Mapping

Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="4">Site details</td><td>Site Code</td><td colspan="4">Site SA18 – Land off Eastgate Street</td></tr>
<tr><td>Area</td><td colspan="4">0.12 hectares</td></tr>
<tr><td>Current land use</td><td colspan="4">Brownfield</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="6">Sources of flood risk</td><td>Existing drainage features</td><td colspan="4">The site is located approximately 230m south of the culverted part of the River Twyver and 620m north of the Sud Brook.</td></tr>
<tr><td rowspan="3">Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>0%</td><td><1%</td><td>17%</td><td>83%</td></tr>
<tr><td colspan="4">Flood risk to the site originates from the River Twyver and the Sud Brook. The flood extents spread through the city in the area between the two watercourses, caused by overland flow paths from culverted reaches of watercourse. Flood Zone 3a encroaches slightly into the site at the north-western and southern edges of the site with Flood Zone 2 further extending into the site. Flood Zone 2 fully surrounds the site in the immediate vicinity.</td></tr>
<tr><td rowspan="3">Surface Water</td><td colspan="4">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td colspan="2">30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td colspan="2">0%</td><td>0%</td><td>2%</td></tr>
<tr><td colspan="4">The site is not at risk of surface water flooding in the 30 and 100-year events; however, the extents come close to the boundary of the site along Eastgate Street. The 1,000-year surface water flood extent encroaches slightly into the site boundary from a flow path along Eastgate Street at the northern edge of the site and a small area of ponding at the southern edge of the site.</td></tr>
<tr><td>Reservoir</td><td colspan="4">The site is not shown to be at risk of reservoir flooding.</td></tr>
<tr><td>Flood history</td><td colspan="4">The site is not covered by the Environment Agency’s historic flood map. There are no records of historic flooding at the site from Gloucestershire County Council or Severn Trent Water.</td></tr>
<tr><td rowspan="4">Flood risk management infrastructure</td><td rowspan="3">Defences</td><td>Defence Type</td><td>Standard of Protection</td><td colspan="2">Condition</td></tr>
<tr><td>-</td><td>-</td><td colspan="2">-</td></tr>
<tr><td colspan="4">The site is not protected by any formal flood defences.</td></tr>
<tr><td>Residual risk</td><td colspan="4">Due to the site being affected by the overland flow paths resulting from culverts surcharging on the River Twyver, if these structures further block, there could be an impact at the site as a result. This should be investigated as part of a detailed site-specific assessment.</td></tr>
<tr><td></td><td>Flood warning</td><td colspan="4">The site is not covered by the Environment Agency’s Flood Warning Service.</td></tr>
</table>

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA18 – Land off Eastgate Street			
	Area	0.12 hectares			
	Current land use	Brownfield			
	Proposed land use	Residential			
Emergency planning	**Access and egress**	Access and egress to the site is only available via an approximately 20m stretch of Eastgate Street. Part of this boundary is available for access and egress in the 30 and 100-year surface water events and in the 100-year fluvial event; however, it is not possible in the 1,000-year surface water and fluvial events. Depths and hazard should be confirmed in a site-specific assessment to confirm whether emergency vehicles could still access where the site is completely encircled by flood water in the higher flood events.			
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**
		Severn	25%	35%	70%
	Implications for the site	Climate change information was unavailable for this site. Please refer to Flood Zone 2 extents (1,000-year fluvial event) for an indication of climate change impacts until latest modelling results being undertaken at the time of this study are available. Fluvial, tidal and surface water extents, along with depth, hazard and the frequency of flooding are likely to increase from climate change in the future.			

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA18 – Land off Eastgate Street
	Area	0.12 hectares
	Current land use	Brownfield
	Proposed land use	Residential

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Clay, silt and sand
		• The site is not located within a Groundwater Source Protection Zone.
		• Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk from groundwater.
		• Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m.
		• Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required due to the site potential groundwater flooding.
		• All filtration techniques are likely to be suitable. A liner maybe required to prevent the egress of groundwater.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.
		The site is not designated by the Environment Agency as previously being a landfill site.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. • Residential development is classified as ‘More Vulnerable’.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA18 – Land off Eastgate Street
	Area	0.12 hectares
	Current land use	Brownfield
	Proposed land use	Residential

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning Flood Zones (which match the modelled 100-year and 1,000-year flood extents) and Flood Zone 3b has been derived from the 2006 River Twyver 2D TUFLOW hydraulic model.
Climate change	Climate change modelling was unavailable for this site. Flood Zone 2 can be used as an indication of the flood risk due to climate change.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Depth mapping for the 1 in 100-year event (Flood Zone 3a) has been taken from the 2006 River Twyver 2D TUFLOW hydraulic model. Hazard and velocity mapping outputs were unavailable.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.

Mapping

Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="4">Site details</td><td>Site Code</td><td colspan="4">Site SA24 – Part of West Quay, the Docks</td></tr>
<tr><td>Area</td><td colspan="4">0.84 hectares</td></tr>
<tr><td>Current land use</td><td colspan="4">Brownfield</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Parking</td></tr>
<tr><td rowspan="6">Sources of flood risk</td><td>Existing drainage features</td><td colspan="4">The site is bounded by the Gloucester and Sharpness canal to the east and is located approximately 30m from the River Severn, separated by Severn Road.</td></tr>
<tr><td rowspan="3">Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>-*</td><td>1%</td><td>100%</td><td>0%</td></tr>
<tr><td colspan="4">The site is located very marginally in Flood Zone 3a via a flow path from the River Severn to the Gloucester and Sharpness Canal. The entire site is located within Flood Zone 2, with the risk originating from the River Severn.
*Detailed modelling is available of the River Severn; however, due to the number of tidal-fluvial combined modelled scenarios, Flood Zone 3b was unavailable for this site. Flood Zone 3a can be used as an indication of Flood Zone 3b in the absence of modelled data.</td></tr>
<tr><td rowspan="3">Surface Water</td><td colspan="4">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td colspan="2">30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td colspan="2">0%</td><td>0%</td><td>10%</td></tr>
<tr><td colspan="4">The site is not at risk of surface water flooding in the 30 and 100-year events. The north-eastern and eastern edges of the site are located within the 1,000-year surface water extent, via flows paths from the Gloucester and Sharpness Canal. Small areas of ponding encroach the site boundary along Llanthony Road and Severn Road in the 1,000-year surface water event.</td></tr>
<tr><td>Reservoir</td><td colspan="4">The eastern edge of the site is partially at risk of flooding from the Saintbridge Balancing Pond 1.</td></tr>
<tr><td>Flood history</td><td colspan="4">99% of the site is covered by the Environment Agency’s historic flood map. There is an incident of overtopping on the Gloucester and Sharpness Canal approximately 80m north of the site, from July 2007.
There are no records of historic flooding at the site from Gloucestershire County Council or Severn Trent Water.</td></tr>
<tr><td rowspan="3">Flood risk management infrastructure</td><td rowspan="2">Defences</td><td>Defence Type</td><td>Standard of Protection</td><td colspan="2">Condition</td></tr>
<tr><td>-</td><td>-</td><td colspan="2">-</td></tr>
<tr><td colspan="4">The site is not protected by any formal flood defences.</td></tr>
<tr><td>Residual risk</td><td colspan="4">-</td></tr>
<tr><td>Emergency planning</td><td>Flood warning</td><td colspan="4">The site is covered by the River Severn at Gloucester (031FWBSE590) Flood Warning Area from the Environment Agency’s Flood Warning Service.</td></tr>
</table>

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA24 – Part of West Quay, the Docks			
	Area	0.84 hectares			
	Current land use	Brownfield			
	Proposed land use	Parking			
	Access and egress	Dry access and egress to the site is only available via Severn Road and Llanthony Road in all surface water events and the 100-year fluvial event (FZ3). As the entire site is located in Flood Zone 2 there is no dry access and egress available in the 1,000-year fluvial event, until a little further along Llanthony Road to the east.			
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**
		Severn	25%	35%	70%
	Implications for the site	The 25% and 35% climate change extents do not increase significantly when compared with Flood Zone 3a, but there is a significant increase with the 70% climate change event, which extends to cover >50% of the site. As the site is affected by surface water flooding from the 1,000-year event, climate change may also increase the extent, depth and frequency of surface water flooding.			

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA24 – Part of West Quay, the Docks
	Area	0.84 hectares
	Current land use	Brownfield
	Proposed land use	Parking

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Clay, silt and sand
		• The site is not located within a Groundwater Source Protection Zone.
		• All forms of source control are likely to be suitable.
		• 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.
		• Mapping suggests that the site slopes are suitable for all forms of detention.
		• All filtration techniques are likely to be suitable. If the site has contamination issues; a liner will be required.
		• 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.
		The site is not designated by the Environment Agency as previously being a landfill site.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. • Parking is classified as ‘Less Vulnerable’.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA24 – Part of West Quay, the Docks
	Area	0.84 hectares
	Current land use	Brownfield
	Proposed land use	Parking

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning Flood Zones. Detailed modelling to produce Flood Zone 3b was not available for this site due to the combined tidal-fluvial scenarios modelled. Flood Zone 3a can be used as an indication of Flood Zone 3b in the absence of modelled data.
Climate change	The climate change allowances for the '2080s' epoch were modelling using the 2007 River Severn Tidal 1D hydraulic model.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping for the 1 in 100-year event (Flood Zone 3a) was unavailable for this site.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.

Mapping

Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	Site SA02 – Barnwood Manor
	Area	1.95 hectares
	Current land use	Brownfield
	Proposed land use	Residential
Sources of flood risk	**Existing drainage features**	The Wotton Brook flows from east to west through the centre of site.
	Fluvial	**Proportion of site at risk**

FZ3b	FZ3a	FZ2	FZ1
0%*	9%	14%	86%

Flood risk to the site is associated with the Wotton Brook that flows through the centre of the site. Flood Zone 3a is largely confined to the channel through the site, with Flood Zone 2 extending slightly further into the floodplain from the left bank (southern area of the site).
*0% of the site is seen to be located within Flood Zone 3b as the modelled outline of the Wotton Brook does not include the channel. As the Wotton Brook flows through the centre of the site, this part of the site is located within Flood Zone 3b; however, the water remains in bank.

	Surface Water	**Proportion of site at risk (RoFfSW)**		
		30-year	**100-year**	**1,000-year**
		4%	6%	16%
		The surface water flood risk affecting the site mainly converges towards the Wotton Brook channel and floodplain with surface water only affecting the site in the 30-year and 100-year event along the watercourse. There are a few isolated areas of surface water ponding at the site in the 1,000-year event, and a flow path along Barnwood Road just encroaching into the site boundary in the 1,000-year event.		
	Reservoir	The site is not shown to be at risk of reservoir flooding.		
	Flood history	Approximately 13% of the site is covered by the Environment Agency's historic flood map, along the Wotton Brook. There are no records of historic flooding at the site from Gloucestershire County Council or Severn Trent Water.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		This site is not protected by any formal flood defences.		
	Residual risk	If the structure at North Upton Lane was to block, this could increase the flood extents into the site on the eastern boundary or affect access on this part of the road; there is already an area of ponding here in the Flood Zones and surface water mapping extent. The potential for blockage may need to be considered in a site-specific assessment.		
	Flood warning	The site is not covered by the Environment Agency's Flood Warning Service.		

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA02 – Barnwood Manor			
	Area	1.95 hectares			
	Current land use	Brownfield			
	Proposed land use	Residential			
Emergency planning	**Access and egress**	Dry access and egress is available via Barnwood Road in the 30-year surface water event and all fluvial events; however, access and egress would be cut off in the 100-year and 1,000-year surface water events as much of the length of Barnwood Road is at surface water risk. The depth and hazard of the surface water along the site boundary with Barnwood Road is however very low for the 100-year event. Dry access and egress via Newstead Road is available in all fluvial and surface water events. Dry access and egress is available along most of North Upton Lane in all fluvial and surface water flood events; however, where the Wotton Brook passes under the road, dry access and egress is not possible in all fluvial and surface water flood events due to an area of ponding. The depths of surface water flooding along access/ egress routes should be investigated in a site-specific assessment, to confirm whether access for emergency vehicles could still be obtained.			
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**
		Severn	25%	35%	70%
	Implications for the site	Fluvial extents from climate change did not increase significantly when compared with FZ3a. Minor increases can be seen at the edges of the site where the Wotton Brook passes the site boundary. As the site is affected by surface water flooding from the 1,000-year event, climate change may also increase the extent, depth and frequency of surface water flooding.			

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA02 – Barnwood Manor
	Area	1.95 hectares
	Current land use	Brownfield
	Proposed land use	Residential

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Clay, silt and sand
		• The site is not located within a Groundwater Source Protection Zone.
		• Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk from groundwater. Mapping also suggests that slopes may be unsuitable for selective source control techniques.
		• Mapping suggests that there is a medium 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.
		• Detention is unlikely to be feasible as mapping suggests mean site slopes are > 5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible, a liner may be required to prevent the egress of groundwater.
		• Filtration is unlikely to be feasible as mapping suggests mean site slopes are > 5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible, it should be located where the depth to the water table is >1m; additionally, a liner maybe required to prevent the egress of groundwater.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.
		The site is not designated by the Environment Agency as previously being a landfill site.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. Residential development is classified as ‘More Vulnerable’.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA02 – Barnwood Manor
	Area	1.95 hectares
	Current land use	Brownfield
	Proposed land use	Residential

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• Onsite attenuation schemes would need to be tested against the Wotton Brook through the centre of the site to ensure flows are not exacerbated downstream within the catchment.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning Flood Zones and Flood Zone 3b has been derived from the 2007 Wotton Brook 1D-2D ISIS-TUFLOW hydraulic model.
Climate change	The climate change allowances for the '2080s' epoch were modelled using the 2007 Wotton Brook 1D-2D ISIS-TUFLOW hydraulic model.
Surface Water	The Environment Agency's Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Depth, velocity and hazard mapping for the 1 in 100-year event (Flood Zone 3a) have been taken from the 2007 Wotton Brook 1D-2D ISIS-TUFLOW hydraulic model.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	JBA consulting

Site details	**Site Code**	Site SA07 – Lynton Fields – Land east of Waterwells				
	Area	2.23 hectares				
	Current land use	Greenfield				
	Proposed land use	Employment				
Sources of flood risk	**Existing drainage features**	The site is bounded by the Dimore Brook at the southern edge of the site.				
	Fluvial	**Proportion of site at risk**				
		FZ3b	**FZ3a**	**FZ2**	**FZ1**	
		1%	1%*	1%*	99%*	
		*The site is not located within the Environment Agency's Flood Zones as the catchment is <3km^2; however, there is some minor fluvial risk to the site from the Dimore Brook which has not been included in the Environment Agency's Flood Map for Planning. Using the hydraulic model results from the 2009 1D-2D ESTRY-TUFLOW Dimore Brook model, 1% of the site is located within the 20-year (Flood Zone 3b), 100-year extent (equivalent to Flood Zone 3a) and 1,000-year extent (equivalent to Flood Zone 2). The channel is therefore shown to stay in-bank along this reach.				
	Surface Water	**Proportion of site at risk (RoFfSW)**				
		30-year	**100-year**	**1,000-year**		
		<1%	1%	3%		
		The site is at risk of surface water flooding at the southern boundary of the site along the Dimore Brook. There is an isolated area of ponding in the 1,000-year surface water event at the north-western corner of the site.				
	Reservoir	The site is not shown to be at risk of reservoir flooding.				
	Flood history	The site is covered by the Environment Agency's historic flood map. There are no records of historic flooding at the site from Gloucestershire County Council or Severn Trent Water.				
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**		
		-	-	-		
		The site is not protected by any formal flood defences.				
	Residual risk	The Dimore Brook is partially culverted near the site; should blockages occur, this could increase flood risk to the site at the south-eastern boundary. The potential impact of this may need to be considered at a site-specific stage.				
Emergency planning	**Flood warning**	The site is not covered by the Environment Agency's Flood Warning Service.				
	Access and egress	Dry access and egress to the site is available via Naas Lane in all fluvial and surface water events.				
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**	
		Severn	25%	35%	70%	

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA07 – Lynton Fields – Land east of Waterwells
	Area	2.23 hectares
	Current land use	Greenfield
	Proposed land use	Employment
	Implications for the site	Climate change was modelled using 2D generalised modelling techniques for the Dimore Brook due to omissions in the model data received, meaning that the detailed hydraulic model could not be rerun for climate change. The 2D generalised modelling shows an increase in flood extents due to climate change; however, 2D generalised modelling tends to be very conservative compared to a detailed model with channel and structure survey. Even with the conservative outputs, the site only has a marginal encroachment of risk from flooding in the climate change scenarios, therefore if sufficient easement was left between the watercourse and the site boundary, the fluvial flood risk could be removed.

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Sand and gravel
		• The site is not located within a Groundwater Source Protection Zone.
		• All forms of source control are likely to be suitable.
		• Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable, it should be avoided in areas where the depth to the water table is <1m.
		• Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required due to the site potential groundwater flooding.
		• All filtration techniques are likely to be suitable. A liner maybe required to prevent the egress of groundwater.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.
		The site is not designated by the Environment Agency as previously being a landfill site.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. • Commercial development is classified as ‘Less Vulnerable’.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA07 – Lynton Fields – Land east of Waterwells
	Area	2.23 hectares
	Current land use	Greenfield
	Proposed land use	Employment

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• If deemed required by the EA at site-specific level, detailed modelling may need to be undertaken to determine the flood extents from climate change as only 2D generalised modelling techniques were available for this site. Even though 2D generalised modelling is very conservative, the majority of the site is not at risk, therefore the location of the southern site boundary could be reconsidered ensure the site is not at risk, and detailed modelling may not be required.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• Onsite attenuation schemes would need to be tested against the Dimore Brook along the southern edge of the site to ensure flows are not exacerbated downstream within the catchment.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2, 3a and 3b have been taken from the 2009 Dimore Brook 1D-2D ESTRY-TUFLOW hydraulic model, as this watercourse is not represented in the EA's Flood Map for Planning.
Climate change	Climate change outlines were derived from 2D generalised modelling conducted for the purpose of this Level 2 SFRA.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Depth, velocity and hazard mapping for the 1 in 100-year event (Flood Zone 3a) have been taken from the 2009 Dimore Brook 1D-2D ESTRY-TUFLOW hydraulic model.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA07 – Lynton Fields – Land east of Waterwells
	Area	2.23 hectares
	Current land use	Greenfield
	Proposed land use	Employment
Surface water depth, velocity and hazard mapping		The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.

Mapping

Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	Site SA08 – King's Quarter				
	Area	4.45 hectares				
	Current land use	Brownfield				
	Proposed land use	Mixed use				
Sources of flood risk	**Existing drainage features**	The River Twyver runs culverted through the eastern edge of the site, with the entrance of the culvert approximately 650m upstream of the site and the exit approximately 400m downstream of the site.				
	Fluvial	**Proportion of site at risk**				
		FZ3b	**FZ3a**	**FZ2**	**FZ1**	
		0%	11%	29%	71%	
		Flood risk to the site is associated with the River Twyver that flows culverted through the site. The flood risk is caused by an overland flow path resulting from this culvert upstream surcharging.				
	Surface Water	**Proportion of site at risk (RoFfSW)**				
		30-year	**100-year**	**1,000-year**		
		1%	6%	17%		
		The site is affected by isolated areas of ponding in the 30-year and 100-year surface water flood events; however, flow paths are present in the 1,000-year event at the north-eastern and south-eastern areas of the site, predominantly along roads.				
	Reservoir	The site is not shown to be at risk of reservoir flooding.				
	Flood history	There are no records of historic flooding at the site from the Environment Agency's Historic Flood Map, Gloucestershire County Council or Severn Trent Water.				
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**		
		-	-	-		
		This site is not protected by any formal flood defences.				
	Residual risk	The River Twyver runs culverted through the eastern edge of the site. Whilst the entrance and exit of the culvert are located at least 400m away from the site, the flood risk to the site is from an overland flow path resulting from the upstream culvert inlet, and so if this culvert was to block further, there could be some impact at the site. This should be investigated and confirmed at site-specific stage.				
Emergency planning	**Flood warning**	The site is not covered by the Environment Agency's Flood Warning Service.				
	Access and egress	Dry access and egress is available via St Aldate Street and Russell Street in all fluvial and surface water events. Access and egress look most suitable away from the site in a south-westerly direction, away from the overland flow route.				
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**	
		Severn	25%	35%	70%	

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA08 – King's Quarter
	Area	4.45 hectares
	Current land use	Brownfield
	Proposed land use	Mixed use
	Implications for the site	Climate change information was unavailable for this site. Please refer to Flood Zone 2 extents (1,000-year fluvial event) for an indication of climate change impacts until new modelling being undertaken at the time of this SFRA is available. Fluvial, tidal and surface water extents, along with depth, hazard and the frequency of flooding are likely to increase from climate change in the future.

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Clay, silt and sand
		• The site is not located within a Groundwater Source Protection Zone.
		• Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk from groundwater.
		• Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable, it should be avoided in areas where the depth to the water table is <1m.
		• Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required due to the site potential groundwater flooding.
		• All filtration techniques are likely to be suitable. A liner maybe required to prevent the egress of groundwater.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.
		The site is not designated by the Environment Agency as previously being a landfill site.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. • As the site is Mixed Use, the highest vulnerability classification should be taken, so if residential and commercial, the residential 'More Vulnerable' should be used.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA08 – King's Quarter
	Area	4.45 hectares
	Current land use	Brownfield
	Proposed land use	Mixed use

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning Flood Zones (which match the modelled 100-year and 1,000-year extents) and Flood Zone 3b has been derived from the 2006 River Twyver 2D TUFLOW hydraulic model.
Climate change	Climate change modelling was unavailable for this site. Flood Zone 2 can be used as an indication of the flood risk due to climate change.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Depth mapping for the 1 in 100-year event (Flood Zone 3a) has been taken from the 2006 River Twyver 2D TUFLOW hydraulic model. Hazard and velocity mapping outputs were unavailable.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.

Mapping

Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	Site SA09 – Former Quayside House – Greater Blackfriars
	Area	1.59 hectares
	Current land use	Brownfield
	Proposed land use	Residential/ student accommodation
Sources of flood risk	**Existing drainage features**	The western edge of the site is separated from the River Severn by the A4301.
	Fluvial	**Proportion of site at risk**

FZ3b	**FZ3a**	**FZ2**	**FZ1**
-*	63%	97%	3%

Flood risk to the site originates from the River Severn which is located to the west of the site. Only 3% of the site is located in Flood Zone 1, at the most eastern corner of the site.
*Detailed modelling is available for the River Severn; however, due to the tidal influence at Gloucester, a number of scenarios are available combining river-dominant with a low tide, and tidal-dominant with a low river event. Therefore, Flood Zone 3b was unavailable for this site. Flood Zone 3a can be used as an indication of Flood Zone 3b in the absence of modelled data.

Surface Water — **Proportion of site at risk (RoFfSW)**

30-year	**100-year**	**1,000-year**
3%	6%	15%

There are isolated areas of surface water ponding at the site in the 30-year and 100-year events, along the site boundary with Quay Street and Barrack Square. In the 1,000-year event, these areas become flow paths down the roads towards the River Severn.

	Reservoir	The site is not shown to be at risk of reservoir flooding.
	Flood history	Approximately 26% of the site is covered by the Environment Agency's historic flood map, along the western edge of the site, from the River Severn. There are no records of historic flooding at the site from Gloucestershire County Council or Severn Trent Water.

Flood risk management infrastructure — **Defences**

Defence Type	**Standard of Protection**	**Condition**
Demountable defence	Unknown	Good (2)

Steps down to the River Severn from the A4301, which also incorporate flood defences, are located approximately 20m from the site's western boundary. The steps are approximately 5m in length.

	Residual risk	There is a residual risk of flooding to the site should the defence be overtopped. This should be investigated at site-specific stage.
Emergency planning	**Flood warning**	The site is covered by the River Severn at Gloucester (031FWBSE590) Flood Warning Area from the Environment Agency's Flood Warning Service.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA09 – Former Quayside House – Greater Blackfriars			
	Area	1.59 hectares			
	Current land use	Brownfield			
	Proposed land use	Residential/ student accommodation			
	Access and egress	Dry access and egress will be available from the site via Barrack Square towards the south-eastern corner of the site and the A4031 in all surface water events and via Barrack Square towards the south-eastern corner of the site in the 100-year fluvial event. There would be no access and egress available from the site in the 1,000-year fluvial event.			
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**
		Severn	25%	35%	70%
	Implications for the site	Fluvial extents from climate change did not increase significantly when compared with FZ3a. However, around the south-eastern corner of the site, the 70% climate change extent increases slightly when compared with FZ2. As the site is affected by surface water flooding from the 100-year event, climate change may also increase the extent, depth and frequency of surface water flooding.			

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA09 – Former Quayside House – Greater Blackfriars
	Area	1.59 hectares
	Current land use	Brownfield
	Proposed land use	Residential/ student accommodation

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Clay, silt and sand
		• The site is not located within a Groundwater Source Protection Zone.
		• All forms of source control are likely to be suitable.
		• 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.
		• Mapping suggests that the site slopes are suitable for all forms of detention.
		• All filtration techniques are likely to be suitable. If the site has contamination issues; a liner will be required.
		• 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.
		The site is not designated by the Environment Agency as previously being a landfill site.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. • Residential development is classified as ‘More Vulnerable.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA09 – Former Quayside House – Greater Blackfriars
	Area	1.59 hectares
	Current land use	Brownfield
	Proposed land use	Residential/ student accommodation

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning Flood Zones. Detailed modelling to produce Flood Zone 3b was not available for this site due to the different combinations of fluvial-tidal scenarios. Flood Zone 3a can be used as an indication of Flood Zone 3b in the absence of modelled data.
Climate change	The climate change allowances for the '2080s' epoch were modelling using the 2007 River Severn Tidal 1D hydraulic model.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping for the 1 in 100-year event (Flood Zone 3a) was unavailable for this site.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.

Mapping

Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="4">Site details</td><td>Site Code</td><td colspan="4">Site SA13 – Land at St Oswalds</td></tr>
<tr><td>Area</td><td colspan="4">6.47 hectares</td></tr>
<tr><td>Current land use</td><td colspan="4">Mixed</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="6">Sources of flood risk</td><td>Existing drainage features</td><td colspan="4">The River Twyver flows around the site, approximately 60m from the north-western corner of the site and the River Severn flows approximately 160m from the site boundary to the west.</td></tr>
<tr><td rowspan="3">Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>-*</td><td>5%</td><td>100%</td><td>0%</td></tr>
<tr><td colspan="4">Flood risk to the site originates from the River Severn and the River Twyver. The River Twyver has existing modelling available, but only the mapped output for the more detailed 2D domain was provided, therefore there are no results in the vicinity of the site. However, the site is elevated on higher ground, with the site's western boundary bounding Flood Zone 3, with Flood Zone 2 completely covering the entire site.
*Detailed modelling to produce Flood Zone 3b was unavailable for this site. Flood Zone 3a can be used as an indication of Flood Zone 3b in the absence of modelled data.</td></tr>
<tr><td rowspan="3">Surface Water</td><td colspan="4">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td colspan="2">30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td colspan="2"><1%</td><td>1%</td><td>5%</td></tr>
<tr><td colspan="4">The western edge of the site is bounded by an area of surface water ponding in the 30-year and 100-year events. A large proportion of the southern site edge is bounded by surface water in the 1,000-year event, though this is marginal, with other isolated areas of ponding within the site boundary in the 100 and 1,000-year surface water events.</td></tr>
<tr><td>Reservoir</td><td colspan="4">The site is not shown to be at risk of reservoir flooding.</td></tr>
<tr><td>Flood history</td><td colspan="4">The site is entirely covered by the Environment Agency's historic flood map.
There are no records of historic flooding at the site from Gloucestershire County Council or Severn Trent Water.</td></tr>
<tr><td rowspan="3">Flood risk management infrastructure</td><td rowspan="3">Defences</td><td>Defence Type</td><td>Standard of Protection</td><td colspan="2">Condition</td></tr>
<tr><td>-</td><td>-</td><td colspan="2">-</td></tr>
<tr><td colspan="4">The site is not protected by any formal flood defences.</td></tr>
<tr><td>Residual risk</td><td colspan="4">-</td></tr>
<tr><td>Emergency planning</td><td>Flood warning</td><td colspan="4">The site is covered by the River Severn at Gloucester (031FWBSE590) and River Severn at Sandhurst and Maisemore (031FWBSE570) Flood Warning Areas from the Environment Agency's Flood Warning Service.</td></tr>
</table>

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA13 – Land at St Oswalds			
	Area	6.47 hectares			
	Current land use	Mixed			
	Proposed land use	Residential			
	Access and egress	Dry access and egress will be available from the site at Longhorn Avenue and parts of Gavel Way in all surface water events and the 100-year fluvial event (FZ3). However, links away from the site to other roads needs to be considered due to Flood Zone 3 crossing the A417 in several locations, and the site bounding a rail embankment. There would be no dry access and egress available from the site in the 1,000-year fluvial event (FZ2).			
Climate Change	**Climate change allowances for '2080s'**	**River Basin District**	**Central**	**Higher Central**	**Upper End**
		Severn	25%	35%	70%
	Implications for the site	Fluvial extents from climate change increase when compared with FZ3a. The majority of the south and eastern site boundary are not located within Flood Zone 3, however climate change extents do cover these areas. As the site is affected by surface water flooding from the 100-year event, climate change may also increase the extent, depth and frequency of surface water flooding.			

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA13 – Land at St Oswalds
	Area	6.47 hectares
	Current land use	Mixed
	Proposed land use	Residential

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Mudstone, siltstone, limestone and sandstone
		  ○ Superficial – Clay, silt and sand
		• The site is not located within a Groundwater Source Protection Zone.
		• Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk from groundwater.
		• Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration.
		• Detention may be feasible provided site slopes are < 5% at the location of the detention feature. A liner maybe required to prevent the egress of groundwater.
		• Filtrations is probably suitable provided site slopes are <5% and the depth to the water table is >1m. A liner maybe required to prevent the egress of groundwater.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.
		
		This entire site has previously been 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. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

NPPF and planning implications	**Exception Test requirements**	The Sequential Test will need to be passed before the Exception Test is applied. The Exception Test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. • Essential Infrastructure in Flood Zone 3b will require the Exception Test. • Residential development is classified as ‘More Vulnerable’.

Mapping	**Gloucester City Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables**	

Site details	**Site Code**	Site SA13 – Land at St Oswalds
	Area	6.47 hectares
	Current land use	Mixed
	Proposed land use	Residential

	Requirements and guidance for site-specific Flood Risk Assessment	• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• Resilience measures will be required if buildings are situated in the flood risk area through the centre of the site's boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
		• Assessment for runoff should include allowance for climate change effects.
		• Safe access and egress will need to be demonstrated.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.

Mapping Information	
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning Flood Zones. Detailed modelling is available for the River Severn, but due to the combination of tidal-fluvial scenarios, Flood Zone 3b was not available for this site. Flood Zone 3a can be used as an indication of Flood Zone 3b in the absence of modelled data.
Climate change	The climate change allowances for the '2080s' epoch were modelling using the 2007 River Severn Tidal 1D hydraulic model.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping for the 1 in 100-year event (Flood Zone 3a) was unavailable for this site.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.