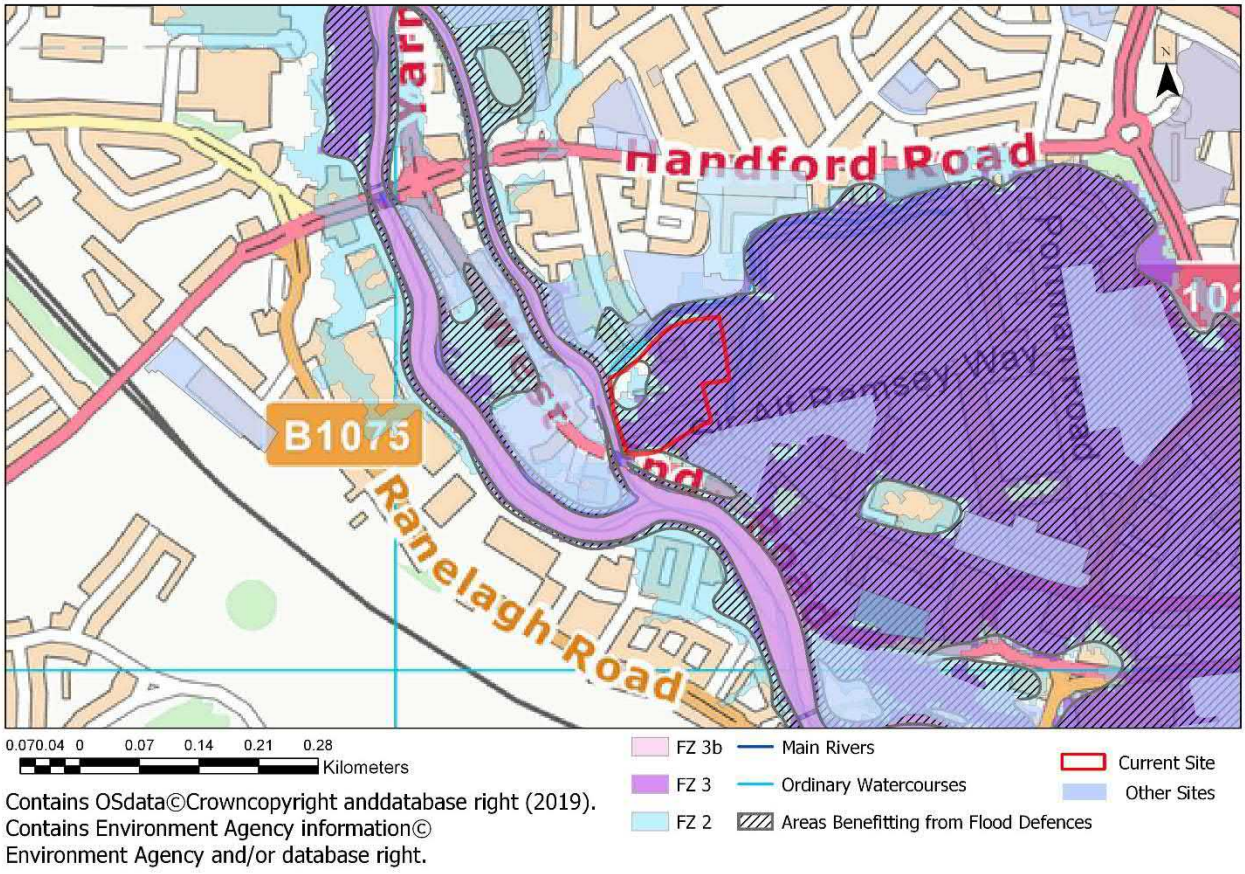
Site Name: Waste tip north of Sir Alf Ramsey Way					
Site ID:	IP003	**Location:**	Waste tip north of Sir Alf Ramsey Way	**Area (ha):**	1.46
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding

Flood Zone 1 (<0.1% AEP): 6%	**Flood Zone 2 (0.1% AEP):** 16%	**Flood Zone 3 (1% AEP):** 78%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 87%

As it flows through Ipswich, the River Gipping becomes the River Orwell. A channel of the River Gipping / Orwell flows south along the western edge of the site and joins with another main channel of the River Orwell. There are further watercourses to the north and east of the site. At this location the River Gipping / Orwell is tidally influenced. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

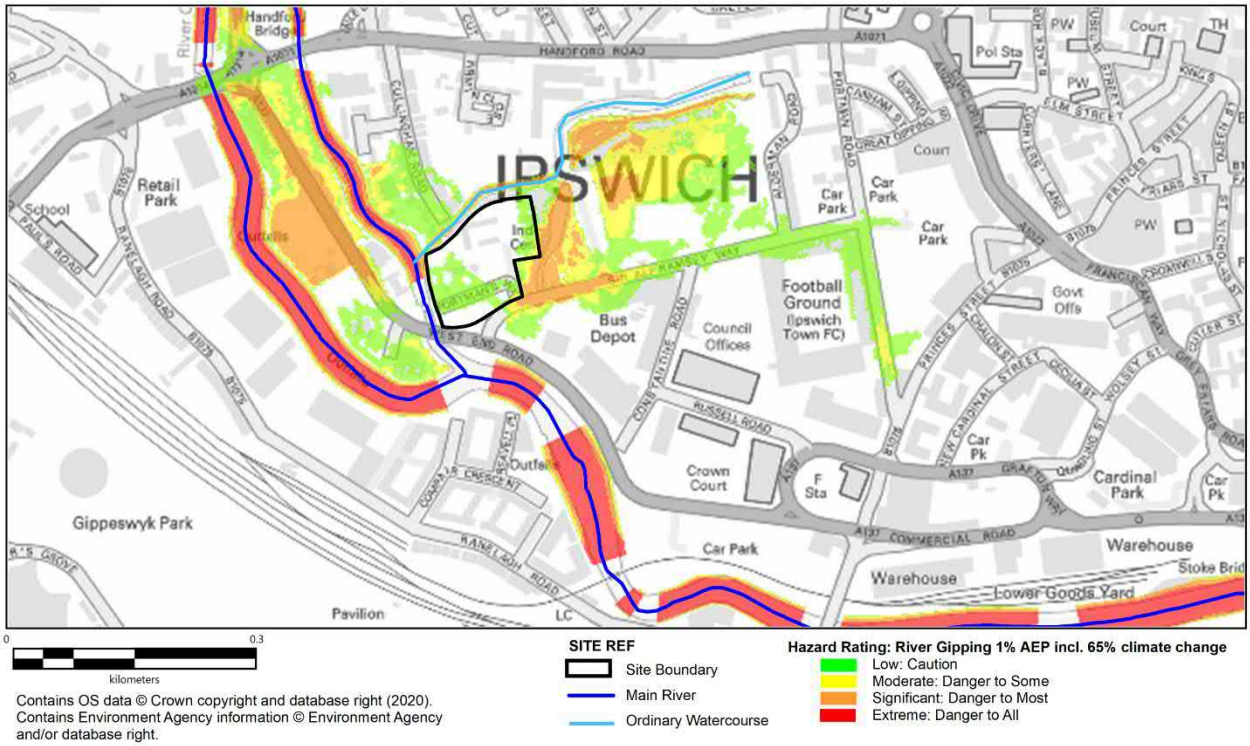
The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents in this location associated with surface water and highway flooding.

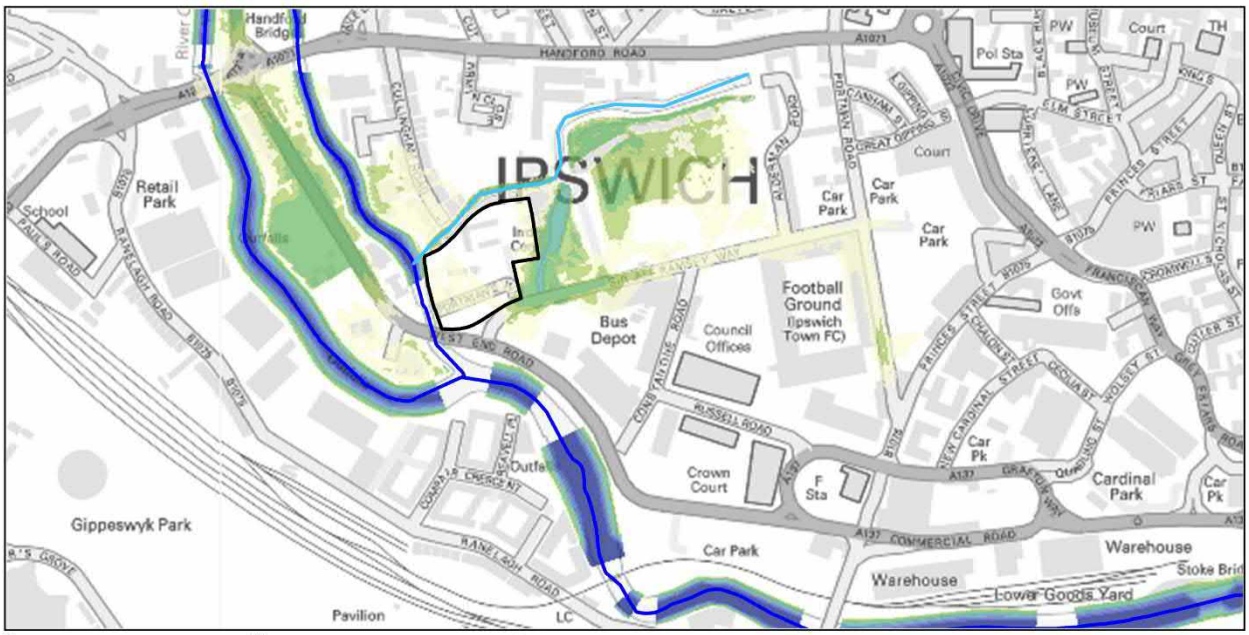


Site Name: Waste tip north of Sir Alf Ramsey Way

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, the site is shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels varying from 3.45 – 4.8 m AOD on the western side of the site; and 3.17 – 3.68 m AOD on the eastern side. Flood depths on the site are approximately 0.25 m, and the hazard rating is Low. The hazard rating to the east of the site is Significant. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.





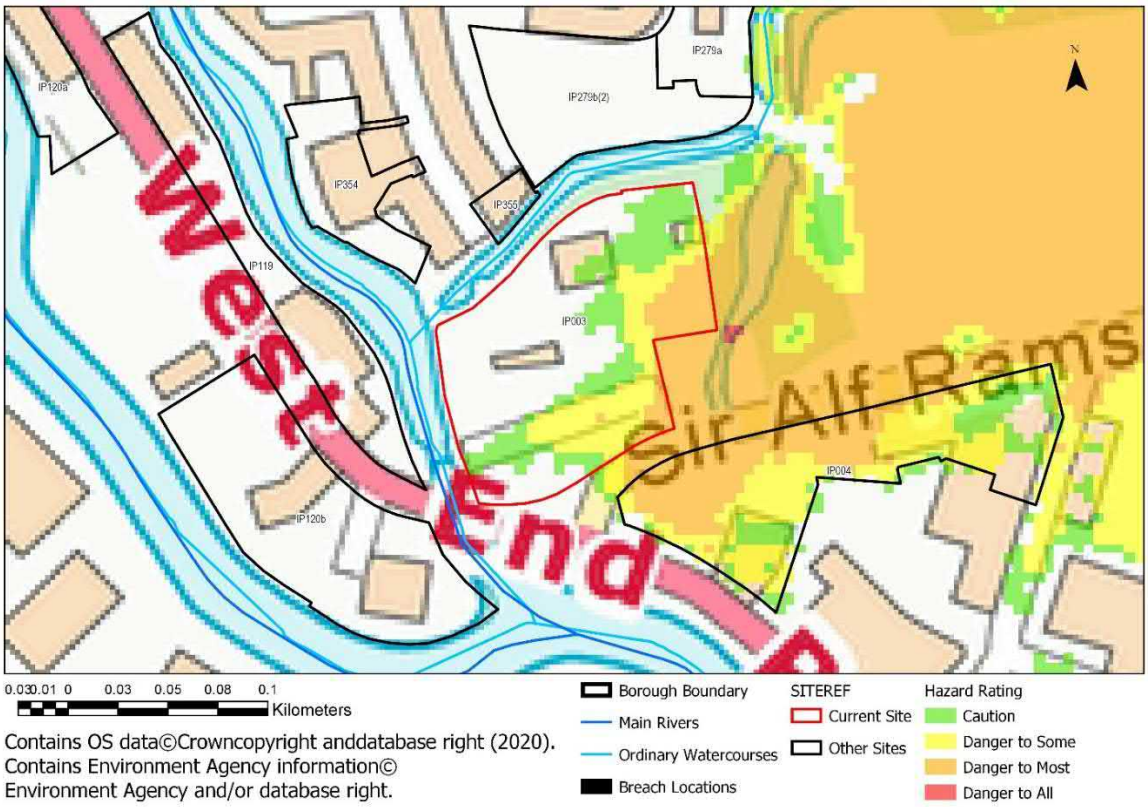
Site Name: Waste tip north of Sir Alf Ramsey Way

Tidal Flood Risk – River Orwell

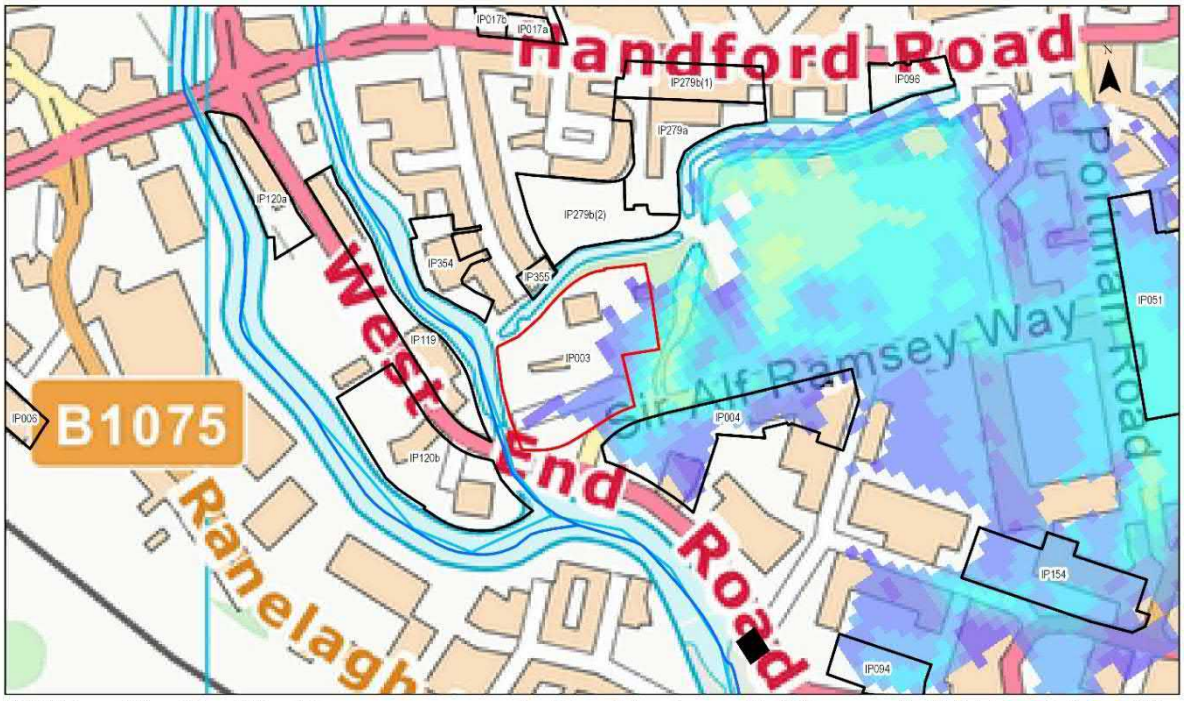
Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate the flood hazard associated with this residual risk. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, flood hazard of Low, Moderate and Significant is recorded on the site and to the east of the site. Flood depths range from 0 to 1.25 m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



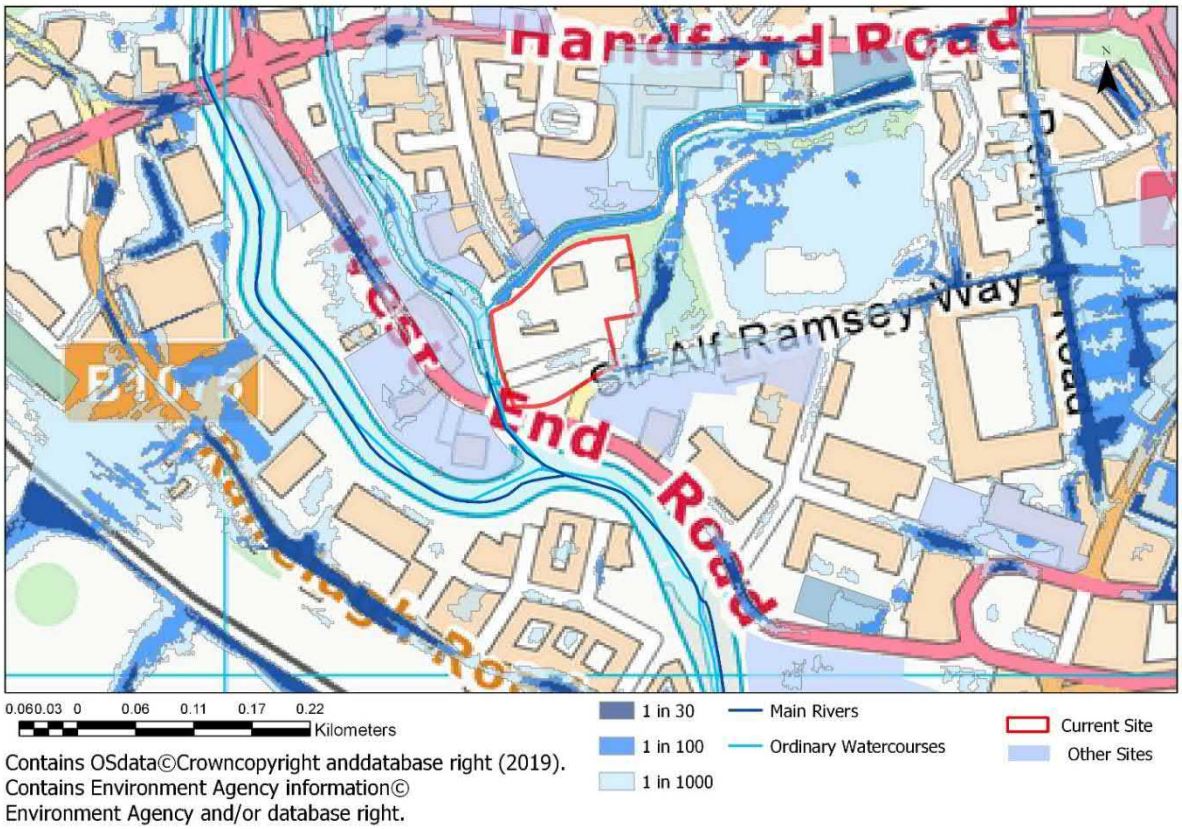
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Waste tip north of Sir Alf Ramsey Way

Surface Water Flood risk

The RoFSW mapping indicates that the site is at low and very low risk of surface water flooding. The RoFSW mapping identifies two important surface water flow paths to the north and east of the site which are watercourses.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from reservoir flooding.

Site Specific Recommendations

The site is shown to be at actual risk of fluvial flooding from the Lower Gipping in the future as a result of climate change, and at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change varies across the site from 3.45 – 4.8 m AOD on the western side of the site; and 3.17 – 3.68 m AOD on the eastern side.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the south along West End Road. Dry access is not likely to be possible along Sir Alf Ramsey Way where the hazard rating is shown to be Significant.

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the south of the site, along West End Road leading north. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Site Name: Waste tip north of Sir Alf Ramsey Way

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Set-back Distance

All development should be set back from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a flood defence structure (whether fluvial or tidal). Consent needs to be obtained from Suffolk County Council (in their capacity as the LLFA) for any works that may affect flow within the Ordinary Watercourse to the north of the site.

Other considerations

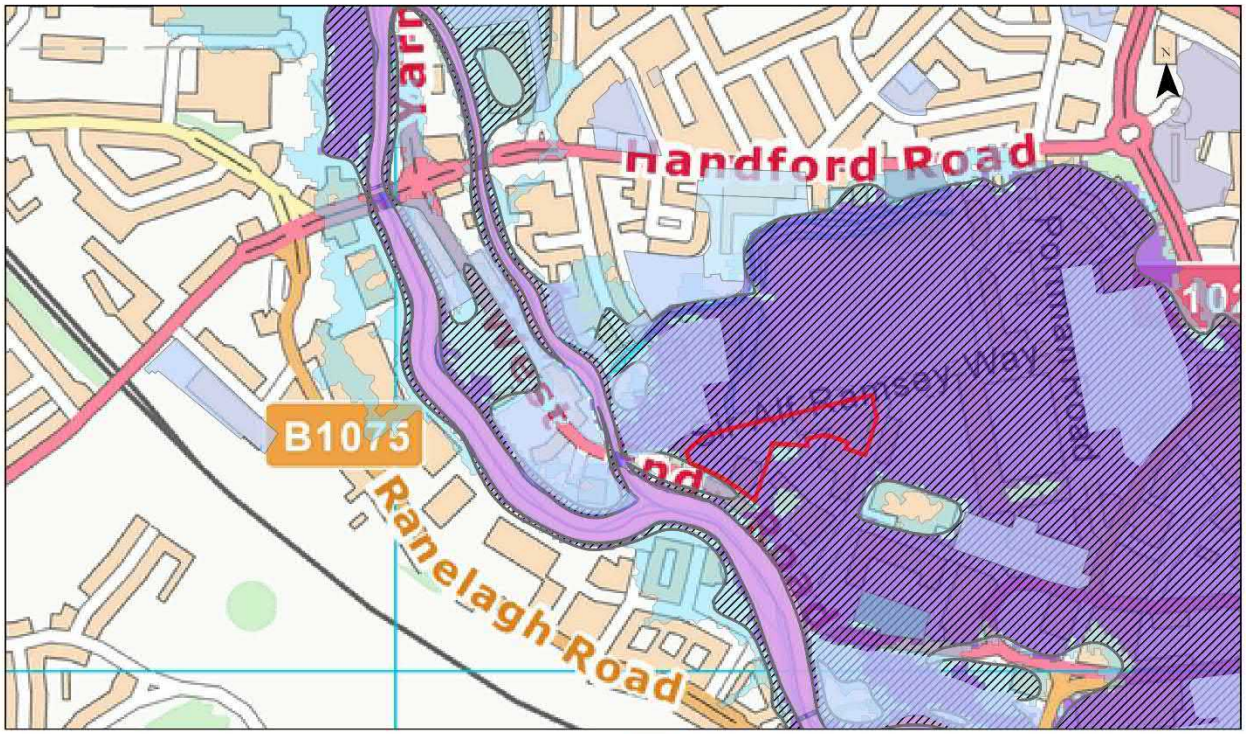
The modelling of the River Gipping shows that water comes out of bank close to Site IP003, and therefore modifications to ground levels in this location (for example, to achieve required finished floor levels) has the potential to increase the flood levels in the channel and thereby potentially lead to flooding elsewhere. Future development in this location must ensure that the risk to other areas is not increased.

Site Name: Bus Depot, Sir Alf Ramsey Way					
Site ID:	IP004	**Location:**	Bus Depot, Sir Alf Ramsey Way	**Area (ha):**	1.07
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 1%	**Flood Zone 3 (1% AEP):** 99%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 100%

As it flows through Ipswich, the River Gipping becomes the River Orwell. A channel of the River Gipping / Orwell flows southeast close to the south western edge of the site, on the opposite side of the A137 West End Road. There is also a small unmodelled watercourse/ drain located to the north of the site which is culverted beneath the site. At this location the River Gipping / Orwell is tidally influenced. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences. This may require updating once the impact of the new modelling for the River Gipping is known.

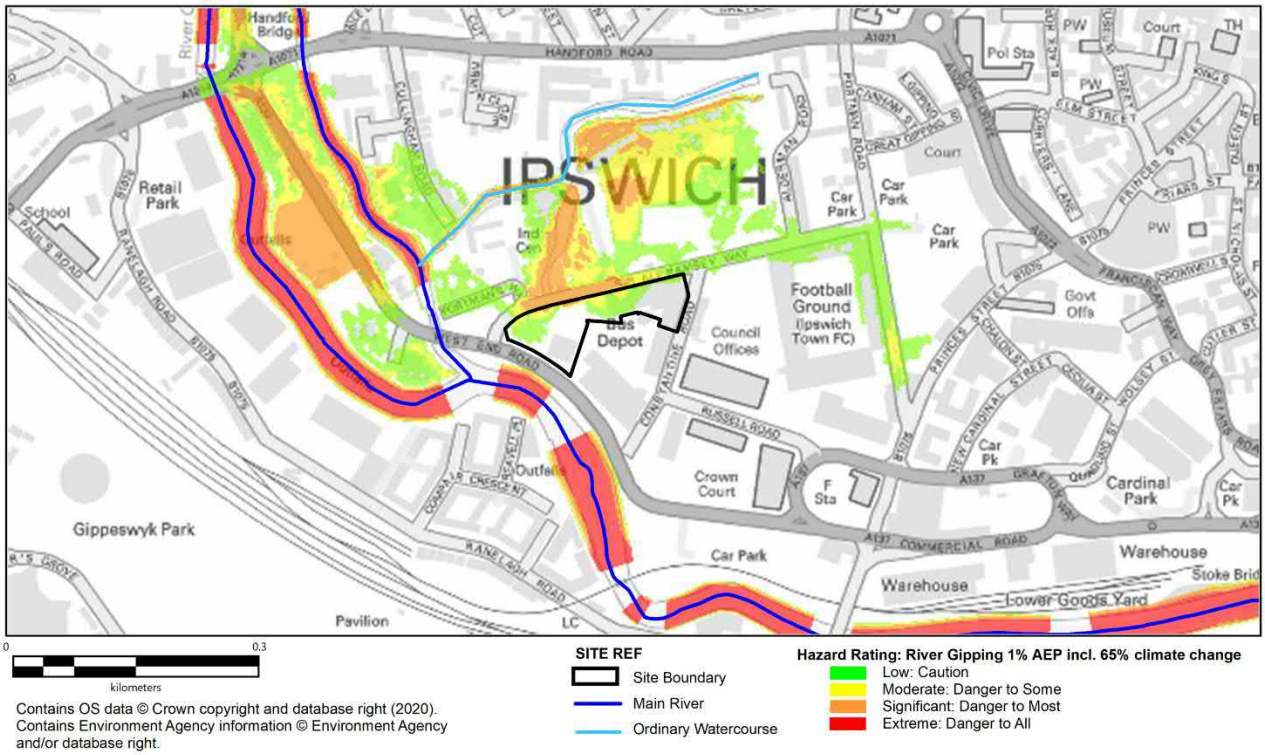
The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents affecting the roads and pavements in this location.

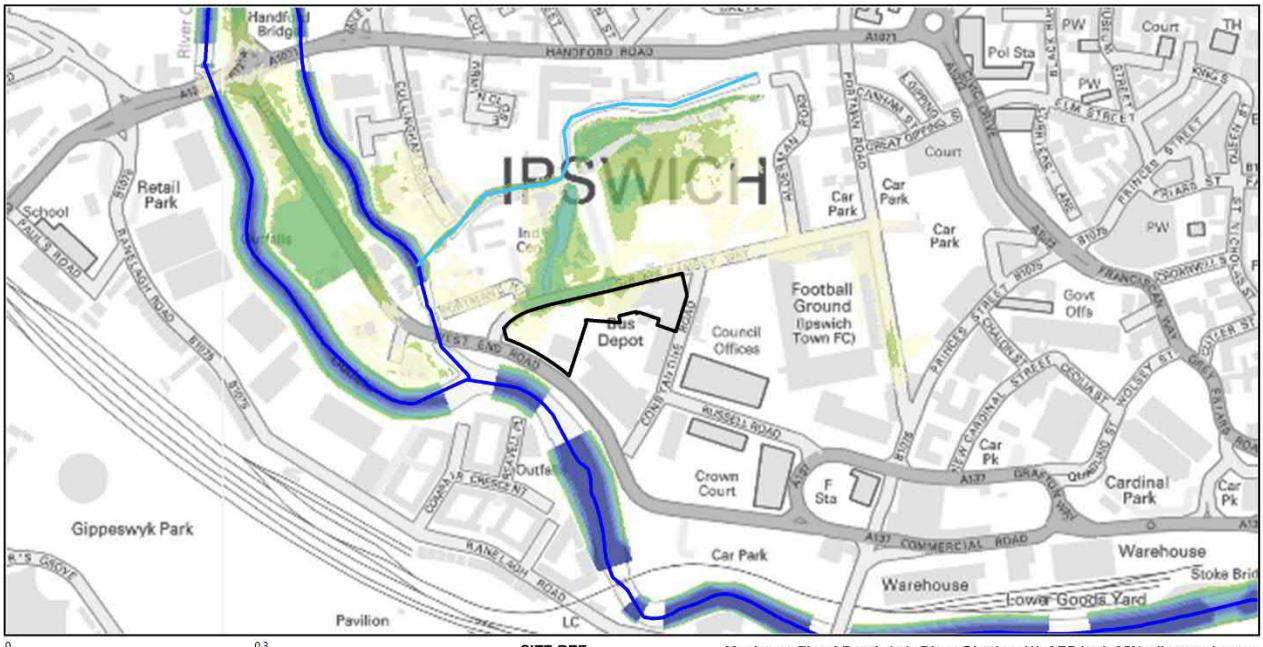


Site Name: Bus Depot, Sir Alf Ramsey Way

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, the site is shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 3.17m AOD on the site. Flood depths on the site are approximately 0.25 m – 1m, and the hazard rating is Low – Significant along the northern edge. The hazard rating to the north of the site on Sir Alf Ramsey Way is Significant. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.





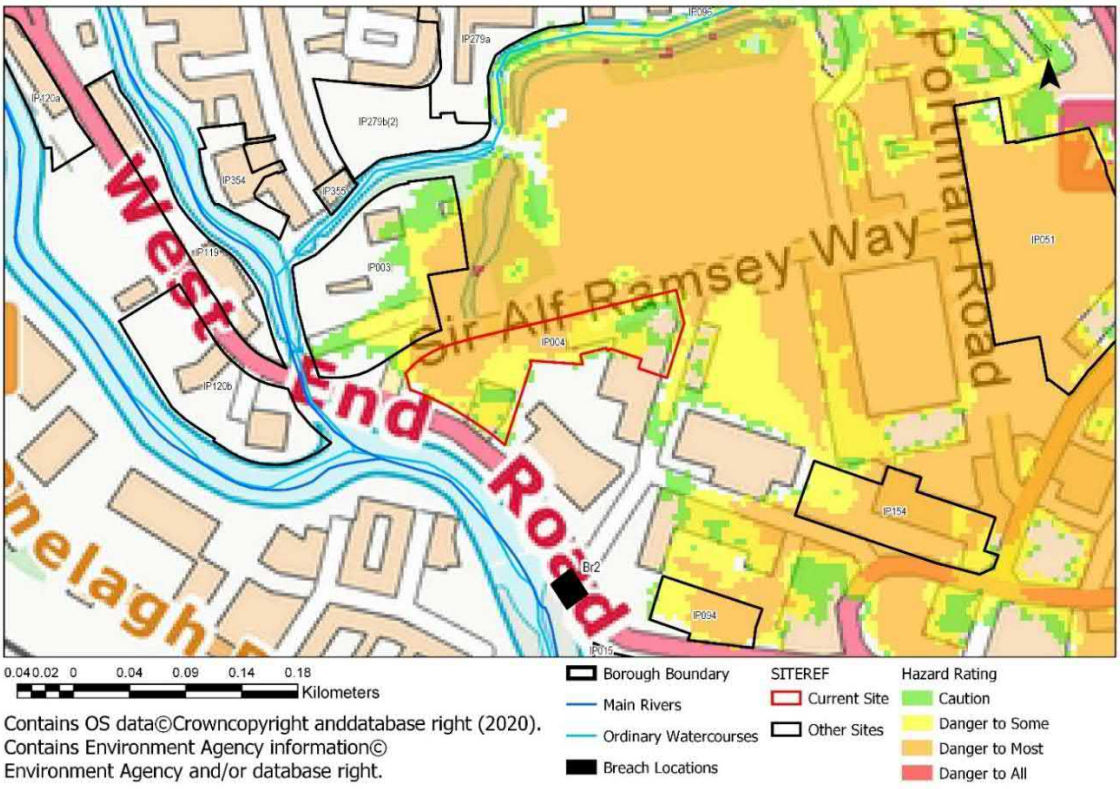
Site Name: Bus Depot, Sir Alf Ramsey Way

Tidal Flood Risk – River Orwell

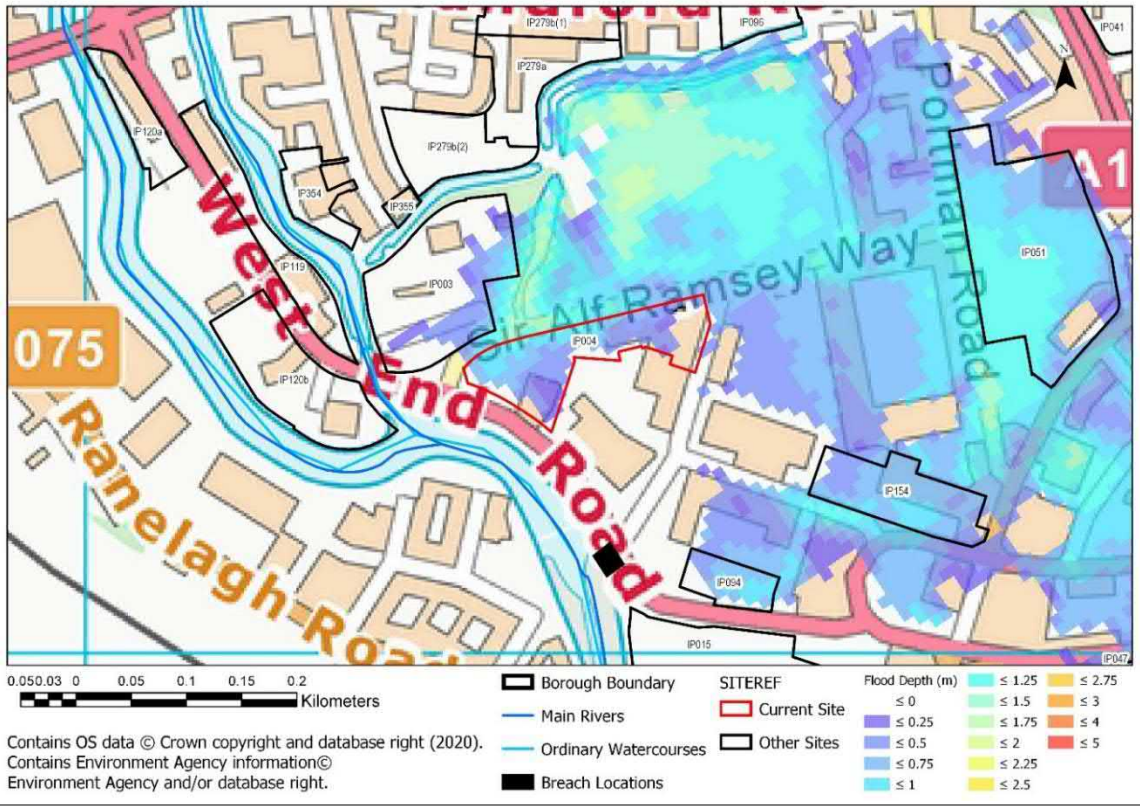
Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario the site is exposed to a range of hazard rating from caution to danger to most with the highest category covering approximately a third of the site. Flood depths on site range from <1m to <0.25m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



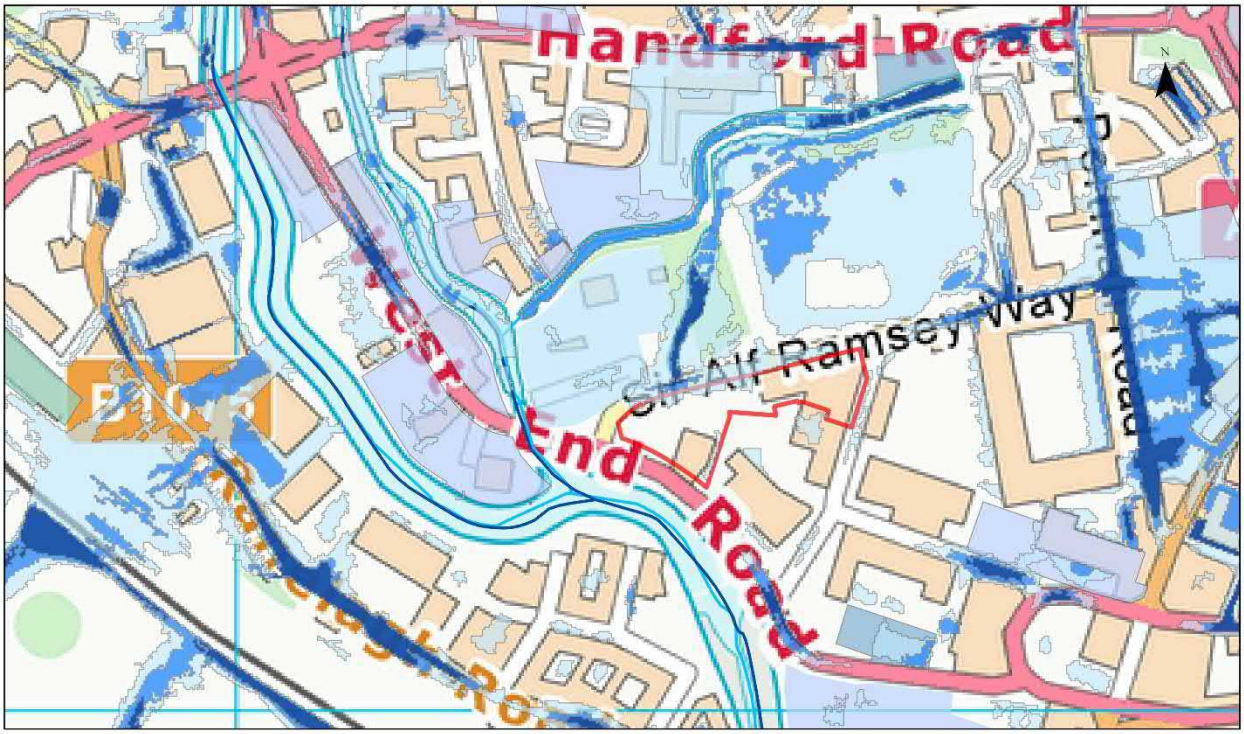
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Bus Depot, Sir Alf Ramsey Way

Surface Water Flood Risk

The RoFSW mapping indicates that the site is at low and very low risk of surface water flooding. The RoFSW mapping identifies a surface water flow path to the north of the site, which is the course of a small watercourse.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is shown to be at actual risk of fluvial flooding from the Lower Gipping in the future as a result of climate change, and at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 3.17m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the south along West End Road. Dry access may not be possible along the full length of Sir Alf Ramsey Way on the northern edge of the site where the hazard rating is shown to be Significant.

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the south of the site, along West End Road leading north. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be

Site Name: Bus Depot, Sir Alf Ramsey Way

adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The site is located within an area that is at high risk of groundwater flooding. The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Additional Information

A site-specific Flood Risk Assessment should confirm the level of flood risk posed to the site from the Alderman Canal to the north of the site, as well as the culverted section that passes beneath the site. Consent needs to be obtained from Suffolk County Council (in their capacity as the LLFA) for any works that may affect flow within this watercourse.

There may be opportunities for the culverted channel to be improved as part of the development proposals for the site to provide improvements to the level of flood risk in this area.

Site Name: Smart Street/Foundation Street

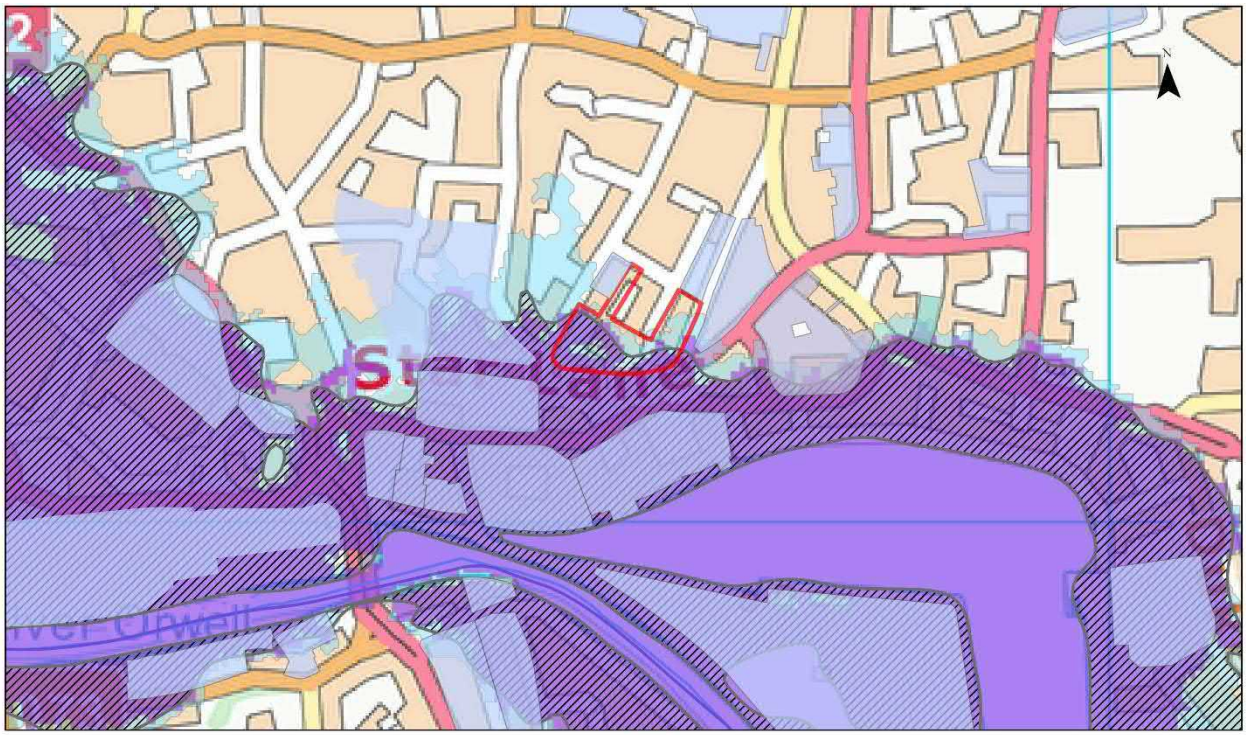
Site ID:	IP011b	**Location:**	Smart Street/Foundation Street	**Area (ha):**	0.62
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 23%	**Flood Zone 2 (0.1% AEP):** 31%	**Flood Zone 3 (1% AEP):** 47%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 52%

The tidal River Orwell is located approximately 250m to the south of the site. The southern part of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents in this location associated with surface water flooding on the highway.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

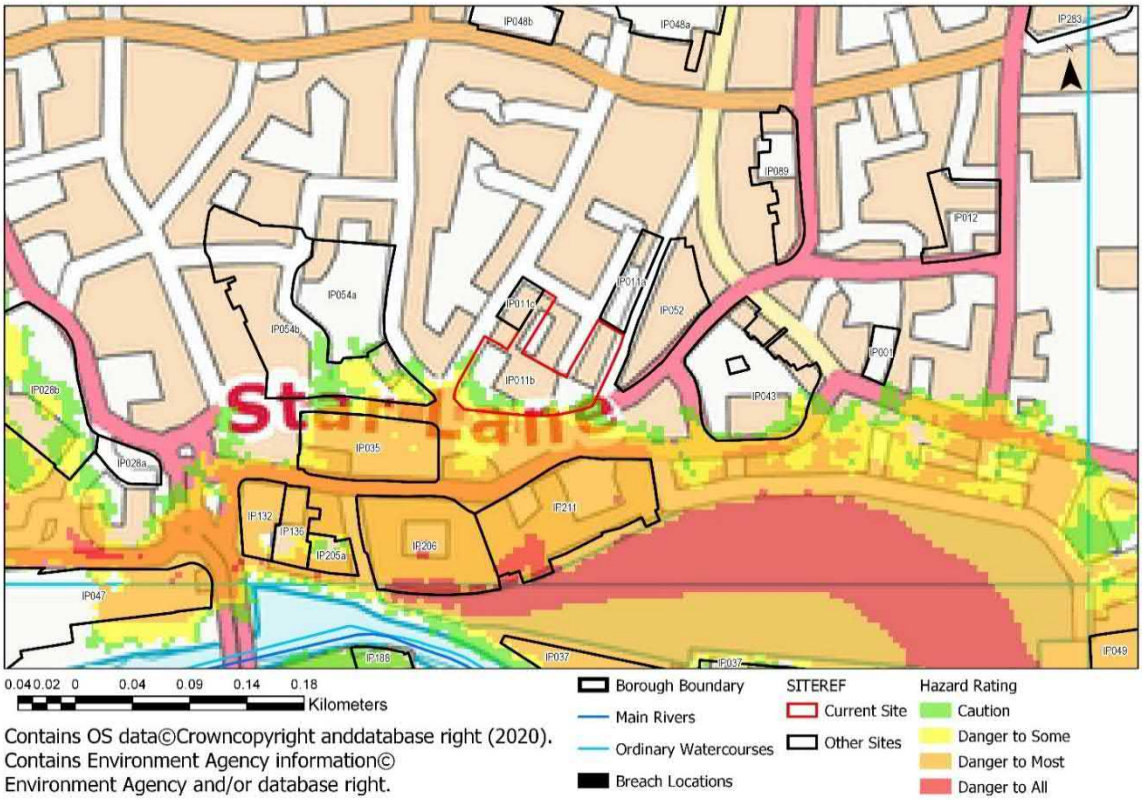
Site Name: Smart Street/Foundation Street

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, only the very southern tip of the site is affected by flood hazard where there is a small area of 'caution' and danger to some. The flood risk is highest in the southwest. The flood depth for this site ranges between 0m and <0.5m. The overall flood depth for the site is low.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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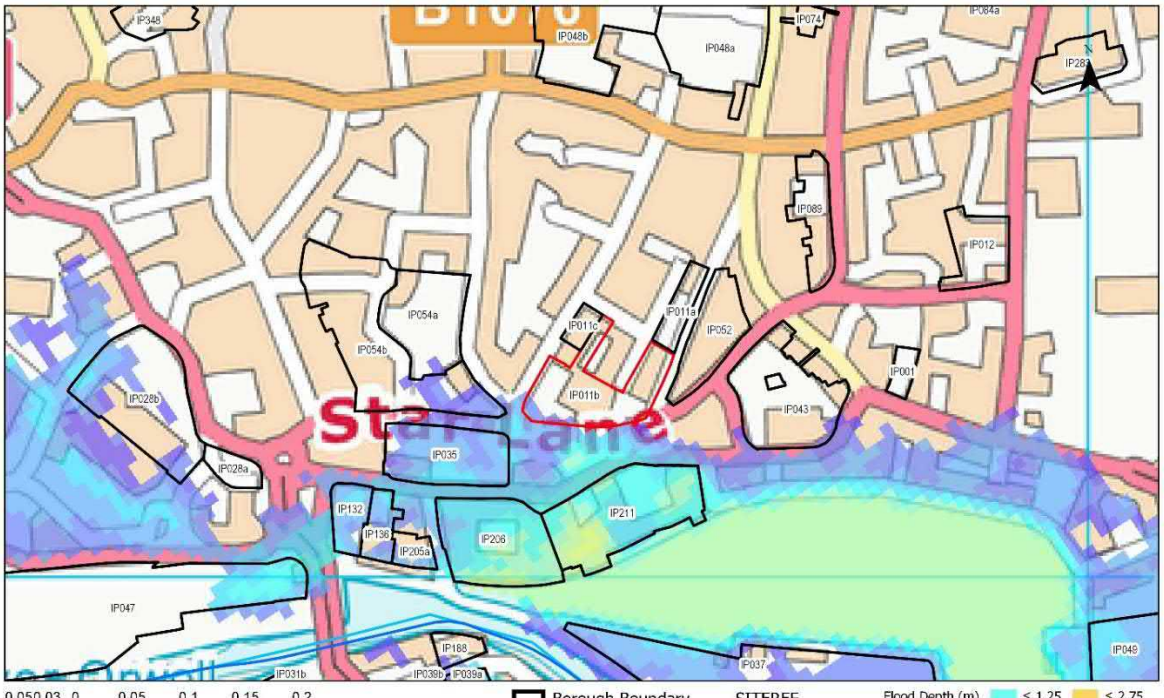
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



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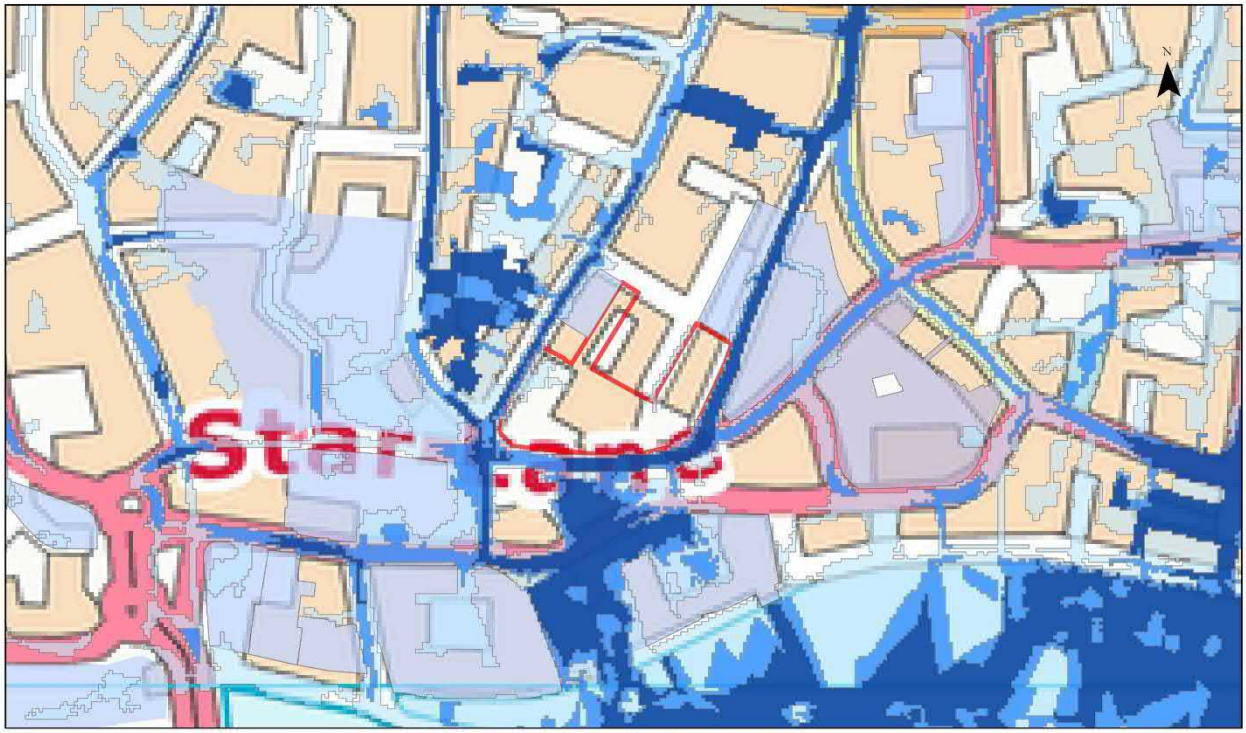
Site Name: Smart Street/Foundation Street

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 – 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable around the northern edges of the site. Star Lane is shown to be flooded and would therefore not offer a dry route. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Smart Street/Foundation Street

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation storage is the most likely SuDS for the site.

Additional Information

The most likely flood receptor is the contribution to flooding at Key Street. Reducing the flood risk at this site is possible.

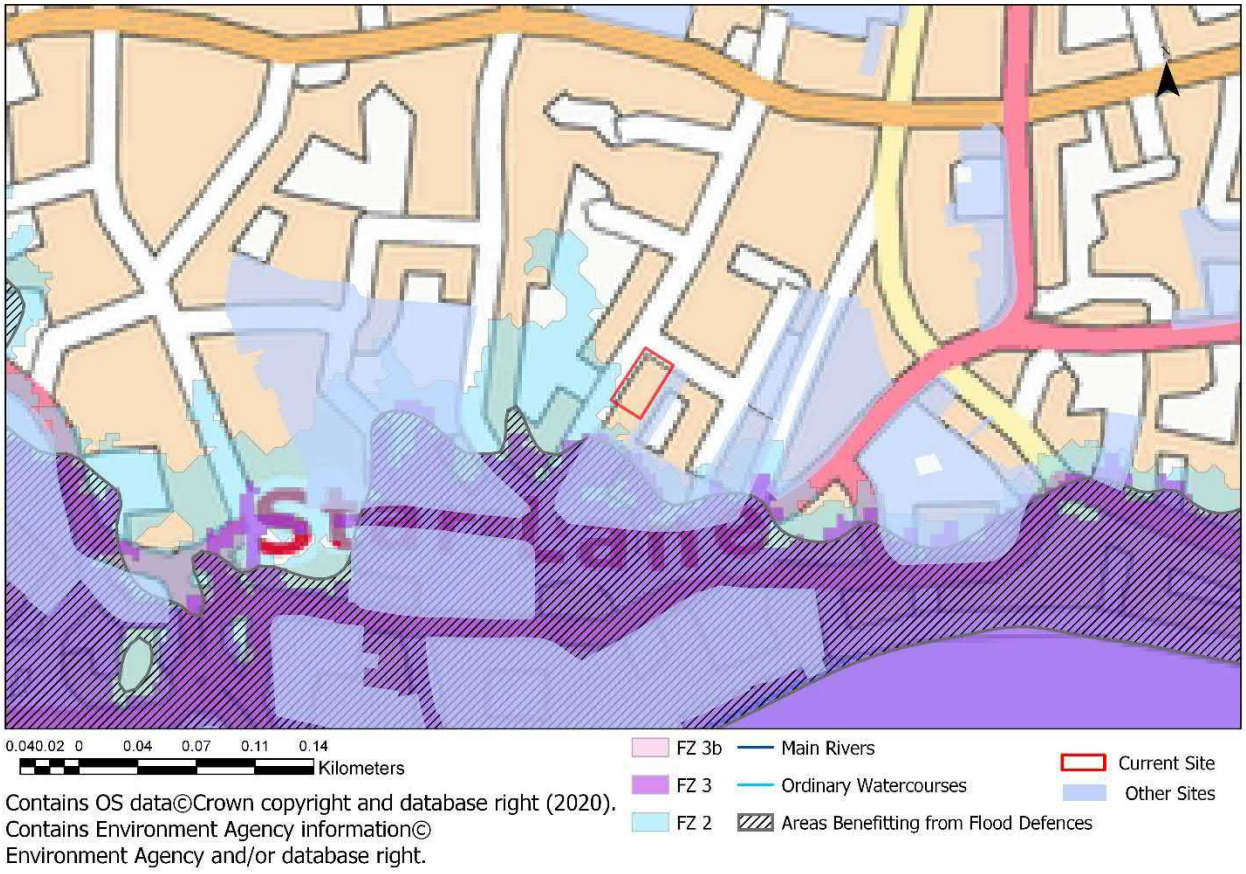
Site Name: Smart Street/Foundation Street					
Site ID:	IP011c	**Location:**	Smart Street/Foundation St	**Area (ha):**	0.08
Current Use:	Car park	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 100%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 0%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 0%

The tidal River Orwell is located approximately 250m to the south of the site. The site is identified as Flood Zone 1. Areas to the southeast and south west of the site's boundary lie within Flood Zone 2.

The Level 1 SFRA Figure 2 shows that this site was not affected by flooding from the River Gipping in either 1939 or 1947 in addition the tidal surge of 2013 did not reach the site. The council do hold a record of a flood incident to the west of the site which may correlate with an area identified to be at high risk from surface water flooding.



Fluvial Flood Risk – Lower Gipping

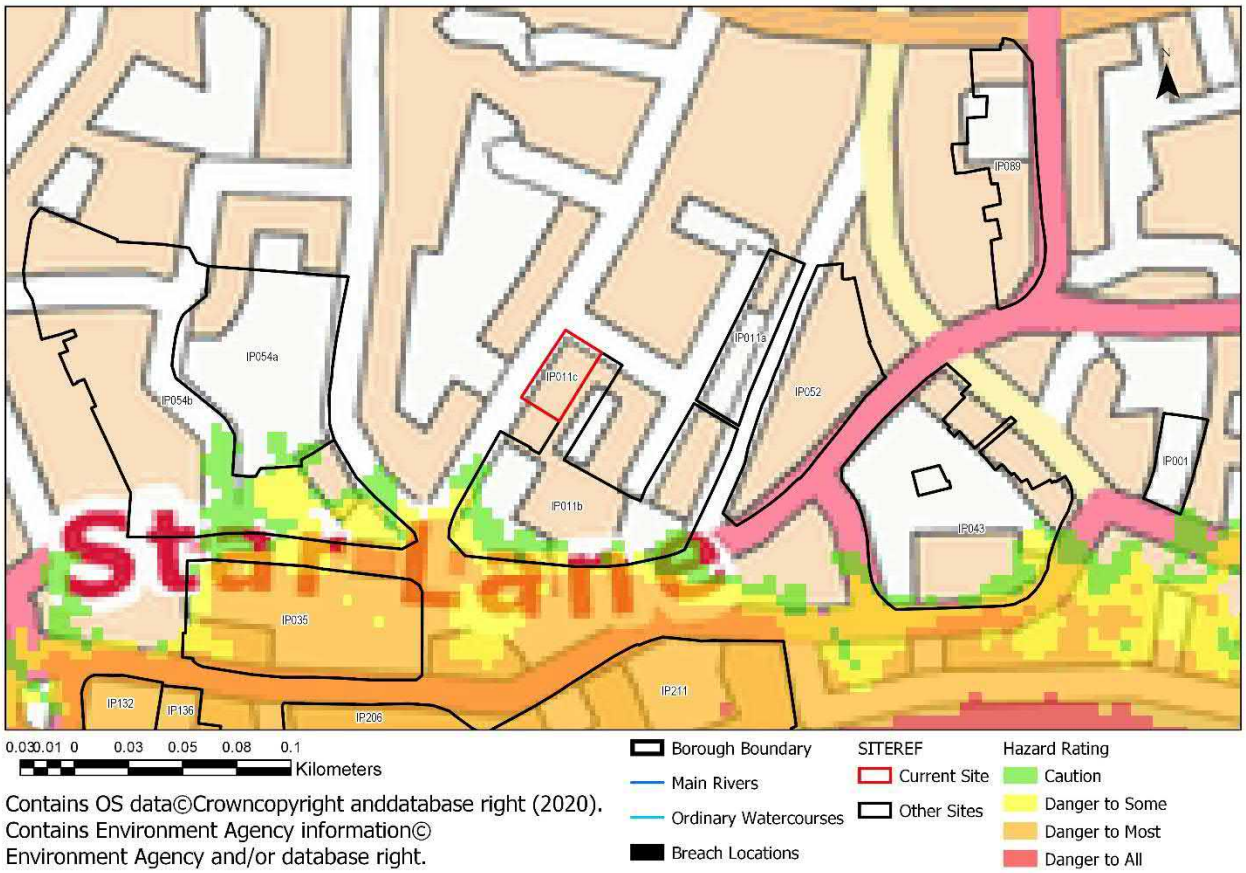
The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: Smart Street/Foundation Street

Tidal Flood Risk – River Orwell

The site is located within Flood Zone 1 and falls outside of any breach modelling inundation areas. The site is therefore not at residual risk of tidal flooding from the breach events modelled.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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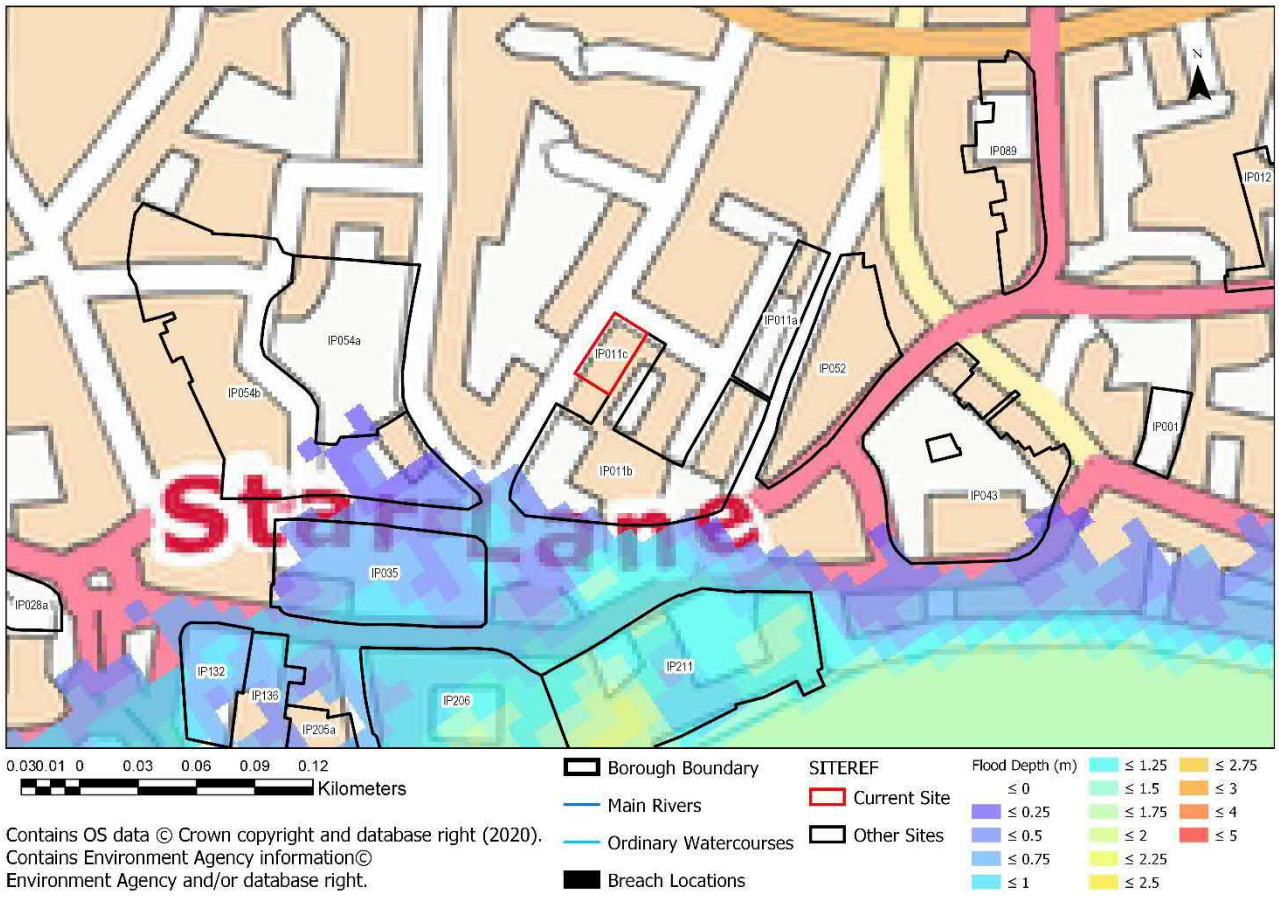
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



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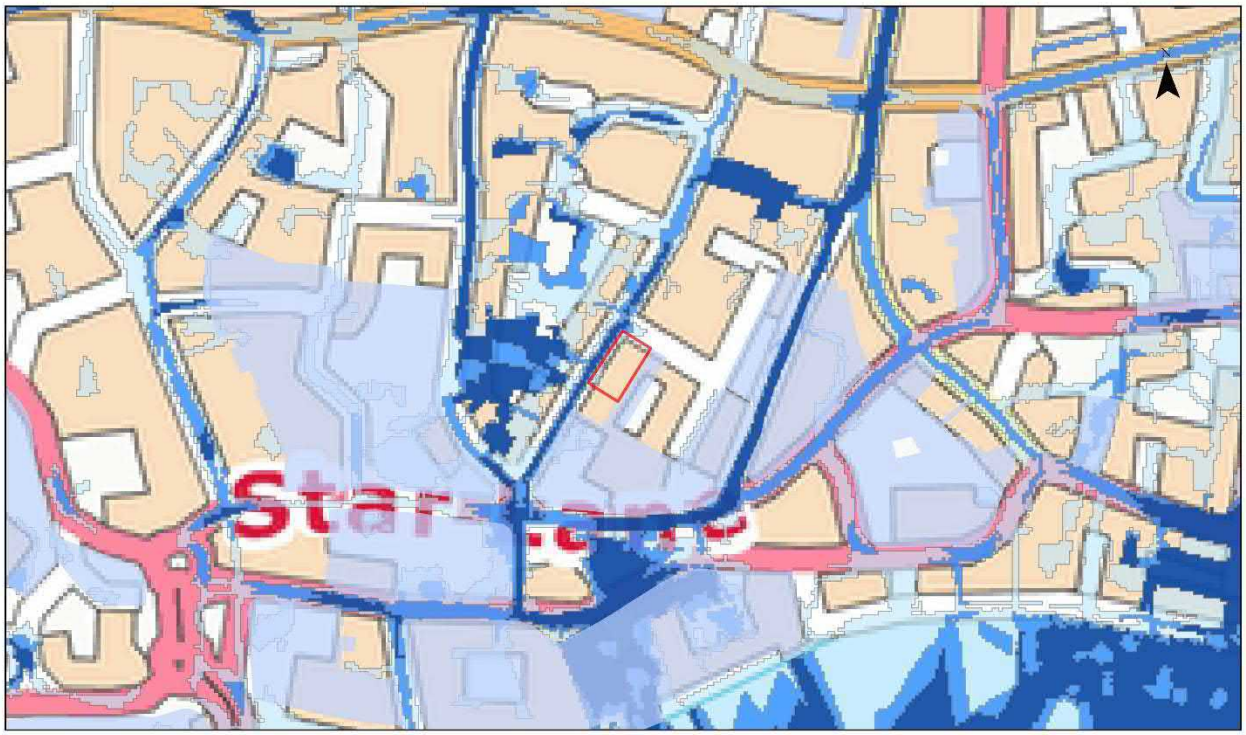
Site Name: Smart Street/Foundation Street

Surface Water Flood Risk

The RoFSW mapping shows that the site is at low risk of surface water flooding. However, the surrounding access routes are at high risk. An area of high risk located to the west of the site appears to correlate with a flood record.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.
The risk of groundwater flooding in this area and potential for the use of infiltration suds should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site is not at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to consider the current risk of surface water flooding particularly in the northern part of the site, to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

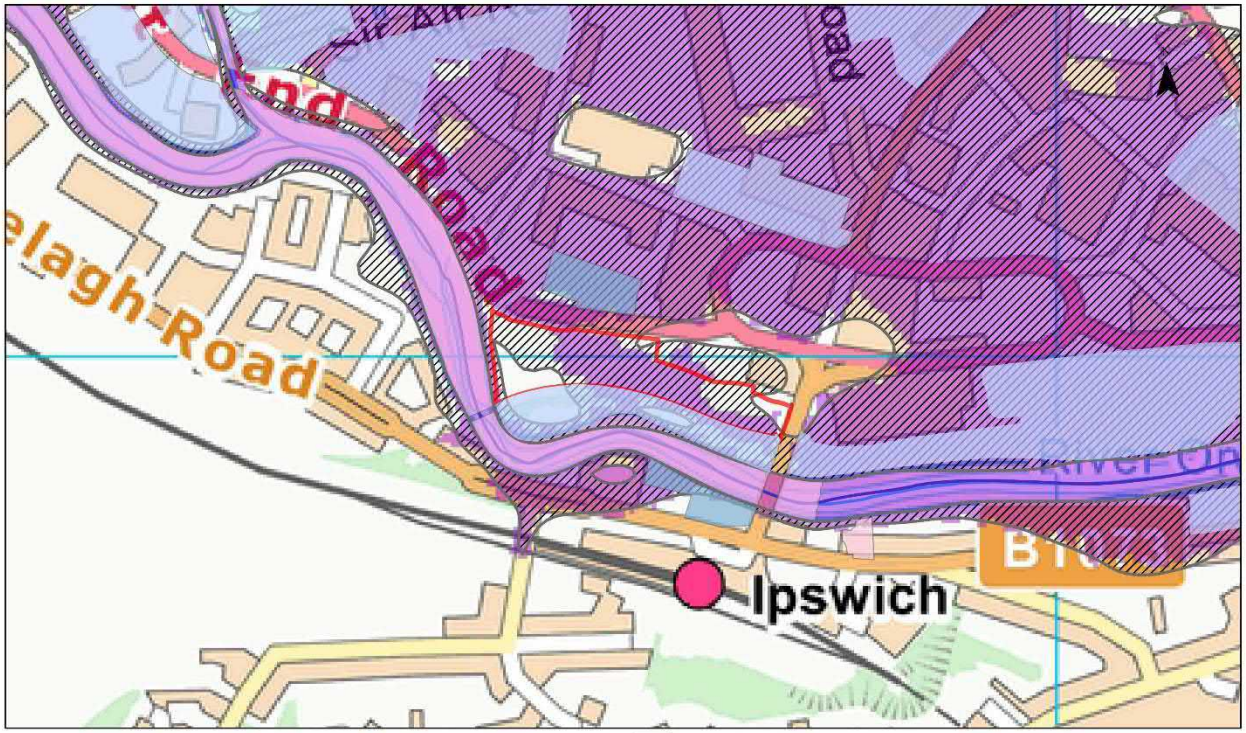
Site Name: West End Road Surface Car Park					
Site ID:	IP015	**Location:**	West End Road Surface Car Park	**Area (ha):**	1.21
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 9%	**Flood Zone 2 (0.1% AEP):** 40%	**Flood Zone 3 (1% AEP):** 51%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 84%

As it flows through Ipswich, the River Gipping becomes the River Orwell. The watercourse flows east through Ipswich approximately 40m to the south of the site. At this location the watercourse is tidally influenced. Half of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site benefits from the presence of defences; there is a flood defence wall along the edge of the River Orwell channel to the south of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences. This may require updating once the impact of the new modelling for the River Gipping is known.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of road and pavement flooding in this location.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

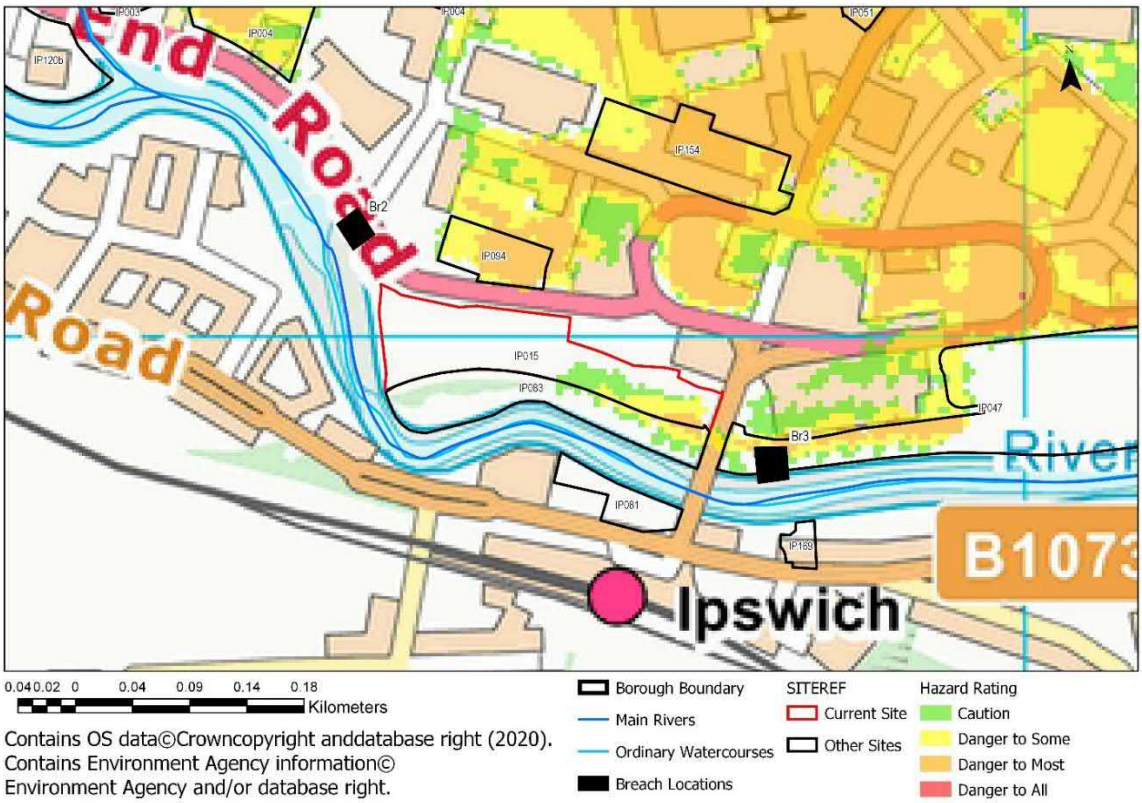
Site Name: West End Road Surface Car Park

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, parts of the site are classified as Low – Significant hazard, with depths up to 0.5m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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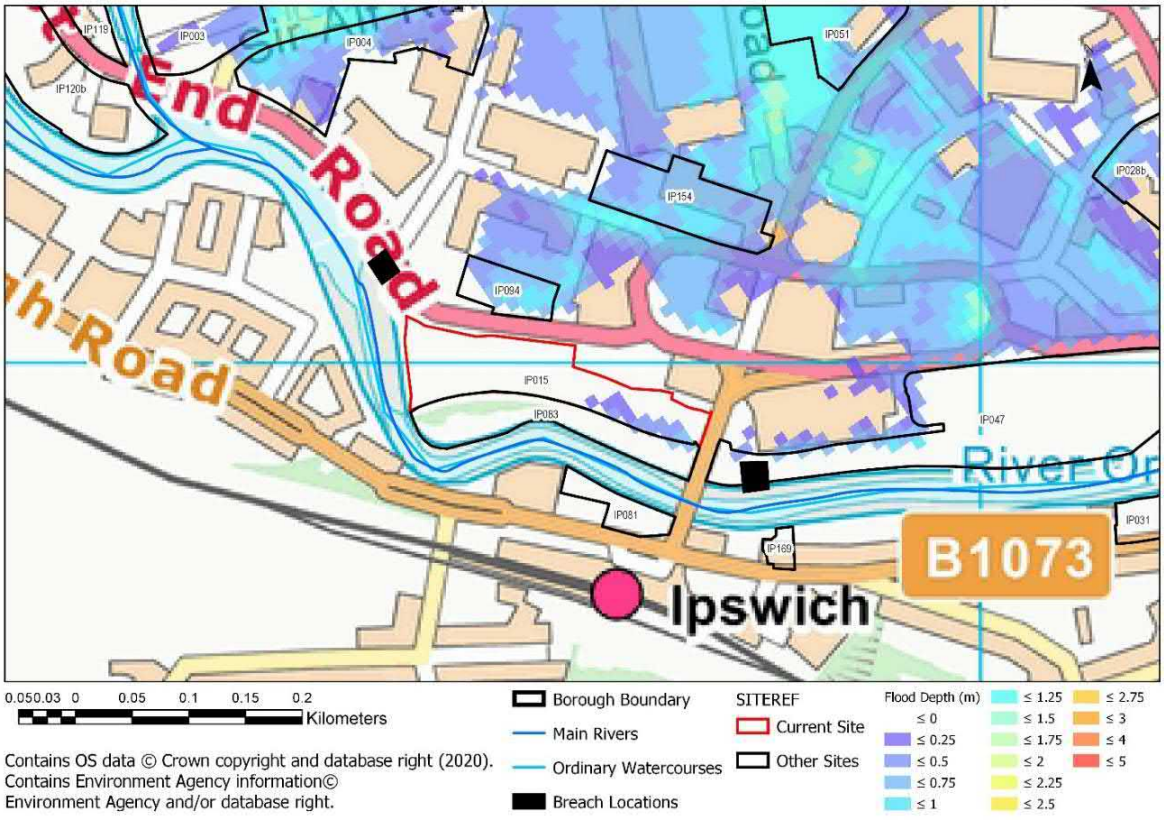
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



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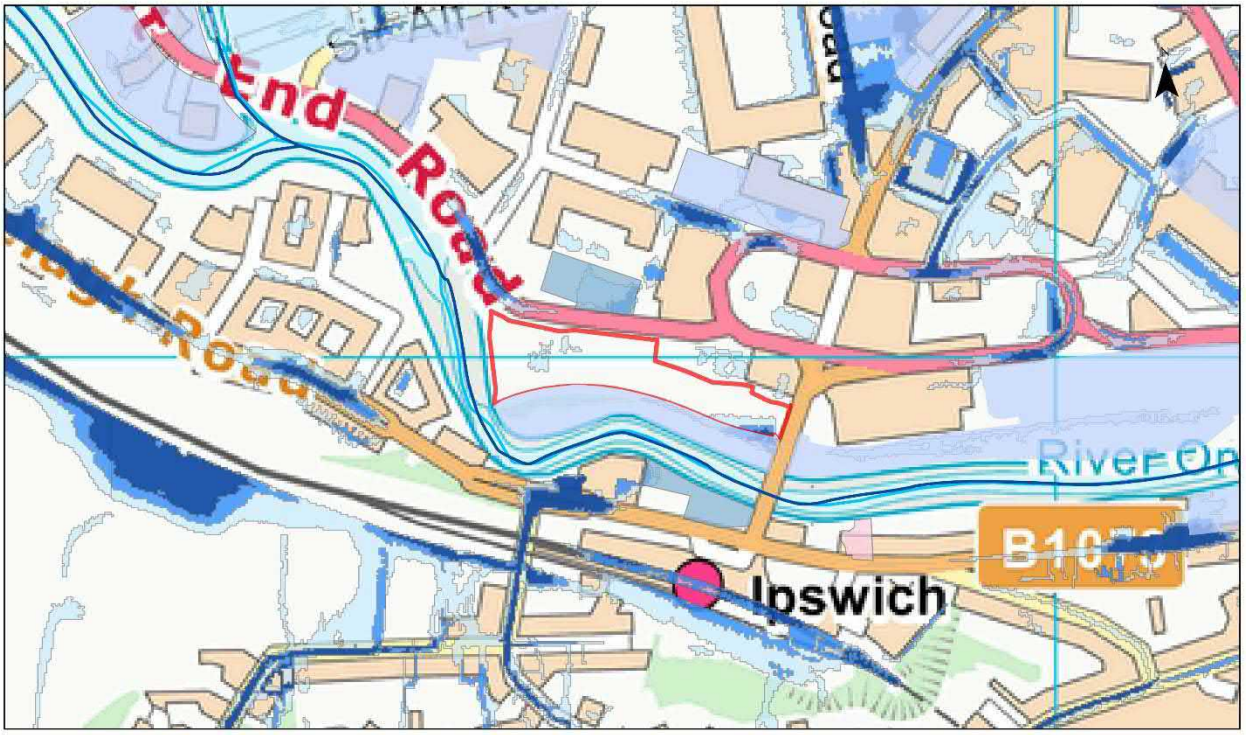
Site Name: West End Road Surface Car Park

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping indicates that the site is at low risk of surface water flooding. The site is slightly elevated compared to the surrounding land, and there is just one area, in the east of the site, where the mapping suggests that surface water may pond, adjacent to Princes Street. However, council records show that the existing car park floods due to a lack of drainage and poor ground conditions. Flood water is currently pumped at Portman Road.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 4) shows that the site is located across two 1km squares of which <25% and between 50-75% are susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from reservoir flooding.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the west along West End Road. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: West End Road Surface Car Park

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment J which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Set-back Distance

All development should be set back from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

The underling geology in this location is Lambeth Group which is permeable and may be suitable for infiltration techniques. However, the site is also located in an area which could be at risk of groundwater emergence (SFRA Appendix A Figure 13), therefore, the risk of groundwater flooding in this area should be further investigated during a site investigation survey to inform SuDS selection. It is considered that attenuation may be the most viable SuDS type for the site.

The existing car park floods due to a lack of drainage and poor ground conditions. Flood water is pumped at Portman Road. The surface water drainage strategy should consider drainage to the River Orwell.

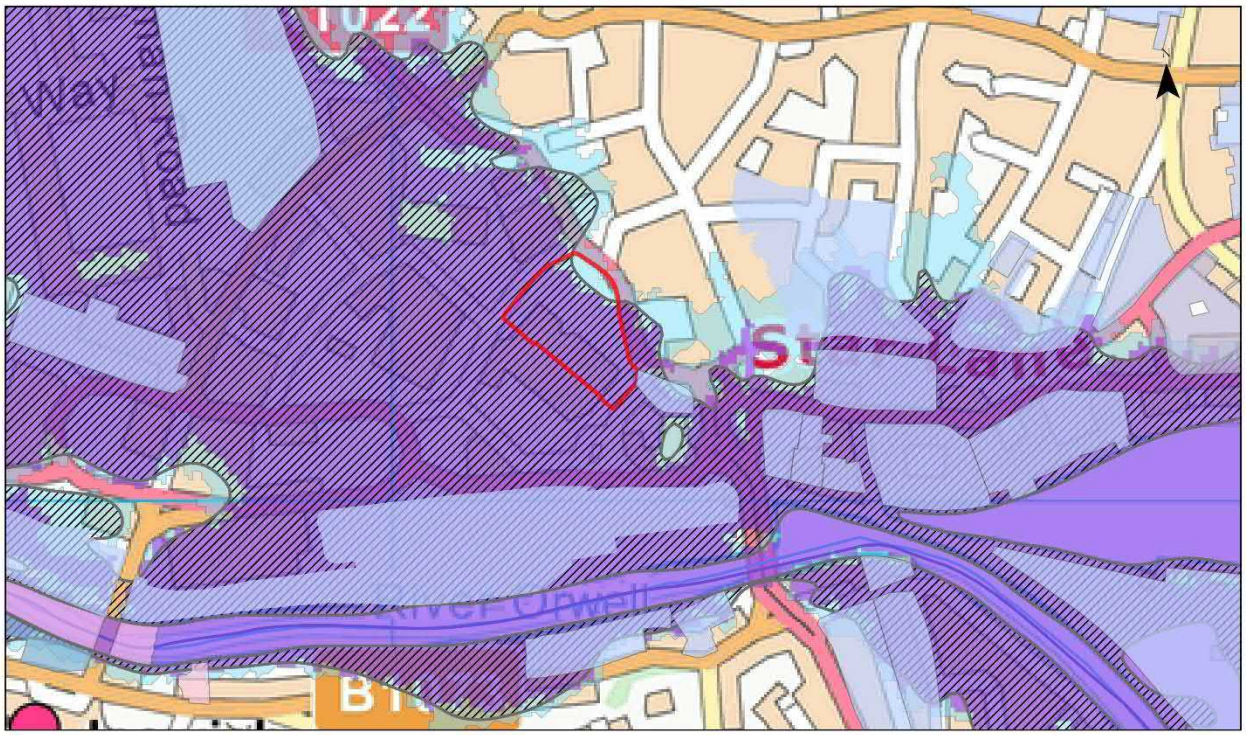
Site Name: Land west of Greyfriars Road					
Site ID:	IP028b	**Location:**	Jewsons, Greyfriars Road	**Area (ha):**	0.9
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 1%	**Flood Zone 2 (0.1% AEP):** 13%	**Flood Zone 3 (1% AEP):** 86%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 91%

As it flows through Ipswich, the River Gipping becomes the River Orwell. The river flows east approximately 300m to the south of the site. At this location the River Orwell is tidally influenced. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is an embankment along the edge of the channel to the south of the site and river walls upstream and downstream of the embankment, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC hold records of a number of flood incidents close to this site, associated with blocked and overflowing drains at the road junction with Star Lane.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

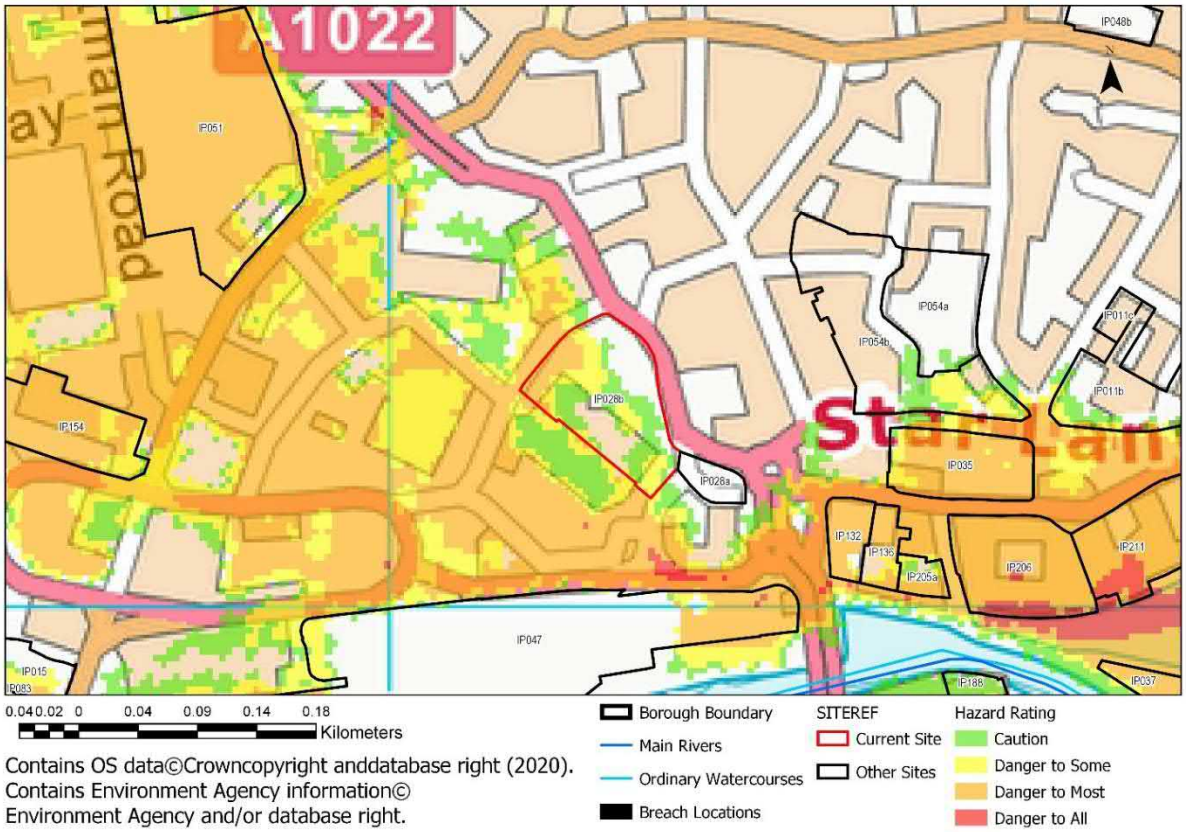
Site Name: Land west of Greyfriars Road

Tidal Flood Risk – River Orwell

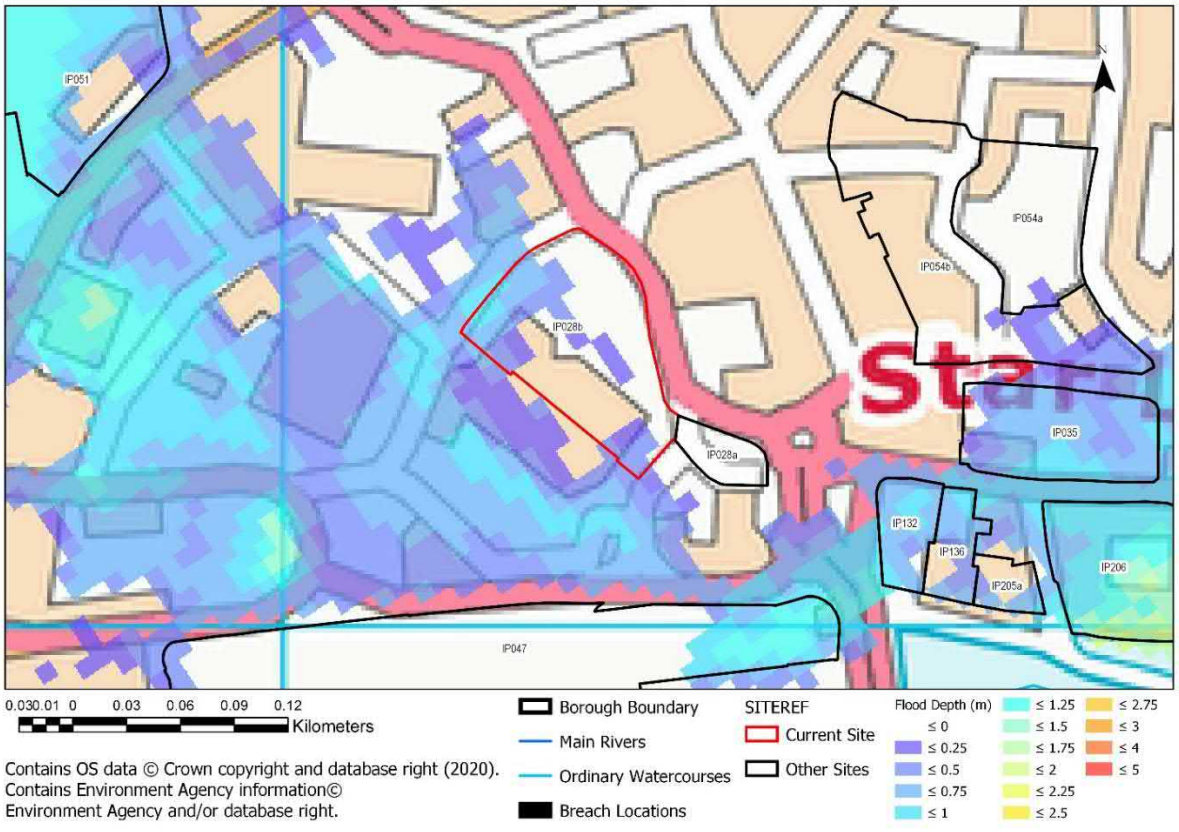
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, parts of the site are classified as Low – Significant hazard, with depths up to 1.0m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



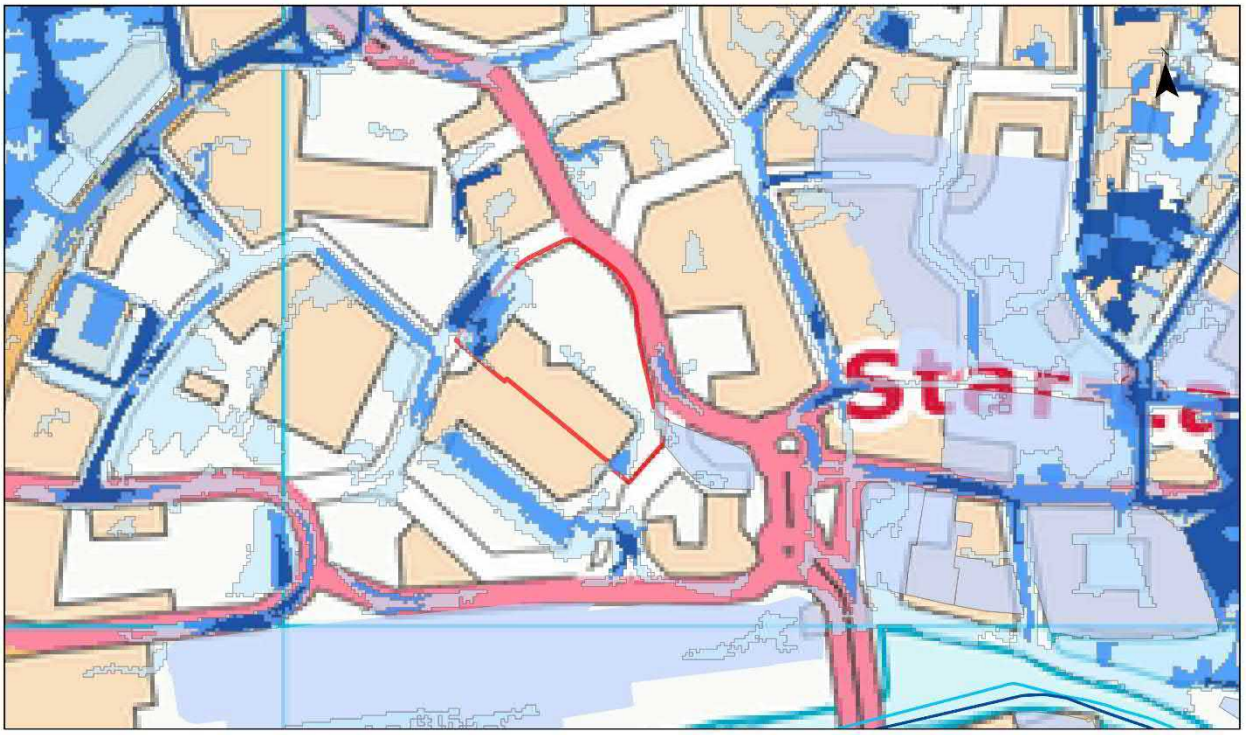
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Land west of Greyfriars Road

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)
The RoFSW mapping indicates that the majority of the site is at low risk of surface water flooding. However, an area to the north west of the site may be susceptible to surface water ponding, along Wolsey Street and Cecelia Street.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 4) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry or low hazard access/egress for the site may be achievable to the north along Greyfriars Road towards the A1022. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the

Site Name: Land west of Greyfriars Road

residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment J which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Additional Information

Ipswich BC has noted a potential risk to the site from combined sewers. Potential flood pathways and opportunities to reduce peak flows to the local sewer network though the use of SuDS should be included in the site design.

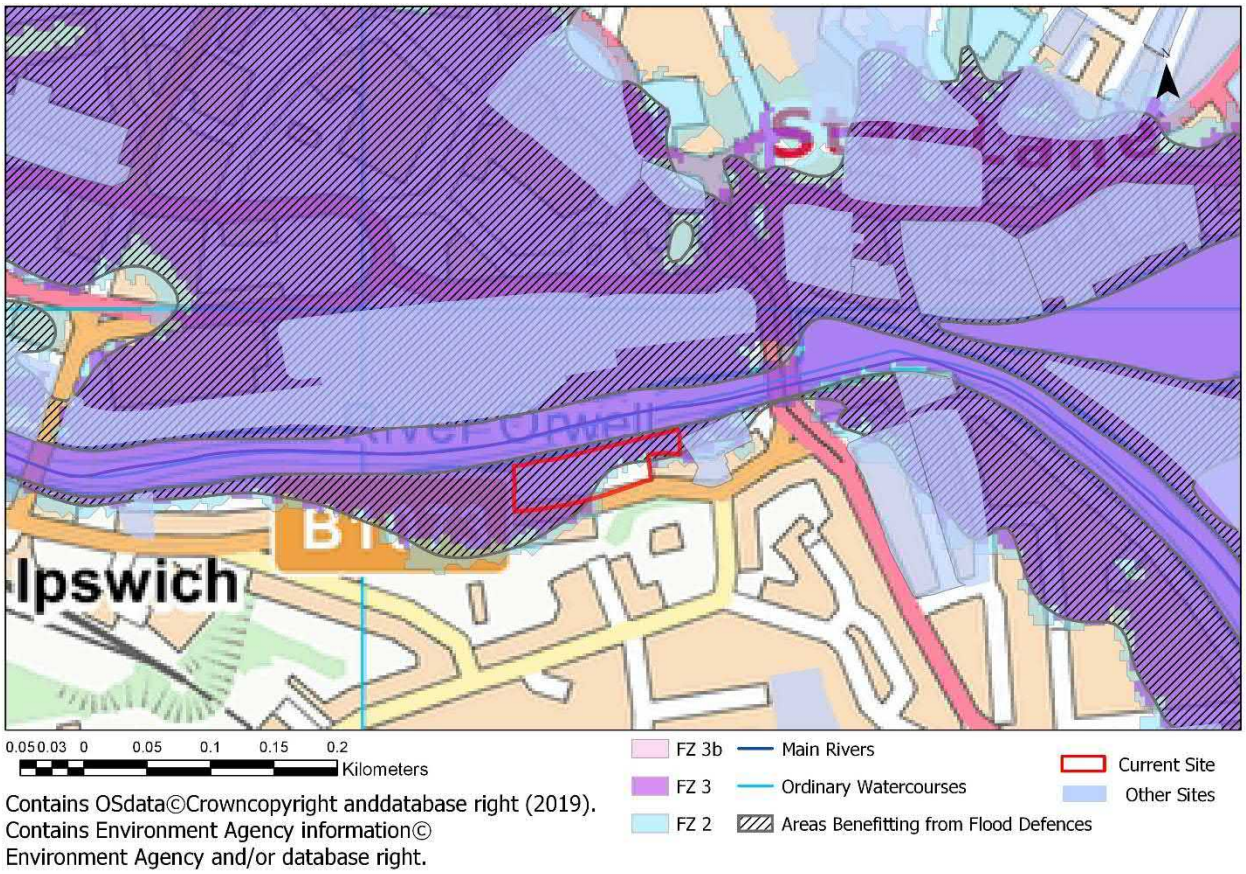
Site Name: 103-115 Burrell Road					
Site ID:	IP031	**Location:**	103-115 Burrell Road	**Area (ha):**	0.43
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 12%	**Flood Zone 2 (0.1% AEP):** 7%	**Flood Zone 3 (1% AEP):** 81%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 83%

The tidal River Orwell flows east along the northern edge of the site. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the River Orwell adjacent to the site, and there is a tidal barrier further downstream on the River Orwell.

On the south side of the River Orwell, where the site is located, there has historically not been any record of flooding. Ipswich BC hold some records of flood incidents to the east of the site where Burrell Road meets Bridge Street. The historical records indicate these incidents are related to the surface water drainage infrastructure being overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: 103-115 Burrell Road

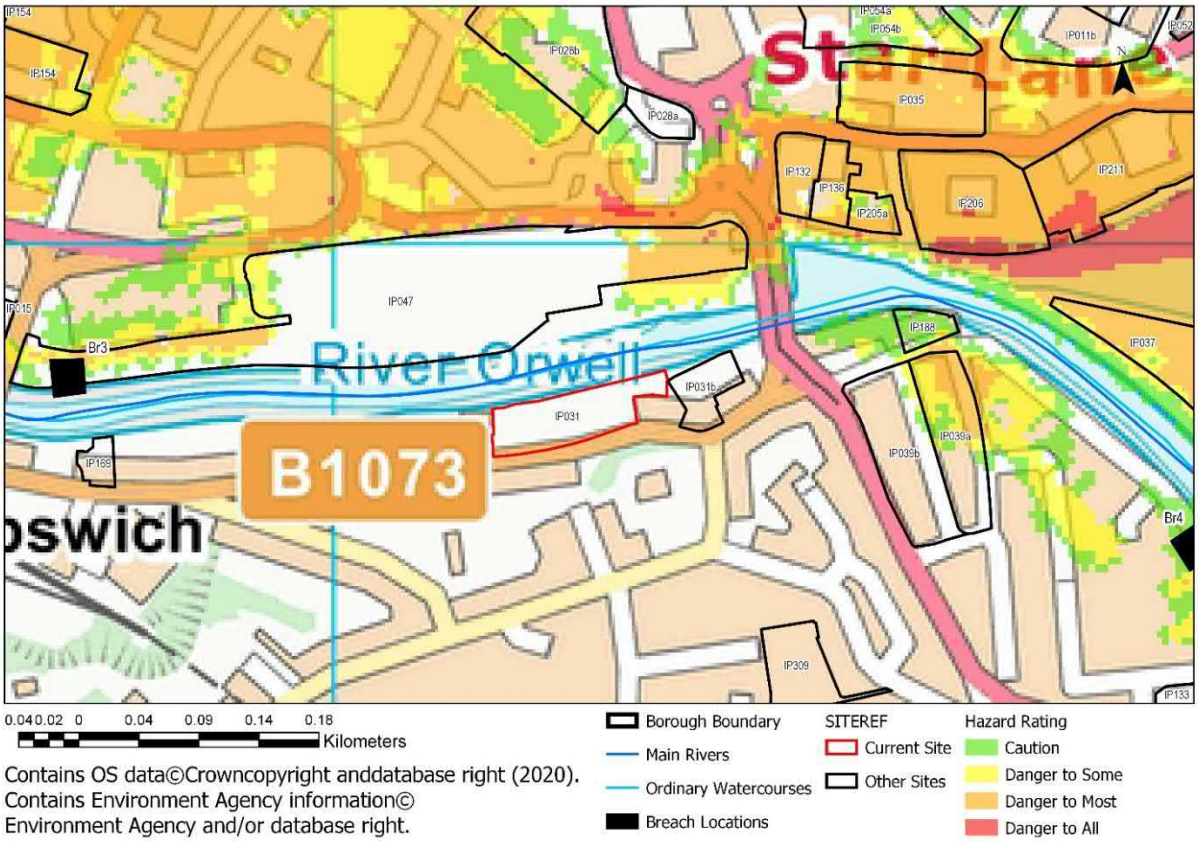
Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

In this modelled scenario, flood water is not shown to enter the site and there is no flood hazard shown on site.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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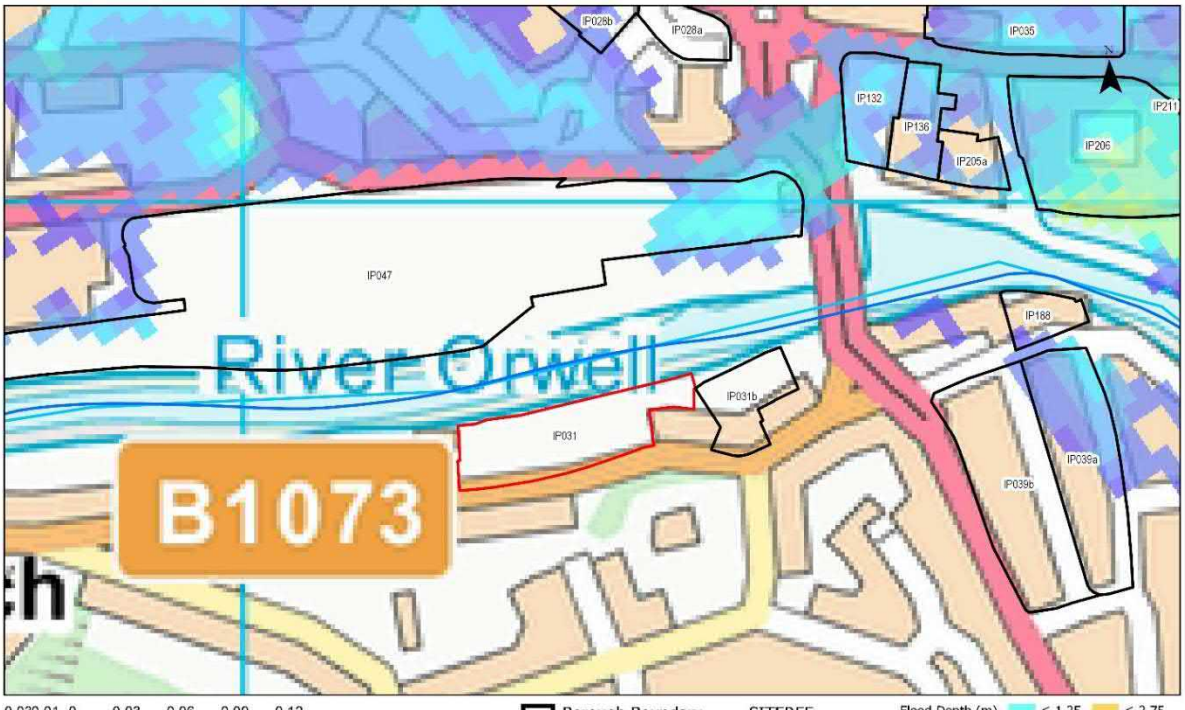
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



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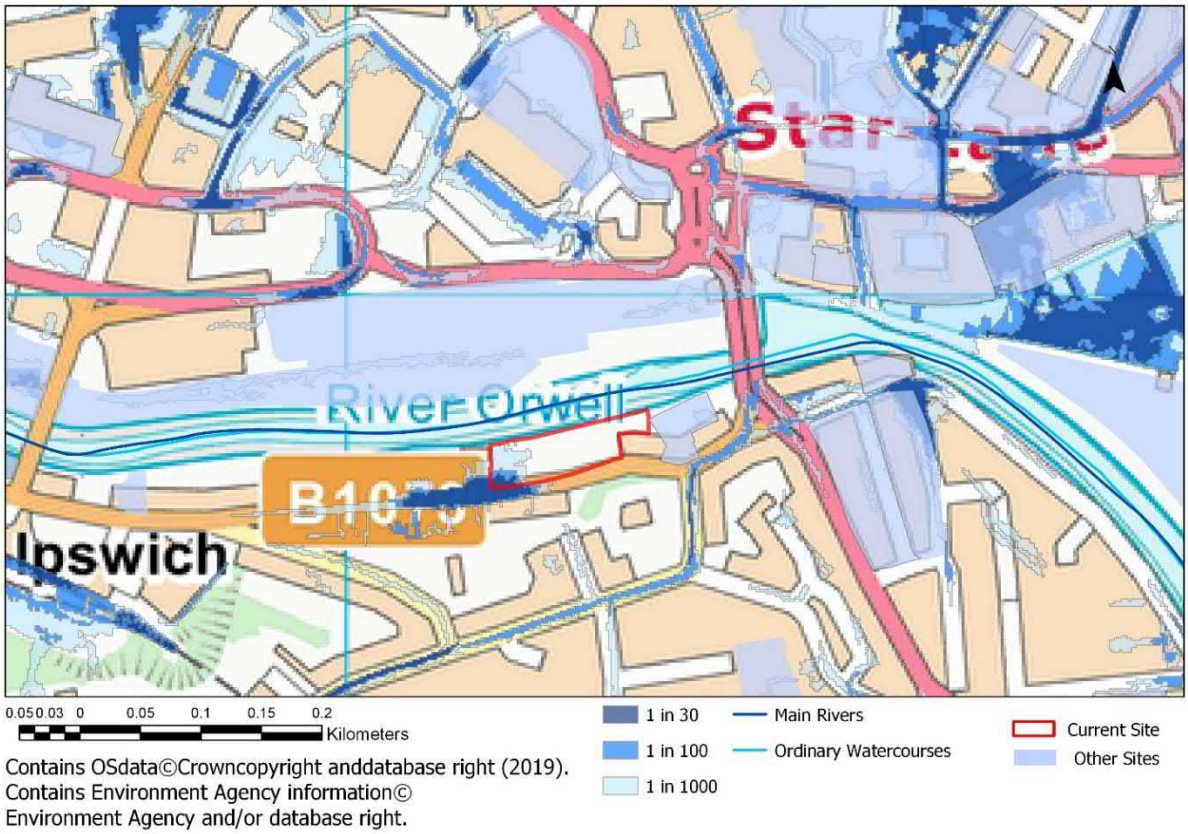
Site Name: 103-115 Burrell Road

Surface Water Flood Risk

The RoFSW mapping identifies that the south western corner of the site and Burrell Road may be susceptible to surface water ponding. It is assumed that surface water drainage outfalls to the River Orwell in this location, and therefore surface water drainage may also be further hampered during high tide conditions.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.
The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site may be at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether tidal or fluvial).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The most likely SuDS to be used on this site is attenuation.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment D is 4m AOD (Figure 7-3). At this location, there is no relevant breach modelled and 4mAOD is applied as the maximum water level in the Orwell upstream of the barrier before flooding into compartment H occurs. The IFDMS is designed to prevent this in a 300 year return period event.

Access / Egress

In the event of a failure of the tidal flood defences close to the site, dry or low hazard access/egress for the site may not be achievable. However, depending on the time and location of the failure of the defences, there may not be sufficient

Site Name: 103-115 Burrell Road

time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Site Name: 22 Stoke Street, IP2 8BX

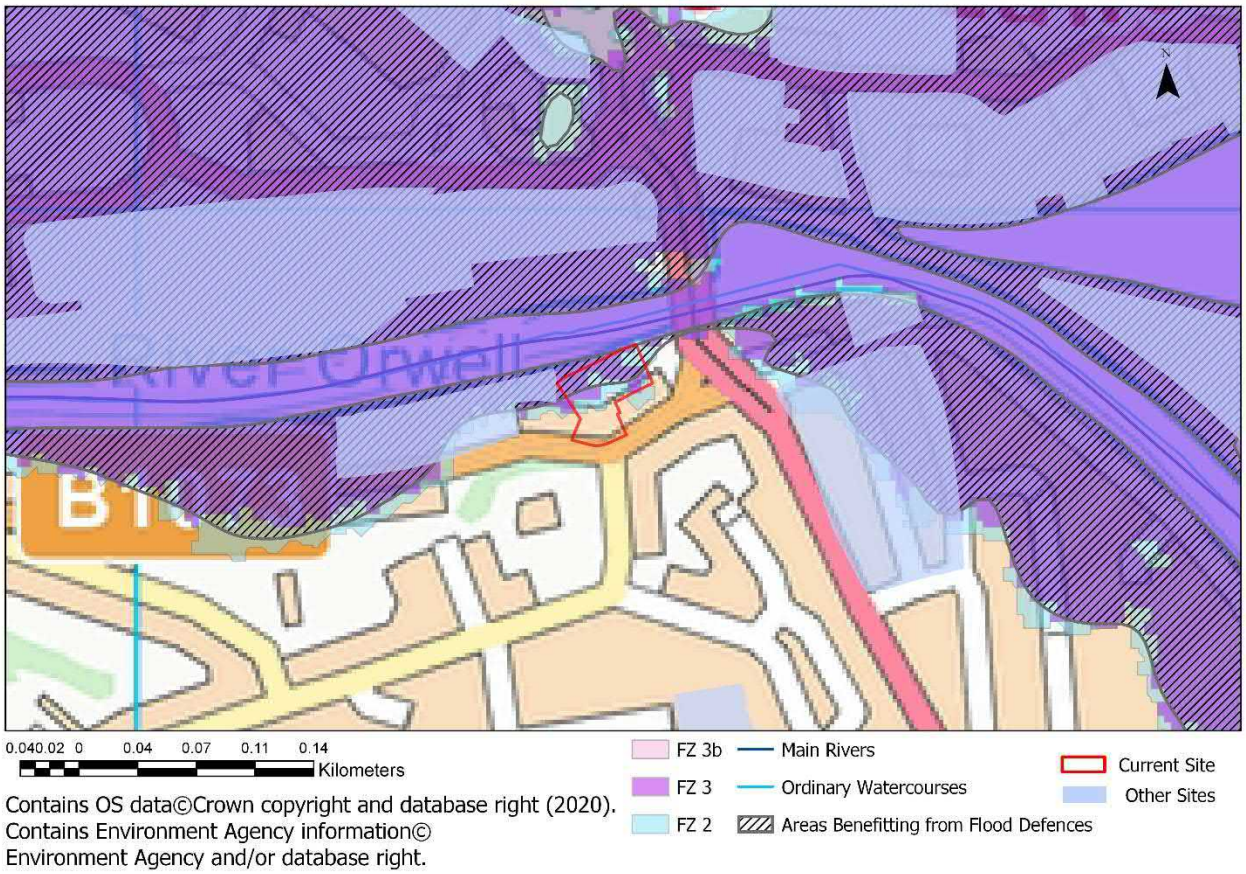
Site ID:	IP031b	**Location:**	22 Stoke Street, IP2 8BX	**Area (ha):**	0.18
Current Use:	Unknown	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 34%	**Flood Zone 2 (0.1% AEP):** 26%	**Flood Zone 3 (1% AEP):** 40%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 40%

The tidal River Orwell is located approximately 10m to the north of the site. The northern part of the site is located in Flood Zones 2 and 3. The south of the site is within Flood Zone 1. The north of the site benefits from flood defences.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC also hold records of flooding to the east of the site associated with the surface water network being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

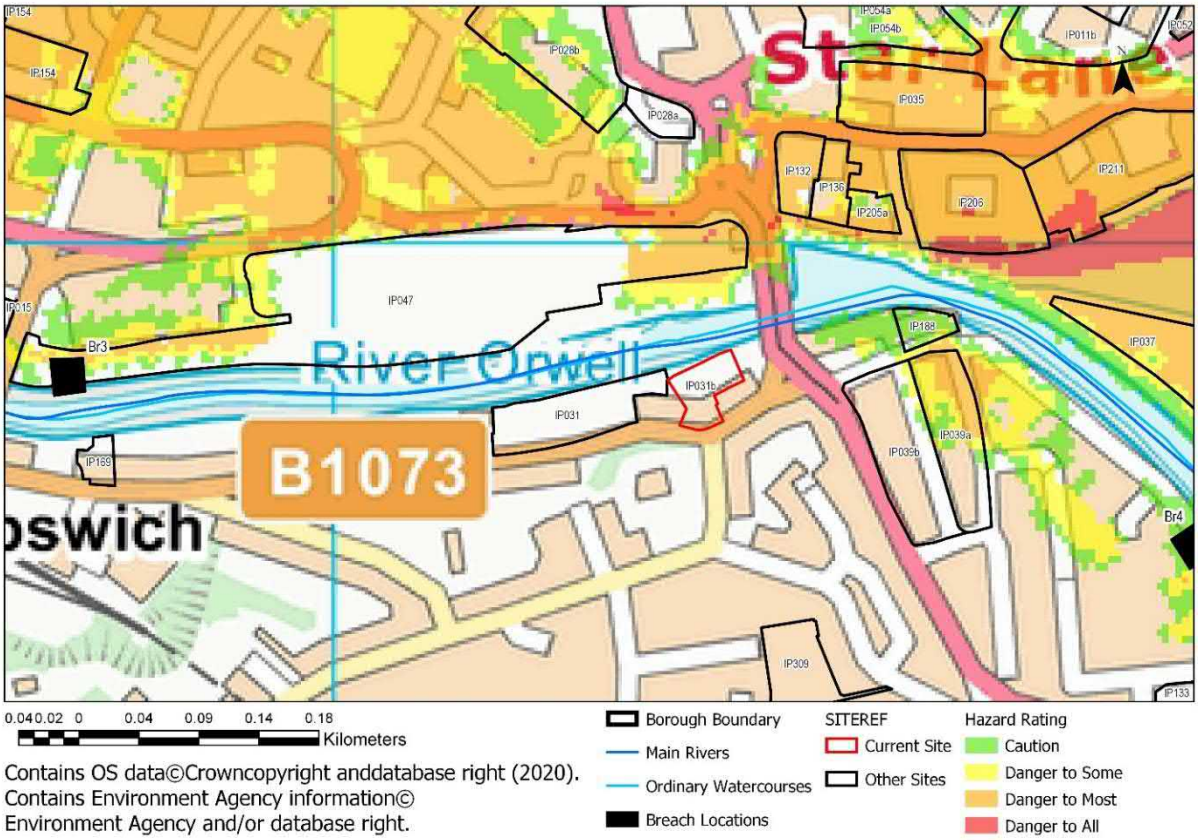
Site Name: 22 Stoke Street, IP2 8BX

Tidal Flood Risk – River Orwell

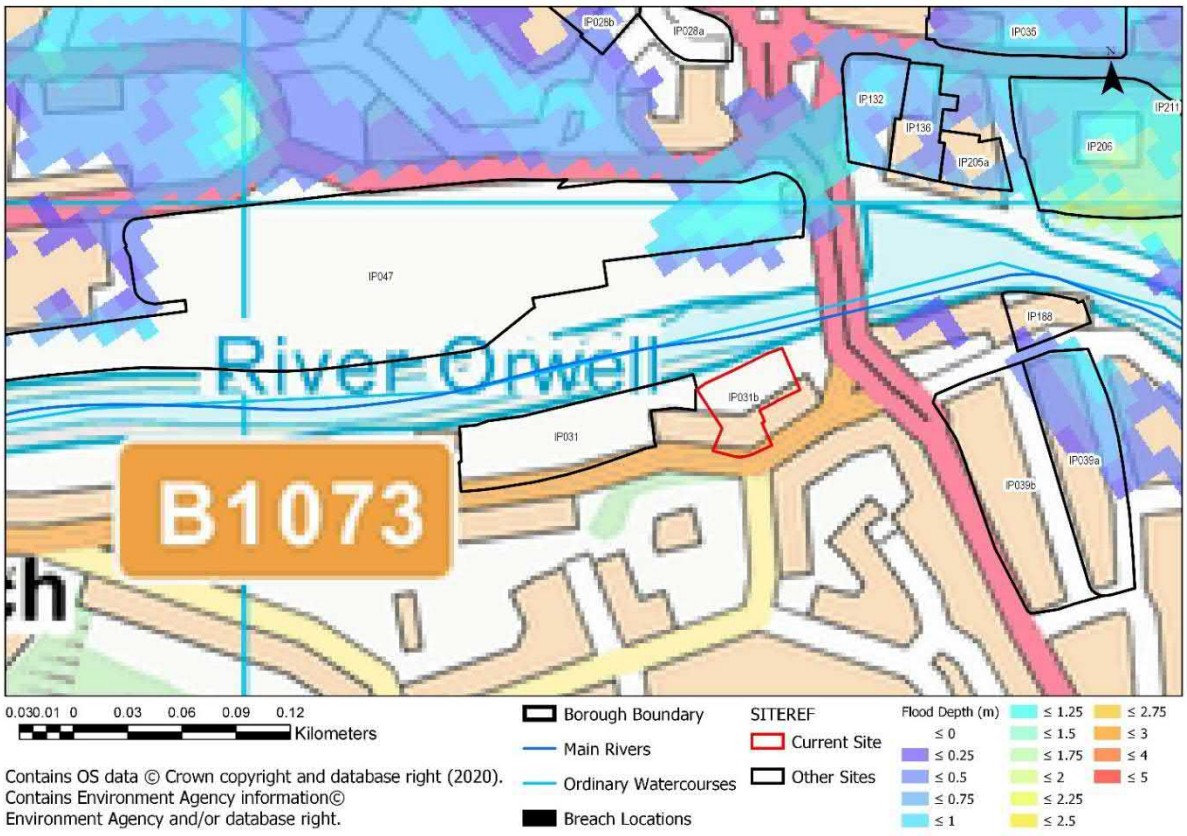
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, the site is not shown to flood.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: 22 Stoke Street, IP2 8BX

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that there are areas in the surrounding roads that are susceptible to overland flow and ponding. The site itself is has a low risk of surface water flooding.

Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.
The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site may be at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether tidal or fluvial).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The most likely SuDS to be used on this site is attenuation.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment D is 4m AOD (Figure 7-3). At this location, there is no relevant breach modelled and 4mAOD is applied as the maximum water level in the Orwell upstream of the barrier before flooding into compartment H occurs. The IFDMS is designed to prevent this in a 300 year return period event.

Access / Egress

In the event of a failure of the tidal flood defences close to the site, dry or low hazard access/egress for the site may not be achievable. However, depending on the time and location of the failure of the defences, there may not be sufficient

Site Name: 22 Stoke Street, IP2 8BX

time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

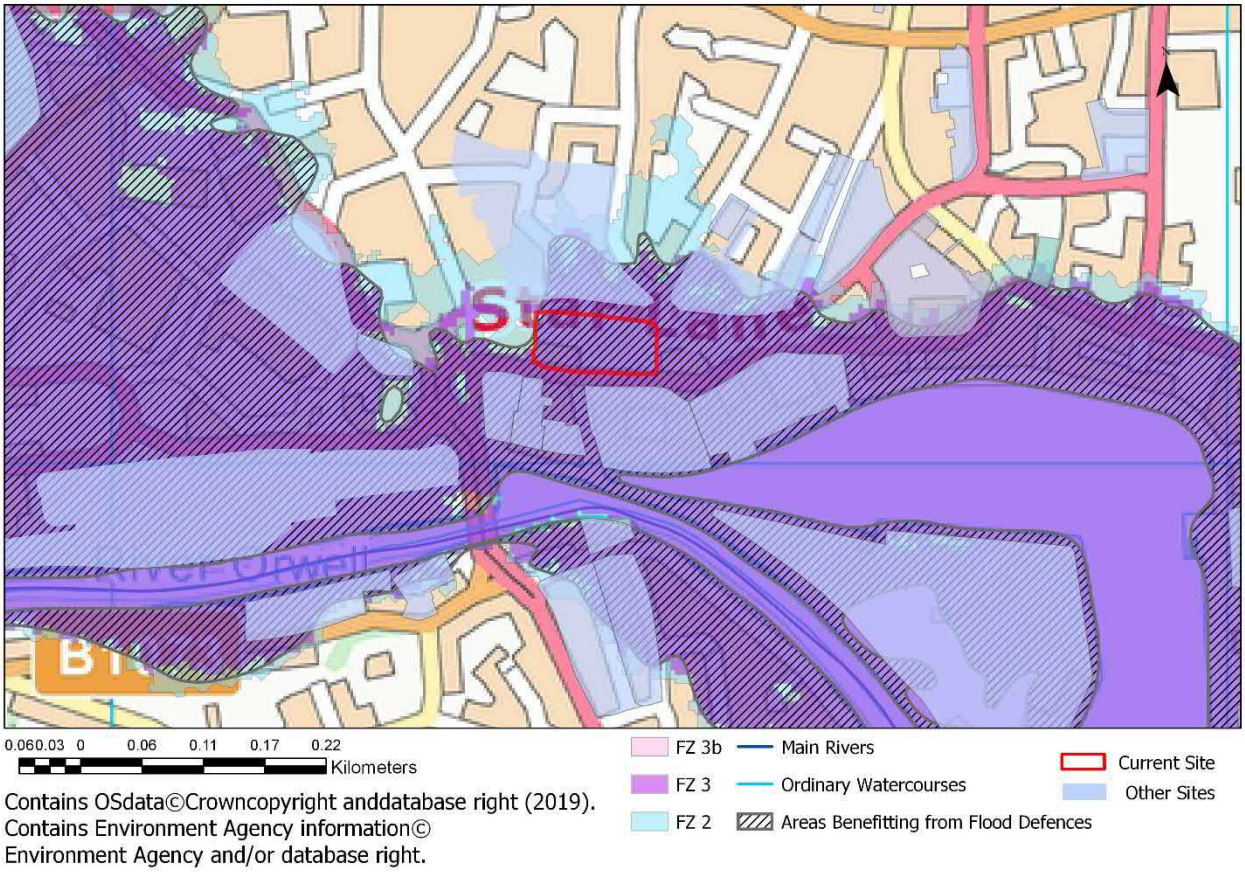
Site Name: Key Street/Star Lane/Burtons Site					
Site ID:	IP035	**Location:**	Key Street/Star Lane/Burtons Site	**Area (ha):**	0.54
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 1%	**Flood Zone 3 (1% AEP):** 99%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 100%

The tidal River Orwell is located approximately 200m to the south of the site. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents in this location associated with the surface water drainage systems being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

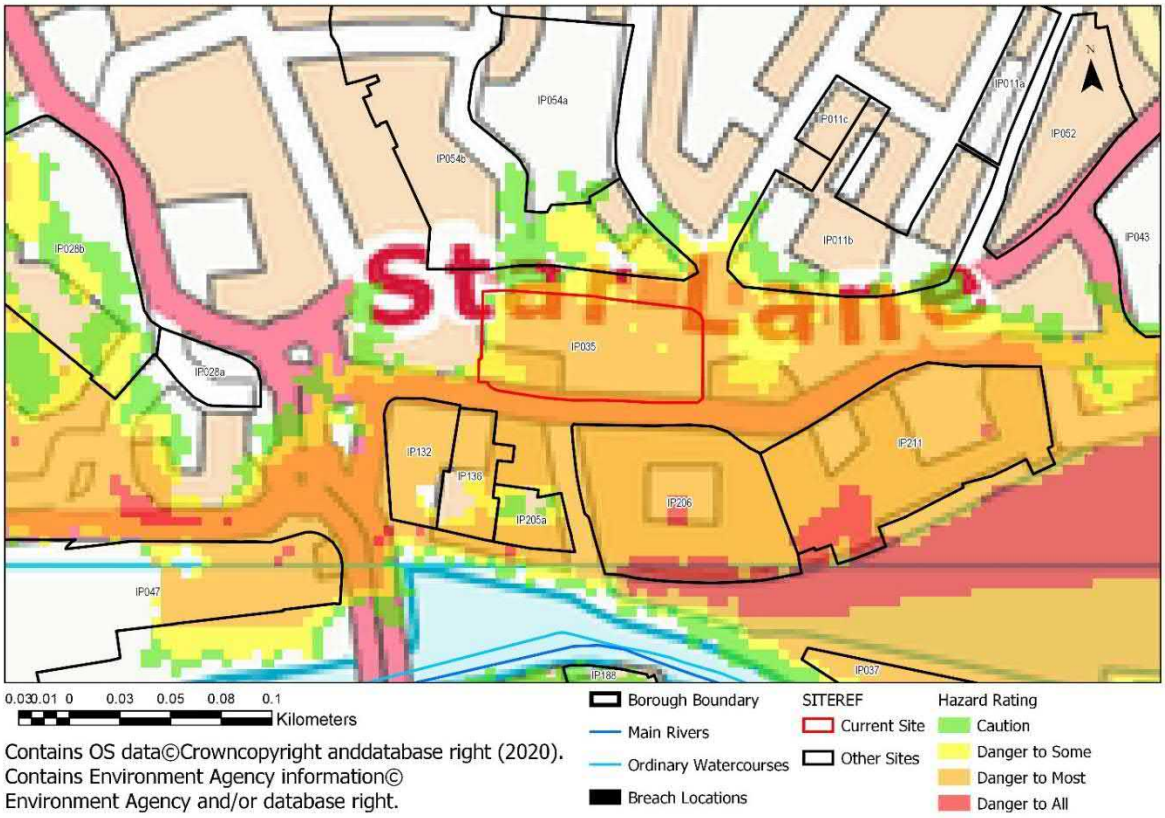
Site Name: Key Street/Star Lane/Burtons Site

Tidal Flood Risk – River Orwell

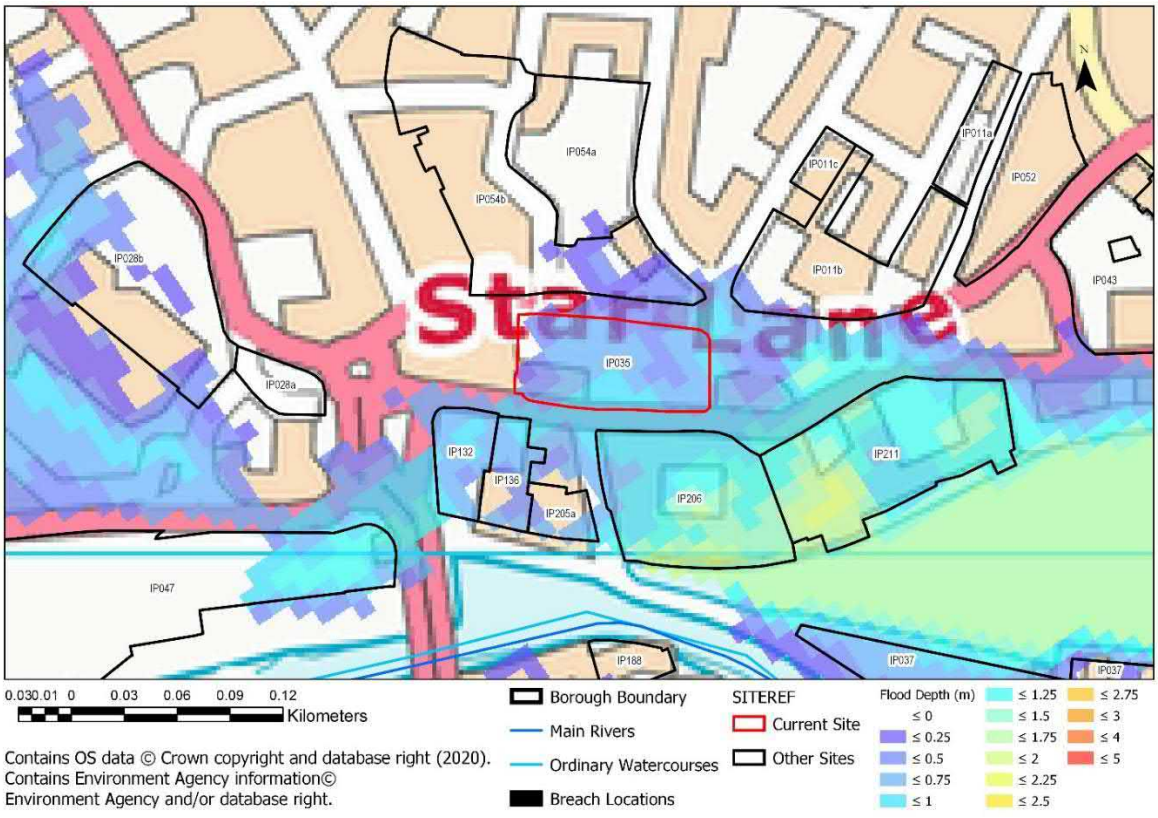
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, tidal flood water inundates the site to depths of up to 1.25m resulting in a hazard rating of Significant (Danger to Most). The main access route along Star Lane is also affected.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



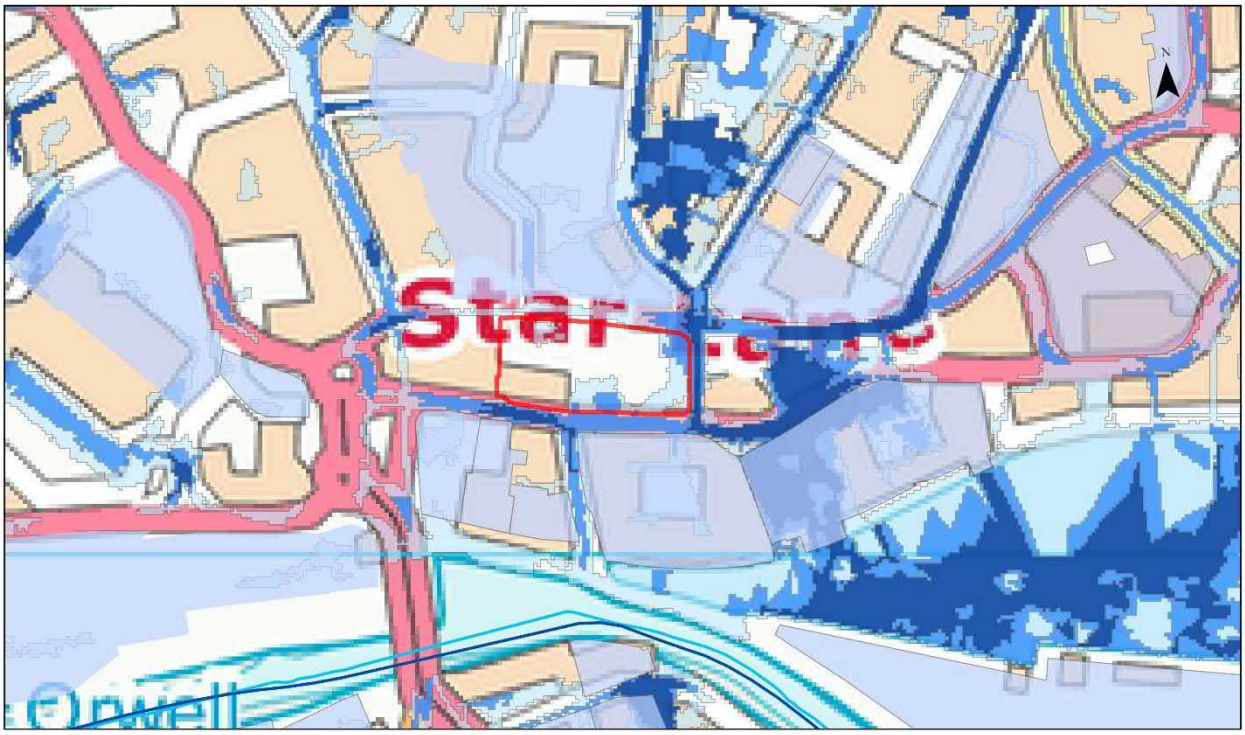
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Key Street/Star Lane/Burtons Site

Surface Water Flood Risk

The RoFSW mapping shows that the majority of the site is not located in an area of surface water flood risk, however, surrounding roads are at high risk of surface water flooding and ponding. Areas along Foundation Street, on the eastern edge of the site, and College Street along the south of the site, are at particular risk.



0.040.02 0 0.04 0.07 0.11 0.14 Kilometers

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1 in 30
1 in 100
1 in 1000
Main Rivers
Ordinary Watercourses
Current Site
Other Sites

Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 – 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, a low hazard access/egress route site may be achievable from the northern side of the site along Turret Lane. The route along College Street to the south of the site and Star Lane to the north are shown to have a hazard rating of Significant (Danger for Most) and would therefore not offer a safe route. Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Key Street/Star Lane/Burtons Site

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation storage is the most likely SuDS for the site.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Additional Information

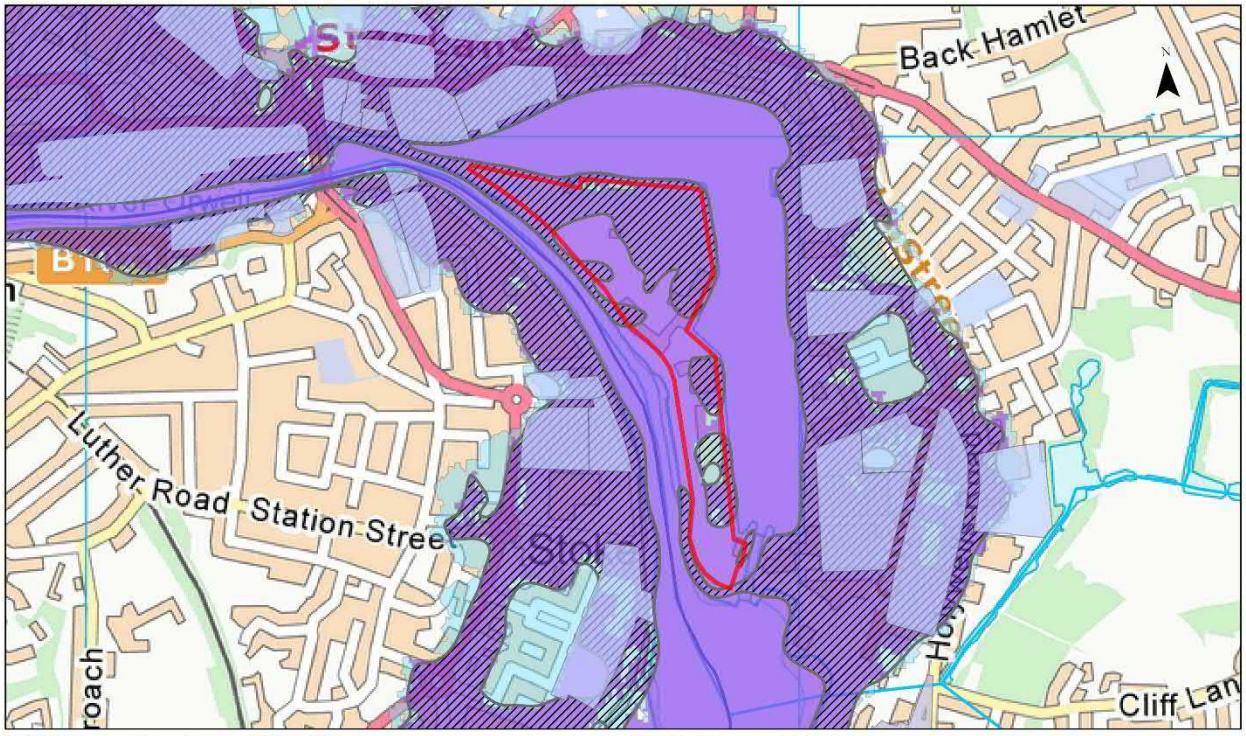
Ipswich BC have noted that there is a potential for flooding from the combined sewer at this location. Flood risk reduction should be possible by reducing peak flow to the sewer by using SuDS.

Site Name: Island Site					
Site ID:	IP037	**Location:**	Island Site	**Area (ha):**	6.02
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 5%	**Flood Zone 3 (1% AEP):** 95%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 57%

The site is located between the tidal River Orwell to the west and Neptune Marina to the east. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the River Orwell channel to the west of the site, as well as the tidal barrier located in the narrow channel or the Orwell before it widens downstream. Water levels in the marina are managed, and there is a flood gate at the south of the marina. The site is therefore at residual risk of tidal flooding, in the event of a failure of the defences.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC do not hold records of flood incidents on the site itself.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

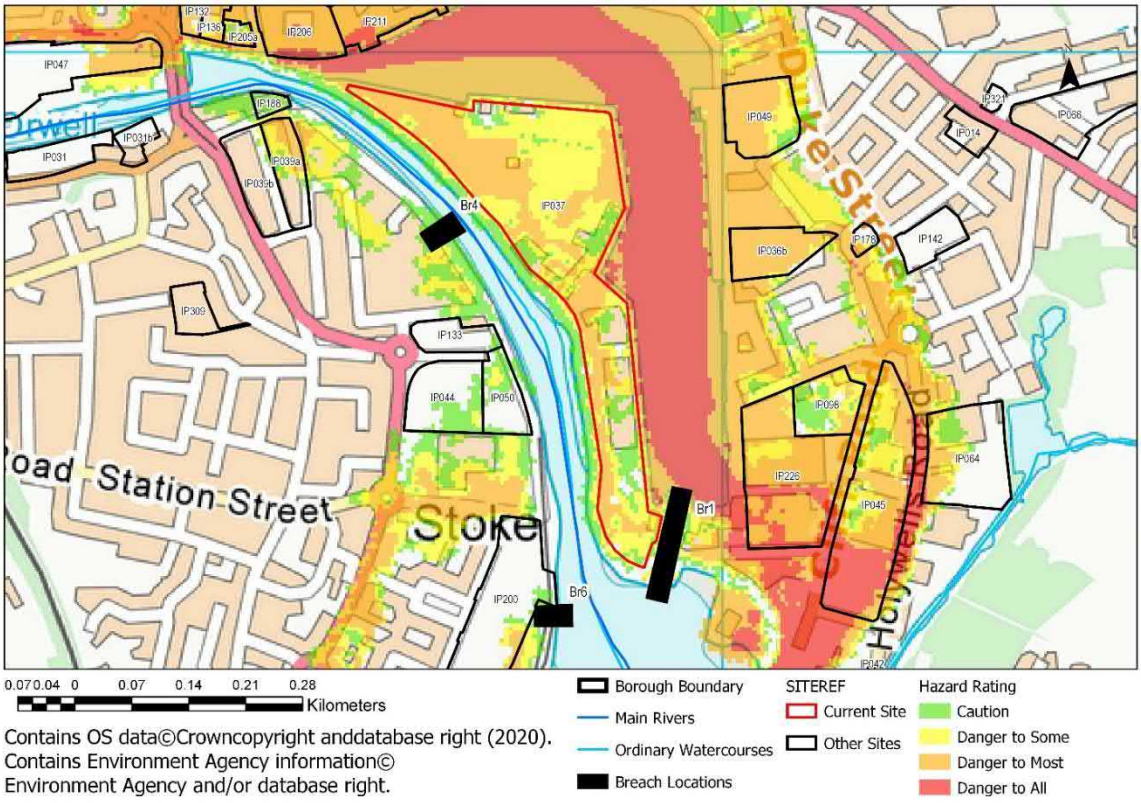
Site Name: Island Site

Tidal Flood Risk – River Orwell

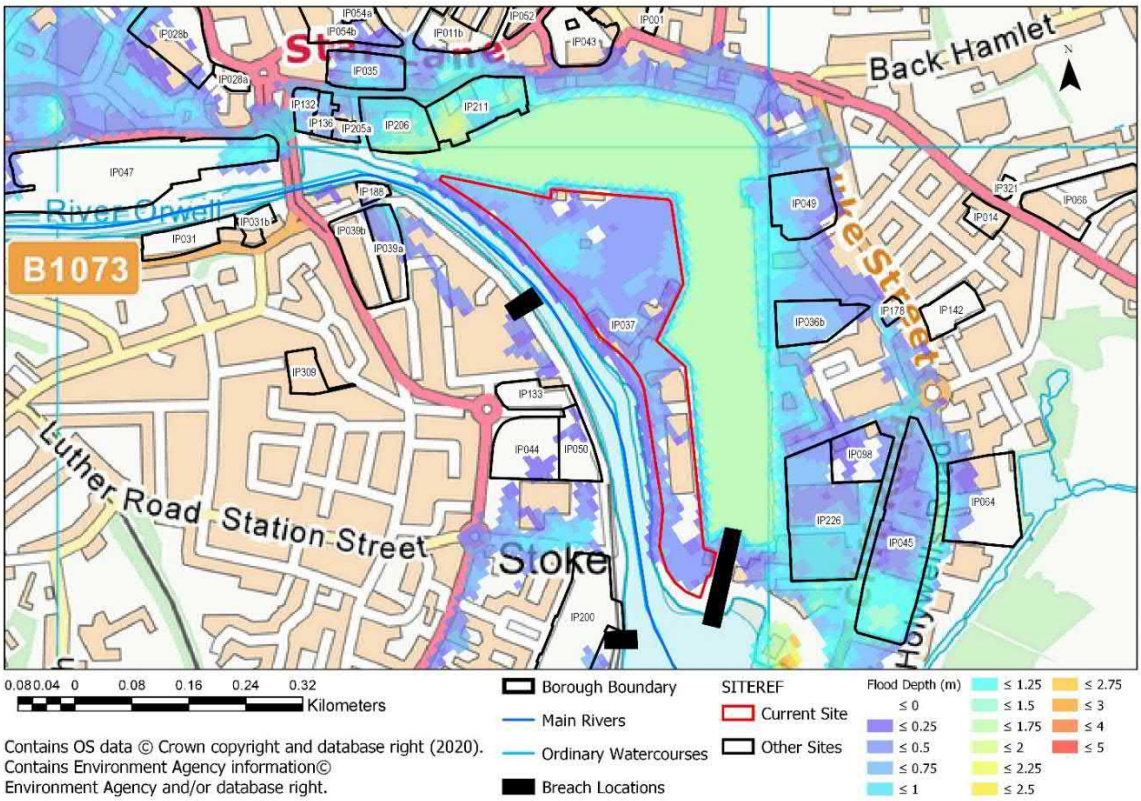
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, the site is exposed to a range of hazard ratings with the highest being Significant (Danger to Most), covering approximately half of the site, with the remainder being Moderate (Danger to Some) and Low (Caution). The combined flood depth map shows that flood depths on site range from 0.25m to <1.25m, with the greatest depths in the north of the site.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

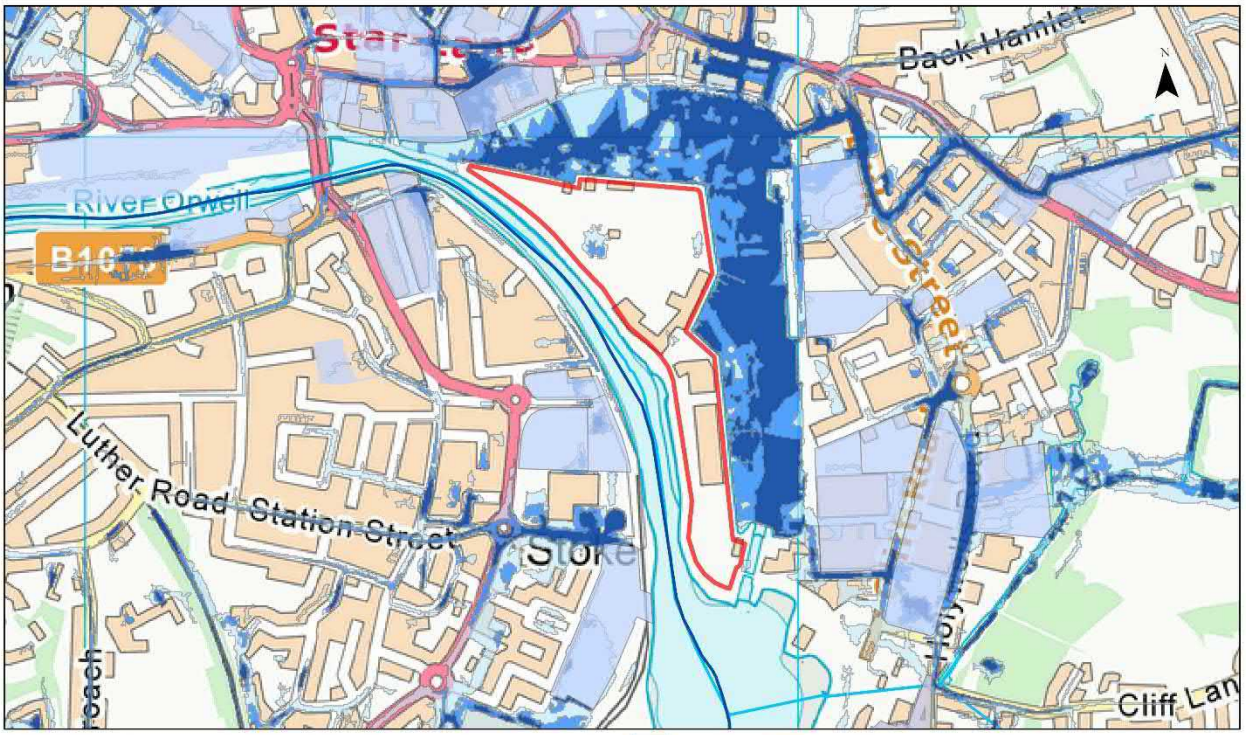


Site Name: Island Site

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The site is not shown to be at risk of surface water flooding or ponding on the Environment Agency RoFSW mapping.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations. The site location would lend itself to discharge to the River Orwell.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 – 4.1m AOD (Figure 7-4).

Access / Egress

Access to the site is currently from St Peter's Dock in the north, and Ship Launch Road in the south. Alternative access to the site could be achieved via the construction of a new bridge, e.g. to Mather Way. Depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Island Site

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS.

Additional Information

Ipswich BC has outlined that the site is at risk of flooding from combined sewers, opportunities to reduce loading to the local sewer network should be sought.

Opportunities to plan a strategic new bridge to Mather Way linking to development of sites 50, 44 and 133 could be considered.

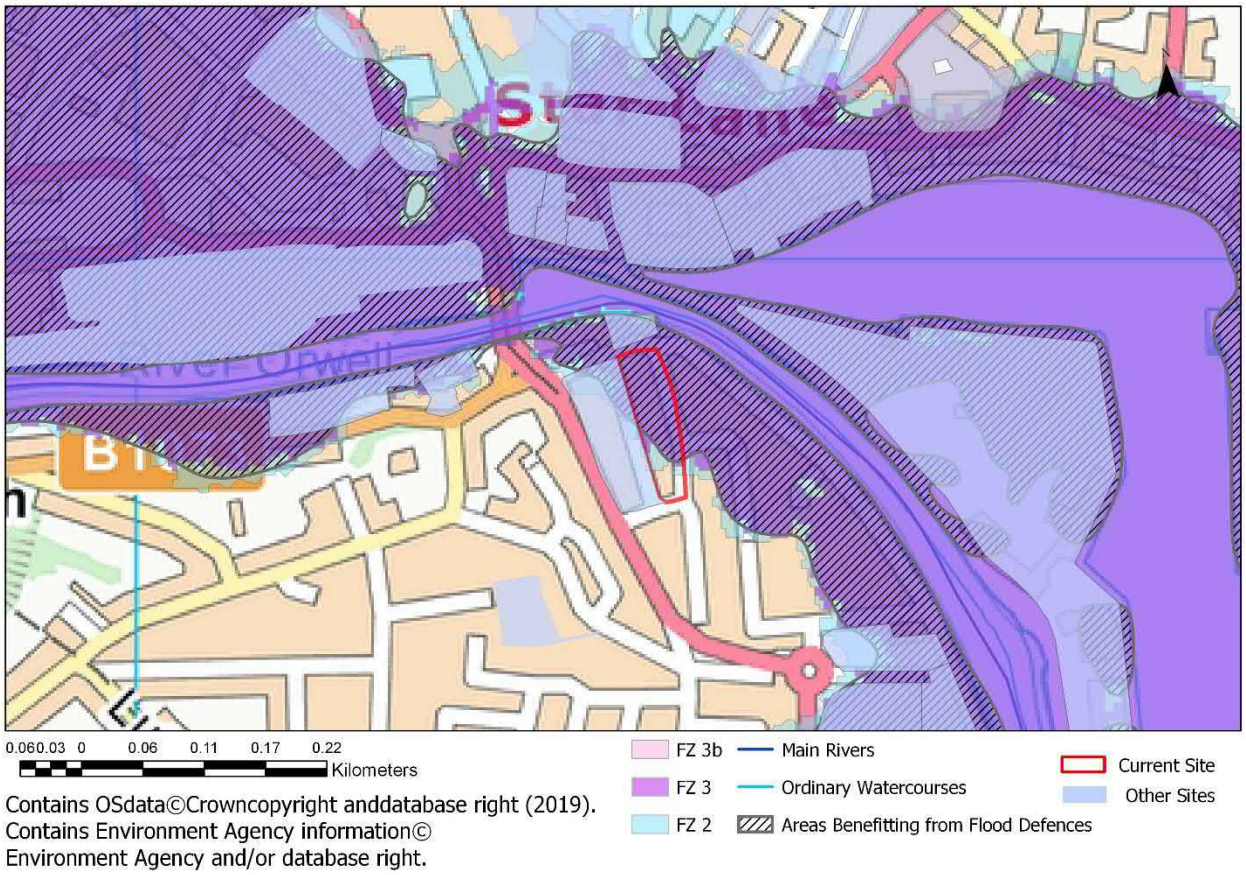
Site Name: Land between Gower Street and Great Whip Street					
Site ID:	IP039a	**Location:**	Land between Gower Street and Great Whip Street	**Area (ha):**	0.48
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 16%	**Flood Zone 2 (0.1% AEP):** 9%	**Flood Zone 3 (1% AEP):** 76%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 72%

The tidal River Orwell flows south east just to north east of the site. Most of the site is identified as Flood Zone 3, high probability of flooding from the tidal River Orwell, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC also hold records of flooding to the north of site where Vernon Street meets Bridge Street, associated with the surface water network being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: Land between Gower Street and Great Whip Street

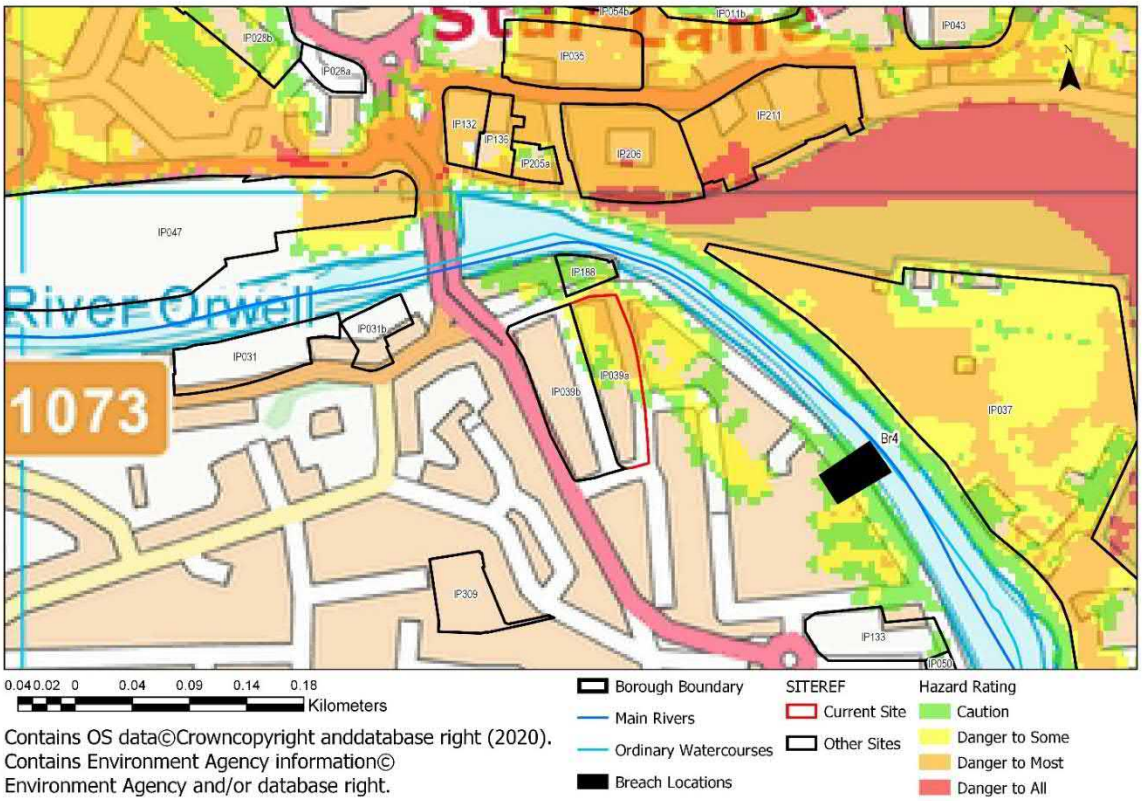
Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

In this scenario, the northern half of the site is affected by a range of hazards from Low (Caution) to Significant (Danger to Most). The south and west of the site is not shown to flood. Flood depths occur along the north east of the site and reach maximum depths of 1m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



0.04 0.02 0 0.04 0.09 0.14 0.18 Kilometers

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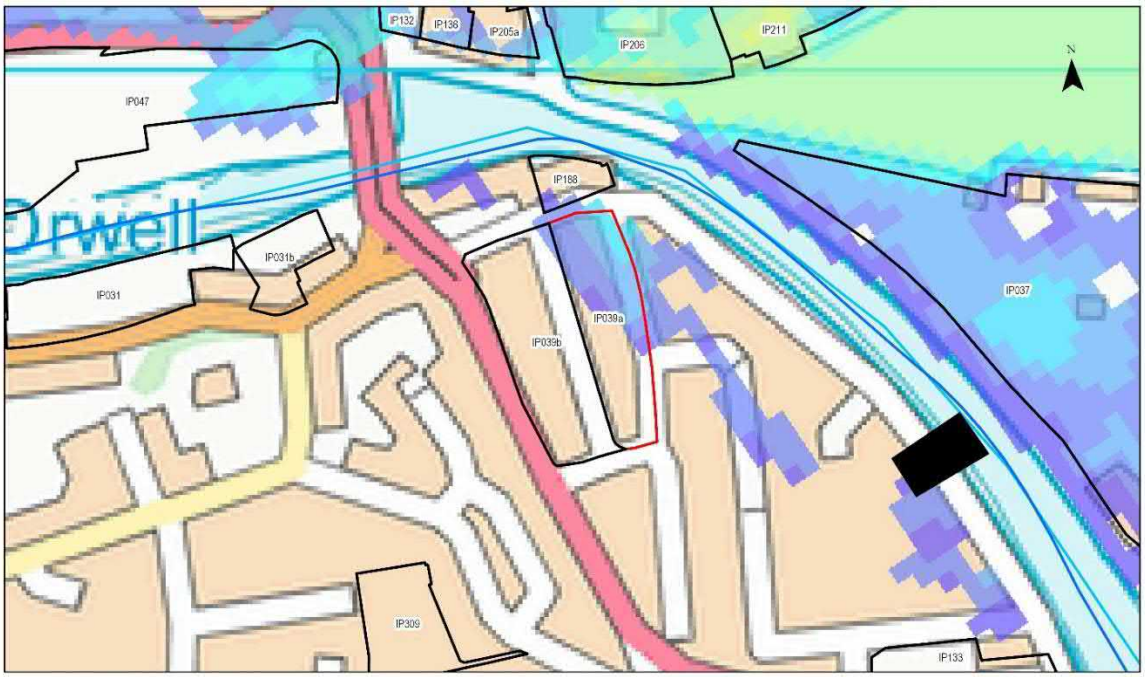
Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

Hazard Rating
Caution
Danger to Some
Danger to Most
Danger to All

Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



0.03 0.01 0 0.03 0.06 0.09 0.12 Kilometers

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Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

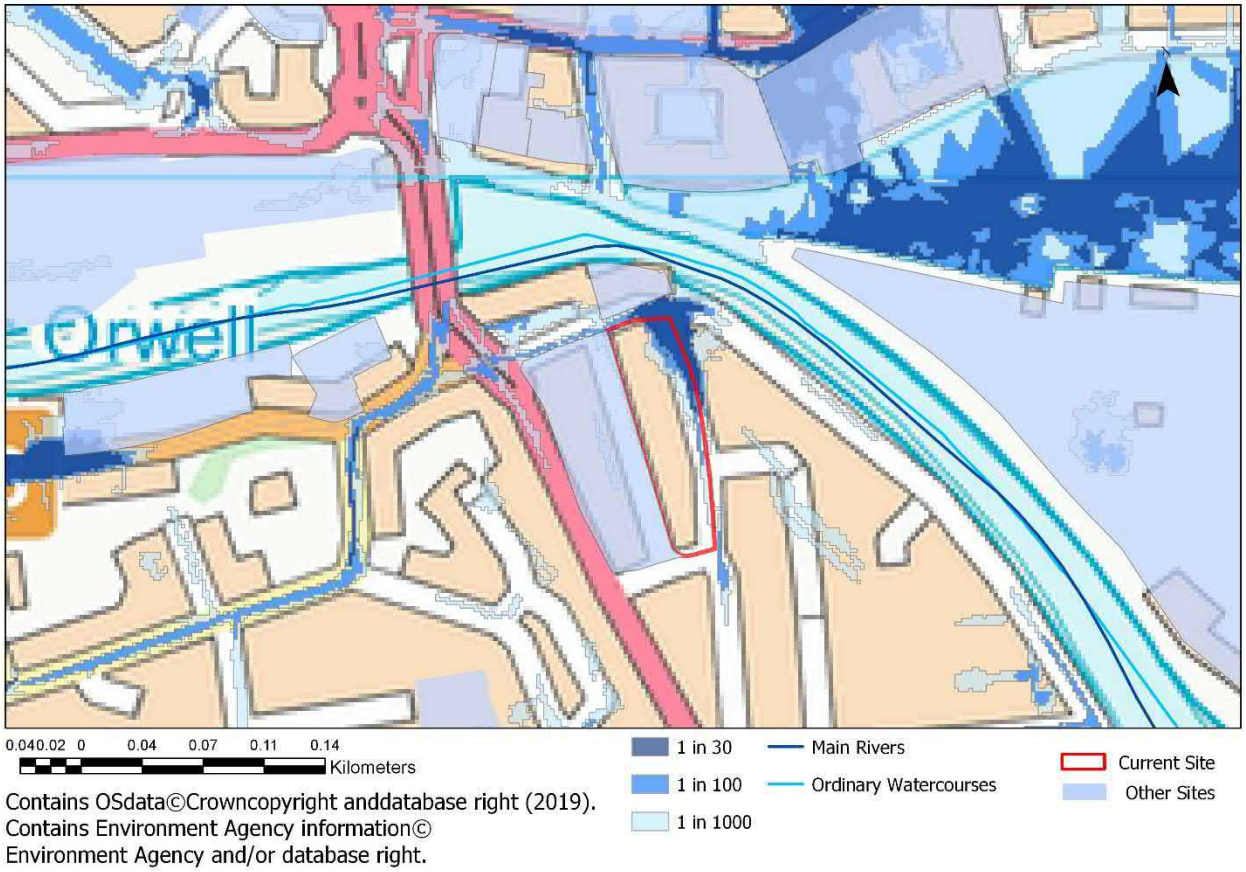
Flood Depth (m)
≤ 0
≤ 0.25
≤ 0.5
≤ 0.75
≤ 1
≤ 1.25
≤ 1.5
≤ 1.75
≤ 2
≤ 2.25
≤ 2.5
≤ 2.75
≤ 3
≤ 4
≤ 5

Site Name: Land between Gower Street and Great Whip Street

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping identifies the north eastern tip of the site to be at high risk of surface water flooding. A flow pathway appears to follow local highways around the site.



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Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment C is 3.5m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the south of the site and onto Vernon Street. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Site Name: Land between Gower Street and Great Whip Street

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D of the SFRA outlines that rate of onset to peak at this location (compartment C) is only 1.5 hour and flood water may remain on site for over 21hrs. This shows the importance of inclusion of a safe place of refuge.

Set-back Distance

All development should be set back 16m from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to consider the current risk of surface water flooding particularly in the northern part of the site, to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Additional Information

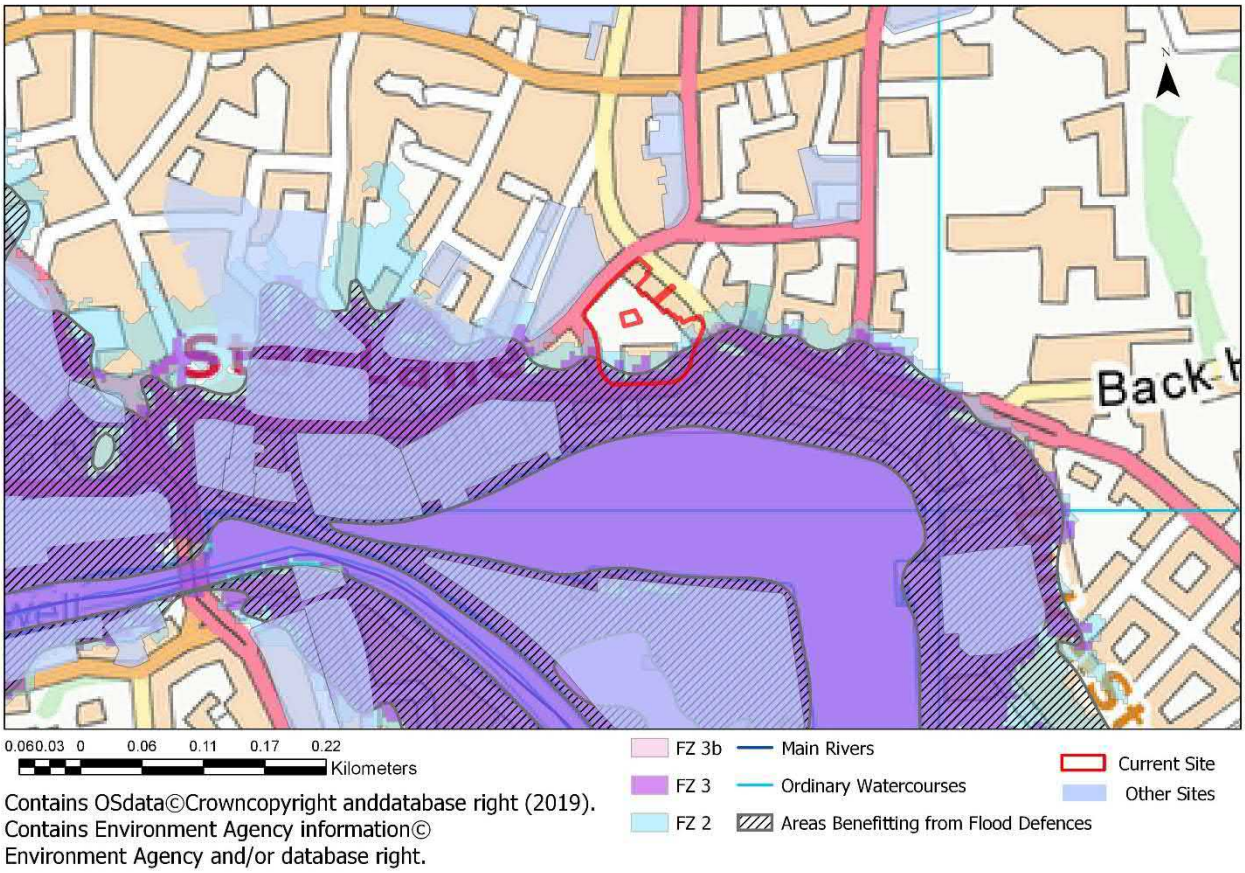
Low parts of the site and buildings in low areas within Dock St Pumping Station combined sewer catchment are the most likely flood receptors. A flood risk reduction should be possible by reducing peak flow to the sewer by using SuDS. Raising the ground and placing vulnerable buildings on higher parts of the site will improve its safety.

Site Name: Commercial Buildings, Star Lane					
Site ID:	IP043	**Location:**	Commercial Buildings, Star Lane	**Area (ha):**	0.7
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records				
Flood Zone 1 (<0.1% AEP): 64%	**Flood Zone 2 (0.1% AEP):** 16%	**Flood Zone 3 (1% AEP):** 21%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 18%

The tidal River Orwell is located approximately 100m to the south of the site. The southern part of the site (21%) is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell. The southern edge of the site is therefore at residual risk of tidal flooding, in the event of a failure of these defences.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold a number of records of flooding to the east of the site close to Bridge Street associated with the surface water drainage system being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

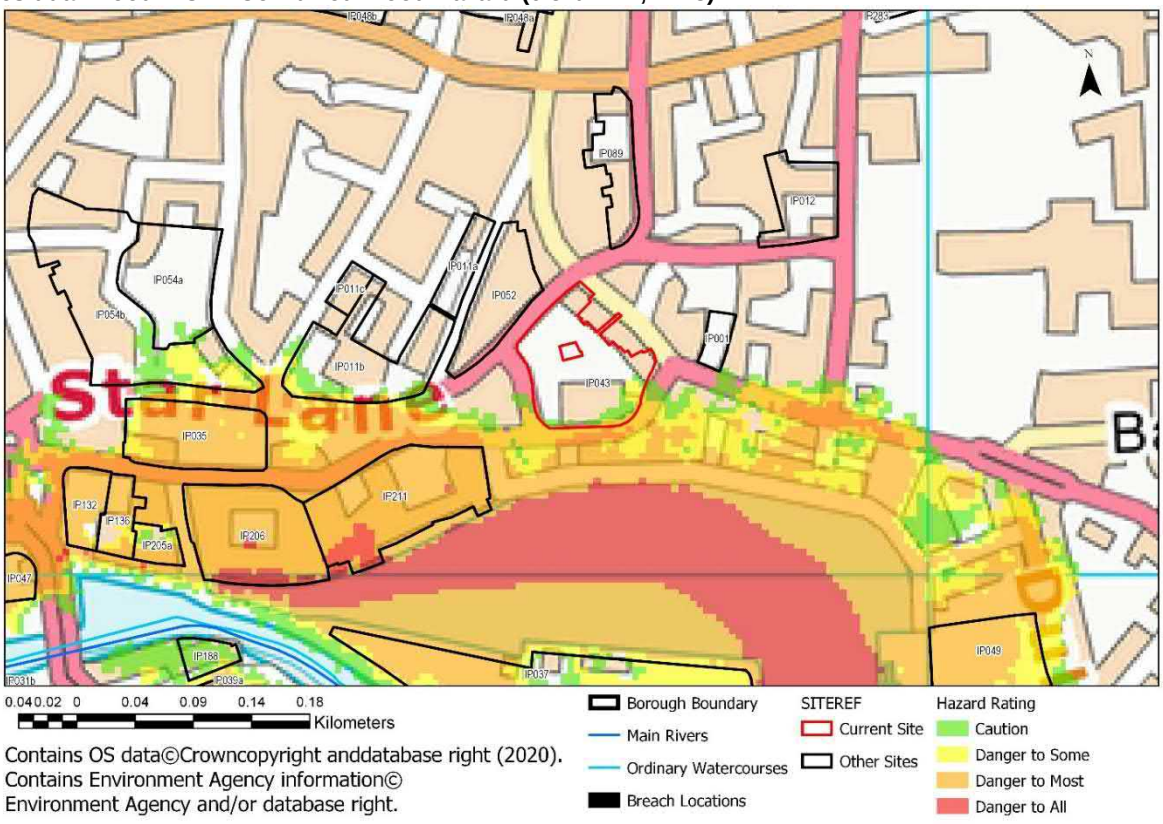
Site Name: Commercial Buildings, Star Lane

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, parts of the site are classified as Low – Moderate hazard, with depths up to 0.5m. The hazard along Star Lane to the south of the site classified as Significant – Danger to Most.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



0.04 0.02 0 0.04 0.09 0.14 0.18 Kilometers

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Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

Hazard Rating
Caution
Danger to Some
Danger to Most
Danger to All

Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

0.03 0.01 0 0.03 0.06 0.09 0.12 Kilometers

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Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

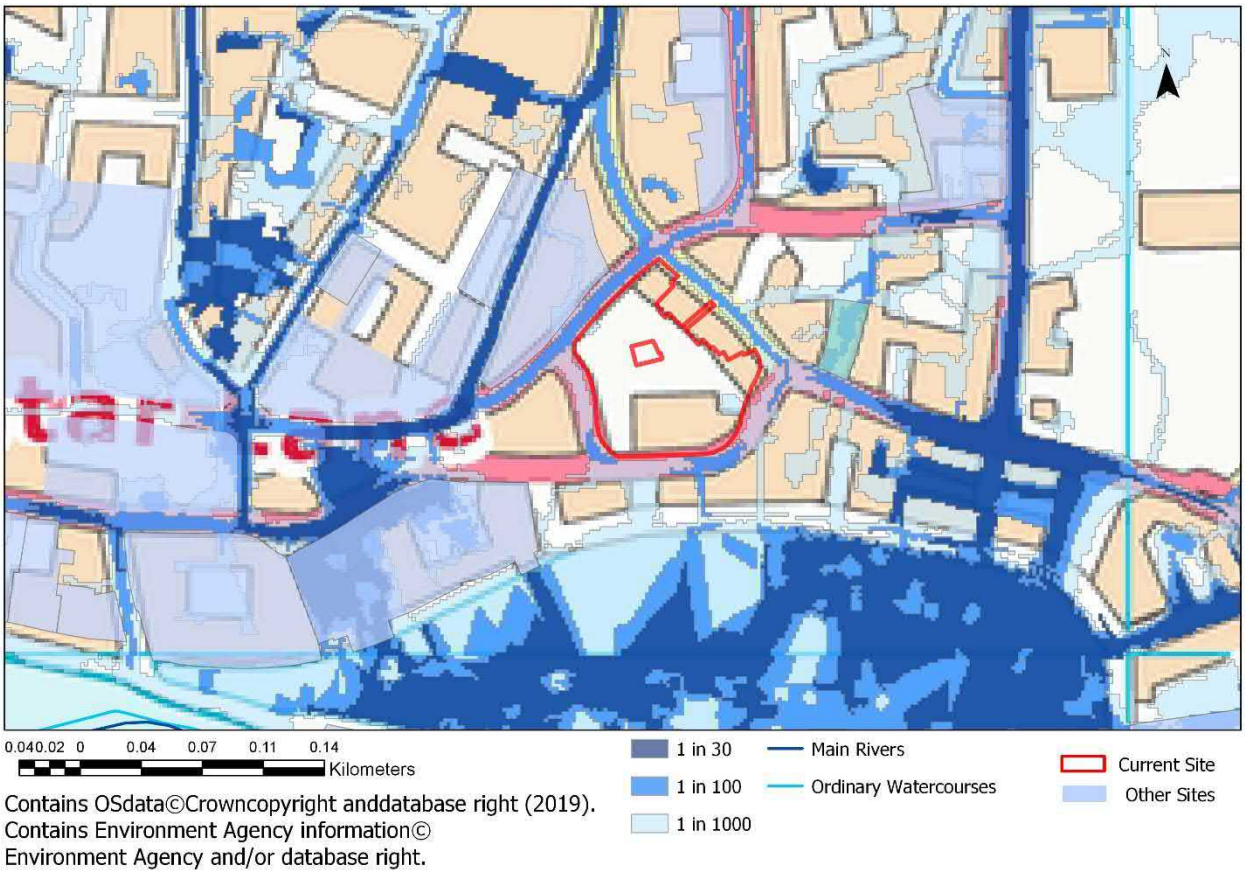
Flood Depth (m)
≤ 0
≤ 0.25
≤ 0.5
≤ 0.75
≤ 1
≤ 1.25
≤ 1.5
≤ 1.75
≤ 2
≤ 2.25
≤ 2.5
≤ 2.75
≤ 3
≤ 4
≤ 5

Site Name: Commercial Buildings, Star Lane

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4.0 – 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry or low hazard access/egress for the site may be achievable to the north along Greyfriars Road towards the A1022. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be

Site Name: Commercial Buildings, Star Lane

adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Surface water discharge may be constrained at this site as the existing local surface water sewer is pumped to the combined sewer. Opportunities to reduce the loading on the existing sewer should be sought.

Additional Information

Flood pathways for the site include an overtopping event collapsing the defences, overland flow and sewer overflow. The site itself, adjacent buildings and roads and buildings around the Wet Dock especially adjacent Coprolite Street are the most likely flood receptors.

The site is sloping. Vulnerable buildings should be placed on the higher parts of the site or ground should be raised to make more areas higher. It should be ensured that ground raising does not increase flood risk elsewhere.

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)					
Site ID:	IP045 & IP064	**Location:**	Holywells Road /Toller Road	**Area (ha):**	West - 2.06 East - 1.2
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

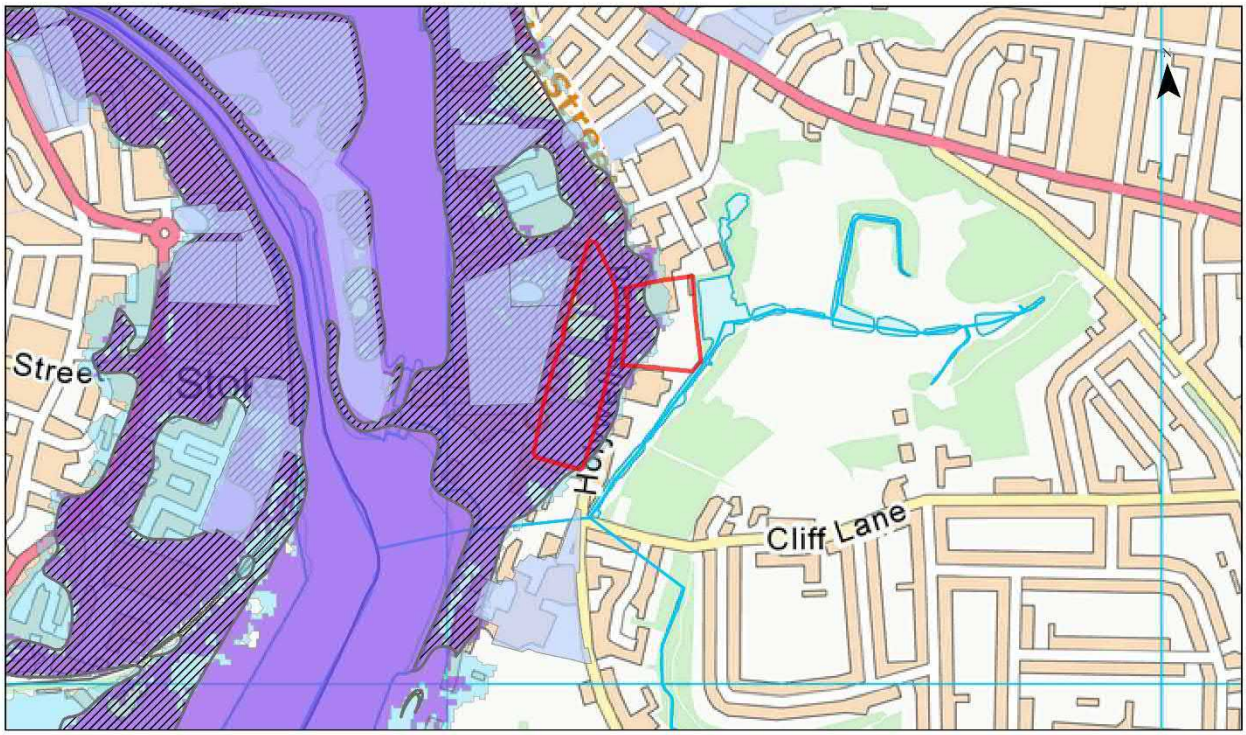
Flood Zones and Historic Records

Site IP045				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 17%	**Flood Zone 3 (1% AEP):** 83%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 100%
Site IP064				
Flood Zone 1 (<0.1% AEP): 52%	**Flood Zone 2 (0.1% AEP):** 19%	**Flood Zone 3 (1% AEP):** 29%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 30%

The tidal River Orwell is located approximately 300m to the west of the sites.

Most of the West site and almost half of the East site are identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the River Orwell to the south of the site, and there is a tidal barrier on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of road and pavement flooding in this location.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)

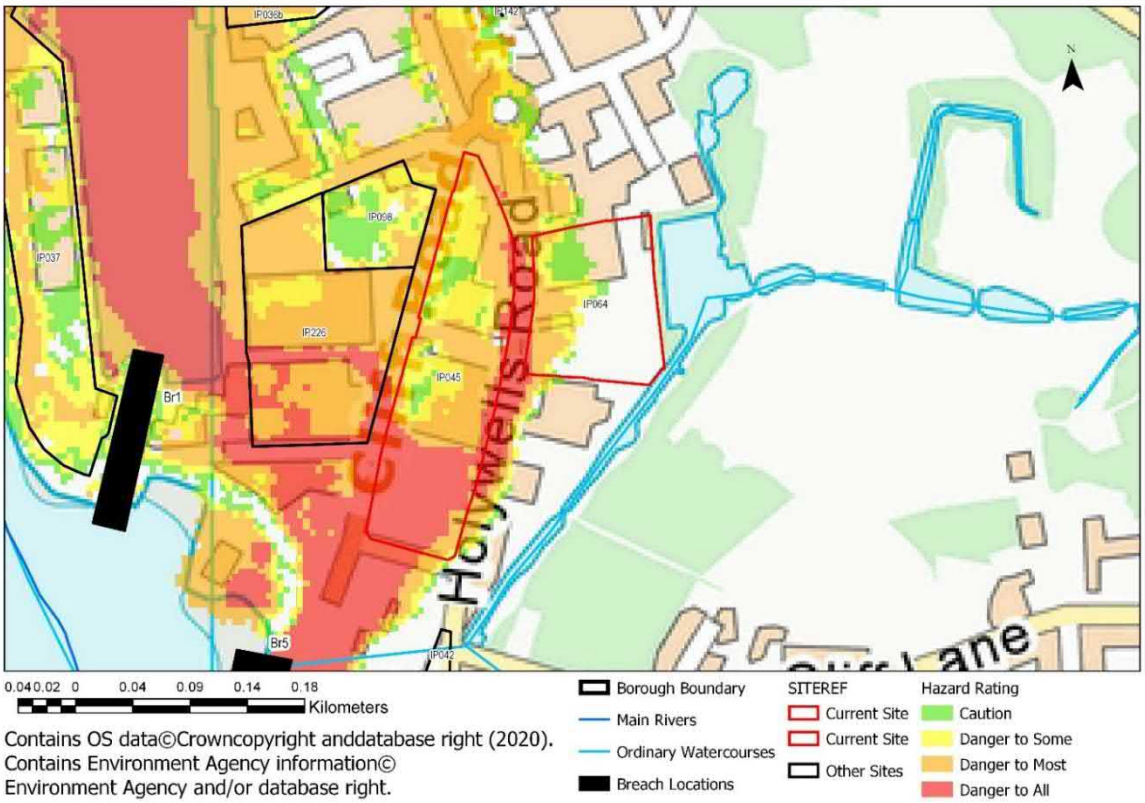
Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

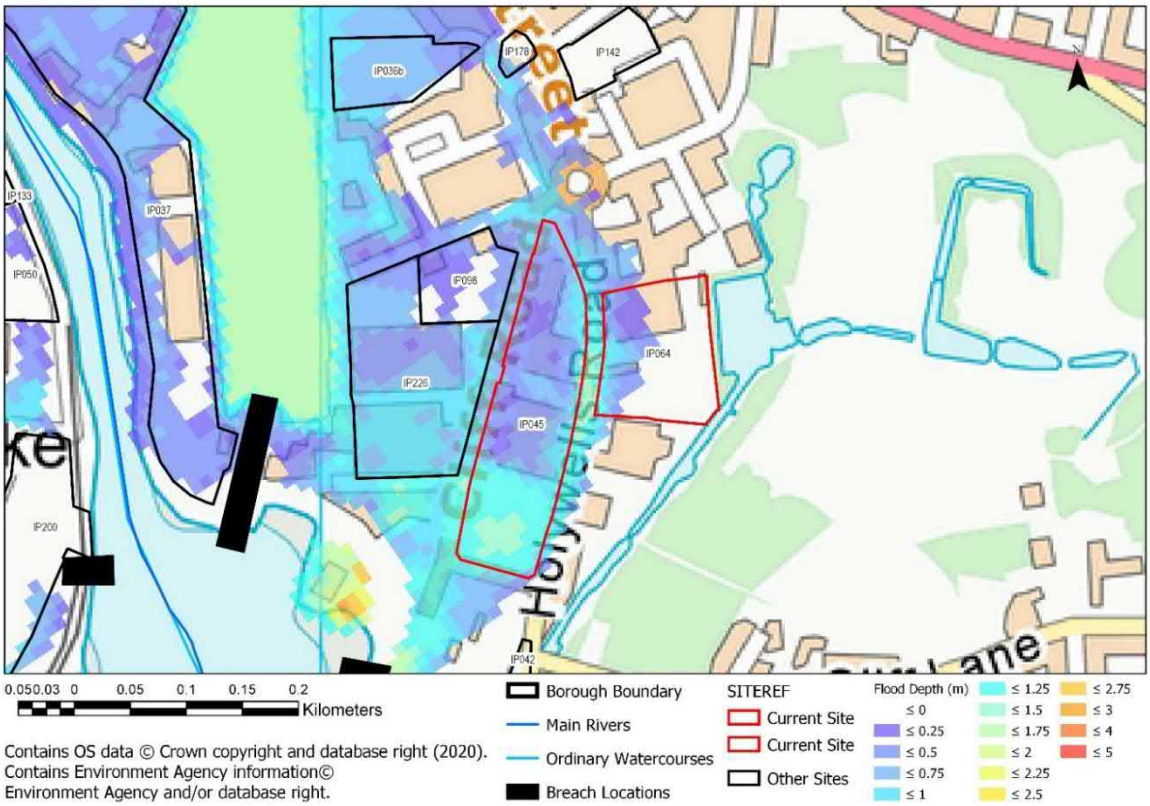
A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

IP045 Holywells Road 'west site' has a hazard rating ranging from Low to Extreme (Danger to All), with depths ranging from 1.5m in the south to <0.25 in the north. The western half of IP064 Holywells Road 'east site' is shown to be at Low – Significant hazard rating, with depths <1.25m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

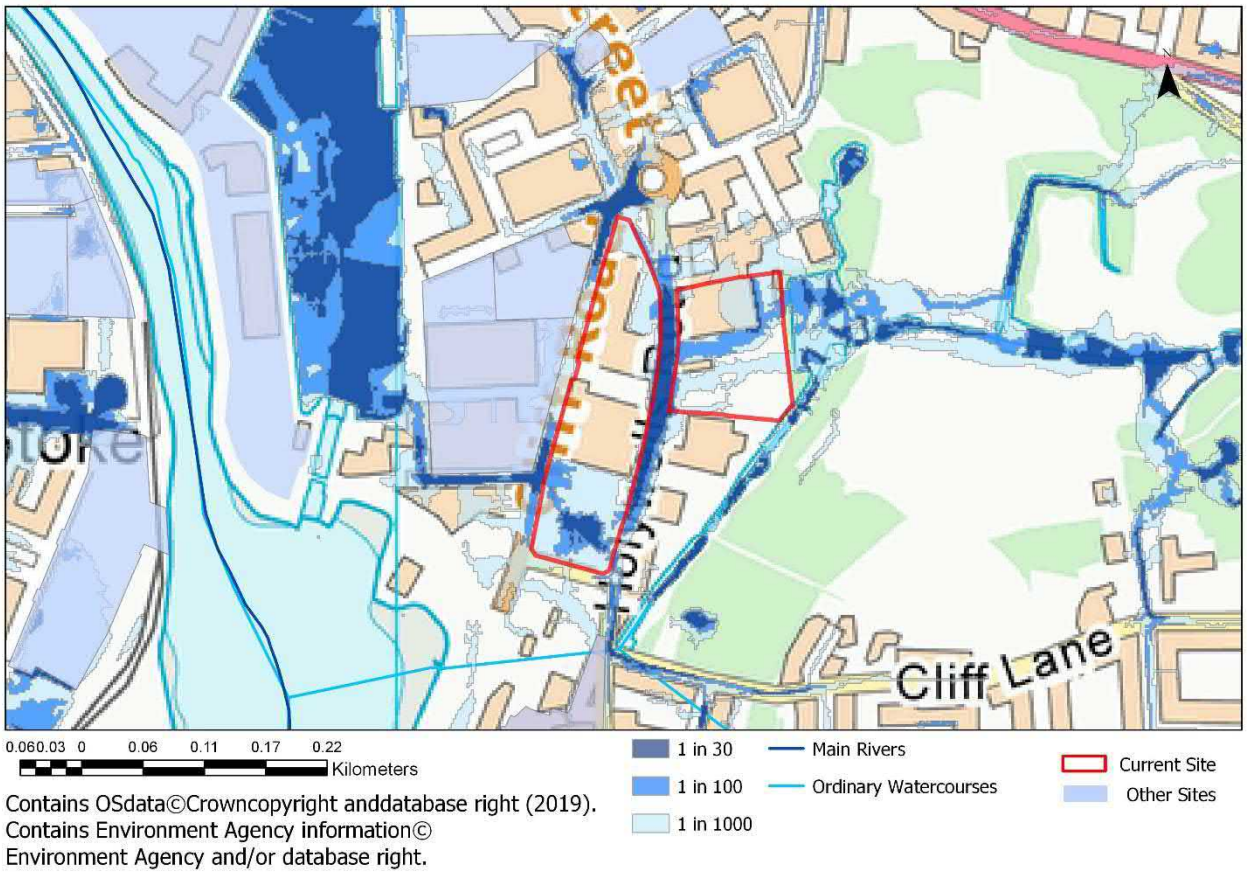


Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)

Surface Water Flood Risk

The RoFSW mapping identifies:

- IP045 Holywells West – there is a flow path crossing the southern quarter of the site and areas of higher surface water flood risk along Holywells road.
- IP064 Holywells East – There appears to be a flow path crossing the central section of the site. This will need further consideration with regard to the location of new buildings and potential displacement of flood flows.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.
The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in this part of compartment H, close to Breach 05 is 4.1 – 5.3m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, access/egress routes along Holywells Road may have a potential hazard rating of up to Significant ("Danger for most") and Extreme ("Danger for all"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)

adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Additional Information – both sites

As site plans progress, opportunities to reduce peak flows to the local sewer network should be sought as Ipswich BC are aware of frequent deep flooding of Holywells Road.

The risk of flooding due to collapsing embankments along the canal in Holywells park has been reduced since 2012/13 but there is still a major surface water flooding issue to resolve.

IP064 Holywells Road East

Caution should be applied to Holywells East IP064 as while mapping included in this proforma illustrates risk from the River Orwell, there is a raised canal to the east which has not been fully mapped.

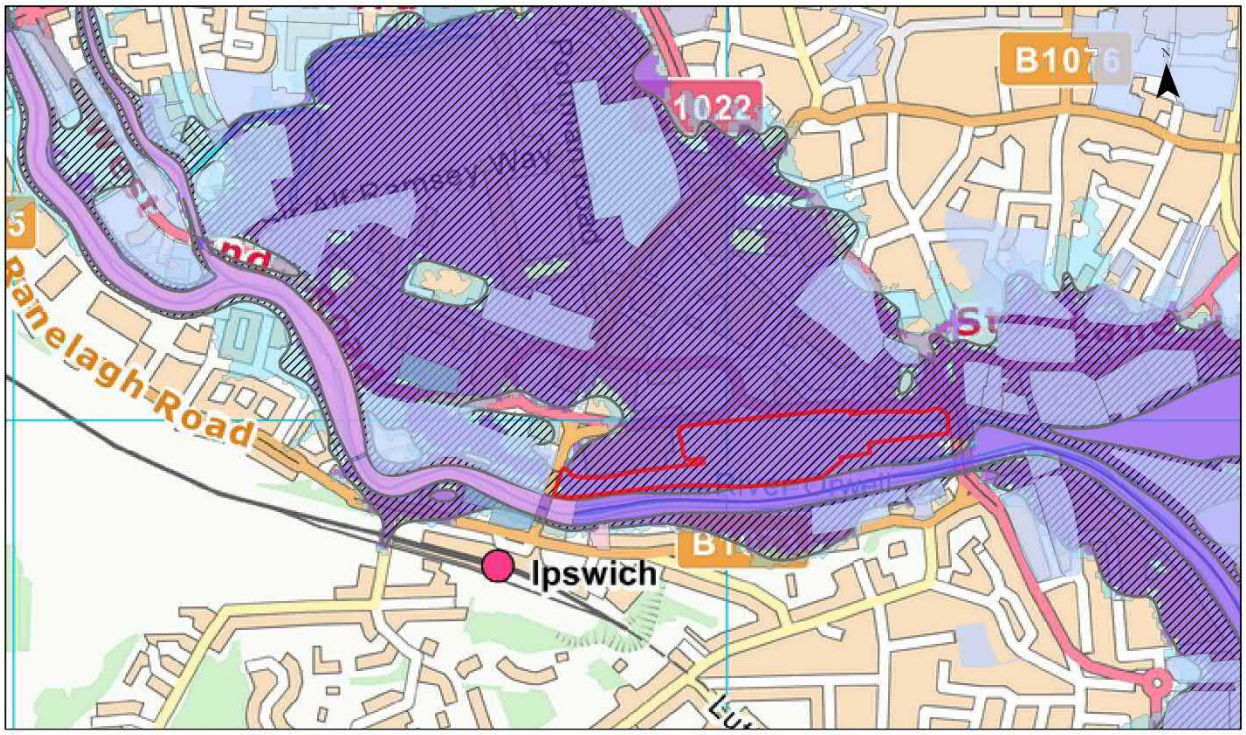
The sloping areas of the site are mainly above Flood Zone 3. A high-level trunk sewer crosses the site. The embankment within the site is in poor condition, the outlet is likely to be too small. These risks require further consideration as part of a site-specific FRA.

Site Name: Land at Commercial Road					
Site ID:	IP047	**Location:**	Land at Commercial Road	**Area (ha):**	3.12
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 100%	**Flood Zone 3b (5% AEP): 0**%	**Area Benefiting from Defences:** 100%

As it flows through Ipswich, the River Gipping becomes the River Orwell. The watercourse flows east through Ipswich along the southern edge of the site. At this location the watercourse is tidally influenced. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site benefits from the presence of defences; there is a flood defence wall along the edge of the River Orwell channel, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flooding on the pavements and roads in this location associated with the surface water drainage network being blocked or overwhelmed.



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Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

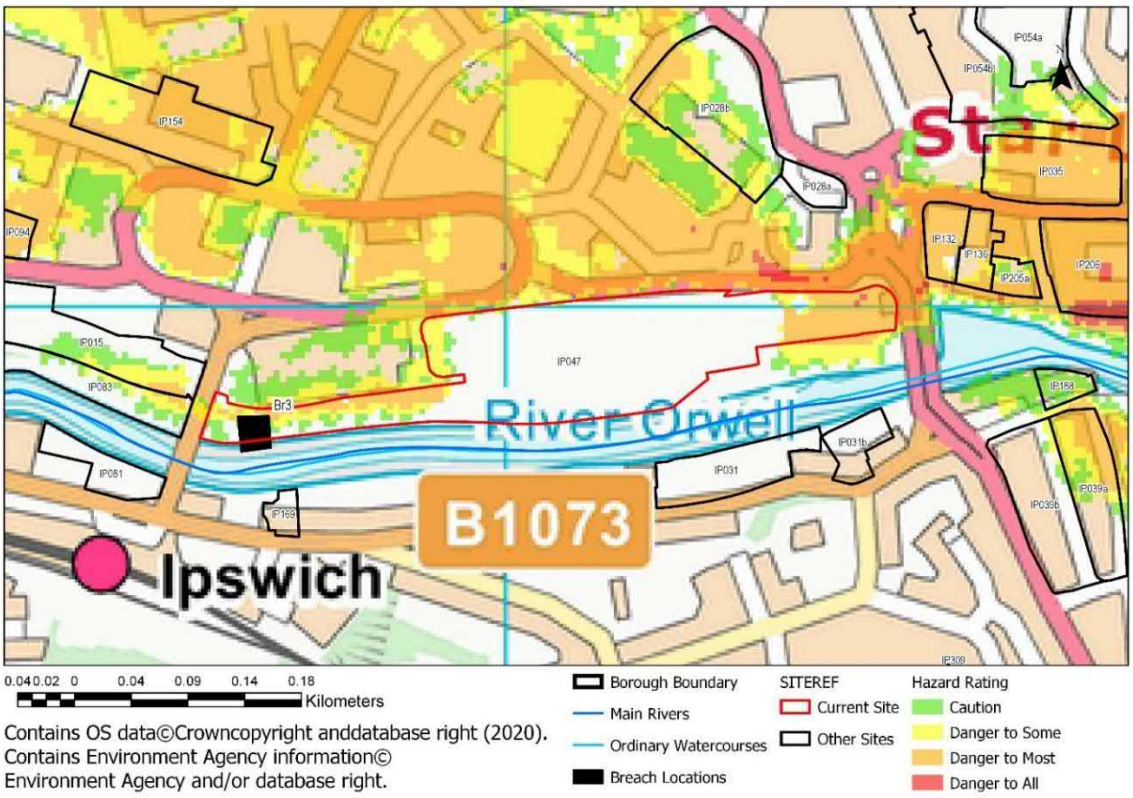
Site Name: Land at Commercial Road

Tidal Flood Risk – River Orwell

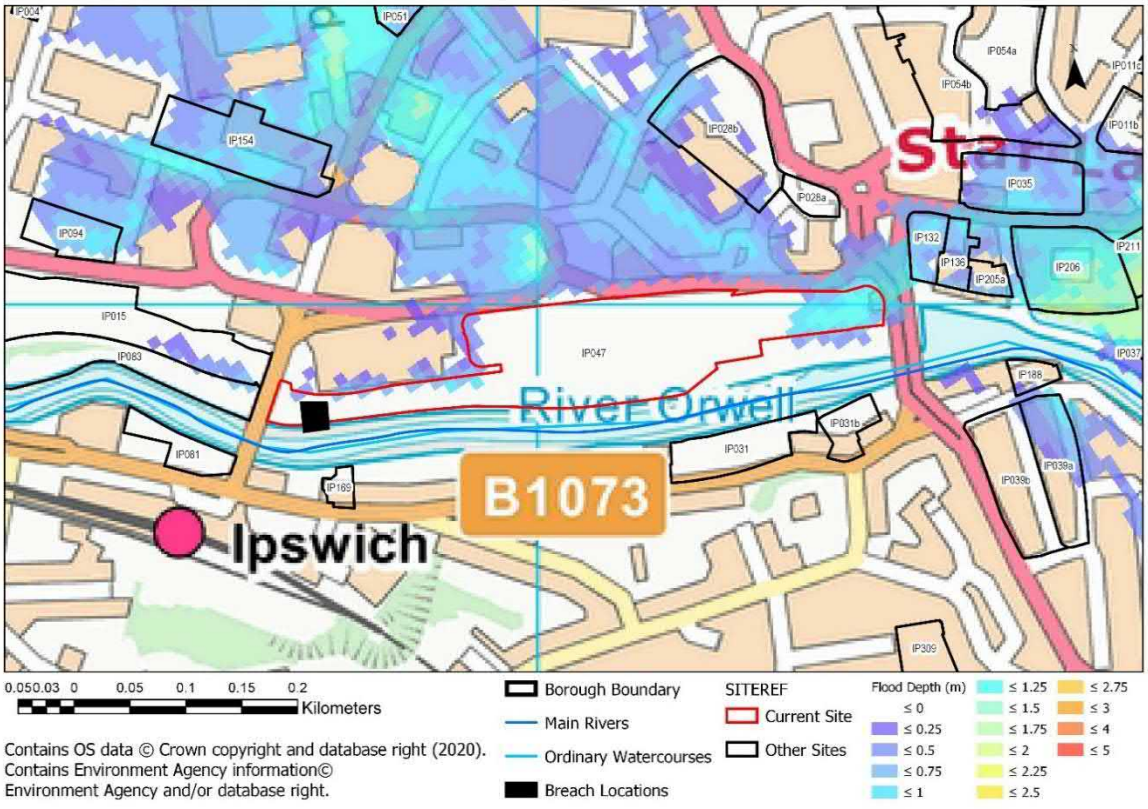
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario the site is shown to have areas of Significant hazard (Danger to Most) at the eastern boundary, with depths up to 1.25m; and Moderate hazard (Danger to Some) in the west, with depths up to 1m. However, it should be noted that the modelling currently assumes ground raising across this site which has not been implemented, and therefore in the current situation depths are likely to be similar across the whole site and could be greater.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



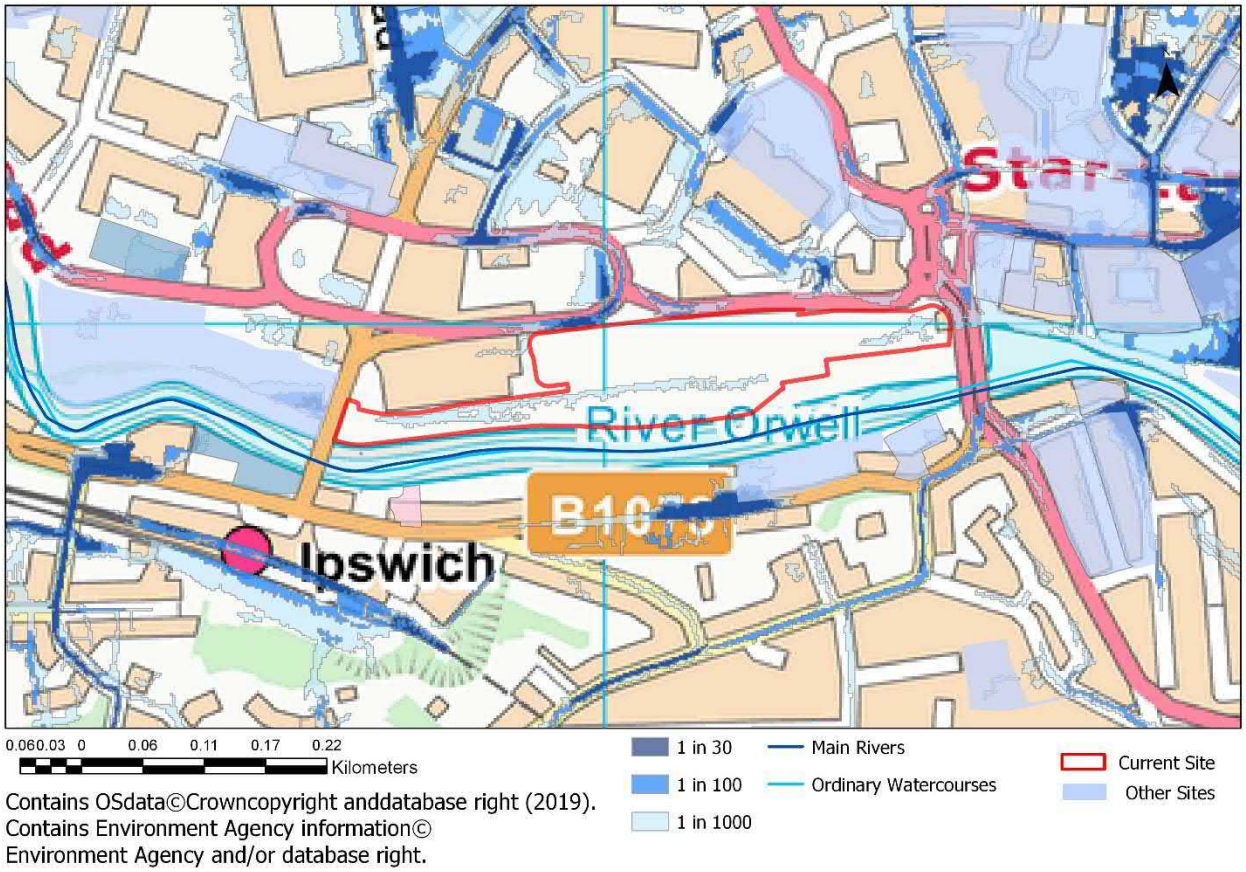
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Land at Commercial Road

Surface Water Source

The RoFSW mapping indicates that the site is generally at low risk of surface water flooding. There may be some risk of surface water ponding on the northern edge of the site along Commercial Road.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located across two 1km squares of which <25% and between 25-50% are susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, access/egress routes along Commerical Road / Grafton Way may have a potential hazard rating of up to Significant ("Danger for most") and Extreme ("Danger for all"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be

Site Name: Land at Commercial Road

adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

The site is located within flood compartment J (refer to Figure 15 SFRA). Appendix D of the SFRA outlines that in this flood compartment the flood peak could be reached within 1.5hrs from breach and water may remain within the flood compartment for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Set-back Distance

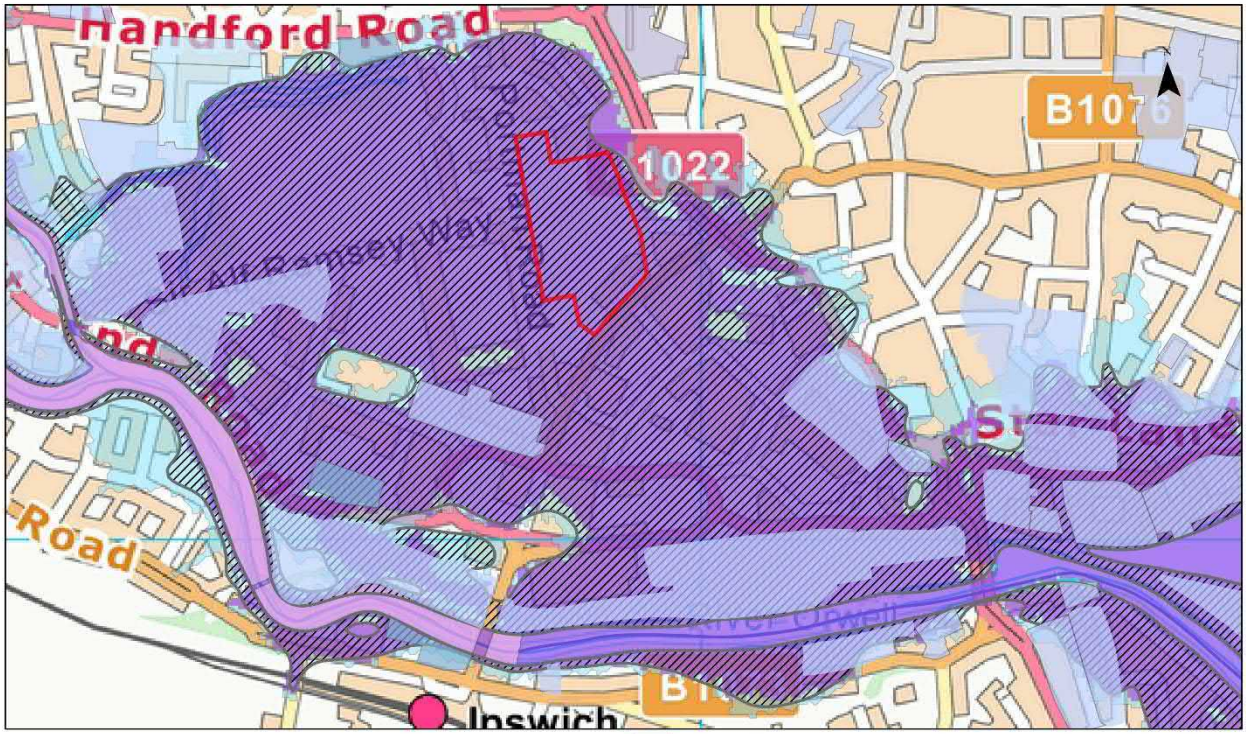
All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Name: Old Cattle Market site, Portman Road (South)					
Site ID:	IP051	**Location:**	Old Cattle Market site, Portman Road (South)	**Area (ha):**	2.21
Current Use:	Commercial and car parking	**Proposed Use:**	Primarily offices; potential hotel and/or leisure and/or car parking as a secondary use.	**Vulnerability Classification:**	Hotel: More Vulnerable

Flood Zones and Historic Flooding				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 100%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 100%

As it flows through Ipswich, the River Gipping becomes the River Orwell. The site is identified as Flood Zone 3, high probability of flooding from the Gipping / Orwell, in the absence of flood defences. The site benefits from the presence of defences; there are embankments and flood defence walls along the edge of the River Gipping / Orwell channel, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences. This may require updating once the impact of the new modelling for the River Gipping is known.

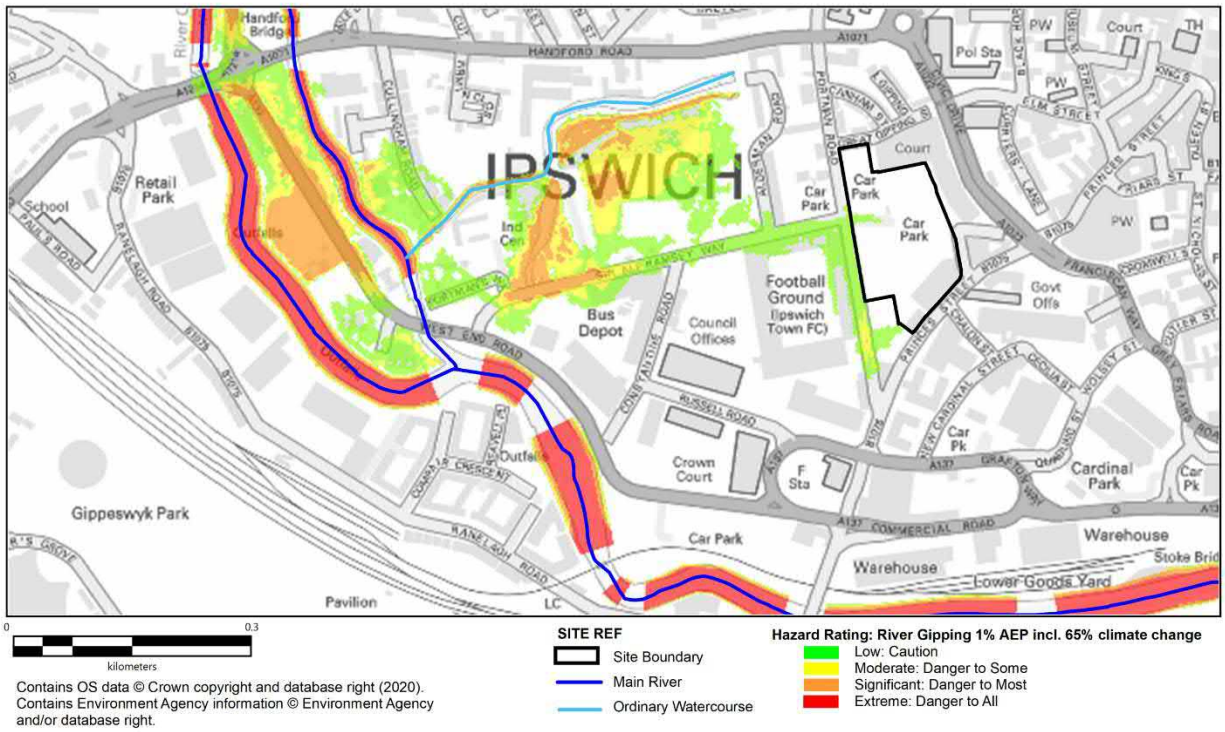
The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flooding along Portman Road associated with blocked or overwhelmed drainage systems.

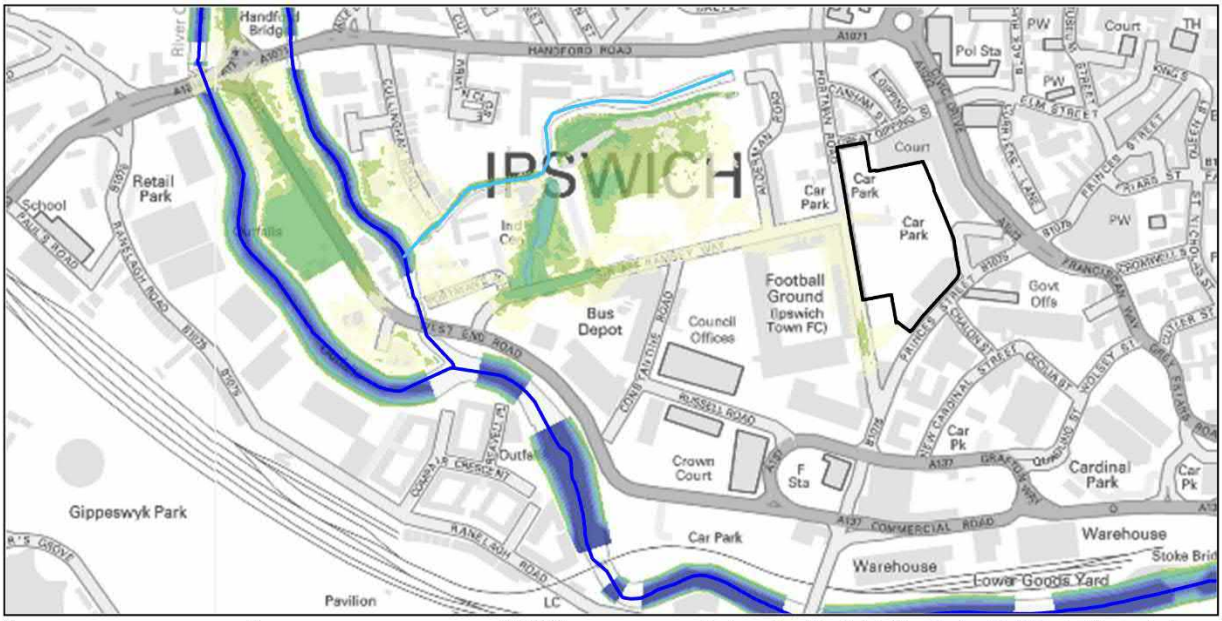


Site Name: Old Cattle Market site, Portman Road (South)

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, there is shown to be a risk of flooding along Sir Alf Ramsey Way and into the western edge of the site risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 2.67m AOD on the site. A small area of the is shown to flood, with depths of approximately 0.25 m, and a hazard rating of Low. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.





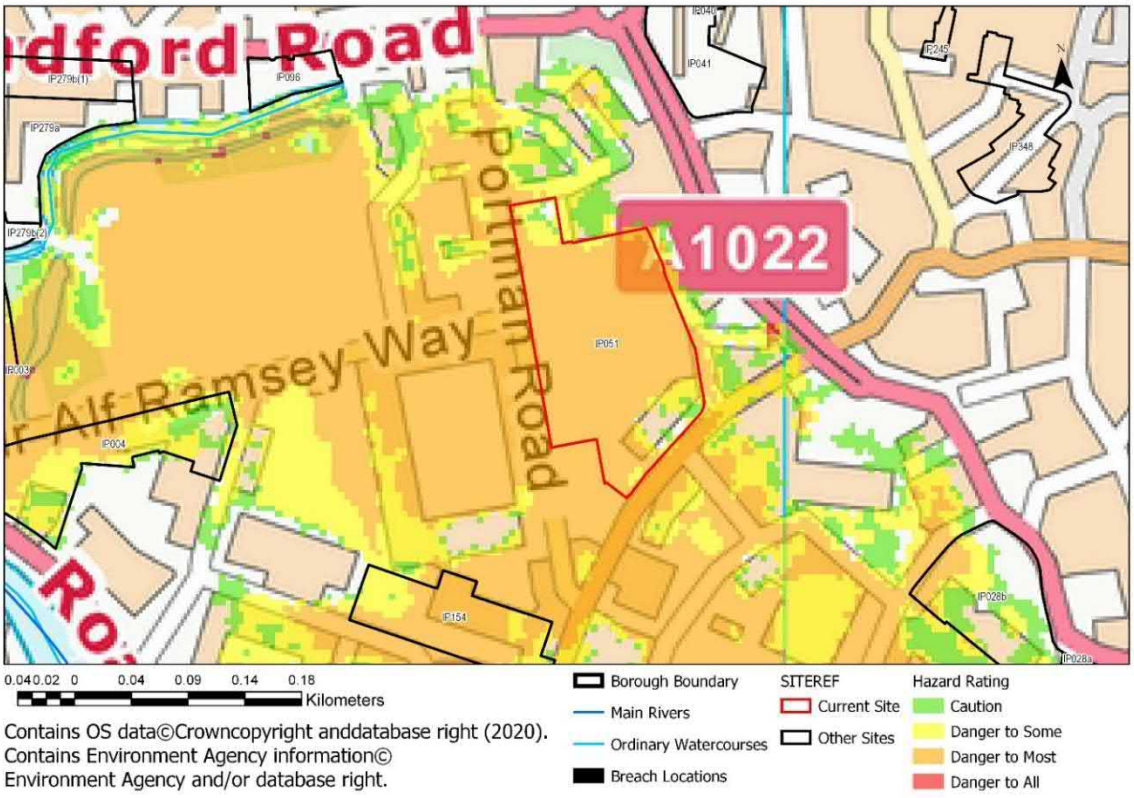
Site Name: Old Cattle Market site, Portman Road (South)

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Flood hazard mapping shows most of the site to be located in an area classified as Significant 'danger to most'. Flood depth mapping shows most of the site to be located within an area which could experience flood depths of approximately 1.25m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)

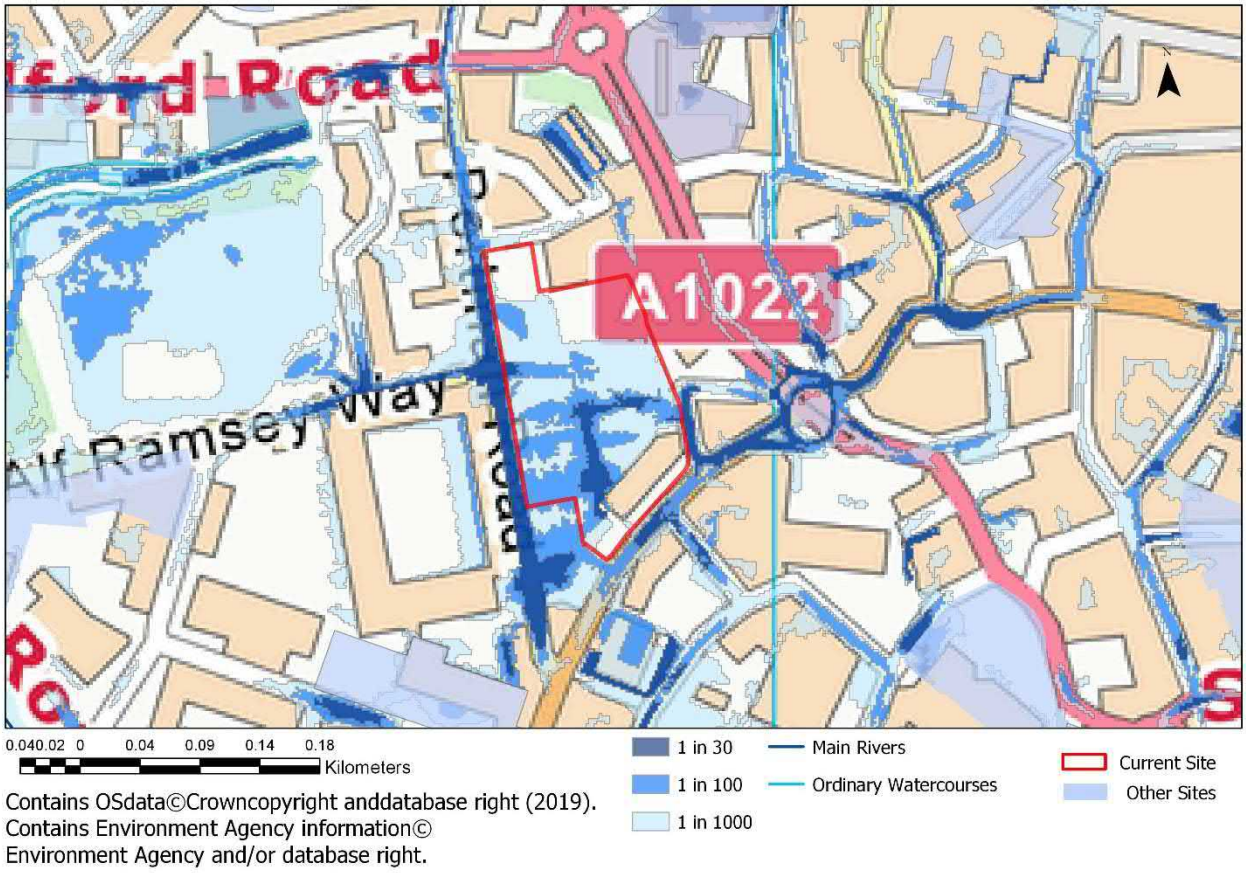


Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

Site Name: Old Cattle Market site, Portman Road (South)

Surface Water Flood Risk

The RoFSW mapping identifies there is a high risk of surface water flooding to the site and the surrounding area. Portman Road is shown to be a noticeable surface water flow path and area susceptible to surface water ponding.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence.
The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

A small area of the site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change. The site and surrounding area are shown to be at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 2.67m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the south along Great Gipping Street and Portman Road to the north, or Princes Street to the south east.

In the event of a failure of the tidal flood defences, the preferable access/egress for the site may be from the eastern side and onto Princes Street heading east. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

Site Name: Old Cattle Market site, Portman Road (South)

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Sewer flooding from the trunk combined sewer at Friars Bridge Road may increase the areas shown to be at risk of surface water flooding in this location. The risk of sewer flooding should be considered when preparing the drainage strategy for the site.

Additional Information

Raising the site and providing an off-site safe access road to Civic Drive will improve the safety of the site. Raised areas should include the redevelopment of existing vulnerable housing to the north of the site.

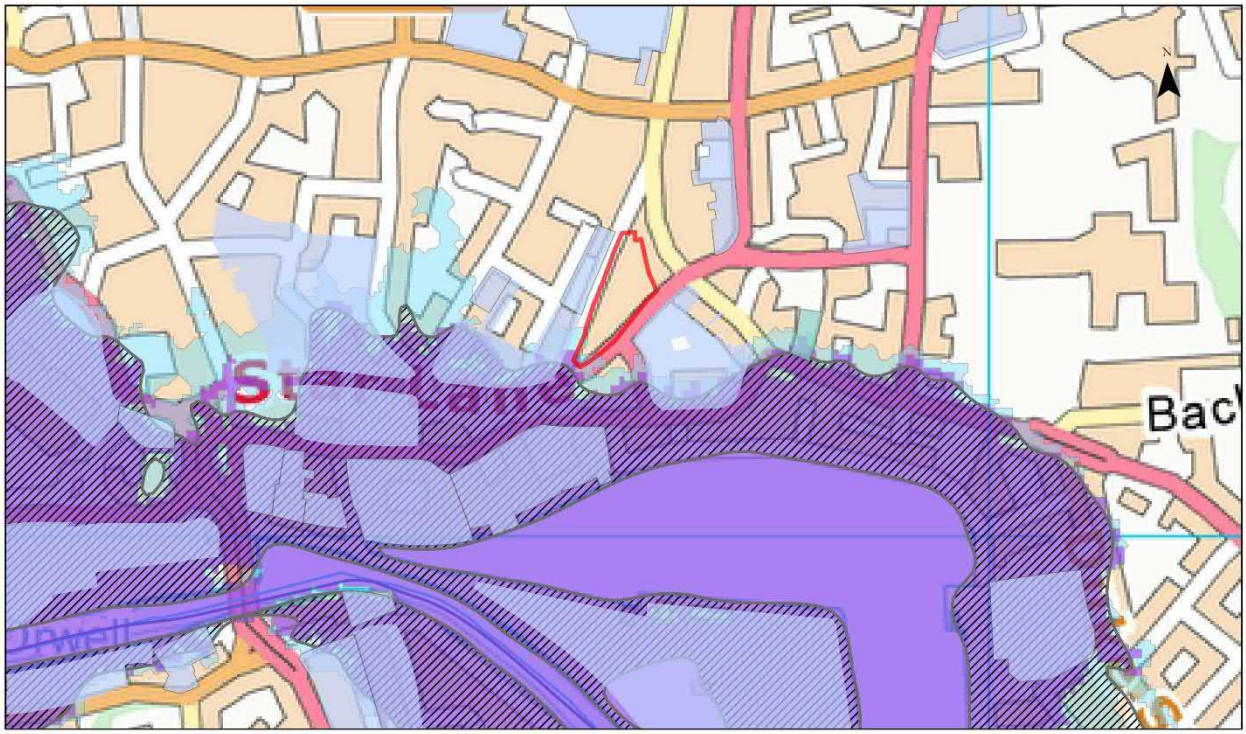
Site Name: Land between Lower Orwell Street and Star Lane					
Site ID:	IP052	**Location:**	Land between Lower Orwell Street & Star Lane	**Area (ha):**	0.39
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 94%	**Flood Zone 2 (0.1% AEP):** 5%	**Flood Zone 3 (1% AEP):** 1%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 0%

The tidal River Orwell is located approximately 250m to the south of the site. The southern edge of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of tidal flooding, in the event of a failure of these defences.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953.



Fluvial Flood Risk – Lower Gipping

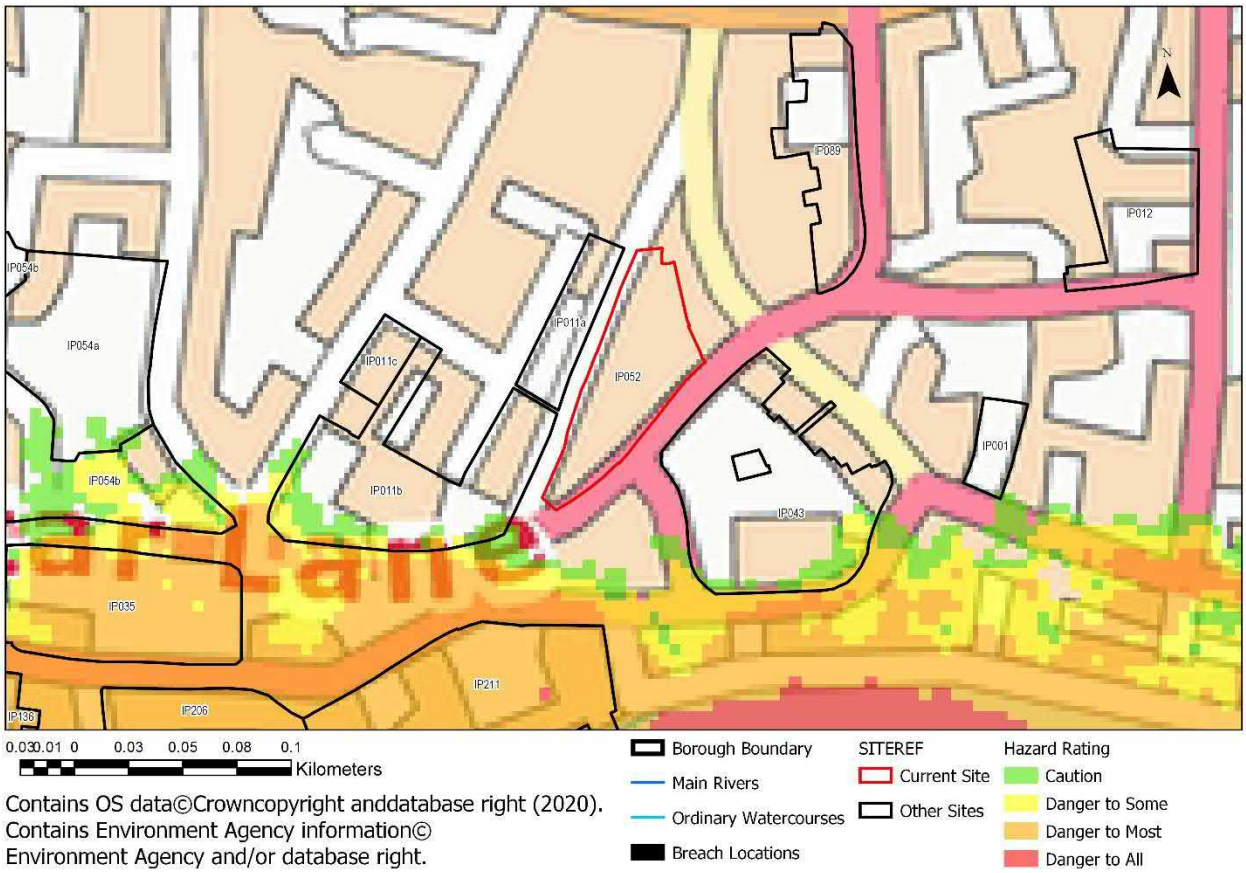
The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: Land between Lower Orwell Street and Star Lane

Tidal Flood Risk – River Orwell

The site is located largely within Flood Zone 1 and falls outside of any breach modelling inundation areas. The site is therefore not at residual risk of tidal flooding from the breach events modelled.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118



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Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

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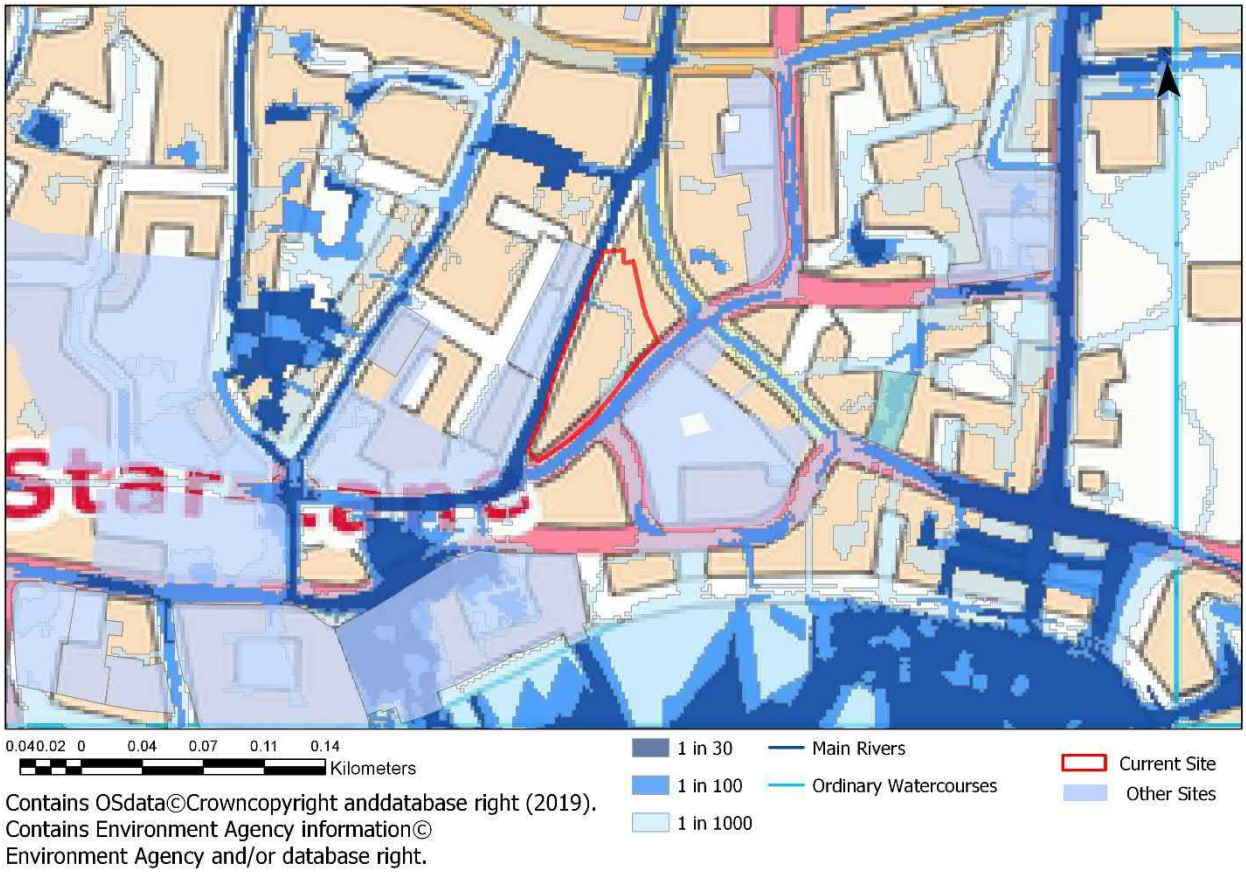
Site Name: Land between Lower Orwell Street and Star Lane

Surface Water Flood Risk

The RoFSW mapping shows that the site is at low risk of flooding from surface water, however, the roads serving the site are at high risk of overland flow and flooding.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.
The underling geology in this location is Lambeth Group which is permeable however, due to the high groundwater flood risk it is unlikely that infiltration techniques will be viable. The risk of groundwater flooding and use of infiltration SUDS in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site is not at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the high risk of surface water flooding in the area immediately surrounding the site and the potential flowpath through the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Access / Egress

In the event of flooding, safe access and egress away from the site would be to the north along Lower Orwell Street.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Site Name: Land between Old Cattle Market and Star Lane

Site ID:	IP54b	**Location:**	Land between Old Cattle Market and Star Lane	**Area (ha):**	1.09
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

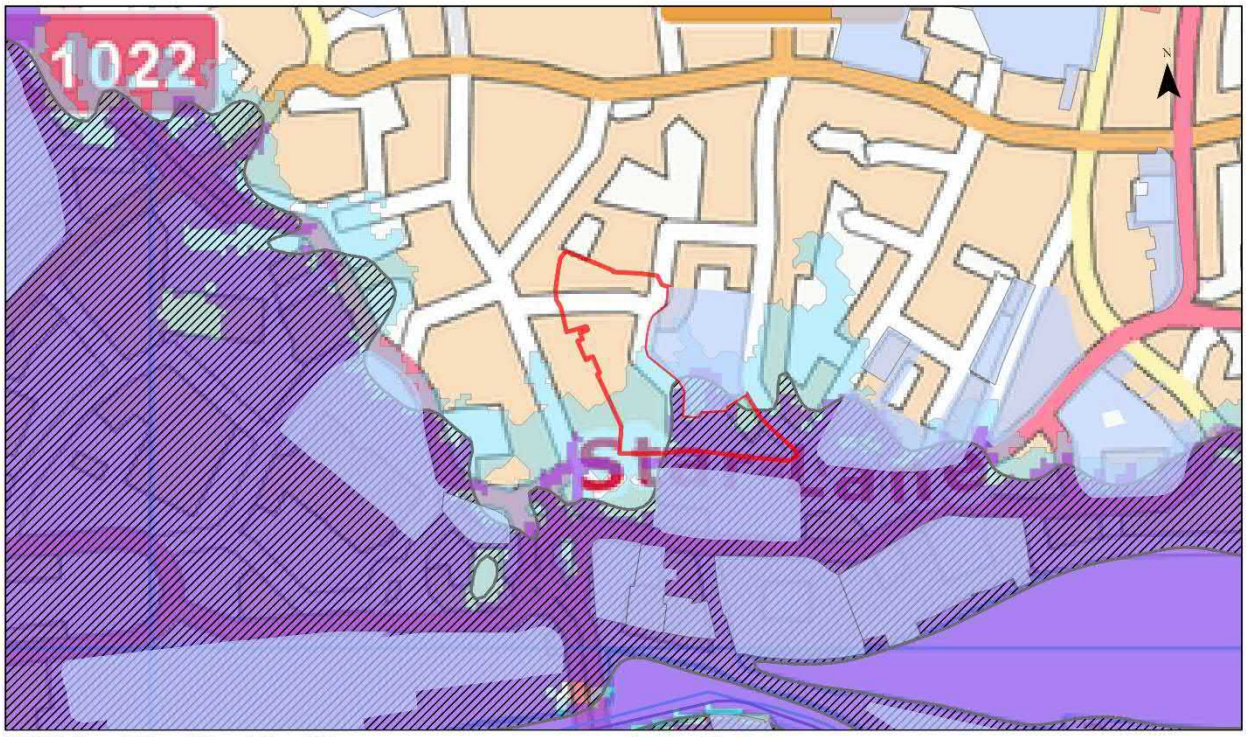
Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 48%	**Flood Zone 2 (0.1% AEP):** 29%	**Flood Zone 3 (1% AEP):** 23%	**Flood Zone 3b (5% AEP): 0**%	**Area Benefiting from Defences:** 27%

As it flows through Ipswich, the River Gipping becomes the River Orwell. The south eastern corner of the site is identified as Flood Zone 2 and 3, being medium and high probability of flooding from the Gipping / Orwell, in the absence of flood defences. The remainder of the site (just under half) resides in Flood Zone 1.

The site benefits from the presence of defences; there are embankments and flood defence walls along the edge of the River Orwell channel, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953 which is recorded on the Environment Agency Historic Flood Map.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

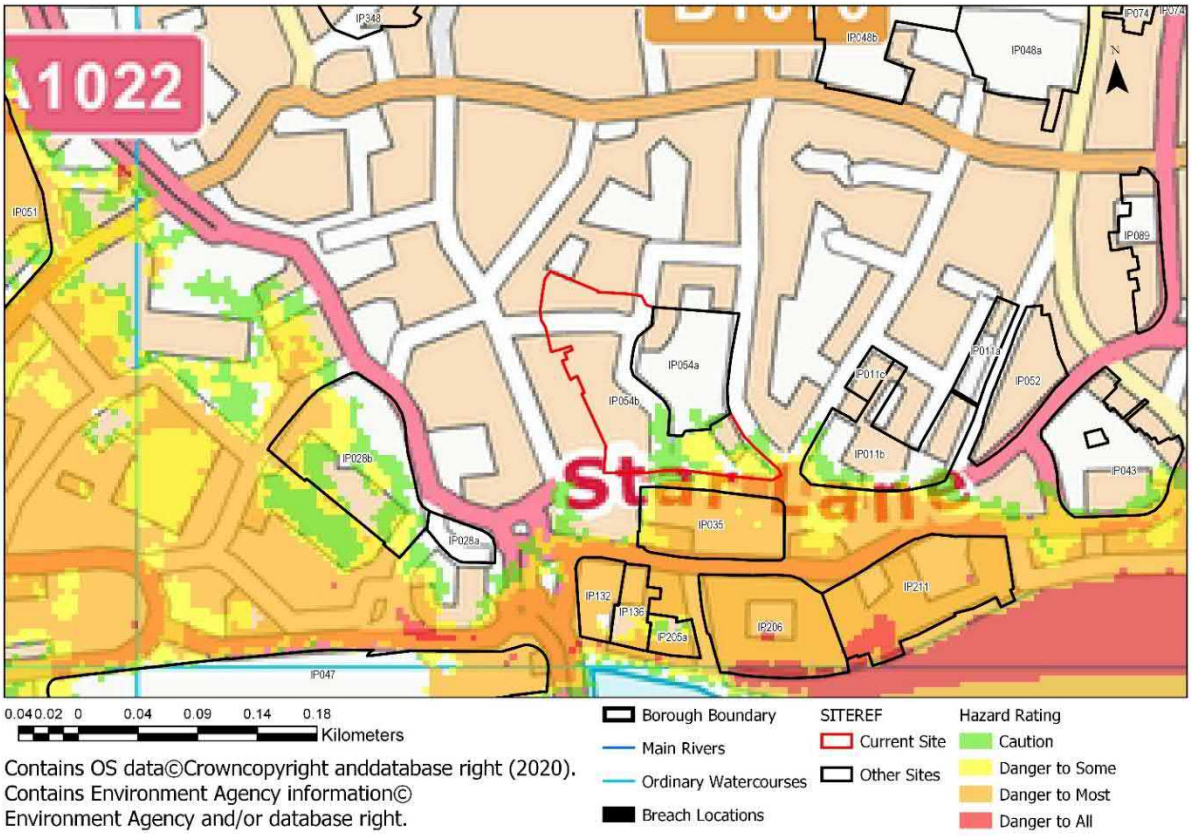
Site Name: Land between Old Cattle Market and Star Lane

Tidal Flood Risk – River Orwell

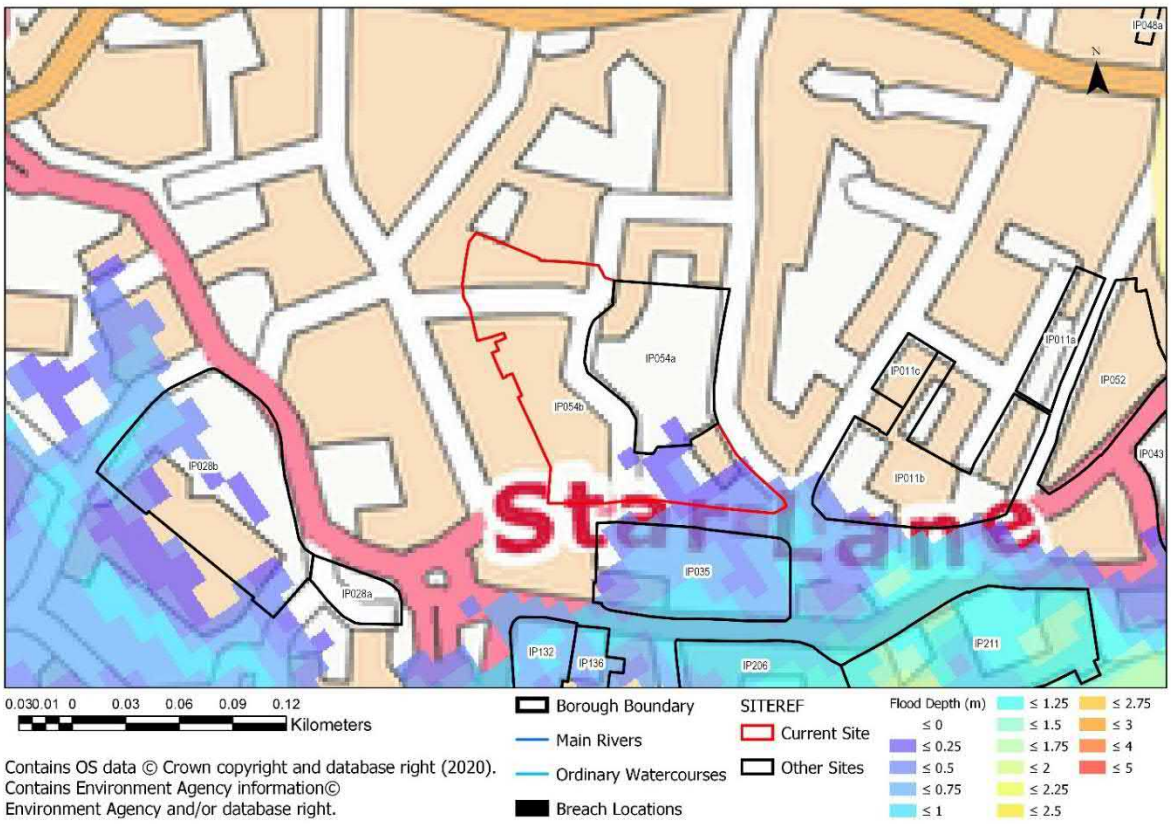
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, tidal flood water from the River Orwell reaches the southern tip of the site creating a small area of Moderate hazard (Danger to Some) and Low hazard (Caution). The southern section of the site is shown to flood to depths of up to 0.5m.

Residual Flood Risk –Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

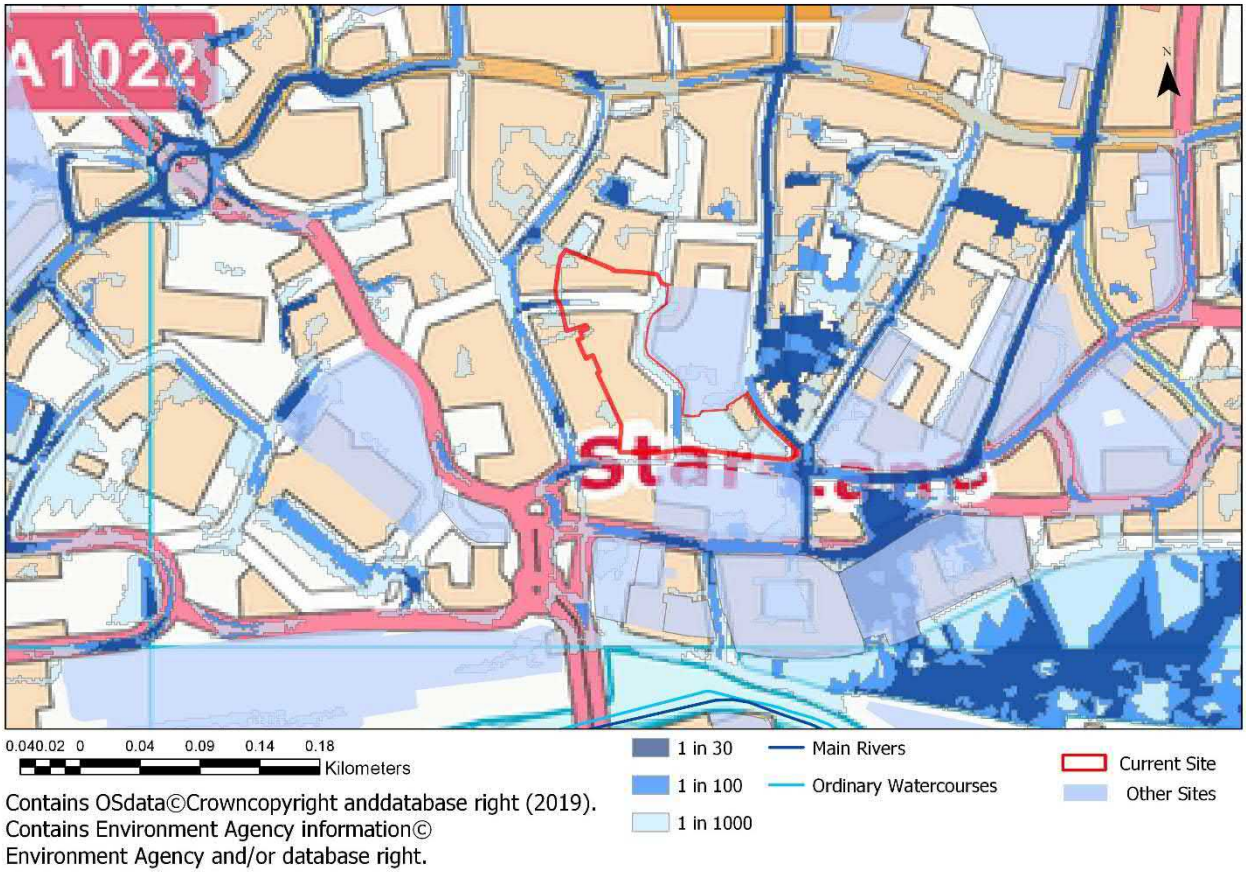


Site Name: Land between Old Cattle Market and Star Lane

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the south-eastern section of the site is susceptible to low risk of flooding from surface water. The surface water flow pathway of low risk arises from Site IP054a and the surrounding roads and flow towards site IP054b.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.
The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 – 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable from the northern side of the site along Rose Lane / St Peter's Street. The route along Star Lane is shown to be flooded, at Significant hazard (Danger for Most), and would therefore not offer a dry route.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Land between Old Cattle Market and Star Lane

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation storage is the most likely SuDS for the site.

Additional Information

Flood risk reduction may be possible by reducing peak flow to the local sewer network by providing on site attenuation using SuDS.

The site is slopping and 50% is above 4.5m AOD. Raising lower parts of the site and providing safe access to the north will increase the site safety.

Site Name: Transco, south of Patteson Road					
Site ID:	IP098	**Location:**	Transco, south of Patteson Road	**Area (ha):**	0.57
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP): 47**%	**Flood Zone 3 (1% AEP): 53**%	**Flood Zone 3b (5% AEP): 0**%	**Area Benefiting from Defences: 80**%

Flood Zones and Flood Defences

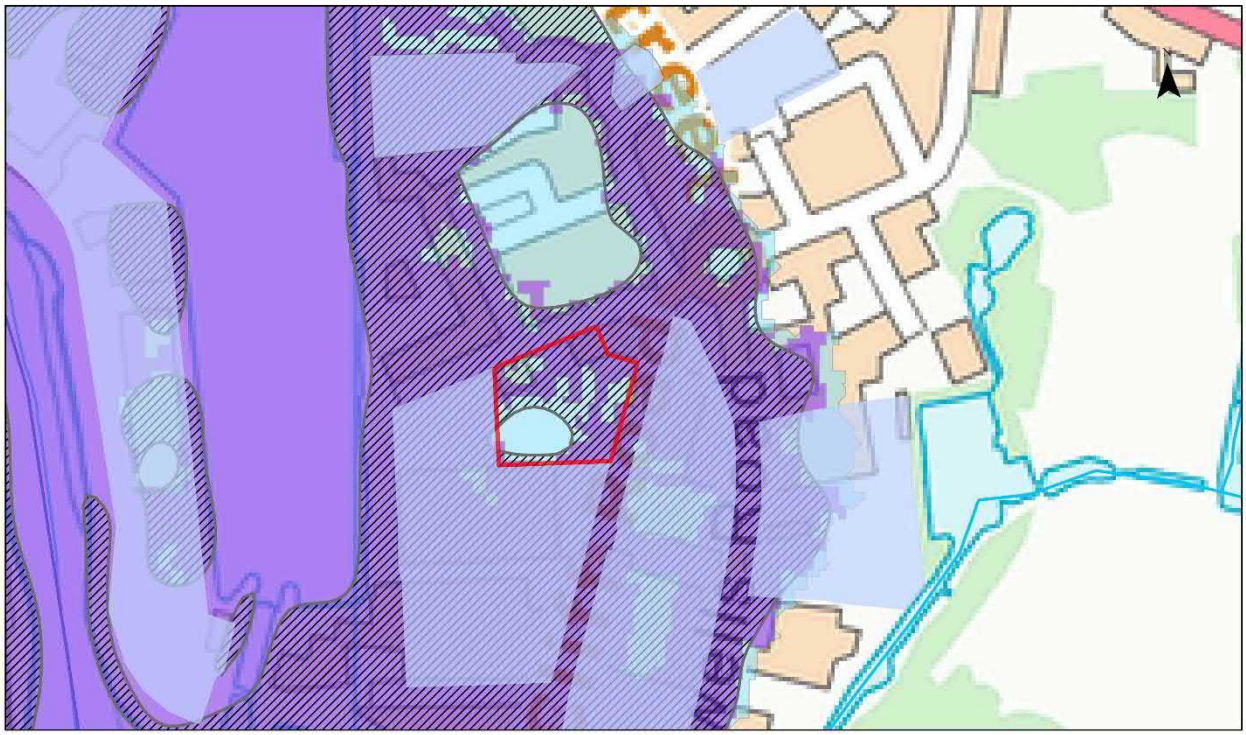
The tidal River Orwell is located approximately 80m to the west of the site. The majority if the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the west of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of tidal flooding, in the event of a failure of these defences.

Climate Change

Modelling of the River Orwell shows that water remains in bank in this location during the 0.5% AEP event including an allowance for climate change i.e. there is no overtopping of defences in this scenario. (These modelled scenarios take account of the presence of defences).

Historic Records

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents on Holywells Road adjacent to this location.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

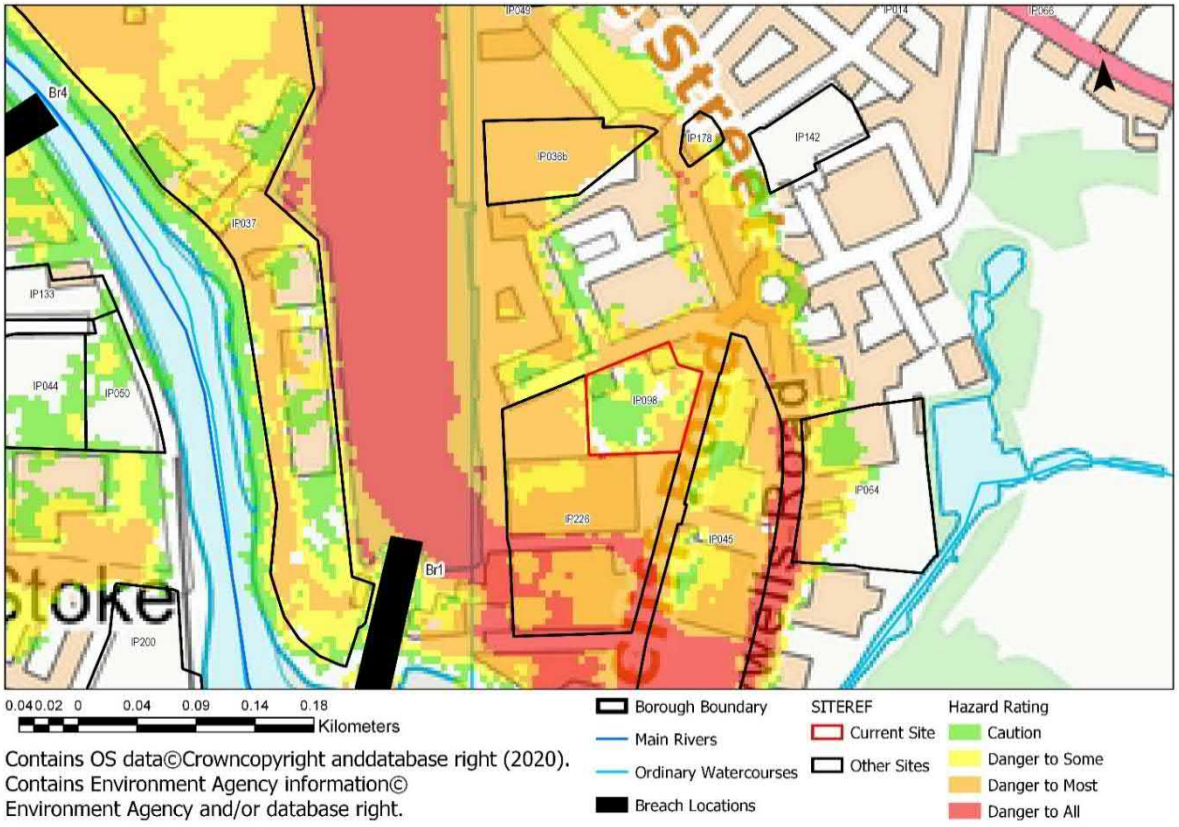
Site Name: Transco, south of Patteson Road

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 (local to the site) and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, potential hazard ratings on the site are Low – Significant, with flood depths up to 0.75m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

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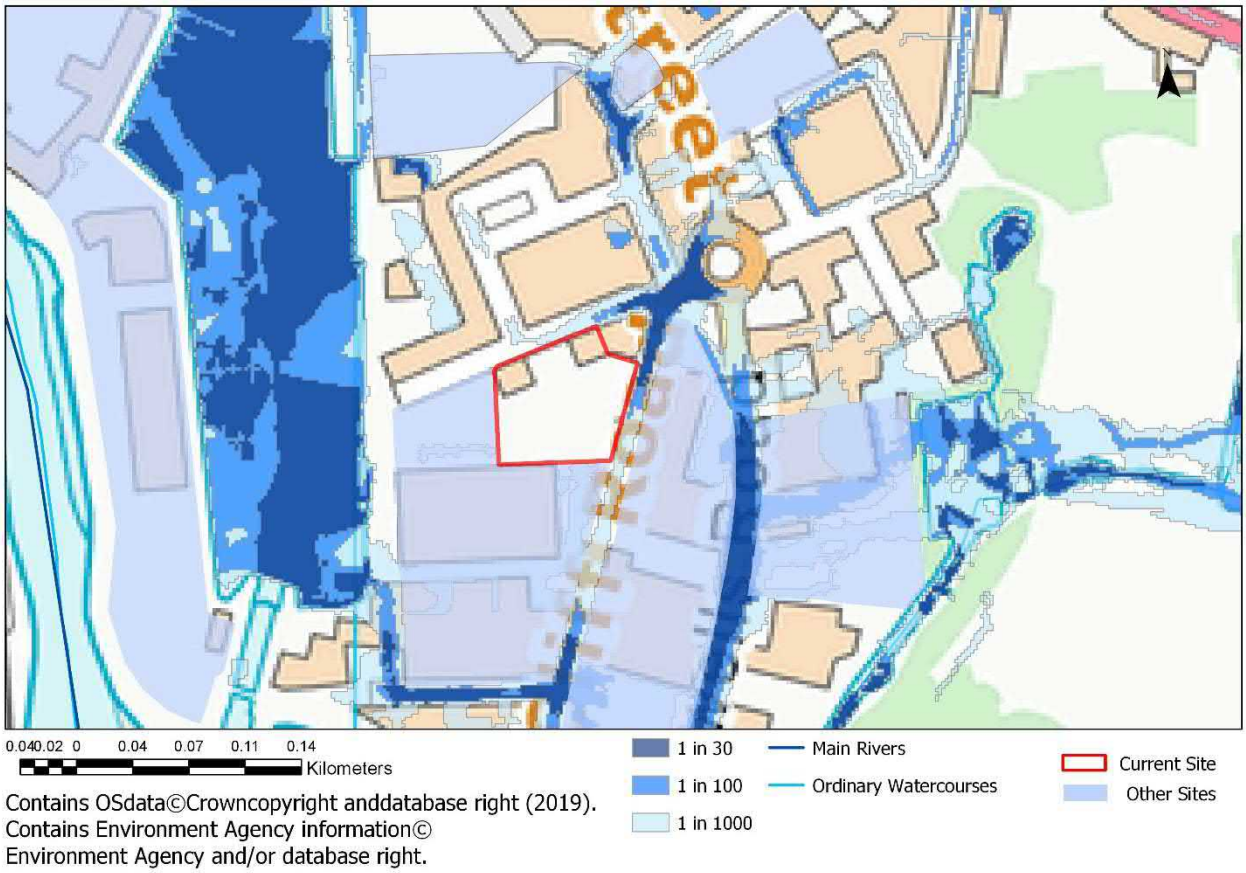
Site Name: Transco, south of Patteson Road

Surface Water Flood Risk

The RoFSW mapping shows that the site is at low risk of surface water flooding, however, the roads serving the site are susceptible to overland flow and ponding.



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Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence.
The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in this part of compartment H, close to Breach 05 is 4.1 – 5.3m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, access/egress routes along Cliff Road towards Myrtle Road roundabout may have a potential hazard rating of up to Significant ("Danger for most"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Transco, south of Patteson Road

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

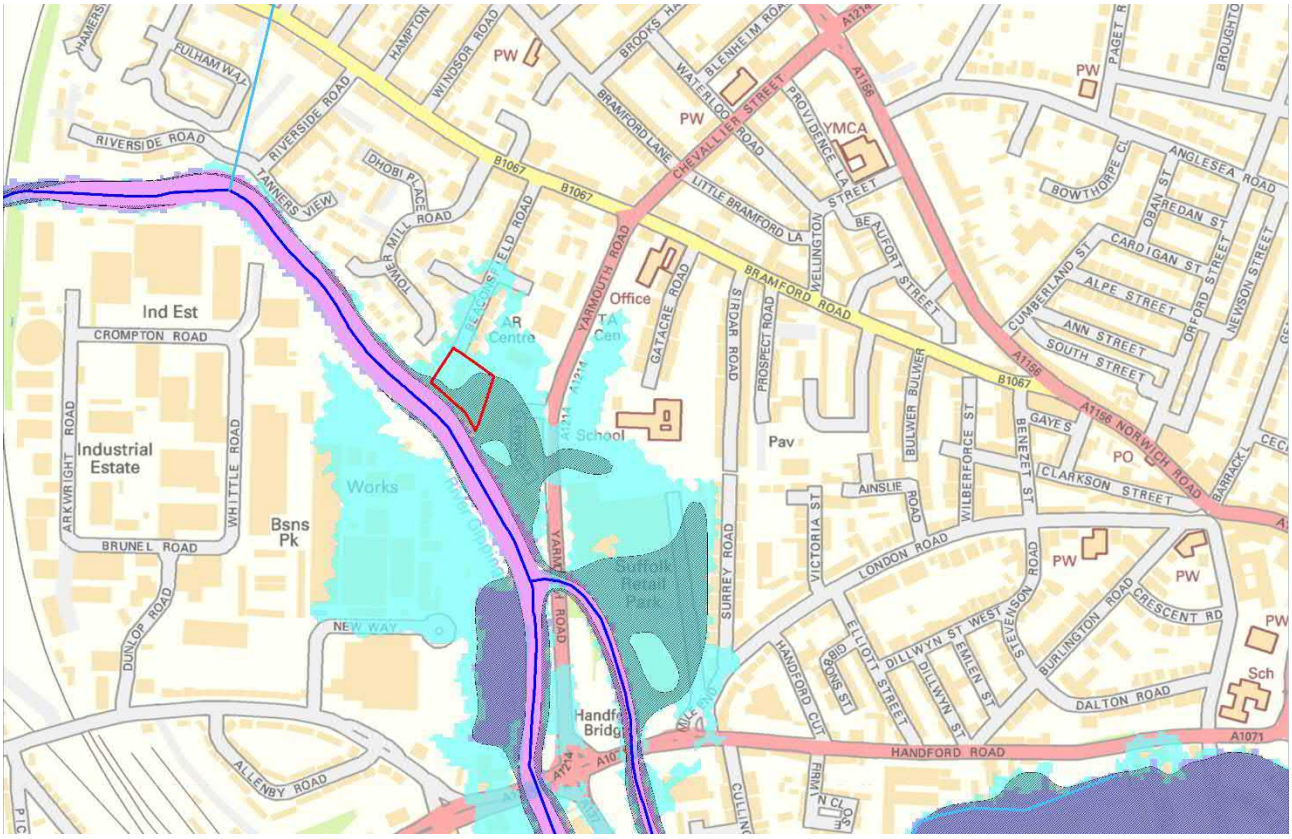
Site Name: Depot, Beaconsfield Road					
Site ID:	IP0105	**Location:**	Depot, Beaconsfield Road	**Area (ha):**	0.33
Current Use:	Light industrial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 100%	**Flood Zone 3 (1% AEP):** 0%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 56%

The River Gipping passes along the southwestern edge of the site. At this location the River Gipping is not tidally influenced.

The site is located within Flood Zone 2, medium probability of flooding. The southern part of the site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the east of the site.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents in this location associated with surface water and highway flooding.



Site Name: Depot, Beaconsfield Road

Fluvial Flood Risk – Lower Gipping

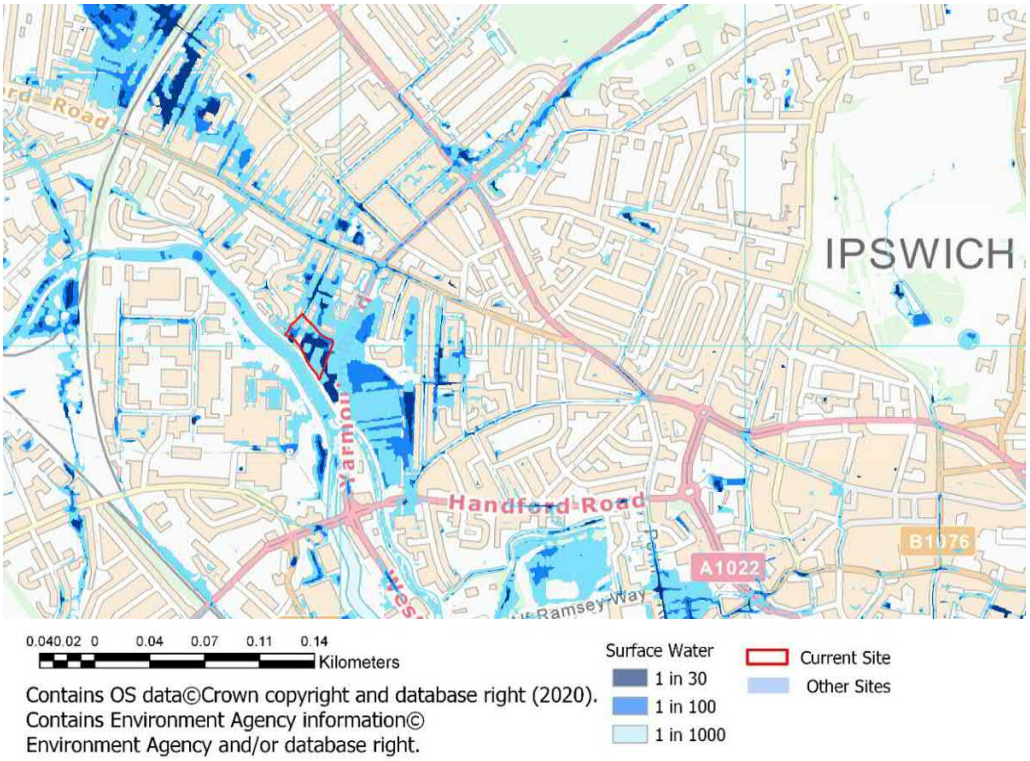
Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events and there is no risk of flooding. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences.

The results of the modelling show that the site does not flood during the fluvial design flood (1% AEP event) including a 65% allowance for climate change. However, there is a risk of flooding during the extreme flood (0.1% AEP event including 25% allowance for climate change), with flood levels of 4.85m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

Site Name: Depot, Beaconsfield Road

Surface Water Flood Risk

The site is located within an area at risk of surface water flooding. The roads in the surrounding area are susceptible to overland flow and ponding.



0.040.02 0 0.04 0.07 0.11 0.14 Kilometers

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Surface Water
1 in 30
1 in 100
1 in 1000

Current Site
Other Sites

Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from reservoir flooding.

Site Specific Recommendations

The site is shown to be at actual risk of fluvial flooding from the Lower Gipping in the future as a result of climate change during the extreme flood (0.1% AEP including 25% climate change). The following measures are recommended to manage the actual risk of fluvial flooding in the future.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level for the River Gipping, which is 4.85m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Set-back Distance

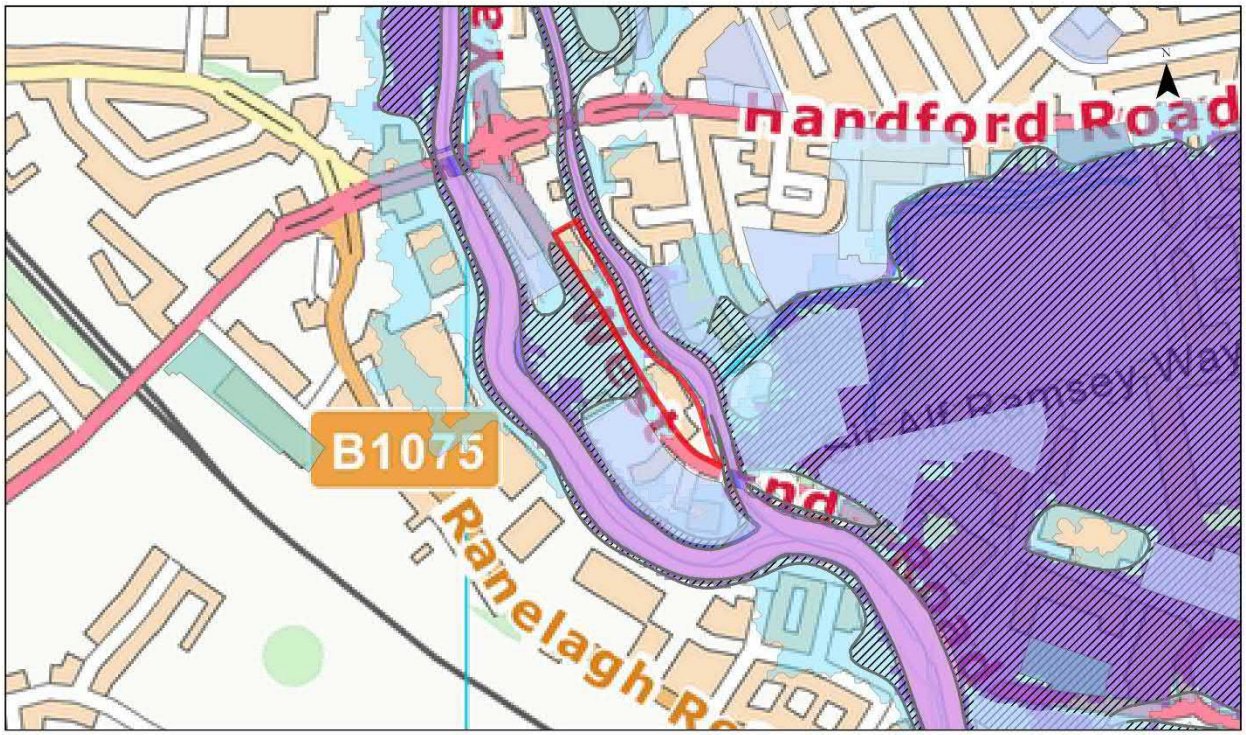
All development should be set back from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Name: Land east of West End Road					
Site ID:	IP119	**Location:**	Land east of West End Road	**Area (ha):**	0.61
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding				
Flood Zone 1 (<0.1% AEP): 54%	**Flood Zone 2 (0.1% AEP):** 42%	**Flood Zone 3 (1% AEP):** 4%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 3%

The site is located adjacent to the River Gipping. The western part of the site (42%) is identified as Flood Zone 2, medium probability of flooding. A small part of the site along the eastern site boundary is located in Flood Zone 3 which is considered to be high probability of flooding.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1939. Ipswich BC also hold records of flood incidents on West End Road which is adjacent to the site.



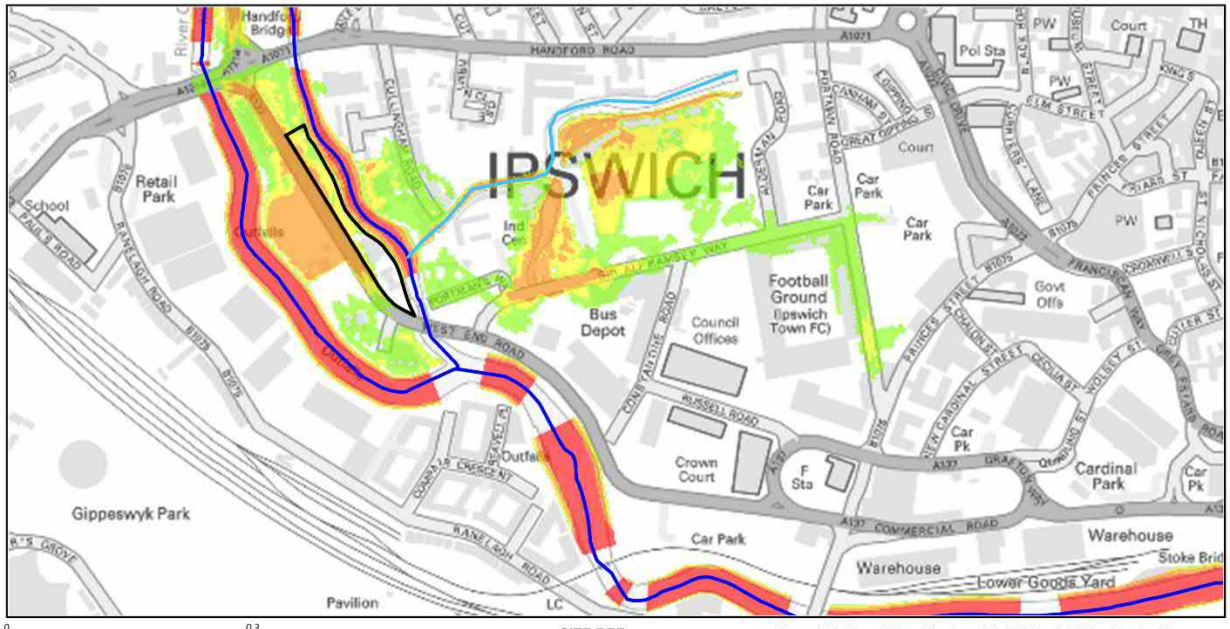
Site Name: Land east of West End Road

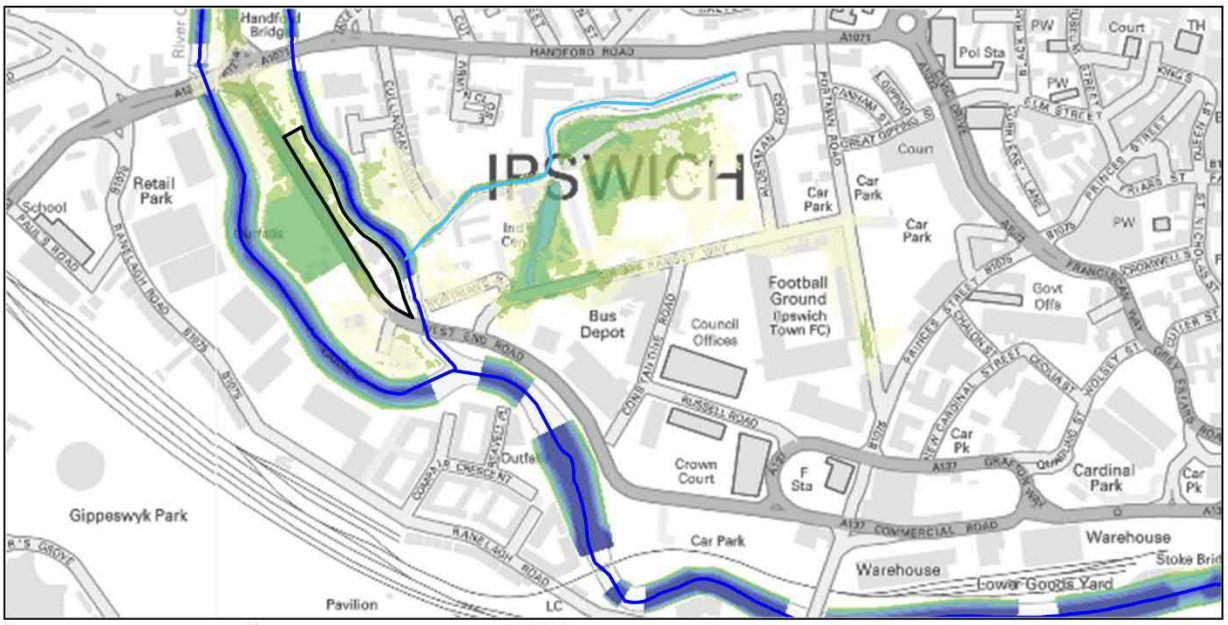
Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences.

In this scenario, there is shown to be a risk of flooding during the 1% AEP design event including a 65% allowance for climate change, with flood levels of 4.82m AOD on the site. The site and adjacent road (West End Road) are shown to flood, with depths of up to 1m and a hazard rating of Moderate – Significant.

The site is also shown to be at risk during the 0.1% AEP extreme flood event including 25% allowance for climate change, with a flood level of 4.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.





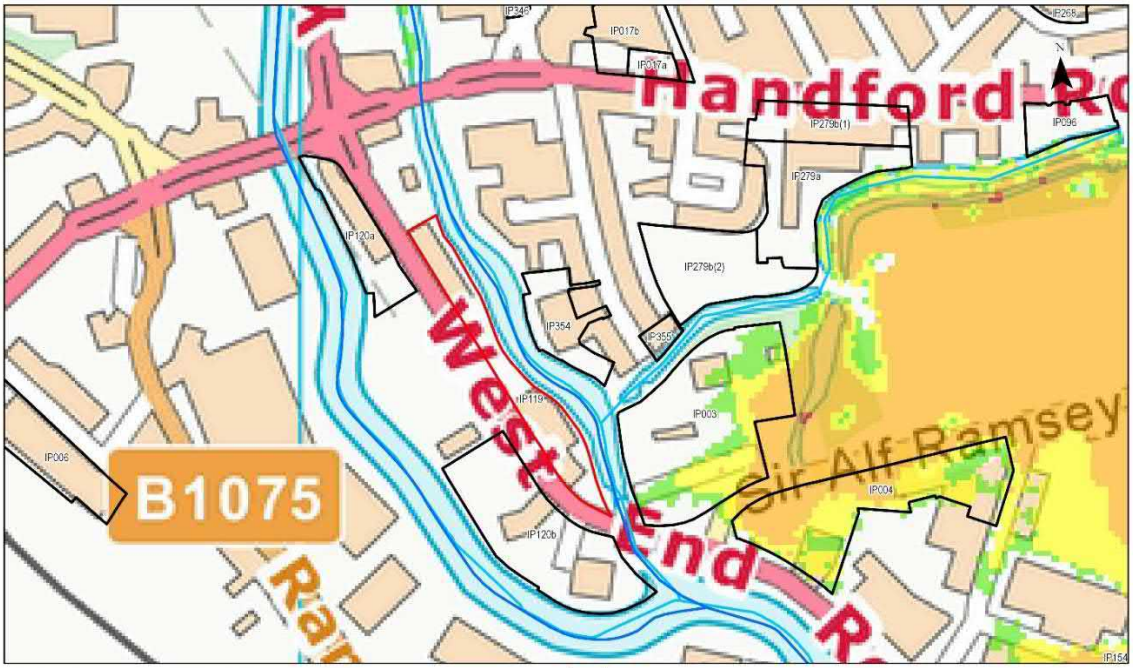
Site Name: Land east of West End Road

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Hazard mapping in this scenario shows that the site is not at risk. This is because the breaches are a reasonable distance to the south.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



0.04 0.02 0 0.04 0.09 0.14 0.18 Kilometers

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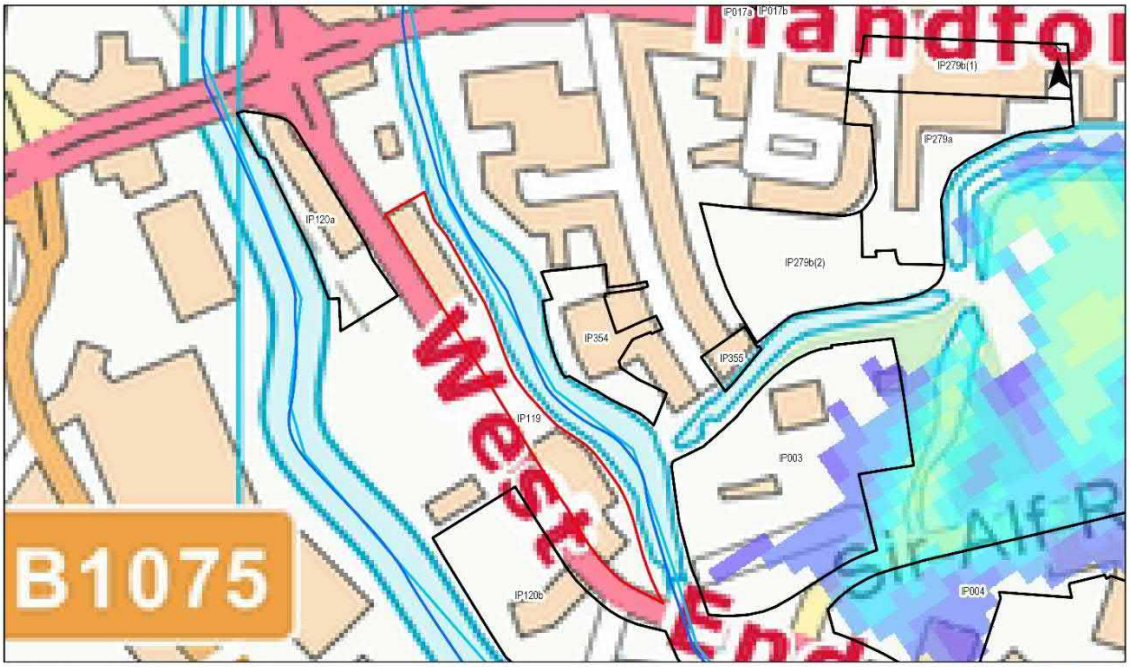
Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

Hazard Rating
Caution
Danger to Some
Danger to Most
Danger to All

Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



0.03 0.01 0 0.03 0.06 0.09 0.12 Kilometers

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Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

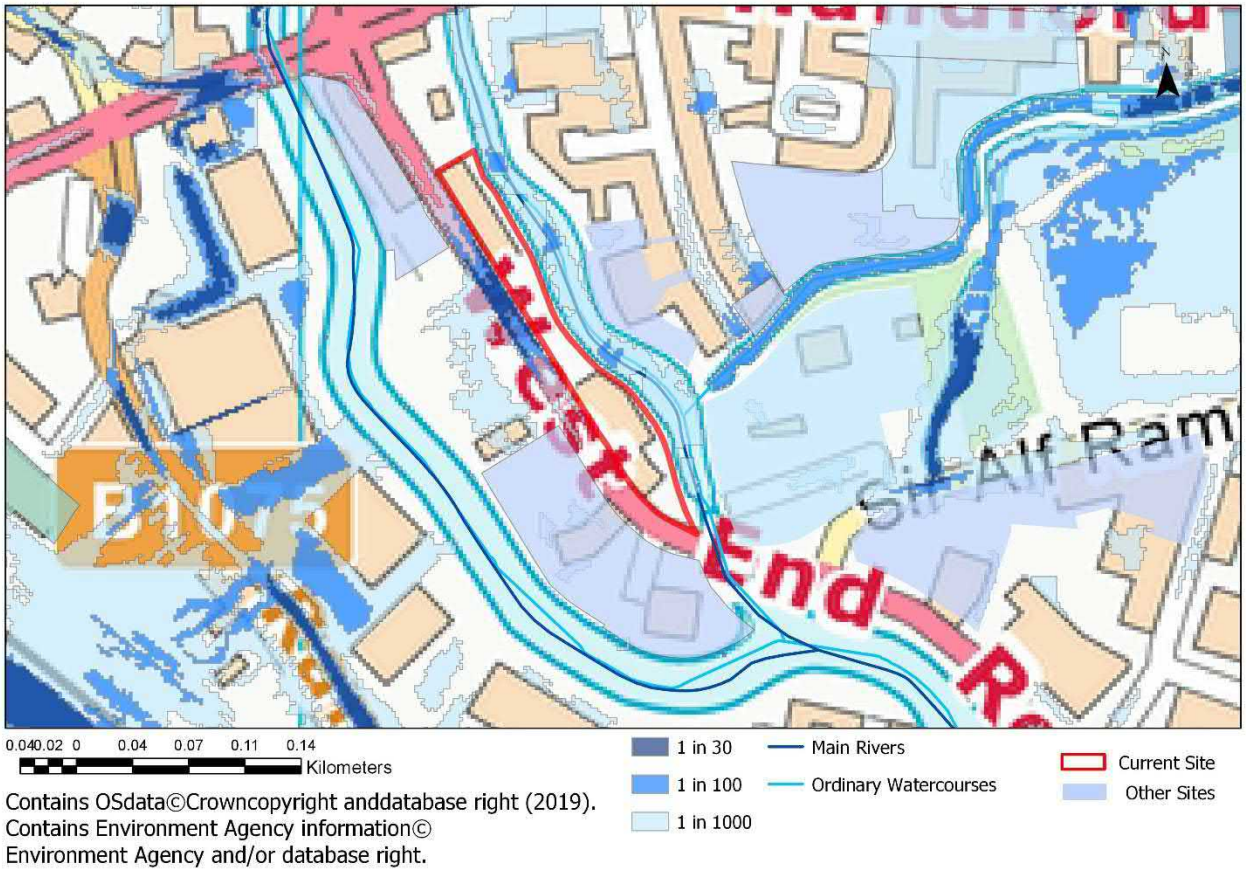
SITEREF
Current Site
Other Sites

Flood Depth (m)
≤ 0
≤ 0.25
≤ 0.5
≤ 0.75
≤ 1
≤ 1.25
≤ 1.5
≤ 1.75
≤ 2
≤ 2.25
≤ 2.5
≤ 2.75
≤ 3
≤ 4
≤ 5

Site Name: Land east of West End Road

Surface Water Flood Risk

The RoFSW mapping shows that the site is not at risk from surface water flooding. However, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change. The following measures are recommended to manage and mitigate the actual risk of fluvial flooding in the future.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 4.82m AOD on the site.

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) the section of West End Road immediately adjacent to the site is shown to be at Significant hazard and therefore does not provide a suitable access/egress route. However, dry access/egress for the site is achievable to the south along West End Road.

There may also be potential to design a route into the site layout to the north of the site towards London Road / Handford Road. The use of a raised riverside pathway in the site design would enable a dry access route for people to be maintained without resulting in significant land take.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be

Site Name: Land east of West End Road

adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 4.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment I, peak flood level could be reached on site within 1 hour from the breach. Flood water could remain within the flood compartment for 24hrs.

Set-back Distance

All development should be set back from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

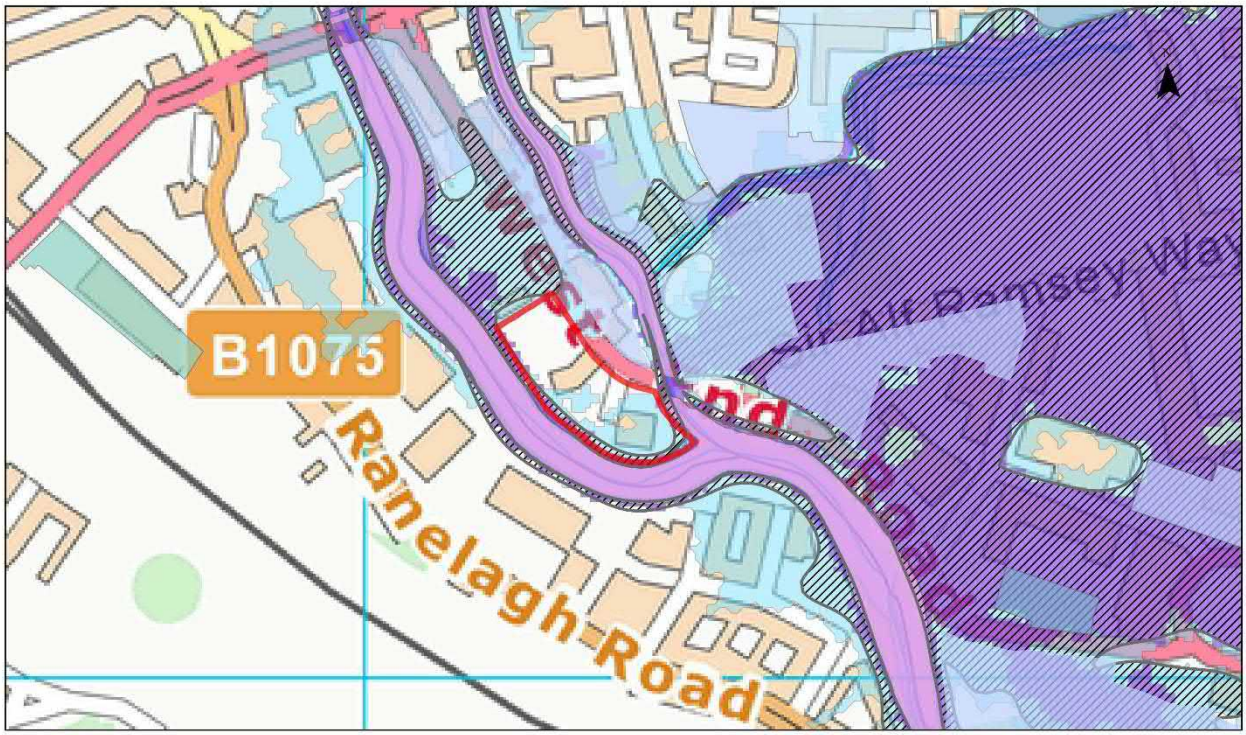
Site Name: Land west of West End Road					
Site ID:	IP120b	**Location:**	Land west of West End Road	**Area (ha):**	1.02
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding

Flood Zone 1 (<0.1% AEP): 52%	**Flood Zone 2 (0.1% AEP):** 39%	**Flood Zone 3 (1% AEP):** 8%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 11%

The site is located adjacent to the River Gipping close to where the fluvial River Gipping turns into the tidally influenced River Orwell. The majority of the site is identified in Flood Zone 1, low probability of flooding. A small part of the site (8%) is identified in Flood Zone 3, high probability of flooding.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1939 and 1953. Ipswich BC also hold records of flood incidents on West End Road which is adjacent to the site.



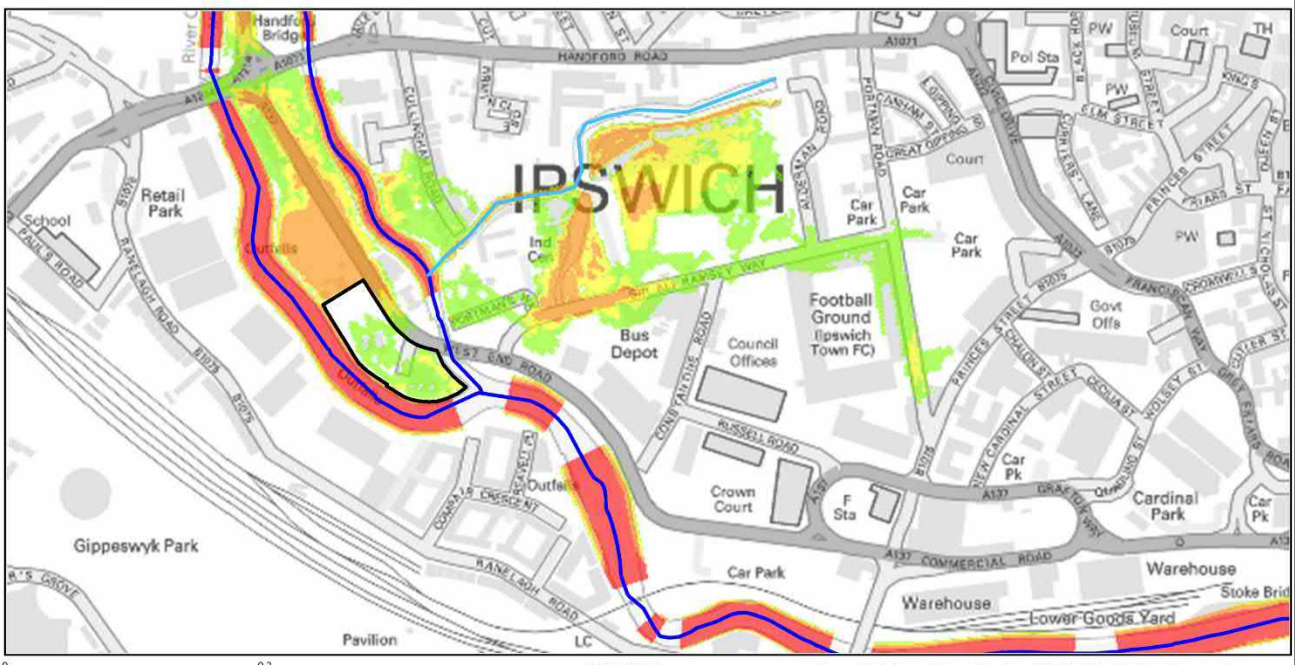
0.050.03 0 0.05 0.1 0.15 0.2 Kilometers

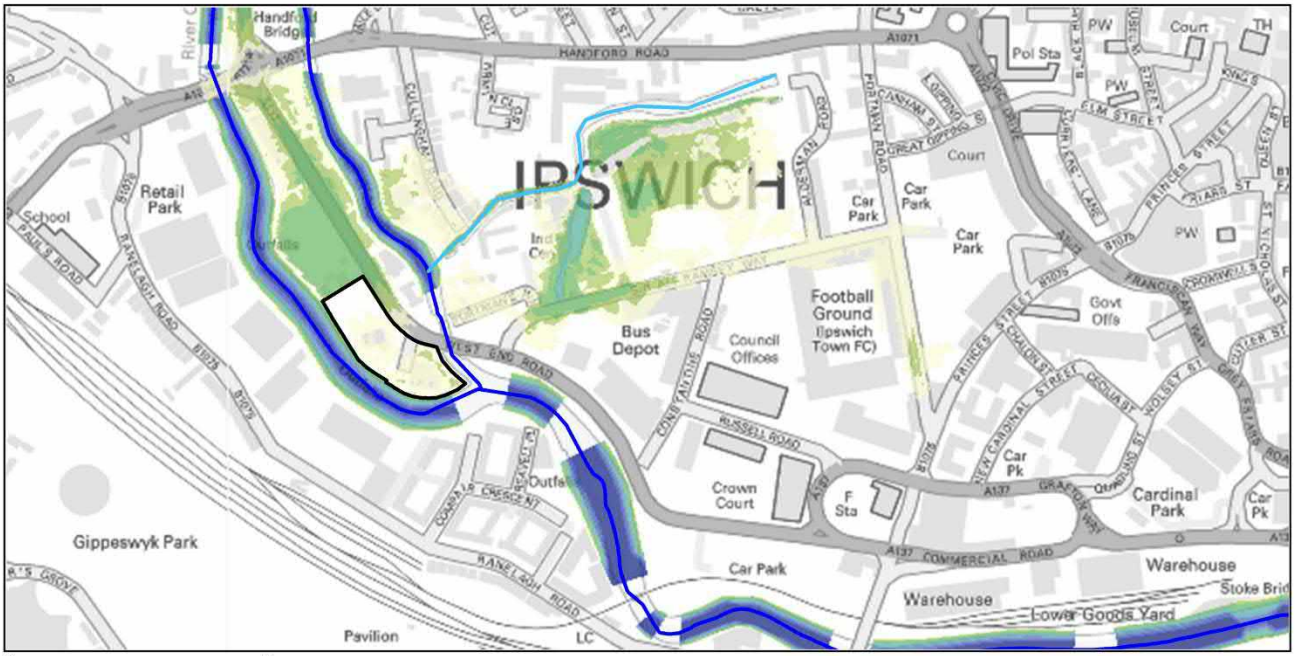
FZ 3b — Main Rivers — Current Site
FZ 3 — Ordinary Watercourses — Other Sites
FZ 2 — Areas Benefitting from Flood Defences

Site Name: Land west of West End Road

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, there is shown to be a risk of flooding during the 1% AEP event including a 65% allowance for climate change, with flood levels of 4.75m AOD on the site. The site is shown to flood with depths of up to 0.25m and a hazard rating of Low. The hazard rating for the area to the north including West End Road is Significant, with depths up to 1m. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 4.80m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.





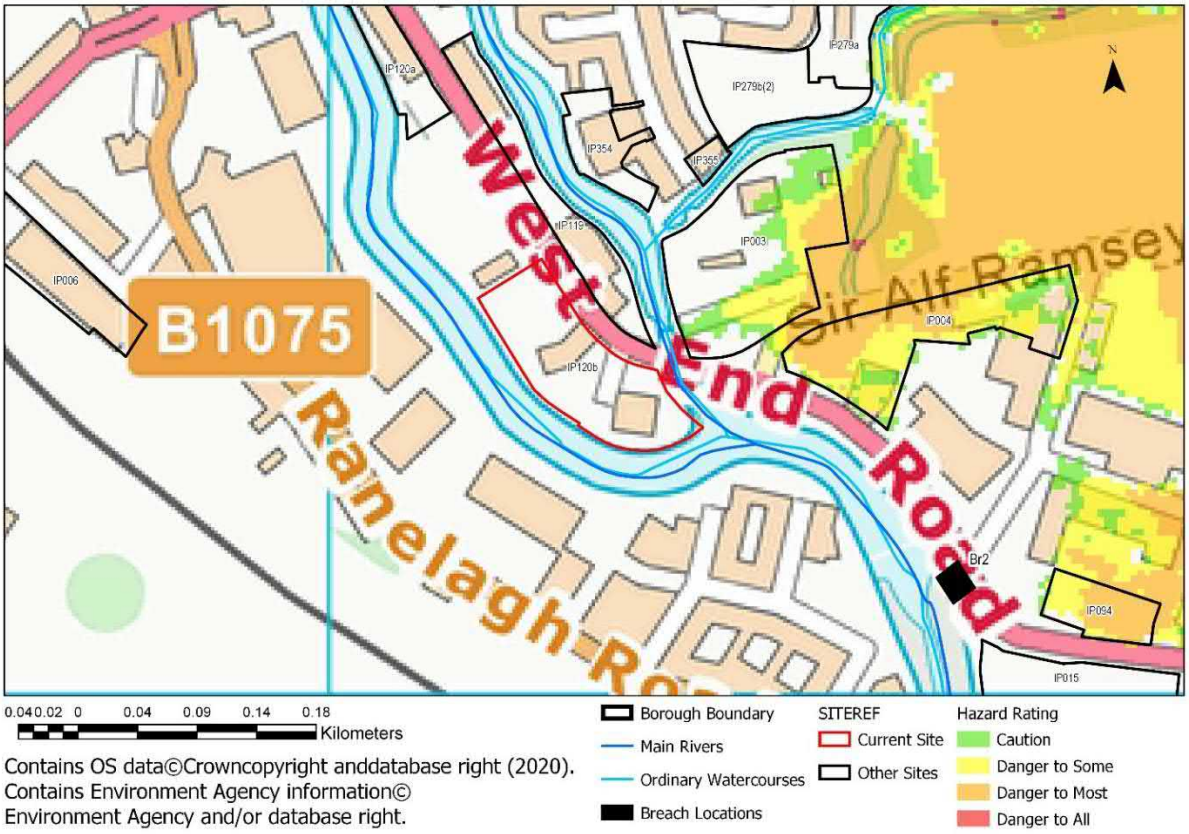
Site Name: Land west of West End Road

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Hazard mapping in this scenario shows that the site is not at risk. This is because the breaches are a reasonable distance to the south.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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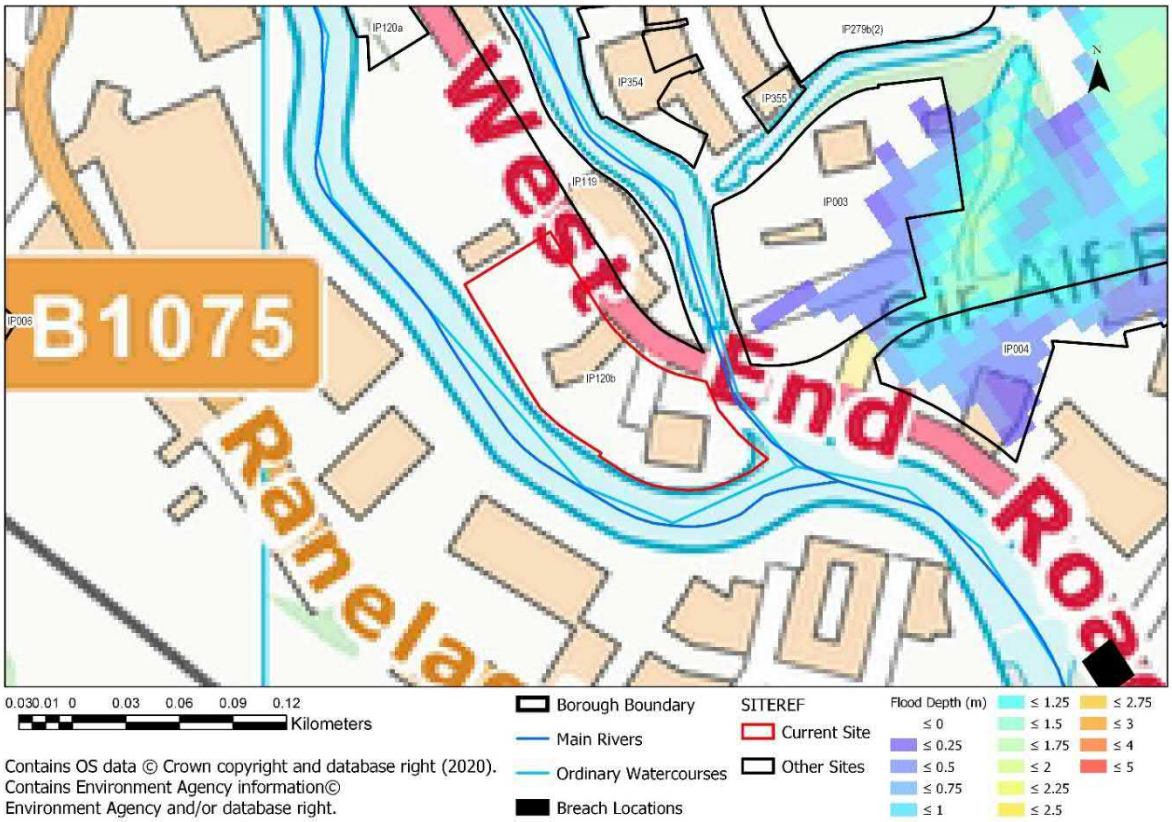
Residual Flood Risk – Combined Flood Depth (0,5% AEP, 2118)



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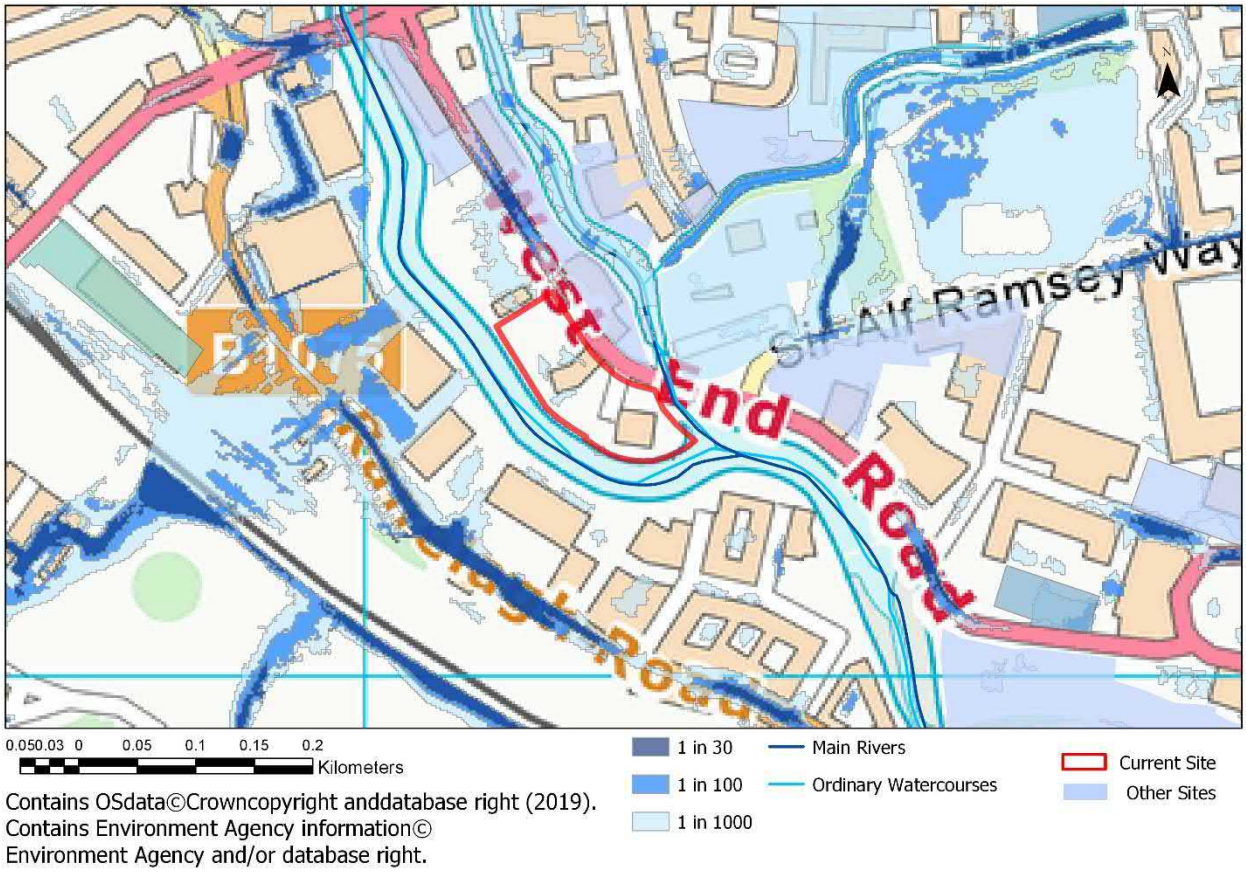
Site Name: Land west of West End Road

Surface Water Flood Risk

The RoFSW mapping shows that West End Road (in this area) is susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change. The following measures are recommended to manage and mitigate the actual risk of fluvial flooding in the future.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 4.75m AOD on the site.

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) the section of West End Road to the north of the site is shown to be at Significant hazard and therefore does not provide a suitable access/egress route. However, dry access/egress for the site is achievable to the south along West End Road.

There may also be potential to design a route into the site layout and the area to the north of the site towards London Road. The use of a raised riverside pathway along the western channel of the River Gipping/River Orwell would enable a dry access route for people to an area outside the Flood Zone.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

Site Name: Land west of West End Road

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 4.80m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment I, peak flood level could be reached on site within 1 hour from the breach. Flood water could remain within the flood compartment for 24hrs.

Set-back Distance

All development should be set back from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Site Name: Bridge Street, Northern Quays (west)

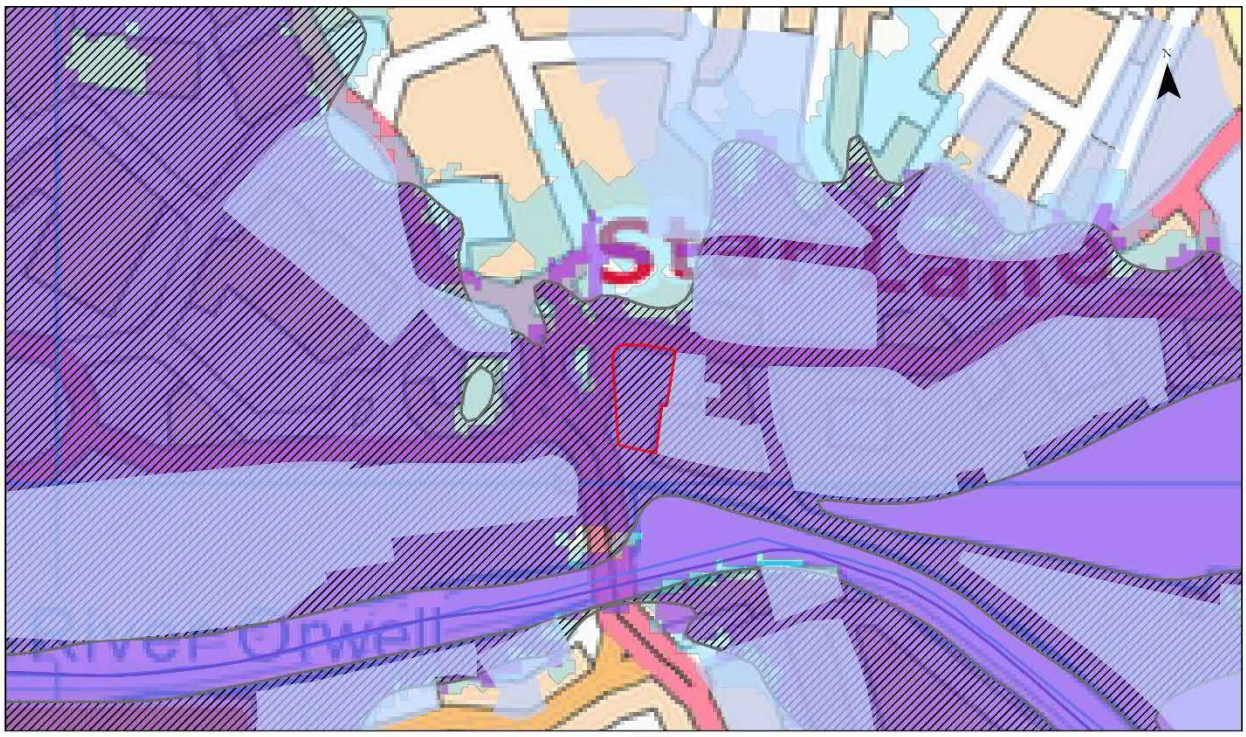
Site ID:	IP132	**Location:**	Bridge Street, Northern Quays (West)	**Area (ha):**	0.18
Current Use:	Unknown	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 100%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 100%

The tidal River Orwell lies approximately 30m to the south of the site. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC also hold records of flooding to the north of site where Vernon Street meets Bridge Street, associated with the surface water network being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

Site Name: Bridge Street, Northern Quays (west)

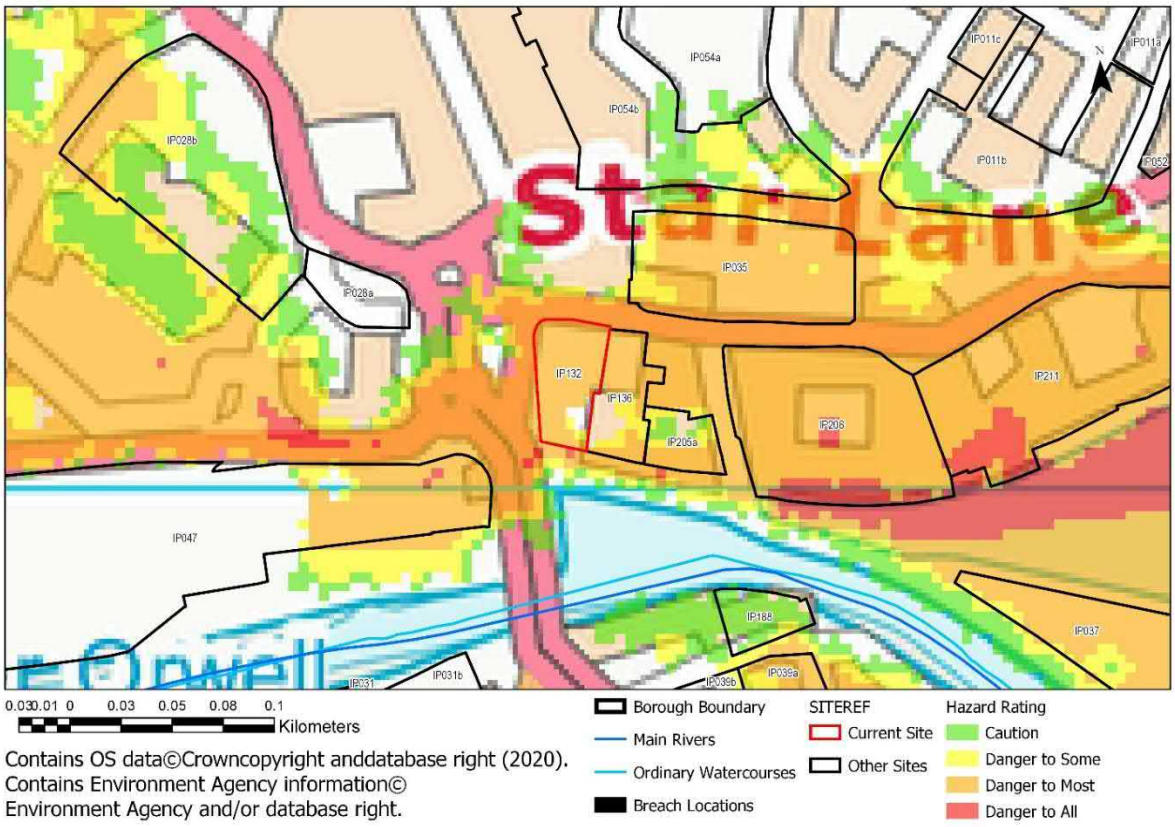
Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

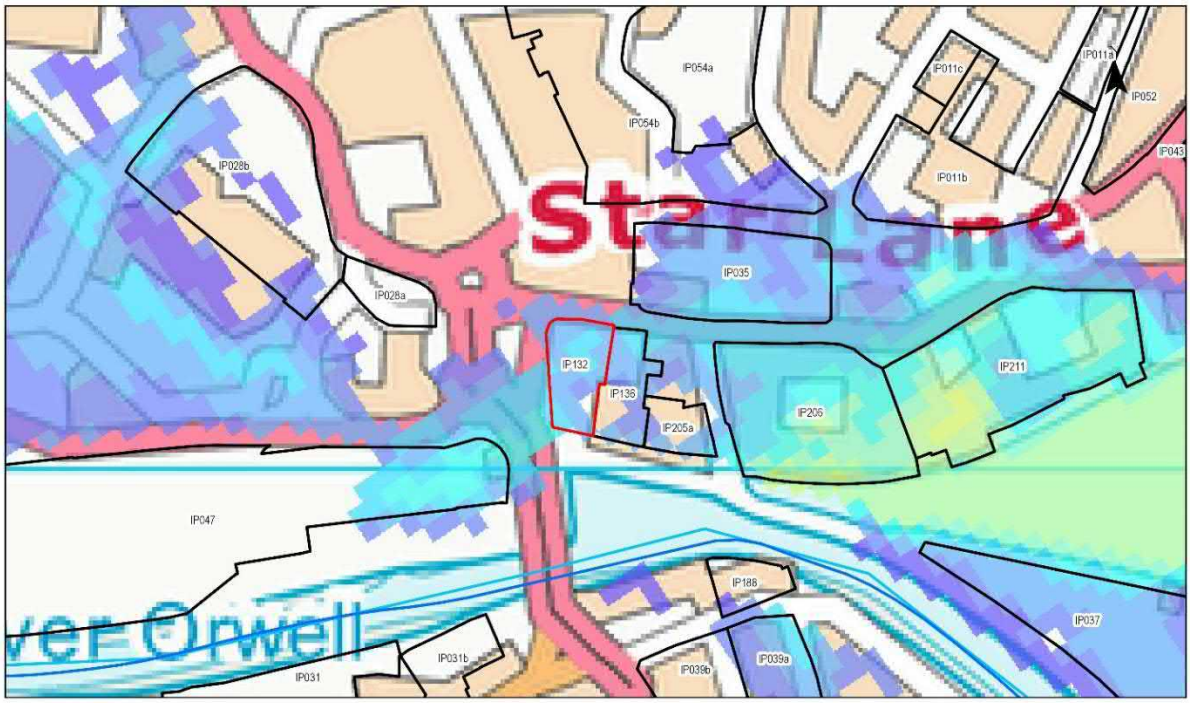
A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, the site hazard is danger to most.

The hazard rating on the site is Significant (Danger to Most), with flood depths of up to 1.25m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



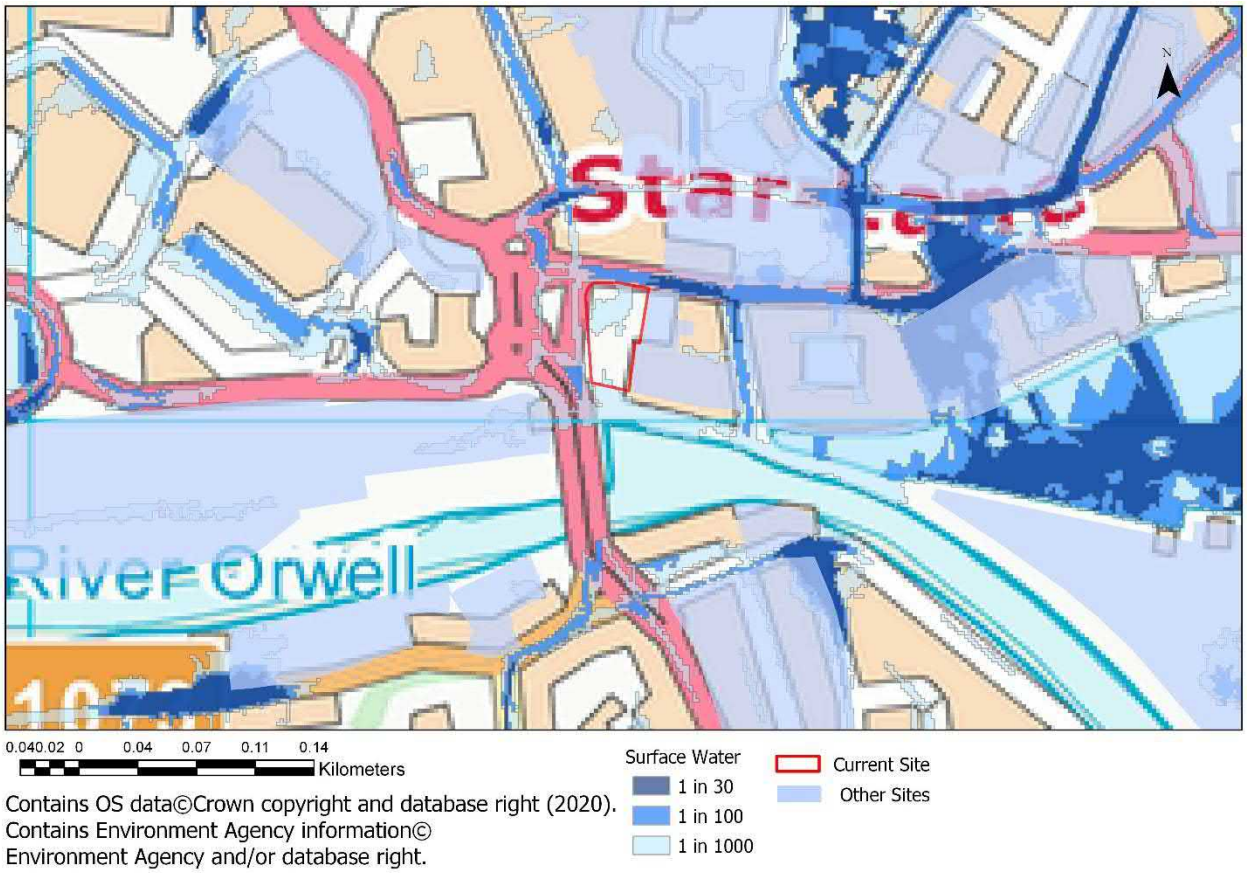
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Bridge Street, Northern Quays (west)

Surface Water Flood Risk

There is risk of surface water flooding in the north of the site. The rest of the site is shown to be at a low risk of surface water flooding. Areas along the road to the north of the site are susceptible to overland flow and ponding.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 – 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, the access / egress route along College Street and Star Lane are shown to have a hazard rating of Significant (Danger for Most) and would therefore not offer a safe route. Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Bridge Street, Northern Quays (west)

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation storage is the most likely SuDS for the site.

Site Name: South of Felaw Street

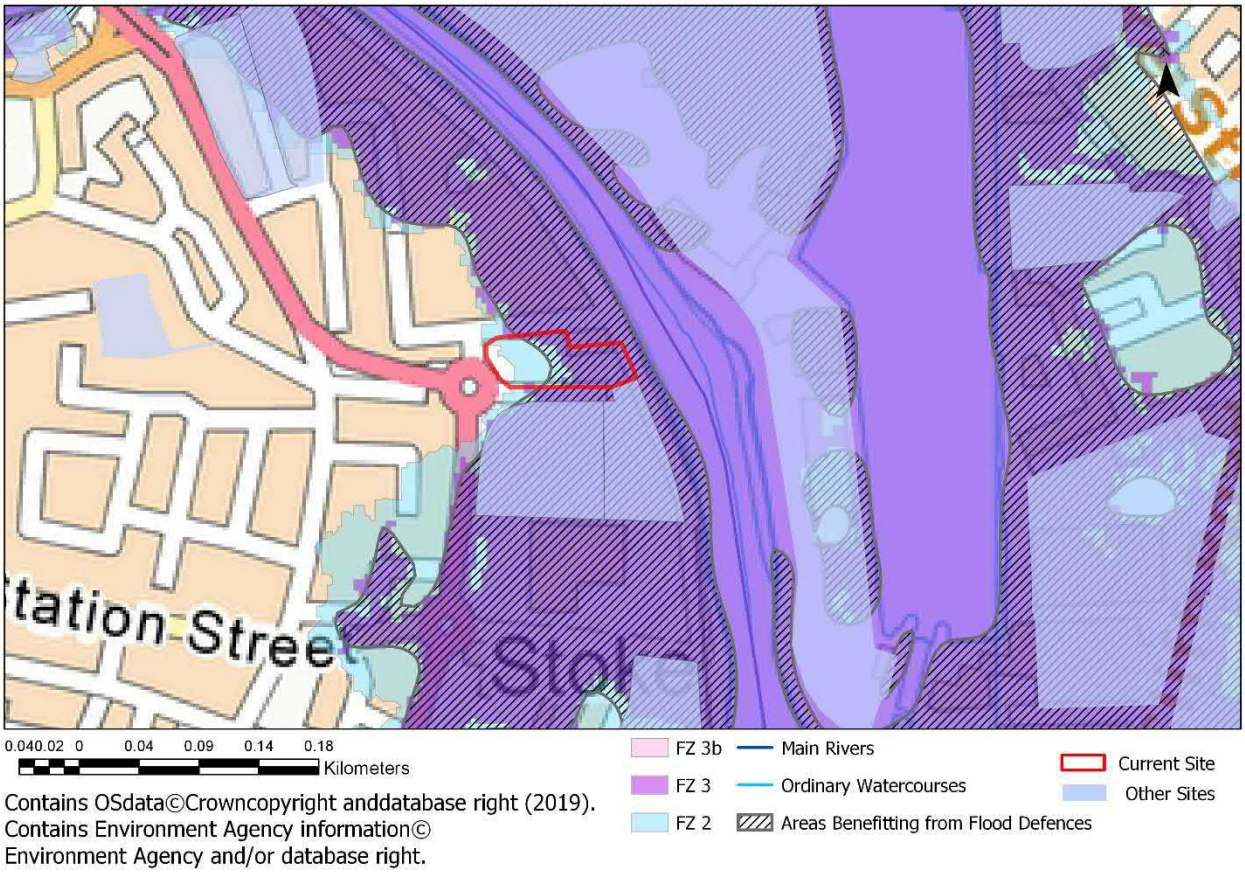
Site ID:	IP133	**Location:**	South of Felaw Street	**Area (ha):**	0.37
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 10%	**Flood Zone 2 (0.1% AEP):** 39%	**Flood Zone 3 (1% AEP):** 51%	**Flood Zone 3b (5%AEP): 0**%	**Area Benefiting from Defences:** 61%

The tidal River Orwell is located approximately 20m to the west of the site. The eastern part of the site (51%) is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the east of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

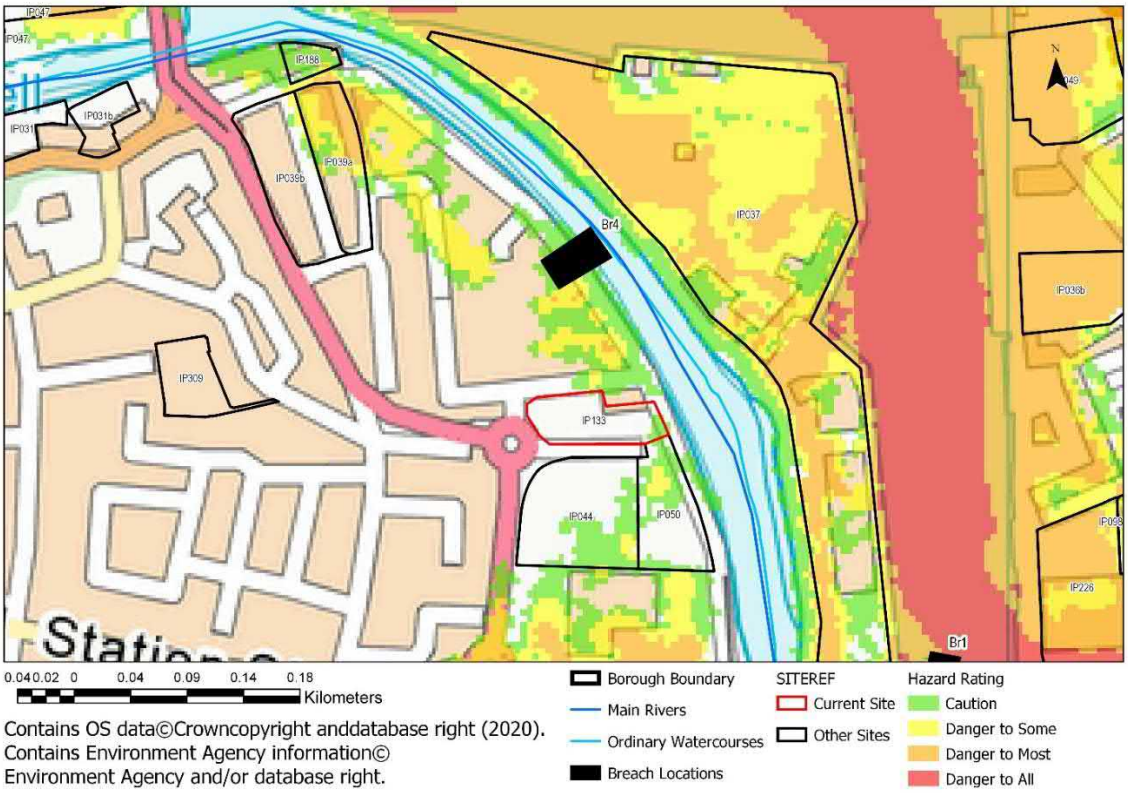
Site Name: South of Felaw Street

Tidal Flood Risk – River Orwell

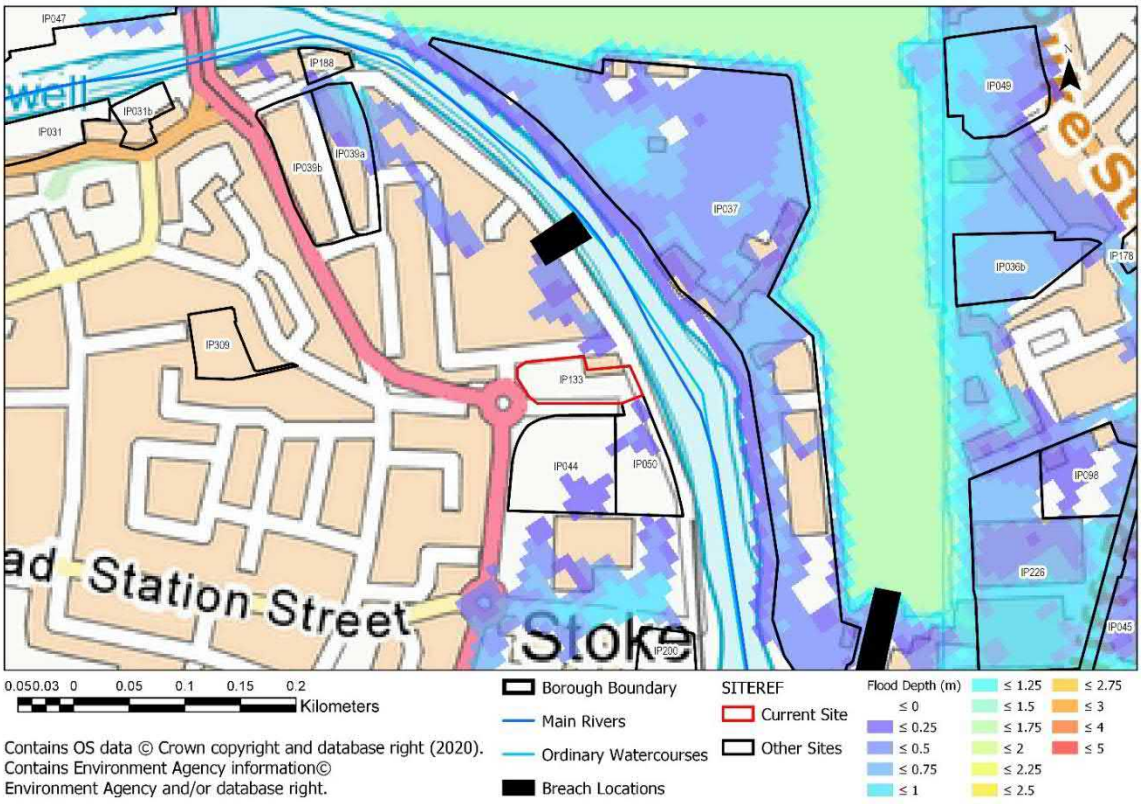
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario flood water only affects the eastern most extent of the site where a hazard category of Low (Caution) is recorded.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



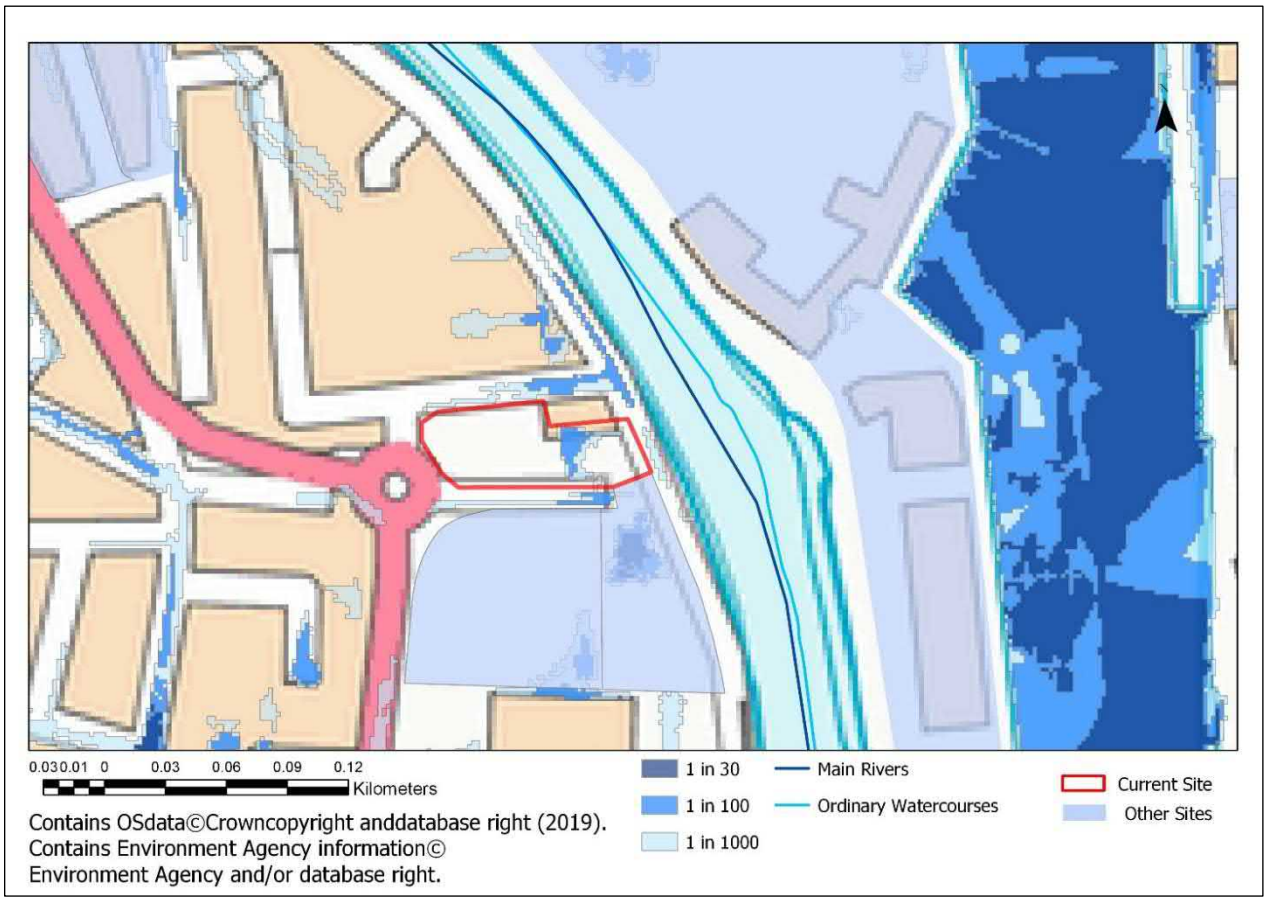
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: South of Felaw Street

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows a potential flow path crossing the site, being at medium risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is White Chalk subgroup and Lambeth Group. White Chalk subgroup is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other Sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment C is 3.5m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable from the western side of the site along Mather Way / Felaw Street onto Vernon Street. The routes that pass westward are within Flood Zone 1 and therefore lead out of the tidal floodplain. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Site Name: South of Felaw Street

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D of the SFRA outlines that rate of onset to peak at this location (compartment C) is only 1.5 hour and flood water may remain on site for over 21hrs. This shows the importance of inclusion of a place of safe refuge.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation is the most likely SuDS for the site.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

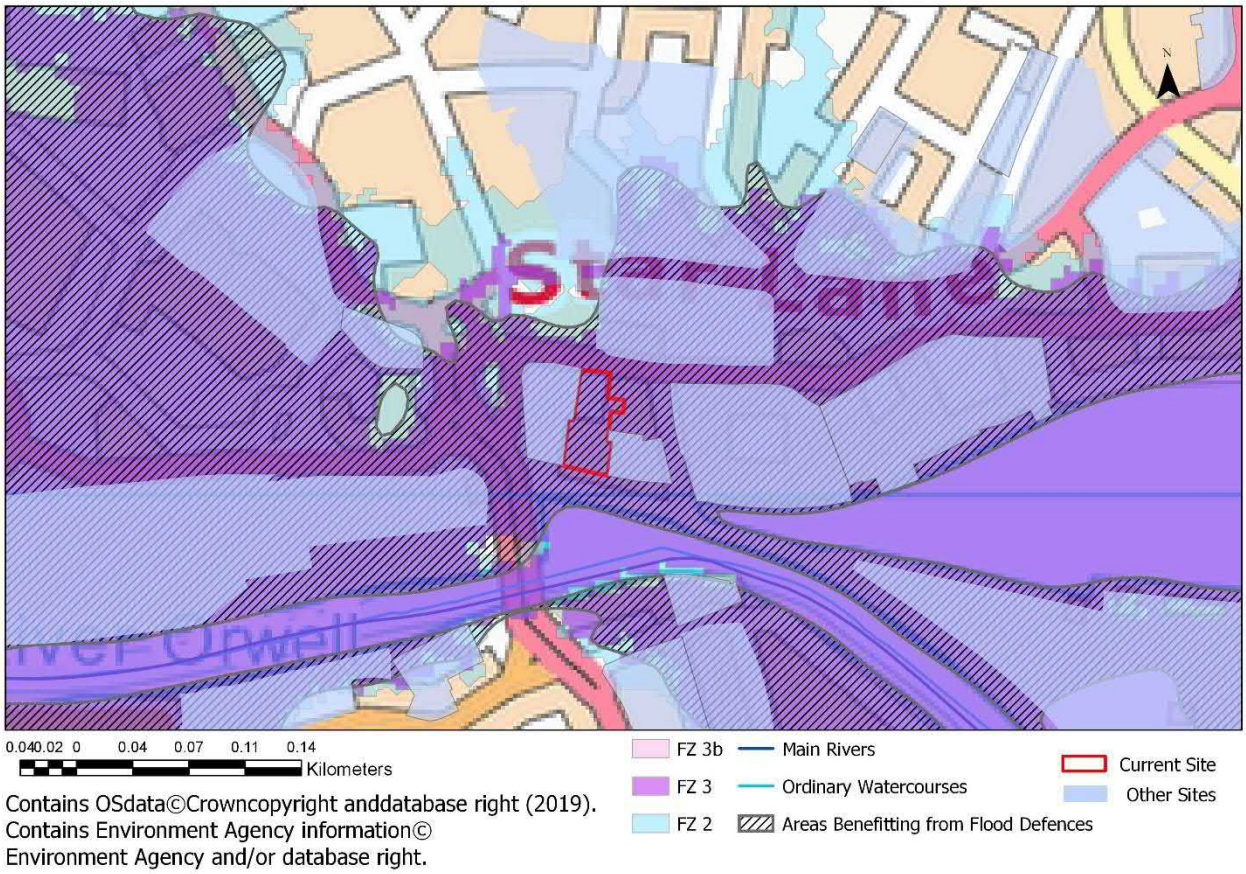
Site Name: Silo, College Street					
Site ID:	IP136	**Location:**	Silo, College Street	**Area (ha):**	0.16
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 100%	**Flood Zone 3b (5% AEP): 0**%	**Area Benefiting from Defences:** 100%

The tidal River Orwell is located approximately 30m to the south of the site. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. The site was also flooded by the 2013 tidal flooding event.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

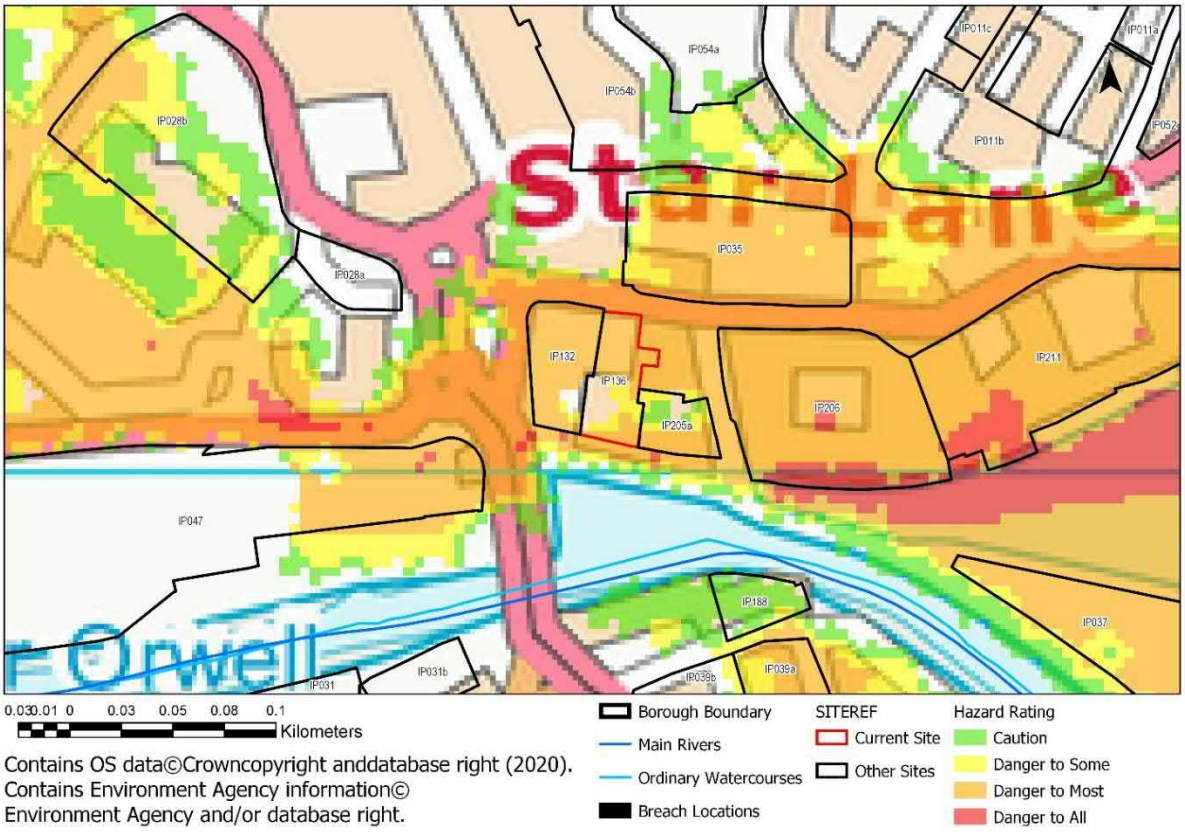
Site Name: Silo, College Street

Tidal Flood Risk – River Orwell

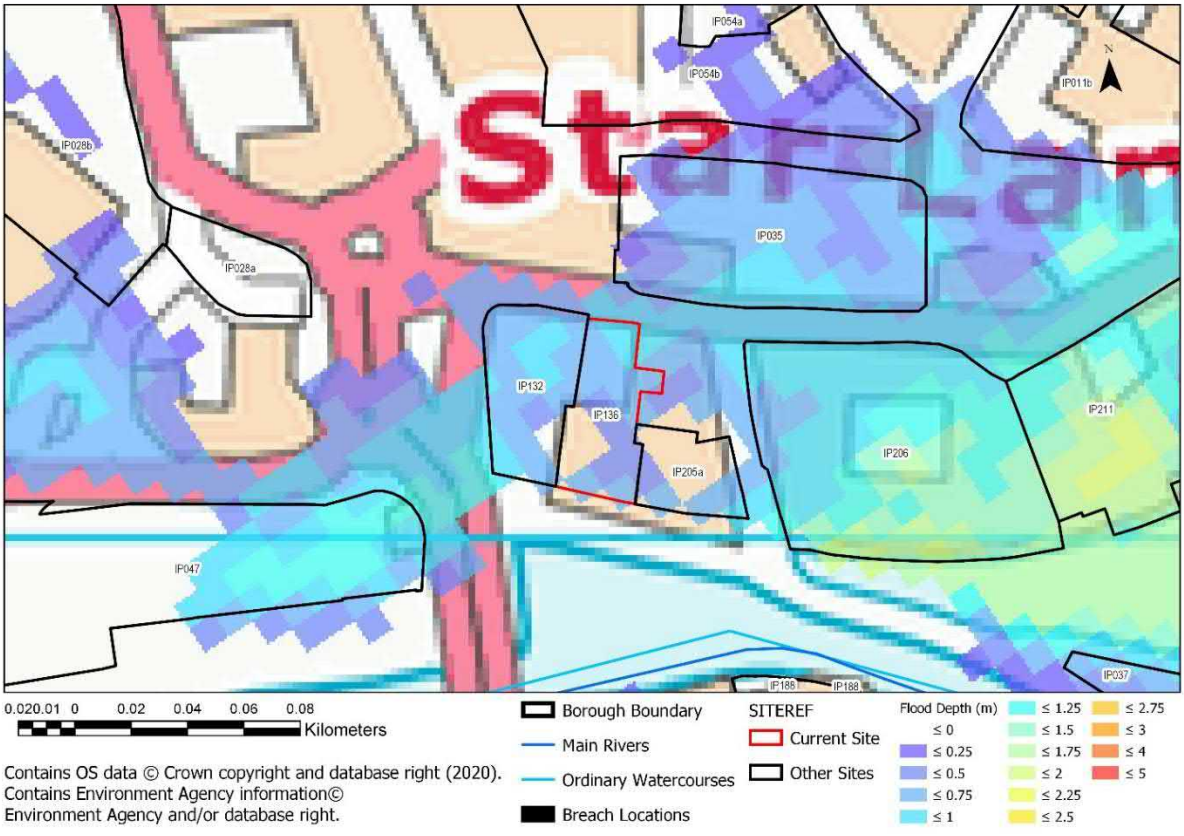
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, the hazard rating on the site is Moderate (danger to some) and Significant (danger to most) and flood depths are up to 1m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



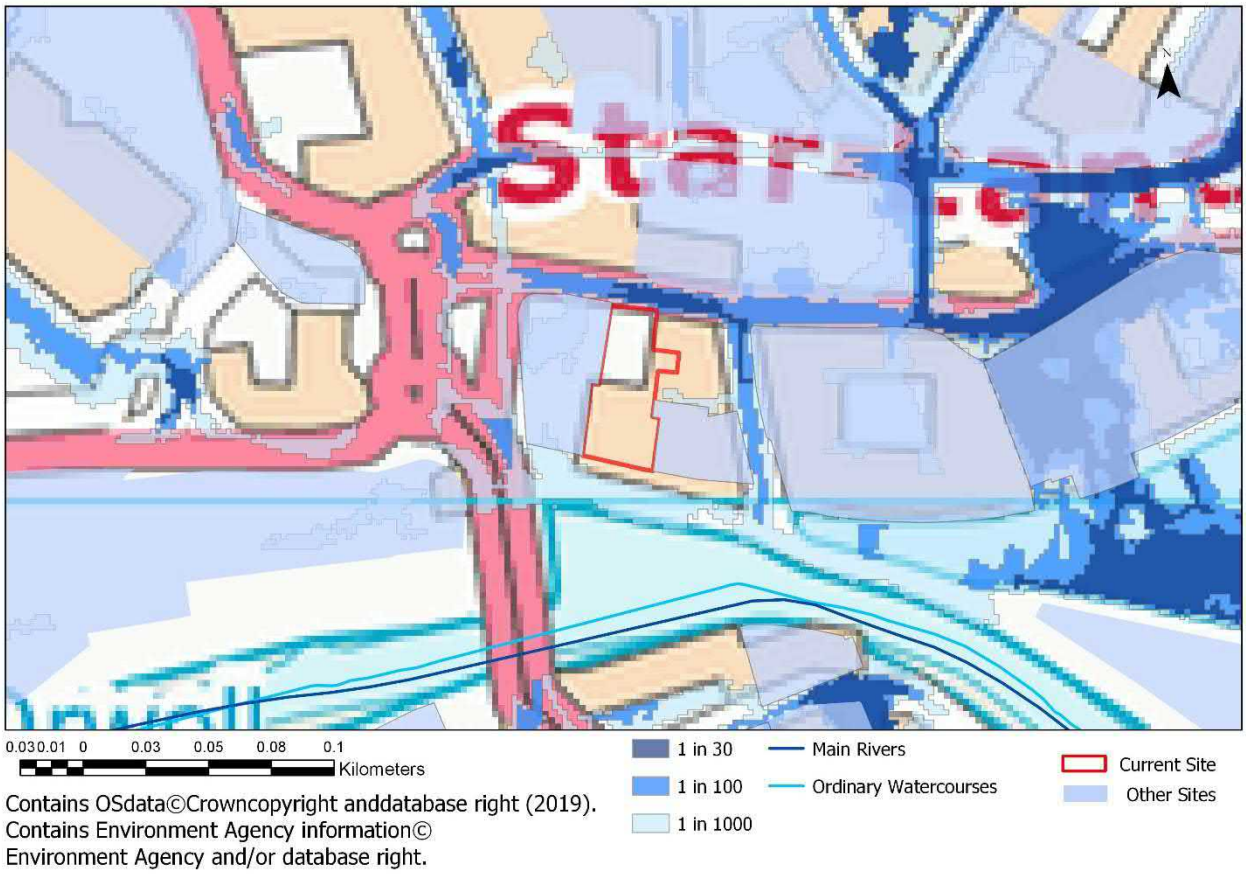
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Silo, College Street

Surface Water Flood Risk

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at medium risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at actual risk of flooding from the Lower Gipping during an extreme flood. The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 – 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may not be achievable along Star Lane from the northern side of the site. Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Silo, College Street

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation is the most likely SuDS to be used on the site.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

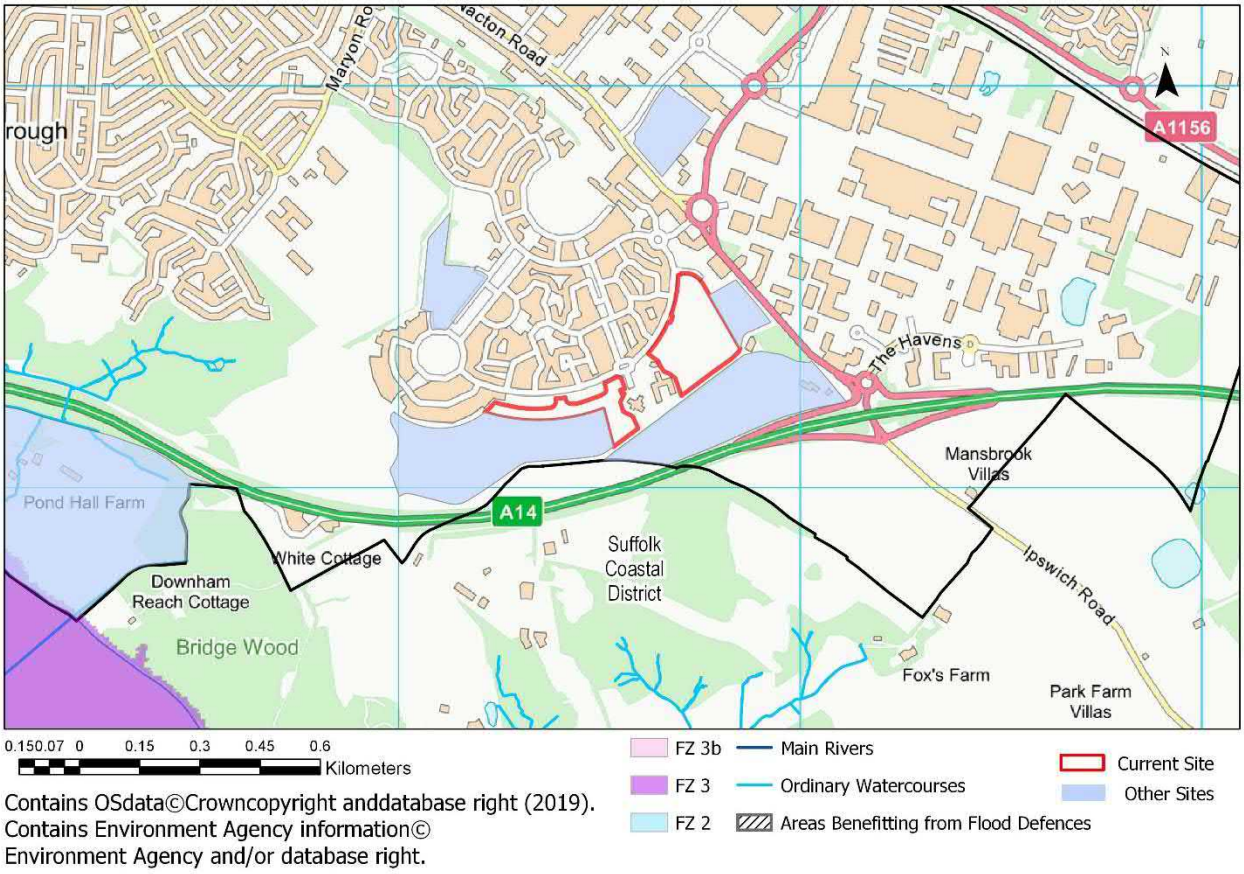
Additional Information

Raising the site and College Street or providing safe access to the south will help increase the safety of the site with respect to the residual tidal flood risk.

Site Name: Ravenswood					
Site ID:	IP150d IP150e	**Location:**	Ravenswood	**Area (ha):**	Site IP150d – 1.73 Site IP150e – 3.61
Current Use:	Open land	**Proposed Use:**	Residential	**Vulnerability:**	More Vulnerable

Flood Zones				
Flood Zone 1 (<0.1% AEP): 100%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 0%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 0%

The sites are identified as Flood Zone 1, low probability of flooding from rivers.



Tidal and Fluvial Flood Risk

The site is in Flood Zone 1, there is no risk from fluvial or tidal sources, therefore a flood hazard and flood depth map have not been included.

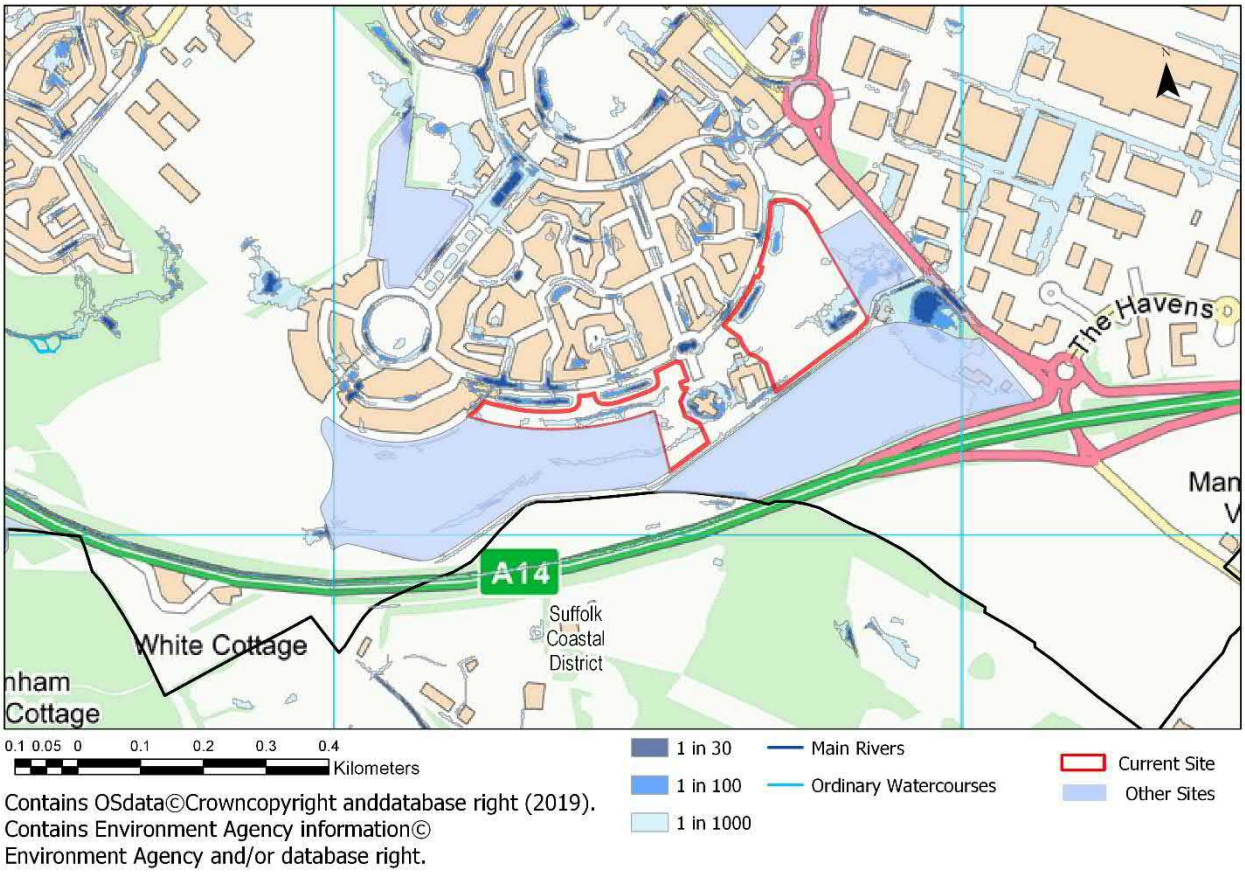
Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding.

Sites IP150d is shown to have a medium risk of surface water flooding. Site IP150e is shown to have high risk of surface water flooding.

Site Name: Ravenswood



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square not considered to be at risk of groundwater flooding.

The underling geology in this location is Neogene to Quaternary Rocks which may be permeable and suitable for infiltration techniques within SuDS.

Site Specific Recommendations

Site Layout and Design

The most likely source of flooding to impact the site is surface water flooding and potentially flooding from sewers.

The areas of surface water flooding shown in the mapping above to the north of Site IP0150d are existing swale features for the effective management of surface water for the existing development. These have been excluded from the site allocation.

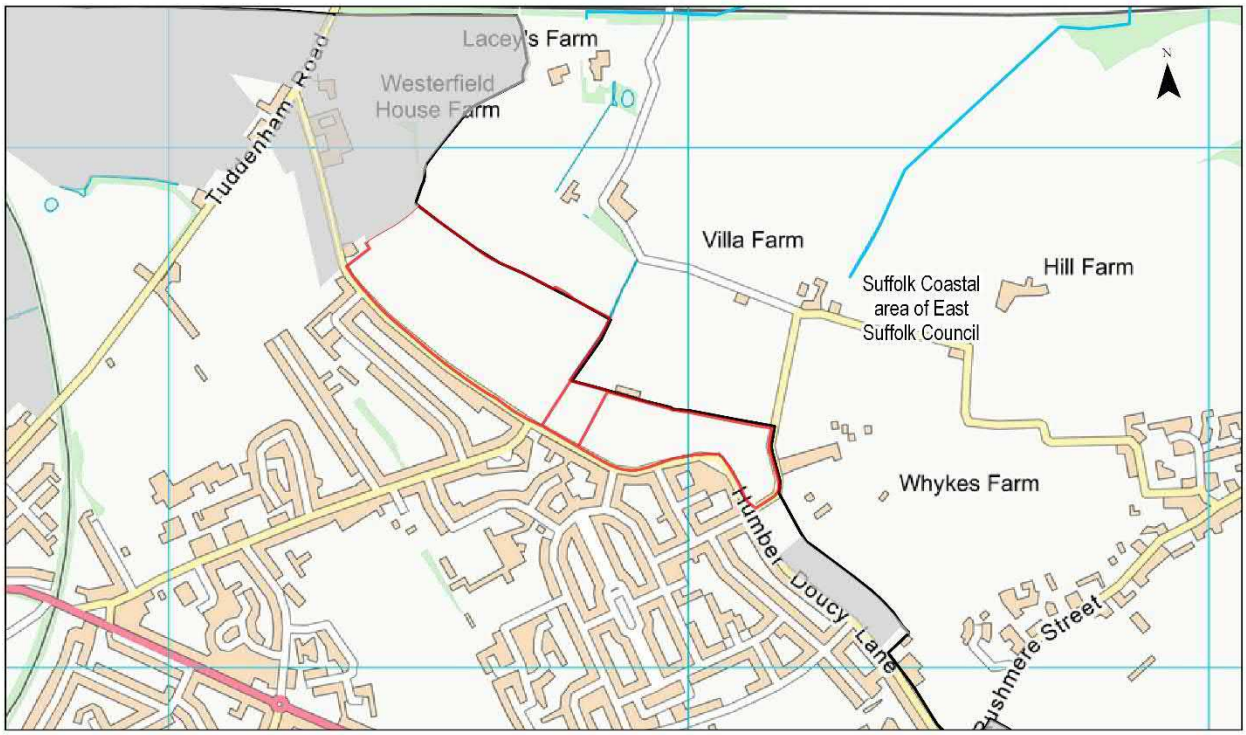
The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. Infiltration is the most likely SuDS for the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Site Name: Humber Doucy Lane					
Site ID:	IP184a, b, c	**Location:**	Humber Doucy Lane	**Area (ha):**	Site IP184a – 10.15 Site IP184b – 0.84 Site IP184c – 4.01
Current Use:	Agricultural land and sports pitch	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones

Flood Zone 1 (<0.1% AEP): 100%	**Flood Zone 2 (0.1% AEP):** 0%	**Flood Zone 3 (1% AEP):** 0%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 0%

The sites are identified as Flood Zone 1, low probability of flooding from rivers and sea.
The closest mapped watercourses are a drain to the north east of the site, that flows northwards to join the River Fynn, and a drain approximately 1.5km west of the site which forms part of the Gipping catchment.



Surface Water Flood Risk

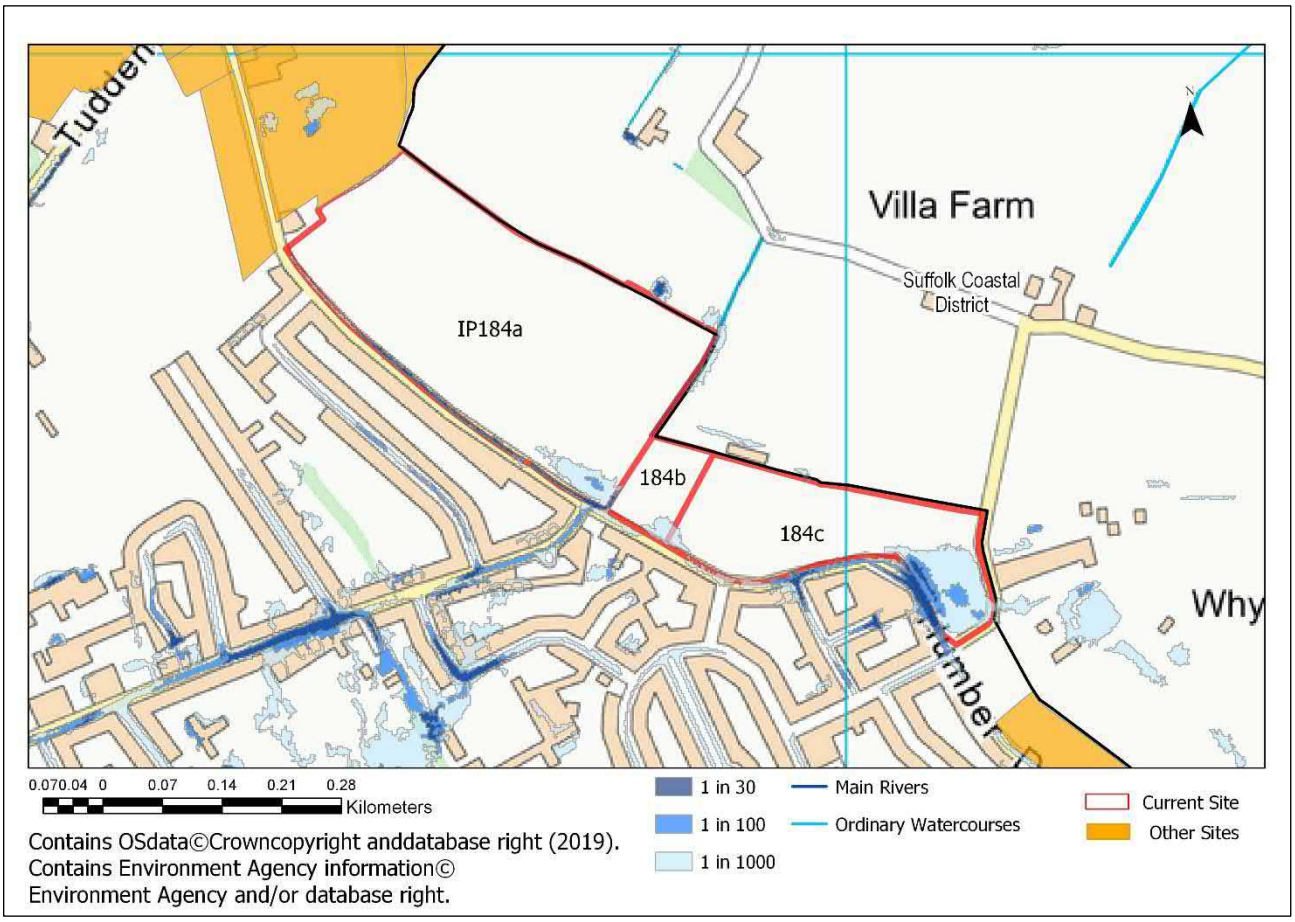
Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding.

- Site IP184a is shown to have a medium risk of surface water flooding.
- Site IP184b is shown to have low risk of surface water flooding.
- Site IP184c is shown to have high risk of surface water flooding.

The percentage of the sites affected by SW flood risk is low and with careful site mitigation sustainable development should be possible at this location, in terms of surface water flood risk.

Site Name: Humber Doucy Lane



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows part of Site IP184a is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. Sites IP184b and IP184c are not considered to be suceptible to groundwater flooding.

The underling geology in at Site IP184a is Neogene to Quaternary Rocks and the Thames Group. Infiltration to be further investigated during a site investigation.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Site Name: Websters saleyard site, Dock Street					
Site ID:	IP188	**Location:**	Websters saleyard site, Dock Street	**Area (ha):**	0.10
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

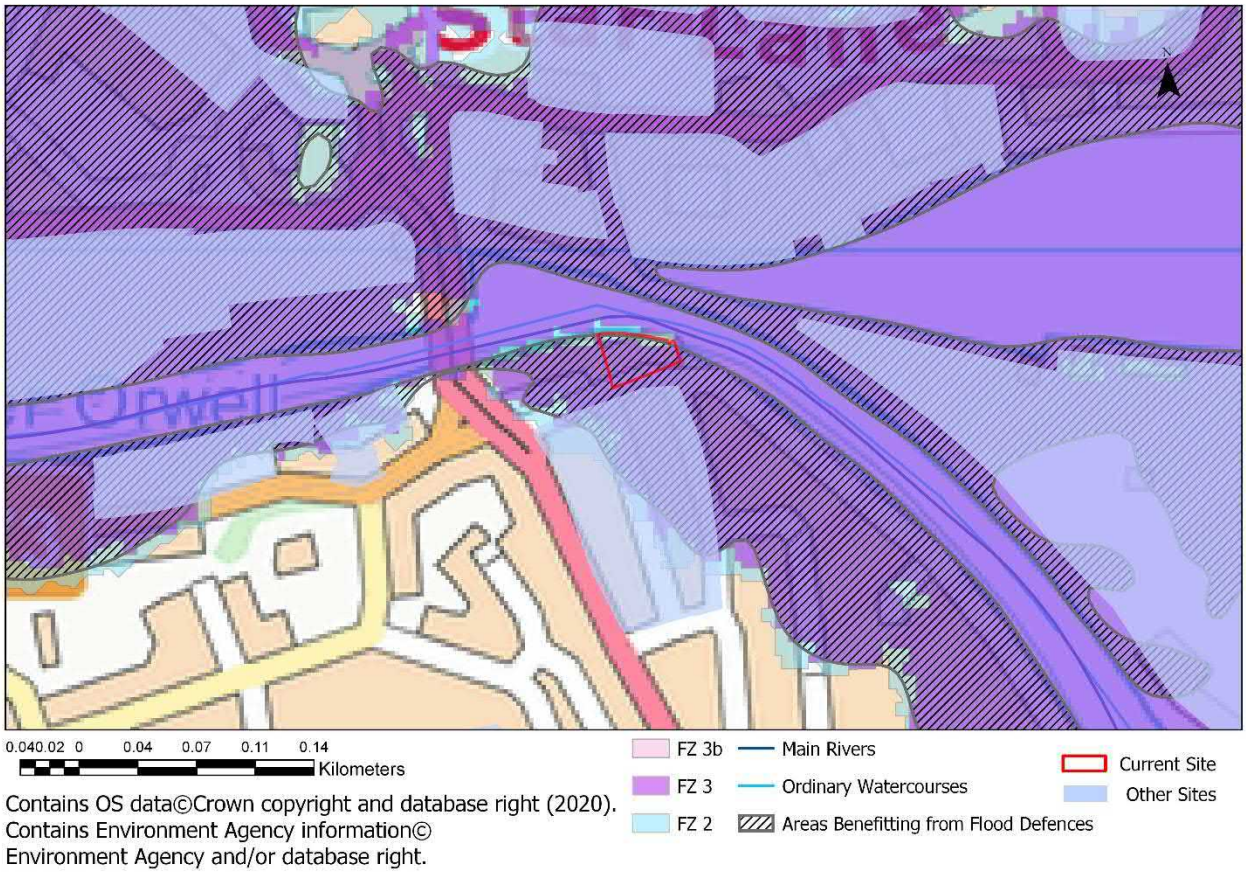
Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 17%	**Flood Zone 3 (1% AEP):** 83%	**Flood Zone 3b (5%AEP):** 0%	**Area Benefiting from Defences:** 94%

The tidal River Orwell flows south east just to north east of the site.

The majority of the site is identified as Flood Zone 3, high probability of flooding from the tidal River Orwell, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC also hold records of flooding to the north of site where Vernon Street meets Bridge Street, associated with the surface water network being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

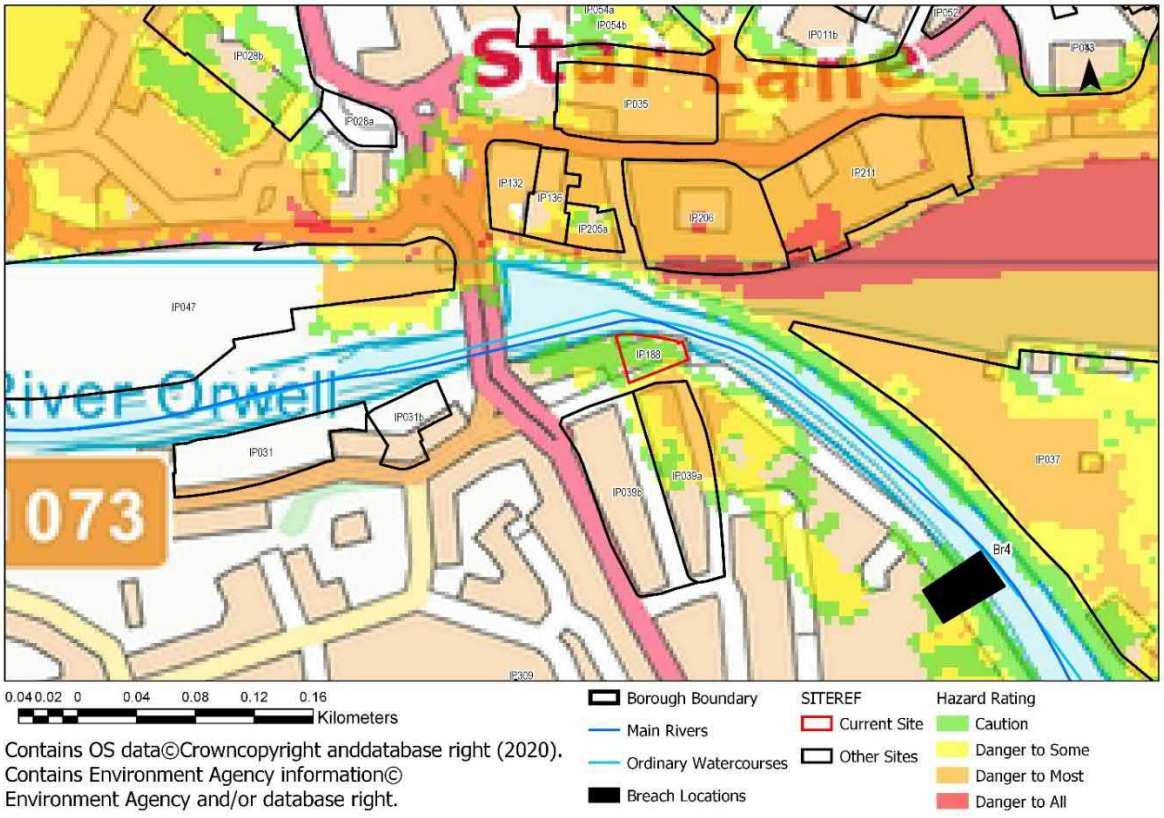
Site Name: Websters saleyard site, Dock Street

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario the hazard rating across the site is predominantly Low (Caution), corresponding to flood depths of up to 0.25m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



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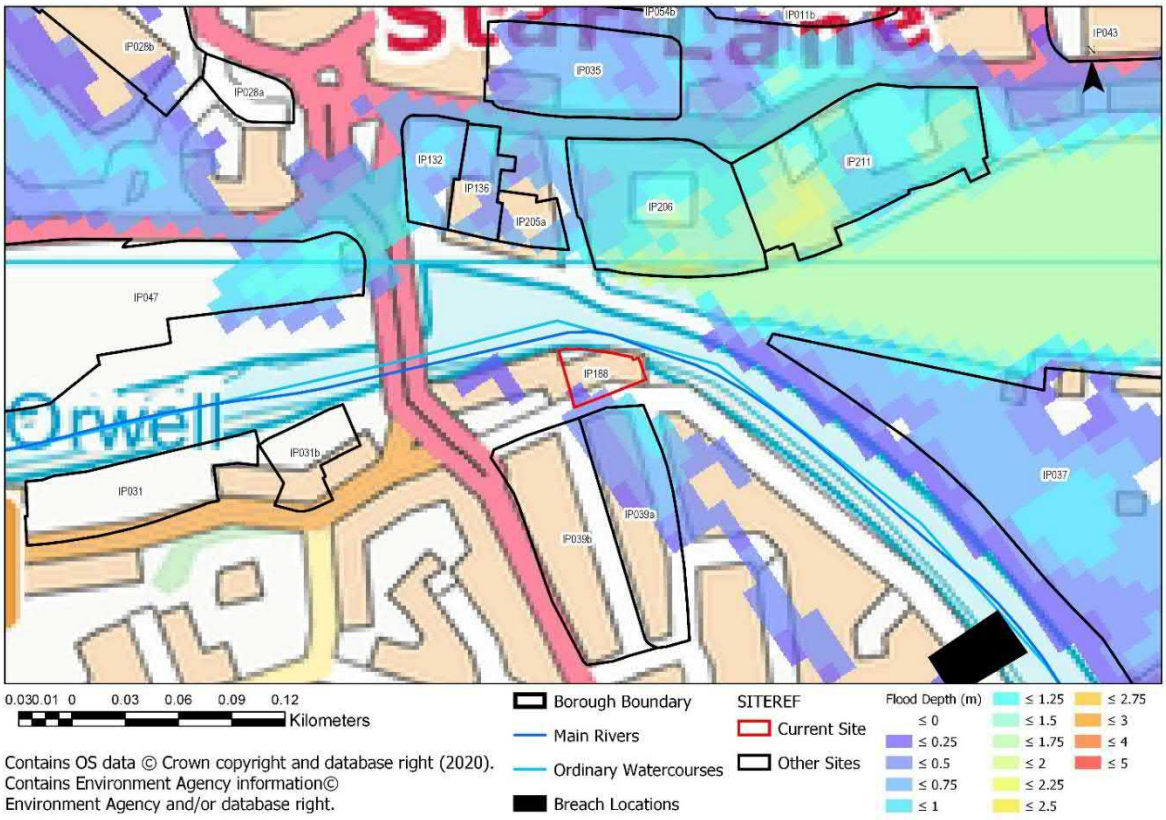
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



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Site Name: Websters saleyard site, Dock Street

Surface Water Flood Risk

Although the site is shown to be at low risk from surface water flooding, there are areas to the south of the site that are susceptible to ponding and overland flow.

Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment C is 3.5m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, part of the access/egress routes away from the site along Stoke Quay may have a potential hazard rating of up Low to Moderate ("Danger for some"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the

Site Name: Websters saleyard site, Dock Street

residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and a safe place of refuge.

Appendix D of the SFRA outlines that rate of onset to peak at this location (compartment C) is only 1.5 hour and flood water may remain on site for over 21hrs. This shows the importance of inclusion of a safe place of refuge.

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to consider the current risk of surface water flooding particularly in the northern part of the site, to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Additional Information

Raising the site and providing high level access via site 38 or raising Dock Street will increase the safety of the site.

Site Name: Helena Road

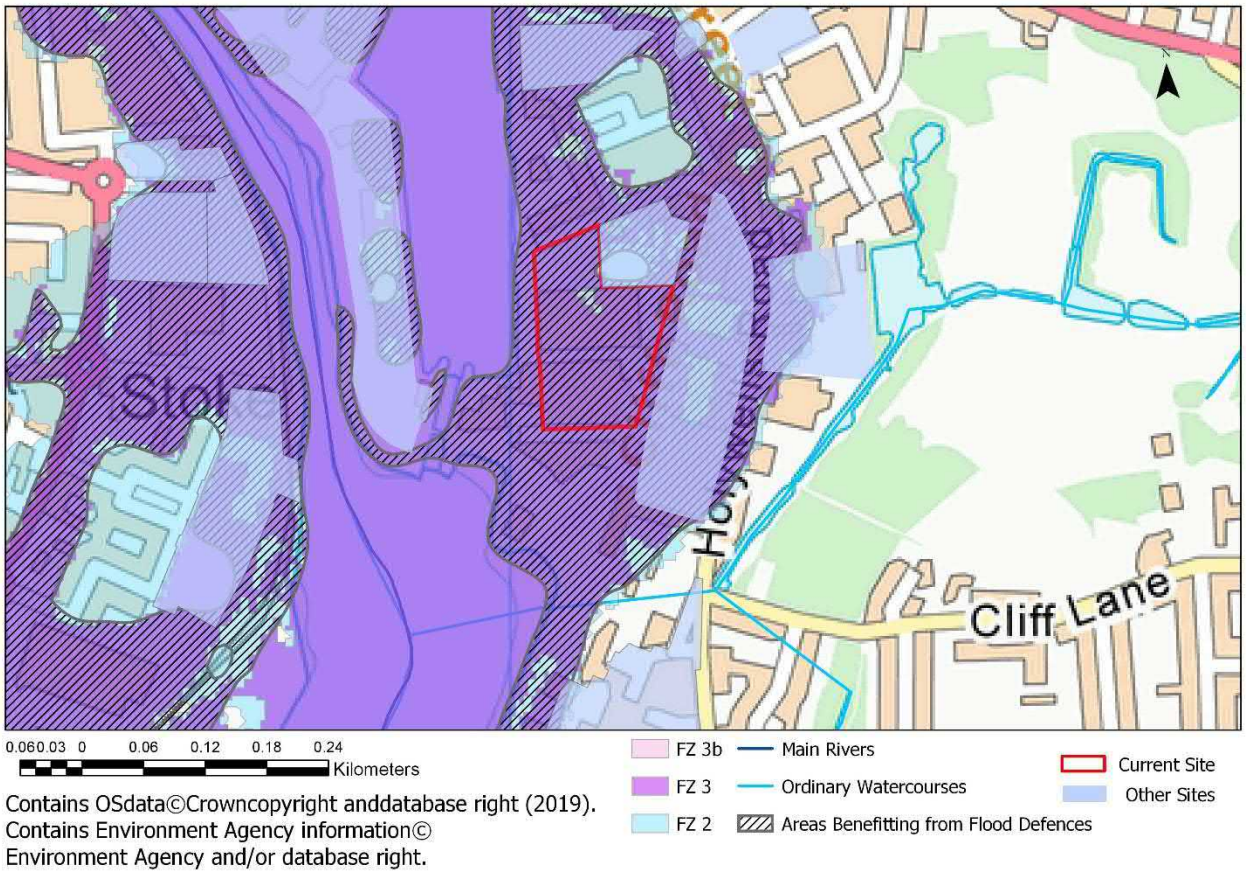
Site ID:	IP226	Location:	Helena Road	Area (ha):	1.85
Current Use:	Commercial	Proposed Use:	Residential	Vulnerability Classification:	More Vulnerable

Flood Zones and Historic Records

Flood Zone 1 (<0.1% AEP): 0%	Flood Zone 2 (0.1% AEP): 2%	Flood Zone 3 (1% AEP): 98%	Flood Zone 3b (5%AEP): 0%	Area Benefiting from Defences: 100%

This site is located approximately 20m to the east of the Wet Dock and 200m to the east of the tidal River Orwell. The majority of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there are flood defence walls and embankments along the edge of the River Orwell, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of road and pavement flooding near to this location on Holywells Road.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.

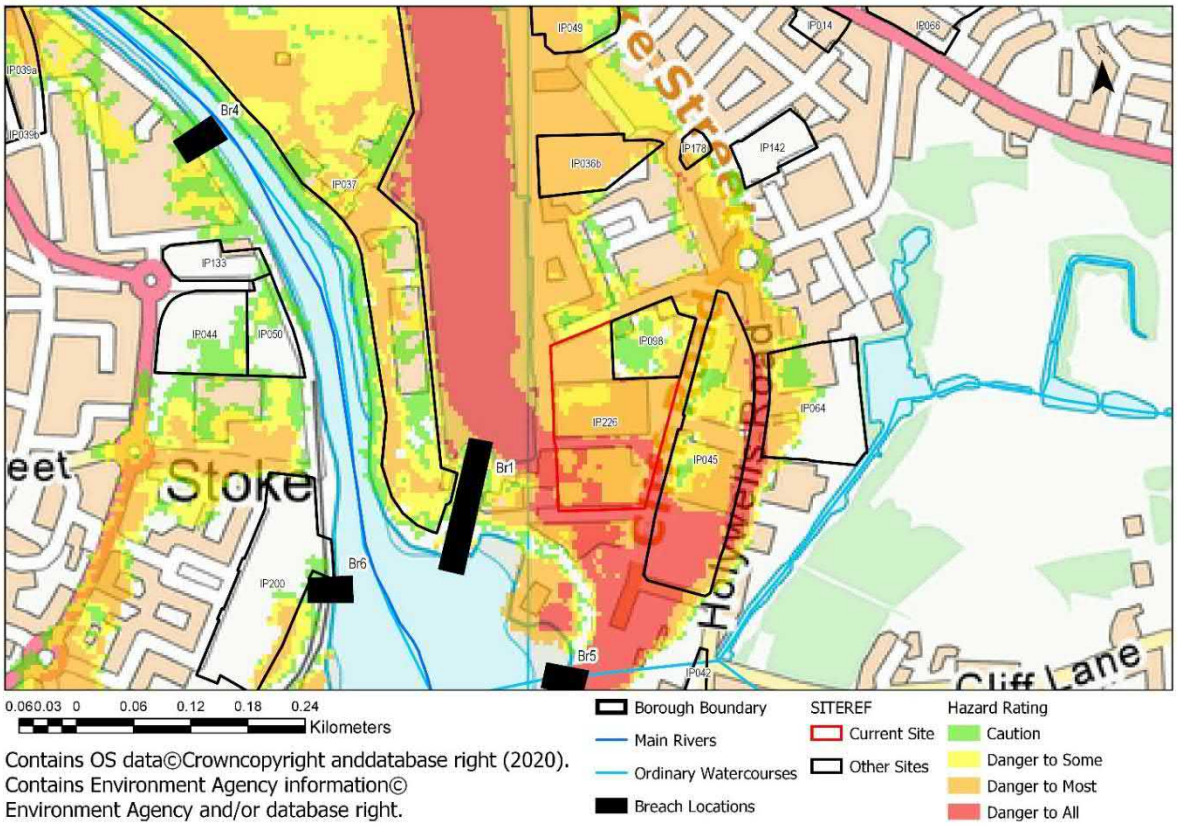
Site Name: Helena Road

Tidal Flood Risk – River Orwell

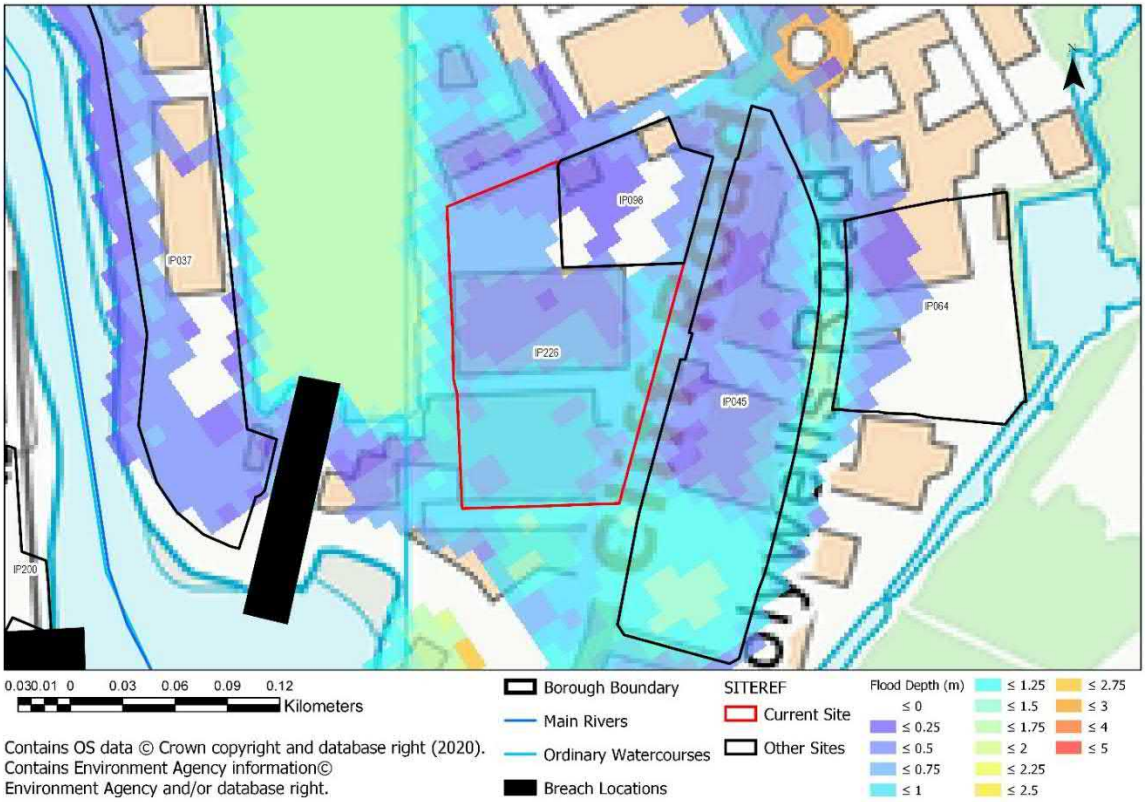
Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, the southern half of the site is modelled to flood to depths of approximately 1m, corresponding to a hazard rating of Extreme (Danger to All), reducing in the north to Significant (Danger to Most) and Moderate (Danger to Some).

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



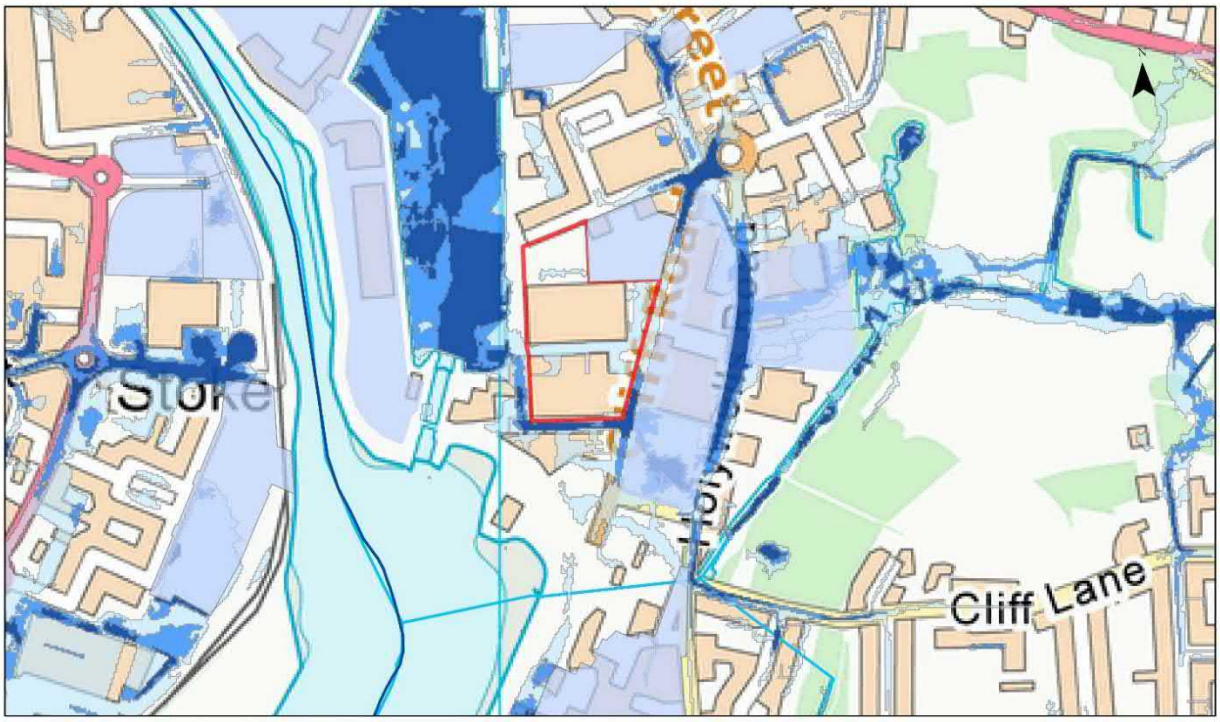
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Helena Road

Surface Water Flood Risk

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in this part of compartment H, close to Breach 05 is 4.1 – 5.3m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, access/egress routes along Cliff Road towards the Myrtle Road roundabout and along Patteson Road may have a potential hazard rating of up to Significant ("Danger for most") and Extreme ("Danger for all"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place of refuge.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be

Site Name: Helena Road

adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Set-back Distance

All development should be set back from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

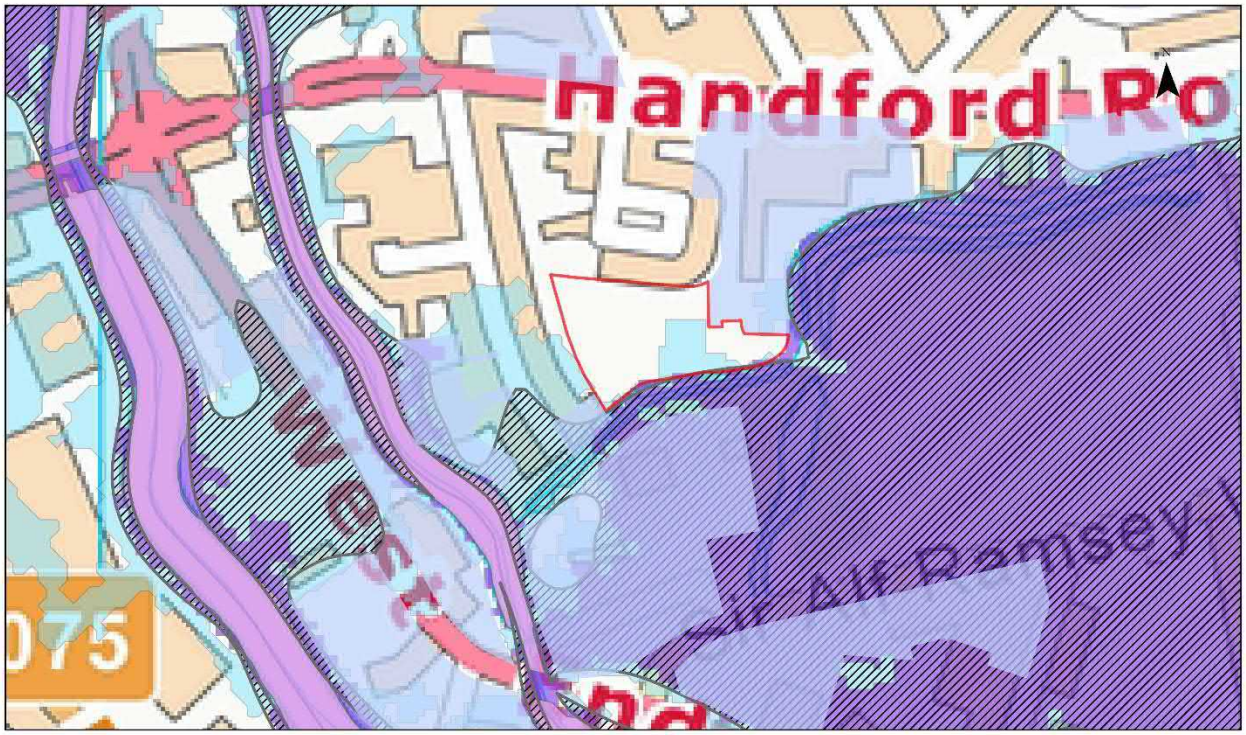
Site Name: South of former BT office, Bibb Way					
Site ID:	IP0279b(2)	**Location:**	South of former BT office, Bibb Way	**Area (ha):**	0.62
Current Use:	Offices	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding				
Flood Zone 1 (<0.1% AEP): 82%	**Flood Zone 2 (0.1% AEP):** 18%	**Flood Zone 3 (1% AEP):** 2%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 1%

As it flows through Ipswich, the River Gipping becomes the River Orwell. A channel of the River Gipping / Orwell flows approximately 90m to the southwest of the site. At this location the River Gipping / Orwell is tidally influenced. A channel of the Alderman Canal flows along the southern edge of the Site, described further in Sections 3.6 and 5.7 of the Main SFRA.

A small section of the centre of the site is located in Flood Zone 2 – undefended, the rest of the site is located in Flood Zone 1. This may require updating once the impact of the new modelling for the River Gipping is known.

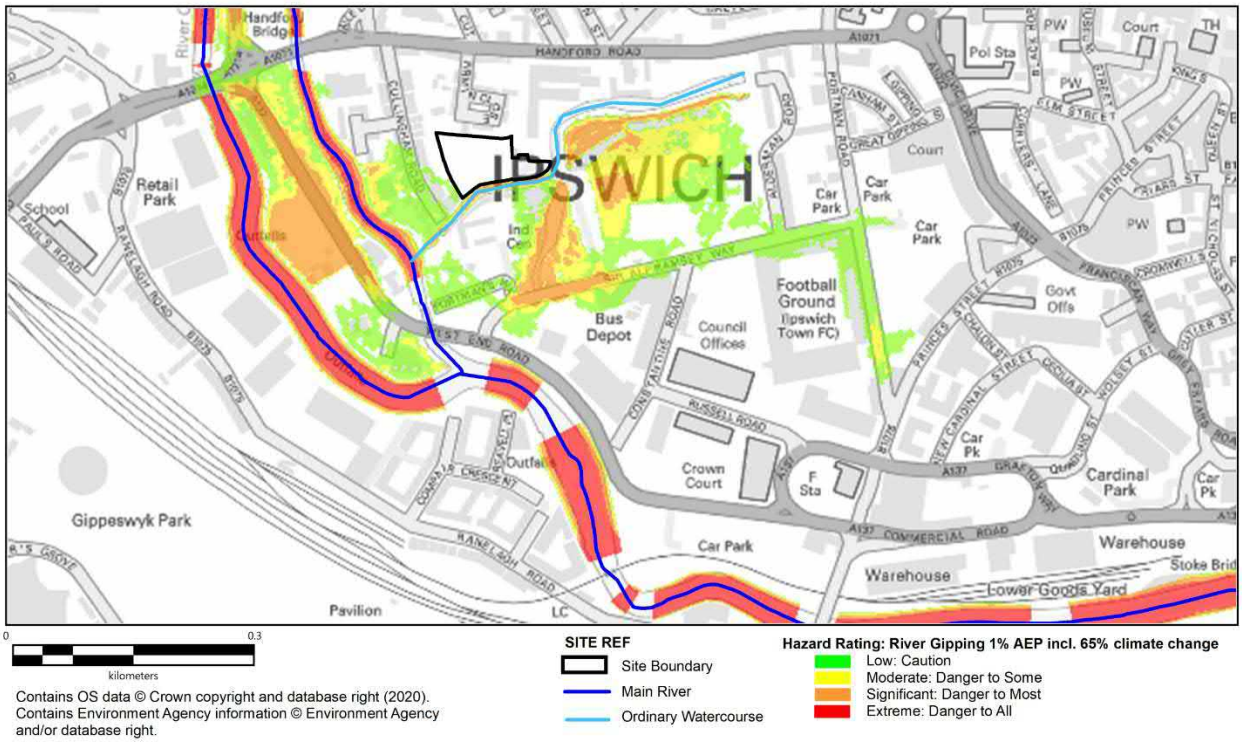
The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1939.



Site Name: South of former BT office, Bibb Way

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, land to the south and west of the site along Bibb Way and Cullingham Road are shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 3.9m AOD and Low - Significant hazard rating. The area to the west and south of the site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with flood levels of 4.6m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.



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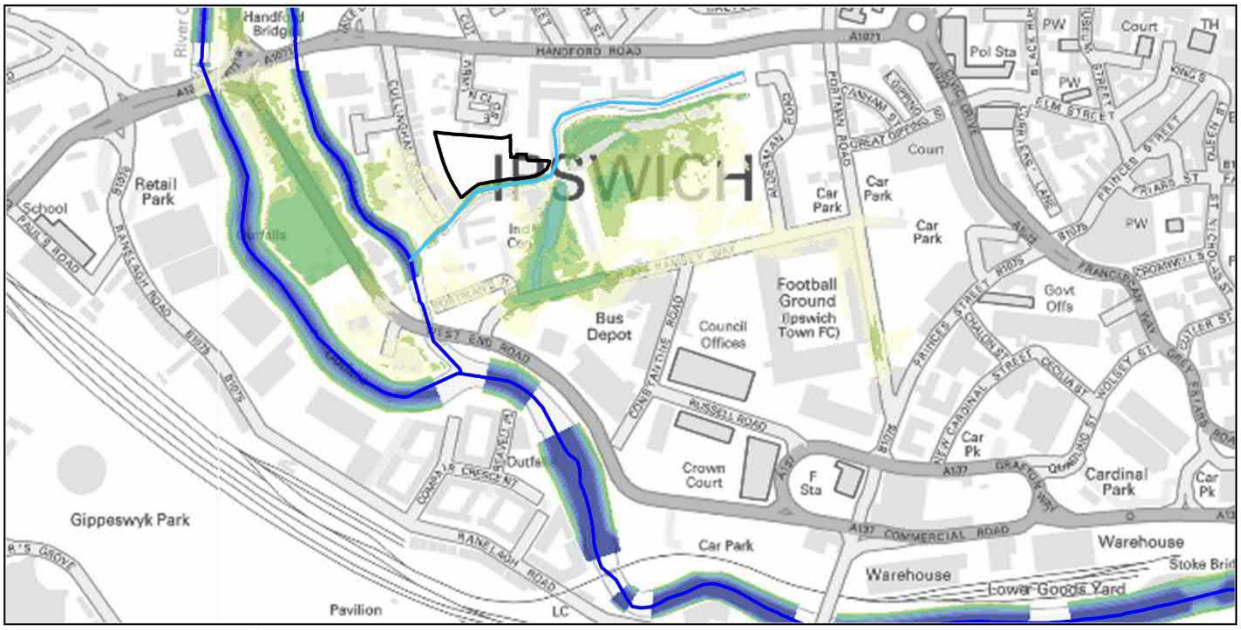

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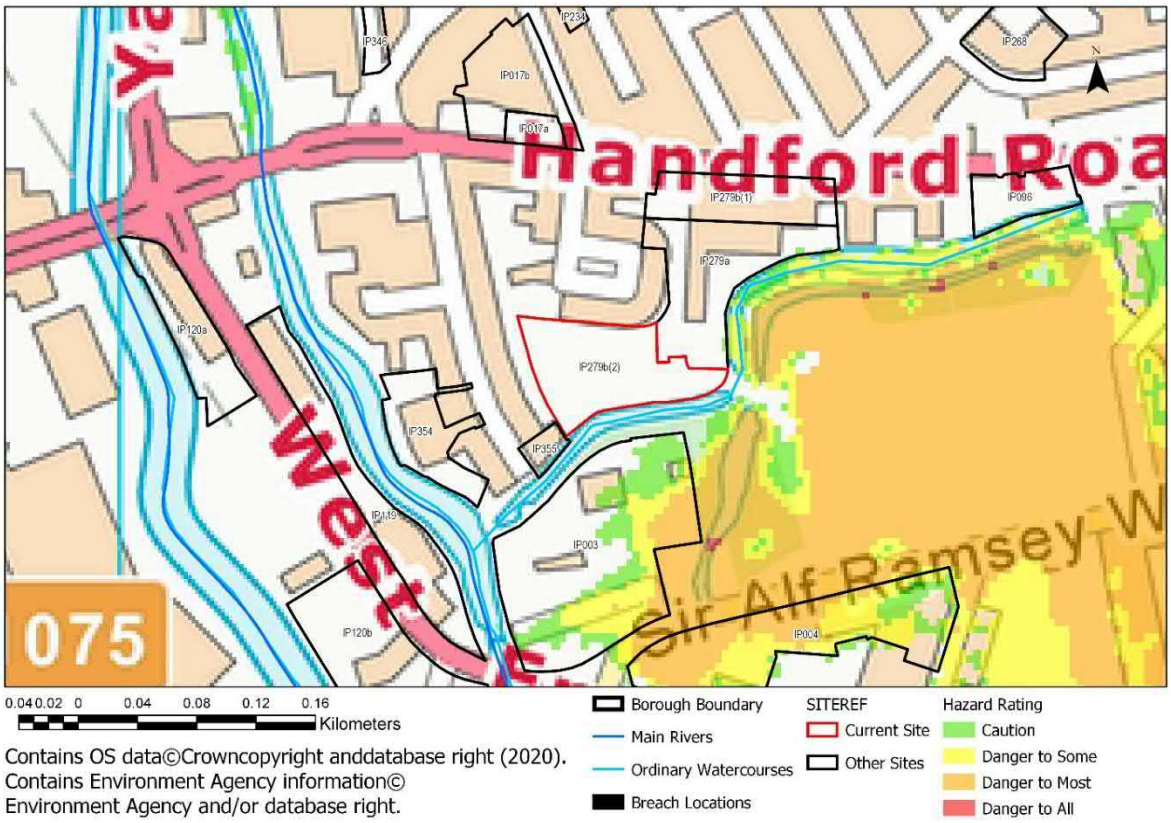
Site Name: South of former BT office, Bibb Way

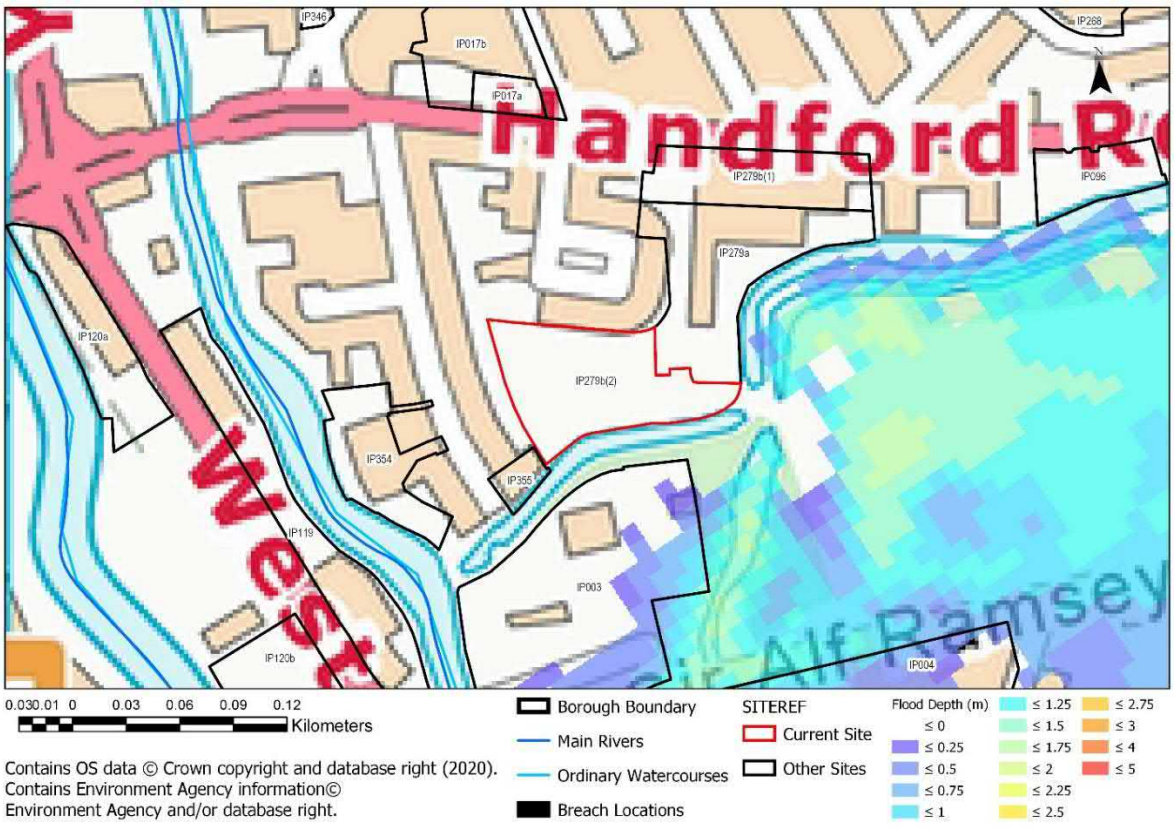
Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure. A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, flood water does not extend as far north as the site.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)

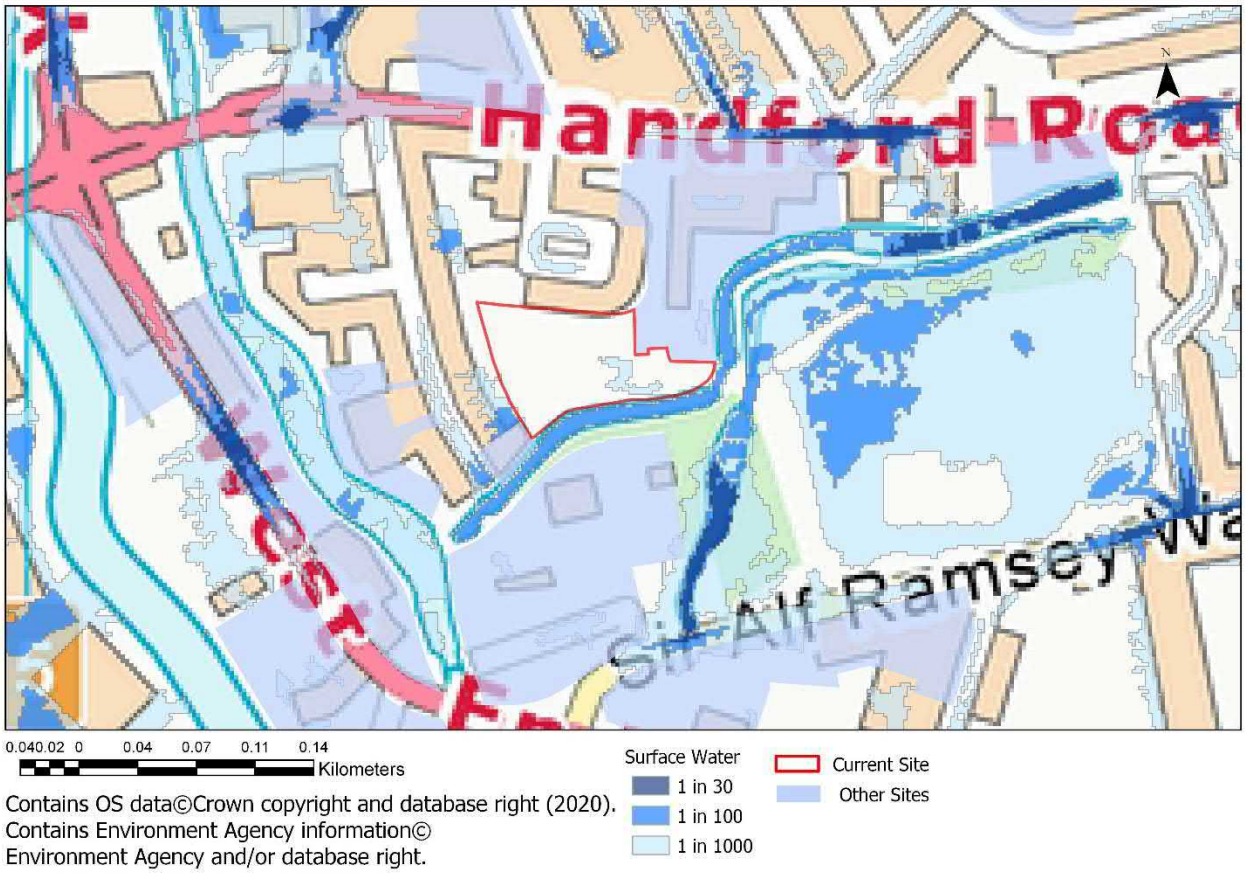


Site Name: South of former BT office, Bibb Way

Surface Water Flood Risk

Risk of Flooding from Surface Water

The risk of surface water flooding to the site is low, with a small area affected in the east. There is a higher risk of surface water flooding along the surrounding roads which are susceptible to ponding and overland flow.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The area surrounding the site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change and at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level for areas near the site for the 1% AEP event including 65% climate change is 3.9m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the north towards Handford Road.

In the event of a failure of the tidal flood defences, floodwater is not shown to extend as far as the site, and dry access/egress for the site would be achievable to the north of the site, towards Handford Road.

Site Name: South of former BT office, Bibb Way

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 4.6m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Set-back Distance

Consent needs to be obtained from Suffolk County Council (in their capacity as the LLFA) for any works that may affect flow within the Ordinary Watercourse to the south of the site.

Additional Information

It should be noted that while the Environment Agency mapping does not place the site in a high risk flood zone, there is channel of the Alderman Canal located along the southern boundary of the site. A simple assessment of the residual risk of a failure of the embankment has been carried out and is reported in Section 5.7 of the Main SFRA. The potential risk from this source to this site needs to be fully understood as part of a site-specific flood risk assessment.

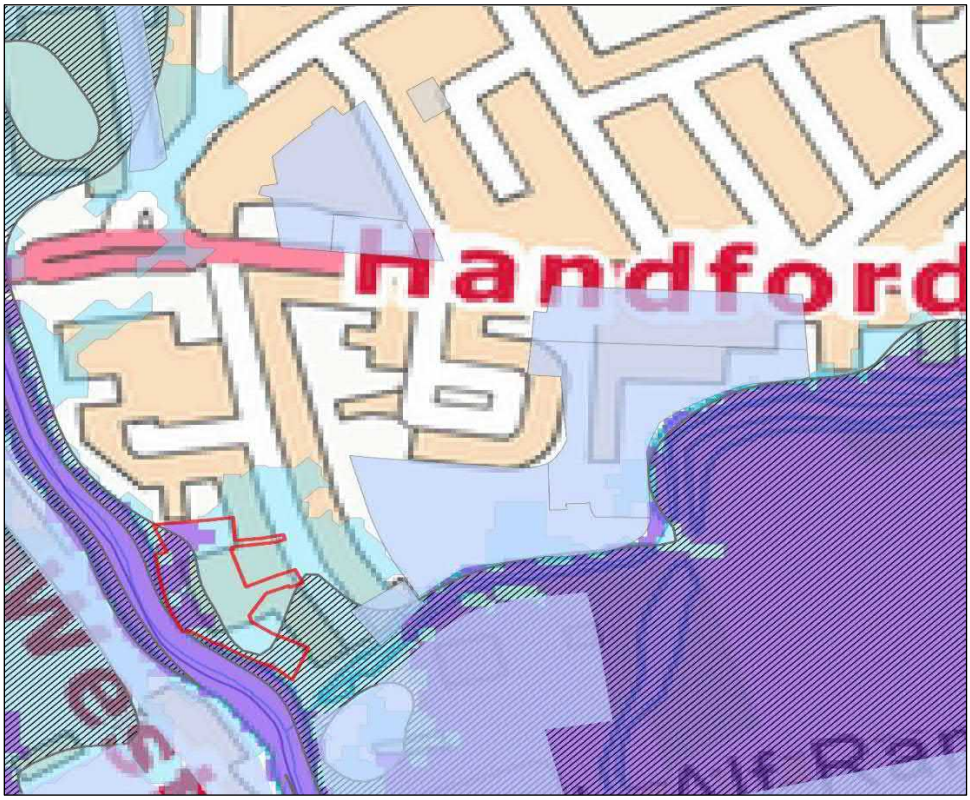
Site Name: 72 (Old Boatyard) Cullingham Road IP1 2EG					
Site ID:	IP354	**Location:**	72 (Old Boatyard) Cullingham Road IP1 2EG	**Area (ha):**	0.34
Current Use:	Commercial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding

Flood Zone 1 (<0.1% AEP): 0%	Flood Zone 2 (0.1% AEP): 74%	Flood Zone 3 (1% AEP): 26%	Flood Zone 3b (5% AEP): 0%	Area Benefiting from Defences: 45%

As it flows through Ipswich, the River Gipping becomes the River Orwell. A channel of the River Gipping / Orwell flows south along the western edge of the site and joins with another main channel of the River Orwell. At this location the River Gipping / Orwell is tidally influenced. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. There is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

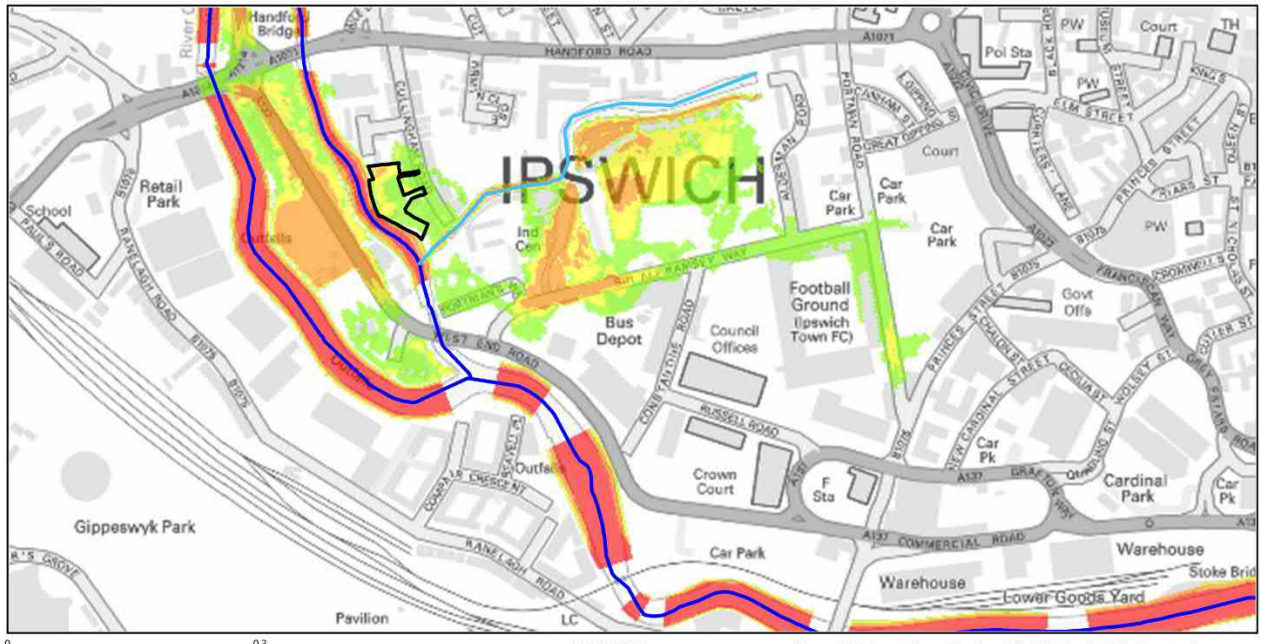
The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1939.

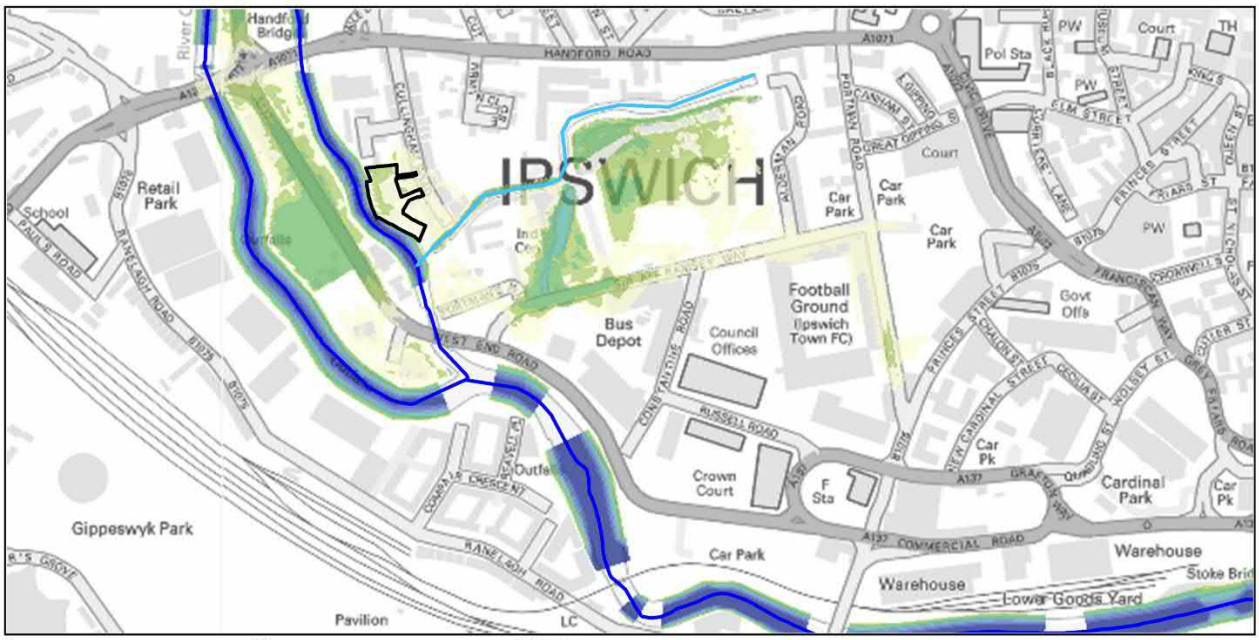


Site Name: 72 (Old Boatyard) Cullingham Road IP1 2EG

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, the site is shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 4.47m AOD and Low - Significant hazard rating. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with flood levels of 4.7 – 4.95m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.



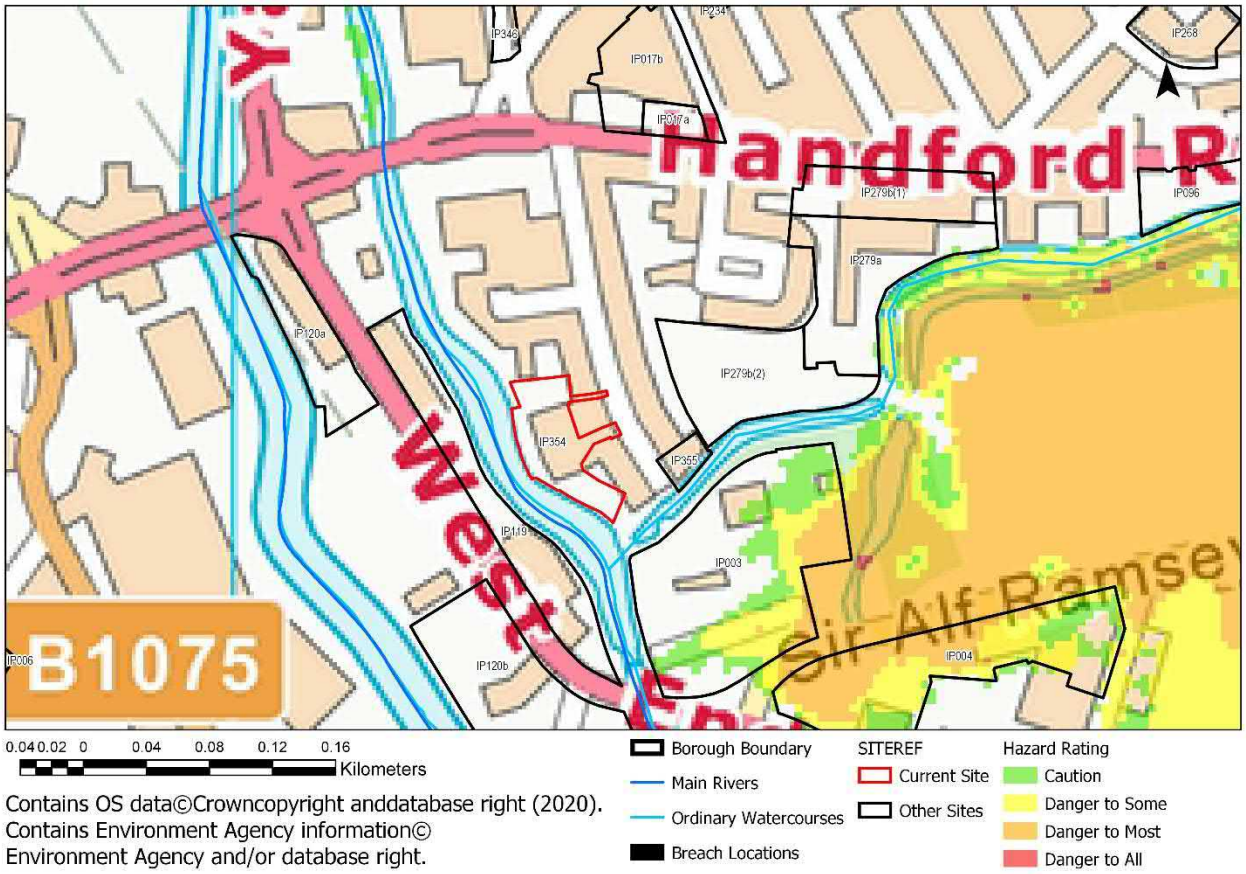


Site Name: 72 (Old Boatyard) Cullingham Road IP1 2EG

Tidal Flood Risk – River Orwell

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences. A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.
Under this scenario, flood water does not enter the site and there is no flood hazard outlined.

Residual Flood risk – Combined Flood Hazard (0.5% AEP, 2118)



0.04 0.02 0 0.04 0.08 0.12 0.16 Kilometers

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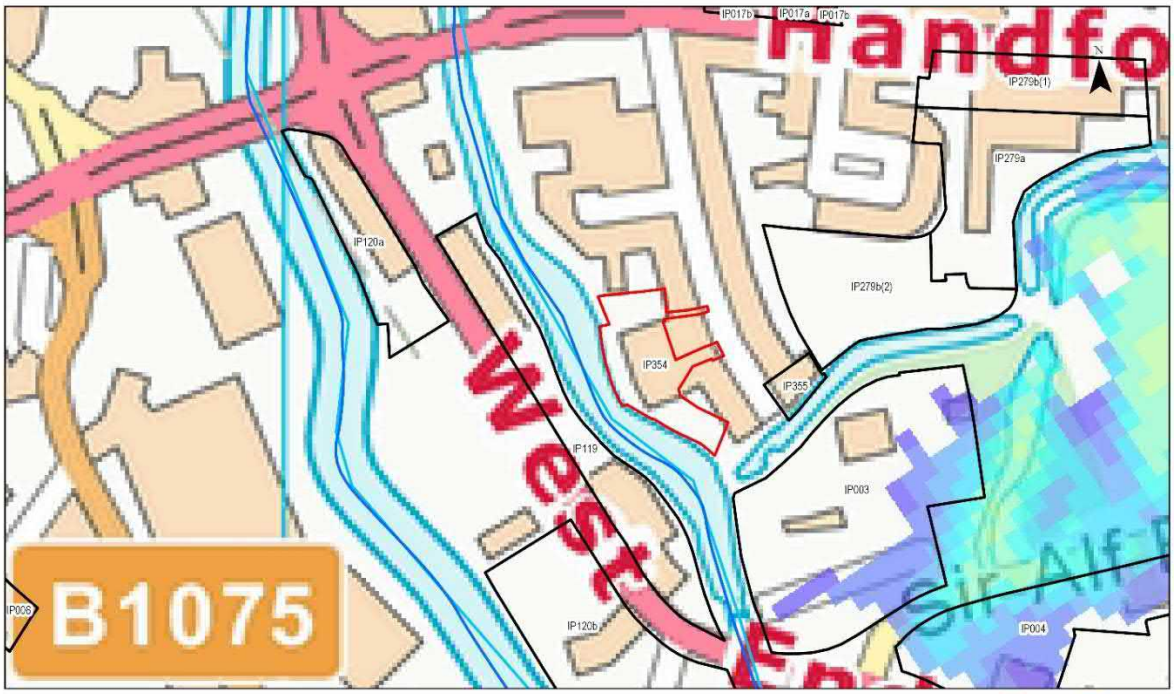
Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

Hazard Rating
Caution
Danger to Some
Danger to Most
Danger to All

Residual Flood risk – Combined Flood Depth (0.5% AEP, 2118)



0.03 0.01 0 0.03 0.06 0.09 0.12 Kilometers

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Borough Boundary
Main Rivers
Ordinary Watercourses
Breach Locations

SITEREF
Current Site
Other Sites

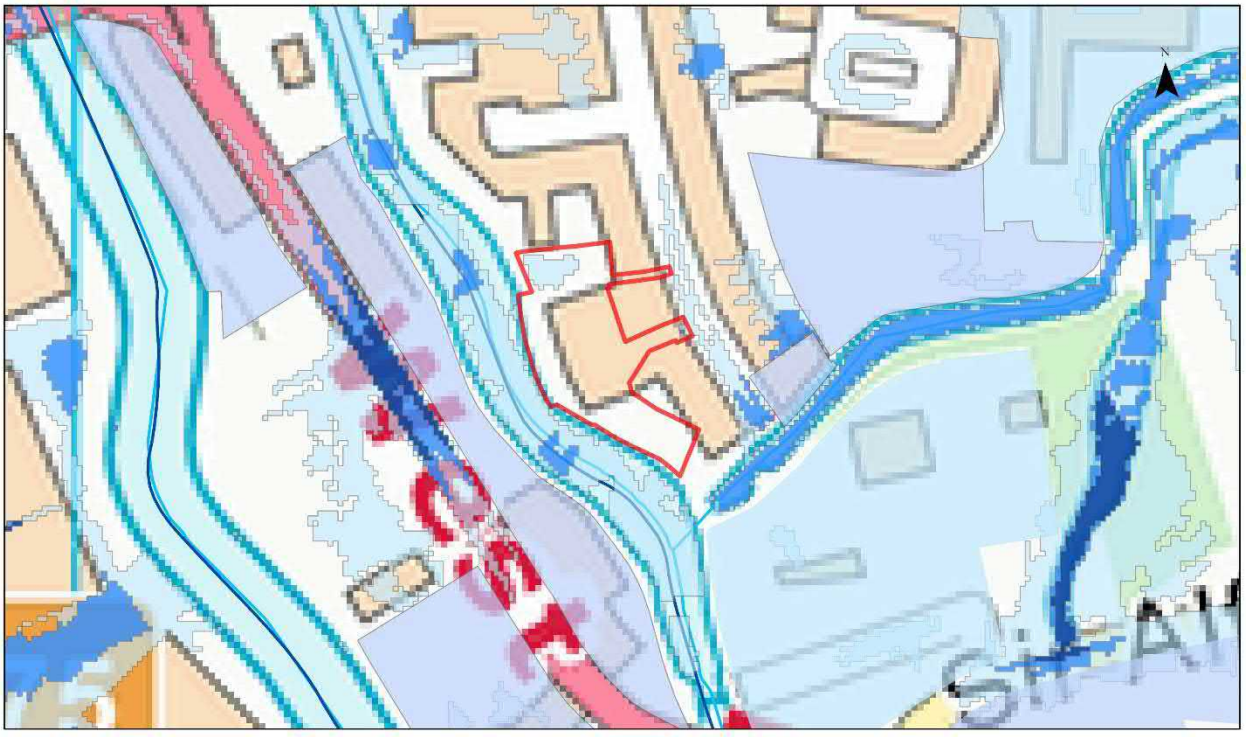
Flood Depth (m)
≤ 0
≤ 0.25
≤ 0.5
≤ 0.75
≤ 1
≤ 1.25
≤ 1.5
≤ 1.75
≤ 2
≤ 2.25
≤ 2.5
≤ 2.75
≤ 3
≤ 4
≤ 5

Site Name: 72 (Old Boatyard) Cullingham Road IP1 2EG

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence.

The underlying geology in this location is White Chalk subgroup and Lambeth Group. White Chalk subgroup is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is shown to be at actual risk of fluvial flooding from the Lower Gipping in the future as a result of climate change, and at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 4.47m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) access/egress for the site is achievable along Cullingham Road at Low hazard rating.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

Site Name: 72 (Old Boatyard) Cullingham Road IP1 2EG

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 4.7 – 4.95m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and a safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Set-back Distance

All development should be set back from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal).

Other considerations

The modelling of the River Gipping shows that water comes out of bank close to Site IP354, and therefore modifications to ground levels in this location (for example, to achieve required finished floor levels) has the potential to increase the flood levels in the channel and thereby potentially lead to flooding elsewhere. Future development in this location must ensure that the risk to other areas is not increased.

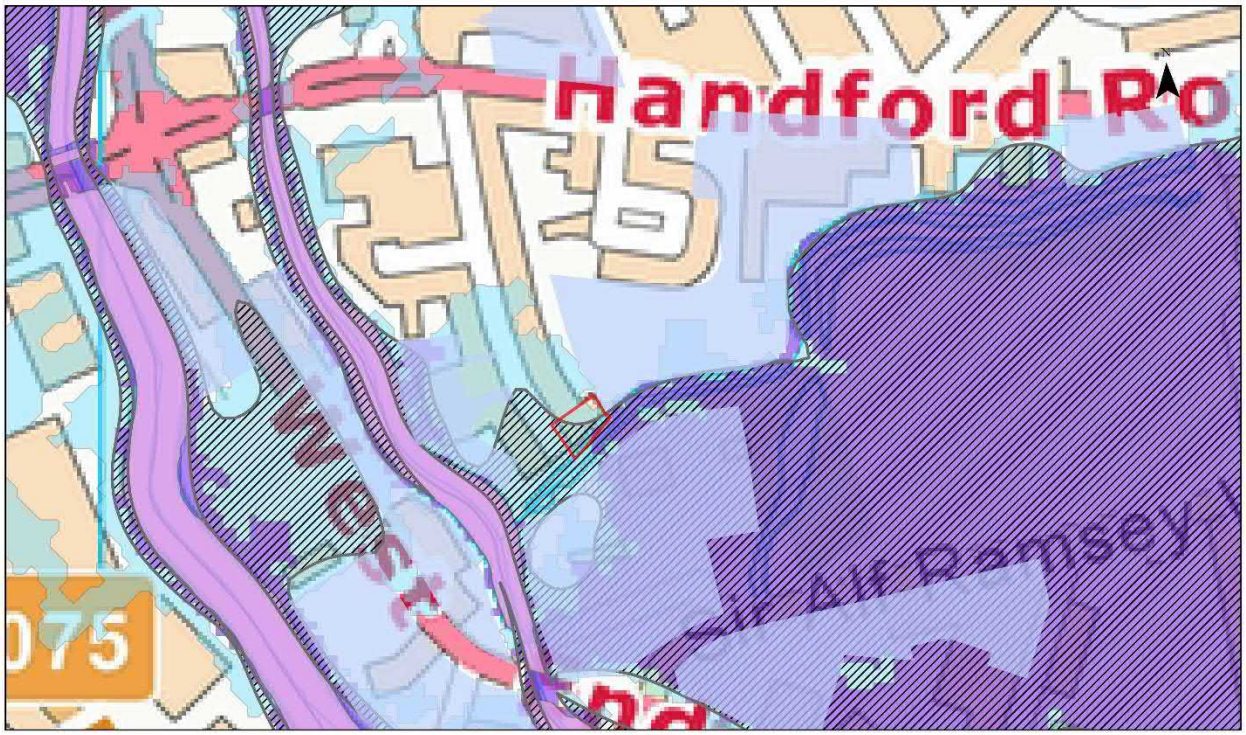
Site Name: 77-79 Cullingham Road					
Site ID:	IP0355	**Location:**	77-79 Cullingham Road	**Area (ha):**	0.06
Current Use:	Light industrial	**Proposed Use:**	Residential	**Vulnerability Classification:**	More Vulnerable

Flood Zones and Historic Flooding				
Flood Zone 1 (<0.1% AEP): 0%	**Flood Zone 2 (0.1% AEP):** 90%	**Flood Zone 3 (1% AEP):** 4%	**Flood Zone 3b (5% AEP):** 0%	**Area Benefiting from Defences:** 62%

As it flows through Ipswich, the River Gipping becomes the River Orwell. The River Gipping is approximately 50m to the southwest of the site. At this location the River Gipping / Orwell is tidally influenced.

The site is located within Flood Zone 2, medium probability of flooding. The south eastern section of the site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

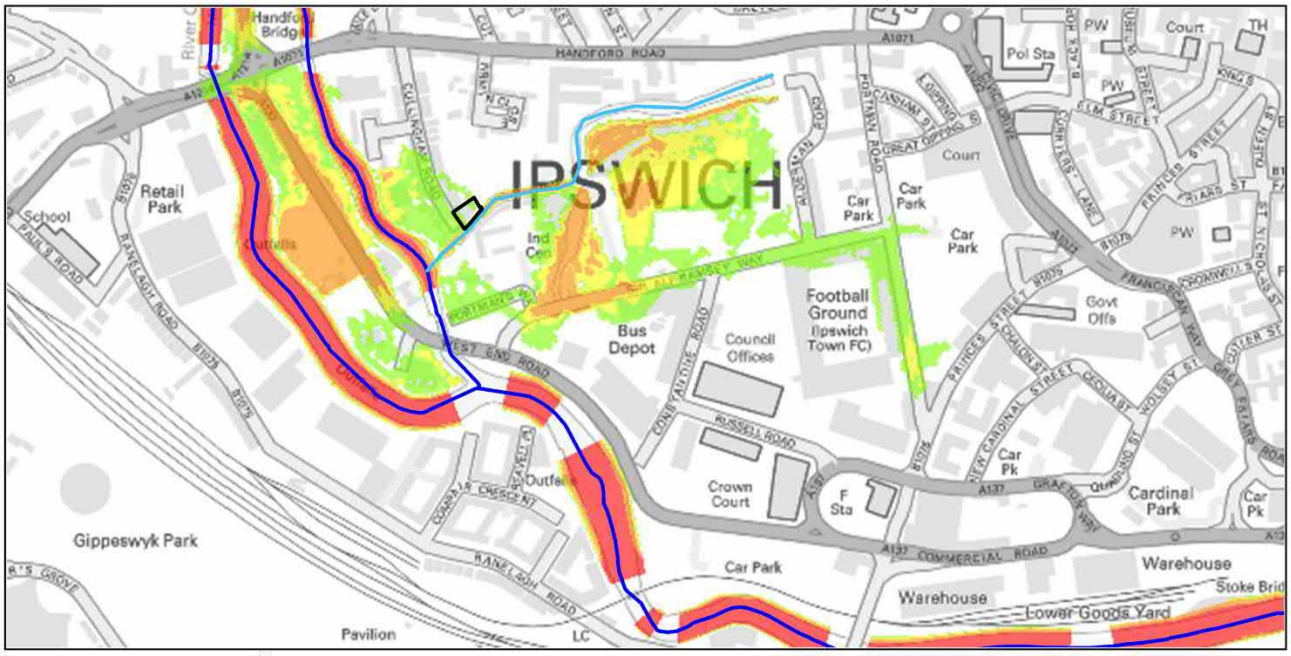
The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents in this location associated with surface water and highway flooding.

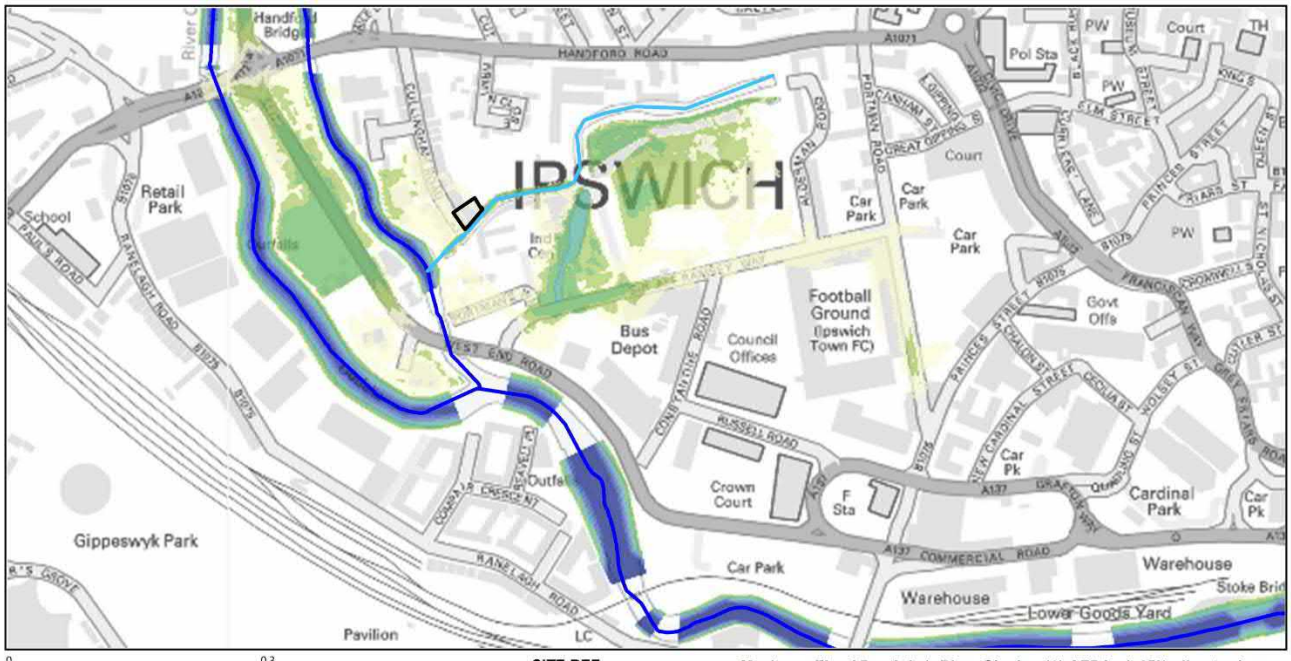


Site Name: 77-79 Cullingham Road

Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, the site is shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 4.16m AOD and Low - Significant hazard rating. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with flood levels of 4.49m AOD. The depth and hazard maps for the 0.1% AEP event including 25% climate change are included in Appendix A Figure 8D an 8E.





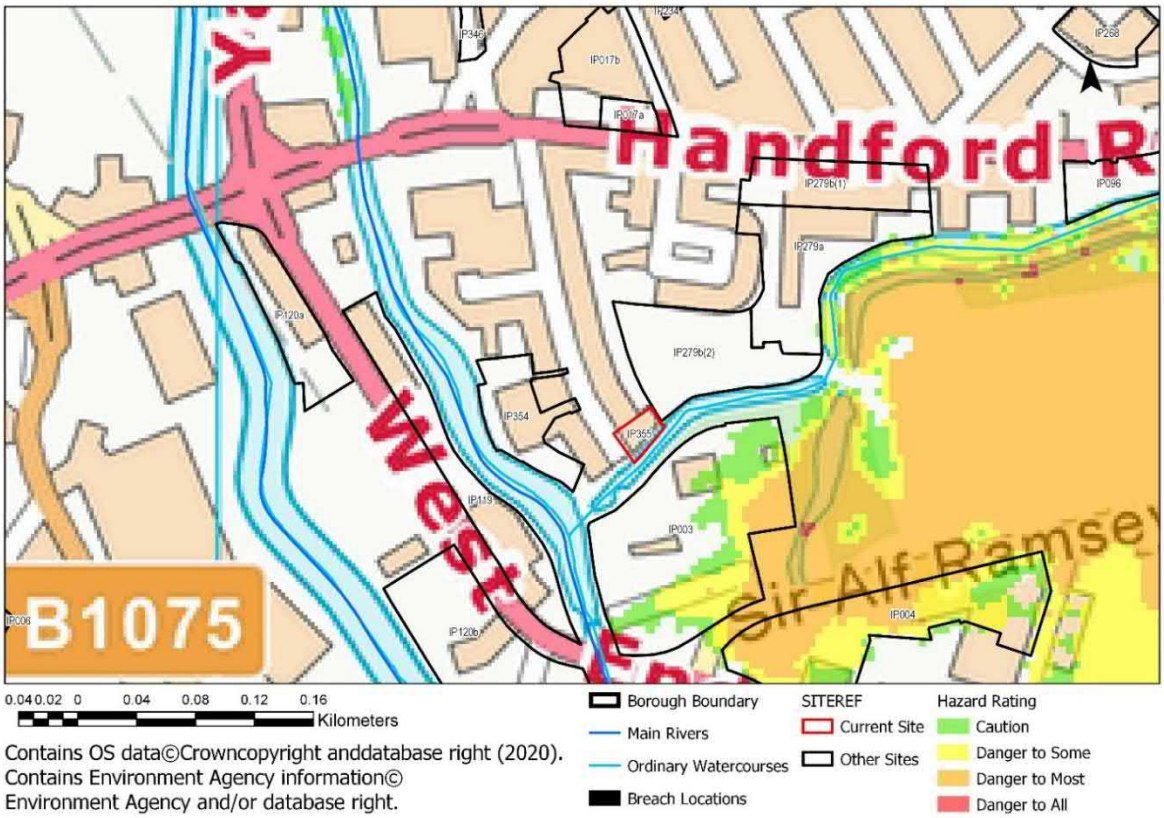
Site Name: 77-79 Cullingham Road

Tidal Flood Risk – River Orwell

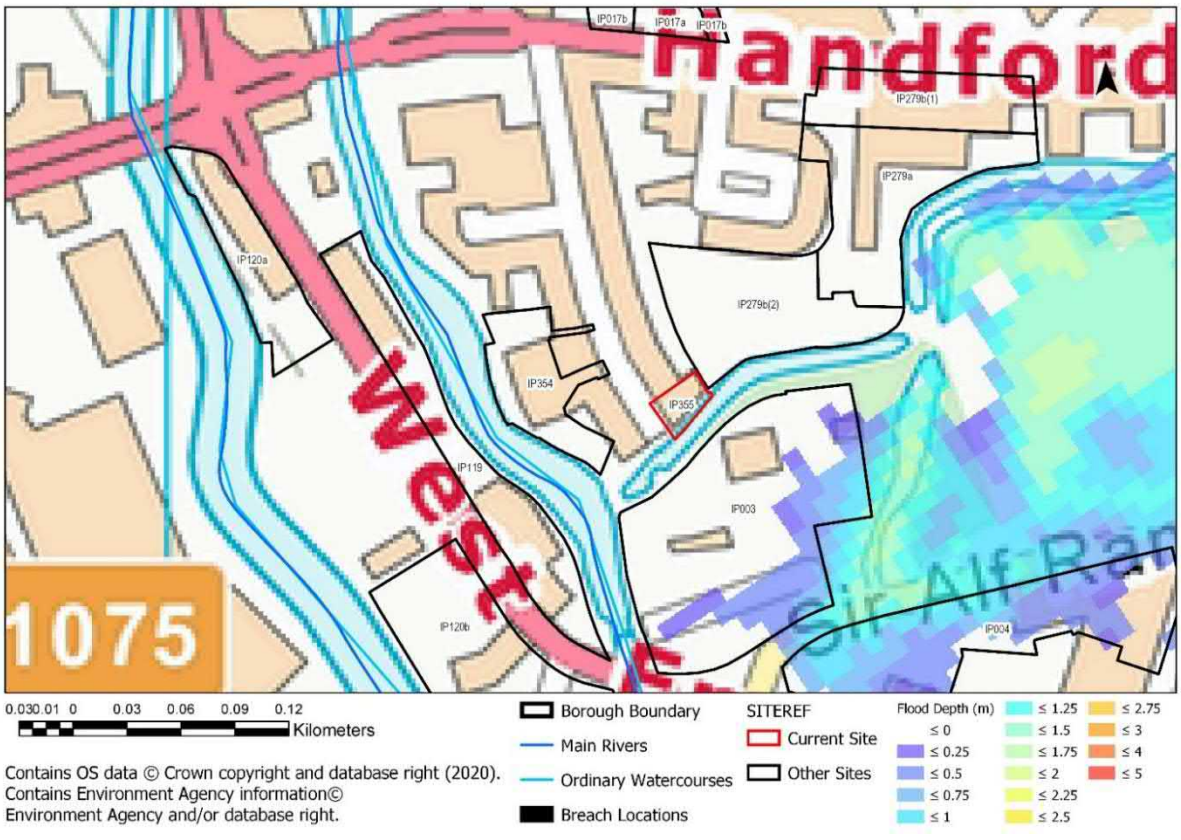
This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences. A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

Under this scenario, the site is not shown to be affected by flood hazard. This may be because the presence of a channel to the south of the site is preventing water from the breaches outlined above from propagating across the flood cell to the site.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



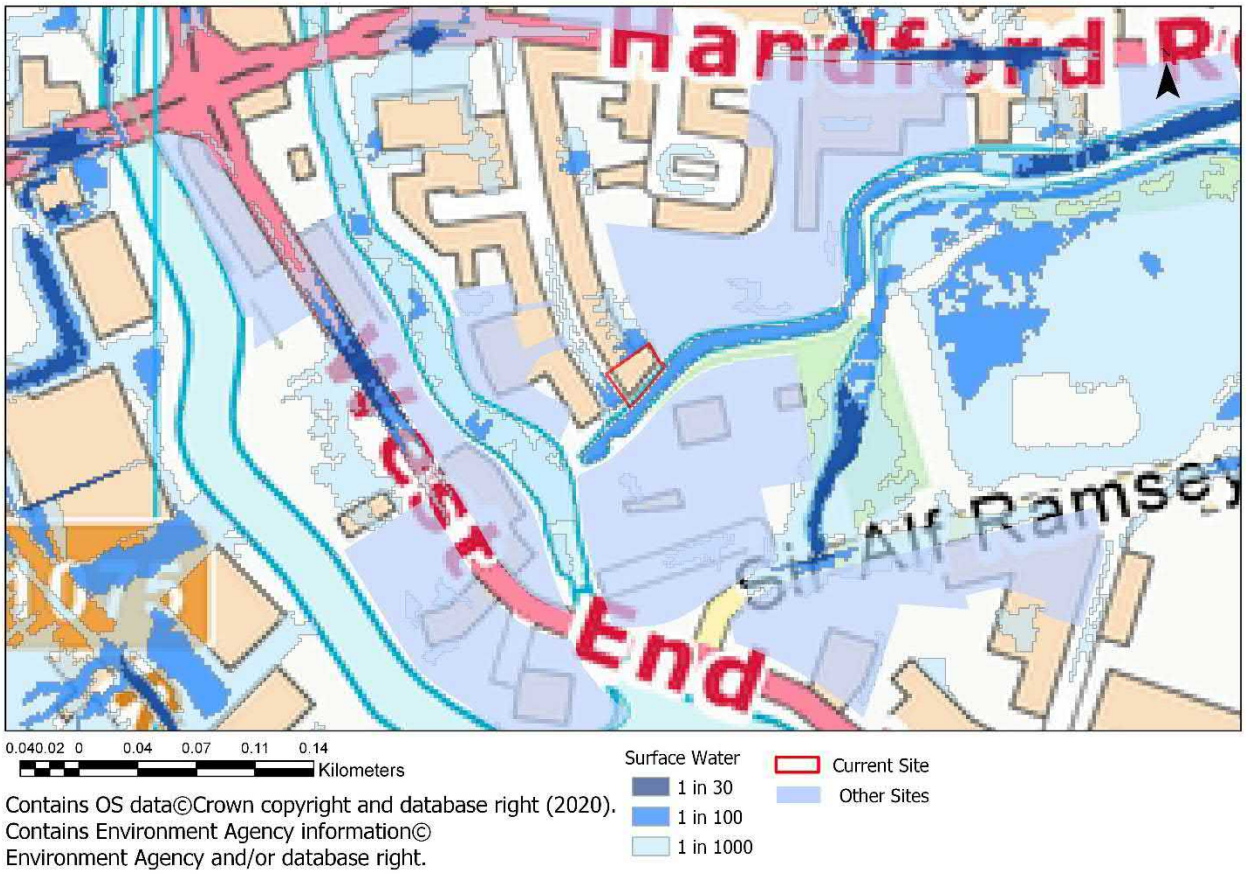
Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: 77-79 Cullingham Road

Surface Water Flood Risk

The site has a risk of surface water flooding to the south west where the road lies. The roads in the surrounding area are susceptible to overland flow and ponding. There are also areas above the northern site boundary that are at risk of ponding.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from reservoir flooding.

Site Specific Recommendations

The site is shown to be at actual risk of fluvial flooding from the Lower Gipping in the future as a result of climate change, and at residual risk of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 4.16m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) access/egress for the site is achievable along Cullingham Road at Low hazard rating.

Safe Refuge

A safe place of refuge must be provided above the extreme flood level.

Site Name: 77-79 Cullingham Road

With respect to the residual risk of tidal flooding, a safe place of refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 4.49m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping; occupants should sign up to receive warnings associated with the Flood Warning Area for the River Gipping from Needham Market to London Road Bridge.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and safe place of refuge.

Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Set-back Distance

All development should be set back from the edge of watercourses. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a flood defence structure (whether fluvial or tidal). Consent needs to be obtained from Suffolk County Council (in their capacity as the LLFA) for any works that may affect flow within the Ordinary Watercourse to the south of the site.