface water flooding. 		

Implications for Development:

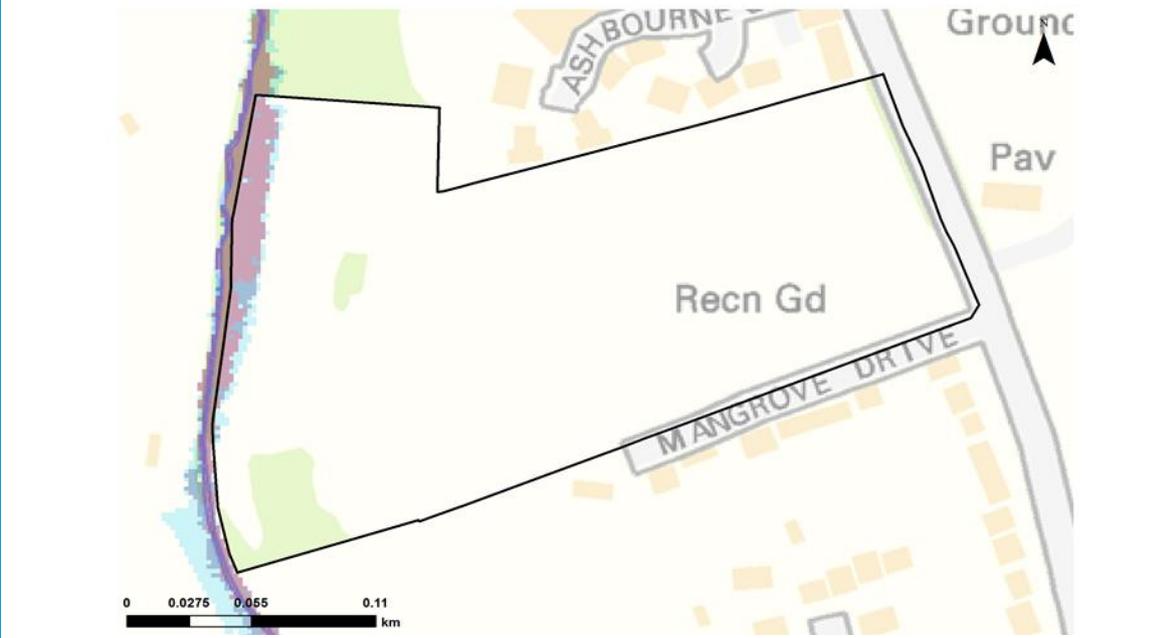
- Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- Any 'Highly Vulnerable' development placed within Flood Zone 2 will be required to pass the Exception Test.
- Safe access and egress is not considered an issue along Marshgate Drive, although climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
- Broad-scale assessment of suitable SuDS has indicated a number of different types may be possible, though infiltration may be unlikely due to groundwater constraints; this should be investigated further at site-specific level. Given the size of the site and the proportion of the site at risk from flooding, the type of SuDS system used may be influenced by amount of land available.
- The site is partially covered by the Environment Agency's Flood Warning Service (Flood Alert).
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment given the land requirement that any strategic storage solution would require.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from a 100-year event but alternate routes are available.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

EH4 - HERT5, Hertford, South				
OSNGR:	533037,211884	Area: 4.89ha		Greenfield
Flood Zone Coverage:		FZ3b	FZ3a	FZ2
<small>*based on 2D Jflow modelling</small>		2.56%*	3.04%*	3.76%*
Proposed Development Details:				
50 homes and green space on western portion of site				
Exception Test Required?				
Unlikely, as the majority of the site is on higher ground and located in Flood Zone 1.				
The Exception Test is needed if:				
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.				
"Essential Infrastructure" development in FZ3b will also require the Exception Test.				
"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.				
"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b				
NPPF Guidance:				
<ul style="list-style-type: none"> • For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques. 				
Sources of Flood Risk:				
The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Fluvial risk is located along the western boundary from a unnamed drain. Factoring in climate change at 25%, 30% and 70% does not result in significantly more of the site being affected by fluvial flooding. Surface water flooding is shown to generally affect the western boundary of the site, in line with topographic flow routes.				

Flood Zone Map

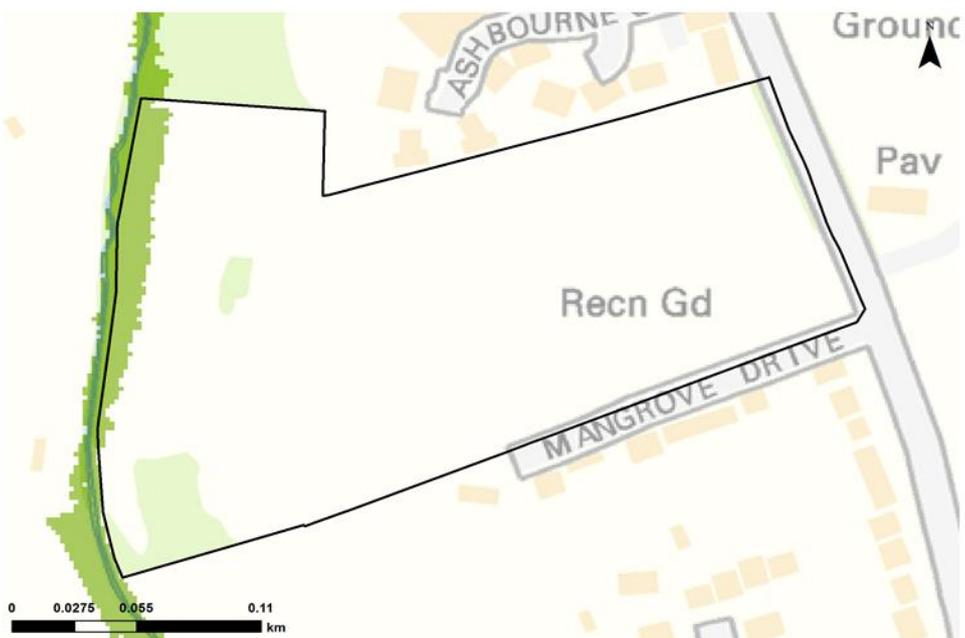


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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

	Potential Site Allocations		Flood Zone 3b		Flood Zone 2
	Council boundary		Flood Zone 3a		

Climate Change Map



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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

- Potential Site Allocations
- Council boundary
- Flood Zone 3 with Climate Change

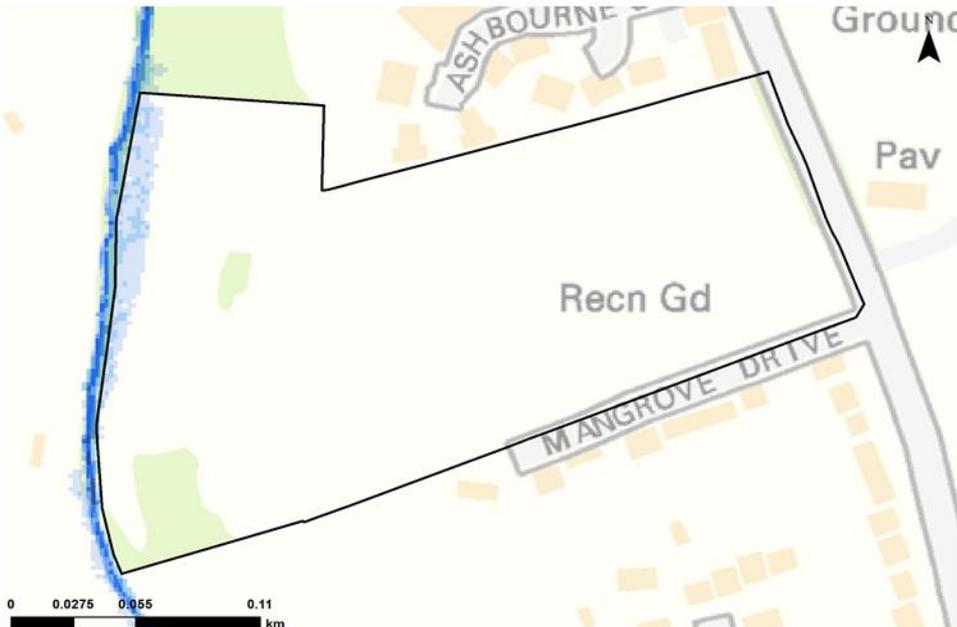
Surface Water Map



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- Potential Site Allocations
- Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

Depth Map



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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations	Depth (m)	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
Council boundary	0 - 0.10	1.00 - 1.50	2.50 - 3.00	>4.00
	0.10 - 0.50	1.50 - 2.00	3.00 - 3.50	

Velocity Map

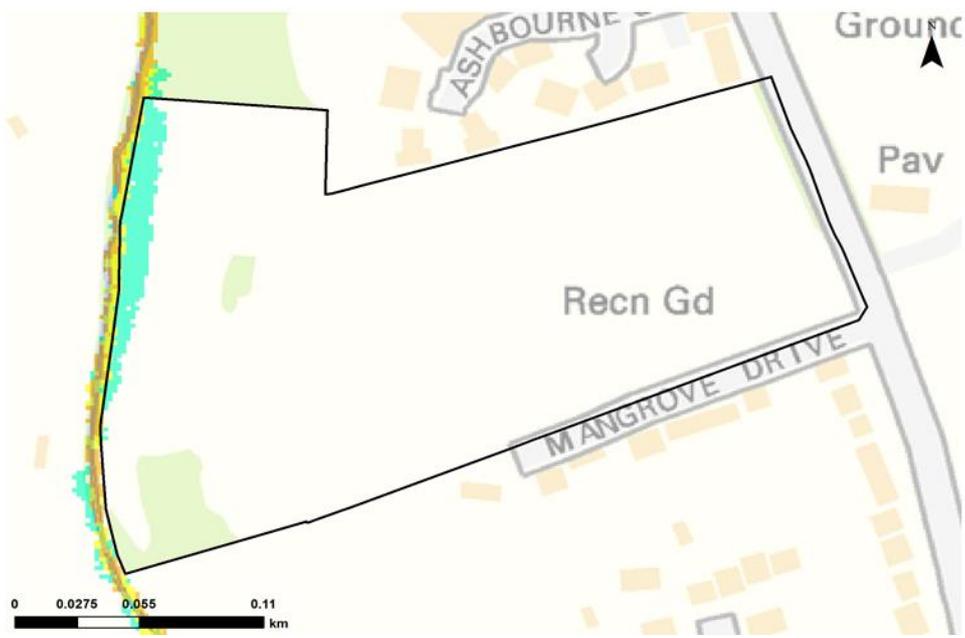


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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations	Velocity (m/s)	0.2 - 0.5	1.0 - 2.0
Council boundary	0 - 0.2	0.5 - 1.0	> 2.0

Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations	Hazard Rating	Danger for some	Danger for all
Council boundary	Very low hazard - caution	Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Infiltration 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		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable.
Conveyance		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. If the site has contamination issues, a liner will be required.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

There are no flood defences at this site.

Flood Warning:

There are currently no flood warning areas or flood alerts covering this site.

Access & Egress:

The main access and egress routes to the site appear to be via Mangrove Road and Mangrove Drive; neither of these routes are significantly affected by fluvial or surface water.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- The increase in Flood Zone 3a outline with differing climate change allowances is minimal within the site boundary.
- The floodplain of the unnamed drain appears to be fairly constrained within this area; with 70% climate change allowance the flood outline is similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential Approach means, given the size of the site, development can be placed away from the Flood Zones, with the small area affected by the Flood Zones left undeveloped.
- Safe access and egress is not an issue for this site
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
- Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment, though green corridors along the watercourse should be encouraged.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed hydraulic modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/structure topographic survey and assumes a channel capacity of QMED.

EH5 - BISH3, Bishops Stortford, The Goods Yard

OSNGR:	549168,220788	Area: 6.66ha		Green & Brownfield (40/60)
Flood Zone Coverage:	FZ3b	FZ3a	FZ2	FZ1
	0.3%	0.3%	38%	61.4%

Proposed Development Details:

400 homes, employment and retail

Exception Test Required?

Yes, if 'Highly Vulnerable' development is located in FZ2.

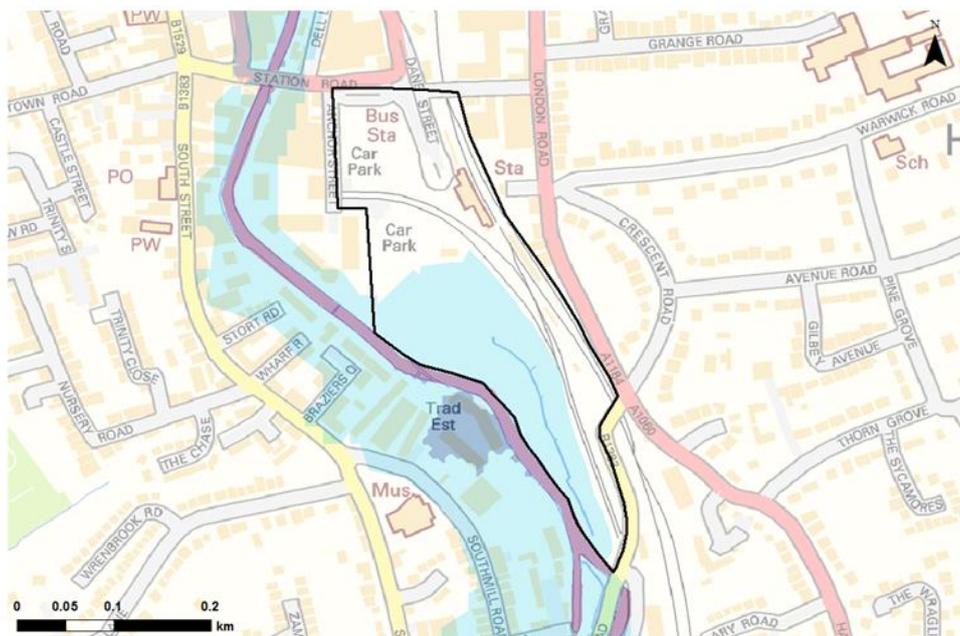
NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

The site is bounded by the River Stort (Navigation) and spilt to the south by an unnamed watercourse. Approximately two-thirds of the site is located within Flood Zone 1 and is considered at very low risk of fluvial flooding. The fluvial risk is located to the south-west of the site in Flood Zone 2. Surface water flooding is shown as a flow path along the railway lines and the unnamed watercourse.

Flood Zone Map

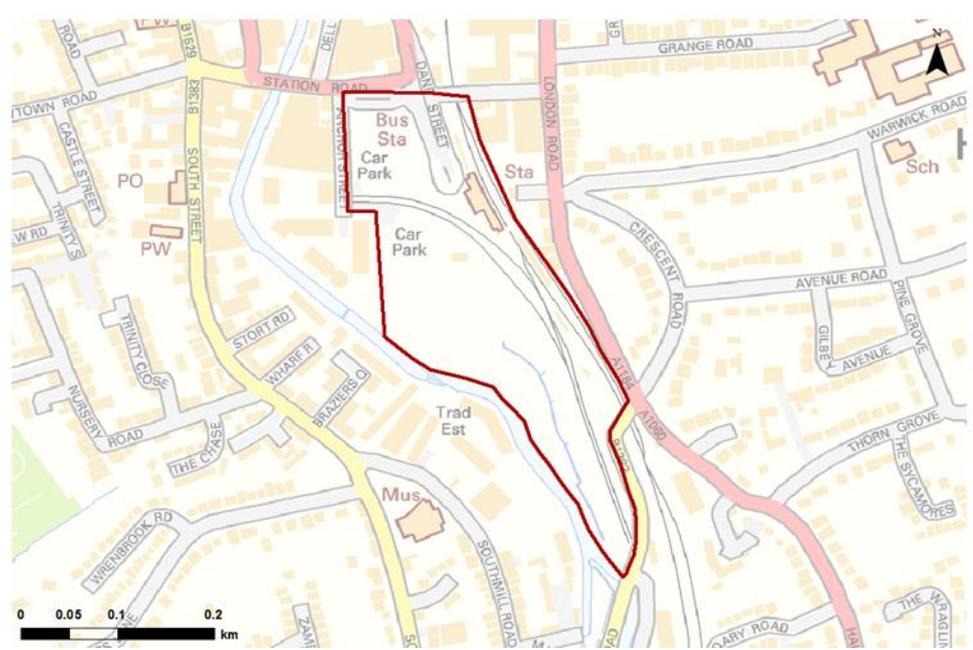


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The Flood Zone maps above are derived from the existing Environment Agency hydraulic model of the River Stort, using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.



Climate Change Map - to be updated when modelling completed

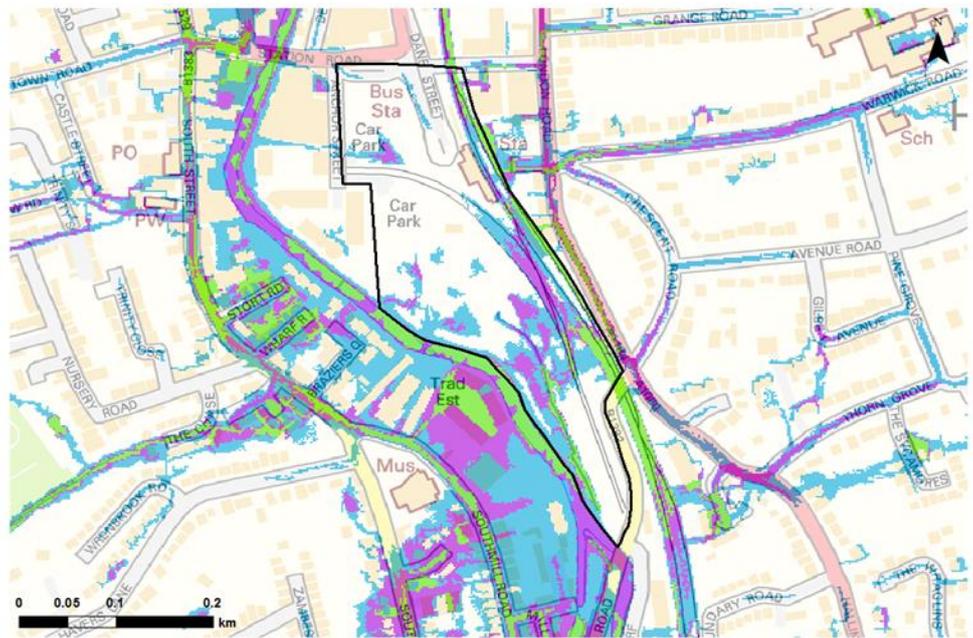


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

- Potential Site Allocations
- Flood Zone 3 with Climate Change
- Council boundary

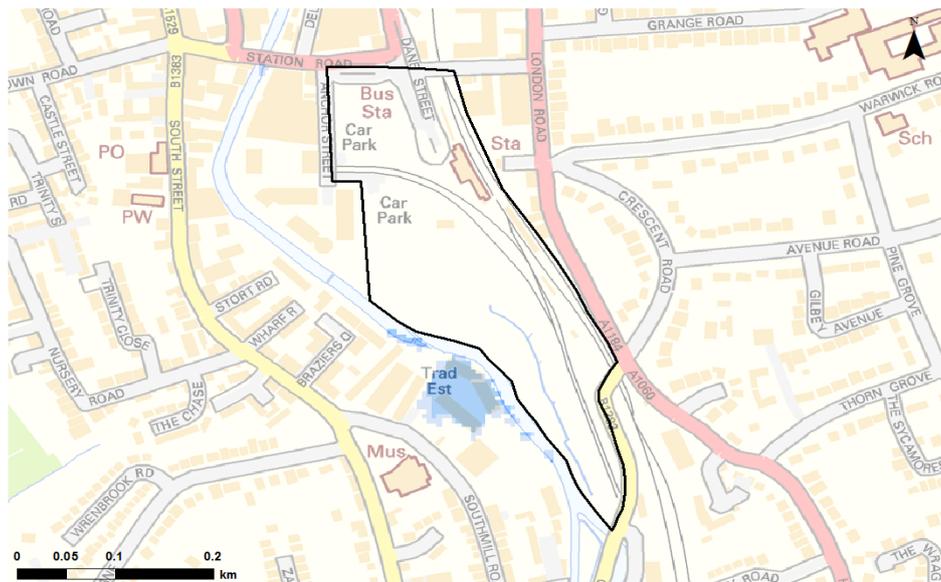
Surface Water Map



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- Potential Site Allocations
- uFMfSW* 30-year Extent
- uFMfSW* 1,000-year Extent
- Council boundary
- uFMfSW* 100-year Extent

Depth Map

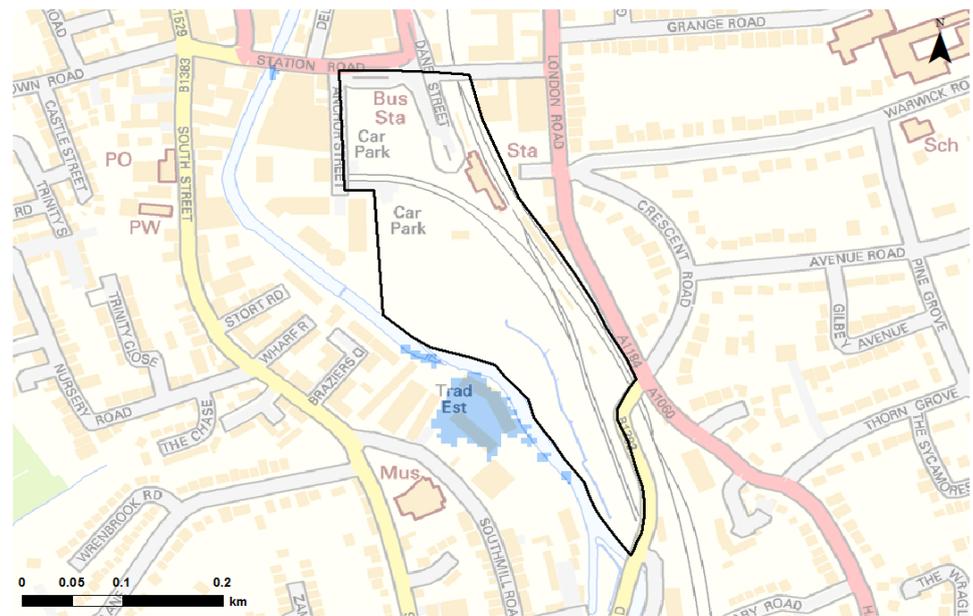


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This depth map shows only a visual representation of the river channel as hydraulic model results show water remains in-bank during the 100-year event, and therefore no depth map of the channel is available.



Velocity Map

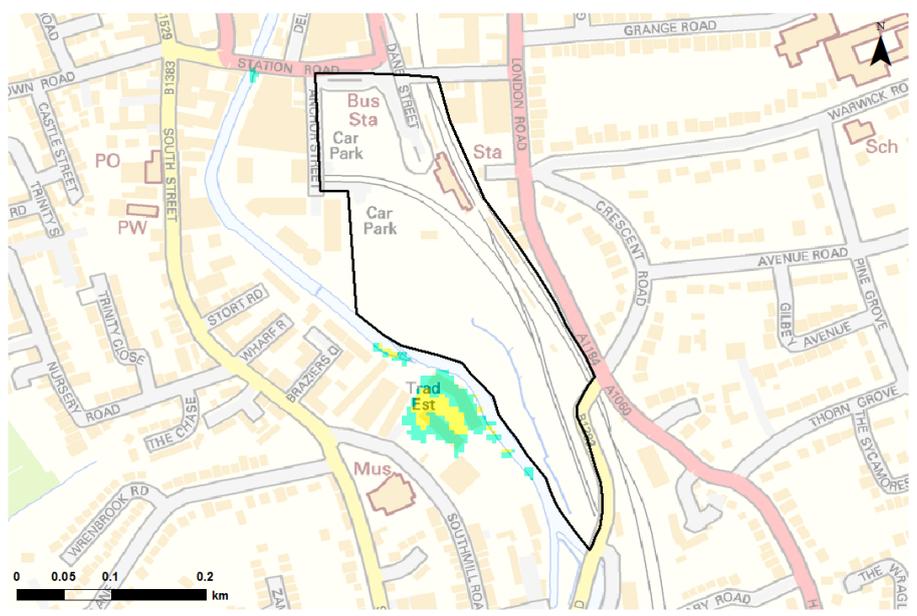


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This velocity map shows only a visual representation of the river channel as hydraulic model results show water remains in-bank during the 100-year event, and therefore no velocity map of the channel is available.



Hazard Map



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This hazard map shows only a visual representation of the river channel as hydraulic model results show water remains in-bank during the 100-year event, and therefore no hazard map of the channel is available.

Potential Site Allocations	Hazard Rating	Danger for some	Danger for all
Council boundary	Very low hazard - caution	Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Infiltration 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. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. A liner maybe required if there are any contamination issues within the site being brownfield
Detention		Mapping suggests that the site slopes are suitable for all forms of detention. If the site has contamination, a liner will be required.
Filtration		All filtration techniques are likely to be suitable. If the site has contamination issues, a liner will be required.
Conveyance		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. If the site has contamination issues, a liner will be required.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is not located within any Environment Agency designated Source Protection Zone.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

The site is not formally defended; however, there is a flood defence present on the opposite bank (right hand bank) providing an "area benefited by defence" for the trading estate.

Flood Warning:

This site is partially covered by 'The River Stort at Bishops Stortford including Spellbrook' Flood Warning Area as well as the 'River Stort and Stansted Brook Catchment' Flood Alert Area (062WAF51Stort).

Access & Egress:

Access and egress to the site is possible via Stations Road, London Road (B1282) and London Road (A1184). The majority of these roads are impacted by surface water flooding according to uFMfSW. Given that the site is shown to be significantly impacted by fluvial flooding to the south, consideration is needed to how safe access and egress can be achieved to the whole site in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- Increased water extent, depth, velocity and hazard in the watercourse.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

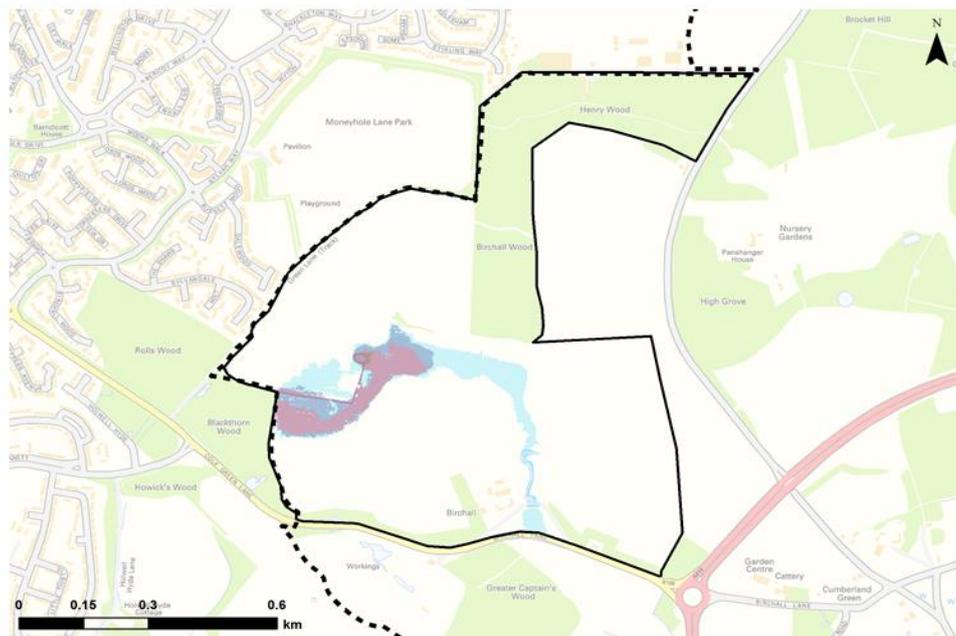
- Use of the Sequential approach to development is limited due to the amount of the site that is covered by Flood Zone 2; therefore any 'Highly Vulnerable' development placed within the Flood Zone will be required to pass the Exception Test.
- The main access and egress routes are affected by surface water flooding, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood.
- Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes.
- Broad-scale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site and the proportion of the site at risk from flooding, the type of SuDS system used may be influenced by amount of land available.
- The site is covered by the Environment Agency's Flood Warning Service. Given the potential access and egress issues, development may need to consider provision of safe refuge in the event of occupiers being unable to evacuate.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment given the land requirement that any strategic storage solution would require.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently access and egress is affected by surface water flooding.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

EH6 - WGC, East of Welwyn				
OSNGR:	527149,212085	Area: 75.34ha		Majority Greenfield
Flood Zone Coverage:		FZ3b	FZ3a	FZ2
<small>*based on 2D Jflow modelling</small>		3.09%*	4.65%*	9.06%*
Proposed Development Details:				
1,350 homes, primary and secondary education, health, retail and green space				
Exception Test Required?				
Likely, as the flood risk from the unnamed drain intersects the site, which may constrain where development can be placed.				
The Exception Test is needed if:				
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.				
"Essential Infrastructure" development in FZ3b will also require the Exception Test.				
"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.				
"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b				
NPPF Guidance:				
<ul style="list-style-type: none"> • For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques. 				
Sources of Flood Risk:				
The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Flood risk is present from an unnamed drain which flows from the site's western edge, eastwards to a small pond. Whilst the drain is shown to end here, there may be overland flow routes following topography, such as in the more extreme flood events. Factoring in climate change at 25%, 35% and 70% does not significantly affect the area at risk of fluvial flooding. Surface water flooding is shown to occur following the drainage channel topography and a new overland flow route is seen from the north in the 1,000-year extent, with pockets of surface water flooding in the lower return periods.				

Flood Zone Map

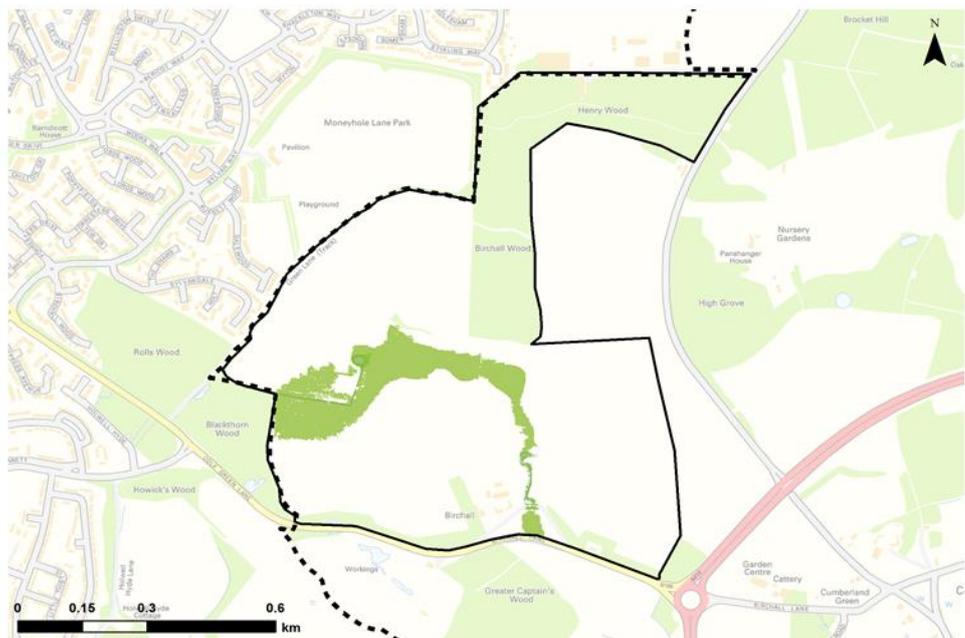


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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.



Climate Change Map

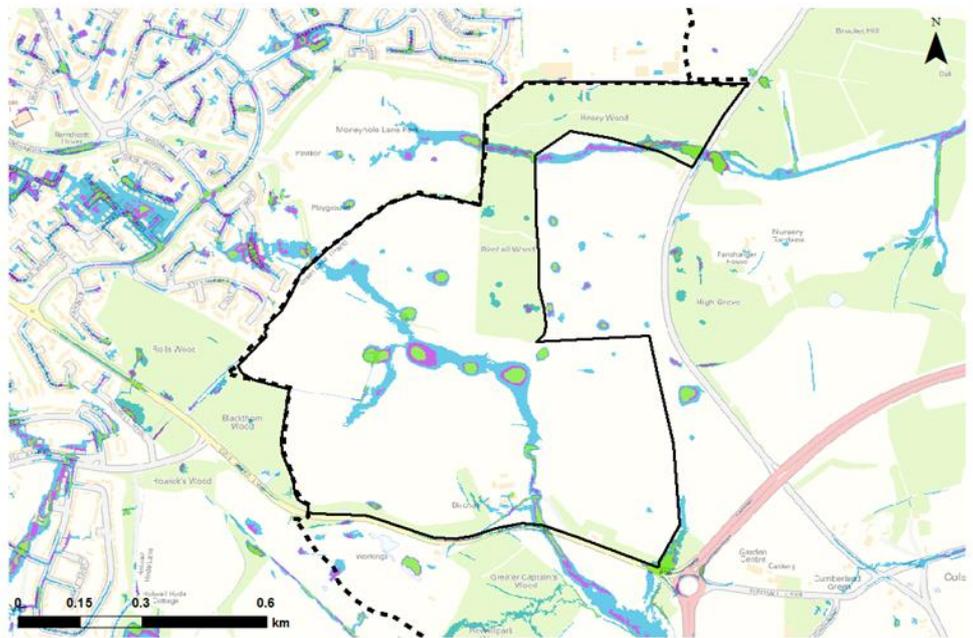


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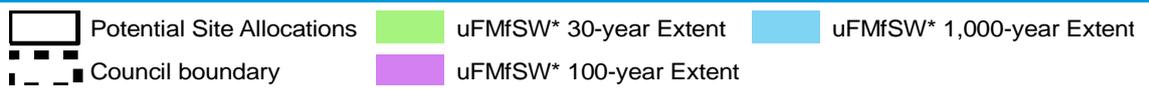
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.



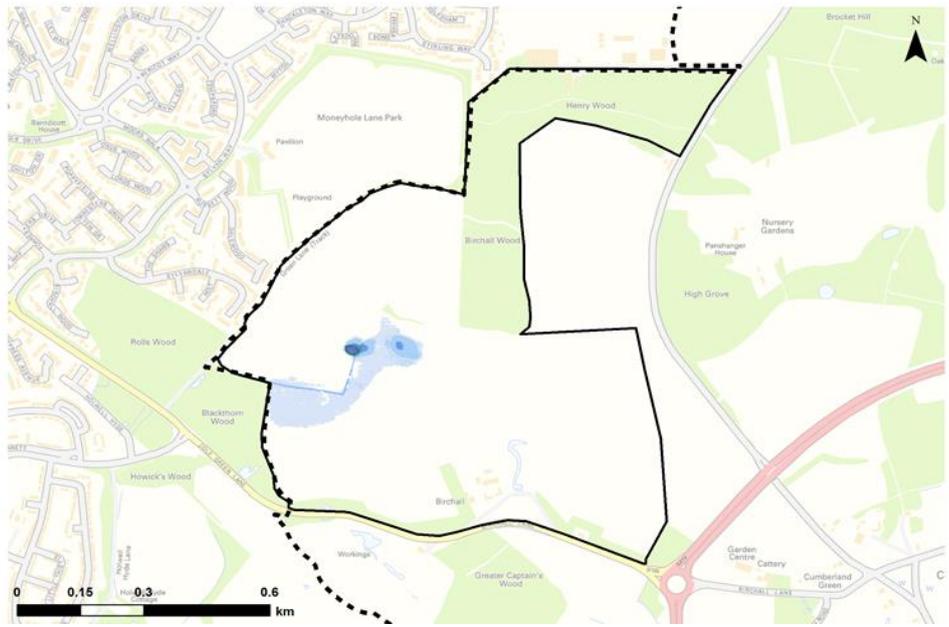
Surface Water Map



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Depth Map

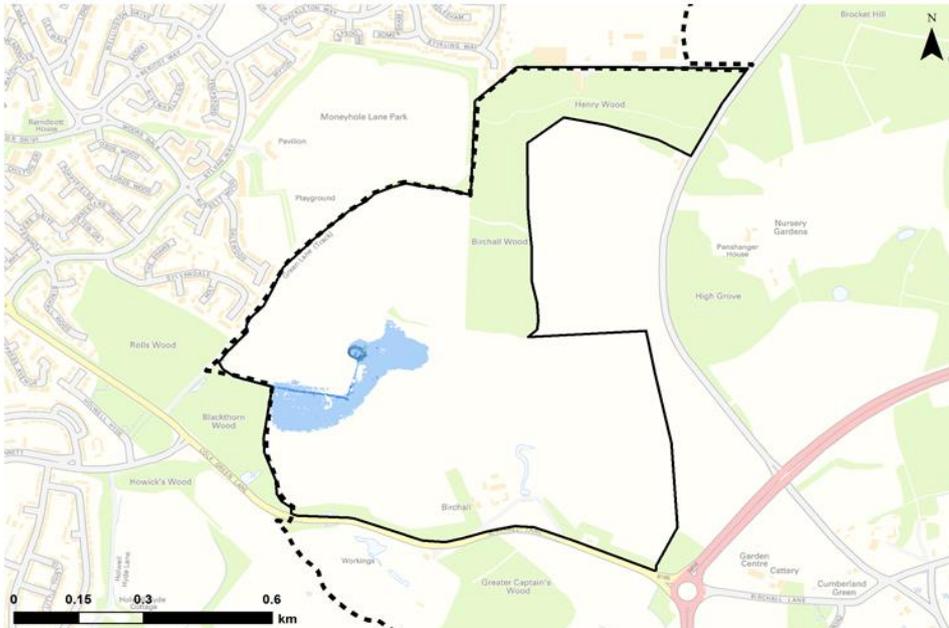


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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Velocity Map

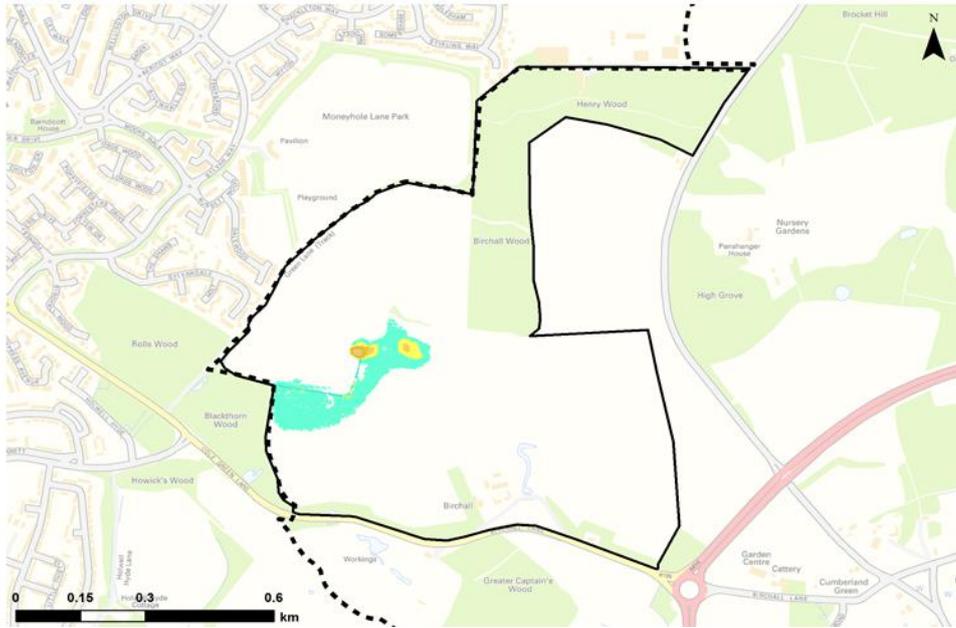


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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

	Potential Site Allocations	Hazard Rating		Danger for some		Danger for all
	Council boundary		Very low hazard - caution		Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Mapping suggest the soils are fairly impermeable in this area. However, there is risk due to contaminated land located adjacent to site which may make infiltration unsuitable. Site investigations should be carried out to assess potential for drainage by infiltration.
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has contamination, due to its proximity to landfill, a liner will be required.
Filtration		Feasibility of filtration 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, additionally a liner maybe required to prevent contamination at the site.
Conveyance		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. If the site has contamination issues, a liner will be required.

This site has areas within its boundary designated by the Environment Agency as being a landfill site. A thorough ground 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.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted.

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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Proposed SuDS should be discussed within relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Flood Defences:

There are no flood defences at this site.

Flood Warning:

There are currently no flood warning areas or flood alerts covering this site.

Access & Egress:

Access and egress to the potential development site is via Birchall Lane (B195) and Station Road. These give access to the south and north east of the site respectively. However, due to surface water and fluvial flooding in the north and south access may be restricted at the center of the site during a flood event. Consideration is needed to how safe access and egress can be achieved to the whole site in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- The increase in Flood Zone 3a outline with differing climate change allowances is minimal.
- The floodplain of the unnamed drain appears, with 70% climate change allowance, very similar to Flood Zone 2. It may, however, increase the depth, velocity or hazard of flooding in the area affected.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood.
- Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
- Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
- The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH7 - Left, Ware, North and East of Ware

OSNGR:	536276,215745	Area: 79.80ha		Greenfield	
Flood Zone Coverage:		FZ3b	FZ3a	FZ2	FZ1
<small>*based on 2D Jflow modelling</small>		2.05%*	2.31%*	2.52%*	93.12%*

Proposed Development Details:

There will be 1,500 homes, primary and secondary education, health, employment, retail and open space split between EH8 and this site.

Exception Test Required?

Likely, as the flood risk from the unnamed watercourse intersects the site which may constrain where development can be placed.

The Exception test is needed if:

"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.

"Essential Infrastructure" development in FZ3b will also require the Exception Test.

"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.

"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b

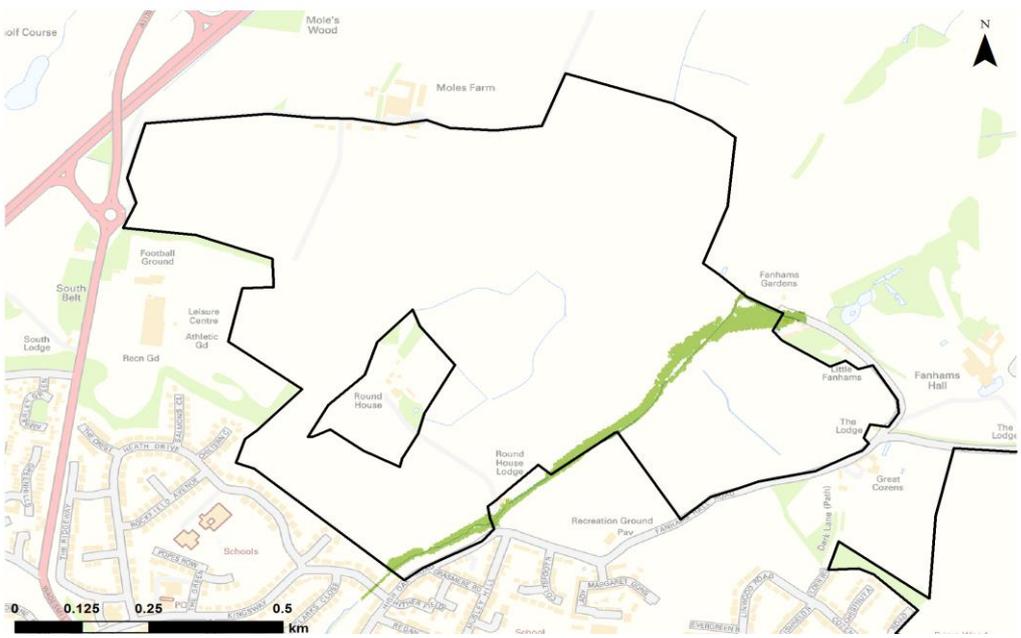
NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Flood risk is present from an unnamed drain flowing through the site from the north-east to the southern boundary. The floodplain of the unnamed drain appears to be fairly constrained which restricts the Flood Zone extents. Factoring in climate change at 25%, 30% and 70% does not result in significantly more of the site being affected by fluvial flooding. Surface water flooding is shown to occur along the banks of the drainage networks and in two overland flow routes with ponding at the north-western site boundary.

Climate Change Map

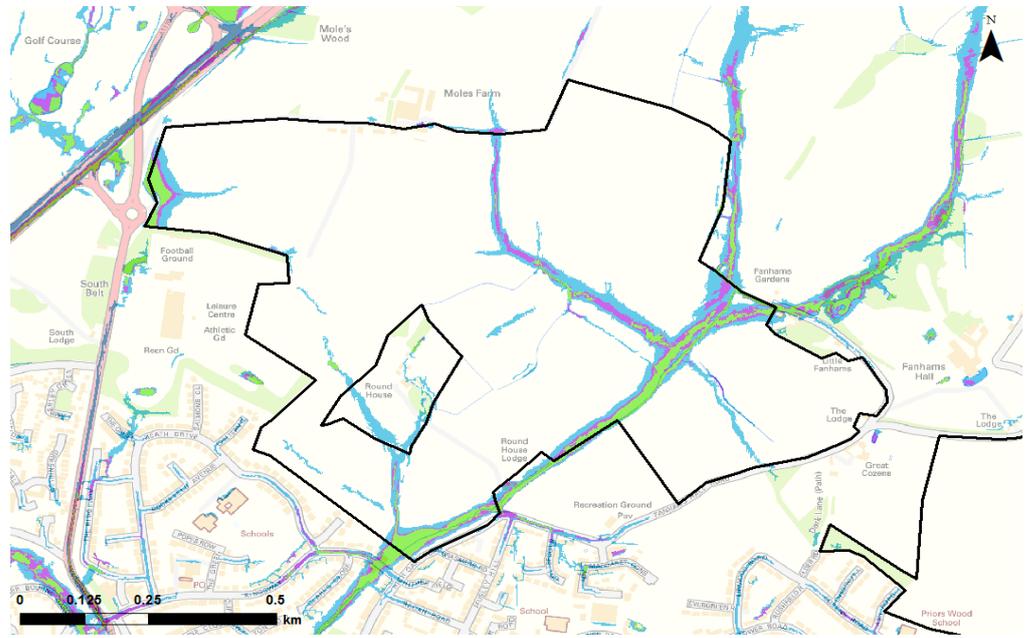


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%. The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.



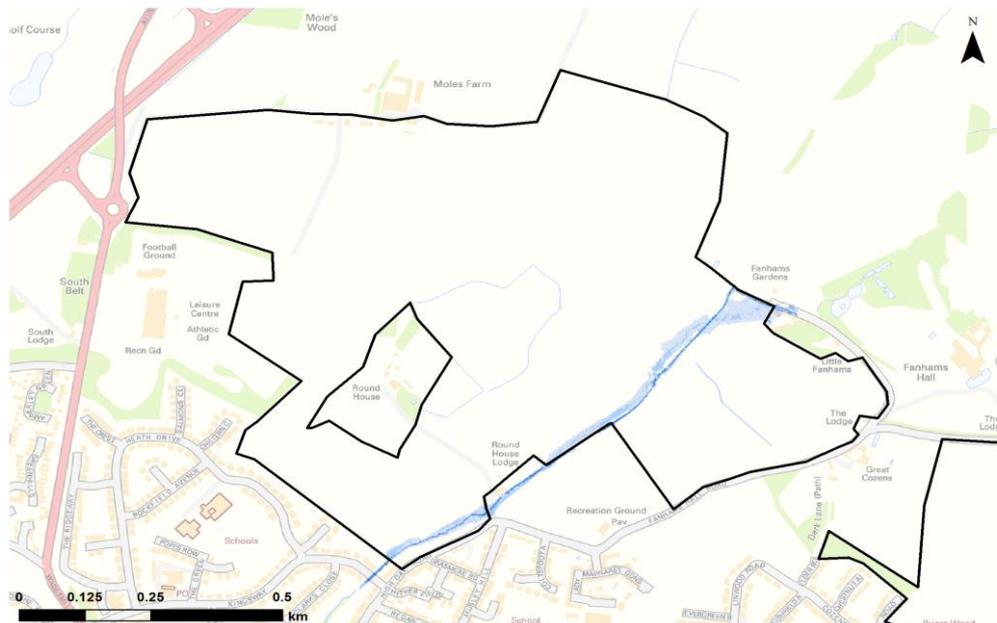
Surface Water Map



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Depth Map

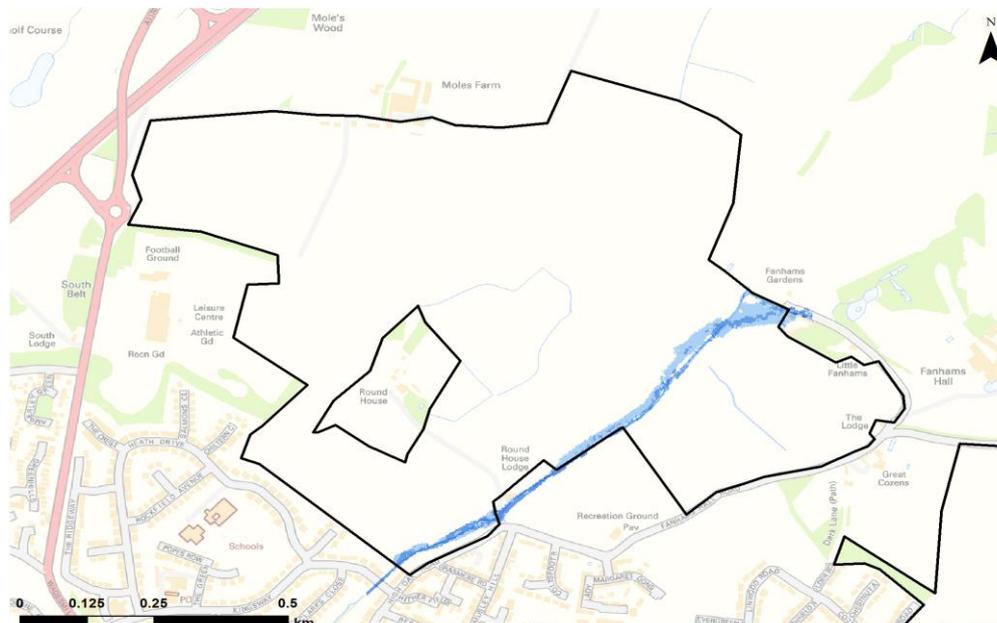


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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Velocity Map

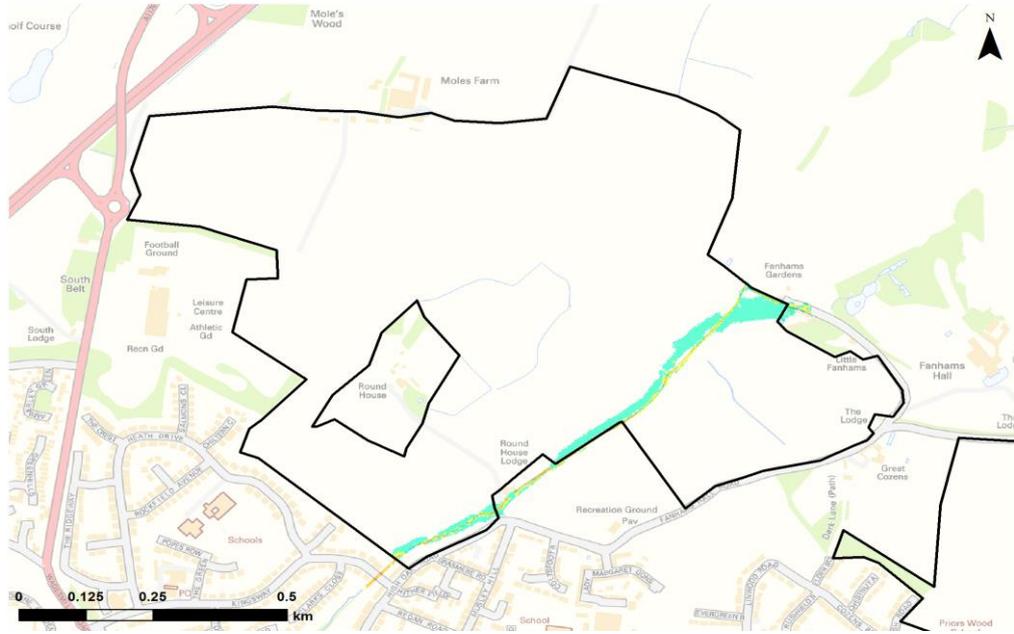


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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

 Potential Site Allocations	Hazard Rating	 Danger for some	 Danger for all
 Council boundary	 Very low hazard - caution	 Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Mapping suggests low permeability at the site with infiltration likely to be suitable. A site investigations should be carried out to assess potential for drainage by infiltration.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable. If the site has contamination issues, a liner will be required.
Conveyance		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.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

There are no flood defences at this site.

Flood Warning:

There are currently no flood warning areas or flood alerts covering this site.

Access & Egress:

Primary access and egress to the site can be provided via Wadesmill Road (A1170) and Fanhams Hall Road. These roads are shown to be susceptible to surface water flooding at certain points. The land within the site boundary that would connect to the Wadesmill Road (A1170) is in a depression and ponding occurs here from the 30-year surface water event, limiting this as an access and egress route. Fluvial and surface water flood risk divides the site; it is important that any development within the site boundary has safe access and egress in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- The increase in Flood Zone 3a outline with differing climate change allowances is minimal.
- The floodplain of the unnamed drain appears, with 70% climate change allowance, very similar to Flood Zone 2. It may, however, increase the depth, velocity or hazard of flooding in the area affected.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood.
- Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
- Broad-scale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
- The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently access and egress is affected by surface water flooding from the 30-year event.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH8 - Right, Ware, North and East Ware

OSNGR:	537243,214869	Area: 46.34ha		Greenfield	
Flood Zone Coverage:		FZ3b	FZ3a	FZ2	FZ1
<small>*based on 2D Jflow modelling</small>		3.95%*	4.29%*	4.6%*	87.16%*

Proposed Development Details:

There will be 1,500 homes, primary and secondary education, health, employment, retail and open space split between EH7 and this site.

Exception Test Required?

Likely, as an unnamed watercourse starts flowing to the north-east from within the centre of the site, which may constrain where development can be placed.

The Exception Test is needed if:

"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.

"Essential Infrastructure" development in FZ3b will also require the Exception Test.

"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.

"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b

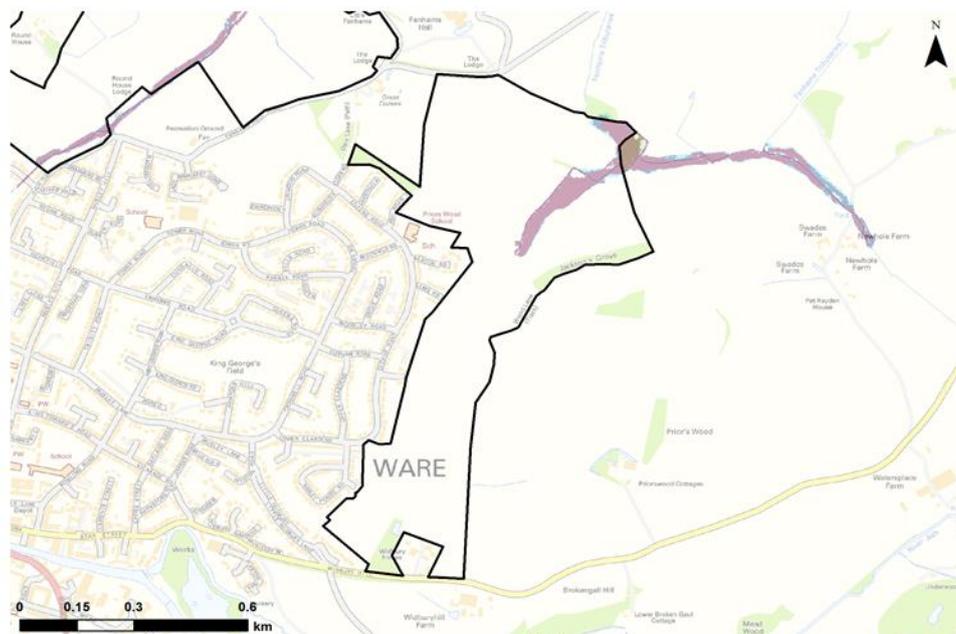
NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Flood risk is present from the Fanhams Tributaries which flows from the central north area of the site, in a north-easterly direction, meeting another drain on the boundary, before flowing east. Factoring in climate change at 25% 35% and 70% does not significantly affect the area at risk of fluvial flooding. Surface water flood risk predominantly corresponds to the alignment of the watercourse but also a smaller overland flow route is present which flows through the south of the site from east to west.

Flood Zone Map



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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.



Climate Change Map

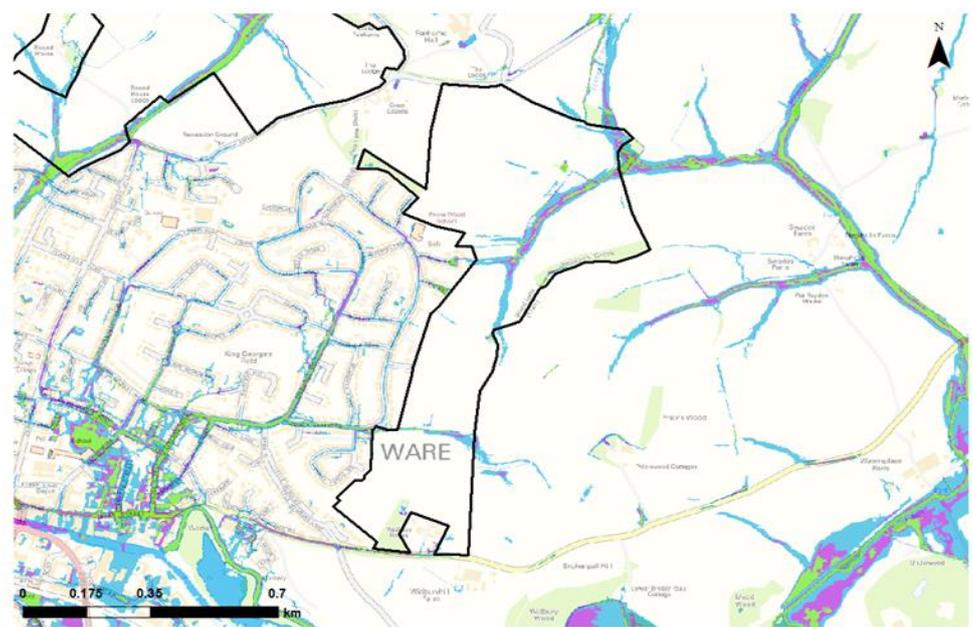


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.



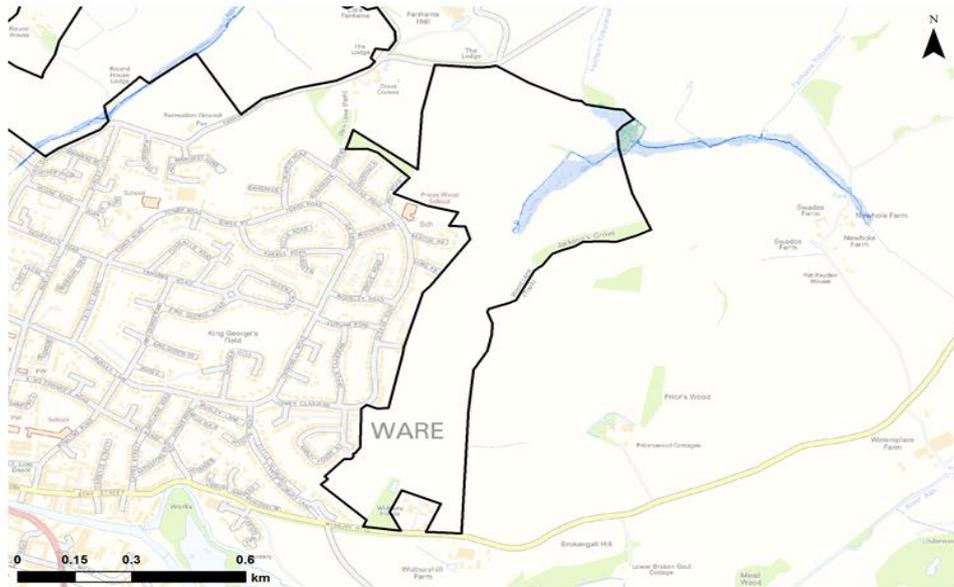
Surface Water Map



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Depth Map

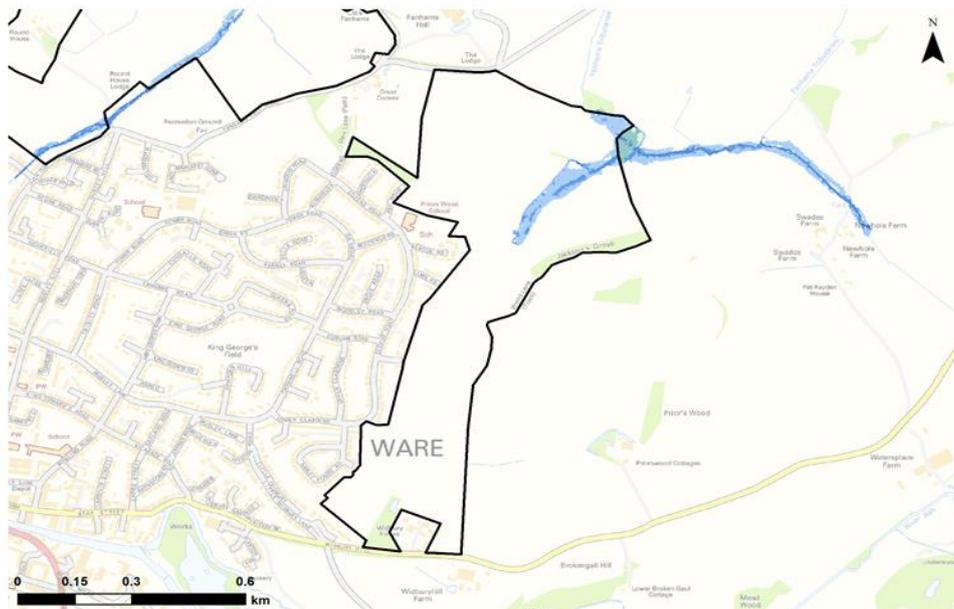


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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Velocity Map

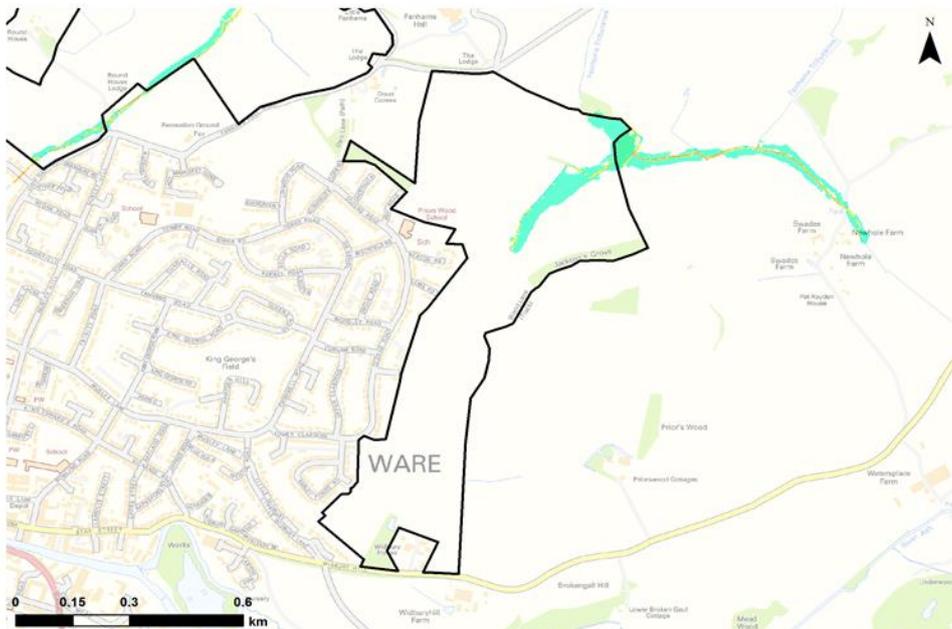


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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

 Potential Site Allocations	Hazard Rating	 Danger for some	 Danger for all
 Council boundary	 Very low hazard - caution	 Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Infiltration 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		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable.
Conveyance		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.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>Areas of this site are located within a Zone 1 groundwater protection zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

There are no flood defences at this site.

Flood Warning:

There are currently no flood warning areas or flood alerts covering this site.

Access & Egress:

Primary access and egress to the site can be provided via Wadesmill Road (A1170) and Fanhams Hall Road. These roads are shown to be susceptible to surface water flooding at certain points. The land within the site boundary that would connect to the Wadesmill Road (A1170) is in a depression and ponding occurs here from the 30-year surface water event, limiting this as an access and egress route. Fluvial and surface water flood risk divides the site; it is important that any development within the site boundary has safe access and egress in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- The increase in Flood Zone 3a outline with differing climate change allowances is minimal.
- The floodplain of the unnamed drain appears, with 70% climate change allowance, very similar to Flood Zone 2. It may, however, increase the depth, velocity or hazard of flooding in the area affected.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

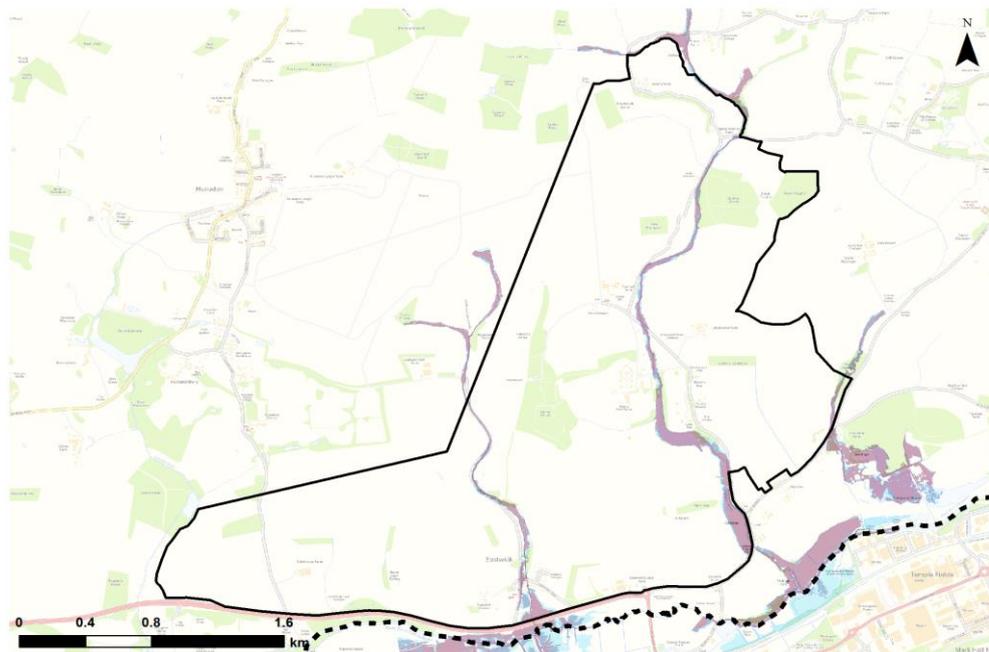
- Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood.
- Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
- Broad-scale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
- The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently access and egress is affected by surface water flooding from the 30-year event.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH9 - GIL, Gilston: Gilston Area				
OSNGR: 544060,213119	Area: 697.75ha		Mixed Greenfield and Brownfield	
Flood Zone Coverage: <small>*based on 2D Jflow modelling</small>	FZ3b 2.15%*	FZ3a 2.65%*	FZ2 3.2%*	FZ1 92%*
Proposed Development Details: 10,000 homes, primary and secondary education, health, retail and green space.				
Exception Test Required? Unlikely, as the majority of the site is located within Flood Zone 1. The Exception Test is required if: "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Essential Infrastructure" development in FZ3b will also require the Exception Test. "Highly Vulnerable" development should not be permitted within FZ3a and FZ3b. "More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b				
NPPF Guidance: <ul style="list-style-type: none"> • For development proposals on sites comprising one hectare or above in Flood Zone 1, the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques. 				
Sources of Flood Risk: A very small area of the site is at risk of fluvial flooding from Fiddlers' Brook and the unnamed drain which flows along Eastwiche Hall Lane; both of which flow south to join the River Stort (Navigation) located just outside of the southern site boundary. The vast majority of the site is located in Flood Zone 1 and therefore is at little risk of fluvial flooding. Factoring in climate change at 25%, 30% and 70% does not significantly affect the area at risk of fluvial flooding. Parts of the site are also shown to be affected by surface water flooding; these areas tend to correspond with the watercourses.				

Flood Zone Map

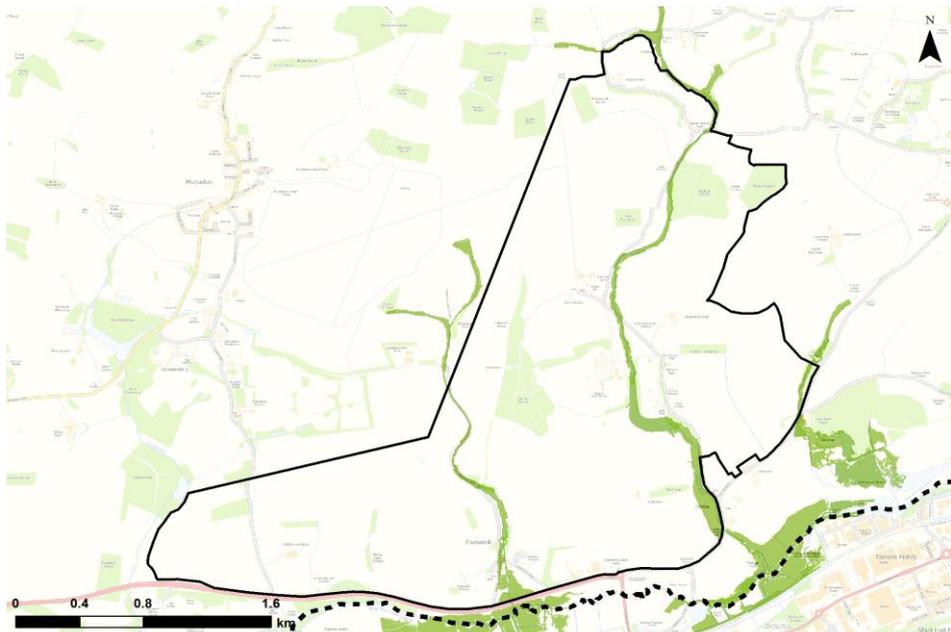


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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents, using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.



Climate Change Map

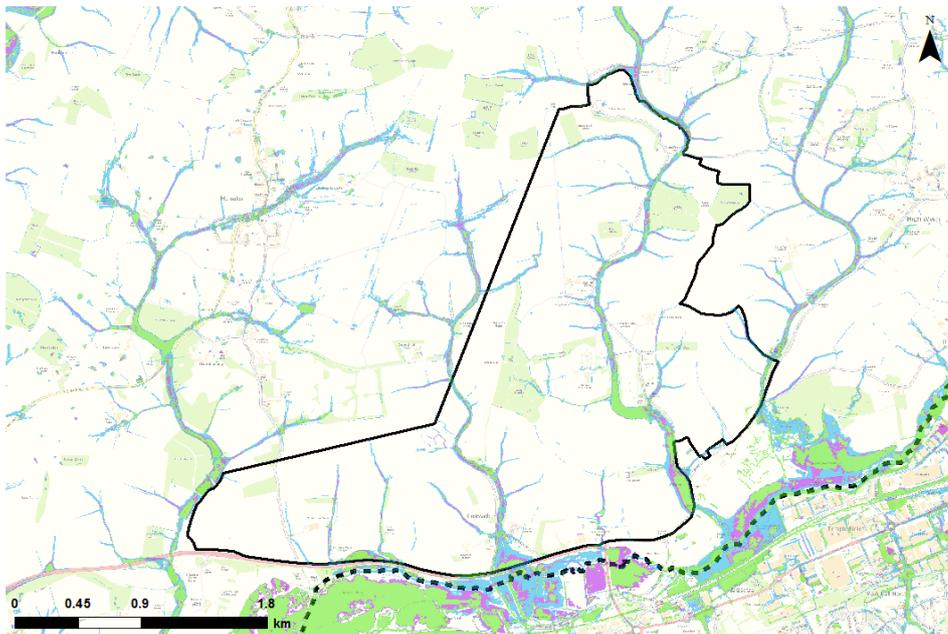


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%. The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

- Potential Site Allocations
- Flood Zone 3 with Climate Change
- Council boundary

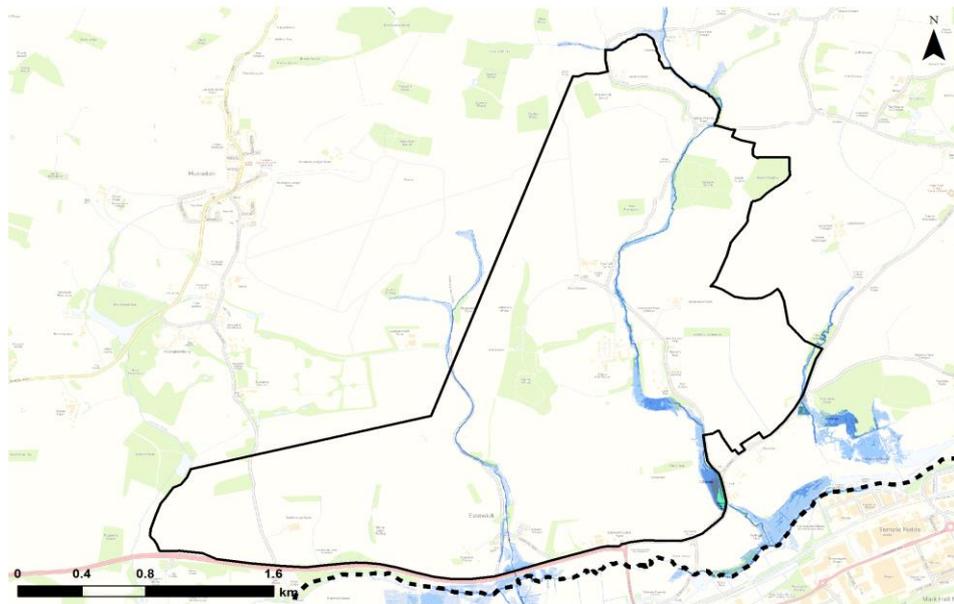
Surface Water Map



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- Potential Site Allocations
- uFMfSW* 30-year Extent
- uFMfSW* 1,000-year Extent
- Council boundary
- uFMfSW* 100-year Extent

Depth Map

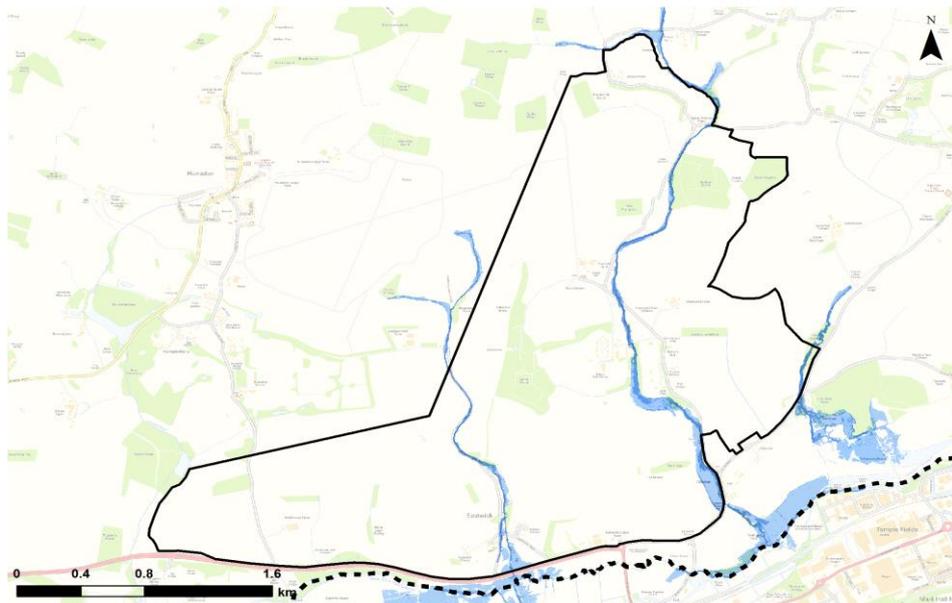


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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Velocity Map

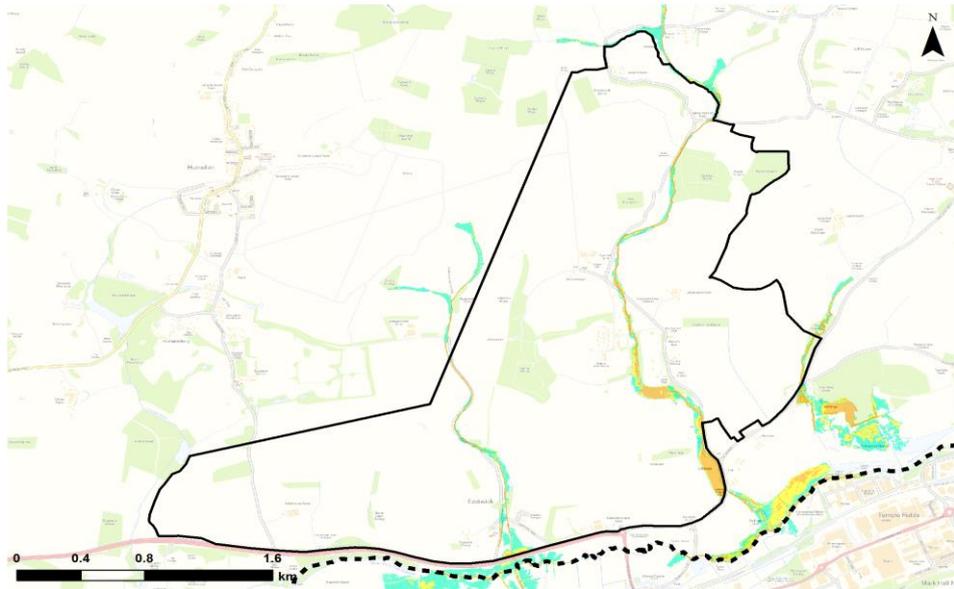


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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event



Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

 Potential Site Allocations	Hazard Rating	 Danger for some	 Danger for all
 Council boundary	 Very low hazard - caution	 Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		Mapping suggests split in the risk of groundwater flooding and underlying soils in the site. The southern area of the site near to the boundary, soil type and the aStGWF map indicate that infiltration would not be suitable. The remainder of the site infiltration, most infiltration techniques are likely to be suitable. Further site investigation should be carried out to assess
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has groundwater issues or contamination issues in areas of brownfields, a liner will be required.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
Conveyance		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. If the site has contamination or groundwater issues; a liner will be required.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>A proportion of the site is located with a Source Protection Zone. Techniques such infiltration should only be used where there are suitable levels of treatment is possible or infiltration may not be permitted.</p> <p>Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

There are no flood defences at this site.

Flood Warning:

This site is partly covered by 'The River Stort at Harlow including Roydon' Flood warning Area following three of the watercourses which intersect the site. Two small areas along the southern boundary are covered by 'The River Stort, Stansted Brook and their tributaries from Clavering to Hoddesdon including Stanstead Mountfitchet, Bishops Stortford, Sawbridgeworth and Harlow ' Flood Alert Area (062WAF51Stort).

Access & Egress:

Access and egress to the site is possible via the A414, Eastwick Road, Eastwick Hall Lane, Church Lane and two unnamed roads to the north of the site. The majority of these roads are impacted by surface water flooding according to uFMfSW and fluvial flooding. Consideration is needed as to how safe access and egress can be achieved to the whole site in times of flood. Fluvial flood risk divides the site; it is important that development across the site has safe access and egress in times of flooding.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- The increase in Flood Zone 3a outline with differing climate change allowances is minimal within the site boundary.
- The floodplain of the unnamed drain appears to be fairly constrained within this area; with 70% climate change allowance the flood outline is similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood for the lifetime of the development.
- Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access and egress routes
- Broadscale assessment of suitable SuDS has indicated a number of different types may be possible.
- The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
- The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Safe access and egress will need to be demonstrated; currently access and egress is affected by fluvial and surface water flooding.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
- Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH10 - SAWB3, Sawbridgeworth: South of West Road

OSNGR: 547617,215113	Area: 9.792997		Greenfield	
Flood Zone Coverage:	FZ3b 0.36%	FZ3a 0.09%	FZ2 1.76%	FZ1 97.79%

Proposed Development Details:

175 homes and green space.

Exception Test Required?

Unlikely, as the majority of the site is located in Flood Zone 1.

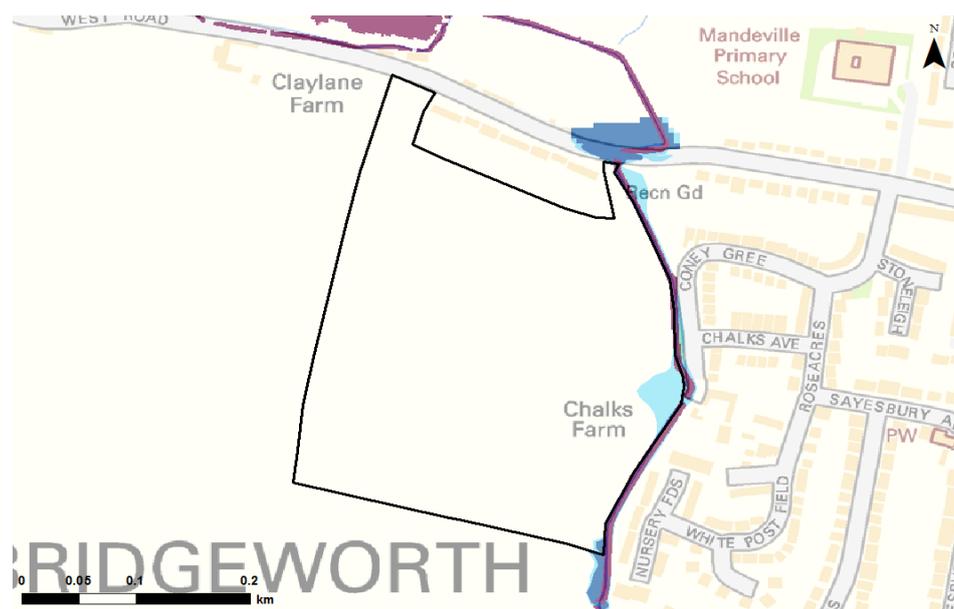
NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

A very small area of the site is at risk of fluvial flooding from an unnamed watercourse located just outside of the eastern site boundary. The vast majority of the site is on higher ground located in Flood Zone 1 and therefore is at little risk of fluvial flooding. The site is at limited risk of surface water flooding adjacent to the unnamed watercourse along the western site boundary.

Flood Zone Map



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The Flood Zones in this map are derived from from existing model results from the Stort Tributaries modelling (Sawbridgeworth Brook). They use the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.

Potential Site Allocations	Flood Zone 3b	Flood Zone 2
Council boundary	Flood Zone 3a	

Climate Change Map - to be updated when modelling completed



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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

- Potential Site Allocations
- Flood Zone 3 with Climate Change
- Council boundary

Surface Water Map



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- Potential Site Allocations
- uFMfSW* 30-year Extent
- uFMfSW* 1,000-year Extent
- Council boundary
- uFMfSW* 100-year Extent

Depth Map

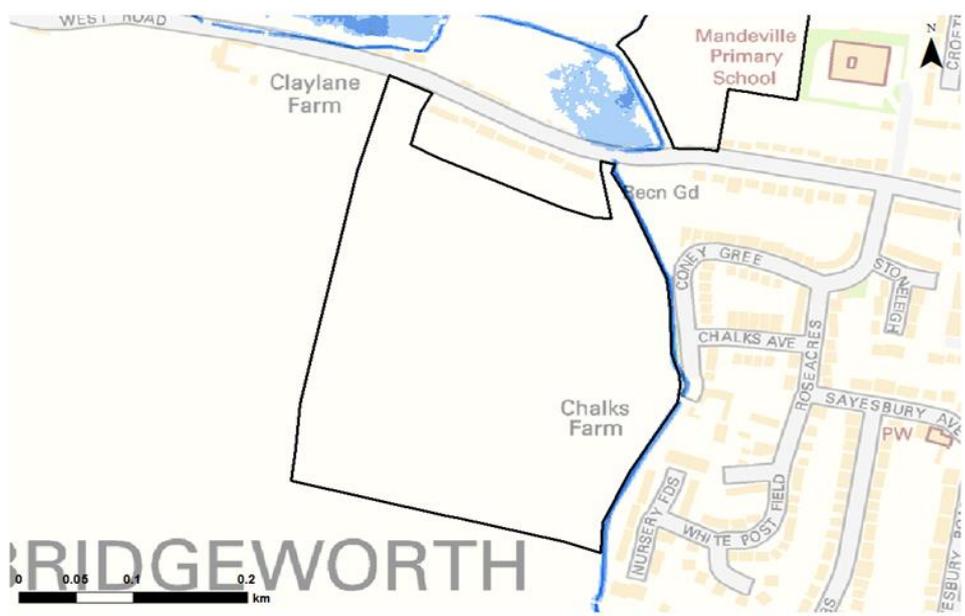


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This velocity map is derived from the existing Environment Agency Stort Tributaries modelling (Sawbridgeworth Brook) and represents the 100-year event

Potential Site Allocations	Depth (m)	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
Council boundary	0 - 0.10	1.00 - 1.50	2.50 - 3.00	>4.00
	0.10 - 0.50	1.50 - 2.00	3.00 - 3.50	

Velocity Map



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This velocity map is derived from the existing Environment Agency Stort Tributaries modelling (Sawbridgeworth Brook) and represents the 100-year event

Potential Site Allocations	Velocity (m/s)	0.2 - 0.5	1.0 - 2.0
Council boundary	0 - 0.2	0.5 - 1.0	> 2.0

Hazard Map



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This hazard map is derived from the existing Environment Agency Stort Tributaries modelling (Sawbridgeworth Brook) and represents the 100-year event

 Potential Site Allocations	Hazard Rating	 Danger for some	 Danger for all
 Council boundary	 Very low hazard - caution	 Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most forms of source control are likely to be suitable.
Infiltration		Mapping suggests low permeability at the site with infiltration likely to be suitable. A site investigations should be carried out to assess potential for drainage by infiltration.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable. If the site has contamination issues, a liner will be required.
Conveyance		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. If the site has contamination issues, a liner will be required.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		

Flood Defences:

There are no flood defences at this site.

Flood Warning:

This site is not currently covered by a Flood Warning Area at the moment but is partly covered by 'The River Stort, Stansted Brook and their tributaries from Clavering to Hoddesdon including Stanstead Mountfitchet, Bishops Stortford, Sawbridgeworth and Harlow ' Flood Alert Area (062WAF51Stort).

Access & Egress:

Access and egress to the site is possible via West Road and Coney Green. Both of these roads are impacted by surface water flooding according to uFMfSW. Given that the site is shown to be significantly impacted by fluvial flooding to the south, consideration is needed as to how safe access and egress can be achieved to the whole site in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
- Access and egress routes are at risk from surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and egress can be provided for the lifetime of the development.
- Broad-scale assessment of suitable SuDS has indicated a number of different types may be possible.
- Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes
- The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
- The site is not known to benefit from any flood defences. Given the location of the watercourse against the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment. This could be investigated further at site-specific level.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from the 1000year event .
- The peak flows of the unnamed watercourse should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

EH11 - BISH4: Bishops Stortford: Causeway/Old River Lane

OSNGR: 548873,221529	Area: 1.373316		Brownfield	
Flood Zone Coverage:	FZ3b 0%	FZ3a 13.25%	FZ2 83.24%	FZ1 3.51%

Proposed Development Details:

Mixed use including 100 homes.

Exception Test Required?

Likely. Buildings used for "dwelling houses" are considered "More Vulnerable" development according to new guidance and over 13% of the site is located in Flood Zone 3a.

The Exception Test is required if:

"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Highly Vulnerable" development should not be permitted within FZ3a.

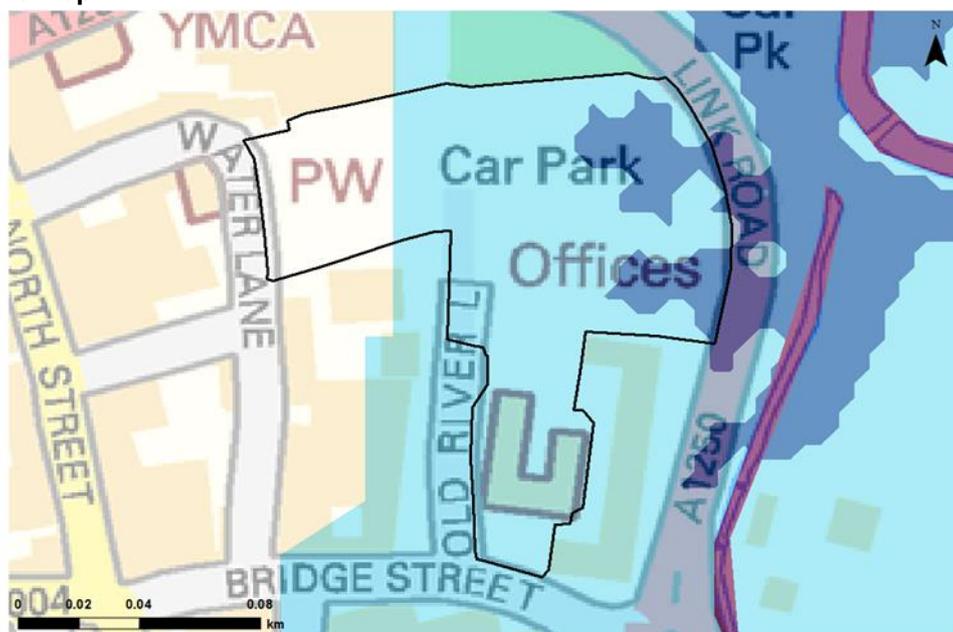
NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
- The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

A large proportion of the site (over 80%) is situated in Flood Zone 2 and at risk of flooding from the 0.1% AEP event from the River Stort. Surface water flooding affects a similar proportion of the site in the 1,000 year event with the north-eastern corner affected by lower return period events.

Flood Zone Map

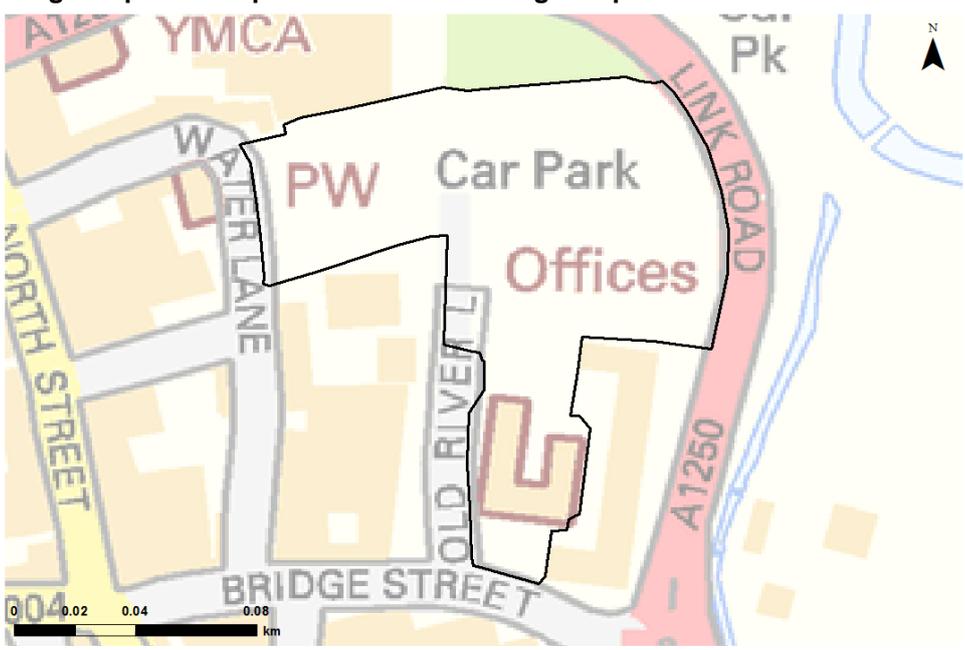


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The Flood Zones in this map are derived from existing model results from the Upper & Middle Stort Modelling (Middle Stort reach) provided by Environment Agency. They use the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.



Climate Change Map - to be updated when modelling completed

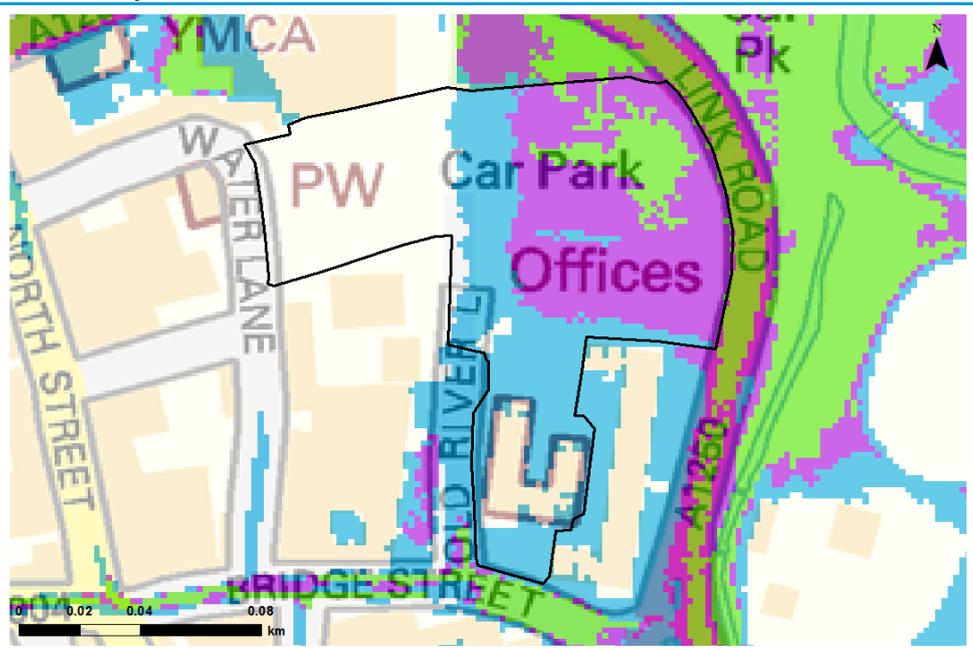


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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

- Potential Site Allocations
- Flood Zone 3 with Climate Change
- Council boundary

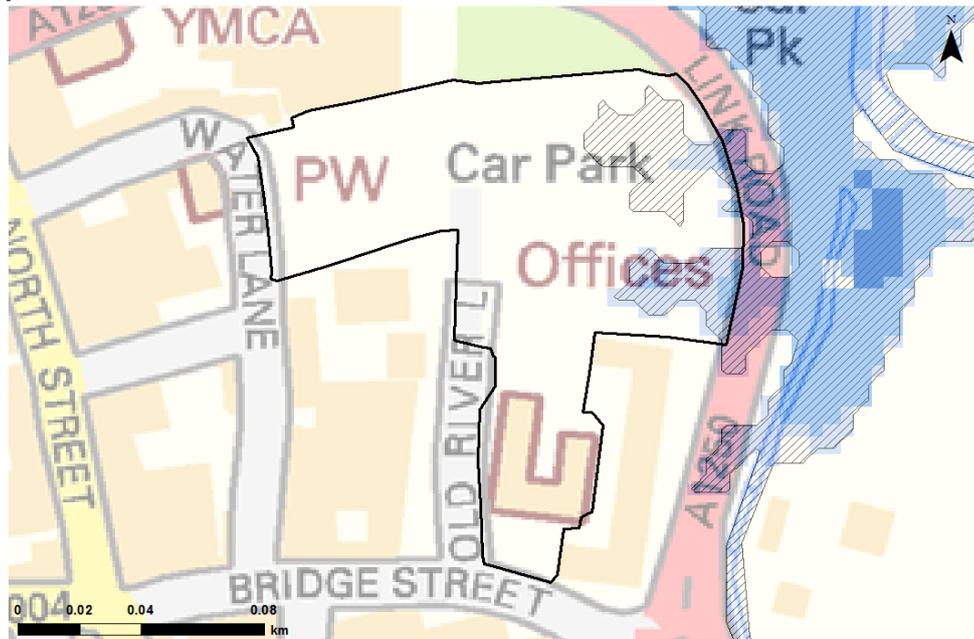
Surface Water Map



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- Potential Site Allocations
- uFMfSW* 30-year Extent
- uFMfSW* 1,000-year Extent
- Council boundary
- uFMfSW* 100-year Extent

Depth Map



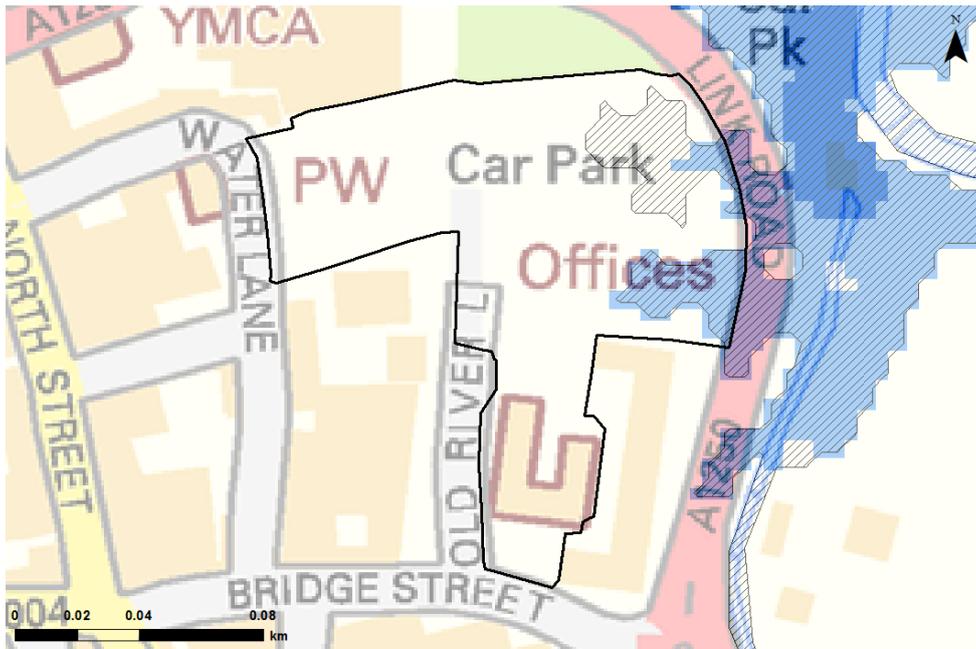
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This depth map is derived from the existing Environment Agency Upper & Middle Stort Modelling (Middle Stort reach) and represents the 100-year undefended event.

To note: the flood zone covers the full hatched extent; depths in some areas are currently not available and should be confirmed as part of a site-specific assessment.

Potential Site Allocations	Depth (m)	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
Council boundary	0 - 0.10	1.00 - 1.50	2.50 - 3.00	>4.00
	0.10 - 0.50	1.50 - 2.00	3.00 - 3.50	

Velocity Map



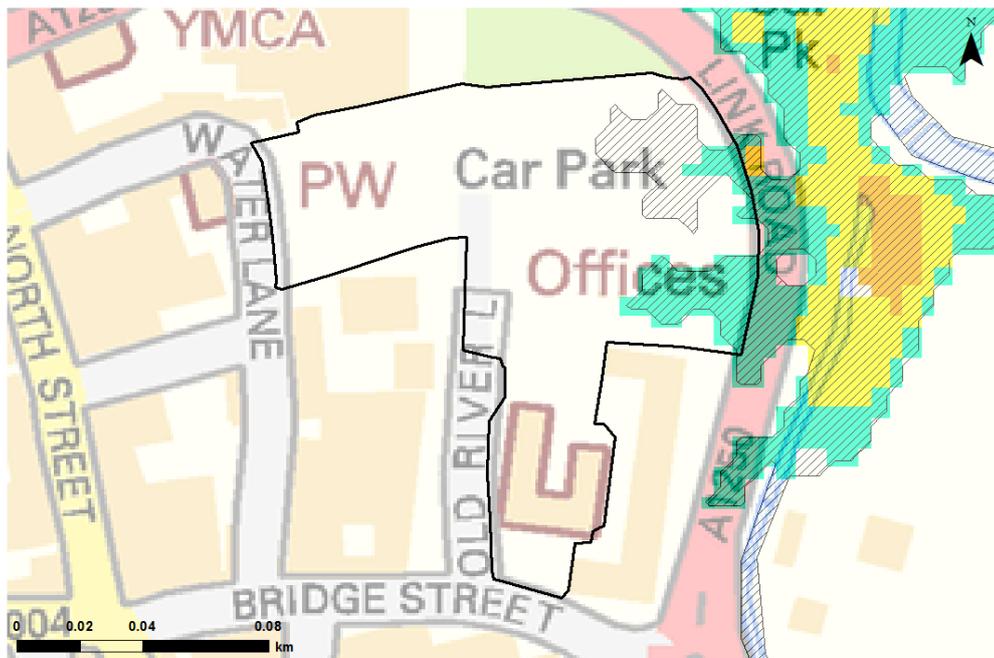
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This velocity map is derived from the existing Environment Agency Upper & Middle Stort Modelling (Middle Stort reach) and represents the 100-year undefended event.

To note: the flood zone covers the full hatched extent; depths in some areas are currently not available and should be confirmed as part of a site-specific assessment.



Hazard Map



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This hazard map is derived from the existing Environment Agency Upper & Middle Stort Modelling (Middle Stort reach) and represents the 100-year undefended event.

To note: the flood zone covers the full hatched extent; depths in some areas are currently not available and should be confirmed as part of a site-specific assessment.

 Potential Site Allocations	Hazard Rating	 Danger for some	 Danger for all
 Council boundary	 Very low hazard - caution	 Danger for most	

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		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. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located with a Source Protection Zone.
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has groundwater issues or contamination issues in areas of brownfields, a liner will be required.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
Conveyance		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. If the site has contamination or groundwater issues; a liner will be required.
<p>The site is not designated by the Environment Agency as previously being a landfill site.</p> <p>The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.</p> <p>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, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).</p>		
<p>Flood Defences:</p> <p>To the east of the site, along right hand bank of the River Stort (site-side), there are two privately-owned embankments. The 100m long north-eastern defence has a 5% AEP standard of protection and the 340m south-eastern embankment has a 0.1% AEP standard of protection. The condition of these defences range from poor to fair respectively.</p>		
<p>Flood Warning:</p> <p>This site is partly covered by 'The River Stort at Bishops Stortford including Spellbrook' Flood warning Area, and partly covered by 'The River Stort, Stansted Brook and their tributaries from Clavering to Hoddesdon including Stanstead Mountfitchet, Bishops Stortford, Sawbridgeworth and Harlow ' Flood Alert Area (062WAF51Stort).</p>		

Access & Egress:

Access and egress from the site can be achieved via a number of roads around the site including the Link Road A1250, Water Lane, Bridge Street and Old River Lane. All of these roads are shown to be affected by surface water and fluvial flooding during the 1,000 year events. Bridge Street and the Link Road are susceptible to surface water flooding in the 30 year event, whereas Link Road is affected by fluvial flooding from the Stort in the 100 year event. Water Lane offers some access/ egress outside of the flood zones/ surface water flood extents.

Climate Change:

Climate change mapping indicates the following impacts for the future:

- Increased storm intensities.
- Increased water extent, depth, velocity and hazard in the watercourse.
- Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

- Use of the Sequential Approach is limited due to the majority of the site being covered by the Flood Zones; therefore development placed within the Flood Zone will be required to pass the Exception Test. The site is afforded some protection from flood embankments. These defences have a 5% -0.1% AEP standard of protection; however, there is still a residual risk of flooding should the defence fail (breach). There is also the potential for the defence to overtop in the future due to climate change. Therefore, it is important that the defences in this area continue to be maintained in line with catchment policy and that any development accounts for the potential residual risk.
- Access and egress routes are at risk from fluvial and surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and egress can be provided for the lifetime of the development. Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes.
- Broad-scale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site and the proportion of the site at risk from flooding, the type of SuDS system used may be influenced by amount of land available; depending on the system used there may be an impact on the amount of land available for development and the cost of development.
- The site is covered by the Environment Agency's Flood Warning Service. Given the potential access and egress issues, development may need to consider provision of safe refuge in the event of occupiers being unable to evacuate. Given the size and location of the site in the flood zones, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment. This could be investigated at site-specific assessment stage.

Guidance for Developers:

- 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 greater than 1ha in size. Other sources of flooding should also be considered.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
- Safe access and egress will need to be demonstrated; currently all access and egress routes are affected by fluvial and surface water flooding in the 1,000 year event. Bridge Street and Link Road are affected during lower return periods.
- The peak flows of the River Stort should be considered when considering drainage.
- Resilience measures will be required if buildings are situated in the flood risk area.
- Assessment for runoff should include allowance for climate change effects.
- 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.
- 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.
 - o 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.
- Onsite attenuation schemes would need to be tested against the hydrographs for the River Stort to ensure flows are not exacerbated downstream within the catchment.