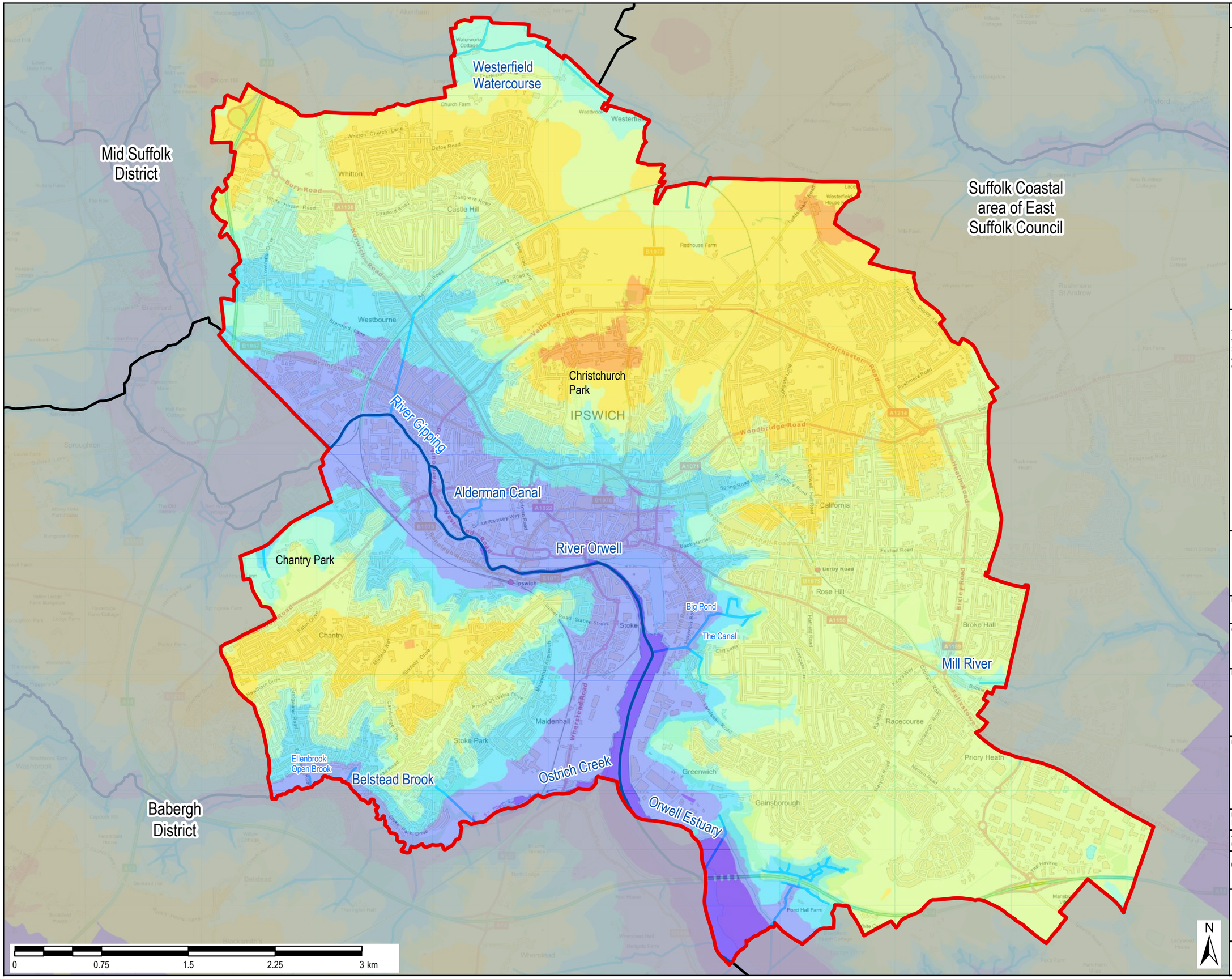


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**LEGEND**

- Borough Boundary
- Surrounding Districts
- Main Rivers
- Ordinary Watercourses

Topography (m AOD)

- ≤0
- ≤ 10
- ≤ 20
- ≤ 30
- ≤ 40
- ≤ 50
- ≤ 60
- ≤76

Notes

1. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground.
2. This dataset has a spatial resolution of 2m. The Environment Agency's LIDAR data archive contains digital elevation data derived from surveys carried out since 1998.



Purpose of Issue: FINAL

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA

Drawing Title: TOPOGRAPHY MAIN RIVERS AND ORDINARY WATERCOURSES

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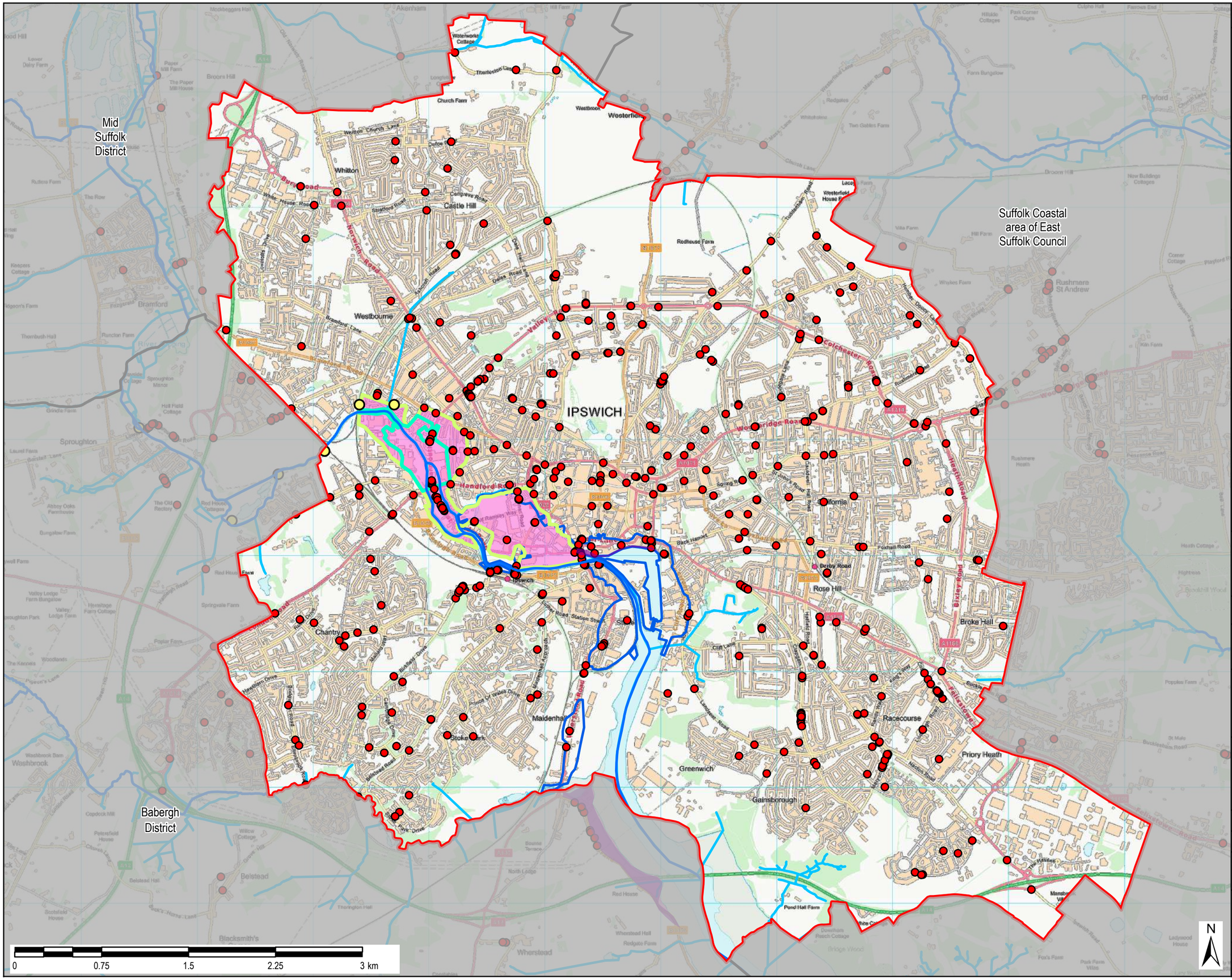


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## LEGEND

- Borough Boundary
- Surrounding Districts
- Main Rivers
- Ordinary Watercourses
- Historic Flood Map
- River Gipping 1939 flood extent
- River Gipping 1947 flood extent

River Gipping 1974 flood events

- 2/12/74
- 1953 Flood Outlines
- December 2013 Flood Surge
- IBC Flood Incidents

Notes

1. Flood Incident data has been provided by the Environment Agency and Suffolk County Council (Lead Local Flood Authority). Further information on these flood records is provided within the Level 1 SFRA report.



Purpose of Issue: FINAL

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA

Drawing Title: HISTORIC FLOOD MAP

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# Appendix A Figure 3
# Trunk Sewers

Trunk Sewers

Project Orwell Tunnel

High Level Trunk Sewer

Low Level Trunk Sewer

Eastern Area Trunk Sewer

South East Area Sewer

Ciff Quay
WWTW

Chantry
WWTW

4

10

# Appendix A Figure 4 Highway and Railway Drains and SUDS Catchments

Highway Drains
Highway Soakaway
Highway Trench Soakaway
Railway Drain
SUDS Catchment



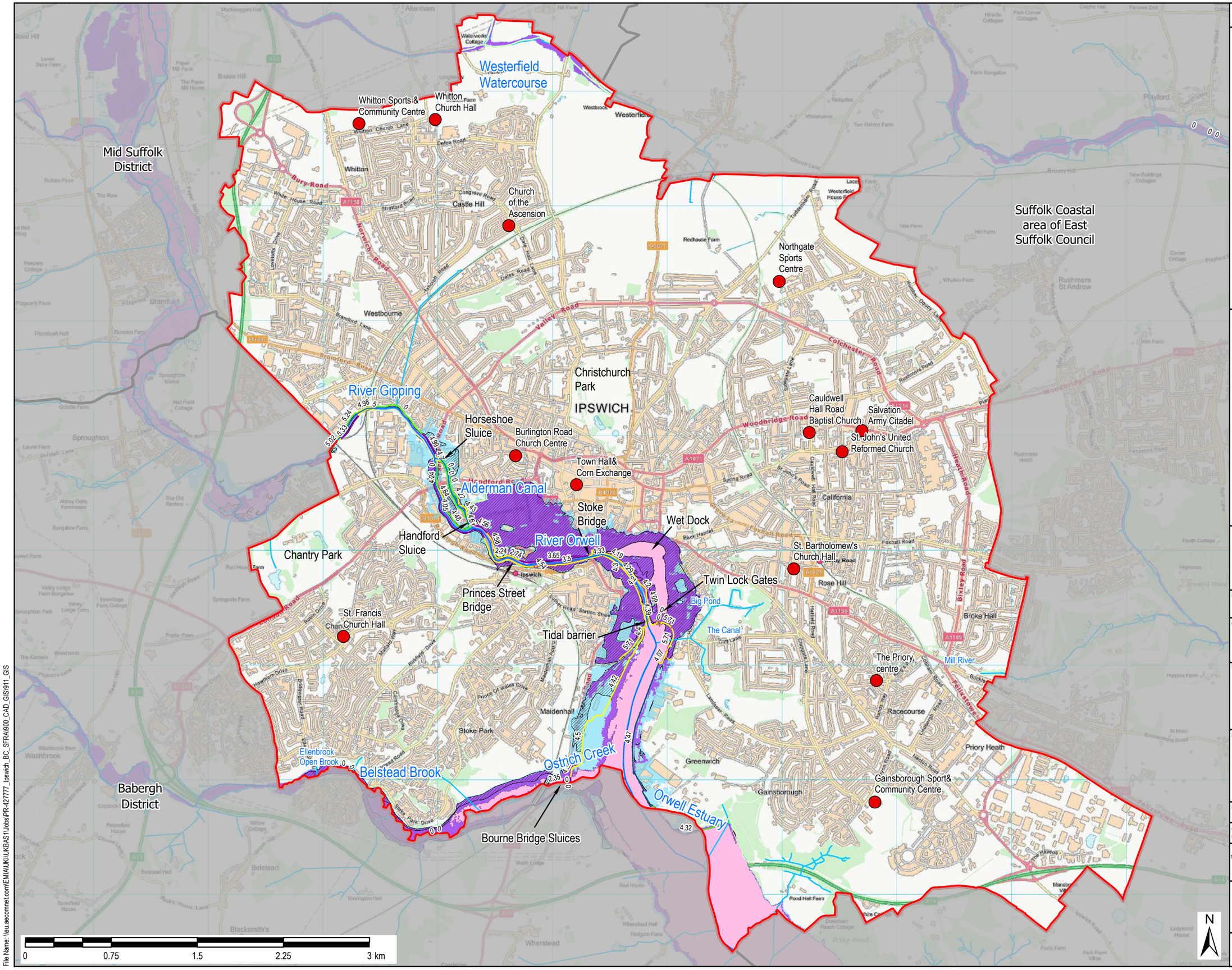
**Strategic Flood Risk Assessment**
**Ipswich Borough Council**

**Appendix A Figure 5: Local Flooding, Watercourses, ASTSWF and Ground-water Flooding**

- Local Flood Risk Areas
- Groundwater Flooding
- Known Watercourses & Major Floodpaths
- Areas Susceptible to Surface Water Flooding - Less
- Areas Susceptible to Surface Water Flooding - Intermediate
- Areas Susceptible to Surface Water Flooding - More
- Suggested SHLAA Site



**SFRA Level 2 May 2011**
**Planning, Transport and Regeneration, Ipswich Borough Council**

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## LEGEND

- Borough Boundary
- Surrounding Districts
- Main Rivers
- Ordinary Watercourses
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

AIMS database Flood Defences
- Embankment
- High Ground
- Wall
- Flood Gate
- Quay
- Demountable Defence

CDL
- Embankment
- High Ground
- Wall
- Flood Gate
- Simple Culvert
- Unknown
- Part of an asset site

- Emergency Rest Centres
- Areas Benefitting from Flood Defences

Notes

1. This map shows the predicted likelihood of fluvial and tidal flooding based on the Environment Agency's Flood Map for Planning (Rivers and the Sea) and catchment modelling studies, which may be subject to revision in the future. The Flood Map for Planning is provided on the Environment Agency website (www.gov.uk/environment-agency).

2. The probability of fluvial flooding is divided into the following categories:

Flood Zone 1 - Land having a less than 0.1% annual exceedence probability (AEP) of river flooding (<1 in 1,000 chance each year). Shown as clear on the Flood Map - all land outside Flood Zones 2 and 3.

Flood Zone 2 - Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (without the presence or functioning of defences). (Land shown in light blue on the Flood Map)

Flood Zone 3 - Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding (without the presence or functioning of defences). (Land shown in dark blue on the Flood Map)

3. Flood Zone 3b Functional Floodplain is defined as land where water has to flow or be stored in times of flood, or land purposely designed to flood in an extreme event (0.1% AEP). For the purpose of this SFRA, land modelled to have a probability of flooding of 5% AEP or greater has been used by Ipswich BC as a starting point for identifying areas of Functional Floodplain.

4. The crest level for the flood defences has been taken from the AIMS data.



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Drawing Title: FLUVIAL AND TIDAL FLOOD RISK

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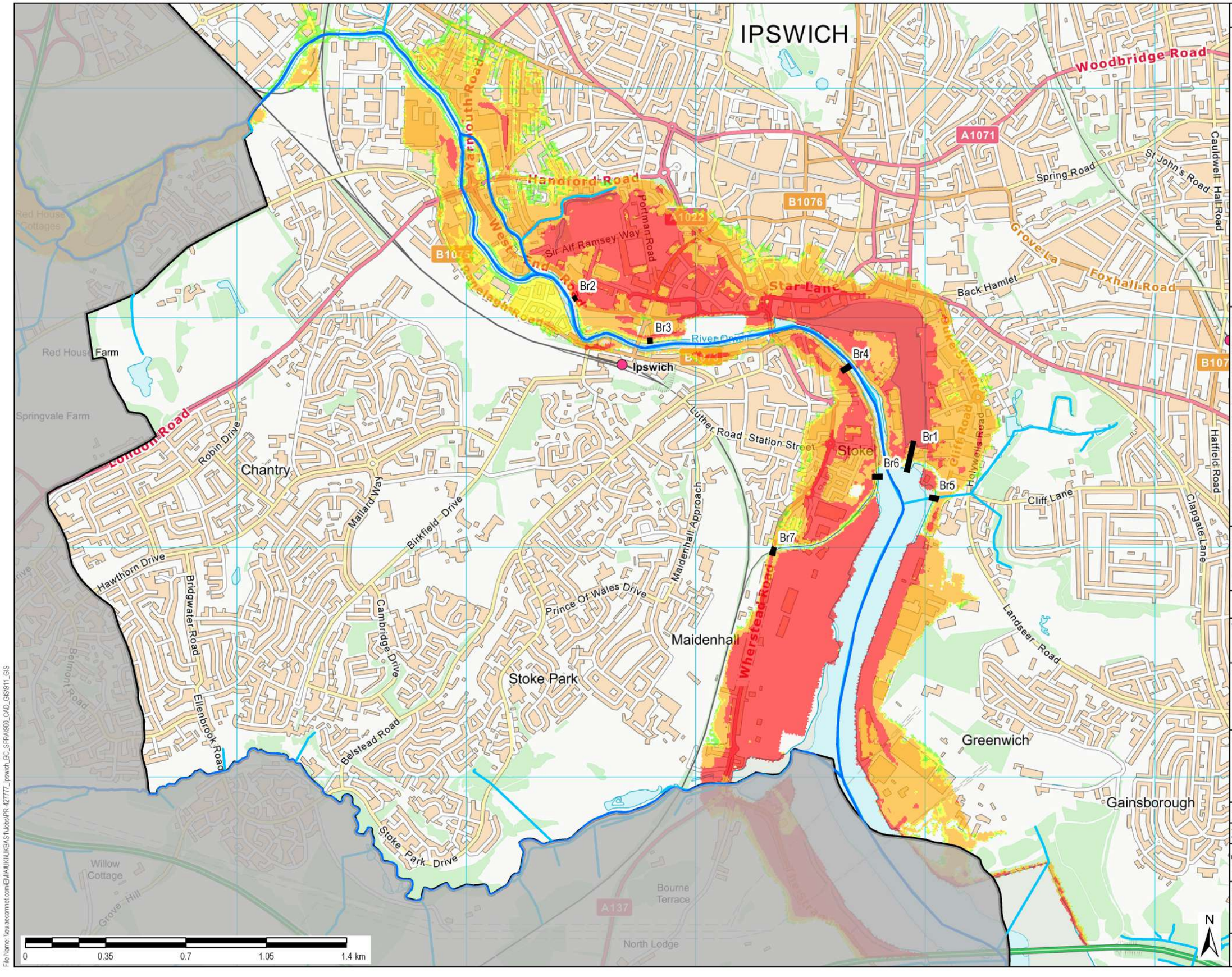


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR02 Breach at West End Road scenario.
2. BR02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR02 AND CLIMATE CHANGE TO 2118

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR03 Breach at Princes St bridge (left bank) .

2. IP02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.

3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.

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Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR03 AT 2015 (PRESENT DAY)

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0 0.35 0.7 1.05 1.4 km

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IPSWICH

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR03 Breach at Princes St bridge (left bank) .
2. IP02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
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Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR03 AND CLIMATE CHANGE TO 2118

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0 0.35 0.7 1.05 1.4 km

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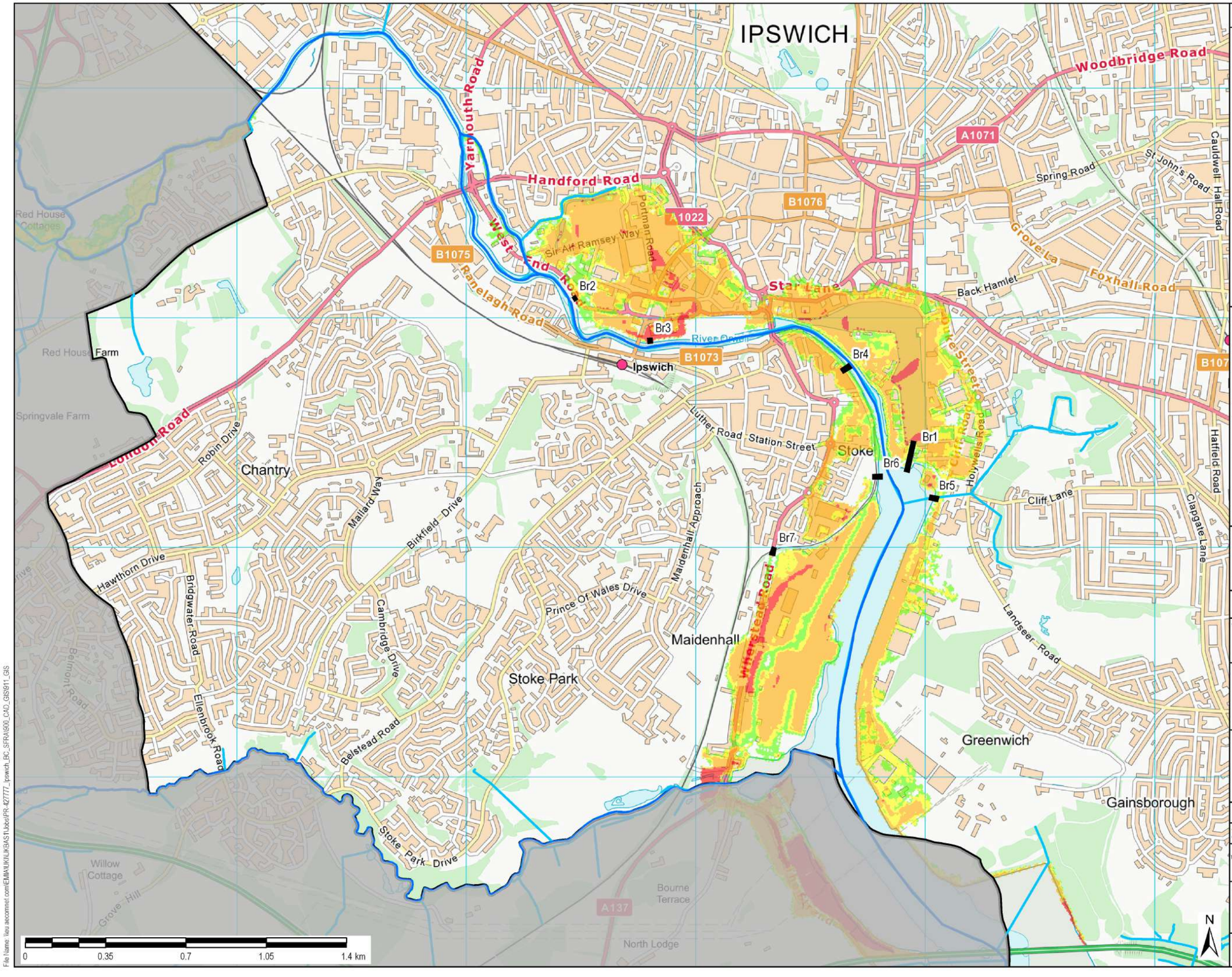


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR03 Breach at Princes St bridge (left bank) .

2. IP02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.

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Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR03 AT 2015 (PRESENT DAY)

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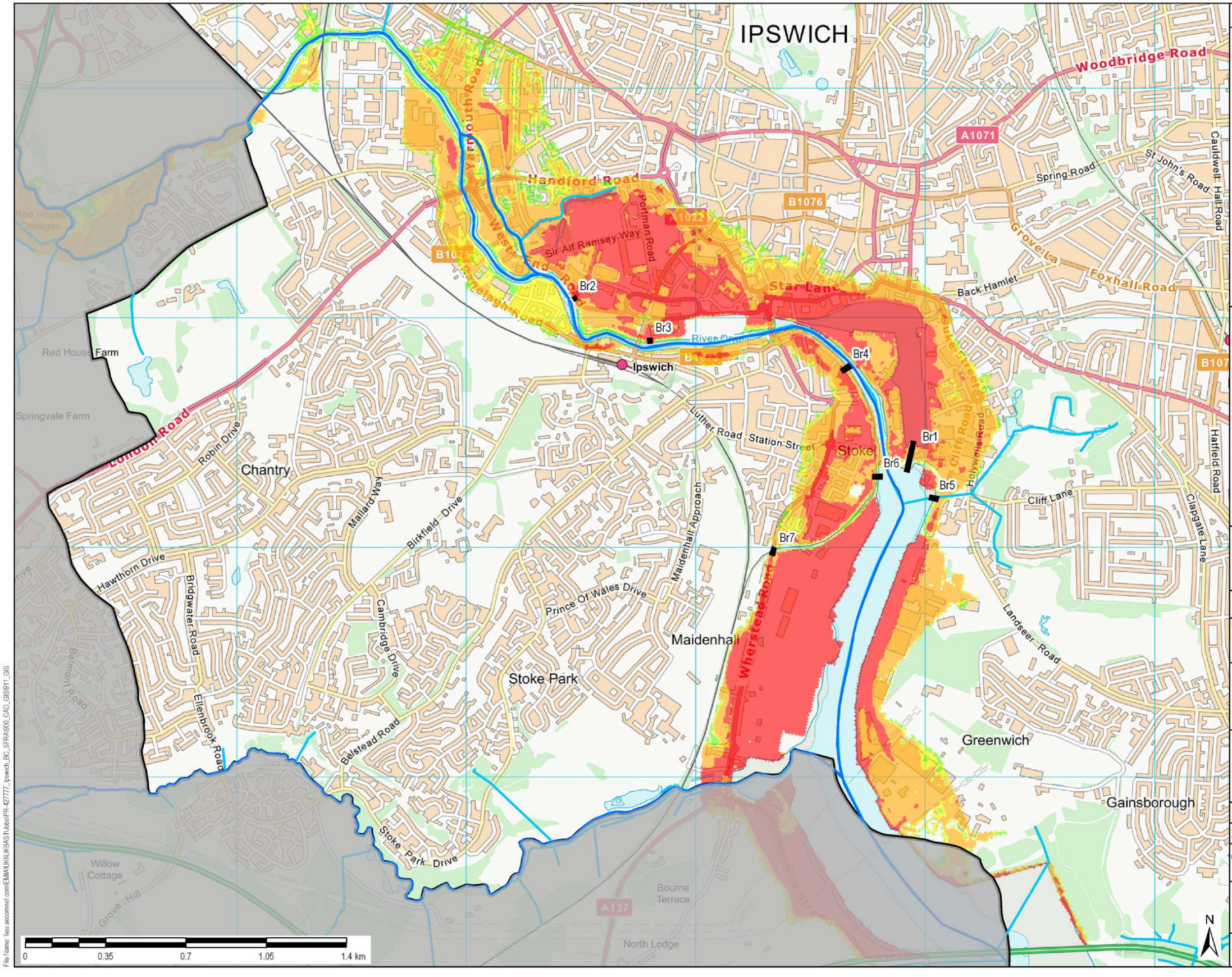


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1. This map shows the modelled flood hazard from the IP02 Barrier Open: BR03 Breach at Princes St bridge (left bank) .
2. IP02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR04 Breach at Bath Street (right bank).
2. IP02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
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Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR04 AT 2015 (PRESENT DAY)

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0 0.35 0.7 1.05 1.4 km

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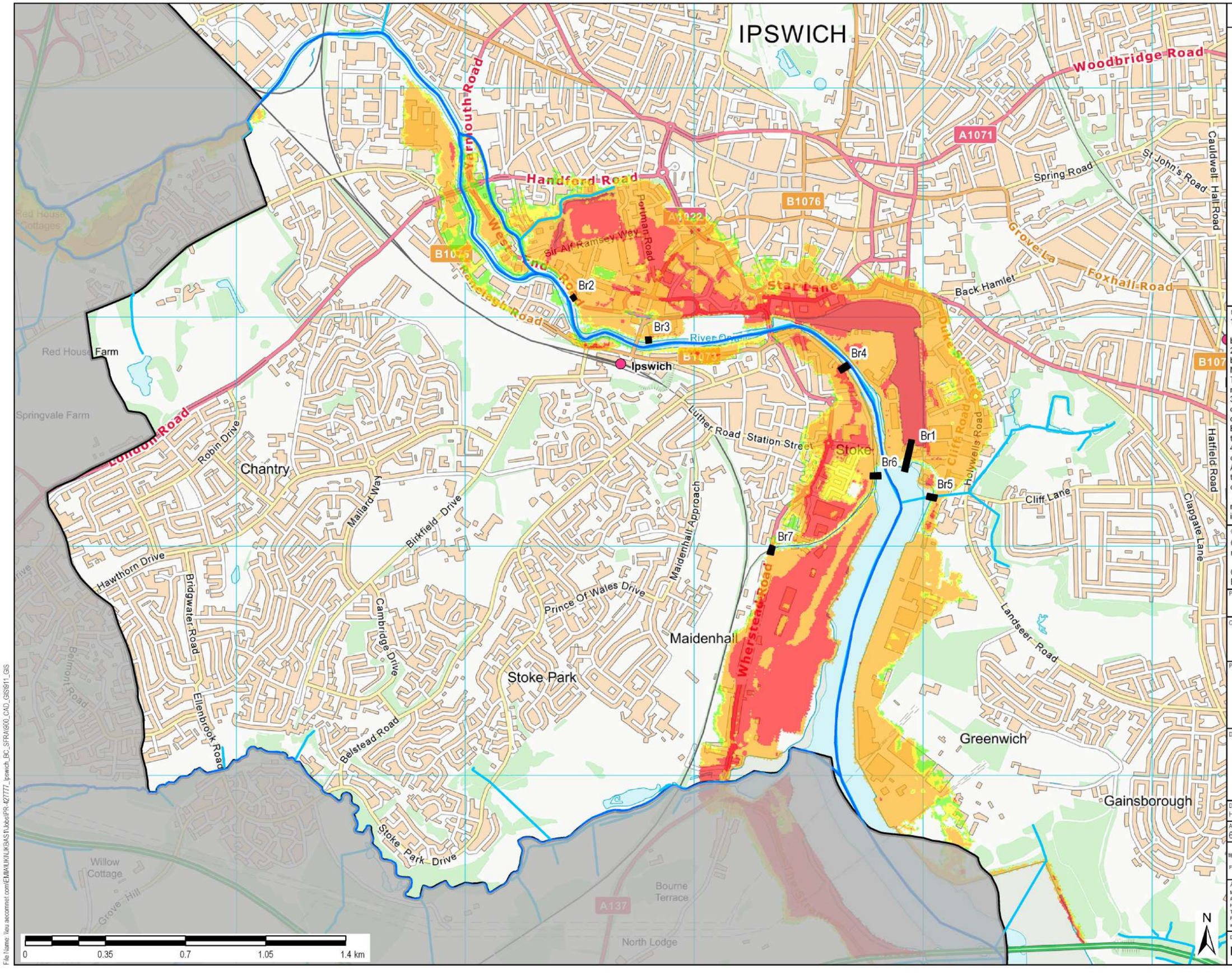


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to most
- Danger to some
- Danger to all

Notes

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Purpose of Issue: DRAFT

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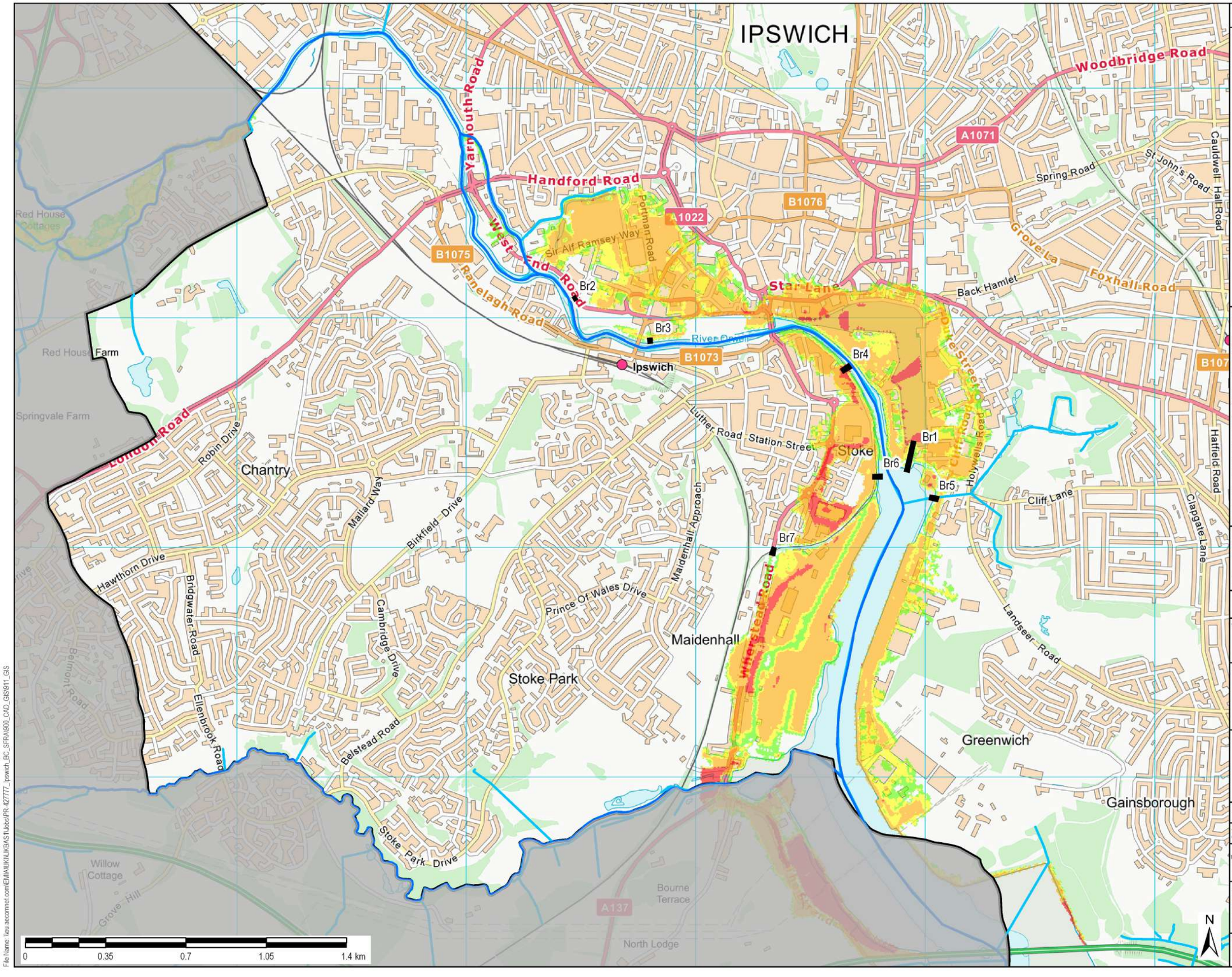


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

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Purpose of Issue: DRAFT

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Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR04 AT 2015 (PRESENT DAY)

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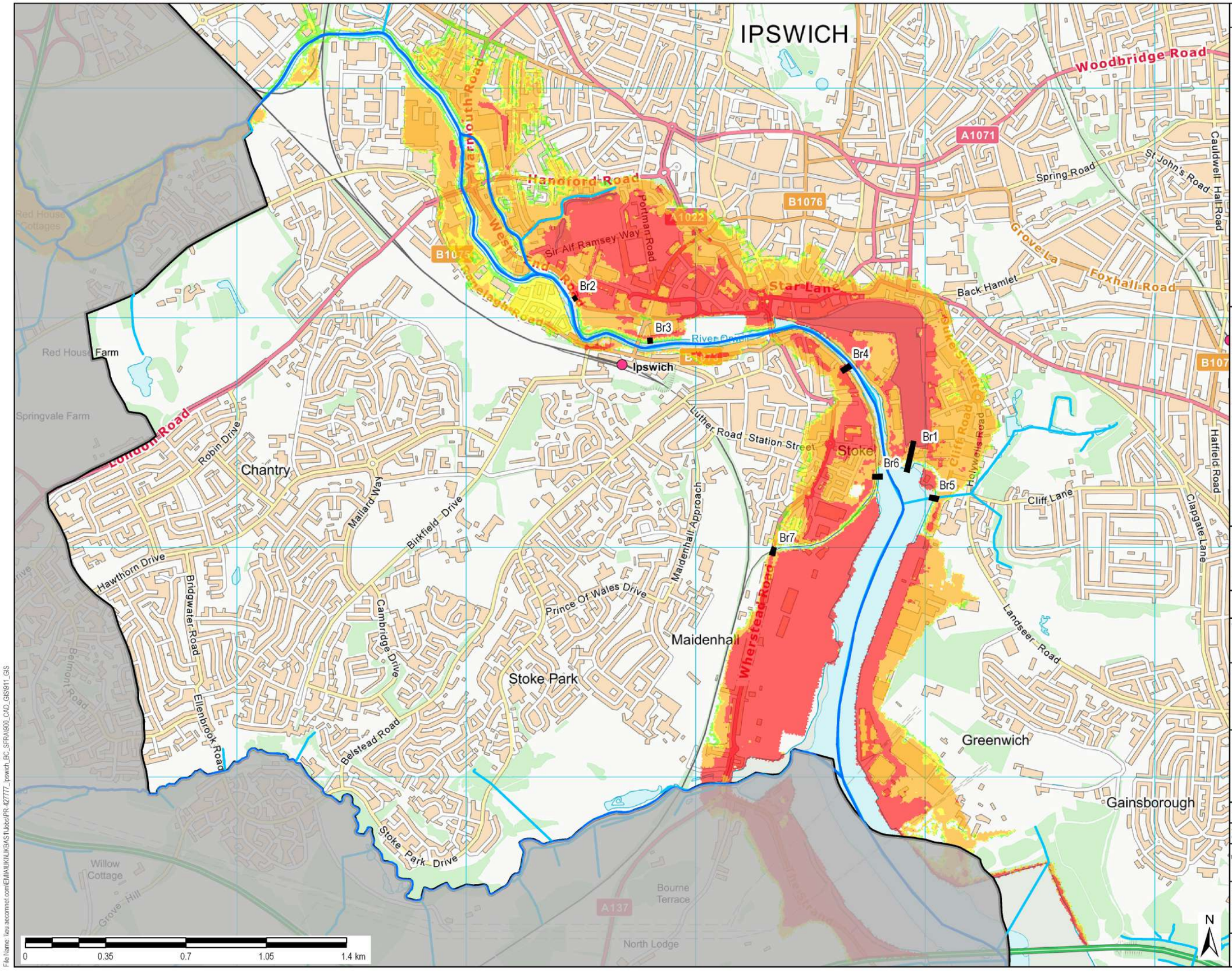


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

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2. IP02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
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Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR04 AND CLIMATE CHANGE TO 2118

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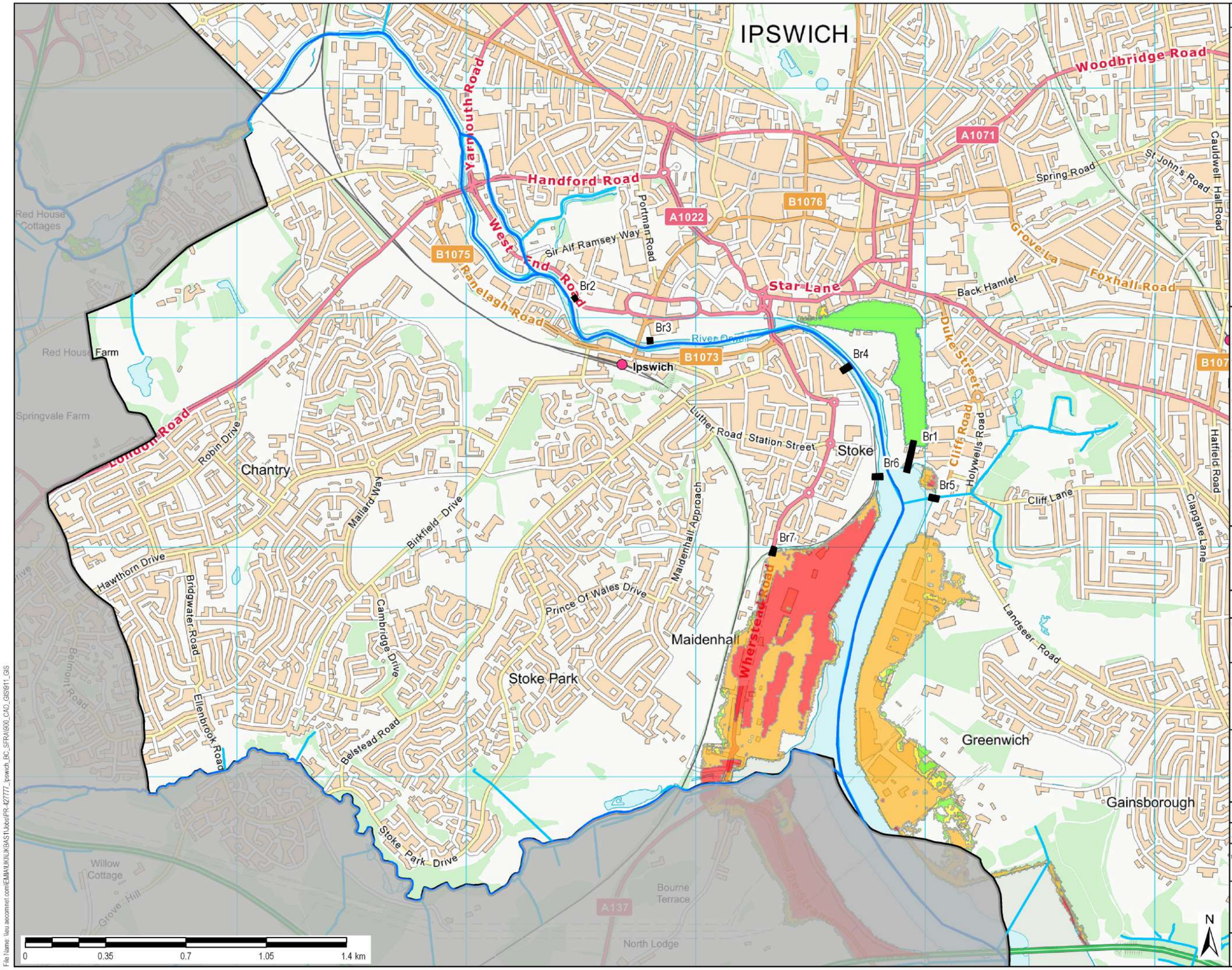


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier closed: no breach.

2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.

3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.

4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% PLUS CLIMATE CHANGE TO 2118, NO BREACH OF FLOOD DEFENCES

| Drawn | Checked | Approved | Date |
|---|---|---|---|
| HB | SL | EC | 01/20 |

AECOM Internal Project No.: 60612179

Scale @ A3: 1:15,000



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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier closed: no breach.

2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.

3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.

4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% AT 2015 (PRESENT DAY), NO BREACH OF FLOOD DEFENCES

| Drawn | Checked | Approved | Date |
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AECOM Internal Project No.: 60612179

Scale @ A3: 1:15,000



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Rev: 01

0 0.35 0.7 1.05 1.4 km

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to most
- Danger to some
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier closed: no breach.

2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.

3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.

4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% PLUS CLIMATE CHANGE TO 2118, NO BREACH OF FLOOD DEFENCES

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AECOM Internal Project No.: 60612179

Scale @ A3: 1:15,000



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Drawing Number: FIGURE 19O

Rev: 01

0 0.35 0.7 1.05 1.4 km

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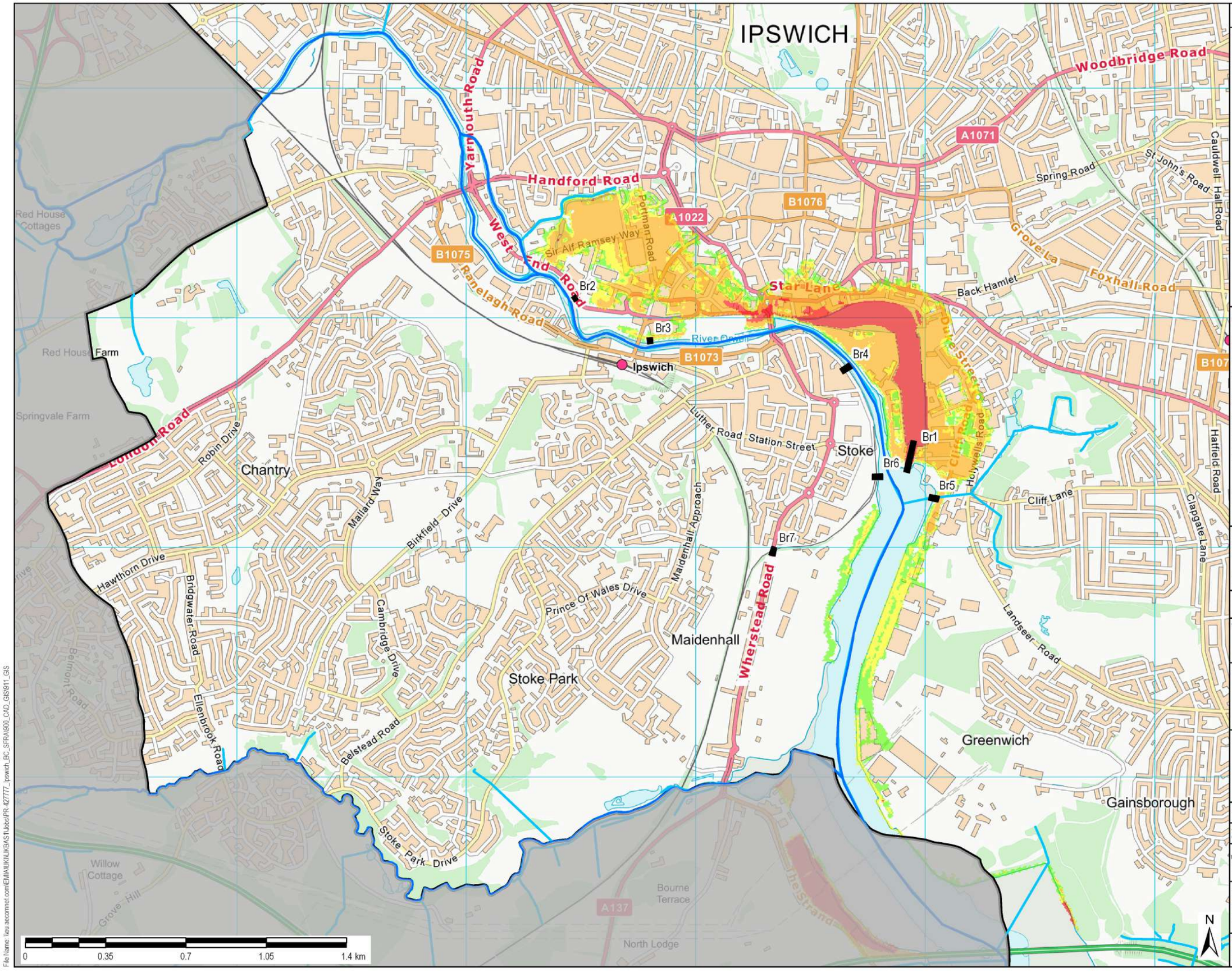


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Closed: BR01 Wet Dock Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR01 AT 2015 (PRESENT DAY)

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier closed: BR01 Wet Dock Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR01 AND CLIMATE CHANGE TO 2118

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Rev: 01

0 0.35 0.7 1.05 1.4 km

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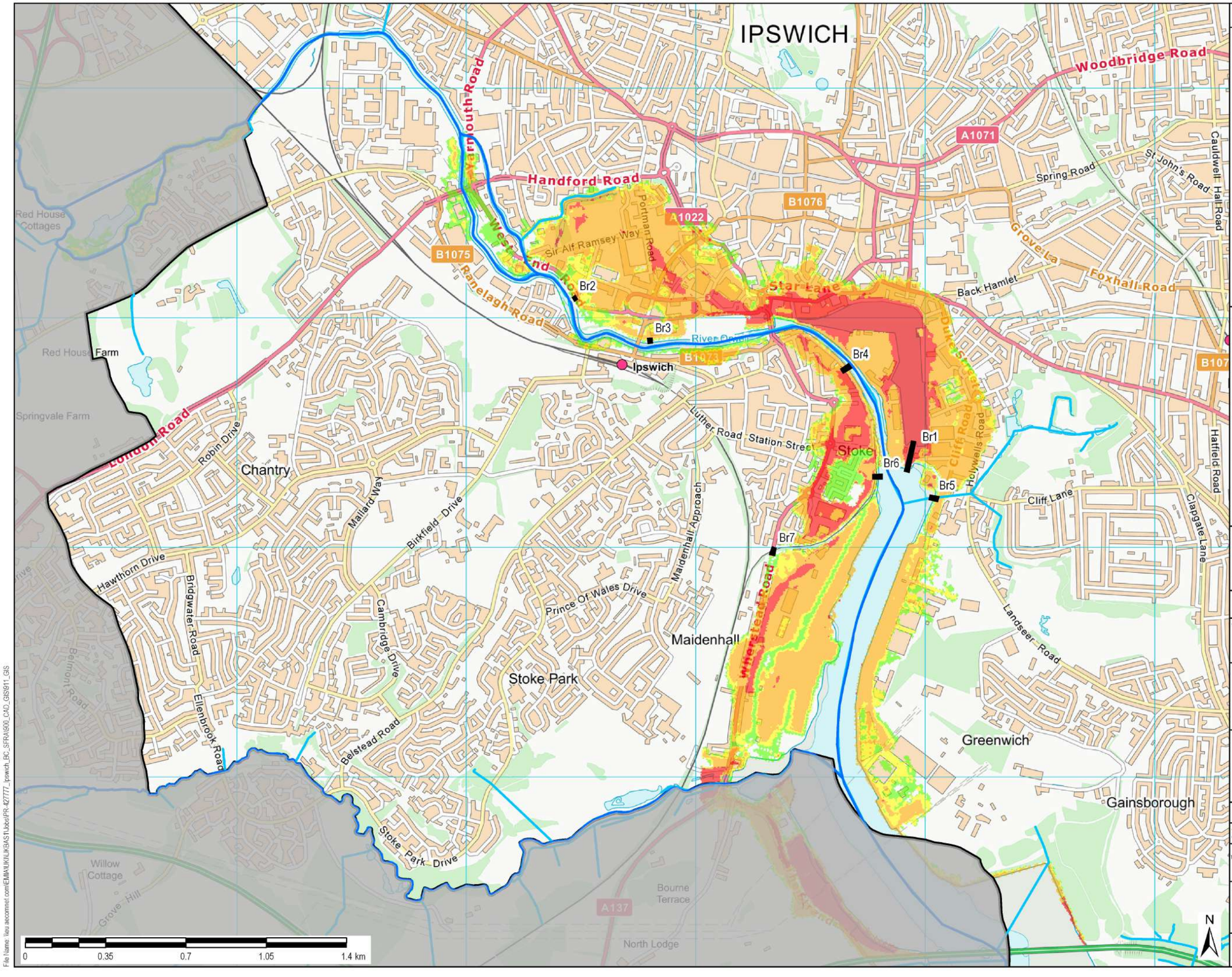


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Closed: BR01 Wet Dock Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
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Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR01 AT 2015 (PRESENT DAY)

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IPSWICH

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier closed: BR01 Wet Dock Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
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Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR01 AND CLIMATE CHANGE TO 2118

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0 0.35 0.7 1.05 1.4 km

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Closed: BR05 Breach at East bank defence.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR05 AT 2015 (PRESENT DAY)

| Drawn | Checked | Approved | Date |
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Drawing Number: FIGURE 19T

Rev: 01

0 0.35 0.7 1.05 1.4 km

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to most
- Danger to some
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR05 Breach at East bank defence
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR05 AND CLIMATE CHANGE TO 2118

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Drawing Number: FIGURE 19U

Rev: 01

0 0.35 0.7 1.05 1.4 km

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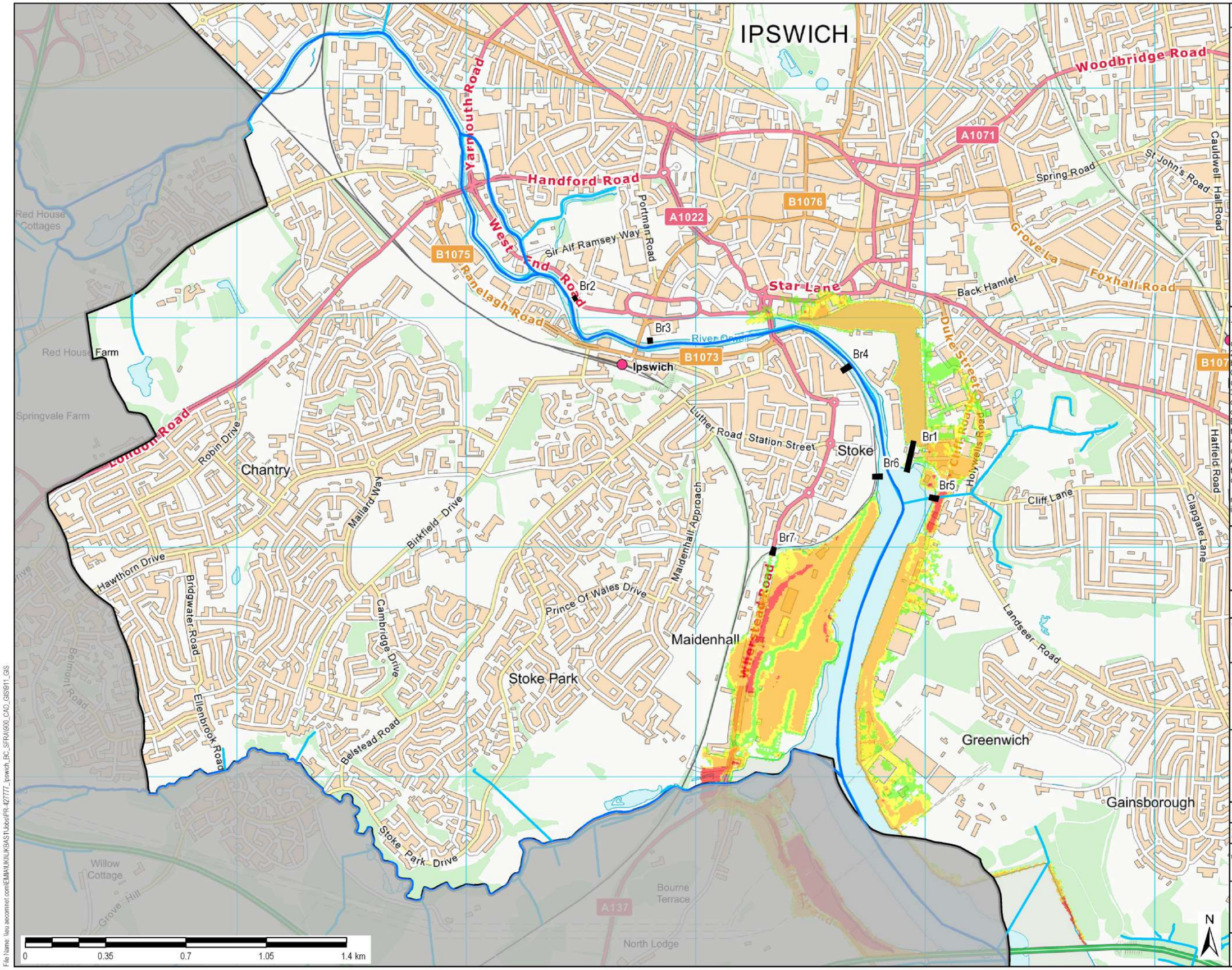


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR05 Breach at East bank defence
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
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Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR05 AT 2015 (PRESENT DAY)

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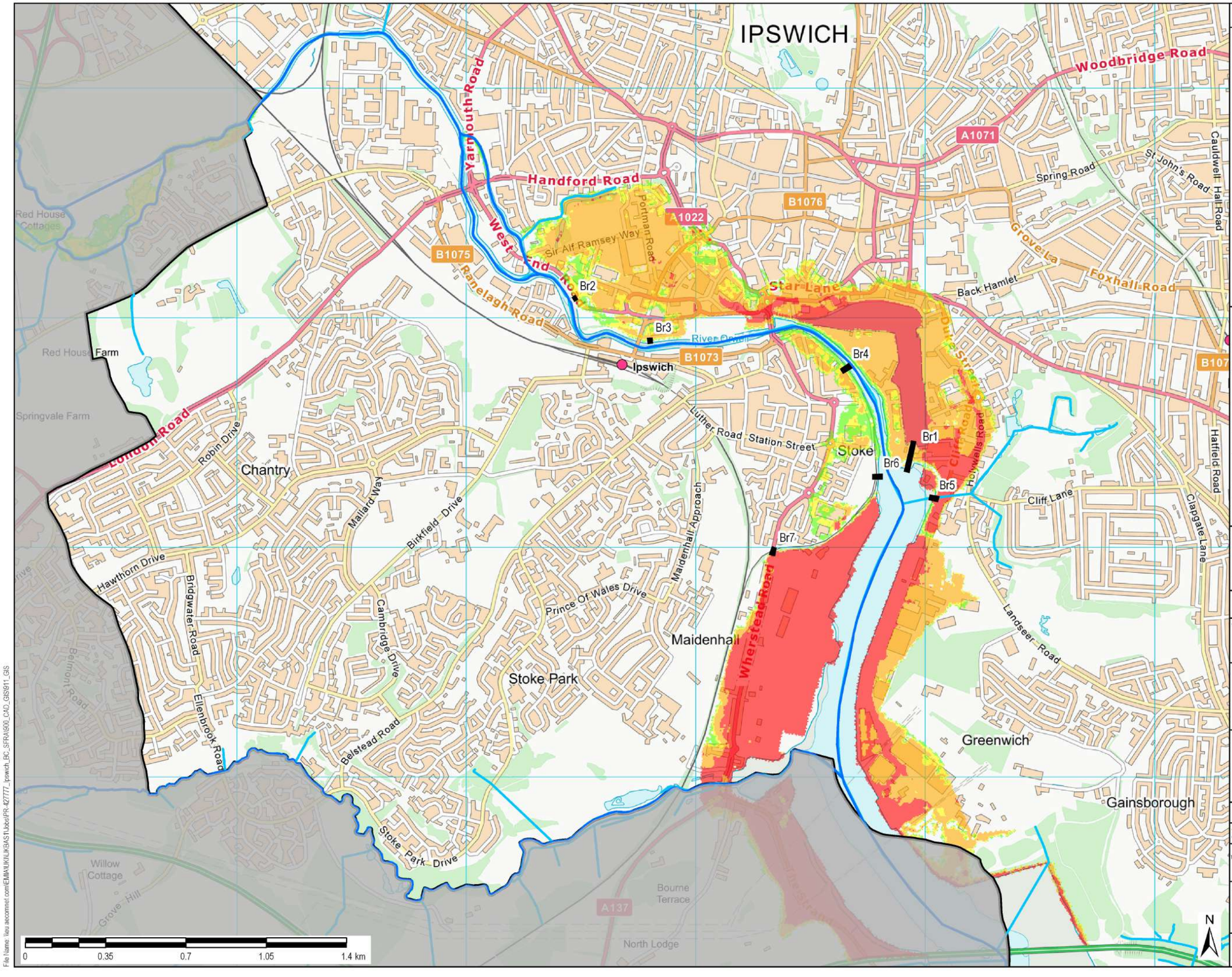


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR05 Breach at East bank defence.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR05 AND CLIMATE CHANGE TO 2118

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AECOM Internal Project No.: 60612179
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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR06 Railway gate in West bank open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR06 AT 2015 (PRESENT DAY)

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Drawing Number: FIGURE 19X
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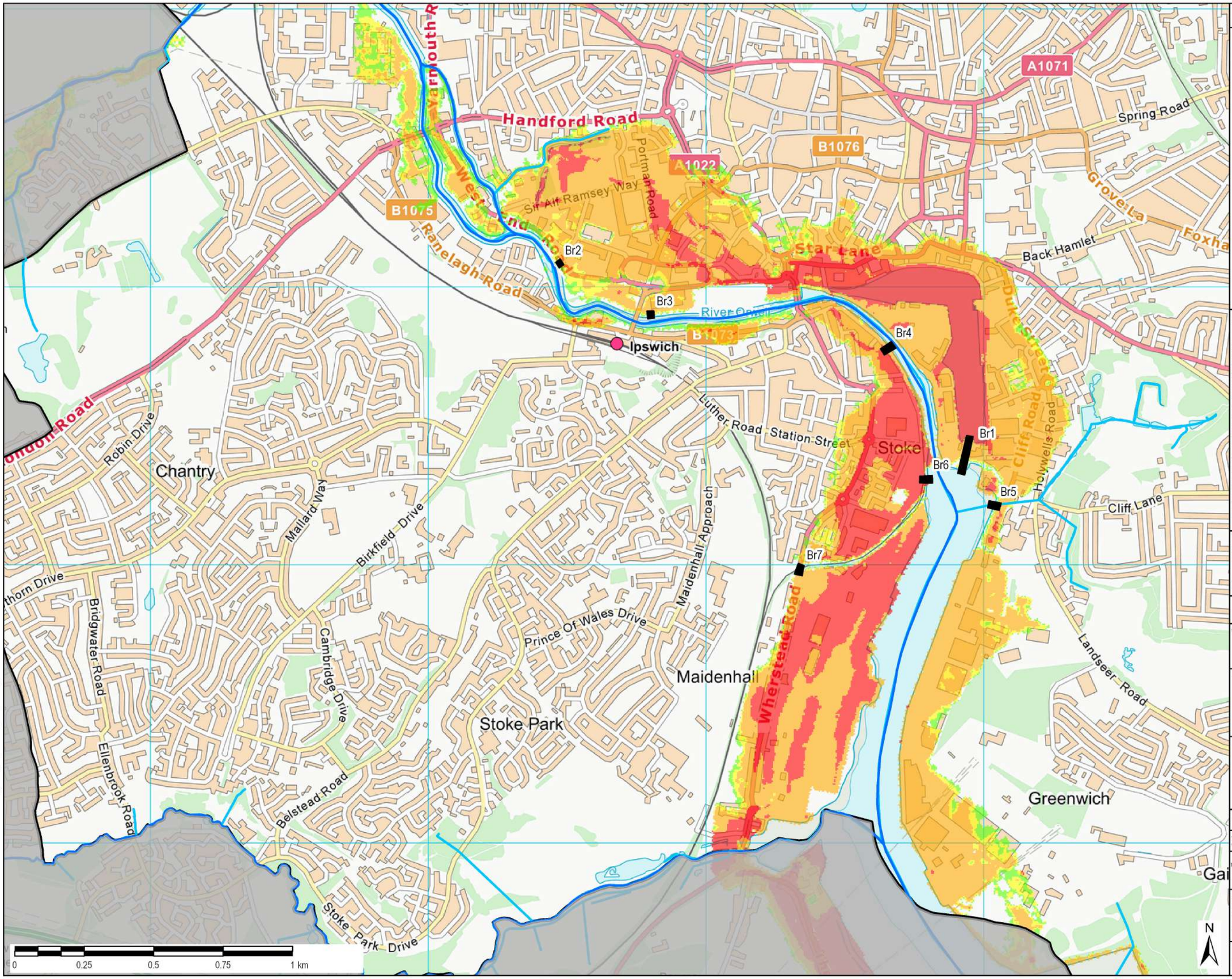


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR06 Railway gate in West bank open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR06 AND CLIMATE CHANGE TO 2118

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Drawing Number: FIGURE 19Y

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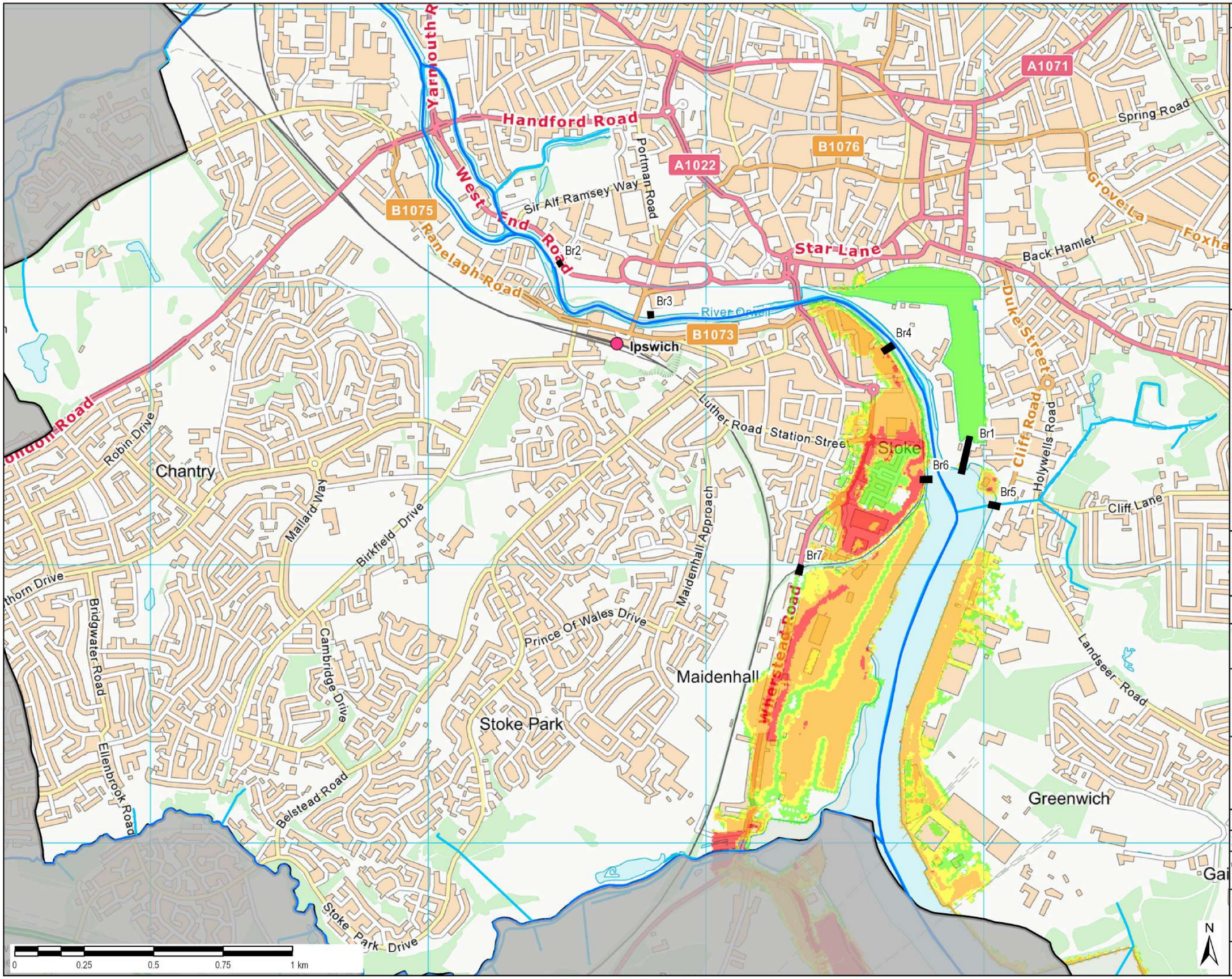


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR06 Railway gate in West bank open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR06 AT 2015 (PRESENT DAY)

| Drawn | Checked | Approved | Date |
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| HB | SL | EC | 01/20 |

AECOM Internal Project No.: 60612179
Scale @ A3: 1:15,000



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Drawing Number: FIGURE 19Z
Rev: 01

File Name: \\eu.aecomnet.com\EMAU\KUKBAS1\Jobs\PR_427777_Ipswich_BC_SFRA\600_CAD_GIS\911_GIS

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR06 Railway gate in West bank open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR06 AND CLIMATE CHANGE TO 2118

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Drawing Number: FIGURE 19AA
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N

0 0.25 0.5 0.75 1 km

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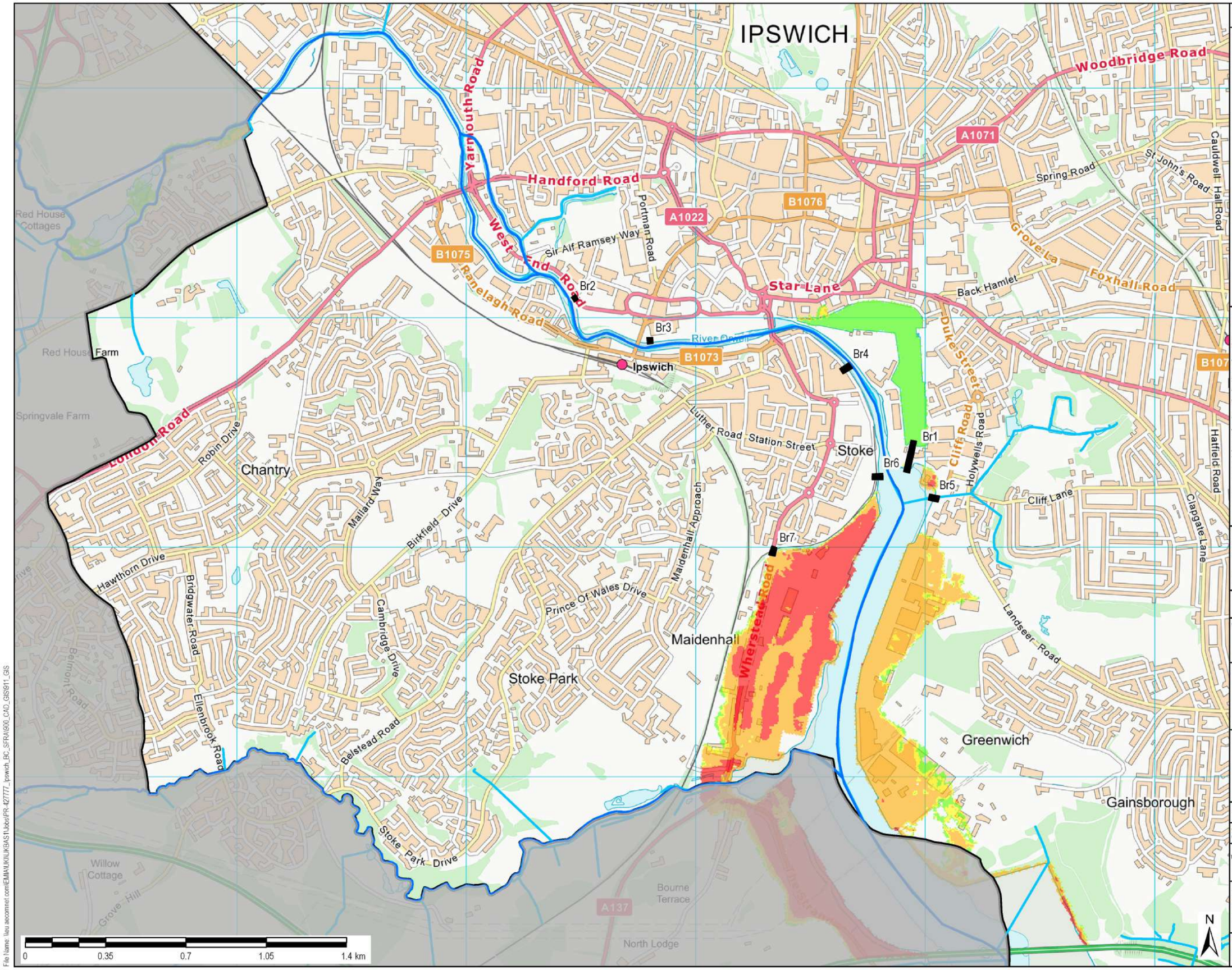


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR07 Wherstead Rd Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR07 AND CLIMATE CHANGE TO 2118

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AECOM Internal Project No.: 60612179

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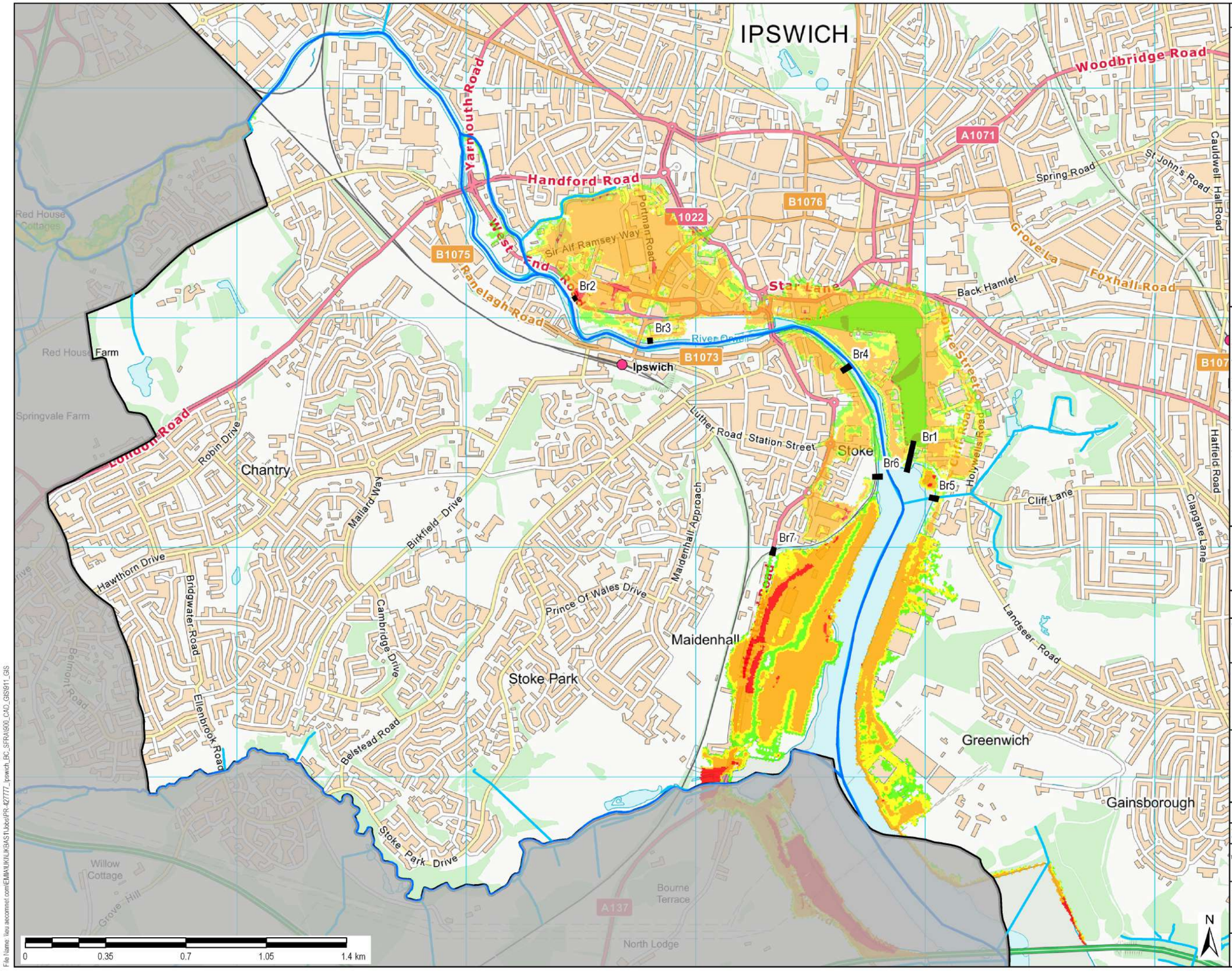


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR07 Wherstead Rd Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR07 AT 2015 (PRESENT DAY)

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP03 Barrier Open: BR07 Wherstead Rd Gate open.
2. IP03 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR07 AND CLIMATE CHANGE TO 2118

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0 0.35 0.7 1.05 1.4 km

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP04 Barrier Open: PS not operating.
2. IP04 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences,Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed and pumping station not built.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% AND CLIMATE CHANGE TO 2118 FROM PUMPING STATION FAILURE

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Drawing Number: FIGURE 19AE | Rev: 01

0 0.35 0.7 1.05 1.4 km

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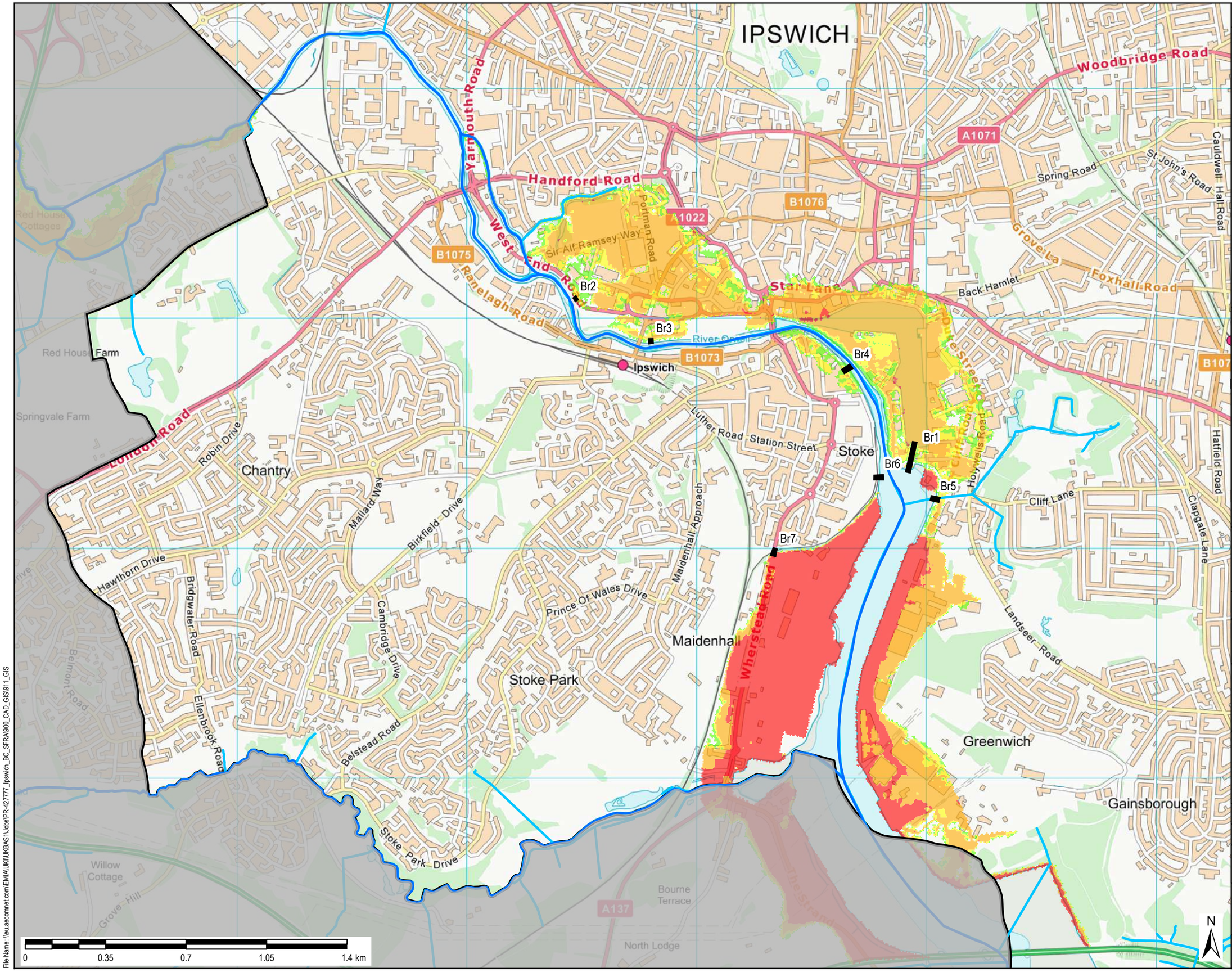


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP04 Barrier closed: PS not operating.
2. IP04 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences,Wherstead Rd floodgate, Tesco development with enhanced defences. Barrier closed and pumping station not built.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% AND CLIMATE CHANGE TO 2118 FROM PUMPING STATION FAILURE

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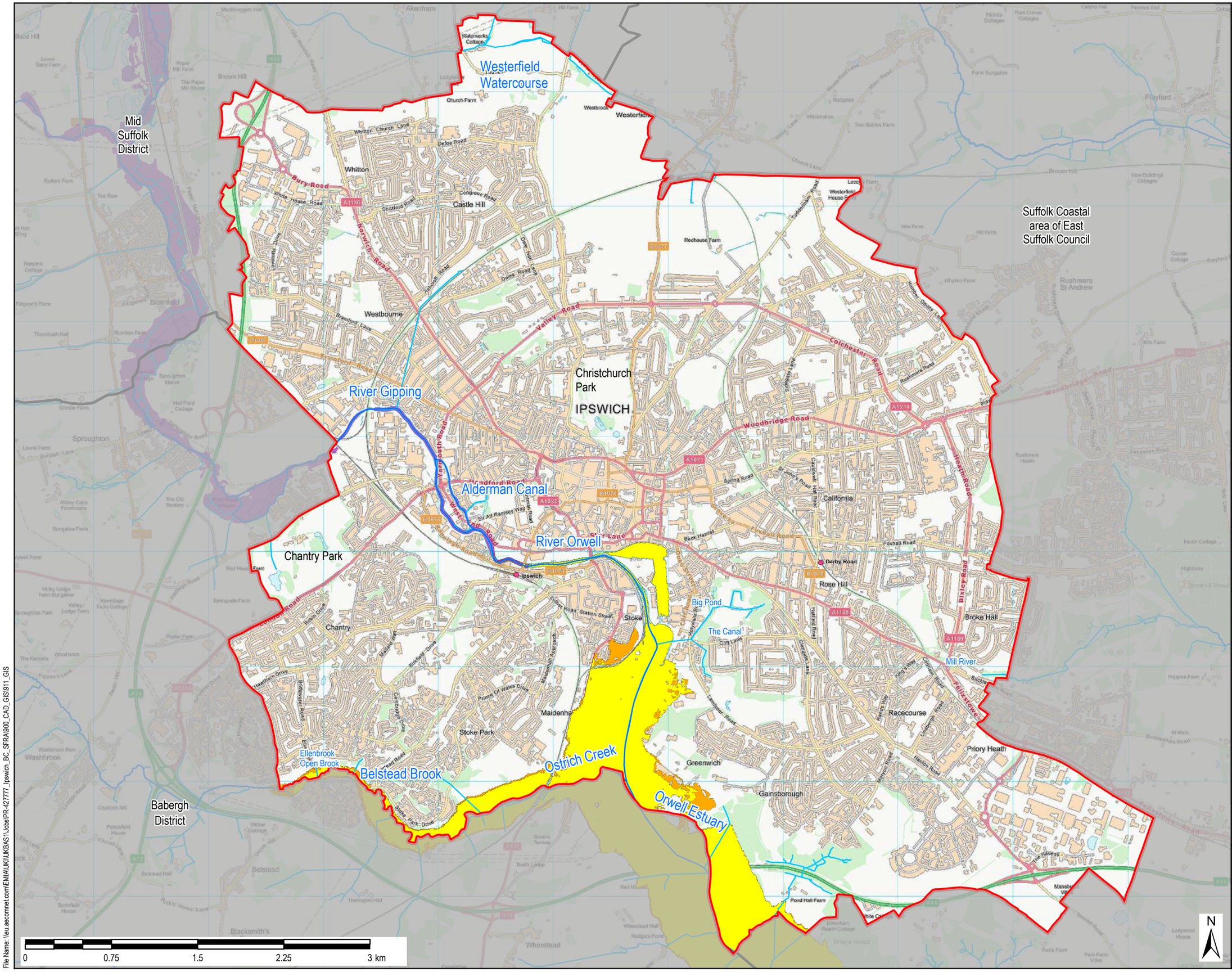


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## LEGEND

- Borough Boundary
- Surrounding Districts
- Main Rivers
- Ordinary Watercourses

### Climate Change

- Gipping 100yr plus 20% climate change
- River Orwell 200 year plus sea level climate change
- River Orwell 200 year plus NPPF climate change

Notes

1. The modelling of the River Gipping defines the extent of flooding including allowances for climate change during the 1% plus climate change (presumed to be 20%). This extent takes into account the presence or functioning of defences.

2.The modelling of the River Orwell defines the extent of flooding including allowances for climate change during the 0.5 event (1 in 200 year) based on two scenarios:

The medium emission 95th percentile UKCP09 scenario projected to the year 2115.

The NPPF sea-level rise values projected to the year 2115.

These extents takes into account the presence or functioning of defences.



Purpose of Issue: FINAL

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA

Drawing Title: MODELLED FLOOD OUTLINES- CLIMATE CHANGE

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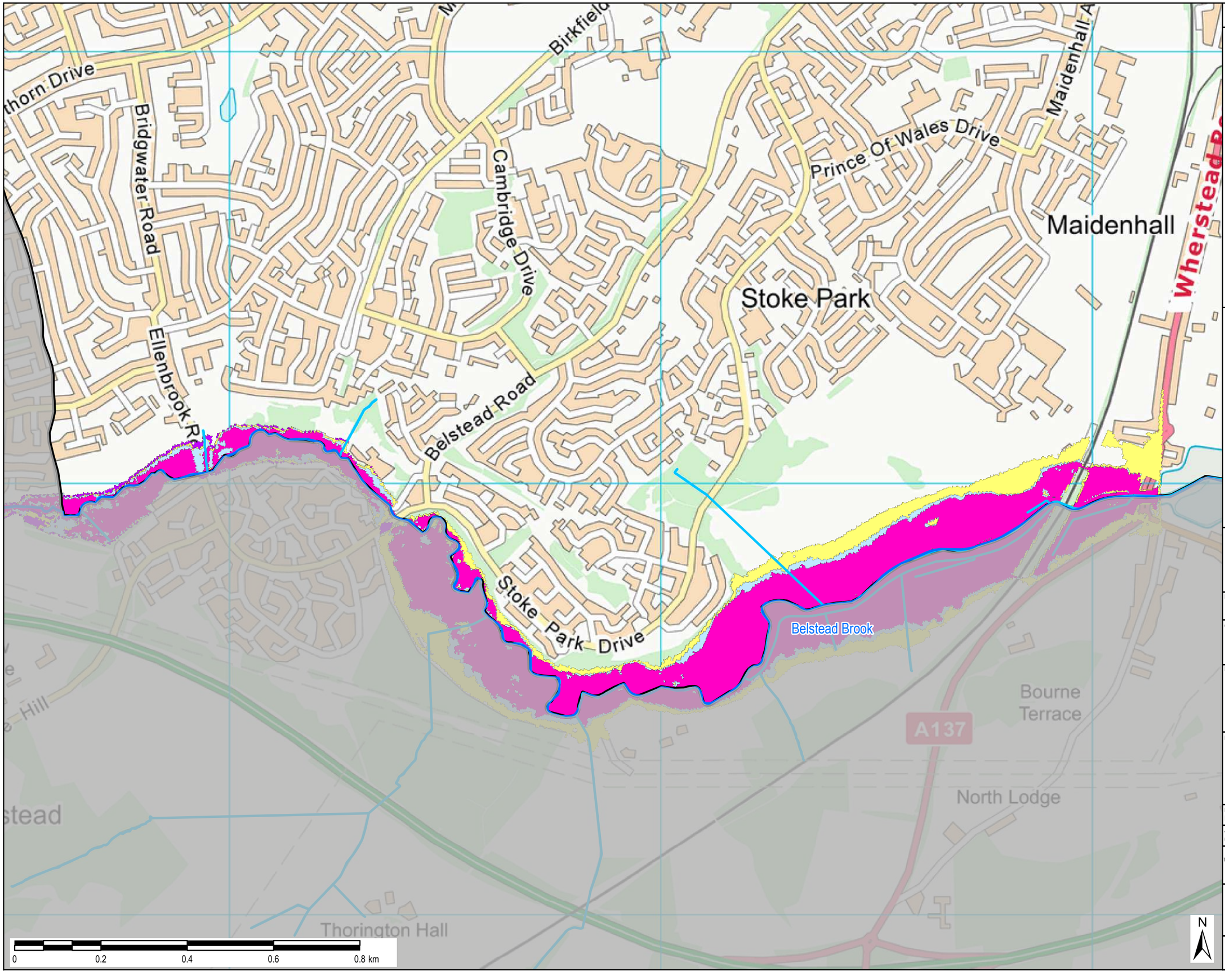


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## LEGEND

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- 5% AEP (1 in 20 year)
- 1% AEP (1 in 100 year)
- 1% AEP plus 20% climate change (1 in 100 year plus CC)
- 0.1% AEP (1 in 1000 year)

Notes

1.This map shows the Modelled Flood Outlines for the Belstead Brook and its tributaries.
2. The modelling outlines included on this map include the1 in100 year event with the 20% AEP allowances for climate change.
3. Further information on Climate Change allowances is detailed within the SFRA report.



Purpose of Issue

FINAL

Client

IPSWICH BOROUGH COUNCIL

Project Title

IPSWICH LEVEL 1 SFRA 2019

Drawing Title

FIGURE 8- BELSTEAD BROOK FLOOD EXTENTS

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**FIGURE 8**

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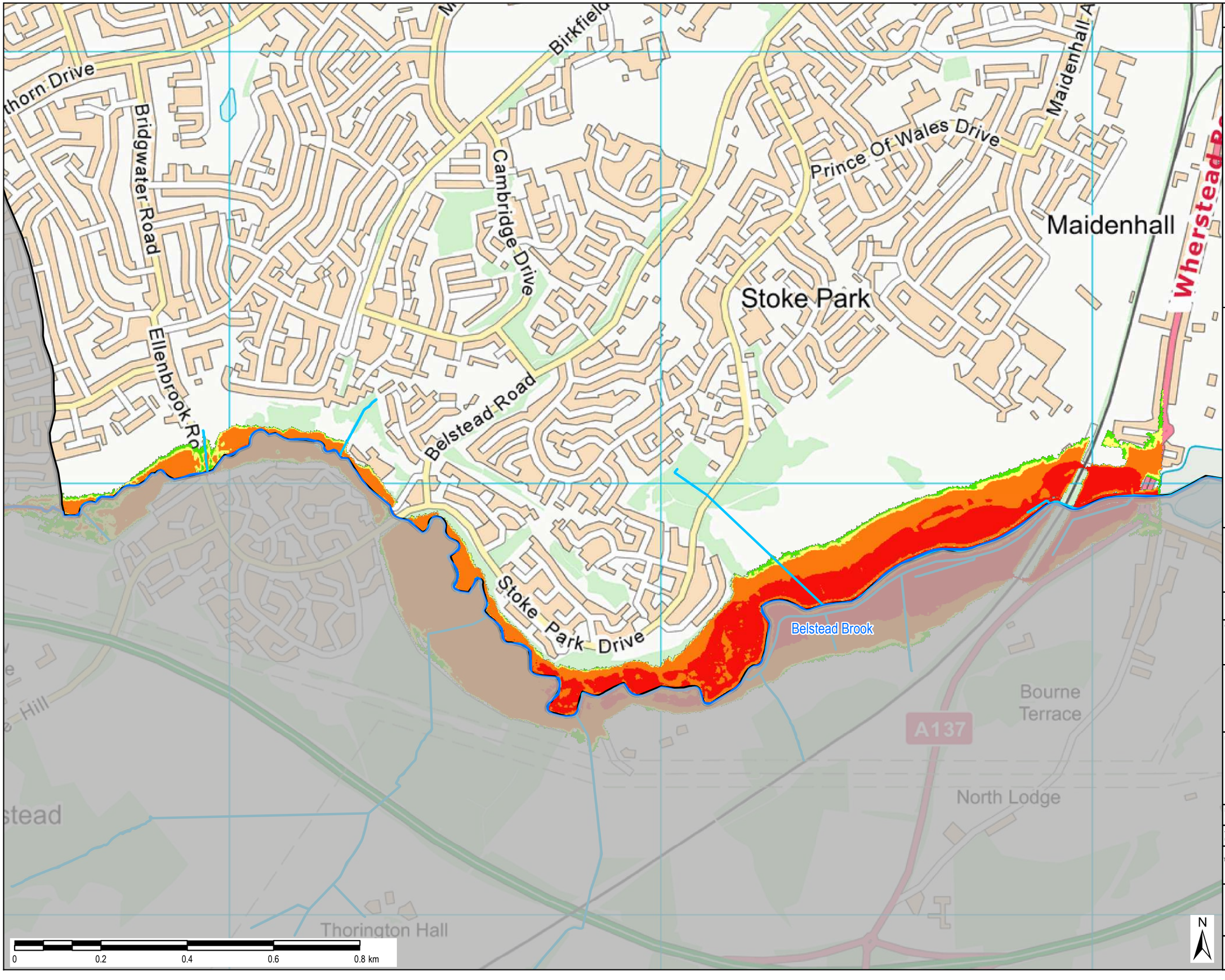


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## LEGEND

- Borough Boundary
- Main Rivers
- Ordinary Watercourses

1% AEP plus climate change hazard rating

- ≤ 0.75
- 0.75 - 1.25
- 1.25- 2.5
- >2.5

Notes

1.This map shows the modelled flood hazard for the Belstead Brook and its tributaries.
2. The modelling outlines included on this map include the1 in100 year event with the 20% AEP allowances for climate change.
3. Further information on Climate Change allowances is detailed within the SFRA report.



Purpose of Issue

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Client

IPSWICH BOROUGH COUNCIL

Project Title

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Drawing Title

FIGURE 9- BELSTEAD BROOK FLOOD HAZARD

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**FIGURE 9**

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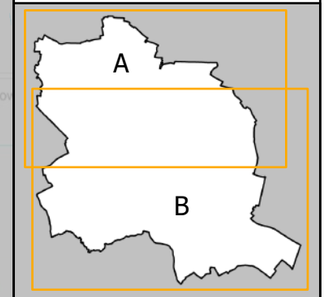
## LEGEND

- Borough Boundary
- High Risk of Flooding
- Medium Risk of Flooding
- Low Risk of Flooding




Notes

1. This map shows the predicted likelihood of surface water flooding based on the Environment Agency's Risk of Flooding from Surface Water (ROFSW) data, which may be subject to further analysis in the future. Further information is provided on the Environment Agency website (www.gov.uk/environment-agency).
2. The Risk from Surface Water Flooding is divided into categories:
   High: each year, the chance of flooding is greater than 1 in 30 (3.3%).
   Medium: each year, the chance of flooding is between 1 in 100 (1%) and 1 in 30 (3.3%).
   Low: each year, the chance of flooding is between 1 in 1000 (0.1%) and 1 in 100 (1%).
   Very Low: each year, the chance of flooding is less than 1 in 1000 (0.1%).
3. The potential impact of surface water flooding can vary according to the depth of the water, and its velocity (speed and direction that it is flowing in).
4. Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. This type of flooding can be difficult to predict as it is hard to forecast exactly where or how much rain will fall in any storm.



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA

Drawing Title: RISK OF FLOODING FROM SURFACE WATER

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0 0.5 1 1.5 2 km

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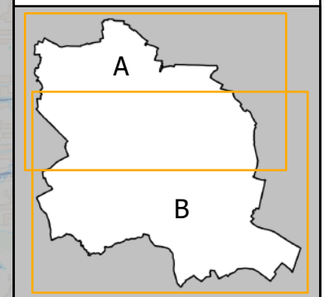
## LEGEND

- Borough Boundary
- High Risk of Flooding
- Medium Risk of Flooding
- Low Risk of Flooding




Notes

1. This map shows the predicted likelihood of surface water flooding based on the Environment Agency's Risk of Flooding from Surface Water (ROFSW) data, which may be subject to further analysis in the future. Further information is provided on the Environment Agency website (www.gov.uk/environment-agency).
2. The Risk from Surface Water Flooding is divided into categories:
   High: each year, the chance of flooding is greater than 1 in 30 (3.3%).
   Medium: each year, the chance of flooding is between 1 in 100 (1%) and 1 in 30 (3.3%).
   Low: each year, the chance of flooding is between 1 in 1000 (0.1%) and 1 in 100 (1%).
   Very Low: each year, the chance of flooding is less than 1 in 1000 (0.1%).
3. The potential impact of surface water flooding can vary according to the depth of the water, and its velocity (speed and direction that it is flowing in).
4. Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. This type of flooding can be difficult to predict as it is hard to forecast exactly where or how much rain will fall in any storm.



Purpose of Issue

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Client

IPSWICH BOROUGH COUNCIL

Project Title

IPSWICH LEVEL 1 SFRA

Drawing Title

RISK OF FLOODING FROM SURFACE WATER

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| HB | SL | EC | 01/2020 |

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FIGURE 10B

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0 0.6 1.2 1.8 2.4 km

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**LEGEND**

- Borough Boundary
- Surrounding Boroughs
- Main Rivers

Bedrock

- Lambeth Group
- Neogene To Quaternary Rocks
- Thames Group
- White Chalk Subgroup

Notes

1. Bedrock geology (formerly known as 'solid' geology by BGS) is the term used for the main mass of rocks forming the earth and is present everywhere, where exposed at the surface, or concealed beneath superficial deposits or water.
2. The data shown is the BGS Bedrock Geology data.
3. Further information on Bedrock Geology can be found within Section 2.3 of the Level 1 SFRA report



Purpose of Issue: FINAL

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA

Drawing Title: BEDROCK GEOLOGY

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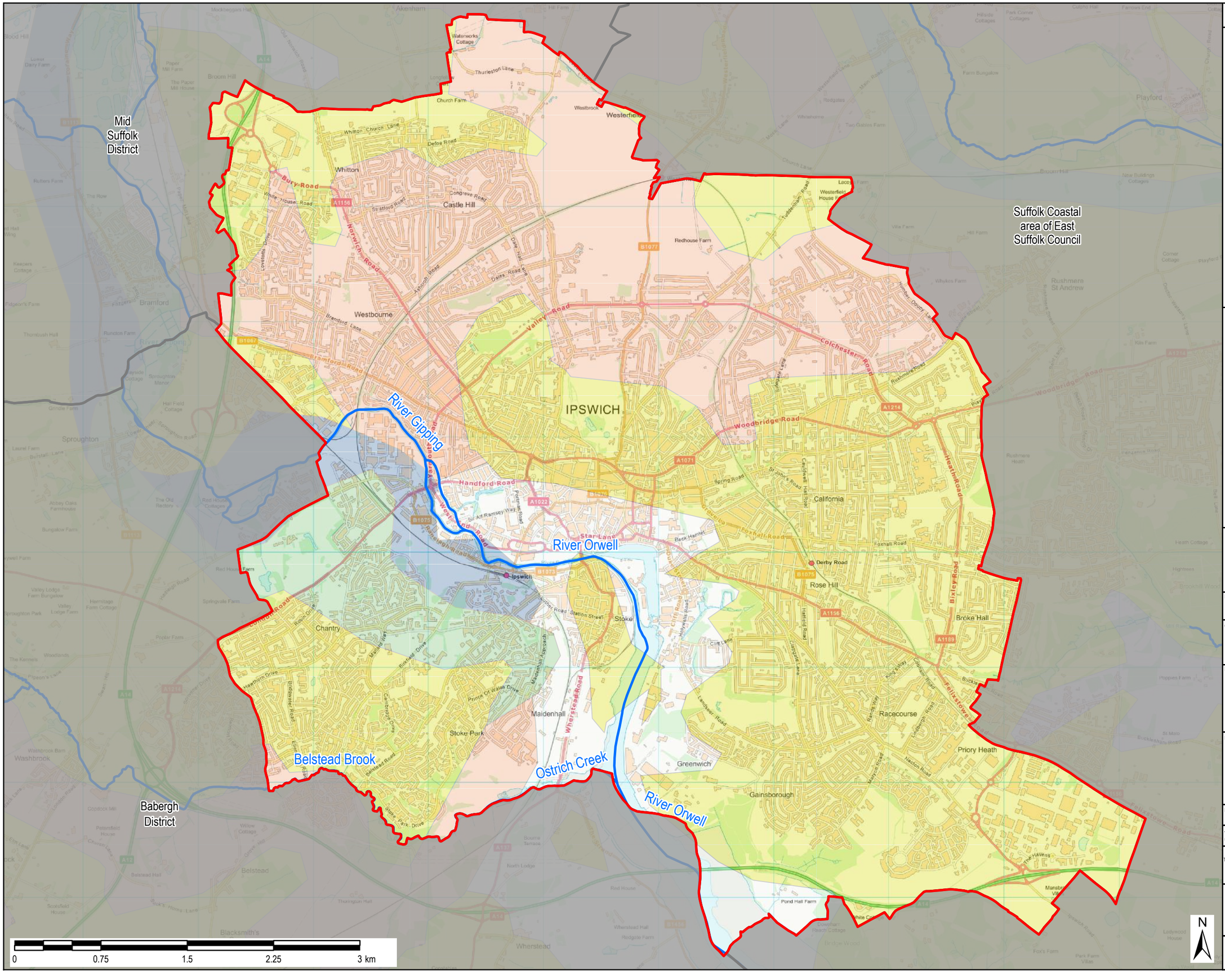


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**LEGEND**

- Borough Boundary
- Main Rivers

Superficial Deposits

- Alluvium
- Crag Group
- Glacial Sand and Gravel
- River Terrace Deposits
- Till
- Surrounding Districts

Notes

1. Superficial deposits (formerly known as 'drift' by BGS) are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 2.6 million years from the present. They rest on older deposits or rocks referred to as bedrock.
2. The data shown is the BGS Superficial Deposits Geology data.
3. Further information on Superficial Deposits Geology can be found within Section 2.3 of the Level 1 SFRA report.



Purpose of Issue

FINAL

Client

IPSWICH BOROUGH COUNCIL

Project Title

IPSWICH LEVEL 1 SFRA

Drawing Title

SUPERFICIAL DEPOSITS

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**FIGURE 12**

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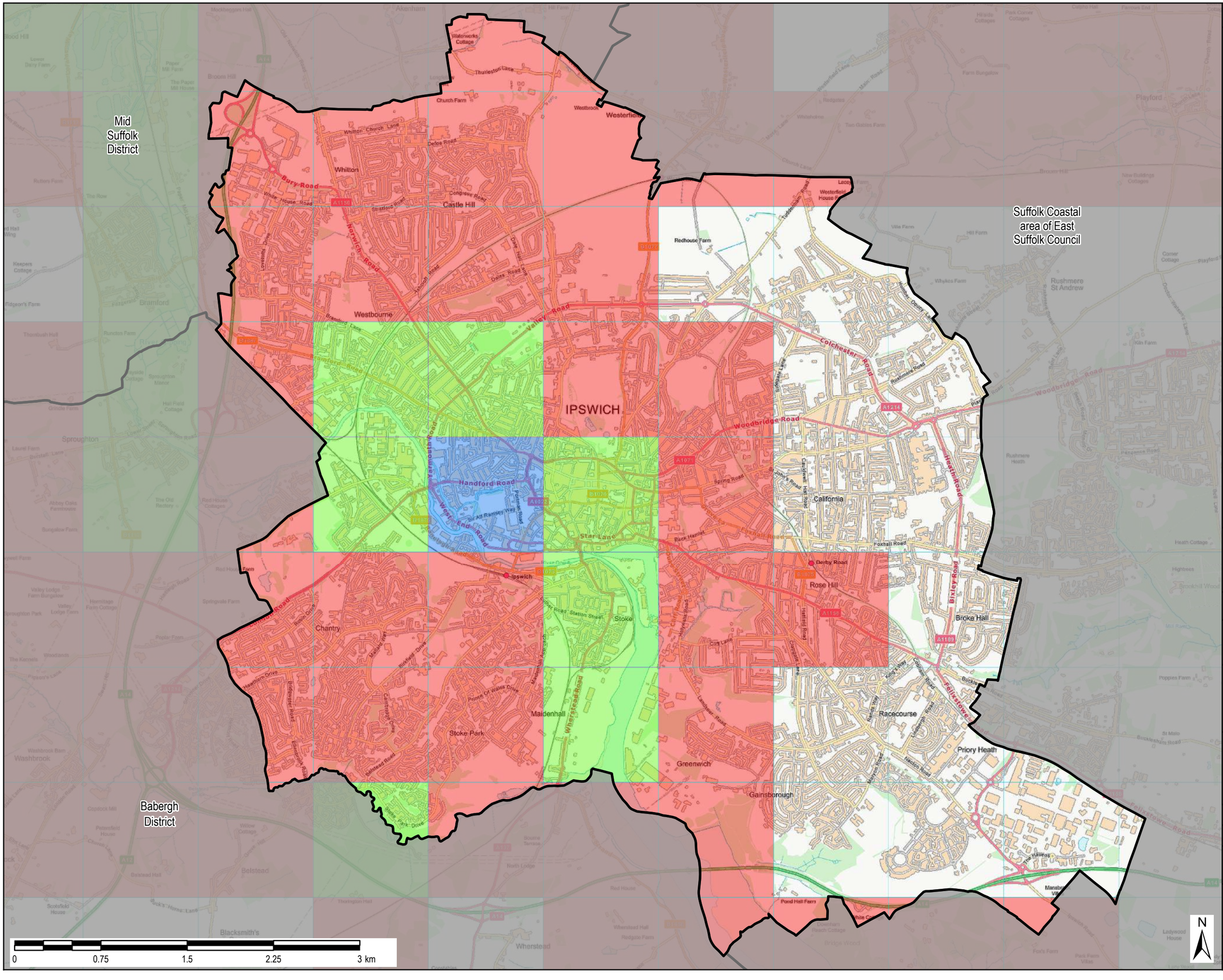


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## LEGEND

- Borough Boundary
- Surrounding Districts

Proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater flooding could occur

- < 25%
- >= 25% <50%
- >= 50% <75%
- Not considered to be at risk of Groundwater flooding

Notes

1. Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing where groundwater flooding could occur on a 1km square grid. It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater flooding could occur. The susceptible areas are represented by one of four categories showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwater flooding occuring.
2. The absence of values for any grid square means that no part of that square is identified as being susceptible to groundwater emergence.
3. The map identifies areas where further investigation is needed to assess whether groundwater flooding may affect property or infrastructure.
4. This data shown is the Environment Agency dataset 'Areas Susceptible to Groundwater Flooding'.



Purpose of Issue

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Client

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Project Title

IPSWICH LEVEL 1 SFRA

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AREAS SUSCEPTIBLE TO GROUNDWATER FLOODING

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FIGURE 13

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## LEGEND

- Borough Boundary
- Main Rivers
- Risk of flooding from Reservoirs

Notes

1. In England and Wales, the Environment Agency has a regulatory role for reservoir safety, under the Reservoirs Act 1975. It ensures that reservoirs are regularly inspected and essential safety works are carried out. The Environment Agency has the power to prosecute reservoir owners for failure to carry out essential safety works, and where emergency works are required, it has the power to carry out these works itself.

2. The outline reservoir flood maps do not give any information about the likelihood of reservoir failure, the depth and speed of the flood waters, or the length of time it would take for the flood waters to reach any location.



Purpose of Issue
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Project Title
IPSWICH LEVEL 1 SFRA

Drawing Title
RISK OF FLOODING FROM RESERVOIRS

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FIGURE 14

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0 0.75 1.5 2.25 3 km

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# Appendix 5.14
# Flood Compartments

L
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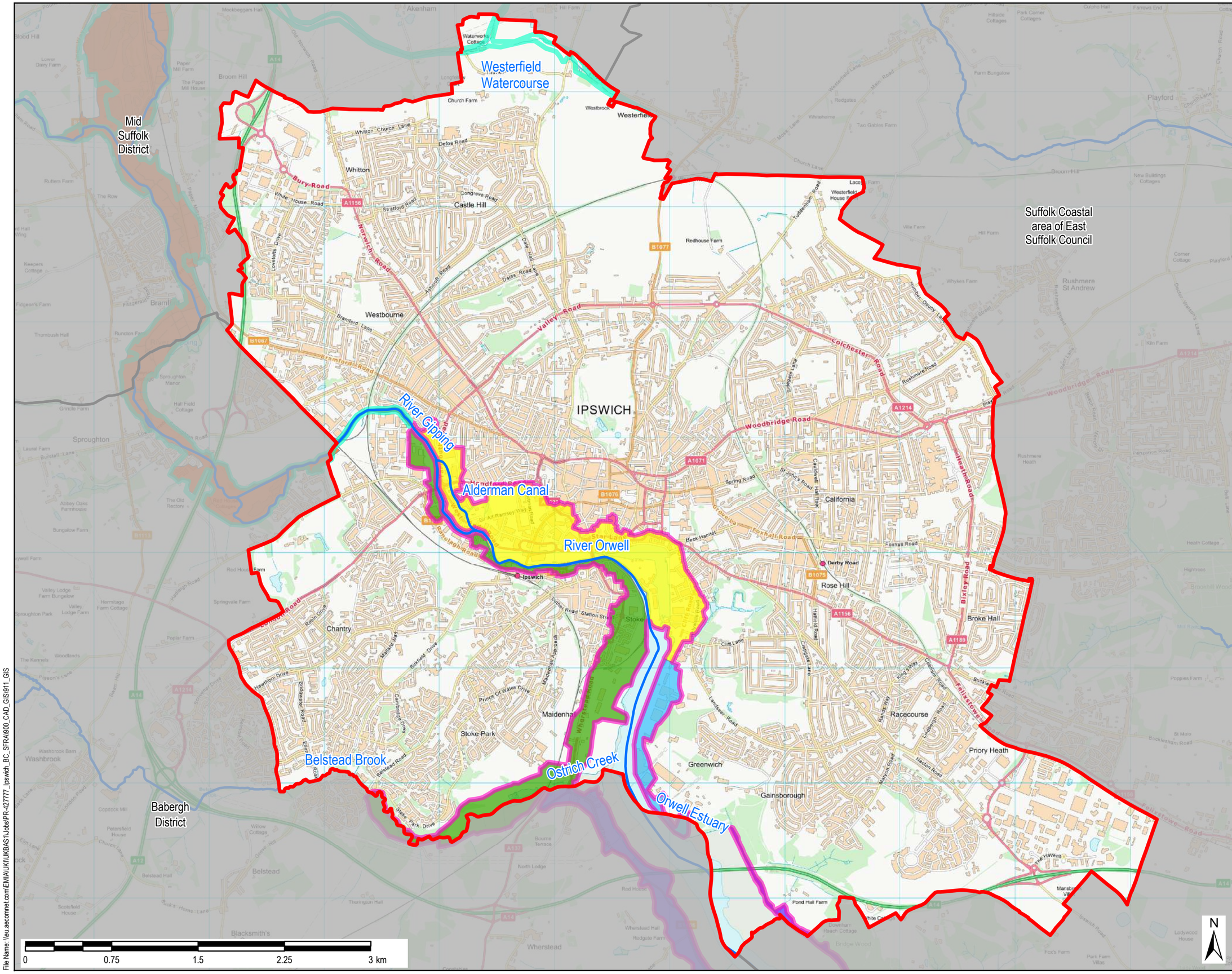
A



**SFRA Level 2 May 2011**
**Planning, Transport and Regeneration, Ipswich Borough Council**

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## LEGEND

- Borough Boundary
- Surrounding Districts
- Main Rivers

Flood Warning Area

- The River Gipping from Needham Market to London Road Bridge, Ipswich
- The tidal River Orwell at Cliff Quay industrial area in Ipswich
- The tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge
- The tidal River Orwell estuary from Felixstowe to Bourne Bridge in Ipswich
- The tidal River Orwell from Bourne Park to Hadleigh Road Industrial Estate

Flood Alert Areas

- The River Gipping, from downstream of Needham Market, to upstream of London Road Bridge, Ipswich
- The Suffolk and Essex coast from Felixstowe to Clacton including Orwell and Stour estuaries

Notes

1.The Environment Agency provide a free flood warning service for many areas at risk of flooding from rivers and the sea. In some parts of England the Environment Agency may be able to provide warnings when flooding from groundwater is possible.The Environment Agency free flood warning service can provide advance notice of flooding and can provide time to prepare.

2.The Environment Agency issue flood warnings to homes and businesses when flooding is expected. Upon receipt of a flood warning, occupants should take immediate action.

3.The Environment Agency issue flood alerts when flooding is possible. Flood alerts cover larger areas than flood warnings and are issued more frequently. Upon receipt of a flood warning, occupants should be prepared for flooding and to take action.

4.If a flood alert for groundwater is available this does not mean that your property is definitely at risk. It is very difficult to predict the exact location of flooding from groundwater as it is often related to local geology. To help people, the Environment Agency provide flood alerts for large areas that could be affected if groundwater levels were high.

5. The 'River Gipping from Needham Market to London Road Bridge, Ipswich' is predominantly upstream of the study area however a small part of the Flood Warning Area extends into the Borough



Purpose of Issue: FINAL

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA

Drawing Title: FLOOD WARNING AREAS AND FLOOD ALERT AREAS

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# Appendix A Figure 17- Areas where infiltration type SUDS are likely to be possible

- Areas where soakaways may be possible
- Areas where high ground water is likely
- Major Watercourses
- Landfill Sites
- Landfill Sites Buffer Zone
- Source Protection Zone 1
- SHLAA Sites

MID SUFFOLK DISTRICT COUNCIL

BABERGH DISTRICT COUNCIL



**SFRA Level 2 May 2011**
**Planning, Transport and Regeneration, Ipswich Borough Council**

**Appendix A Figure 18- Flood Storage Facilities Existing and Future Needs**

- Flood Storage Tunnel
- Flood Storage Tanks
- Flood Storage Future Needs
- Indicative Local Flood Areas
- Watercourse



**SFRA Level 2 May 2011**
**Planning, Transport and Regeneration, Ipswich Borough Council**

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Woodbridge Road
Yarmouth Road
Handford Road
A1071
B1076
A1022
B1075
West End Road
Portman Road
Sir Alf Ramsey Way
Ranelagh Road
Star Lane
Spring Road
St John's Road
Cauldwell Hall Road
Grove La
Foxhall Road
Back Hamlet
Duke Street
Cliff Road
Holywells Road
Hatfield Road
Clapgate Lane
Cliff Lane
Landseer Road
Br1
Br2
Br3
Br4
Br5
Br6
Br7
River Orwell
Ipswich
B1073
Luther Road
Station Street
Stoke
Red House Cottages
Red House Farm
Springvale Farm
London Road
Robin Drive
Chantry
Mallard Way
Birkfield Drive
Hawthorn Drive
Bridgwater Road
Cambridge Drive
Prince Of Wales Drive
Maidenhall Approach
Maidenhall
Stoke Park
Wherstead Road
Ellenbrook Road
Belstead Road
Stoke Park Drive
Greenwich
Gainsborough
Willow Cottage
Grove Hill
Bourne Terrace
A137
North Lodge
The Strand
Belmont Road

0 0.35 0.7 1.05 1.4 km

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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR02 Breach at West End Road scenario.
2. BR02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue
DRAFT

Client
IPSWICH BOROUGH COUNCIL

Project Title
IPSWICH LEVEL 1 SFRA 2019

Drawing Title
FLOOD HAZARD 0.5% FROM BREACH BR02 AT 2015 (PRESENT DAY)

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FIGURE 19A

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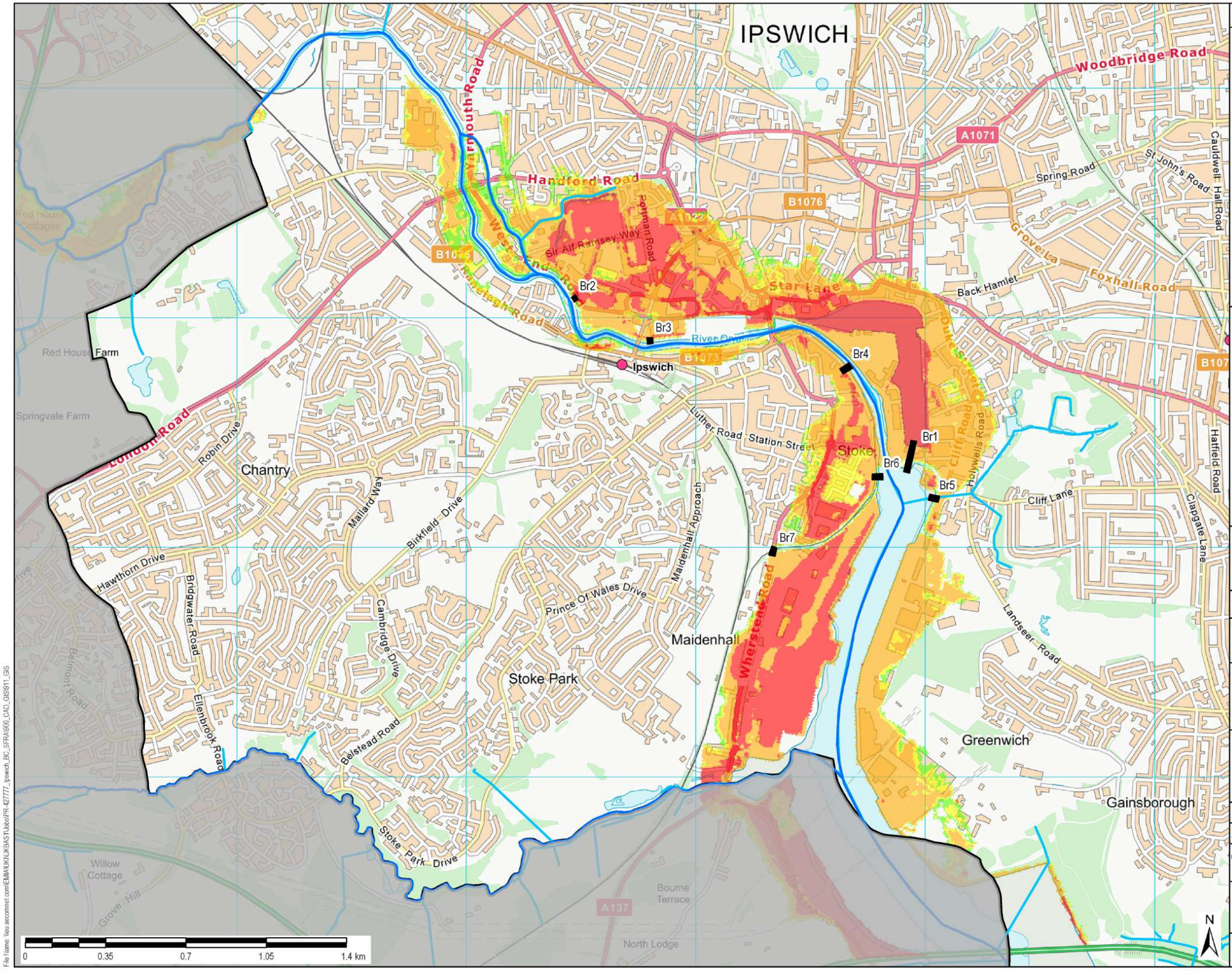


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR02 Breach at West End Road scenario.
2. BR02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.5% FROM BREACH BR02 AND CLIMATE CHANGE TO 2118

| Drawn | Checked | Approved | Date |
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| HB | SL | EC | 01/20 |

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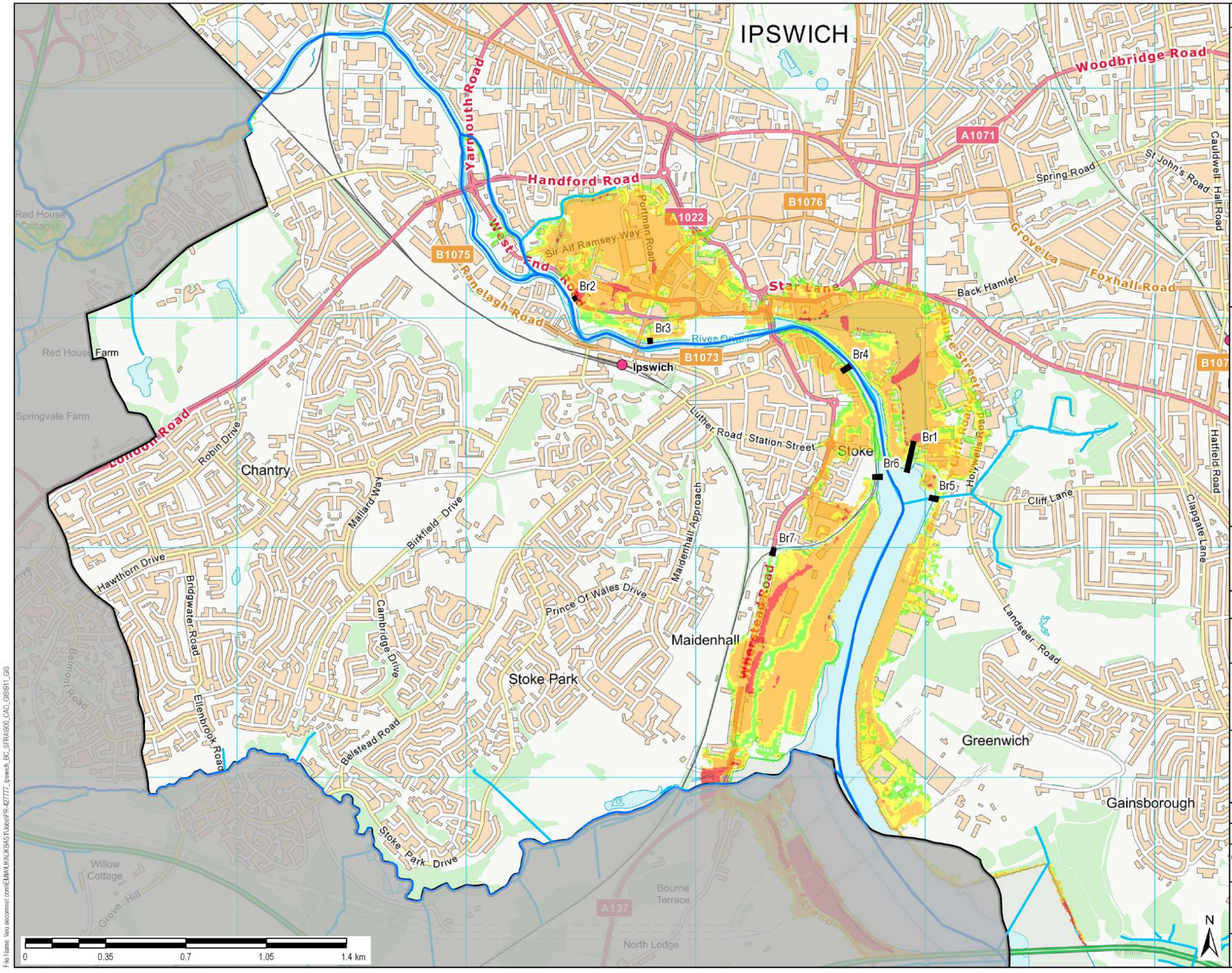


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**LEGEND**

- Borough Boundary
- Main Rivers
- Ordinary Watercourses
- Breach Locations

Hazard rating

- Caution
- Danger to some
- Danger to most
- Danger to all

Notes

1.This map shows the modelled flood hazard from the IP02 Barrier Open: BR02 Breach at West End Road scenario.
2. BR02 scenario includes: Ipswich FDMS including barrier, pumping station for fluvial flow, repairs to New Cut u/s defences, Wherstead Rd floodgate and Tesco development with enhanced defences (see note 4 below). Barrier open.
3. The breach modelling was updated in 2011 as part of the original SFRA (from EA breach modelling created in 2009) and was sensitivity tested by the Environment Agency in 2019 for inclusion within this updated SFRA.
4. Modelling shown includes the raising of flood defences (relative to former SHLAA site 47) to 6m AOD. This defence raising has not been completed, therefore, the local representation of flood hazard and depth may be slightly altered. Development proposals local to this site should further develop breach modelling in consultation with the EA, IBC & LLFA to inform development layout



Purpose of Issue: DRAFT

Client: IPSWICH BOROUGH COUNCIL

Project Title: IPSWICH LEVEL 1 SFRA 2019

Drawing Title: FLOOD HAZARD 0.1% FROM BREACH BR02 AT 2015 (PRESENT DAY)

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| HB | SL | EC | 12/19 |

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| Site Name: Land between Vernon Street and Stoke Quay (west) | | | | | |
|---|---|---|---|---|---|
| **Site ID:** | IP039a | **Location:** | Land between Vernon Street and Stoke Quay (west) | **Area (ha):** | 0.48 |
| **Current Use:** | Commercial | **Proposed Use:** | Residential | **Vulnerability Classification:** | More Vulnerable |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

The tidal River Orwell flows south east just to the 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 site is therefore at *residual risk of fluvial or tidal flooding,* in the event of a failure of these defences.

Refer to Map 1 below for Flood Zone outlines

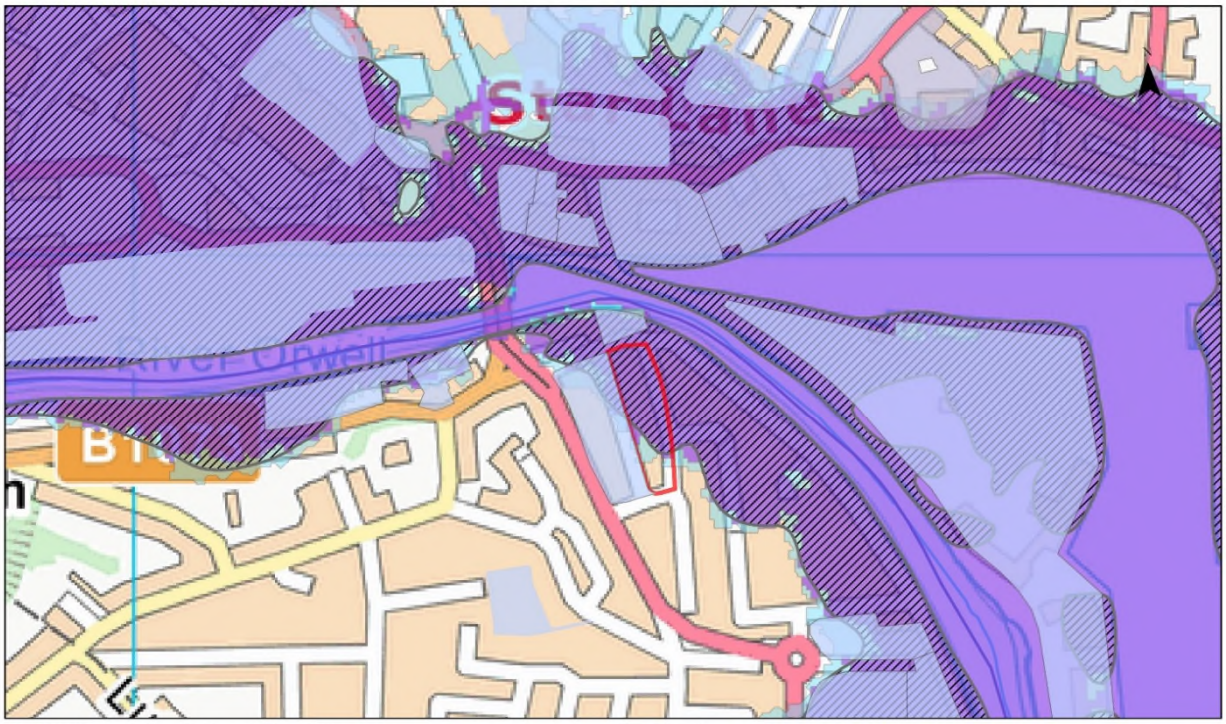
**Climate Change**

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

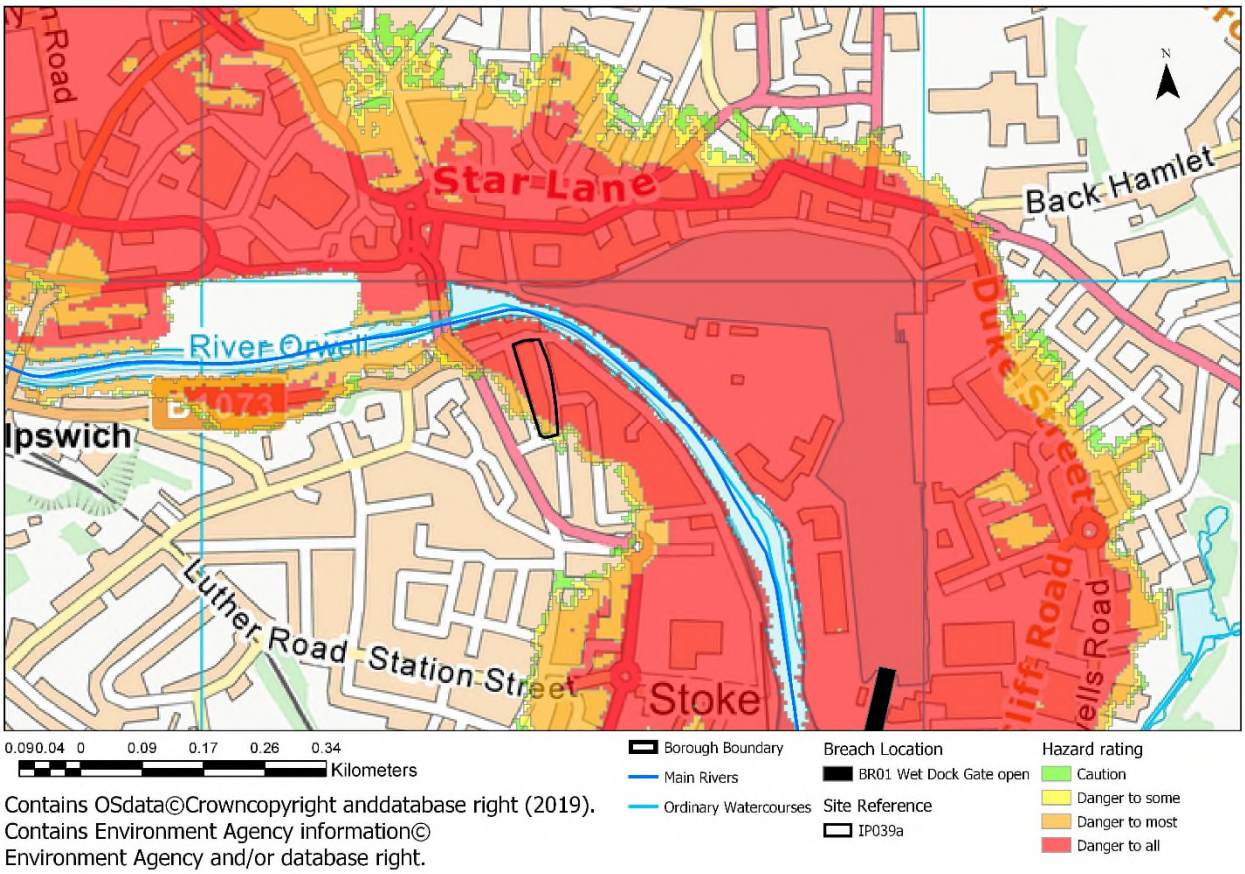
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1953. Ipswich BC also hold records of flooding to the north of site where Vernon Street meets Bridge Street, associated with the surface water network being blocked or overwhelmed.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Land between Vernon Street and Stoke Quay (west)**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The site is on the edge of the hazard extents therefore, safe access likely to be achievable to the south along Vernon Street.

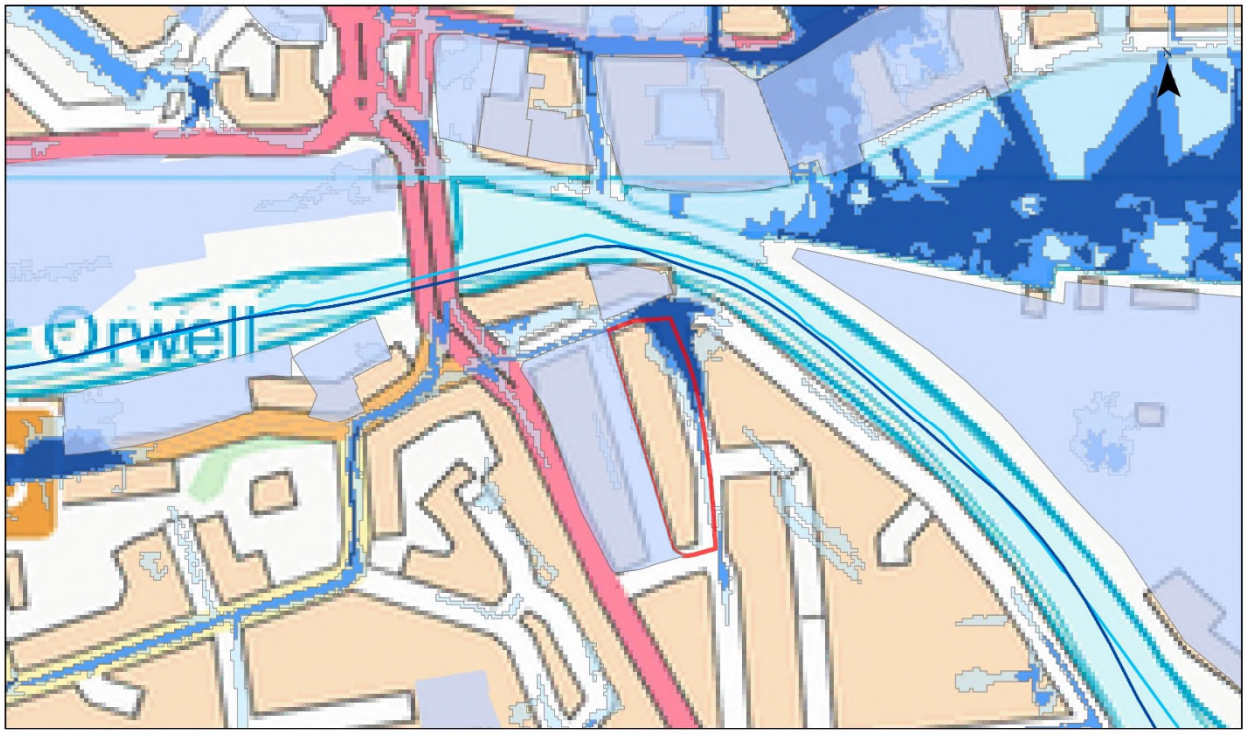
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

The RoFSW mapping identifies the site to be at high risk of surface water flooding.

**Site Name: Land between Vernon Street and Stoke Quay (west)**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.
Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*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 Main River.

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event

**Site Name: Land between Vernon Street and Stoke Quay (west)**

including an allowance for climate change, or 300mm above the maximum water level 3.5m AOD in Compartment C (Table 7-1), whichever is greater.

*Access / Egress*

The main access to the site is from Stoke Quay, which is adjacent to the River Orwell, and therefore also at residual risk of tidal flooding. The egress route away from the site could be west onto Vernon Street and then west towards Stoke Street and Belstead Road; this route would lead away from the floodplain to an area within Flood Zone 1.

*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.

| 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 |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

The tidal River Orwell is located approximately 100m 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 southern edge of the site is therefore at *residual risk of tidal flooding,* in the event of a failure of these defences.

Refer to Map 1 below for Flood Zone outlines

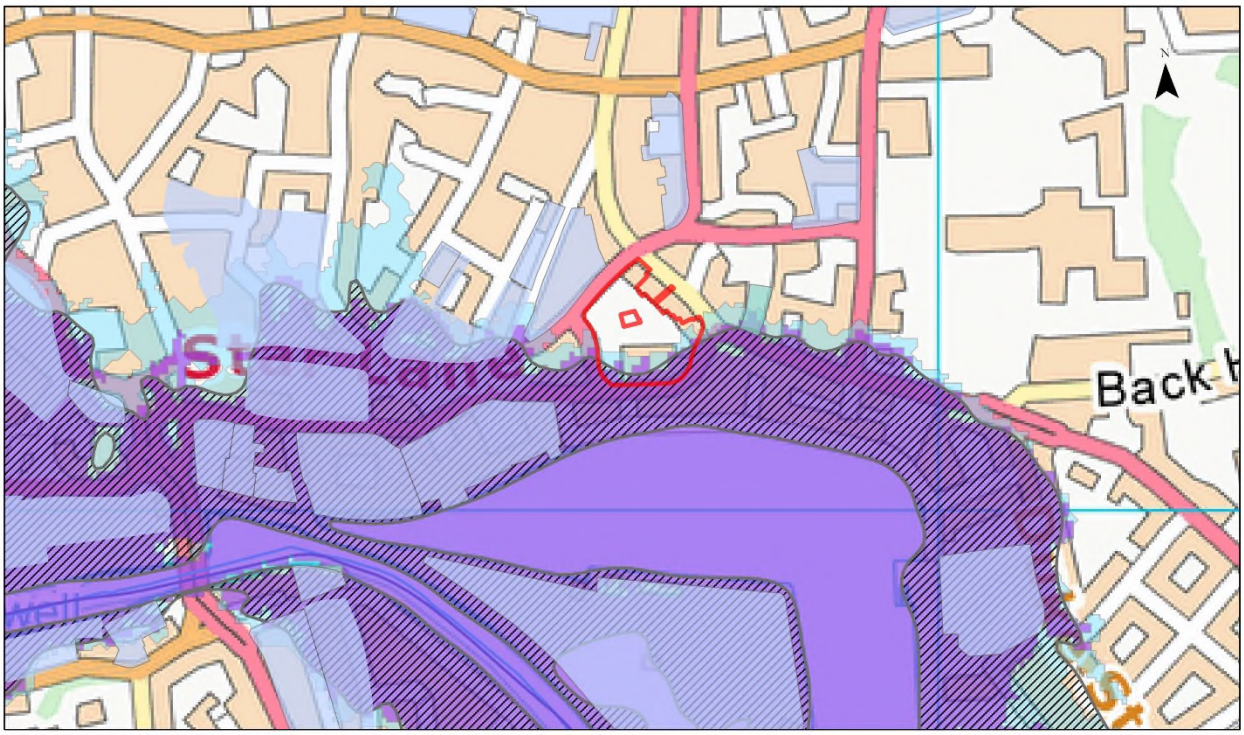
**Climate Change**

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

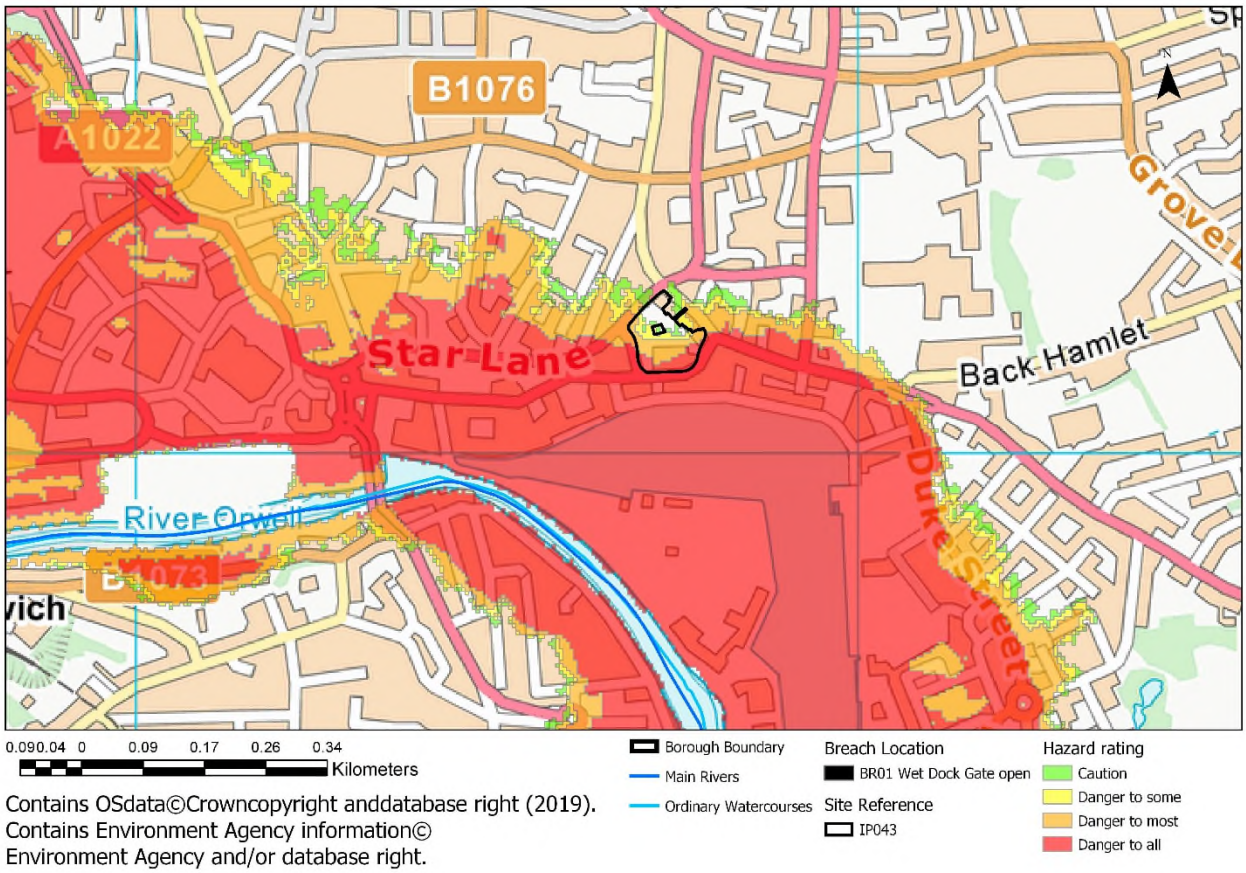
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold a number of records of flooding to the east of the site close to Bridge Street associated with the surface water drainage system being blocked or overwhelmed.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Commercial Buildings, Star Lane**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Site is located on the edge of Flood Zone 3 and at the edge of hazard extent. Safe access is achievable along Star Lane.

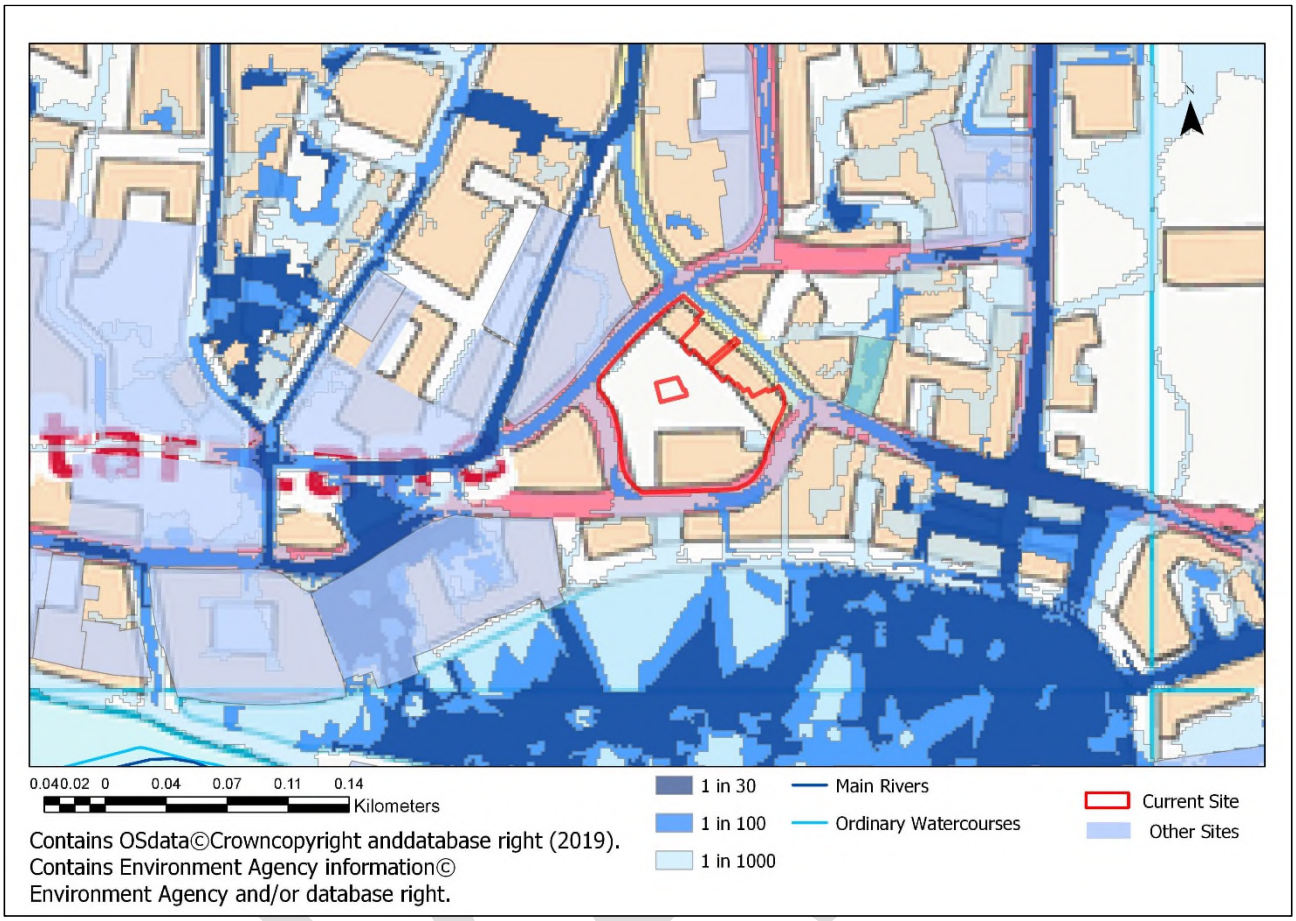
**Surface Water Flood Risk**

**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.

**Site Name: Commercial Buildings, Star Lane**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment H (Table 7-1), whichever is greater.

**Site Name: Commercial Buildings, Star Lane**

*Access / Egress*

Access to the site may be from Key Street, Fore Street or Star Lane (A1022). The routes that pass northwards are within Flood Zone 1 and therefore lead out of the tidal floodplain.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

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

| **Tidal and Fluvial Flood Risk** | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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 site is therefore at *residual risk of tidal flooding,* in the event of a failure of these defences.

*Refer to map 1 below for an illustration of the extent of flood zones local to the site.*

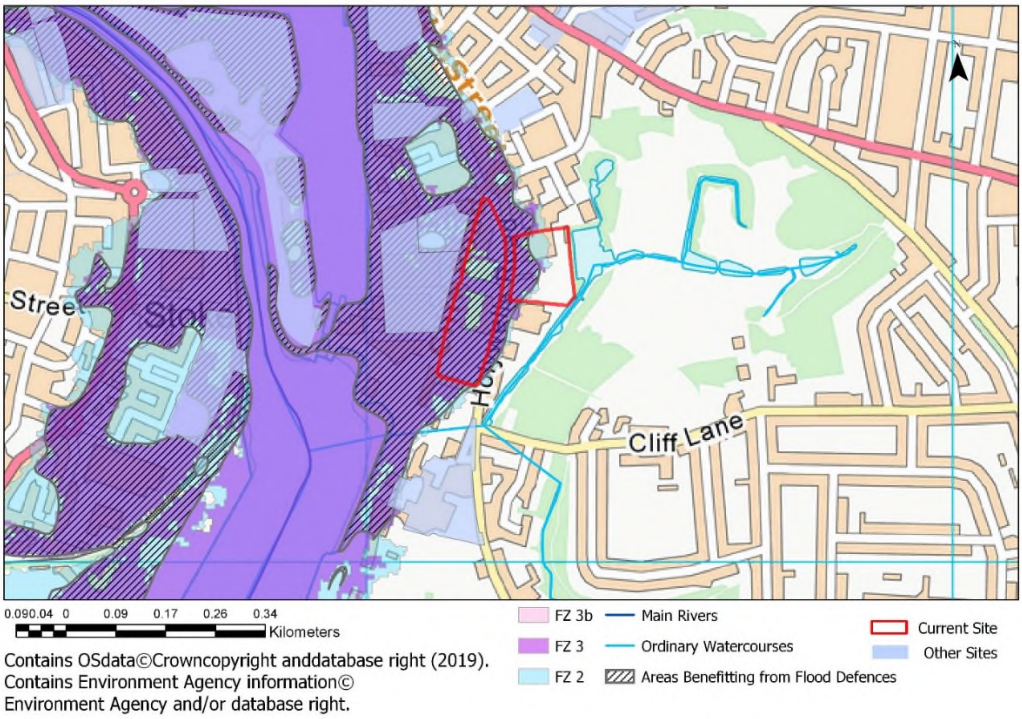
**Climate Change**

Modelling of the River Orwell shows that tidal flood water remains in bank in this location during the 0.5% AEP event including an allowance for climate change i.e. overtopping does not occur in this scenario (These modelled scenarios take account of the presence of defences).

**Historic Records**

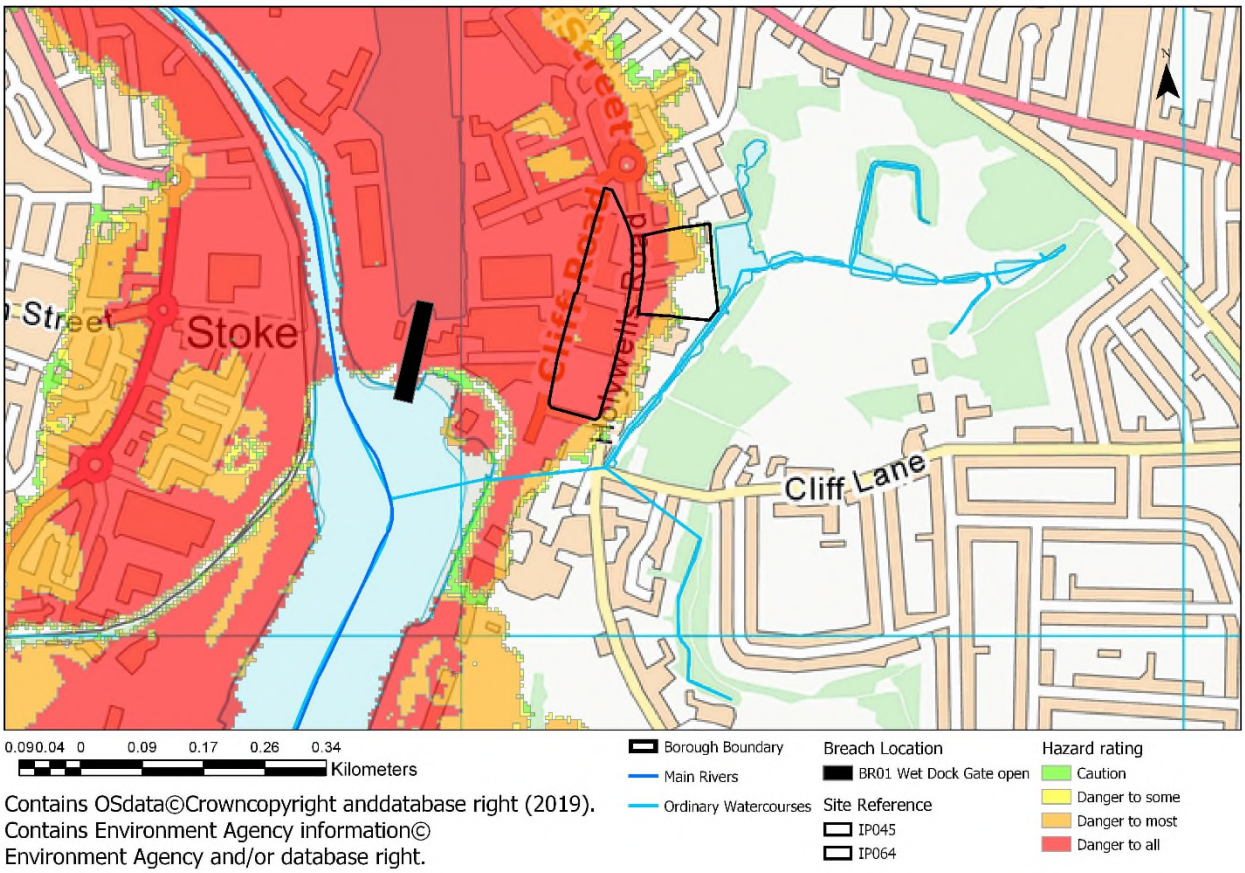
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of road and pavement flooding in this location.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Holywells Road (West)/Toller Road and Land between Holywells Road & Holywells Park ('Holywells East')**

**Map 2 – Residual Risk - Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.
Hazard mapping illustrated in Map 2 shows ratings with the Wet Dock gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Holywells Road west site is at higher residual flood risk as it is located 100% in Flood Zone 2 and 3. The site is entirely within the defended floodplain with limited opportunities for safe access in the event of a breach. Safe refuge should be provided above 5.3m AOD.

Holywells Road east is at a lower risk as it is on the boundary of Flood Zone 3, 2 and 1. Therefore, safe access may be achievable along Holywells Road in the event of a breach, depending on the time of the breach and the warning period. Safe refuge should be provided above 5.3m AOD.

There is a history of flooding from the canal in the vicinity of the site due to blockages in the canal outlet. In addition, there is a risk of failure of the privately owned embankment should trees fall.

There may be opportunities to complete some land raising to enable egress to the south east corner of the site, however, consideration of the potential impact on surface water flood risk to others needs to be included.

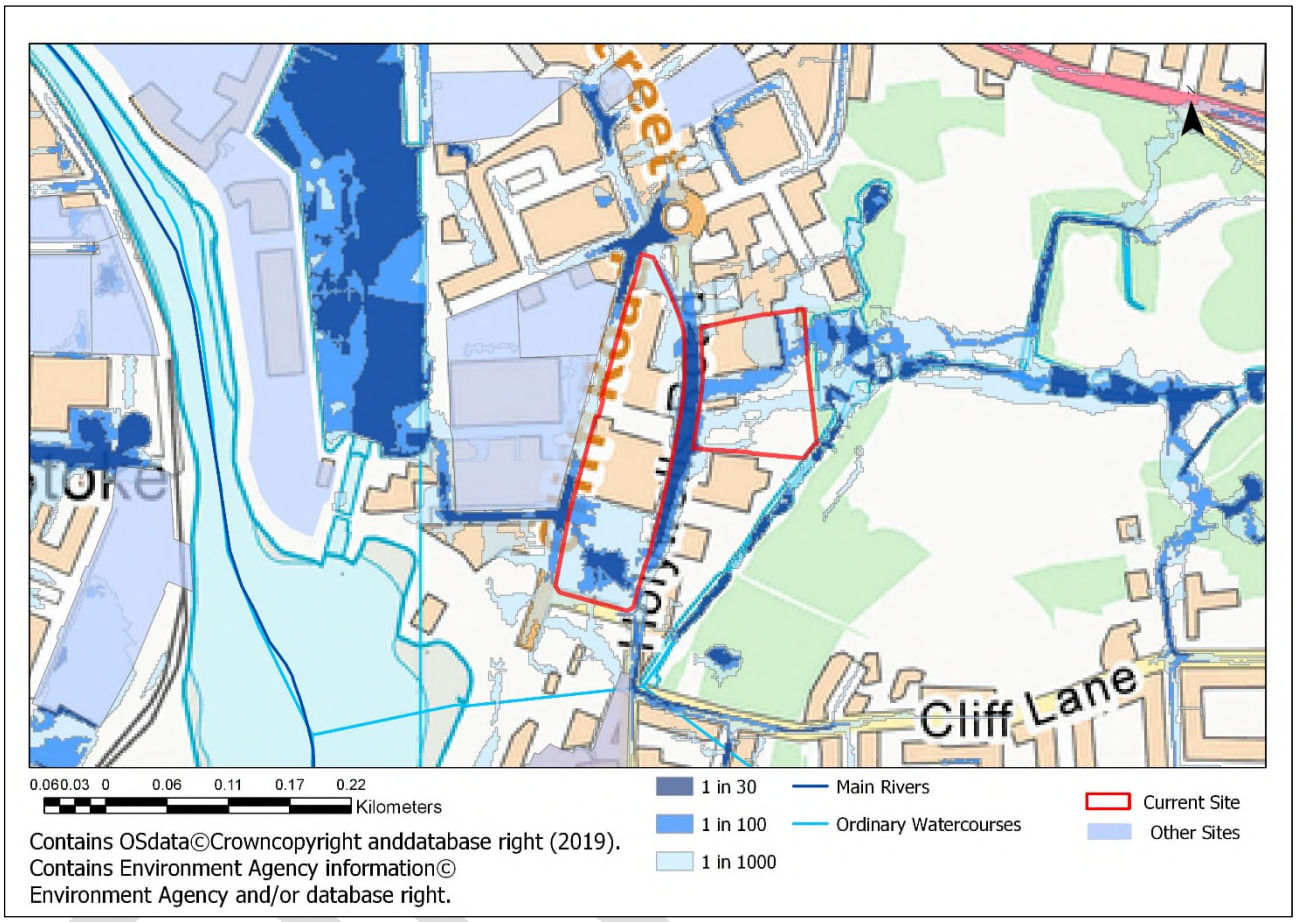
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

**Site Name: Holywells Road (West)/Toller Road and Land between Holywells Road & Holywells Park ('Holywells East')**

The RoFSW mapping identifies that the site and surrounding area are at high risk of surface water flooding and ponding.

**Map 3 – Environment Agency RoFSW mapping**




**Groundwater Flood Risk**

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

The underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, ground water flood records indicate the potential for a high water table which would likely prevent the use of infiltration SuDS on site.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

There is a past history of frequent deep local flooding as described in the SFRA. This flooding is likely to be due to overloading of the Anglian Water combined Sewerage system and lack of drainage serving sites to the East.

**Site Name: Holywells Road (West)/Toller Road and Land between Holywells Road & Holywells Park ('Holywells East')**

There is a history of flooding from the canal in the vicinity of the site due to blockages in the canal outlet. In addition, there is a risk of failure of the privately owned embankment should trees fall.

**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).

An Anglian Water trunk high level sewer crosses the site and will require careful consideration for diversion (if viable).

It would be difficult to alleviate the sewer flooding without worsening flooding elsewhere as the road is very low and the low level trunk sewer is very shallow.

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level, 5.3m AOD (Table 7-1) whichever is greater.

*Access / Egress*

Holywells Road west site is at higher residual flood risk and is entirely within the defended floodplain with limited opportunities for safe access in the event of a breach.

Holywells Road east is at a lower risk as it is on the boundary of Flood Zone 3, 2 and 1. Therefore, safe access may be achievable along Holywells Road in the event of a breach, depending on the time of the breach and the warning period.

In the event of a failure of the flood defence measures protecting this area, safe dry egress for the West site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change or 5.3m AOD, whichever is greater.

*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.

*Flood Risk Assessment*

The site is located within an area of residual risk from various sources. At the site level a flood risk assessment should obtain breach modelling data from the Environment Agency and interpret flood depth and velocity along with hazard to inform site layout and design through the planning process.

| 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 |

| Tidal/Fluvial Source: | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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 site is therefore at *residual risk of fluvial or tidal flooding,* in the event of a failure of these defences.

Refer to Map 1 below for Flood Zone outlines

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

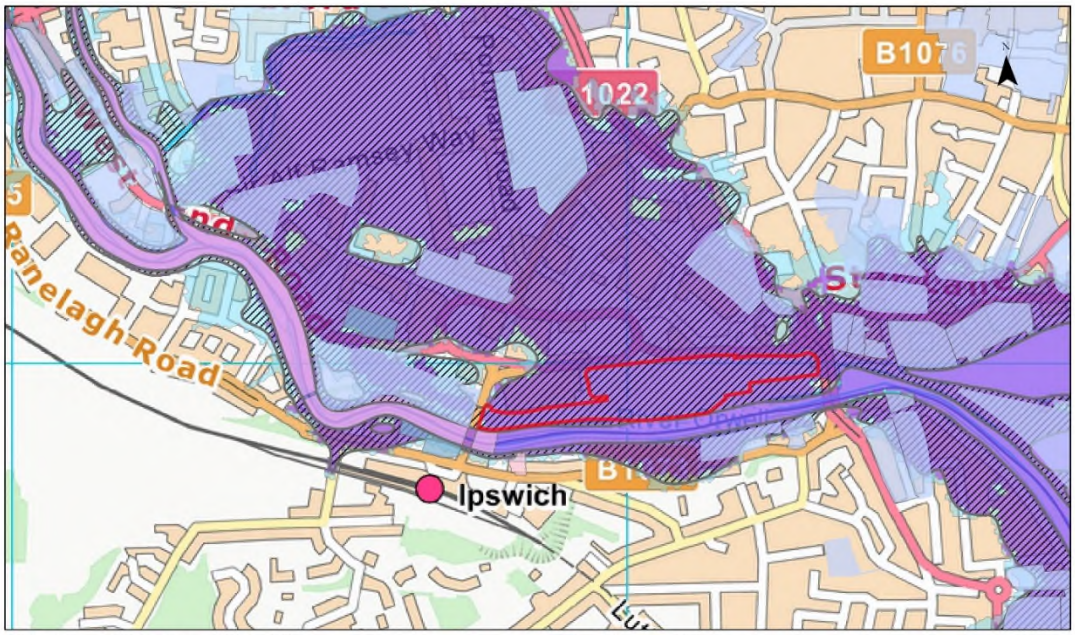
**Climate Change**

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

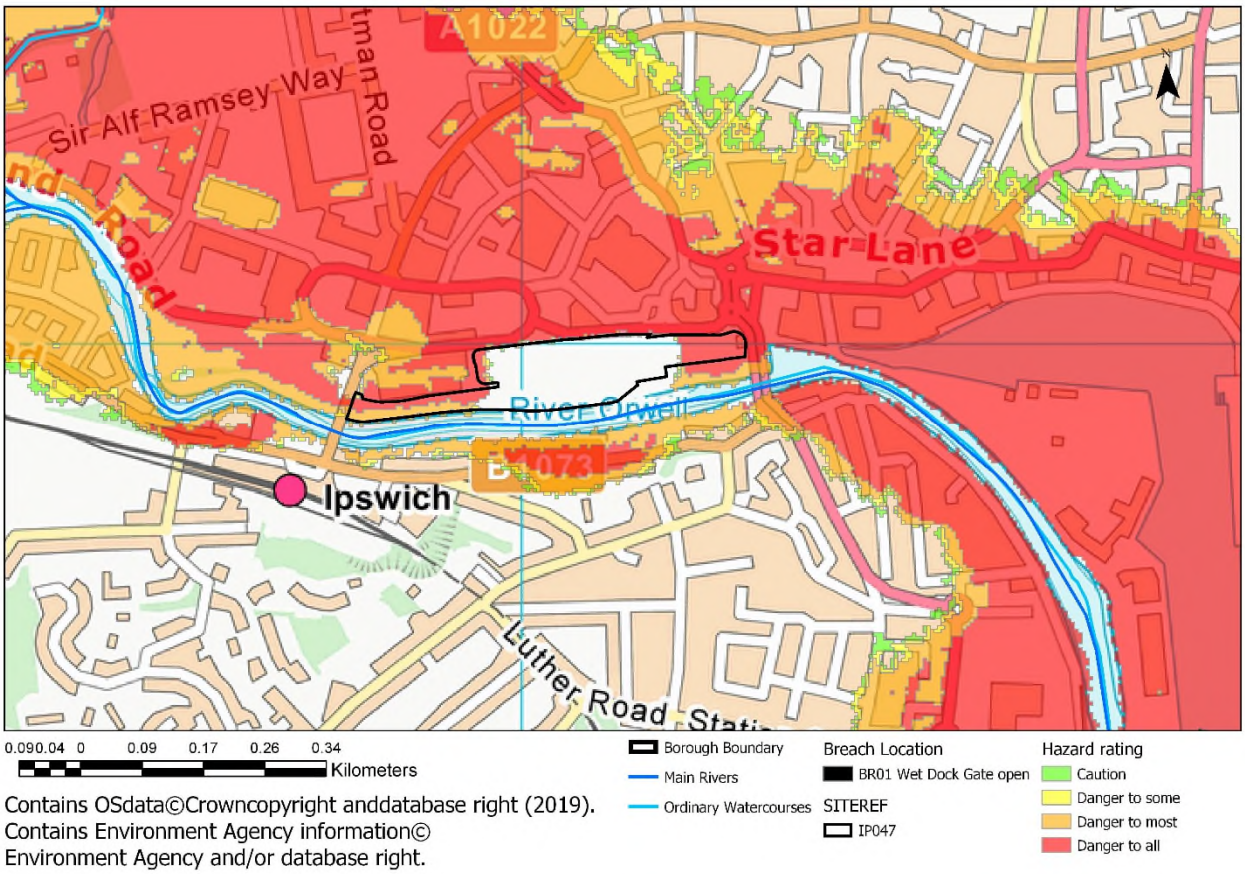
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flooding on the pavements and roads in this location associated with the surface water drainage network being blocked or overwhelmed.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Land at Commercial Road**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

It should be noted that the model grid in this location includes a major development on the north bank, upstream of Stoke Bridge which is planned to raise the existing defence to 6mAOD. This development has not yet progressed to construction phase. Therefore, there is potential for the flow paths and flood storage capacity shown by these breach scenarios to be modified from the current situation.

However, this data remains the best available data at the time of writing and Map 2 provides a good indication of potential flood hazard at the site.

Given that the flood defence raising has not been completed, and with reference to the location of the site and the surrounding hazard rating, it is safe to assume that the site will be a mix of danger to all and danger to most.

The site is entirely within the defended floodplain with limited opportunities for safe access in the event of a breach. Safe refuge should be provided above 4m AOD in Compartment J.

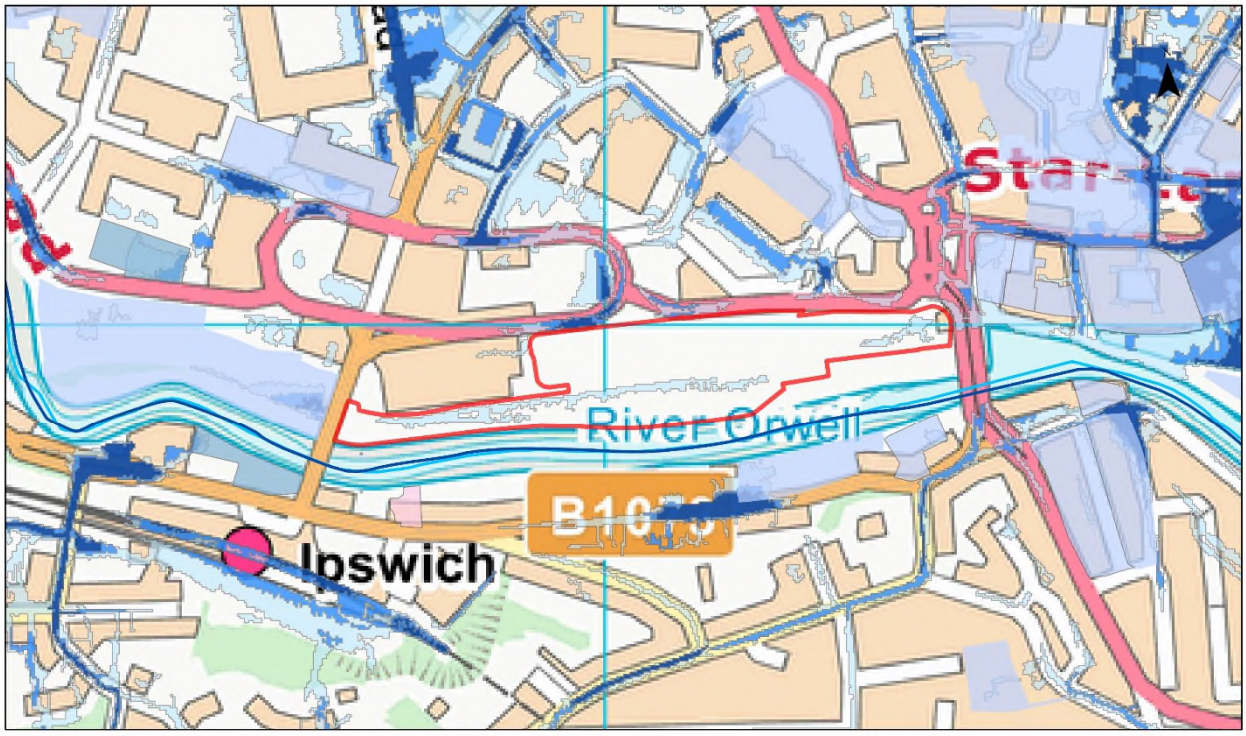
**Surface Water Source**

**Risk of Flooding from Surface Water (RoFSW)**

**Site Name: Land at Commercial Road**

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.

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW**




**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 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 underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*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 Main River

*Site Layout and Design*

**Site Name: Land at Commercial Road**

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).

SW drainage would drain to the Orwell and provision of tide lock storage may be required.
The potential impact of Anglian Water surface water sewers which cross the site and an Anglian Water underground storage tank/pumps/kiosk/culvert and penstock located at Stoke Bridge (East of the site) need to be considered further as part of a site specific flood risk assessment.

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4m AOD in compartment J, whichever is greater.

*Access / Egress*

The main access to the site is from Commercial Road which is also shown to be at residual risk of tidal flooding from the River Orwell. The egress route away from the site is likely to north towards Commercial Road, Grey Friars Road and into an area of Flood Zone 1. An alternative may be via Princes Street to the West, however, this would require some land raising.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood level including an allowance for climate change.

*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.

*Flood Defences*

The life expectancy of the existing steel sheet pile flood defence walls in this location is limited increasing the risk of breaching. Land raising behind the defences would reduce this risk, however the EA would have to agree to such a proposal. The defences upstream of the barrier need to be retained even now that the barrier is operational.

*Note*
*In the absence of accurate flood hazard and flood depth information at this location should raising of flood defences not be completed or incorporated within a development proposal, it would be expected that a site specific FRA includes re-running of the Environment Agency breach modelling to create an accurate representation of risk posed to the site.*

| 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 | **Proposed Use:** | Residential | **Vulnerability Classification:** | More Vulnerable |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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.

Refer to Map 1 below for Flood Zone outlines

**Climate Change**

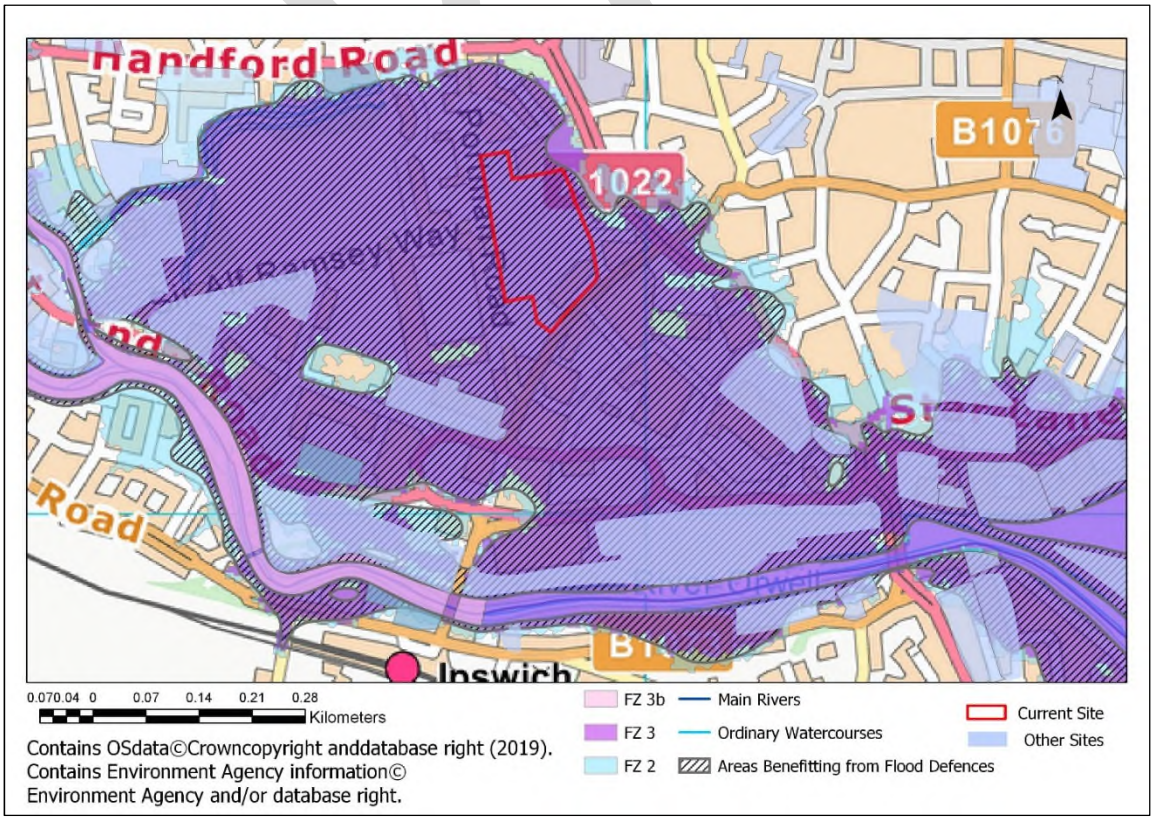
Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. An addendum to the SFRA report will be created early 2020 to include updated climate change model runs for the River Gipping which are currently being prepared by the Environment Agency.

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

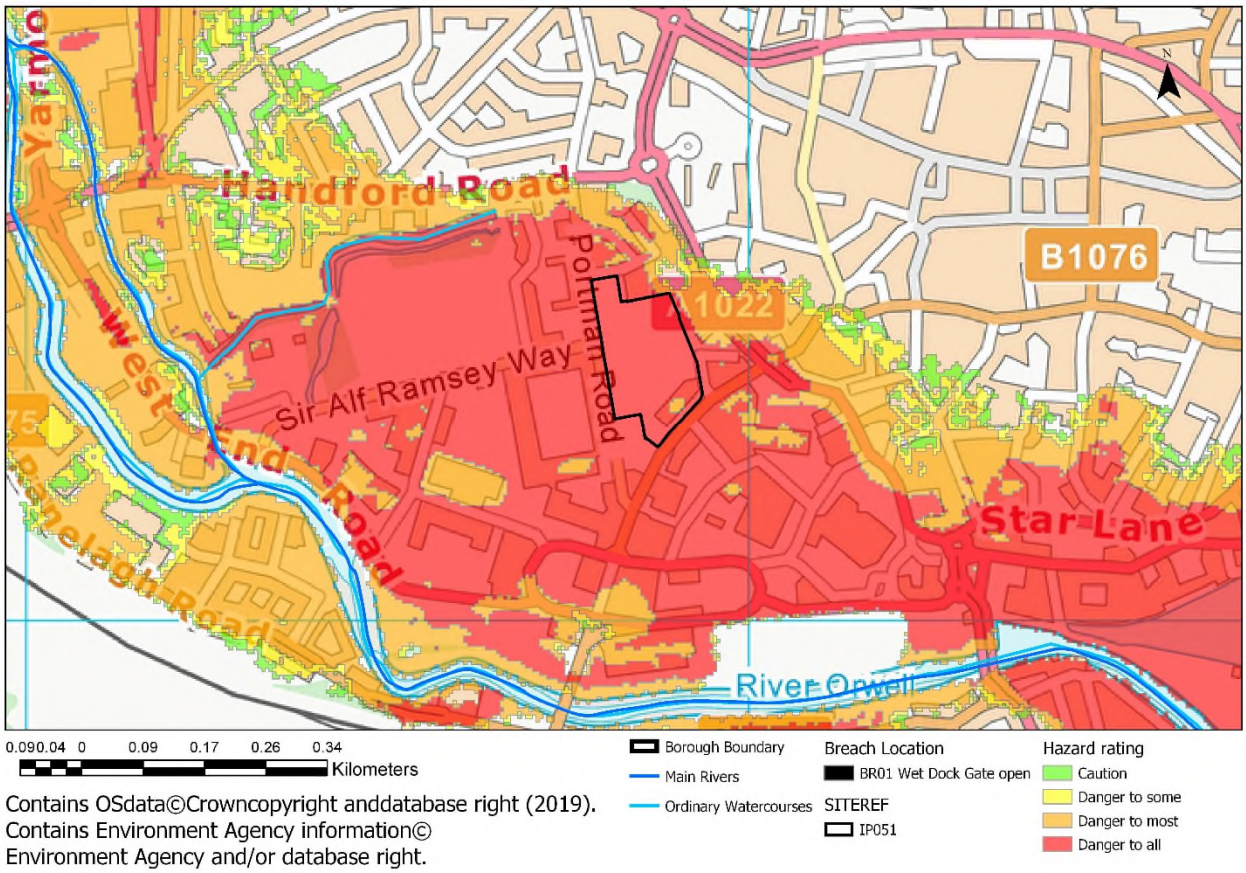
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flooding along Portman Road associated with blocked or overwhelmed drainage systems.

**Map 1 – Environment Agency Flood Map for Planning Data**



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

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**

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**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Hazard mapping above shows hazard rating of danger to all with Wet Dock Gate open at BR01. Site is located on the edge of Flood Zone 3 and at the edge of hazard extent. Safe access may be achievable in a northerly direction to the A1071 Handford Road which is in Flood Zone 1.

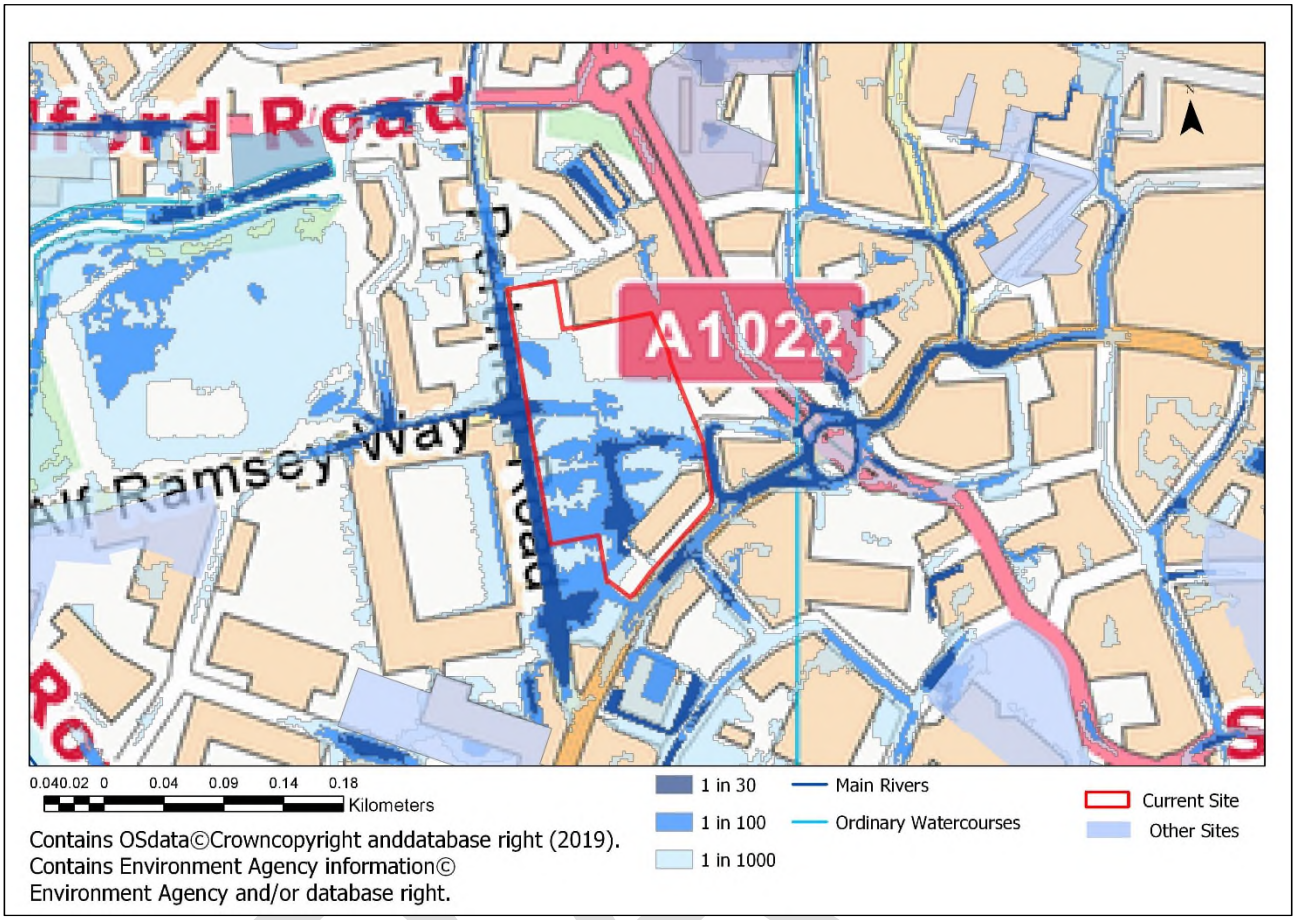
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

This is a low lying site and 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. There may also be a risk of flooding from the low level combined trunk sewer located in the vicinity of the site – this should be investigated further as part of a site specific flood risk assessment.

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

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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 underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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 particularly considering the level of surface water flood risk posed to the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

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

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change.

*Access / Egress*

In the event of a failure of the flood defence measures protecting this area, safe access may be achievable in a northerly direction to the A1071 Handford Road which is in Flood Zone 1. If safe access cannot be achieved, it will be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change. The site is also at risk of surface water flooding, the possibility of land raising has been raised in the past, however, it would have to be ensured that any land raising would not increase flood risk elsewhere.

*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.

| 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 |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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.

Refer to Map 1 below for Flood Zone outlines

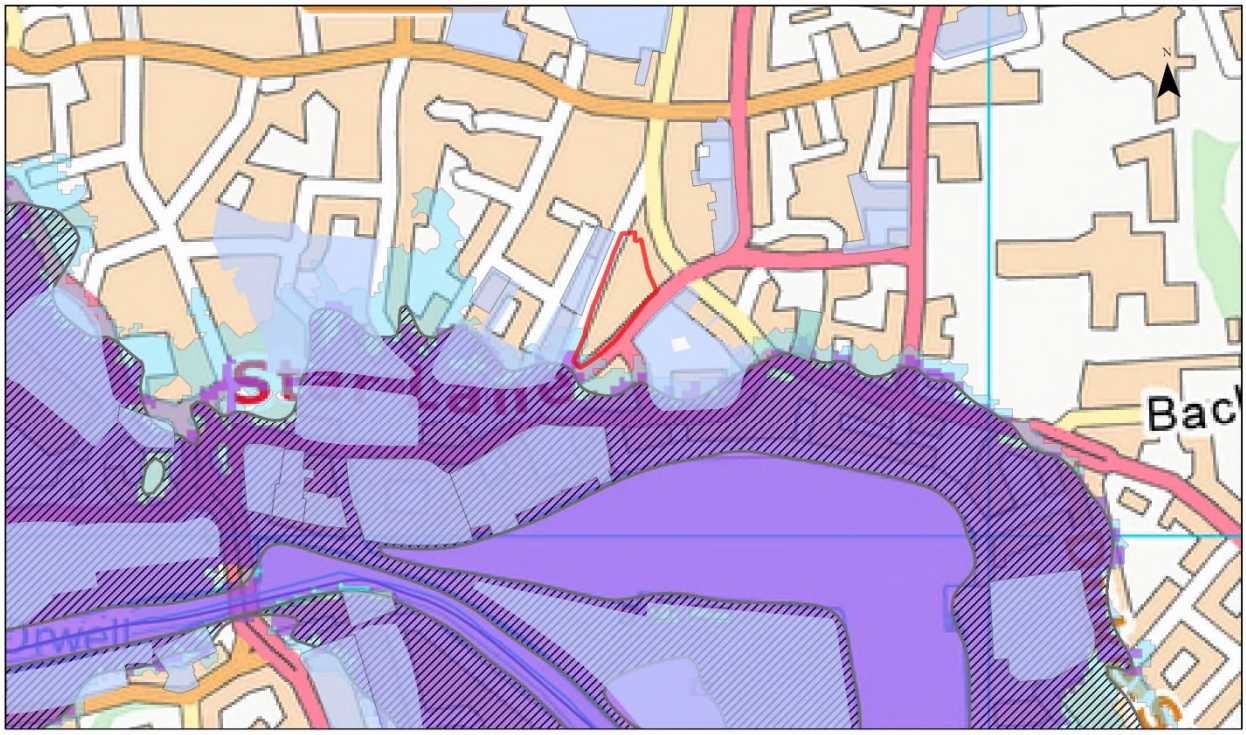
**Climate Change**

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

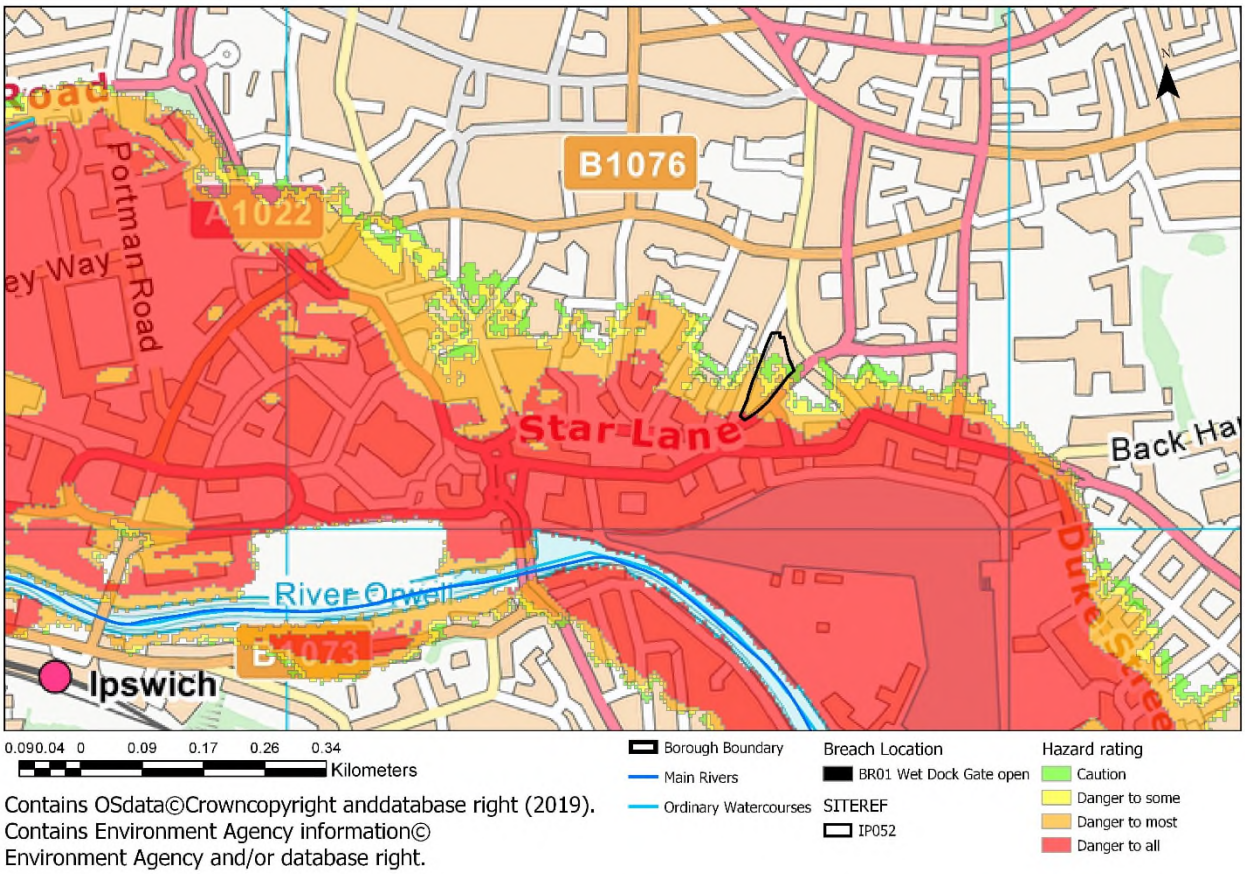
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Land between Lower Orwell Street and Star Lane**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

A small section of the south east corner of the site at danger to most, with rating decreasing to the north east where it is caution. The majority of the site is located in Flood Zone 1.

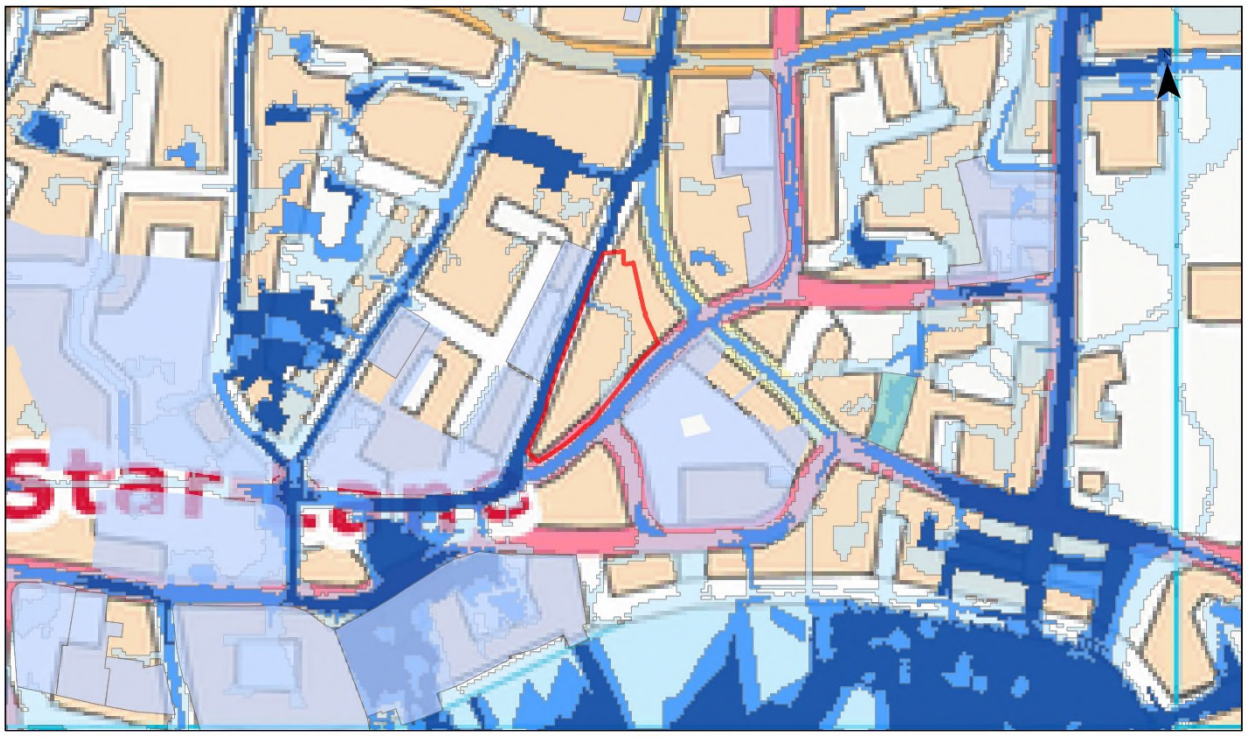
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

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

**Site Name: Land between Lower Orwell Street and Star Lane**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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 high risk of surface water flooding in the area immediately surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). A sequential approach to development layout within the site is required to ensure that development with a higher vulnerability is prioritised in the north east.

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment

**Site Name: Land between Lower Orwell Street and Star Lane**

Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change.

*Access / Egress*

Access to the site is from Lower Orwell Street or Star Lane which are both located in Flood Zone 1 low probability of flooding from the tidal Orwell.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. If it proposed to develop this part of the site, consideration of the escape route to the north of the site should be made.

*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.

| 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 |

| **Tidal/Fluvial Source:** | | | | |
|---|---|---|---|---|
| **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% |

## Flood Zones and Flood Defences

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 1. However, the parts of the site are located in Flood Zone 2 and Flood Zone 3, medium to high probability of flooding respectively, in the absence of flood defences. The south-east part of the site is shown to benefit from the presence of defences; there is a flood defence wall 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.

Refer to Map 1 below for Flood Zone outlines

## Climate Change

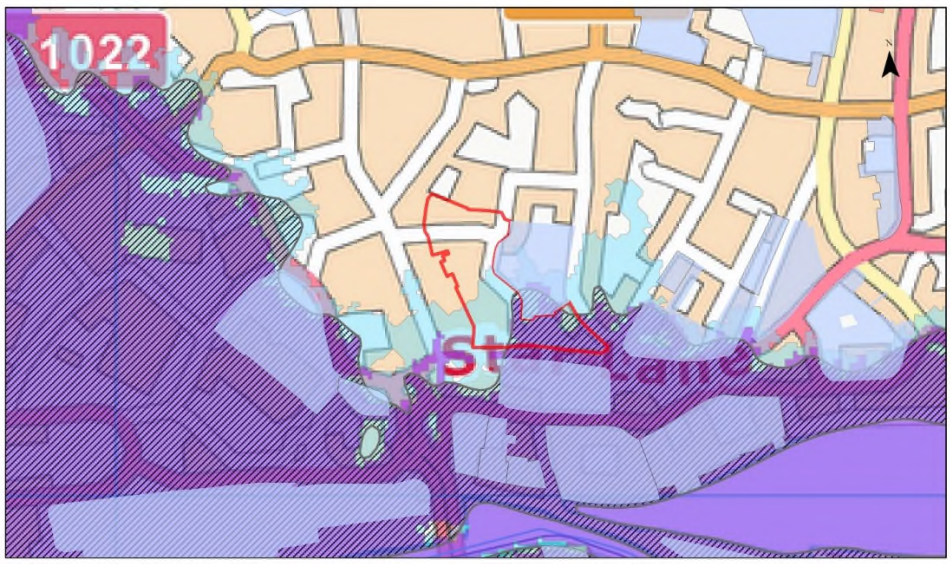
Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. An addendum to the SFRA report will be created early 2020 to include updated climate change model runs for the River Gipping which are currently being prepared by the Environment Agency.

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 flood defences. (These modelled scenarios take account of the presence of defences).

## Historic Records

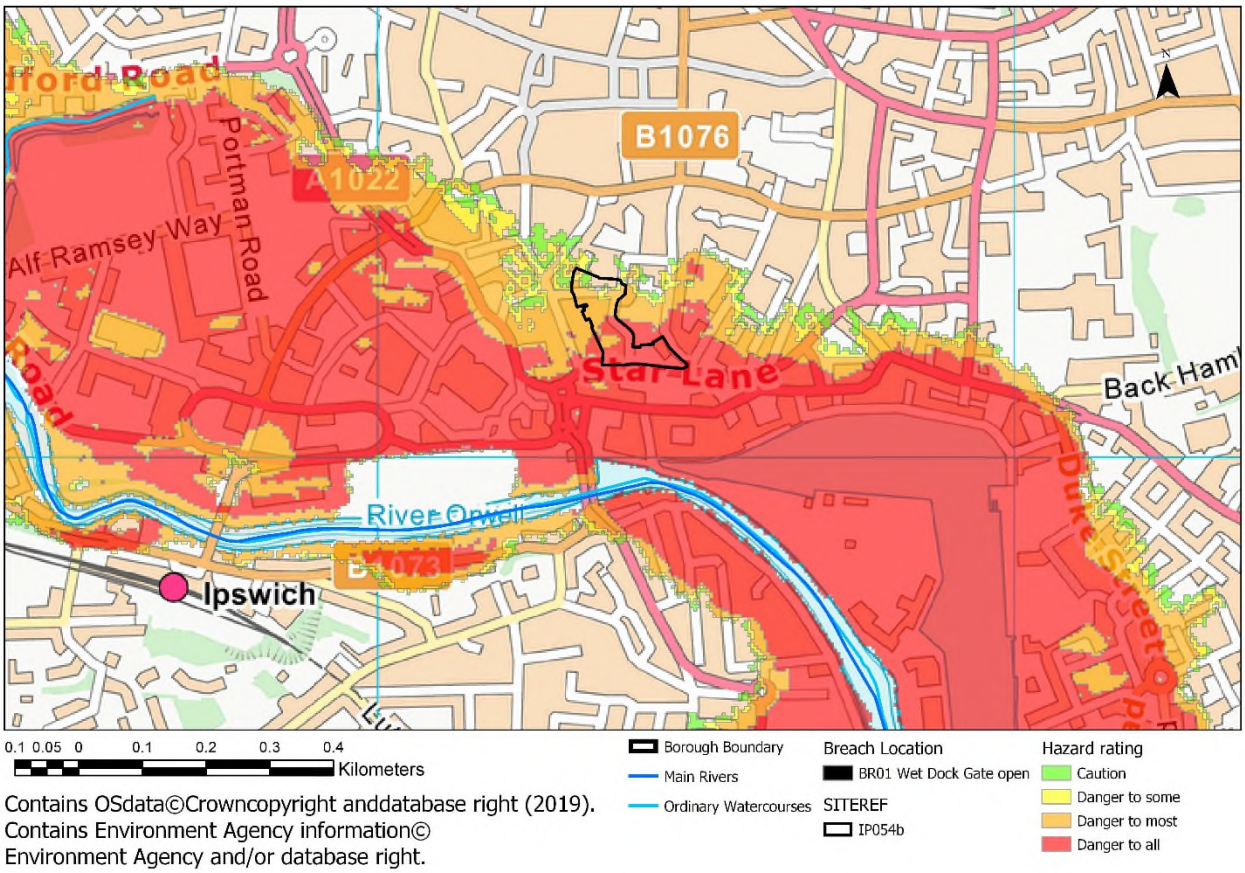
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1953 which is recorded on the Environment Agency Historic Flood Map.

## Map 1 – Environment Agency Flood Map for Planning Data



**Site Name: Land between Old Cattle Market and Star Lane**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**

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**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 with the southern section of the site classified as danger to all with the hazard reducing to the north of the site where caution can be applied. The site is located on the edge of Flood Zone 3 and at the edge of hazard extent.

**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

The RoFSW mapping shows that the south-east part 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.

**Site Name: Land between Old Cattle Market and Star Lane**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**


## 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.

The underlying geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

## 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: Land between Old Cattle Market and Star Lane**

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change.

*Access / Egress*

Access to the site may be from Turret Lane or Rose Lane. The routes that pass northwards are within Flood Zone 1 and therefore lead out of the tidal floodplain.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

| 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 |

| Tidal/Fluvial Source: | | | | |
|---|---|---|---|---|
| **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.

Refer to Map 1 below for Flood Zone outlines

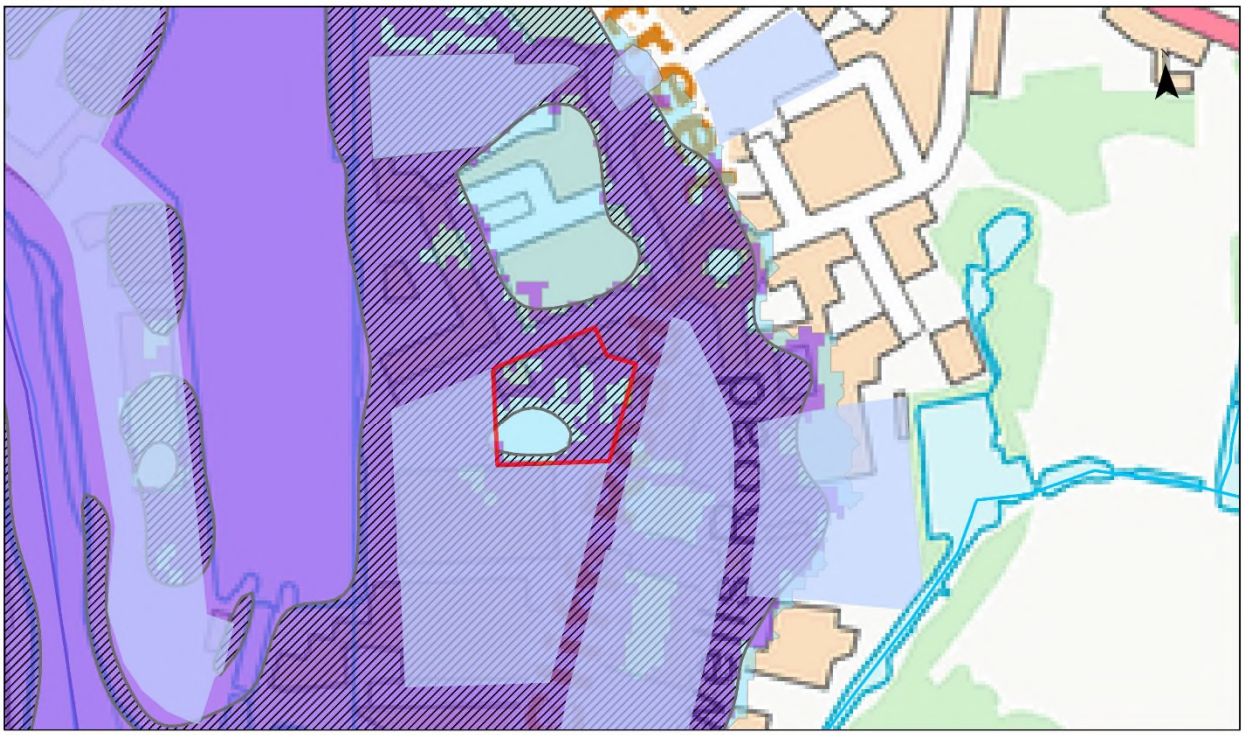
**Climate Change**

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

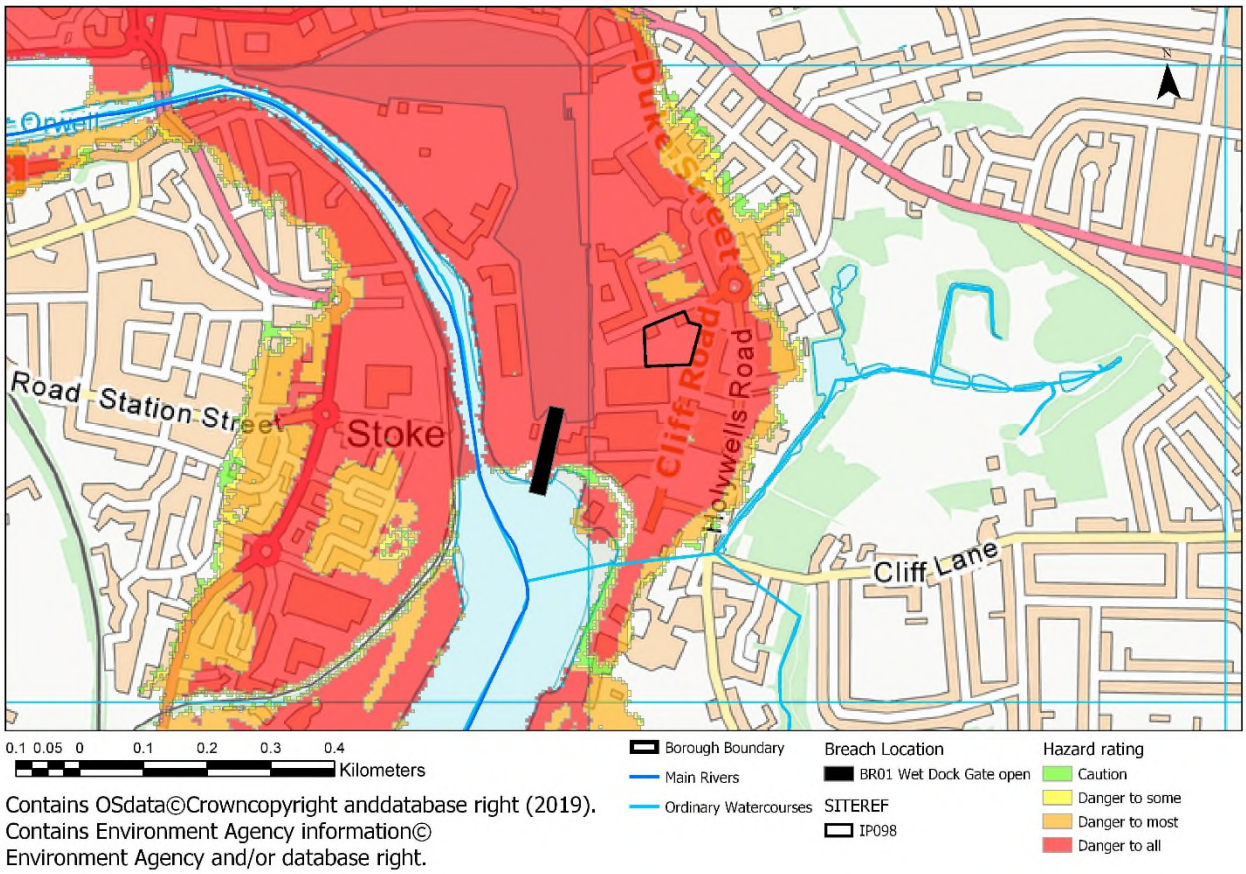
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents on Holywells Road adjacent to this location.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Transco, south of Patteson Road**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**

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**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.
Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The site is entirely within the defended floodplain; safe access may be achievable along Patteson Road to the east in the event of a breach, depending on the time of the breach and the warning period. Safe refuge should be provided above 5.3m AOD.

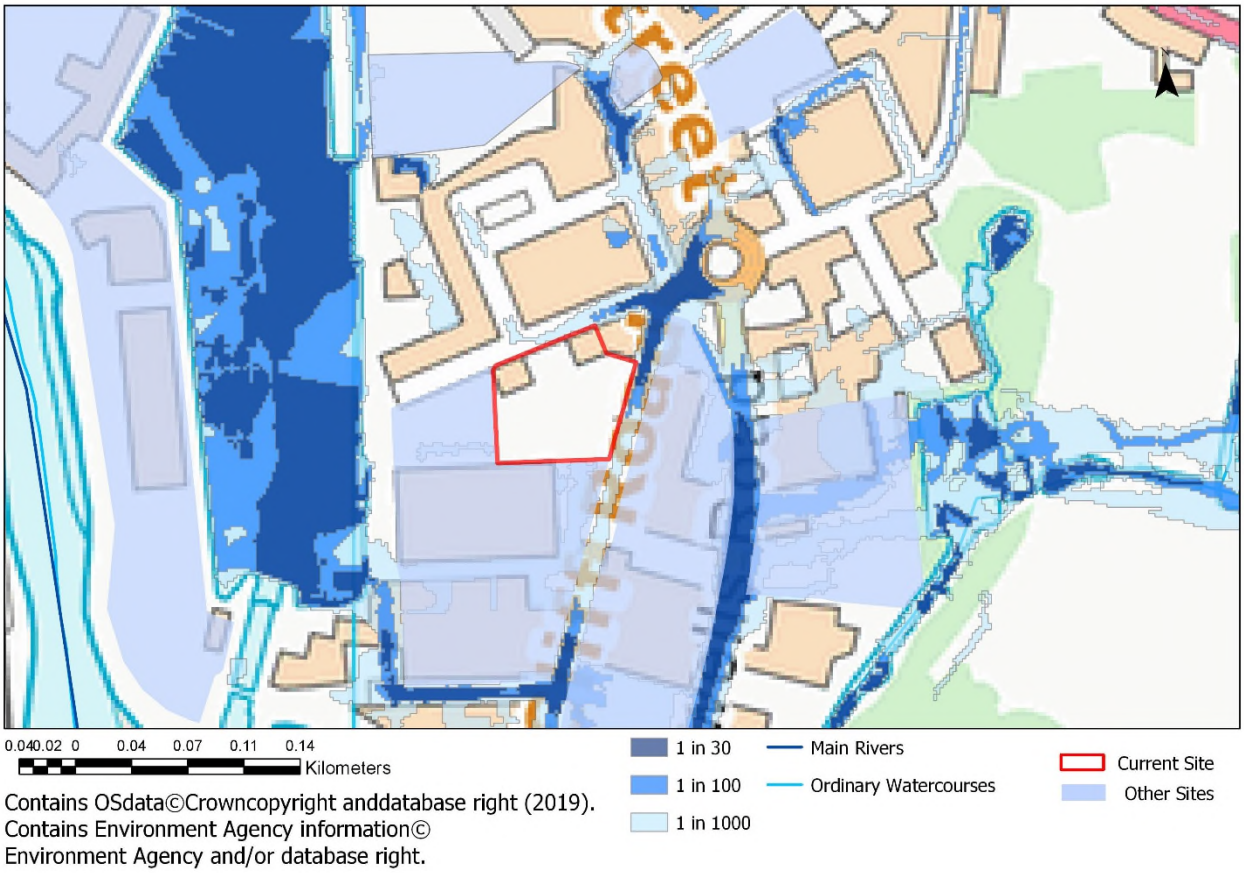
**Surface Water Flood Risk**

**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.

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**

**Site Name: Transco, south of Patteson Road**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 5.3m AOD (Table 7-1), whichever is greater.

*Access / Egress*

Access to the site may be from Cliff Road toward Mytle Road roundabout. The routes that pass north-east are within Flood Zone 1 and therefore lead out of the tidal floodplain.

**Site Name: Transco, south of Patteson Road**

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change or >5.3mAOD, whichever is greatest.

Due to the proximity of the site to flood defences, consideration of the rate of onset is required to inform site access/egress and emergency planning.

*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.

| 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 |
| **Tidal/Fluvial Source:** | | | | | |
| **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% | |

**Flood Zones and Flood Defences**

The site is located adjacent to the River Gipping. The western part of the site 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, however, this part of the site is benefits from flood defences. This part of the site is therefore at *residual risk of fluvial flooding.*

Refer to Map 1 below for Flood Zone outlines

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

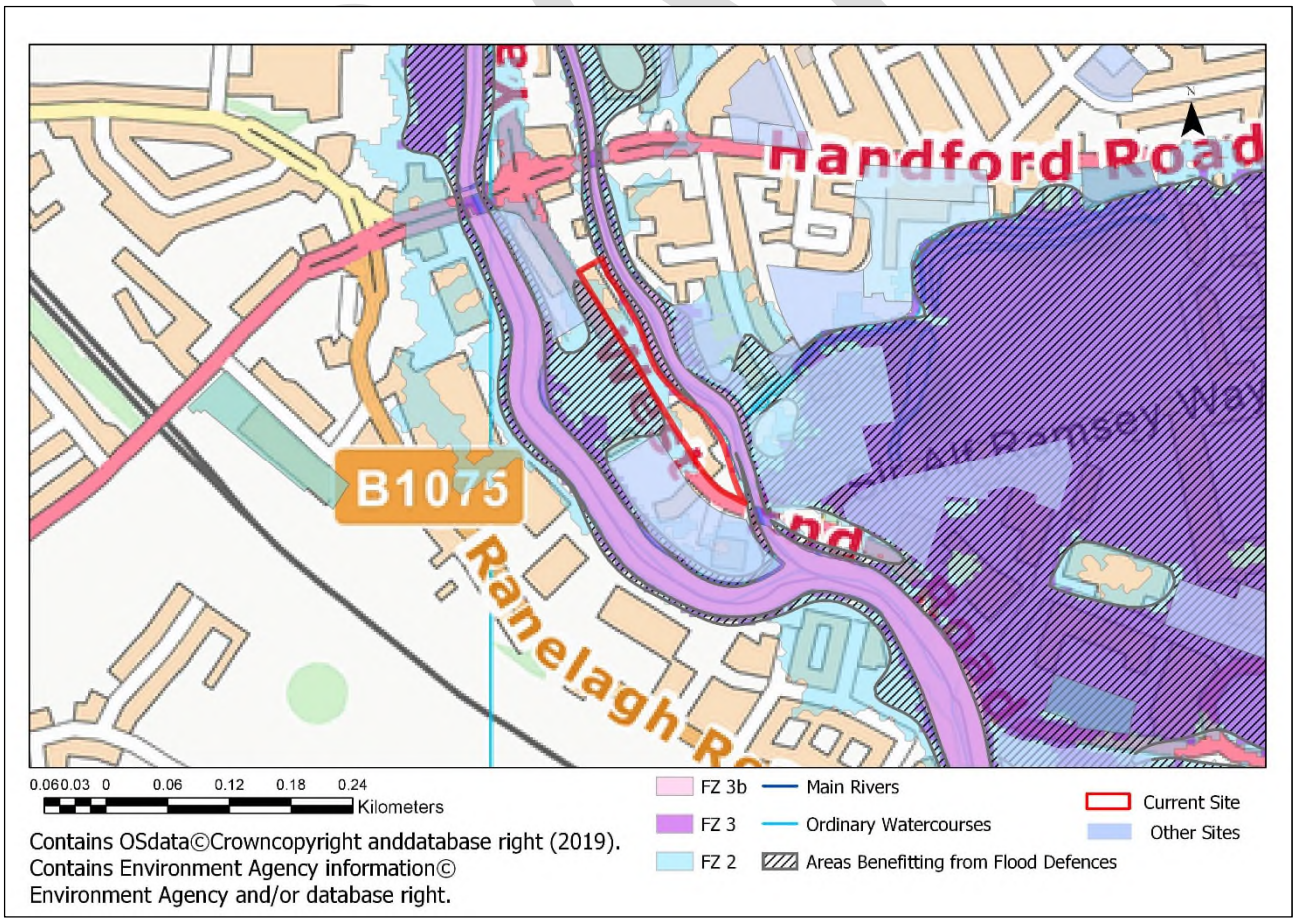
**Climate Change**

Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. (These modelled scenarios take account of the presence of defences).

**Historic Records**

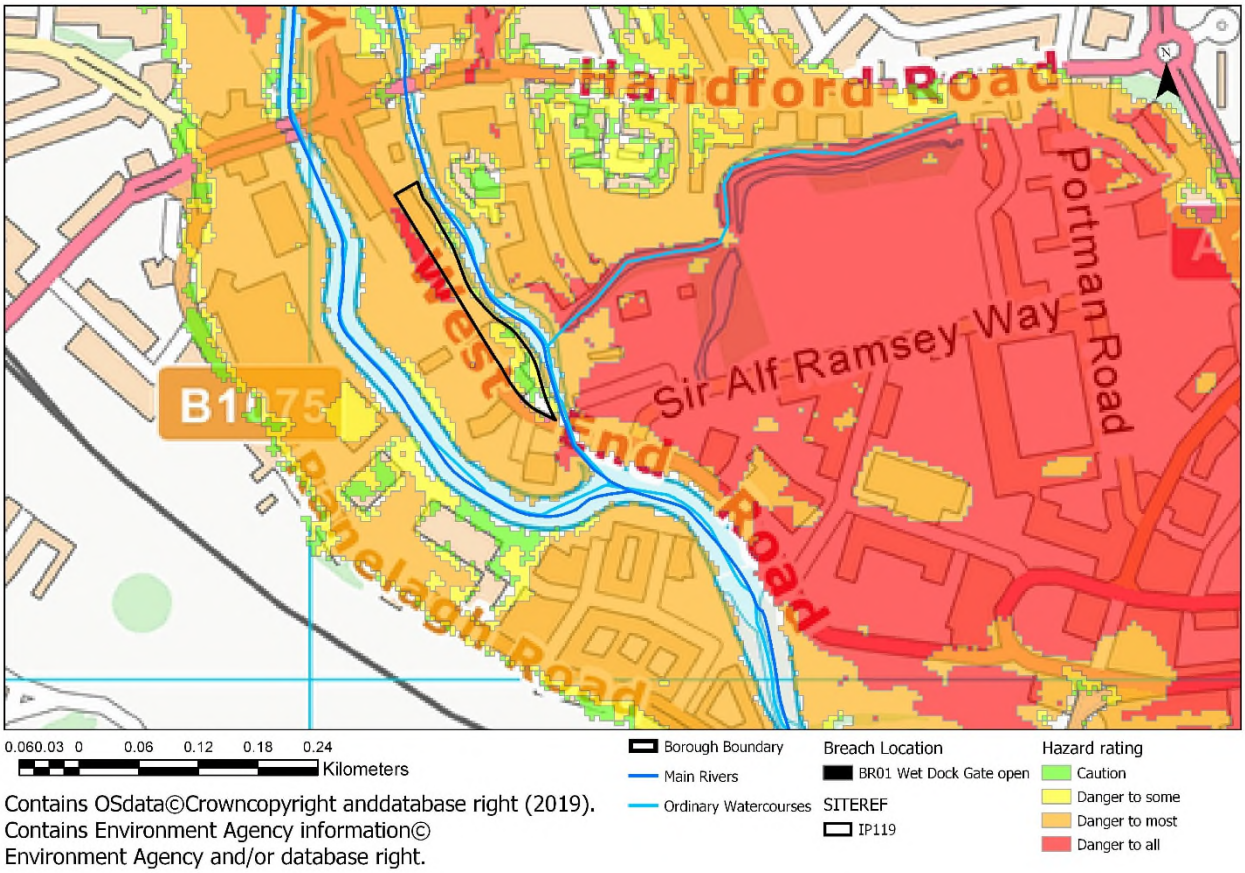
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1939. Ipswich BC also hold records of flood incidents on West End Road which is adjacent to the site.

**Map 1 – Environment Agency Flood Map for Planning Data**




**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**

**Site Name: Land east of West End Road**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Site hazard rating range from danger to most to caution.

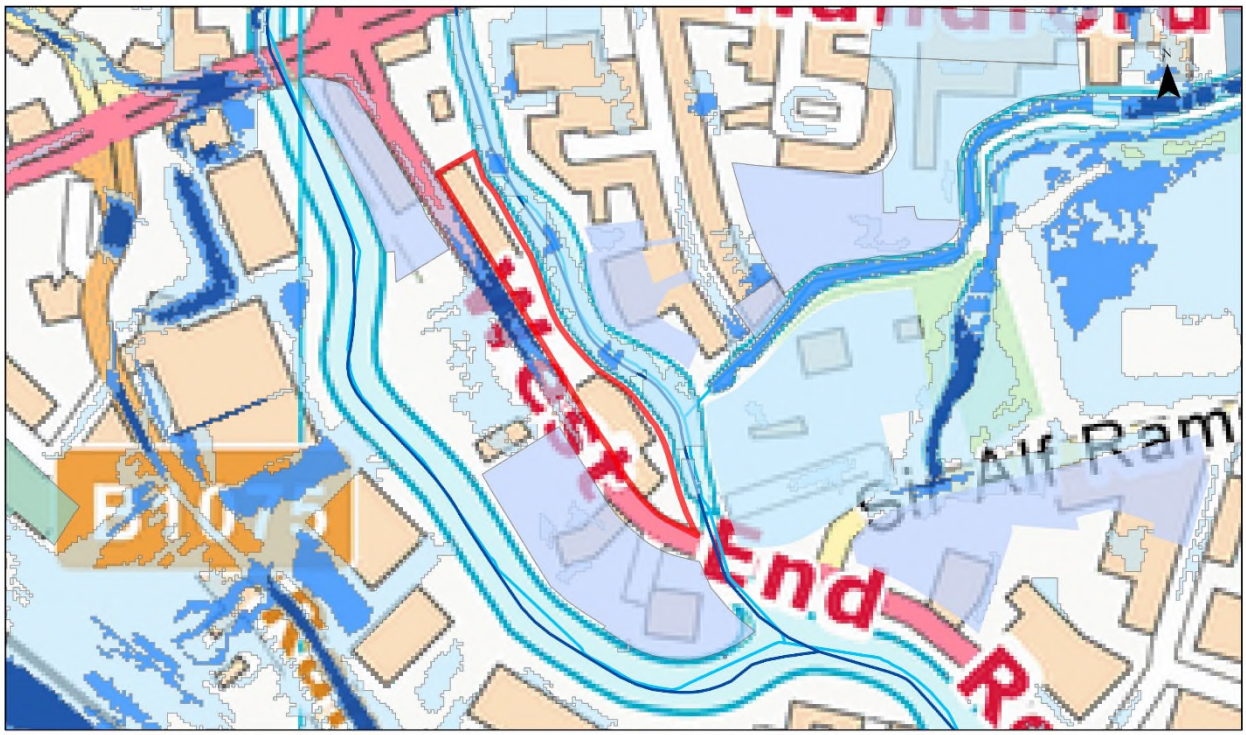
**Surface Water Flood Risk**

**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.

**Site Name: Land east of West End Road**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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.
Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*Set-back Distance*

All development should be set back 16m 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 Main River.

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event

**Site Name: Land east of West End Road**

including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment I (Table 7-1), whichever is greater.

*Access / Egress*

Access to the site may be from West End Road towards Handford Road. The routes that pass northwards are within Flood Zone 1 however, consideration needs to be made of the wider site location, between two watercourses and the impact this has on safe access/egress.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

| 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 |

| Tidal/Fluvial Source: | | | | |
|---|---|---|---|---|
| **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%** |

**Flood Zones and Flood Defences**

The site is located adjacent to the River Orwell. The majority of the site is identified in Flood Zone 1, low probability of flooding. However, it should be noted that this site is an island. A small part of the site is identified in Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences to the south-east of the site. The site is therefore at *residual risk of tidal flooding*, in the event of a failure of these defences. Development should be directed away from Flood Zone 3.

Refer to Map 1 below for Flood Zone outlines

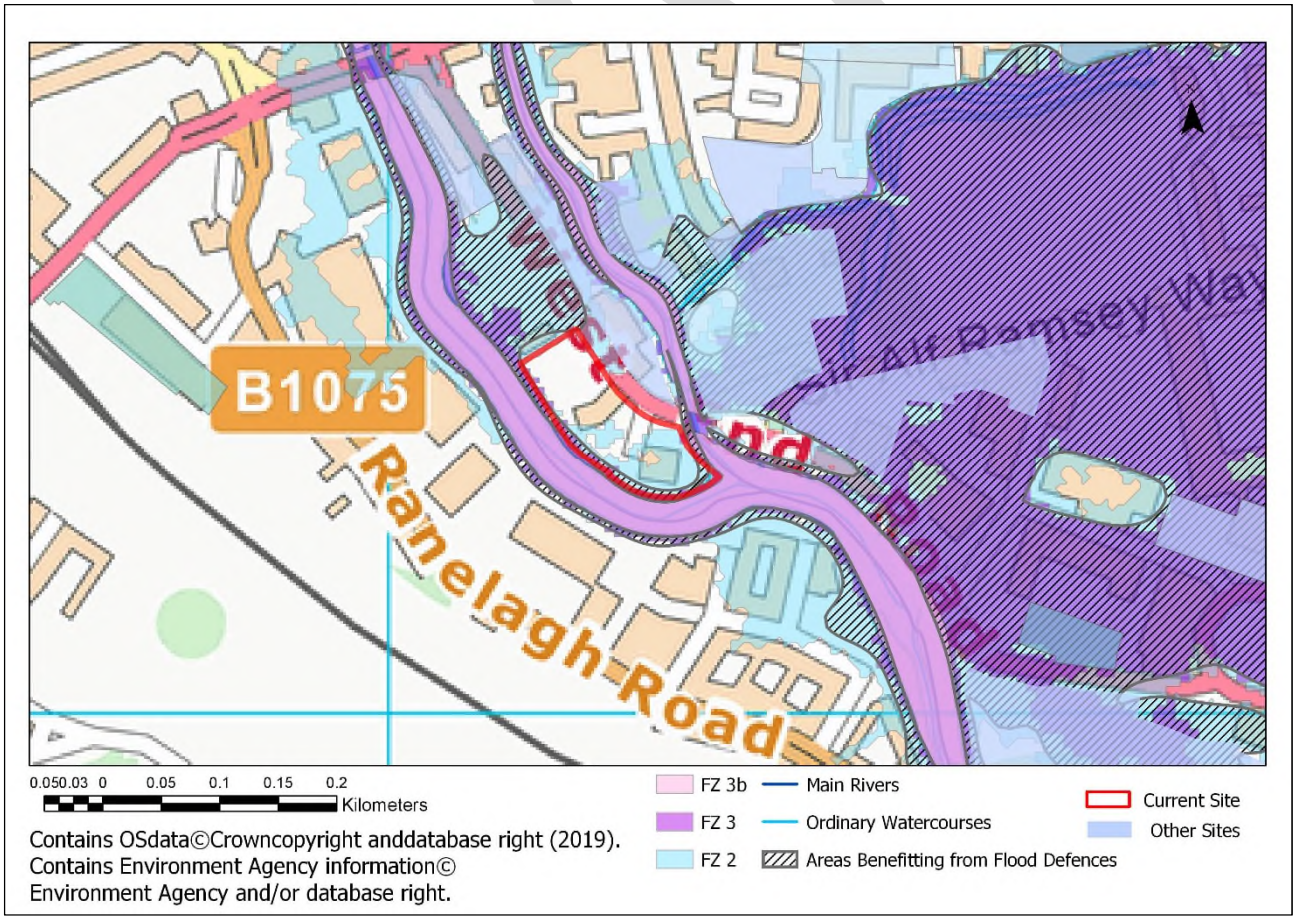
**Climate Change**

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

**Historic Records**

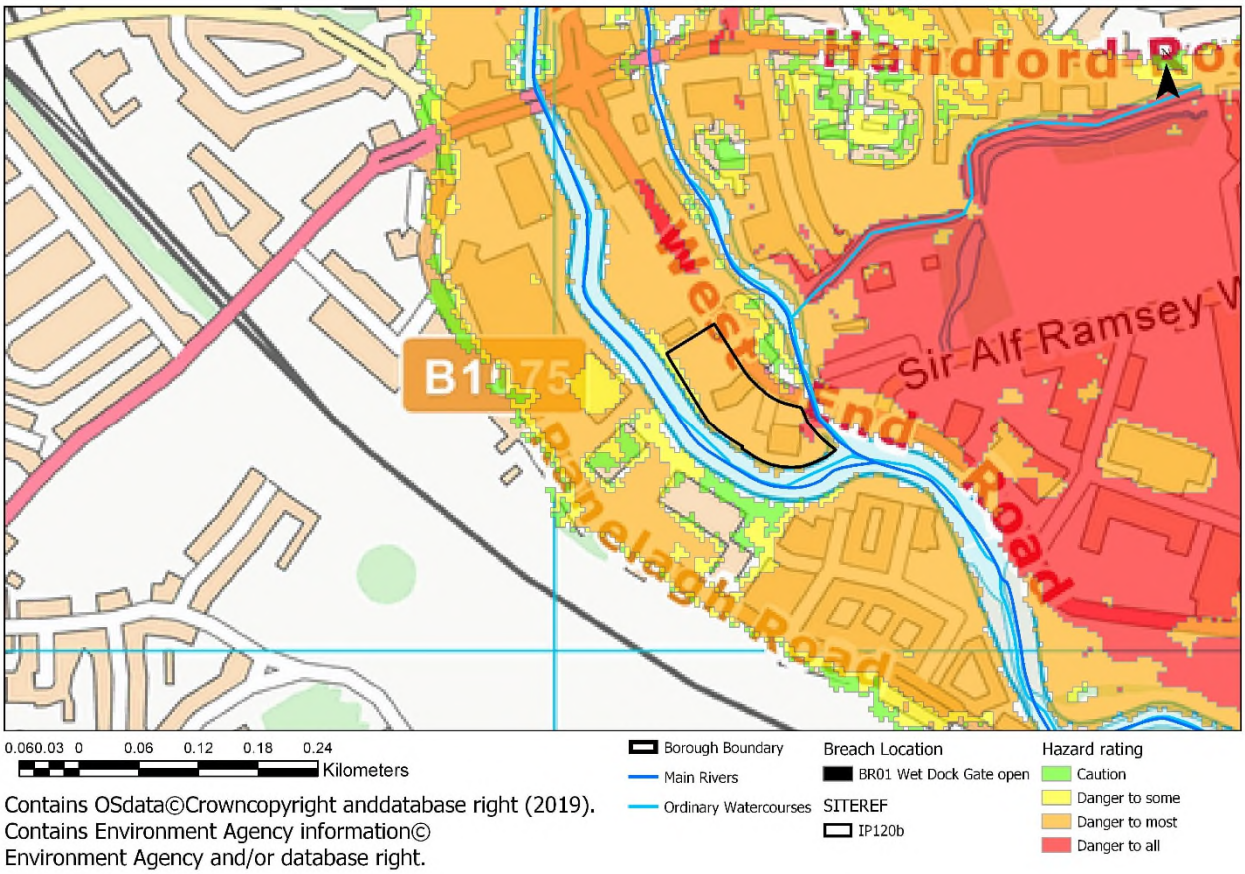
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1939 and 1953. Ipswich BC also hold records of flood incidents on West End Road which is adjacent to the site.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Land West of West End Road**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The majority of the site is classified as danger to most.

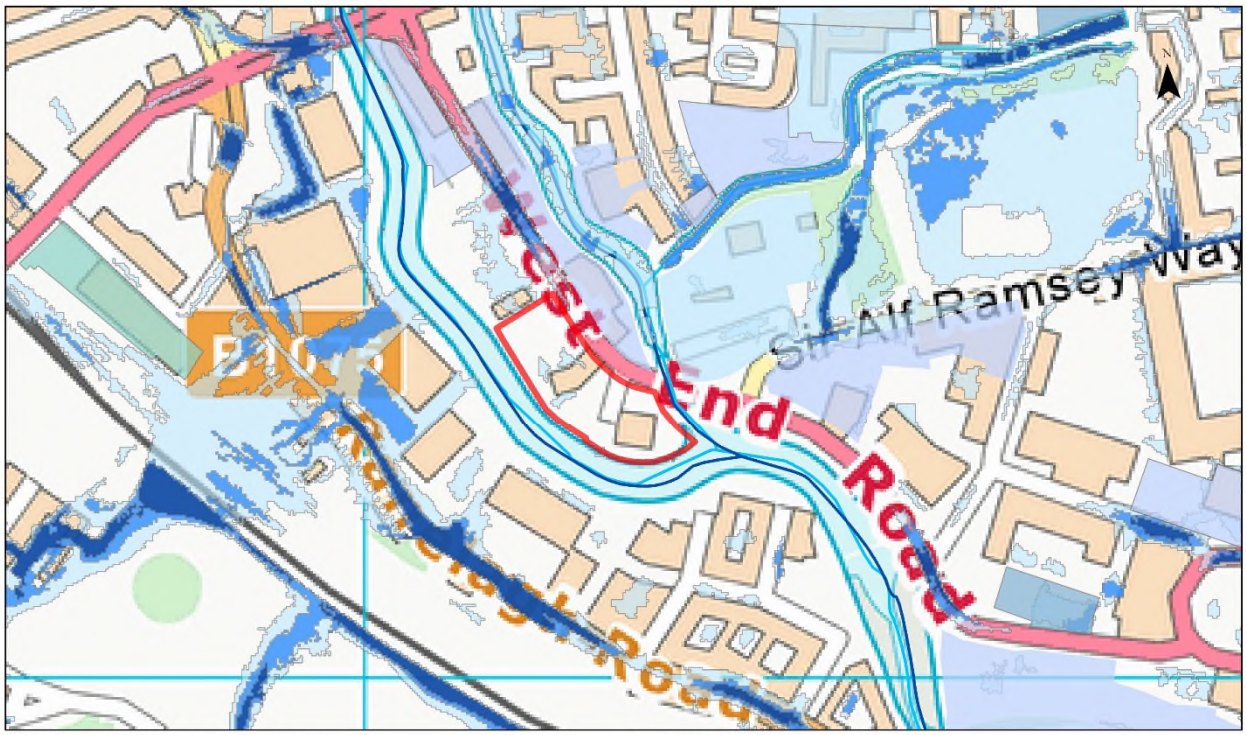
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

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.

**Site Name: Land West of West End Road**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*Set-back Distance*

Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a Main River.

*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 type SUDs may need to be designed for tide-locking.

**Site Name: Land West of West End Road**

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment I (Table 7-1), whichever is greater.

*Access / Egress*

Access to the site may be from West End Road to Hanford Road and Ranelagh Road (B1075) onto London Road (A1214) towards Handford Road. The routes that pass northwards are within Flood Zone 1 and therefore lead out of the tidal floodplain. Consideration of the wider site location is required as it is located between two watercourses which may affect the viability of safe access if a watercourse must be crossed to access Flood Zone 1

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

| Site Name: Land south of Felaw Street | | | | | |
|---|---|---|---|---|---|
| **Site ID:** | IP133 | **Location:** | Land south of Felaw Street | **Area (ha):** | 0.37 |
| **Current Use:** | Commercial | **Proposed Use:** | Residential | **Vulnerability Classification:** | More Vulnerable |

| Tidal/Fluvial Source: | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

The New Cut (tidal River Orwell) is located approximately 20m to the west of the site. The eastern 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 New Cut to the east 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.

Refer to Map 1 below for Flood Zone outlines

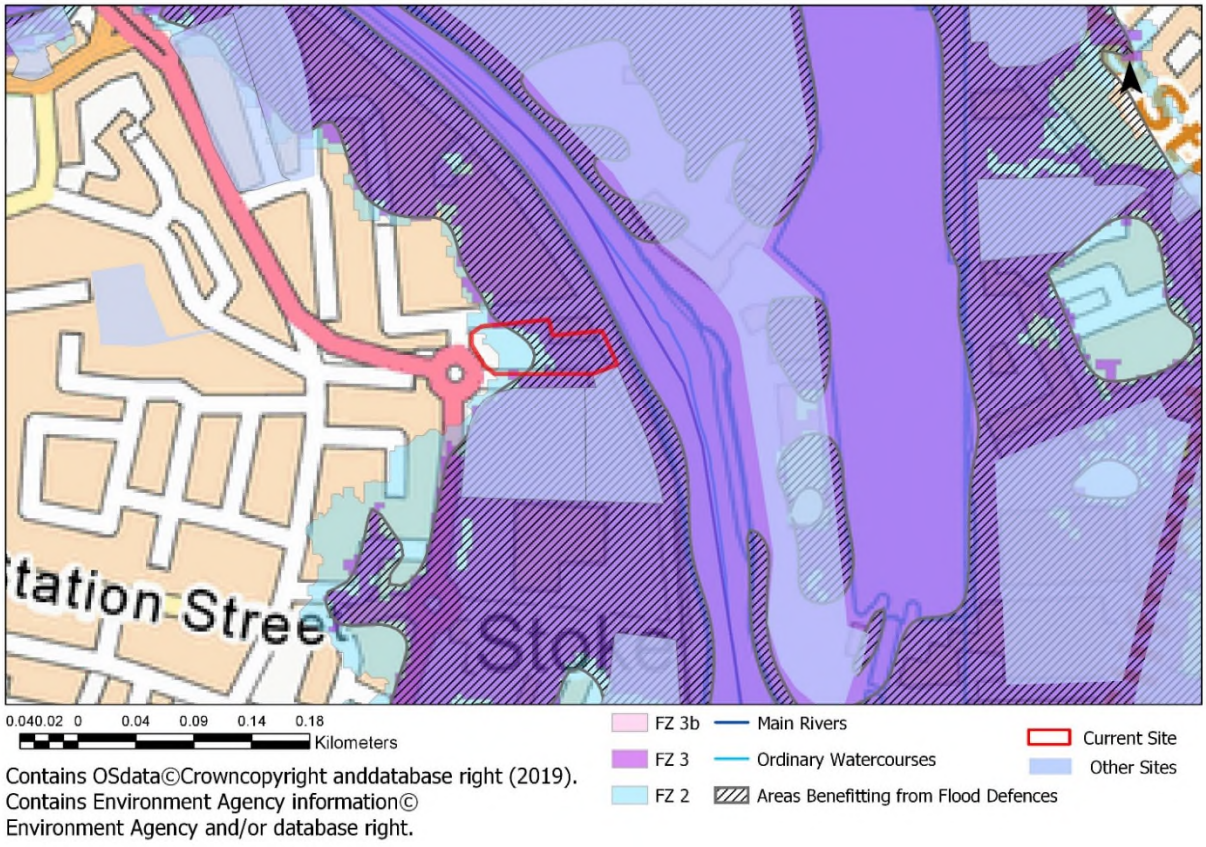
**Climate Change**

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

**Historic Records**

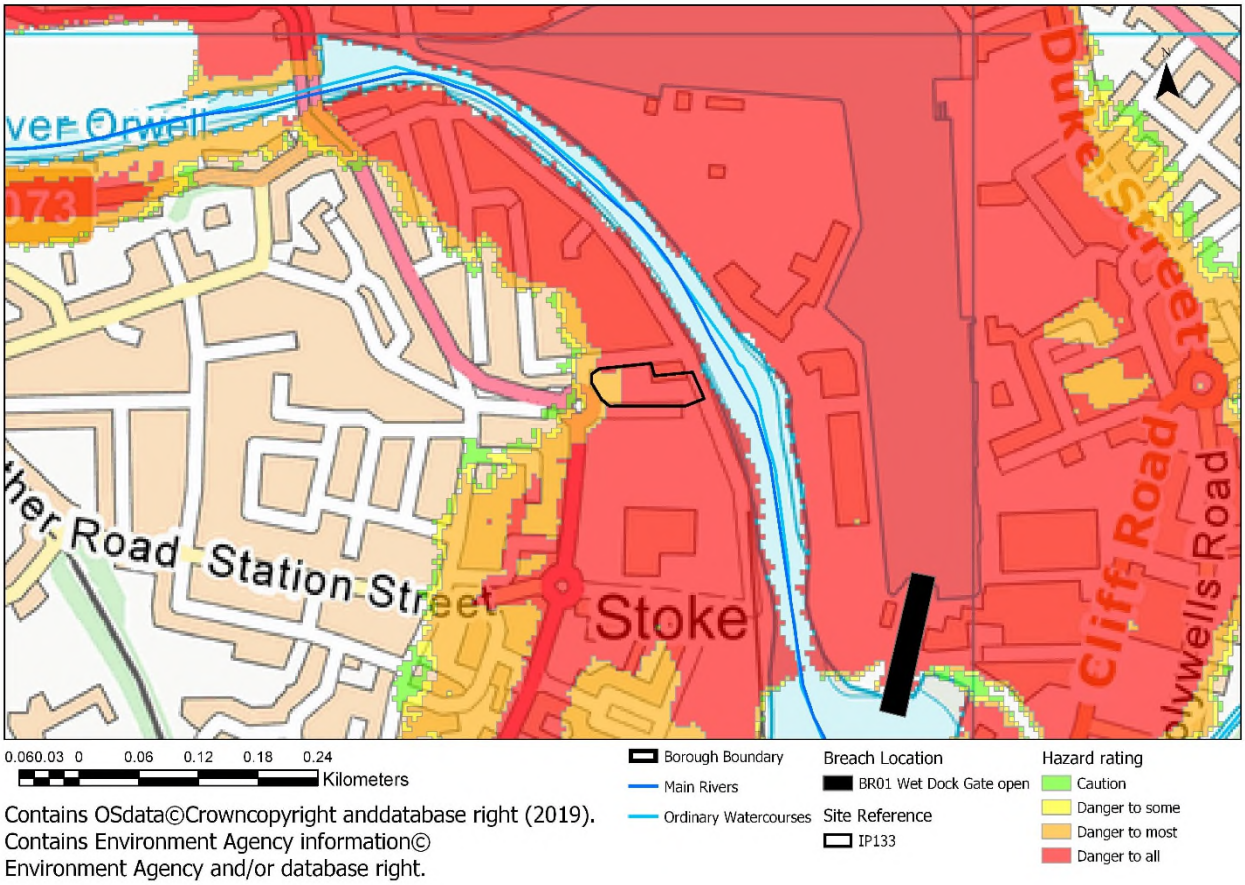
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Land south of Felaw Street**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The majority of the site is classified as danger to all, reducing to the west across the site as you move away from the river. Safe access likely to be achievable to the west along Vernon Street.

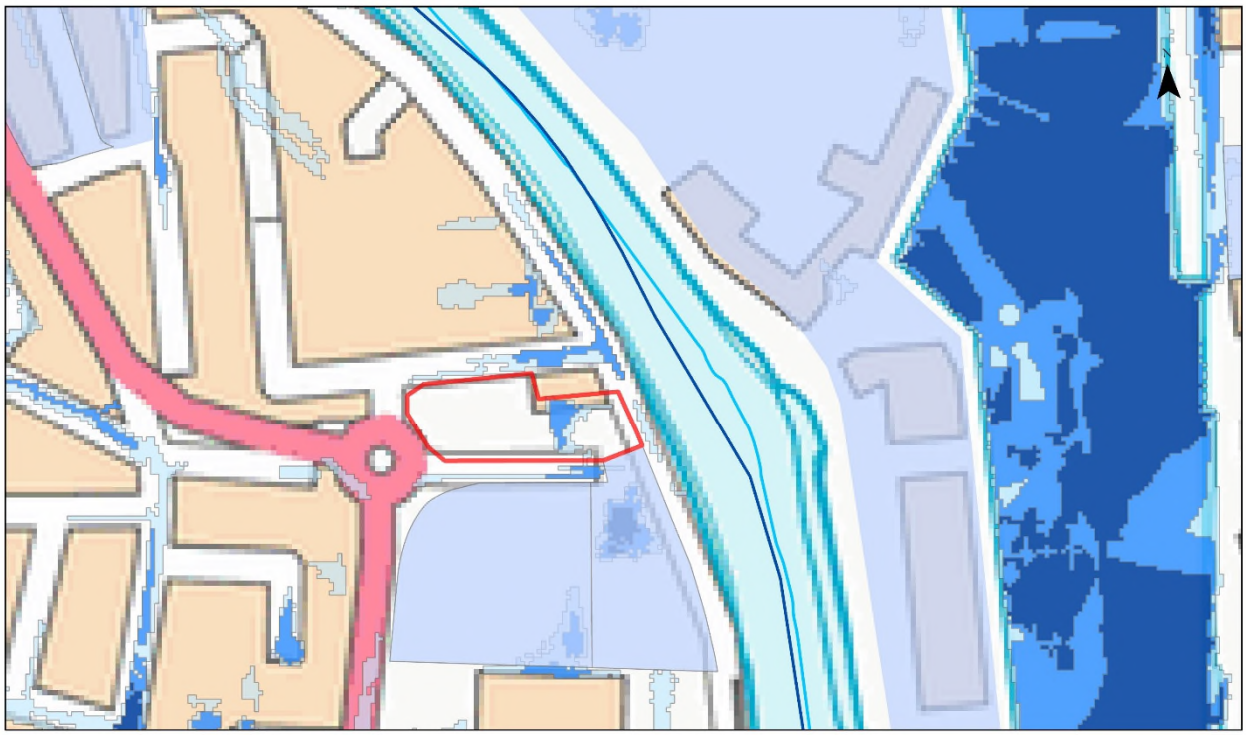
**Surface Water Flood Risk**

**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 medium risk of surface water flooding, the surrounding routes are at medium risk.

**Site Name: Land south of Felaw Street**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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). The destination for surface water runoff could be the New Cut, however, consideration of storage requirements under tide locked situations would be required.

**Site Name: Land south of Felaw Street**

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 3.5m AOD in Compartment C (Table 7-1), whichever is greater.

*Access / Egress*

Access to the site may be from 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.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

| 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 |
| **Tidal/Fluvial Source:** | | | | | |
| **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% | |

## Flood Zones and Flood Defences

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 site is therefore at *residual risk of tidal flooding,* in the event of a failure of these defences.

Refer to Map 1 below for Flood Zone outlines

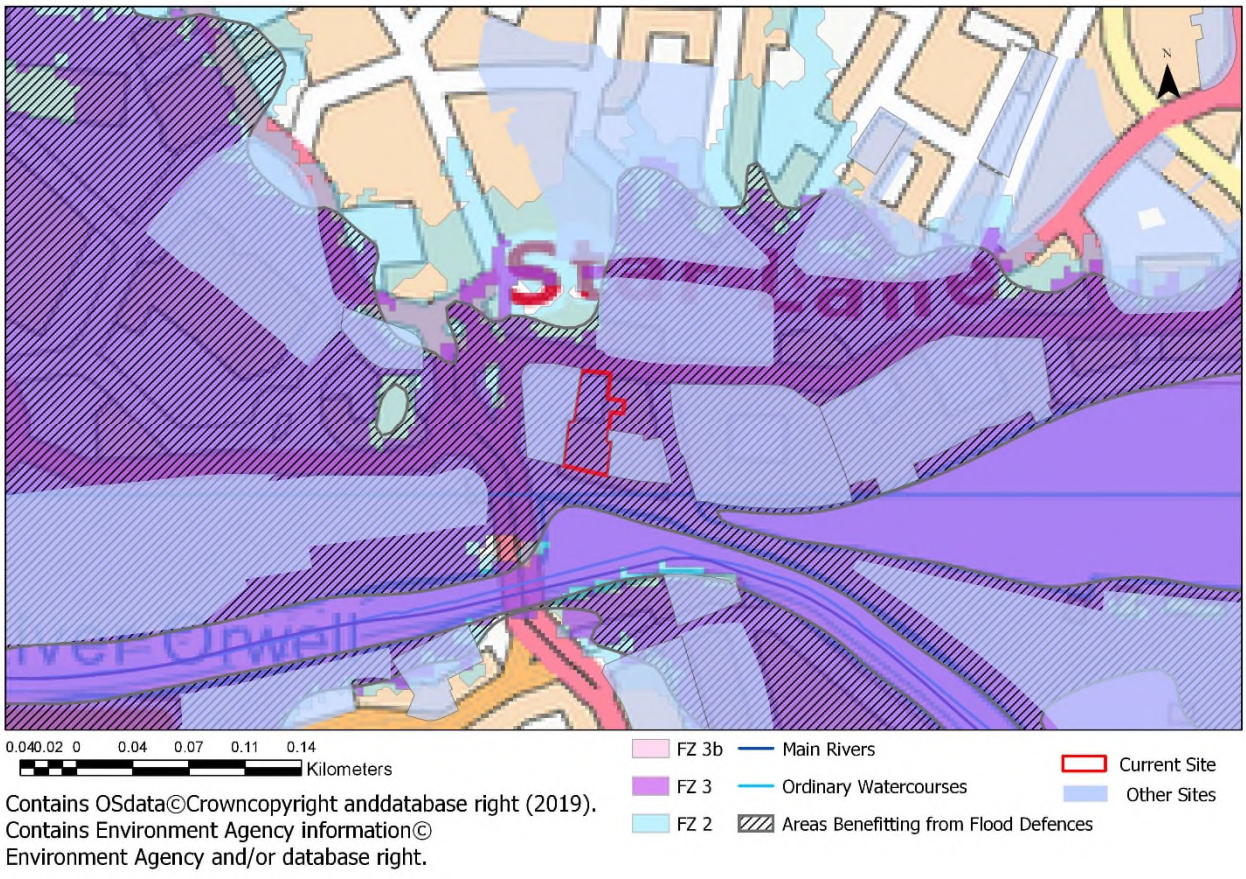
## Climate Change

Modelling of the River Orwell shows that water remains in bank during the 0.5% AEP event including climate change. (These modelled scenarios take account of the presence of defences).

## Historic Records

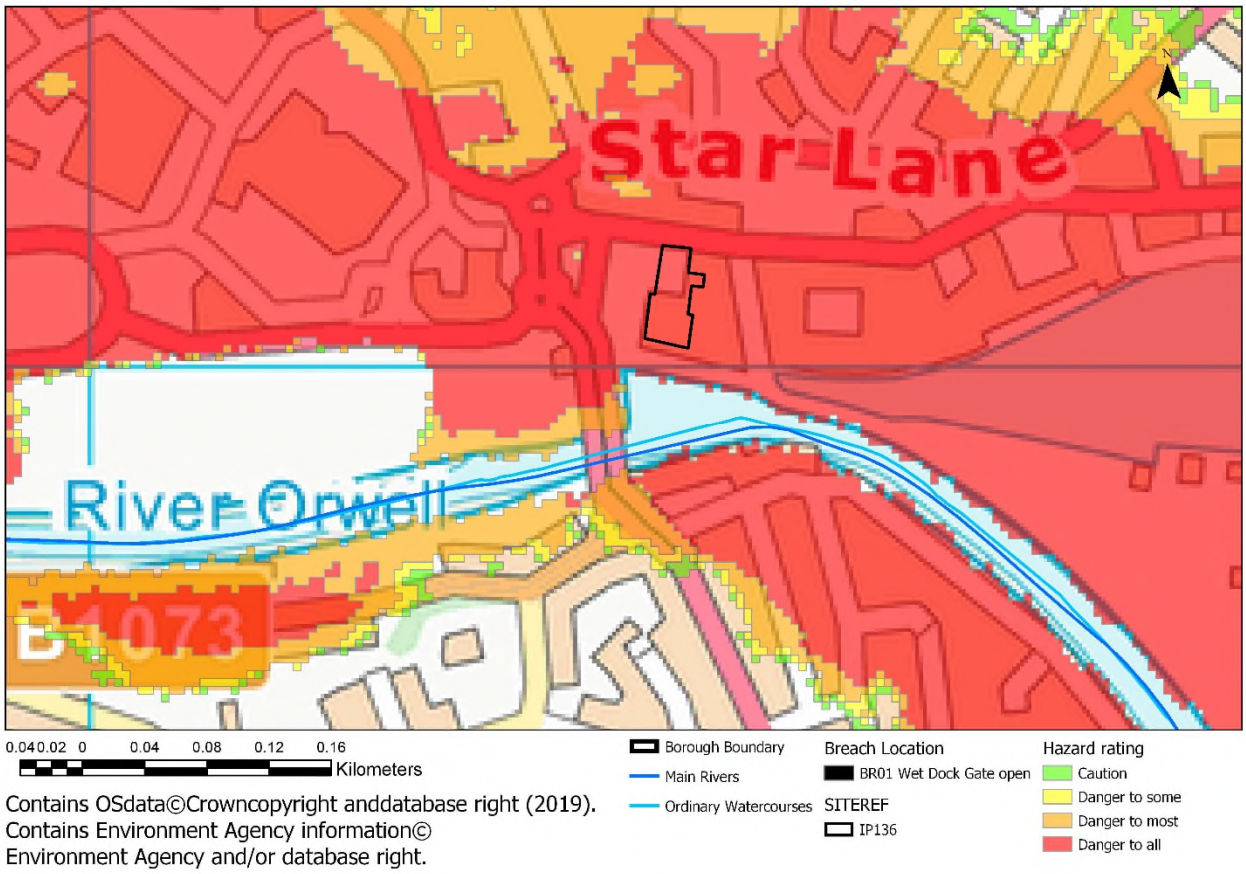
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. The site was also flooded by the 2013 tidal flooding event.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Silo, College Street**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The site is 100% classified as danger to all. Due to proximity to River Orwell, safe access may not be achievable, depending on the location of the breach. Onset of flooding in the event of a breach could be within 1 hour (Appendix D).

**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 medium risk.

**Site Name: Silo, College Street**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**


**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.
Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*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 a Main River.

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4-5.3mm AOD in Compartment H (Table 7-1), whichever is greater.

**Site Name: Silo, College Street**

*Access / Egress*

Access to the site may be from College Street on Star Lane. The routes that pass northwards are within Flood Zone 1 and therefore lead out of the tidal floodplain. However, the distance to Flood Zone 1 and the location of the site in close proximity to flood defences may mean that dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

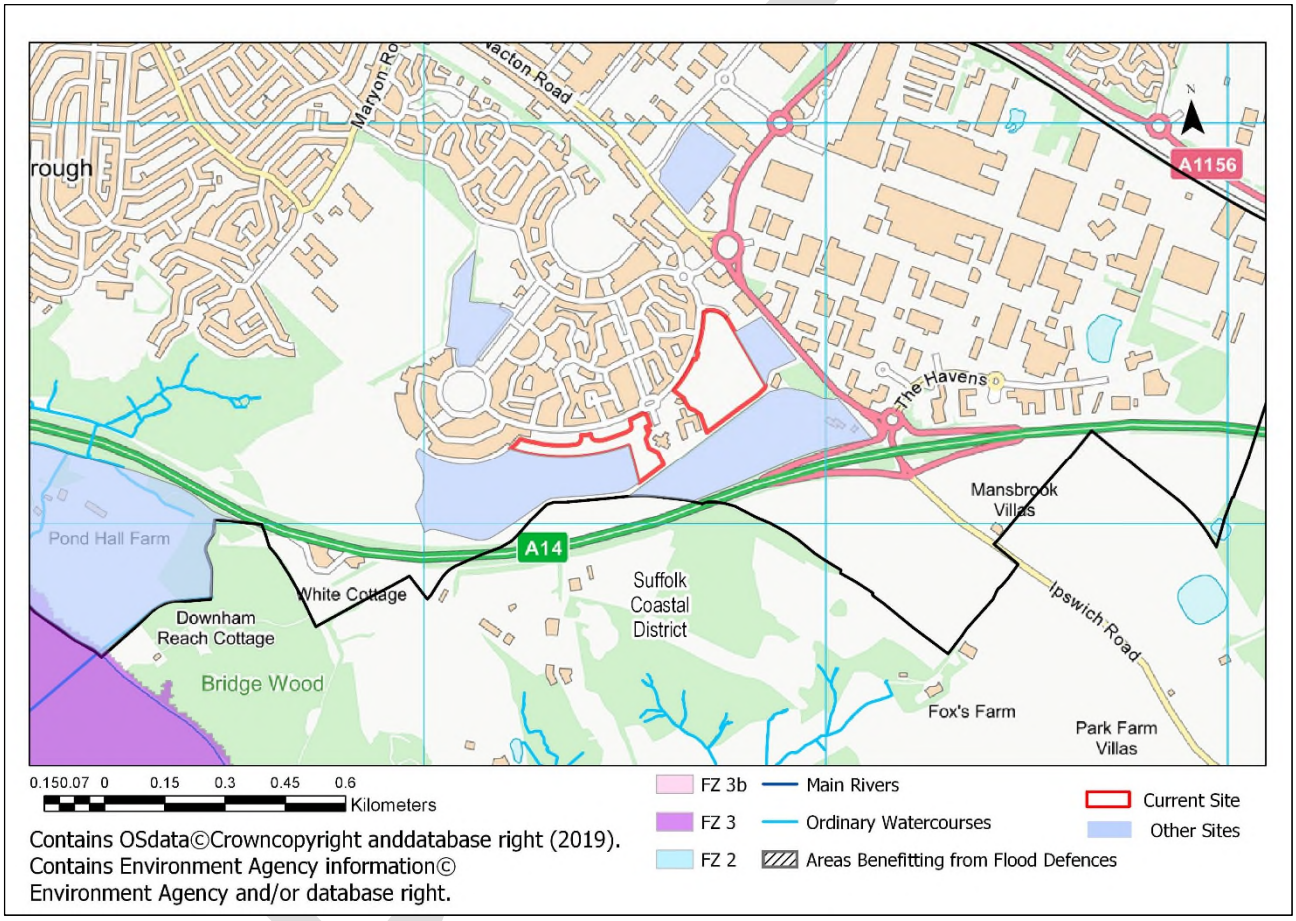
| Site Name: Ravenswood | | | | | |
|---|---|---|---|---|---|
| **Site ID:** | IP150d<br>IP150e | **Location:** | Ravenswood | **Area (ha):** | Site IP150d – 1.73<br>Site IP150e – 3.61 |
| **Current Use:** | Commercial | **Proposed Use:** | Residential | **Vulnerability Classification:** | More Vulnerable |

| Tidal/Fluvial Source: | | | | |
|---|---|---|---|---|
| **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% |

## Flood Zones and Flood Defences

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

**Map 1 – Environment Agency Flood Map for Planning Data**




## Residual Flood Risk

The site is located in Flood Zone 1, there is no residual risk from fluvial or tidal sources, therefore a hazard map has not been included.

## Surface Water Flood Risk

### Risk of Flooding from Surface Water (RoFSW)

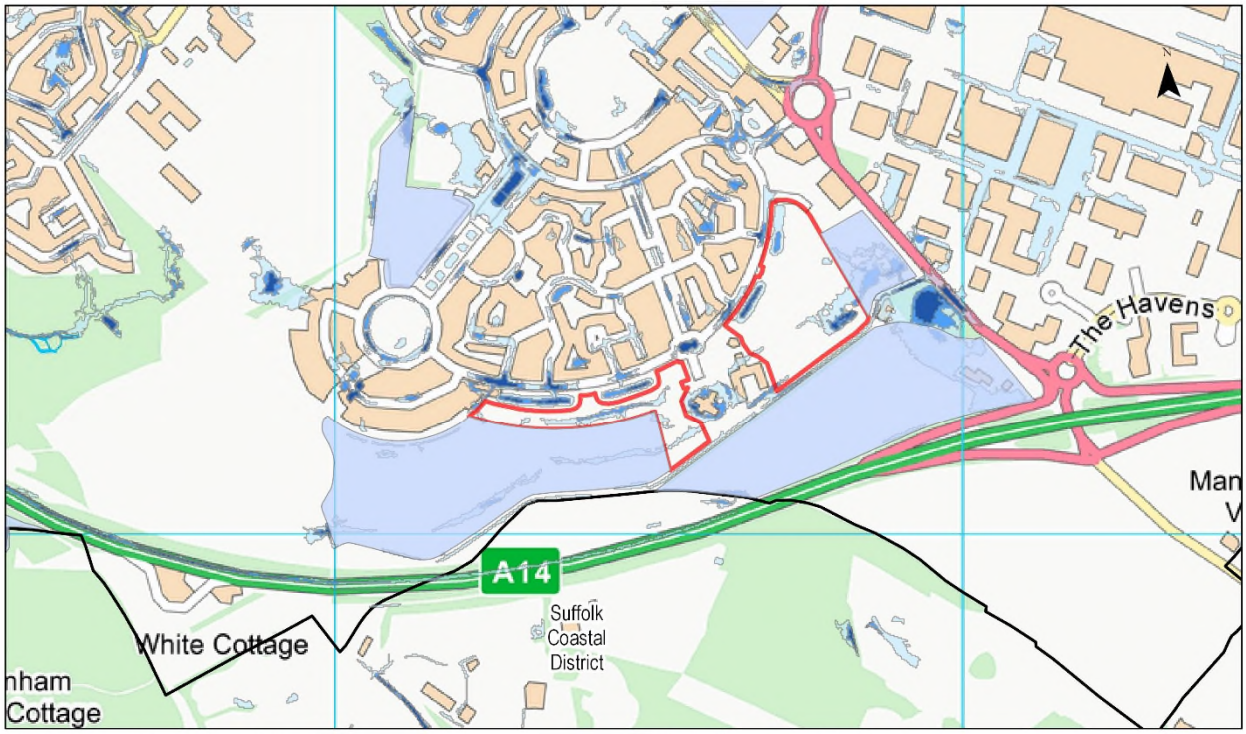
The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding.

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.

### Geology

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

**Site Name: Ravenswood**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) shows that the site is located within a 1km square not considered to be at risk of groundwater flooding.

**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).

Due to the level of flood risk posed to the site, there are no further site specific requirements.

| Site Name: | Site IP184a – Urban Edge of Ipswich Humber Doucy Lane<br>Site IP184b – Land adjacent to Humber Doucy Lane (part Option F)<br>Site IP184c – Urban Edge of Ipswich Humber Doucy Lane | | | | |
|---|---|---|---|---|---|
| **Site ID:** | IP184a<br>IP184b<br>IP184c | **Location:** | **Site IP184a** - Urban Edge of Ipswich - Kesgrave Covenant Ltd<br>**Site IP184b** - Land adjacent to Humber Doucy Lane (part Option F)<br>**Site IP184c-** Urban Edge of Ipswich - Kesgrave Covenant Ltd | **Area (ha):** | Site IP184a – 10.15<br>Site IP184b – 0.84<br>Site IP184c – 4.01 |
| **Current Use:** | Commercial | **Proposed Use:** | Residential | **Vulnerability Classification:** | More Vulnerable |

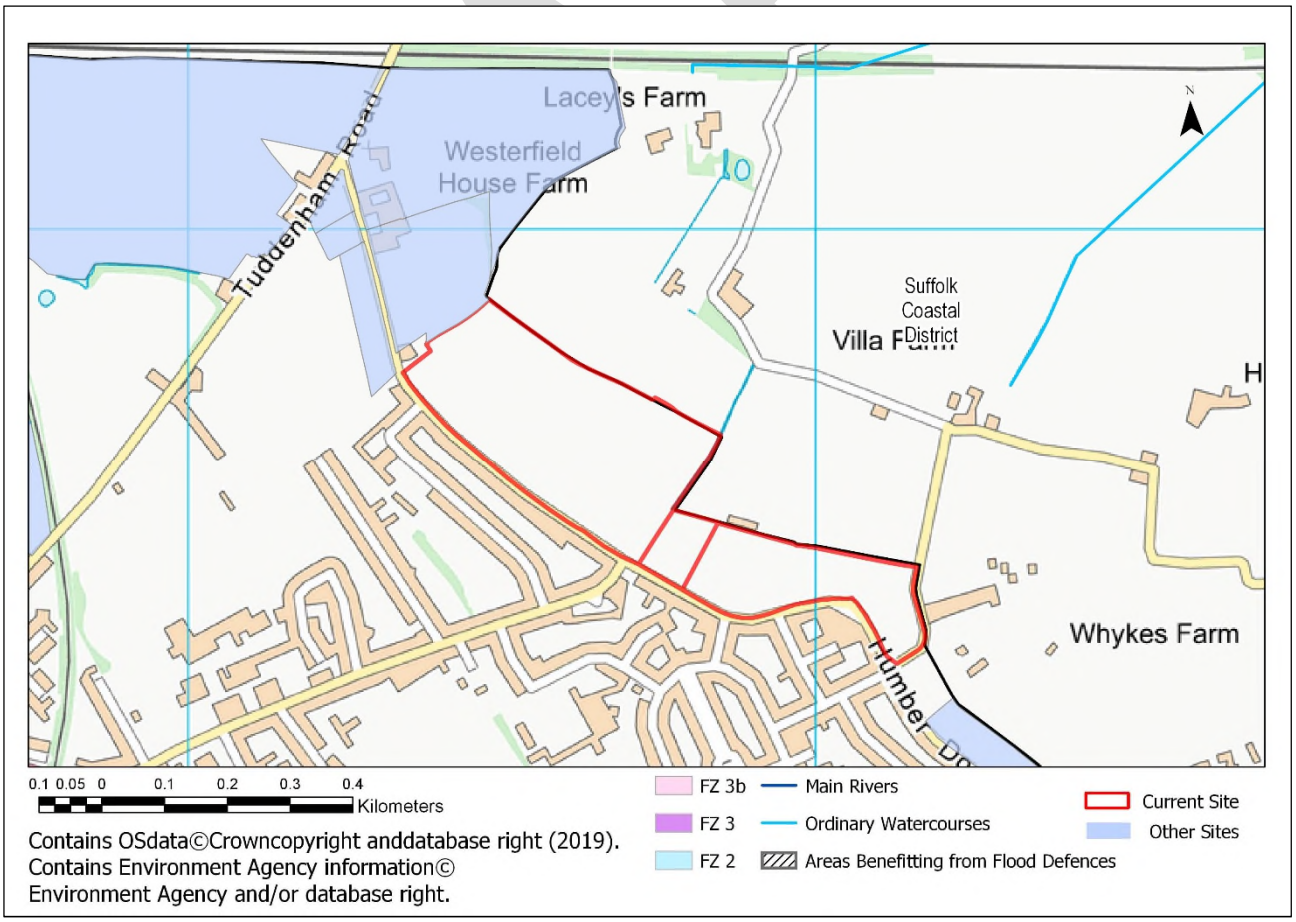
**Tidal/Fluvial Source:**

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

**Flood Zones and Flood Defences**

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.

**Map 1 – Environment Agency Flood Map for Planning Data**




**Residual Flood Risk – Flood Hazard**

As noted above, the sites are located within 100% Flood Zone 1. There is therefore no residual flood risk, or flood hazard associated with fluvial or tidal sources at the sites.

| Site Name: | Site IP184a – Urban Edge of Ipswich Humber Doucy Lane<br>Site IP184b – Land adjacent to Humber Doucy Lane (part Option F)<br>Site IP184c – Urban Edge of Ipswich Humber Doucy Lane |
|---|---|

**Surface Water Source**

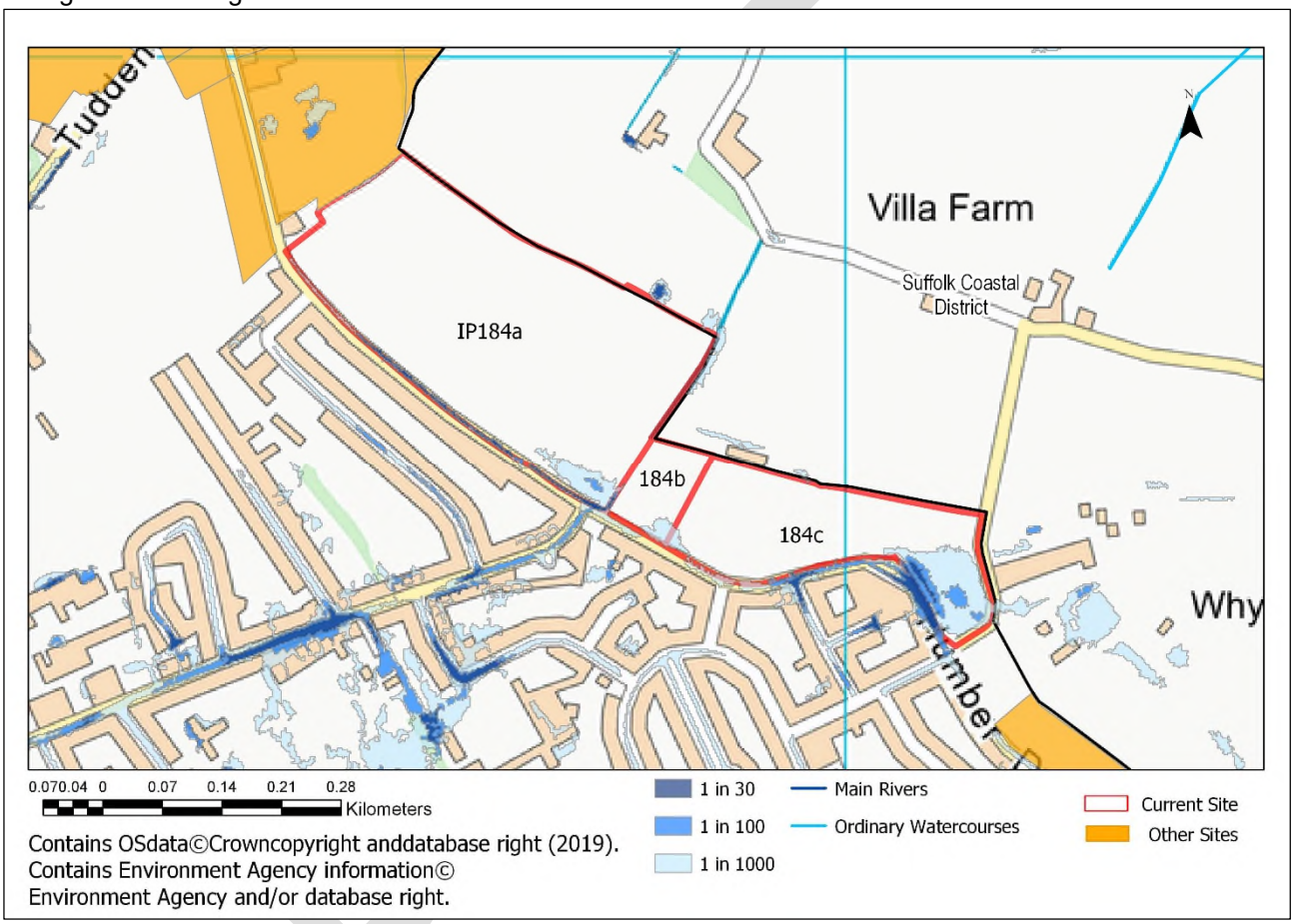
**Risk of Flooding from Surface Water (RoFSW)**

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

**Geology**

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.

The underling geology in at Site IP184b and IP184c is the Thames Group. Infiltration be further investigated during a site investigation.




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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.

**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

| Site Name: | Site IP184a – Urban Edge of Ipswich Humber Doucy Lane<br>Site IP184b – Land adjacent to Humber Doucy Lane (part Option F)<br>Site IP184c – Urban Edge of Ipswich Humber Doucy Lane |
|---|---|
| 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: **Helena Road** | | | | | |
|---|---|---|---|---|---|
| **Site ID:** | IP226 | **Location:** | Helena Road | **Area (ha):** | 1.85 |
| **Current Use:** | Commercial | **Proposed Use:** | Residential | **Vulnerability Classification:** | More Vulnerable |
| **Tidal/Fluvial Source:** | | | | | |
| **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% | |

### Flood Zones and Flood Defences

The tidal River Orwell is located approximately 20m to the west of the site. 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 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.

Refer to Map 1 below for Flood Zone outlines

### Functional Floodplain

The site is located adjacent to, but not within, the functional floodplain.

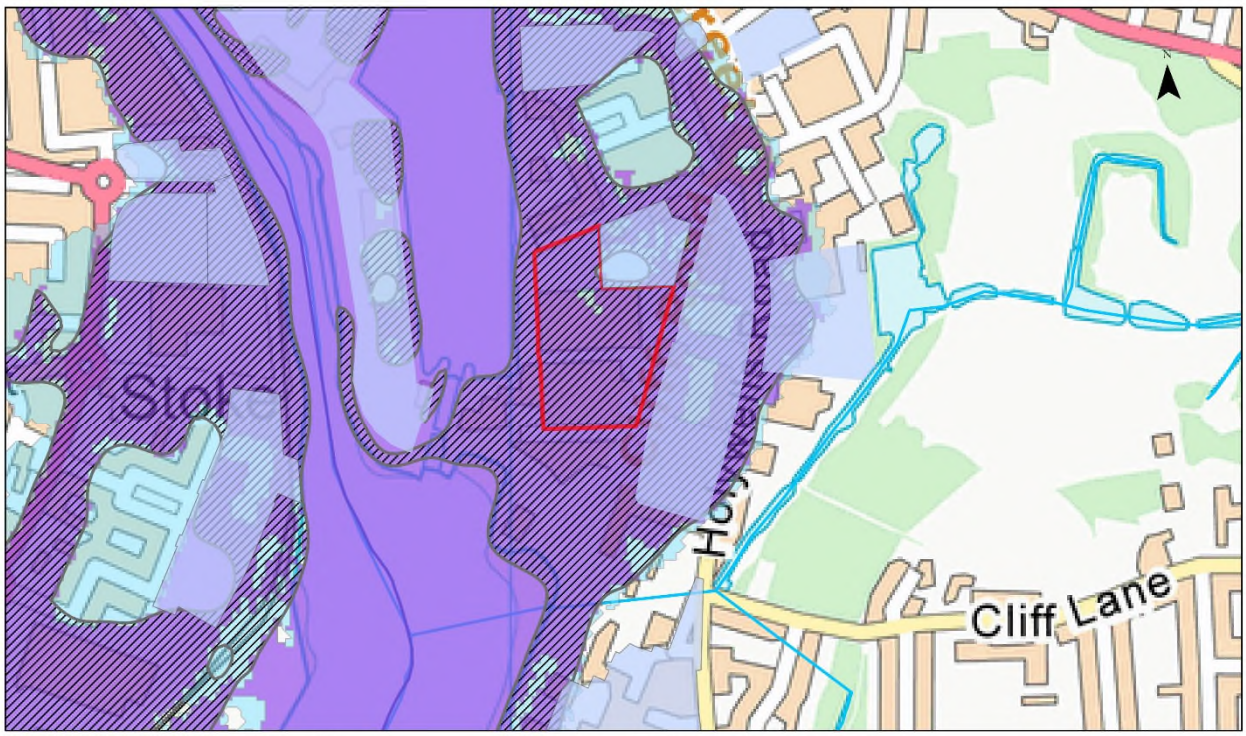
### Climate Change

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. (These modelled scenarios take account of the presence of defences).

### Historic Records

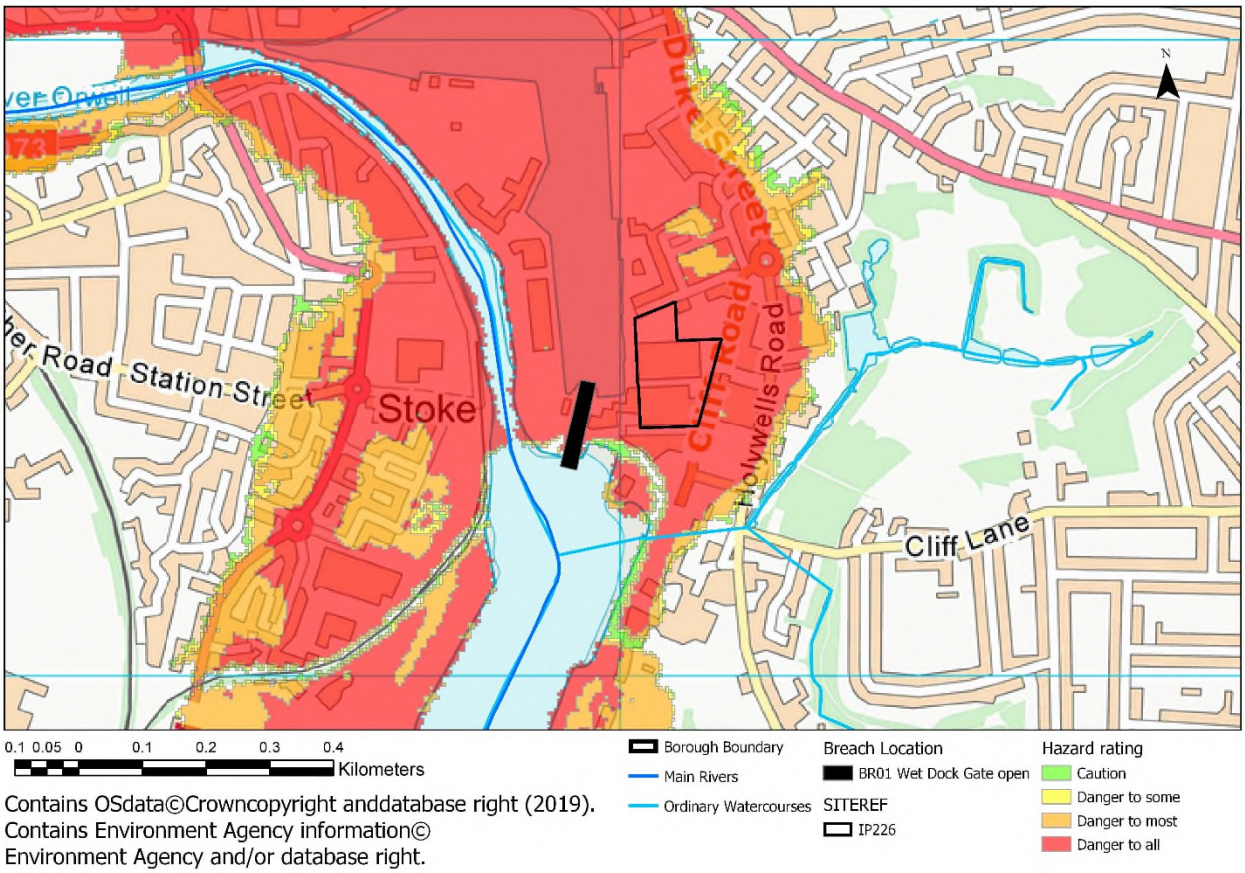
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of road and pavement flooding near to this location on Holywells Road.

### Map 1 – Environment Agency Flood Map for Planning Data



**Site Name: Helena Road**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

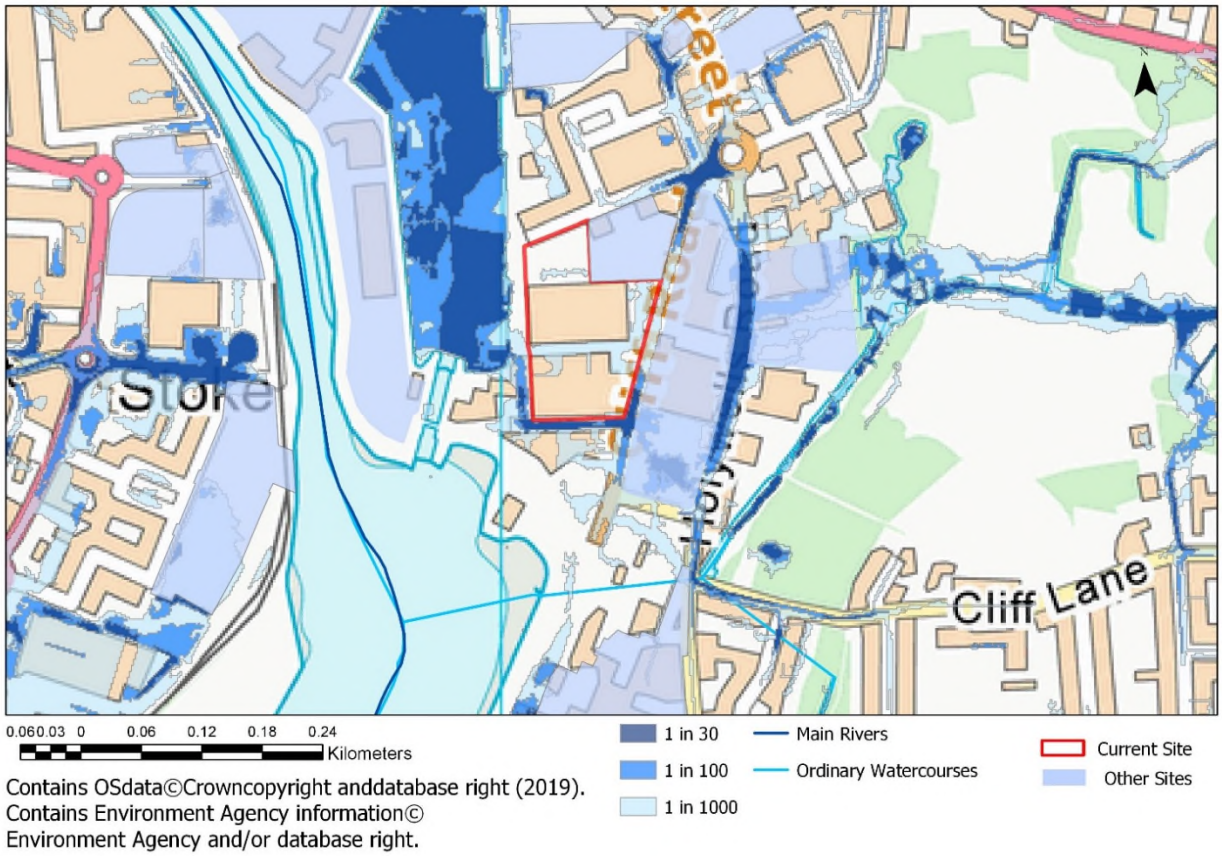
The site is shown to experience a hazard rating of danger to all affecting 100% of the site. The site is entirely within the defended floodplain with limited opportunities for safe access in the event of a breach. Due to the site location, consideration of rate of onset of flooding should be included in a site assessment. Safe refuge should be provided above 5.3m AOD.

**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

**Site Name: Helena Road**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (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 4) shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 5.3m AOD (Table 7-1), whichever is greater

**Site Name: Helena Road**

*Access / Egress*

Access to the site may be from Cliff Road toward Mytle Road roundabout. The routes that pass north-east are within Flood Zone 1 and therefore lead out of the tidal floodplain.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change (>5.3m AOD).

Due to the site location, rate of onset should be a consideration at the planning stage.

*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.

| 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 |

| Tidal/Fluvial Source: | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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. 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.

Refer to Map 1 below for Flood Zone outlines

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

**Climate Change**

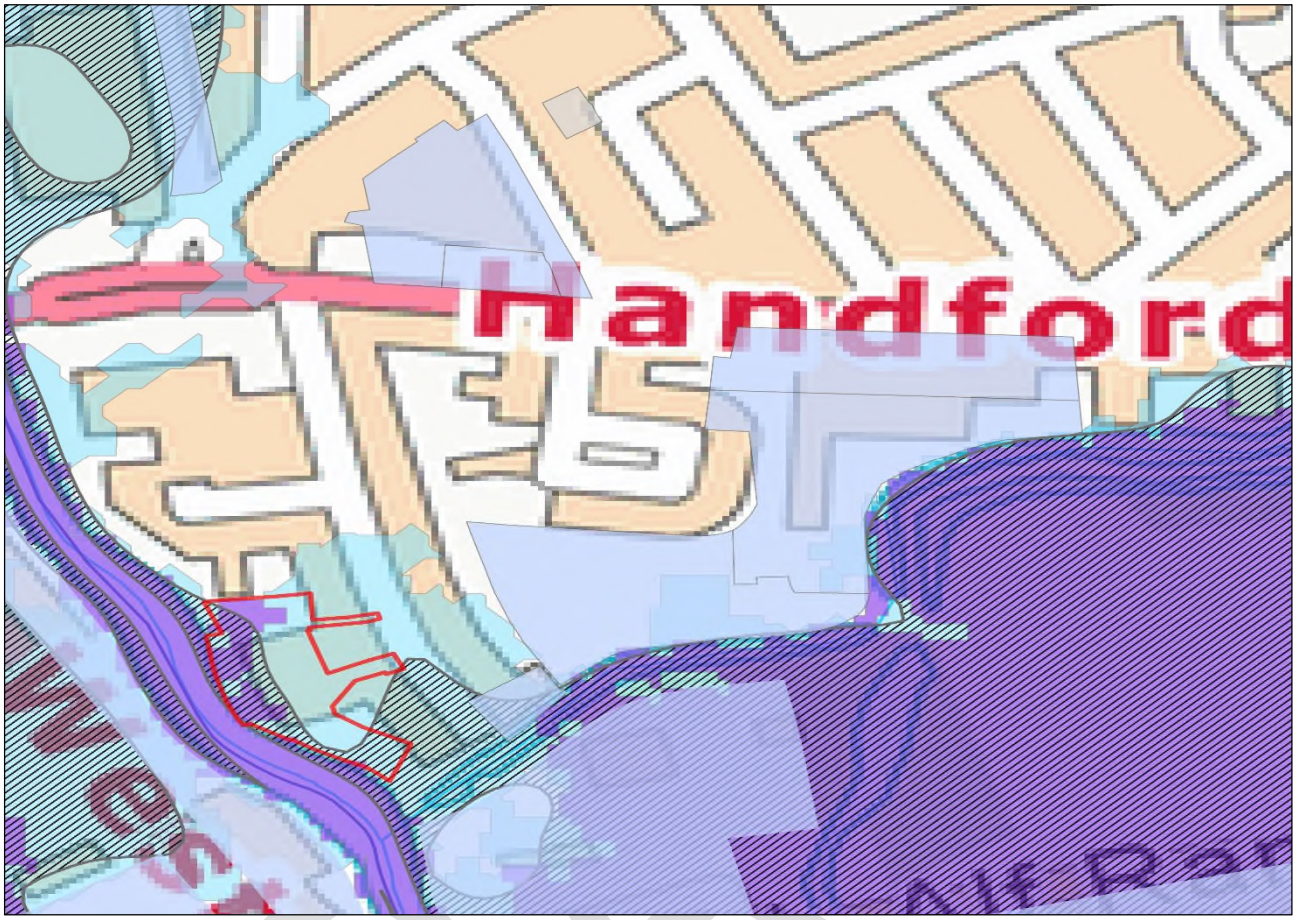
Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. Modelling of the River Orwell shows that water remains in bank in this location during the 0.5% AEP event including an allowance for climate change. (These modelled scenarios take account of the presence of defences).

**Historic Records**

The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1939.

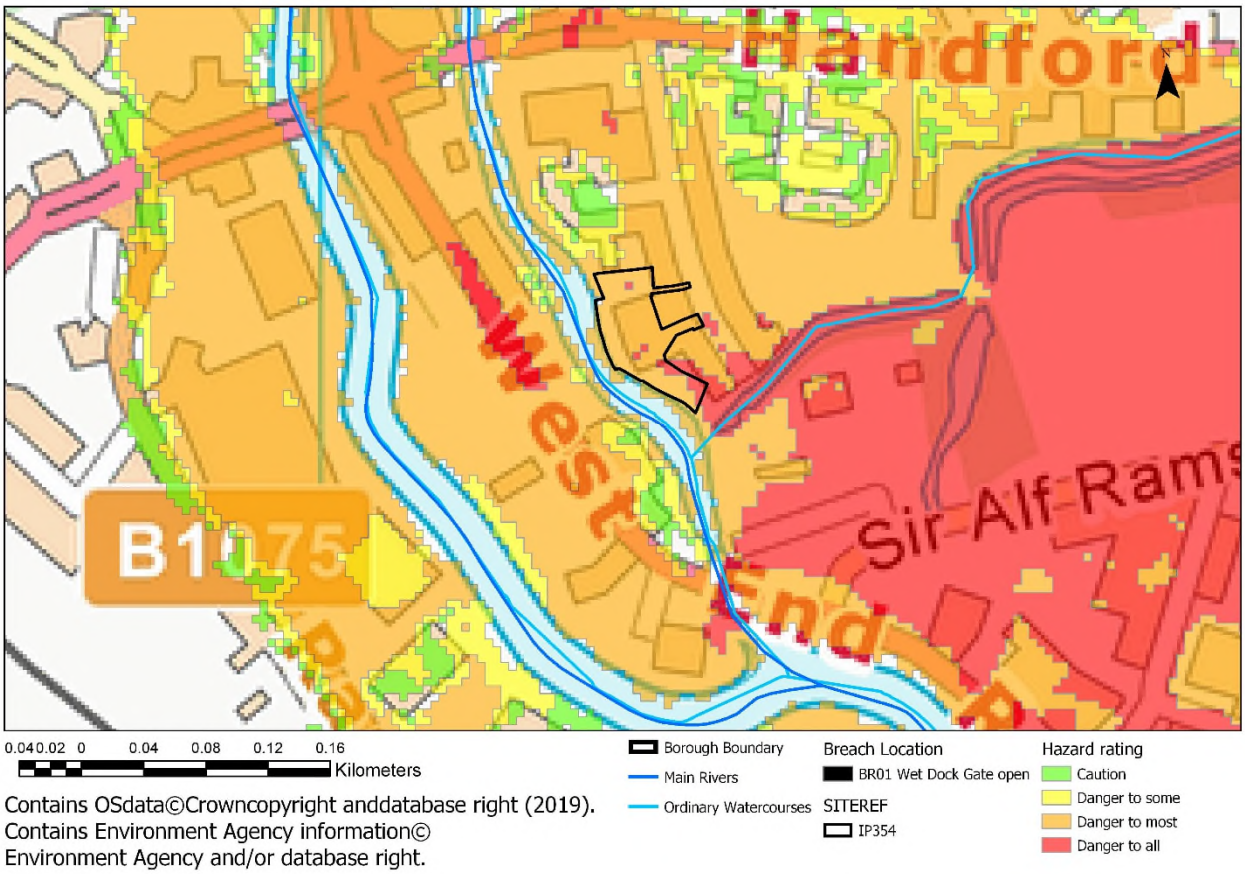
**Site Name: 72 (Old Boatyard) Cullingham Road IP1 2EG**

**Map 1 – Environment Agency Flood Map for Planning Data**



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

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The majority of the site classified as danger to most.

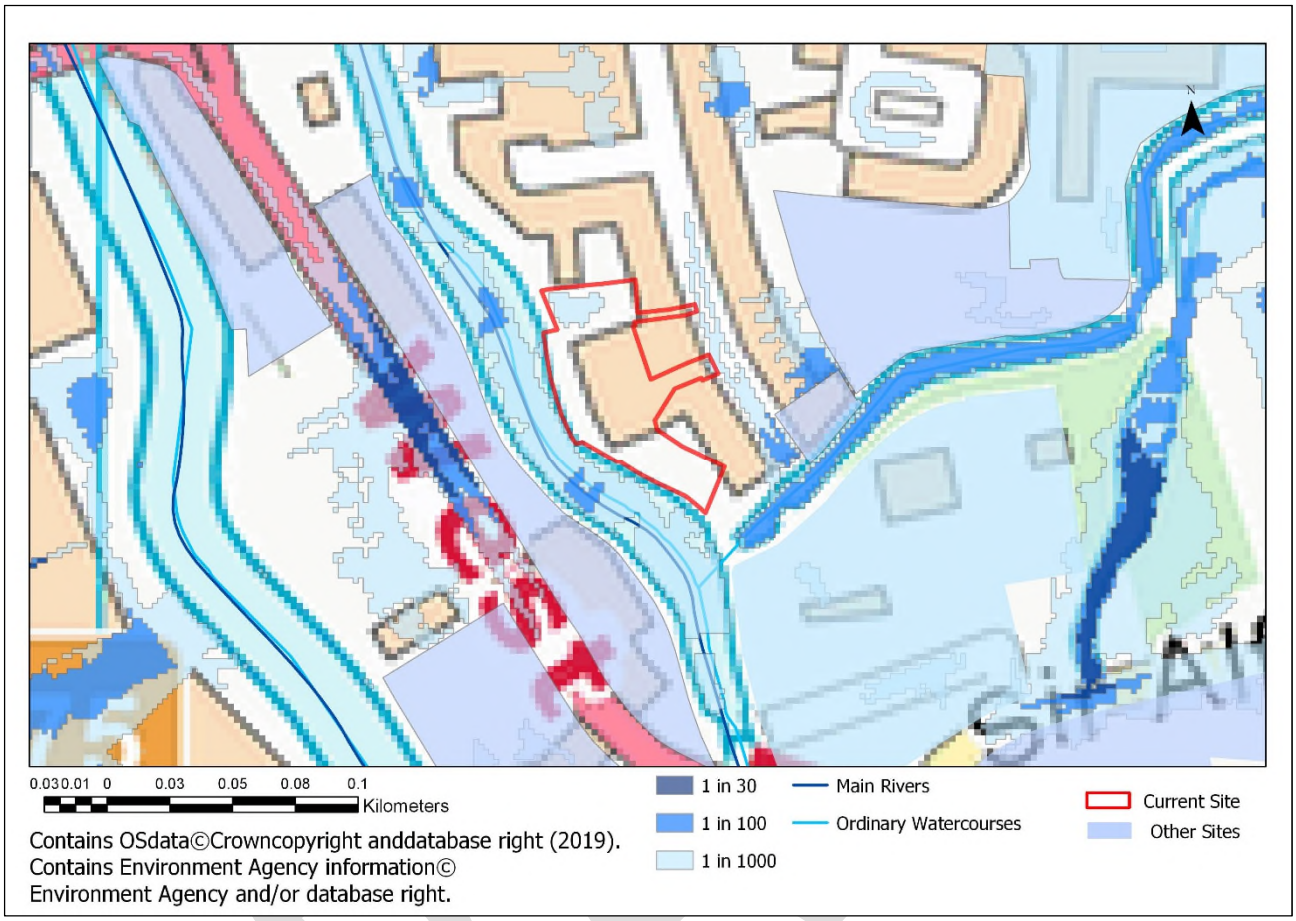
**Surface Water Source**

**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.

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

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*Set-back Distance*

All development should be set back 16m from the edge of the River Gipping / Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a Main River.

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event

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

including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment J (Table 7-1), whichever is greater.

*Access / Egress*

Access to the site may be from Cullingham Road to Handford Road.The routes that pass northwards are within Flood Zone 1 and therefore lead out of the tidal floodplain.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

| 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 |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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 site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences.

*Refer to map 1 below for an illustration of the extent of flood zones local to the site.*

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

**Climate Change**

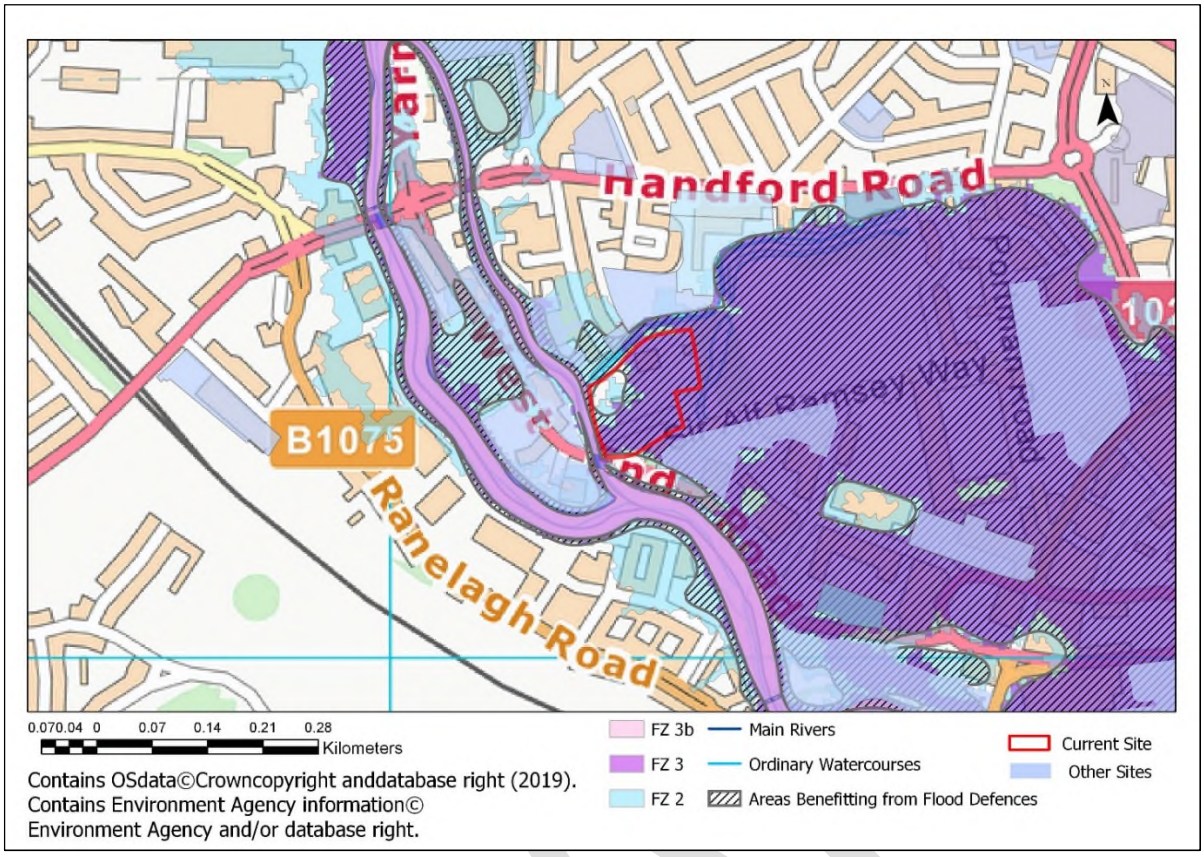
Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. Modelling of the River Orwell shows that water remains in bank in this location during the 0.5% AEP event including an allowance for climate change. (These modelled scenarios take account of the presence of defences).

**Historic Records**

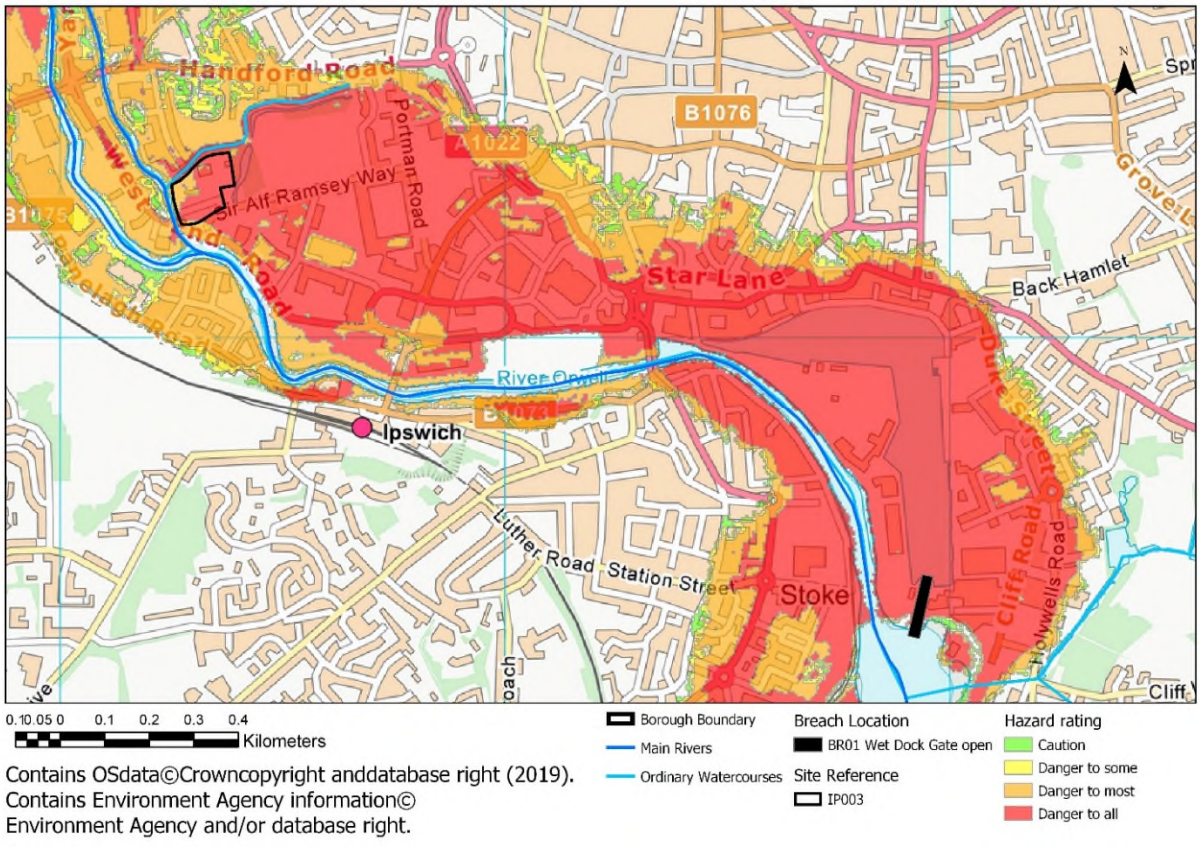
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents in this location associated with surface water and highway flooding.

**Site Name: Waste tip north of Sir Alf Ramsey Way**

**Map 1 – Environment Agency Flood Map for Planning Data**




**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**



**Site Name: Waste tip north of Sir Alf Ramsey Way**

**Residual Flood Risk**

The site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of defences.

Hazard mapping illustrated in Map 2 shows ratings with the Wet Dock gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

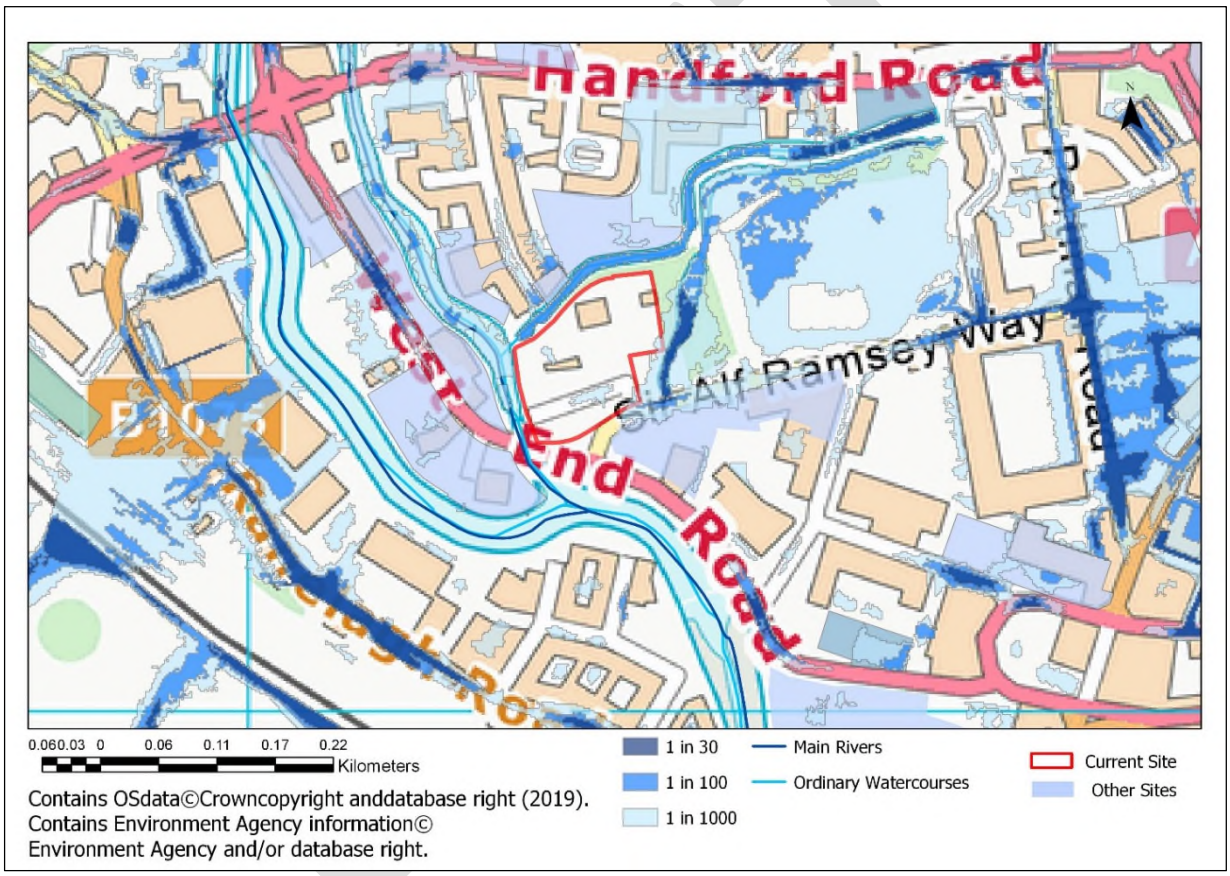
In this scenario the site hazard is Danger to most or higher. Due to proximity to River Orwell, safe access may not be achievable.

Safe refuge should be provided set above maximum water level 4m AOD in Compartment J (Table 7-1).

**Surface Water Flood risk**

The RoFSW mapping (map 3) 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.

**Map 3 – Environment Agency RoFSW mapping**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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 underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Site Name: Waste tip north of Sir Alf Ramsey Way**

**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**

*Set-back Distance*

This location will require an environmental permit from the Environment Agency as it will include ' activity within 8 metres of the bank of a main river, or 16 metres of a tidal main river'. Consideration of set back distances to enable access to maintain flood defences will be required. (refer to .gov.uk Flood Risk Activities: Environmental Permits for further detail)[1] 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.

*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).

*Finished Floor Levels*

The design flood event for setting finished floor levels in areas at risk of fluvial flooding is the 1% AEP including an allowance for climate change. In areas at risk of tidal flooding, the design flood is the 0.5% AEP event including an allowance for climate change. A freeboard is used to account for residual uncertainty within design, with an extra 300mm added to finished floor level above the design flood level to account for any uncertainty in flood levels as a safety factor.

*Access / Egress*

The main access to the site is from Sir Alf Ramsey Way which is also shown to be at residual risk of flooding from the River Gipping and Orwell. The egress route away from the site is likely to be east along Sir Alf Ramsey Way on to Portman Road and then north to the A1071 Handford Road which is in Flood Zone 1.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the site may not be possible. Consideration of raising access roads to enable access/egress. It will also be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

*Flood Risk Assessment*

The site is located within an area of residual risk. At the site level a flood risk assessment should obtain breach modelling data from the Environment Agency and interpret flood depth and velocity along with hazard to inform site layout and design through the planning process.



[1] https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

| 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 |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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 rise of the A137 West End Road. There are further watercourses to the north of the site. At this location the River Gipping / Orwell is tidally influenced.

Nearly 100% of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences,. However, 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.

***Refer to map 1 below for an illustration of the extent of flood zones local to the site.***

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

**Climate Change**

Modelling of the River Gipping shows that fluvial flood water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. Upon receipt of updated climate change flood outlines for the River Gipping, this flood risk will be reviewed.

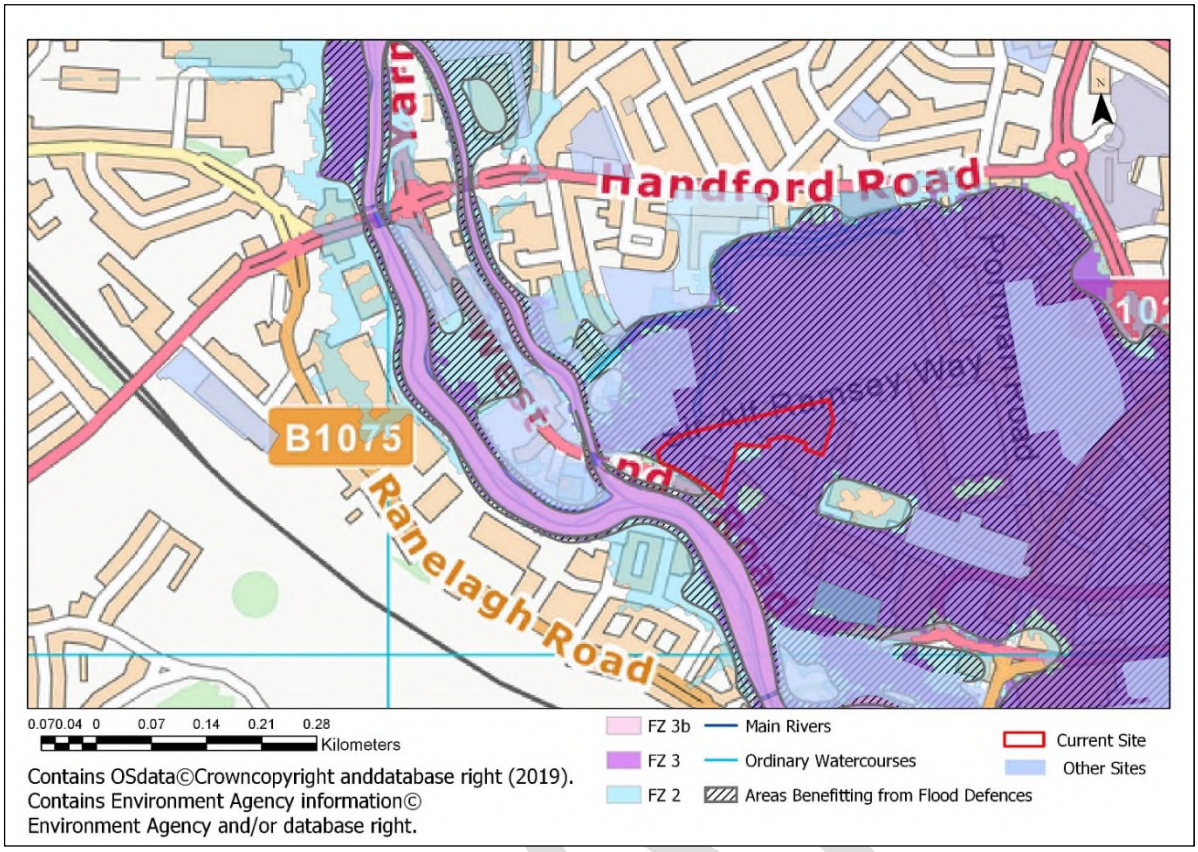
Modelling of the River Orwell shows that tidal flood water remains in bank in this location during the 0.5% AEP event including an allowance for climate change i.e. overtopping of flood defences does not occur (modelled scenarios take account of the presence of defences).

**Historic Records**

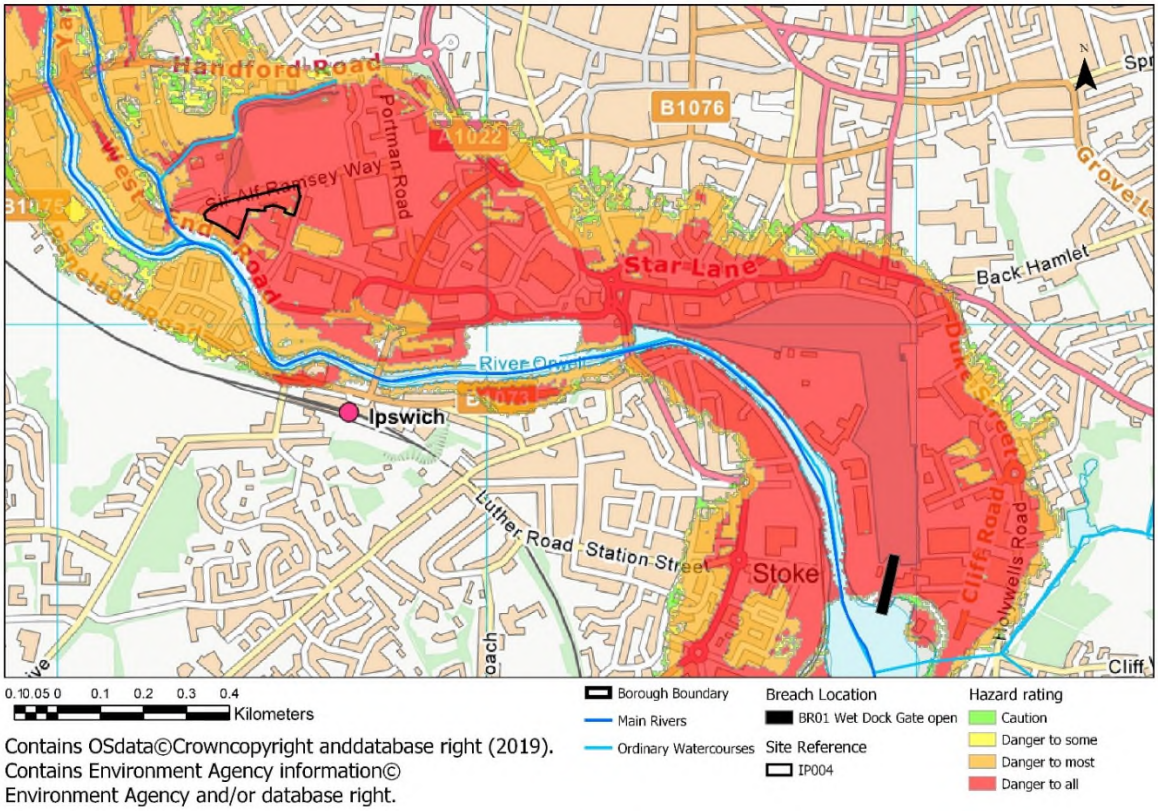
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents affecting the roads and pavements in this location.

**Site Name: Bus Depot, Sir Alf Ramsey Way**

**Map 1 – Environment Agency Flood Map for Planning Data**




**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**



**Site Name: Bus Depot, Sir Alf Ramsey Way**

**Residual Flood Risk**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences. In order to better understand the level of residual flood risk both within the site boundary and between SHELAA sites, reference to hazard mapping is required.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

In this scenario the site is classified as 100% Danger to all. Due to proximity to River Orwell, safe access may not be achievable.

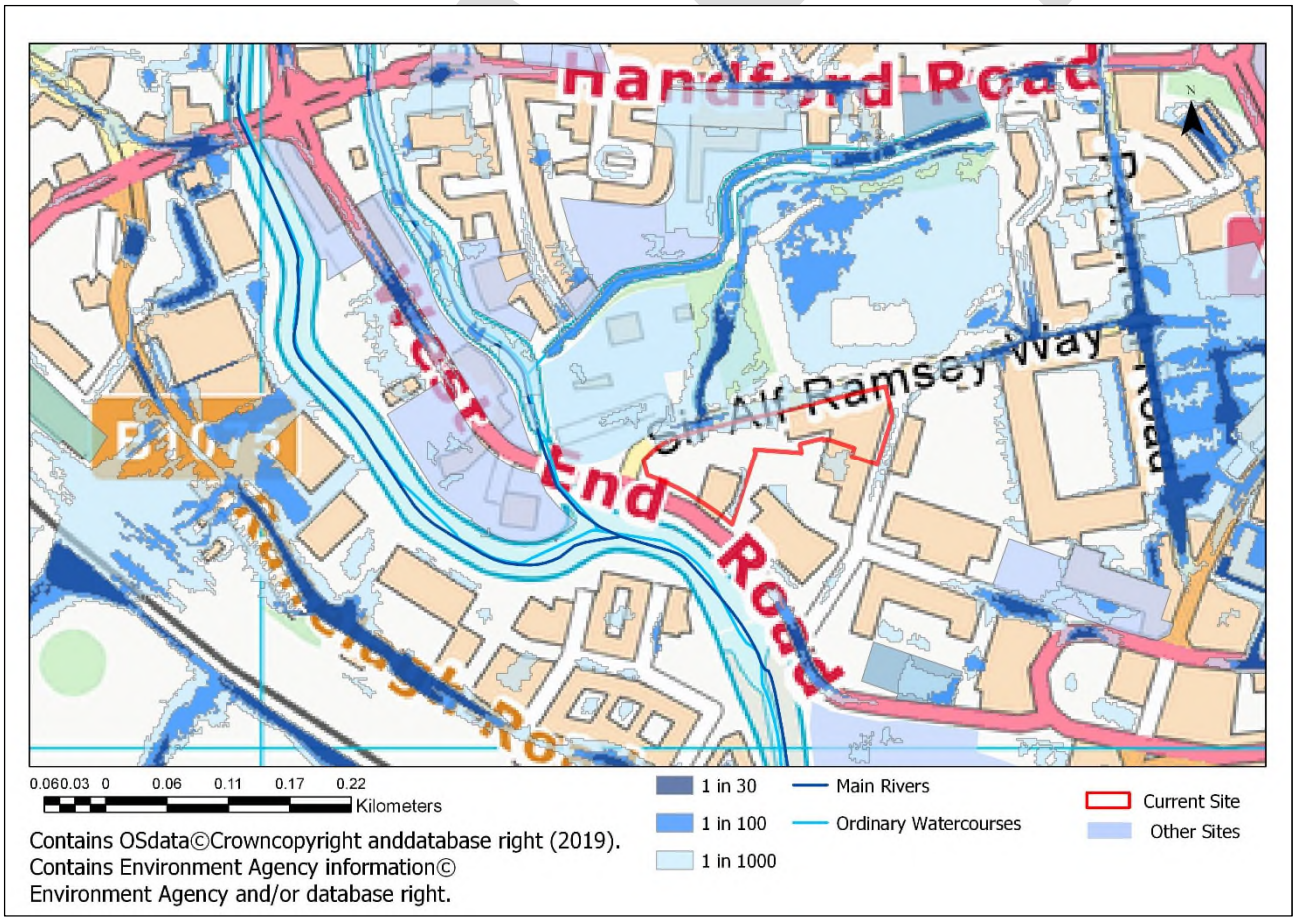
Safe refuge should be provided, set above the 0.1% AEP water level of 4m AOD in Compartment J (Table 7-1).

**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

The RoFSW mapping (map 3) 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.

**Map 3 - Environment Agency RoFSW mapping**




**Groundwater Flood Risk**

The AStGWF mapping (Level 1 SFRA Figure 4) 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.
Local geology indicates that the site is likely to be underlaid by fill, with chalk unlikely to be close to the surface.

**Site Name: Bus Depot, Sir Alf Ramsey Way**

The underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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**

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the design flood is the 0.5% AEP event including an allowance for climate change. A freeboard is used to account for residual uncertainty within design, with an extra 300mm added to finished floor level above the design flood level to account for any uncertainty in flood levels as a safety factor.

*Access / Egress*

The main access to the site is from Portman's Walk / Sir Alf Ramsey Way which is also shown to be at residual risk of flooding from the River Gipping and Orwell. The egress route away from the site is likely to east along Sir Alf Ramsey Way on to Portman Road and then north to the A1071 Handford Road which is in Flood Zone 1.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

Note: Site 004 has a piped watercourse crossing the site which must not be built over.

*Flood Risk Assessment*

The site is located within an area of residual risk. At the site level a flood risk assessment should obtain breach modelling data from the Environment Agency and interpret flood depth and velocity along with hazard to inform site layout and design through the planning process.

| 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 |

| Tidal and Fluvial Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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 site is therefore at *residual risk of tidal flooding, in* the event of a failure of these defences.

Refer to Map 1 below for Flood Zone outlines

**Climate Change**

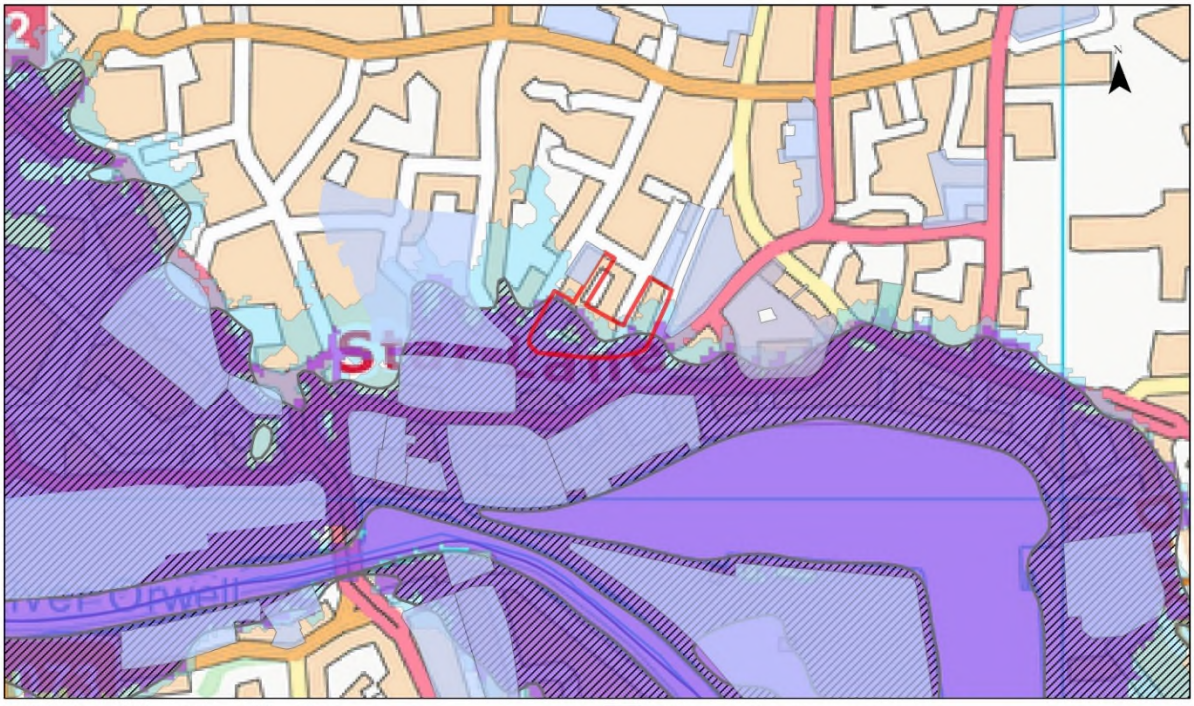
Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. Upon receipt of updated climate change flood extents for the River Gipping (expected early 2020) the site will be reviewed.

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

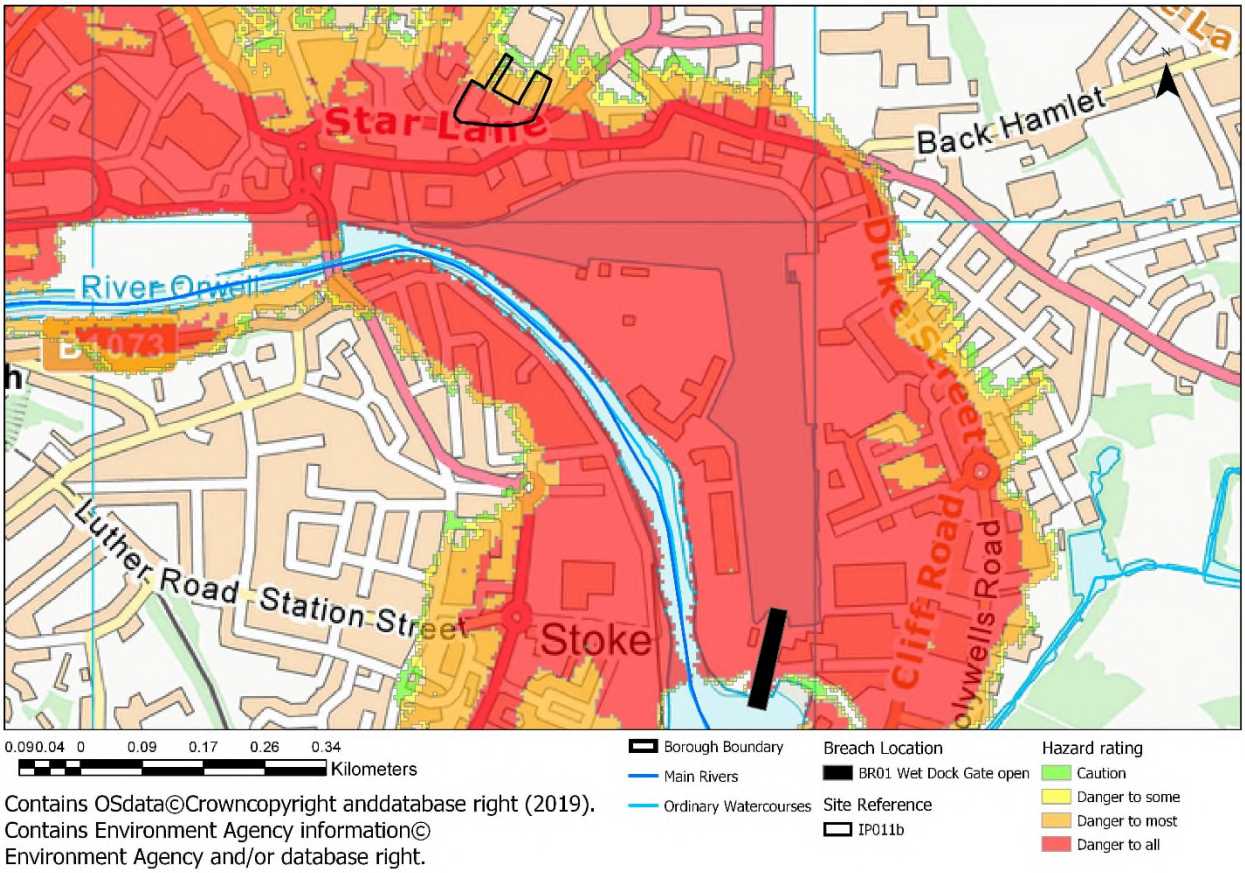
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents in this location associated with surface water flooding on the highway.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Smart Street/Foundation Street**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations

Site is located on the edge of Flood Zone 3 with hazard rating reducing from danger to all to danger to most as you travel nort east across the site. Safe access achievable along Foundation Street and north.

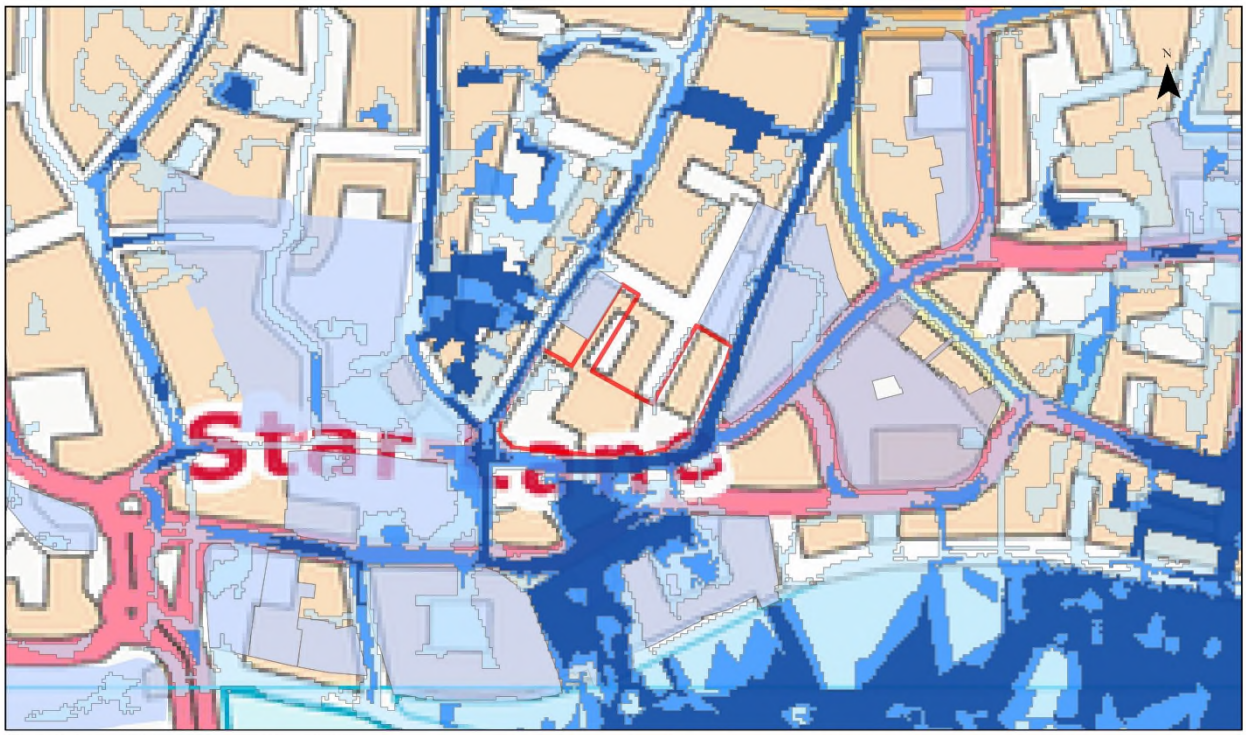
**Surface Water Flood Risk**

**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.

**Site Name: Smart Street/Foundation Street**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment H (Table 7-1), whichever is greater.

**Site Name: Smart Street/Foundation Street**

*Access / Egress*

Safe access may be achievable along Foundation Street, Smart Street, Lower Orwell Street or Star Lane (A1022) to the north. The routes that pass northwards are within Flood Zone 1 and therefore lead out of the tidal floodplain. However, due to the proximity of the site to the flood defences, it will be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

| 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 Classification** | More Vulnerable |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

As it flows through Ipswich, the River Gipping becomes the River Orwell. The watercourse flows east through Ipswich approximately 100m to the south of the site on the opposite side of the railway line. At this location the watercourse is tidally influenced. Half 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.

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

**Climate Change**

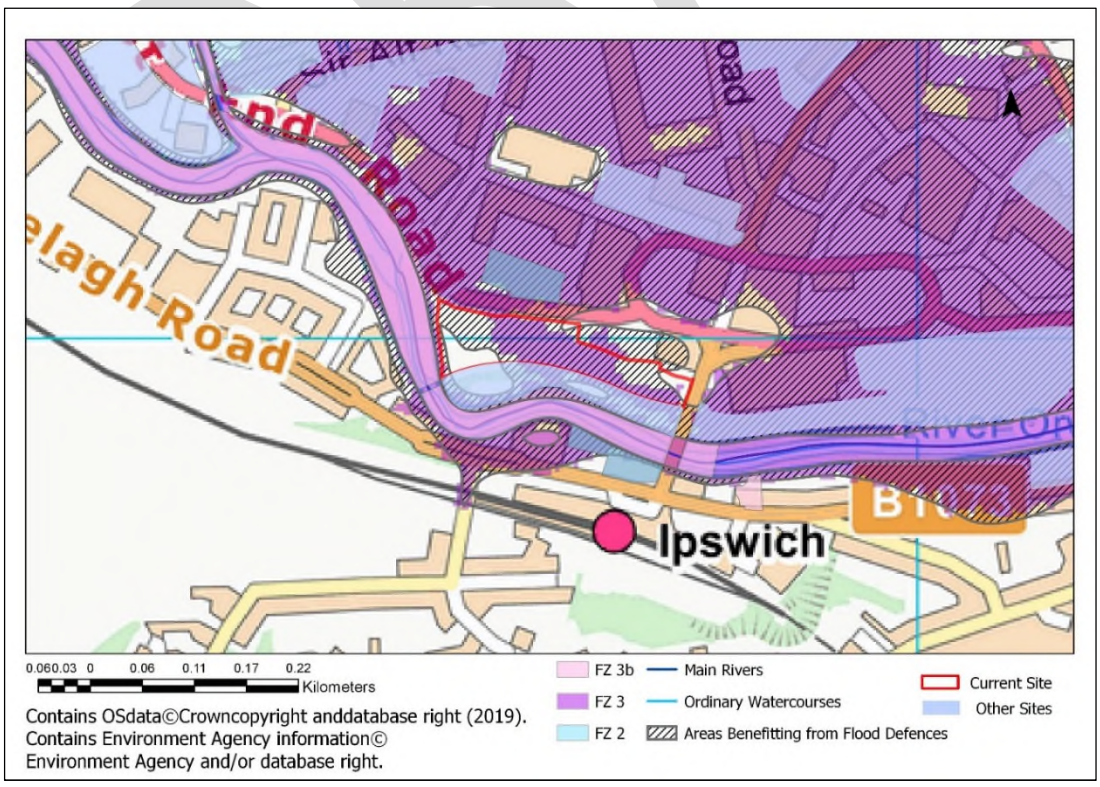
Modelling of the River Gipping shows that water remains in bank in this location during the 1% AEP event including a 20% allowance for climate change. Upon receipt of updated climate change flood outlines for the River Gipping, this flood risk will be reviewed.

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. overtopping of flood defences does not occur. (These modelled scenarios take account of the presence of defences).

**Historic Records**

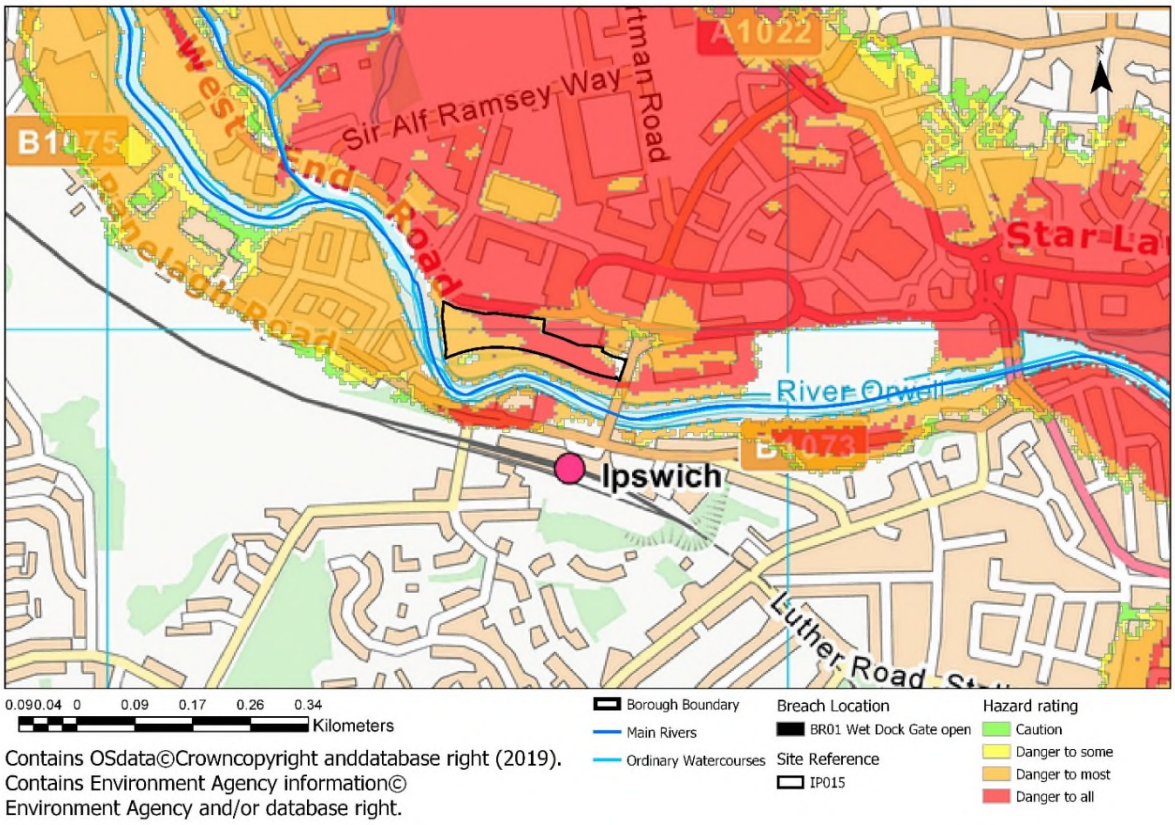
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of road and pavement flooding in this location.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: West End Road Surface Car Park**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

In this scenario the site falls into two categories, danger to most and danger to all, with hazard rating increasing as you move to the east across the site.

The site is entirely within the defended floodplain with limited opportunities for safe access in the event of a breach. Safe refuge should be provided, set above the 0.1% AEP water level of 4m AOD in Compartment J (Table 7-1).

Finished floor level for habitable rooms should be set above 4m AOD (Table 7-1).

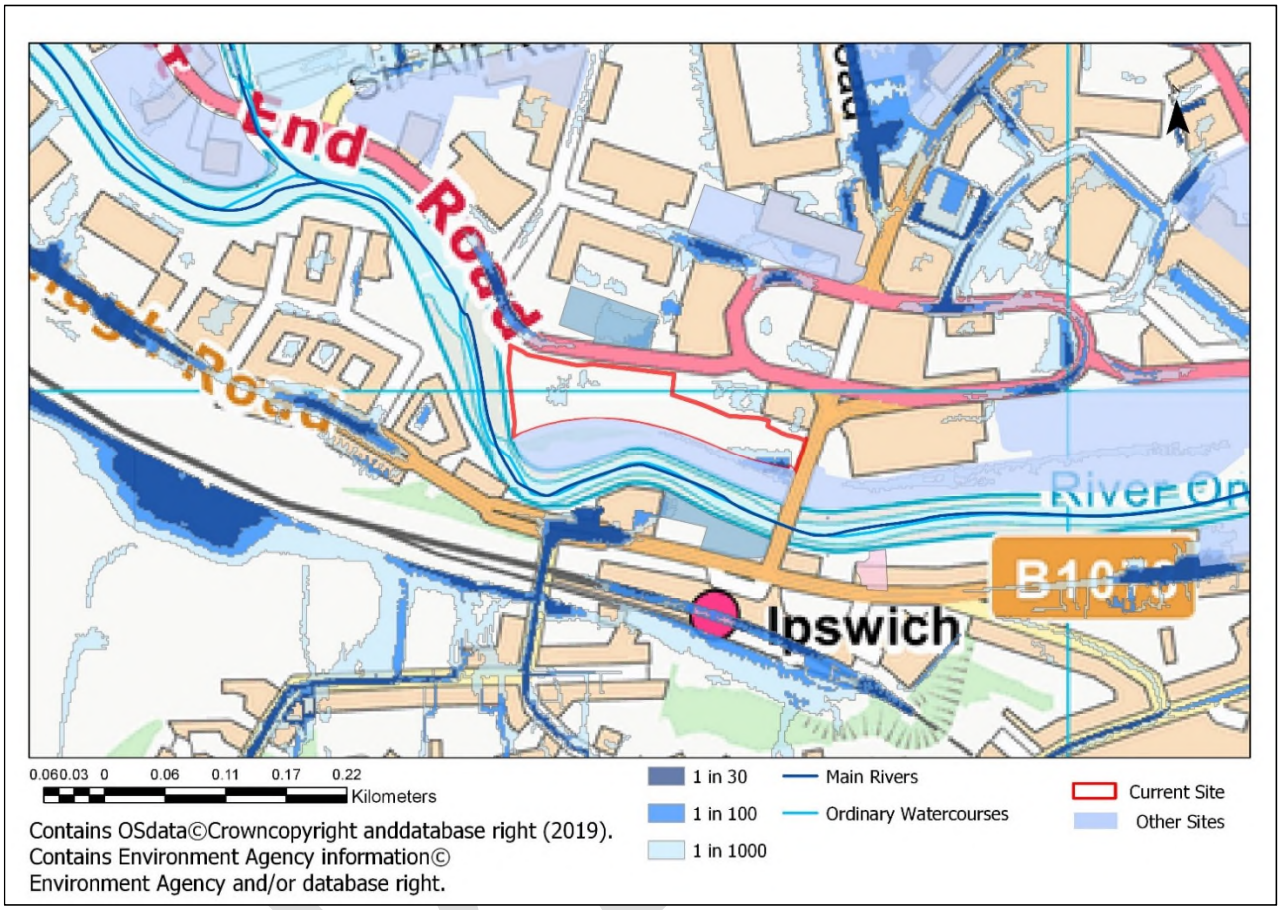
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

The RoFSW mapping (map 3) 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.

**Site Name: West End Road Surface Car Park**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.

The underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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**

*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).

Consideration of Anglian Water surface water sewers which cross this site needs to be included in site level assessments. These should not be built over and may require diversion.

**Site Name: West End Road Surface Car Park**

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment J (Table 7-1), whichever is greater.

*Access / Egress*

The site is entirely within the defended floodplain with limited opportunities for safe access in the event of a breach. The main access to the site is from West End Road which is also shown to be at residual risk of flooding from the River Orwell. The egress route away from the site is likely to the north towards Portman Road or A1022 Civic Drive and into an area of Flood Zone 1. The site is closer to an area of Flood Zone 1 to the south of the River Orwell; however, this would involve crossing the River Orwell which may not be feasible during flood conditions.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood level including an allowance for climate change.

*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.

*Flood Risk Assessment*

The site is located within an area of residual risk classified as danger to all. At the site level a flood risk assessment should obtain breach modelling data from the Environment Agency and interpret flood depth and velocity along with hazard to inform site layout and design through the planning process.

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

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

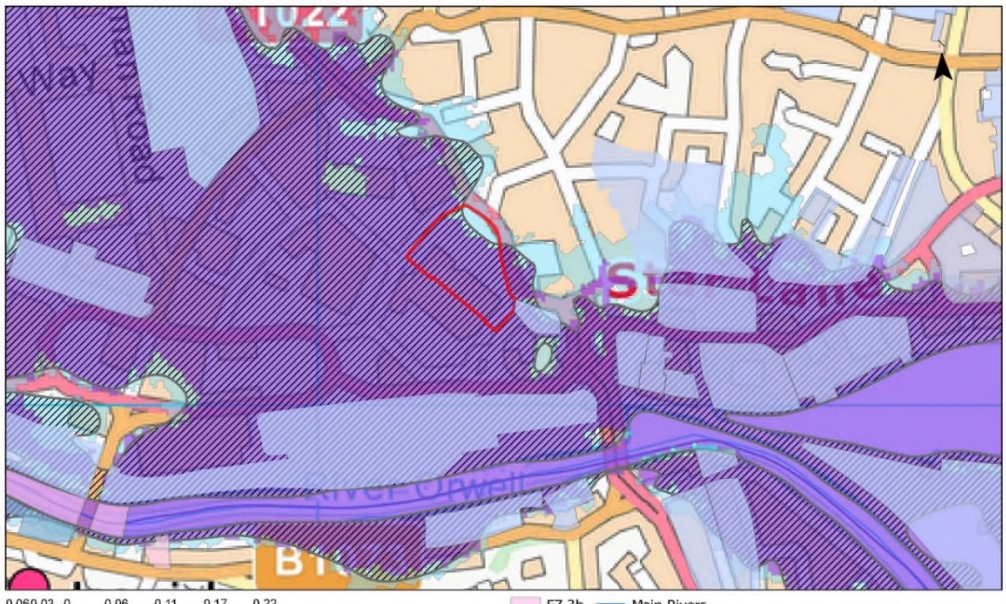
**Flood Zones and Flood Defences**
As it flows through Ipswich, the River Gipping becomes the River Orwell. The river flows east approximately 300m to the south of the site. At this location the River Orwell is tidally influenced. Most of the site is identified as Flood Zone 3, high probability of flooding, 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.

**Functional Floodplain**
The site is located adjacent to, but not within, the functional floodplain.

**Climate Change**
Modelling of the River Orwell shows that tidal flood water remains in bank in this location during the 0.5% AEP event including an allowance for climate change i.e. overtopping of flood defences does not occur in this scenario. (These modelled scenarios take account of the presence of defences).

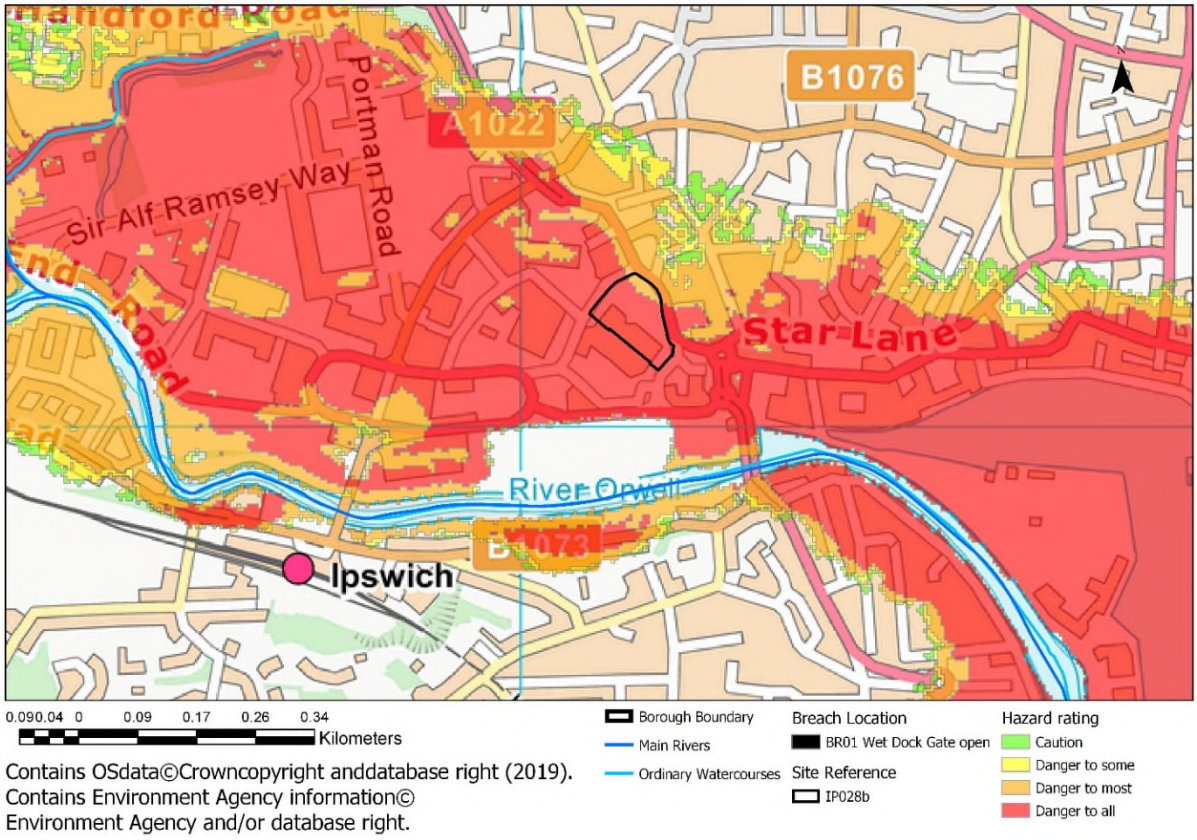
**Historic Records**
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC hold records of a number of flood incidents close to this site, associates with blocked and overflowing drains at the road junction with Star Lane.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Land west of Greyfriars Road**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

In this scenario the site resides largely within the danger to all category.

Site is located on the edge of Flood Zone 3. Access achievable along Greyfriars Road.

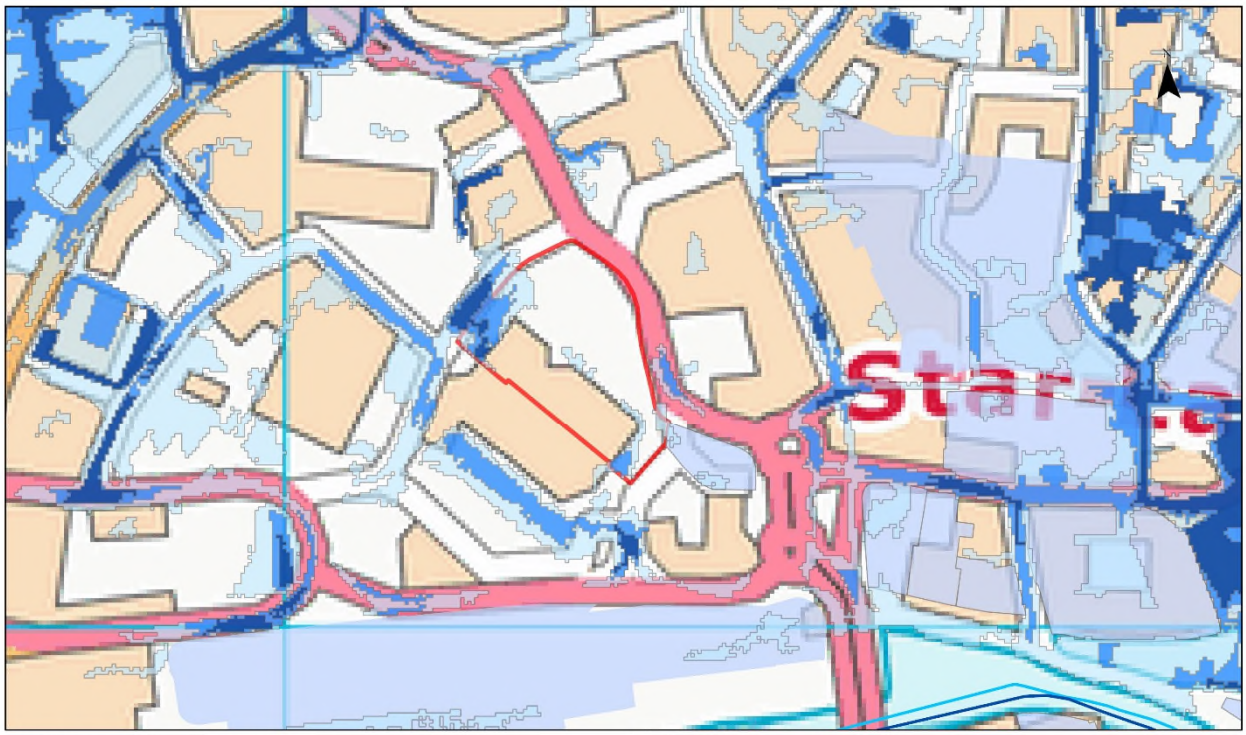
Finished floor level for habitable rooms should be set above 4m AOD (Table 7-1).

**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**
The RoFSW mapping indicates that the area around the site may be susceptible to surface water ponding, along Wolsey Street and Cecelia Street.

**Site Name: Land west of Greyfriars Road**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




## 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.

The underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

## 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

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event

**Site Name: Land west of Greyfriars Road**

including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment J (Table 7-1), whichever is greater.

*Access / Egress*

The main access to the site is from Greyfriars Road and Wolsey Street which are also shown to be at residual risk of flooding from the River Orwell. The egress route away from the site is likely to be north along Greyfriars Road towards the A1022 which is located within Flood Zone 1.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the site may not be possible. It may therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

*Flood Risk Assessment*

The site is located within an area of residual risk. At the site level a flood risk assessment should obtain breach modelling data from the Environment Agency and interpret flood depth and velocity along with hazard to inform site layout and design through the planning process.

| 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 |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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. The site is therefore at *residual risk of fluvial or tidal flooding*, in the event of a failure of these defences.

Refer to Map 1 below for Flood Zone outlines

**Functional Floodplain**

The site is located adjacent to, but not within, the functional floodplain.

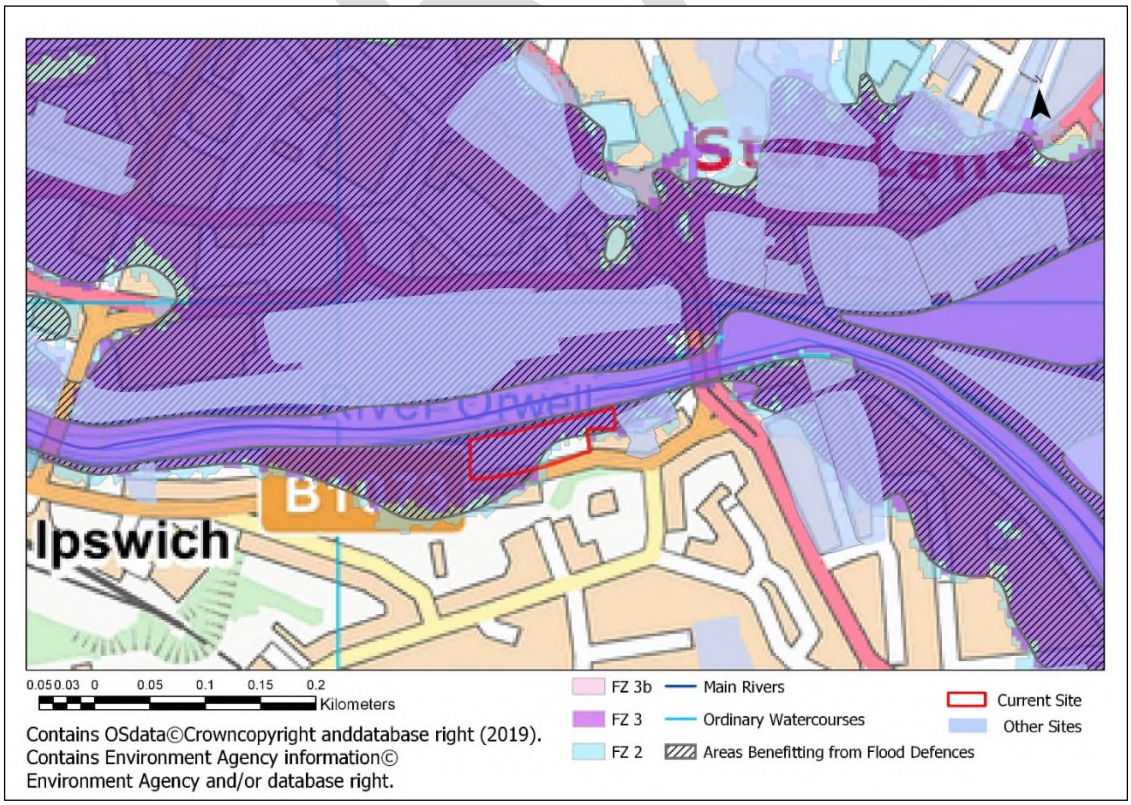
**Climate Change**

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. (These modelled scenarios take account of the presence of defences).

**Historic Records**

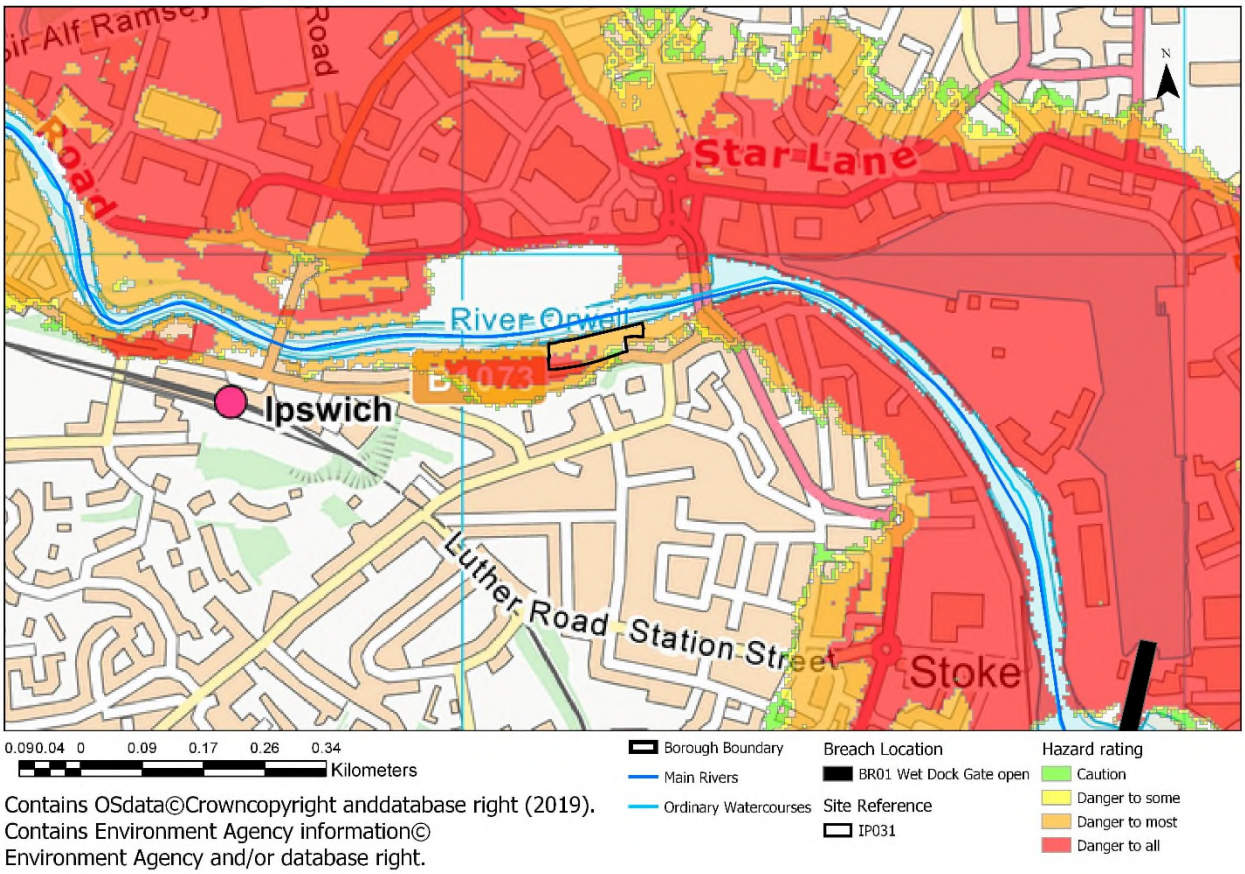
On the south side of the River Orwell, where the site is located, there has historically not been any record of flooding. Ipswich BC hold some records of flood incidents to the east of the site where Burrell Road meets Bridge Street. The historical records indicate these incidents are related to the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

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: 103-115 Burrell Road**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Safe access likely to be achievable along Burrell Road to south which is in Flood Zone 1. FFL should be set above maximum water level 4m AOD in Compartment D (Table 7-1).

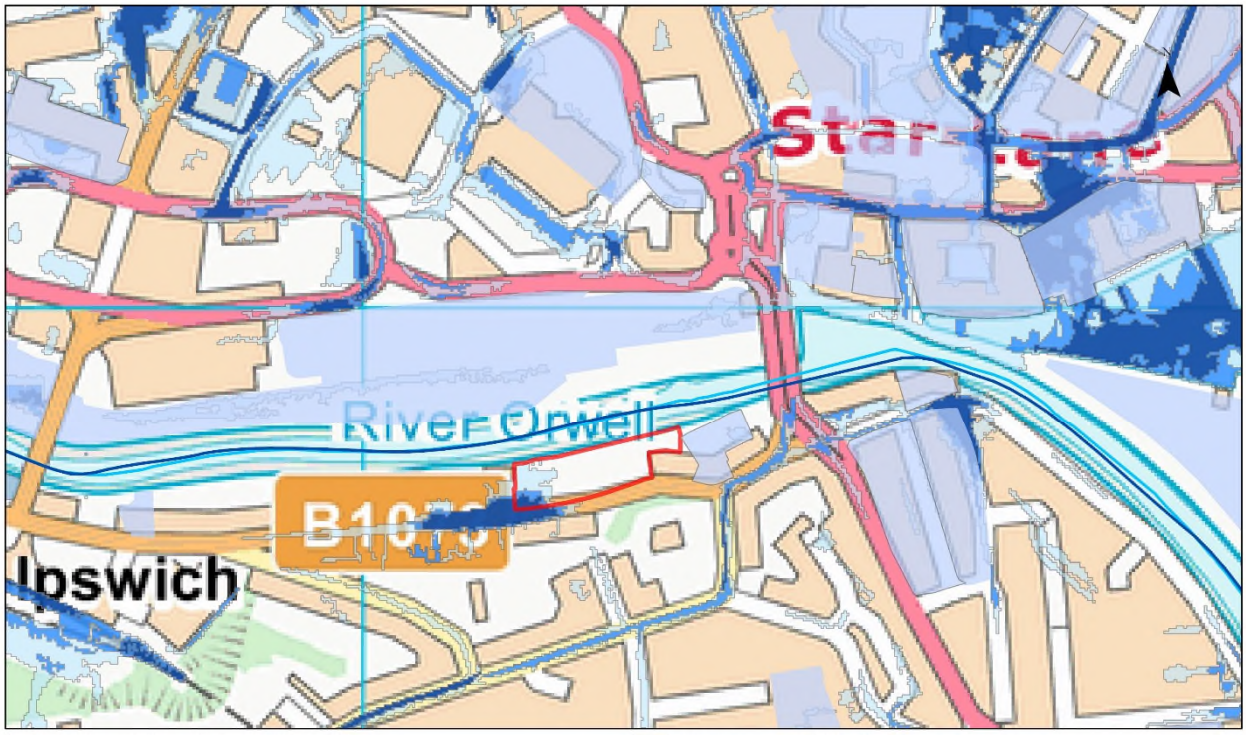
**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

The RoFSW mapping identifies that 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.

**Site Name: 103-115 Burrell Road**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.
Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*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 the watercourse.

*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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event

**Site Name: 103-115 Burrell Road**

including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment D (Table 7-1), whichever is greater.

*Access / Egress*

The main access to the site is from Burrell Road. The egress route away from the site is either east or west along Burrell Road and then south on to Stoke Street, Willoughby Road and then onto Belstead Road; this route would lead away from the floodplain to an area within Flood Zone 1.

*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.

| 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 |

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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 site is therefore at *residual risk of tidal flooding,* in the event of a failure of these defences.
Refer to Map 1 below for Flood Zone outlines

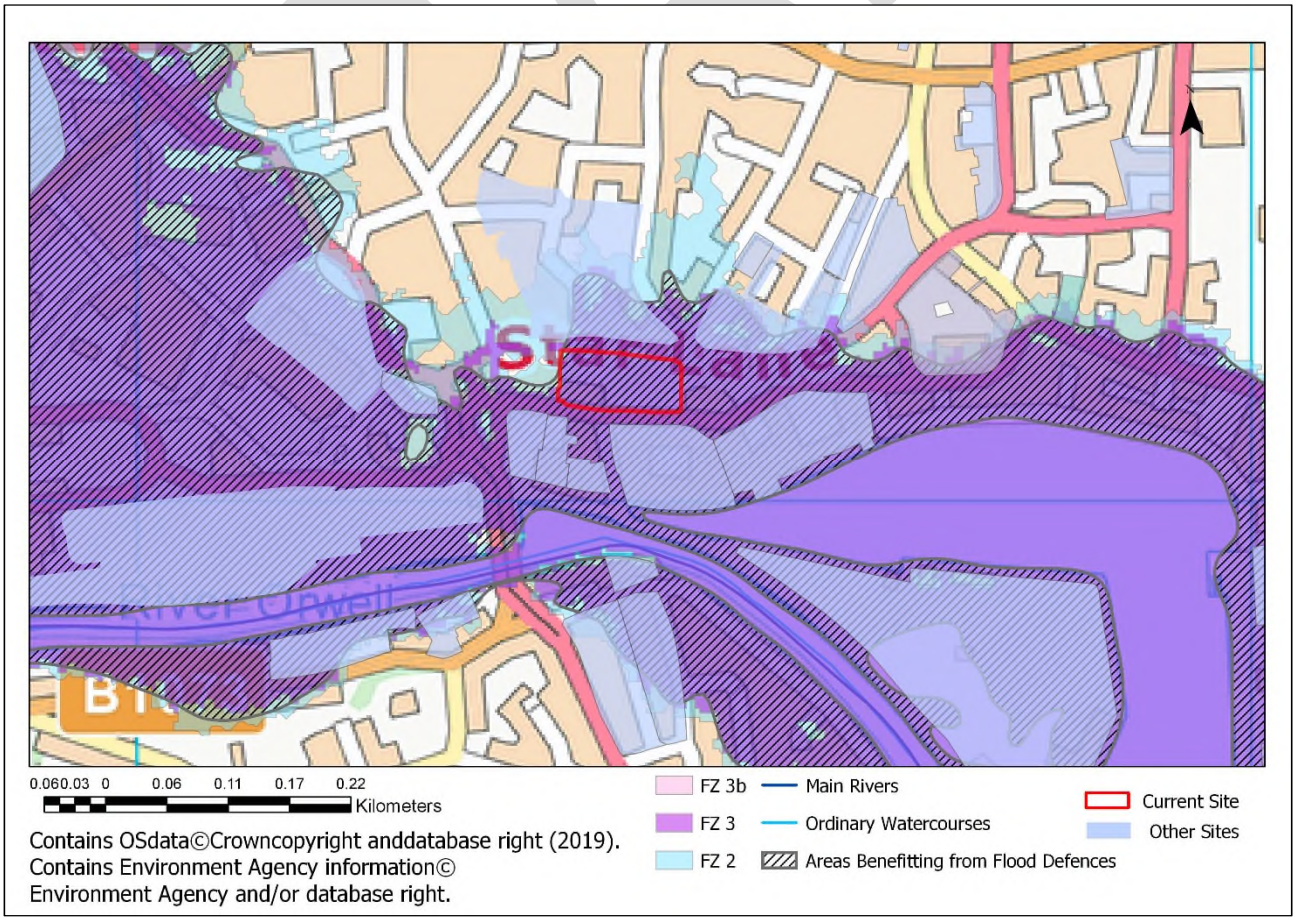
**Climate Change**

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 flood defences. (These modelled scenarios take account of the presence of defences).

**Historic Records**

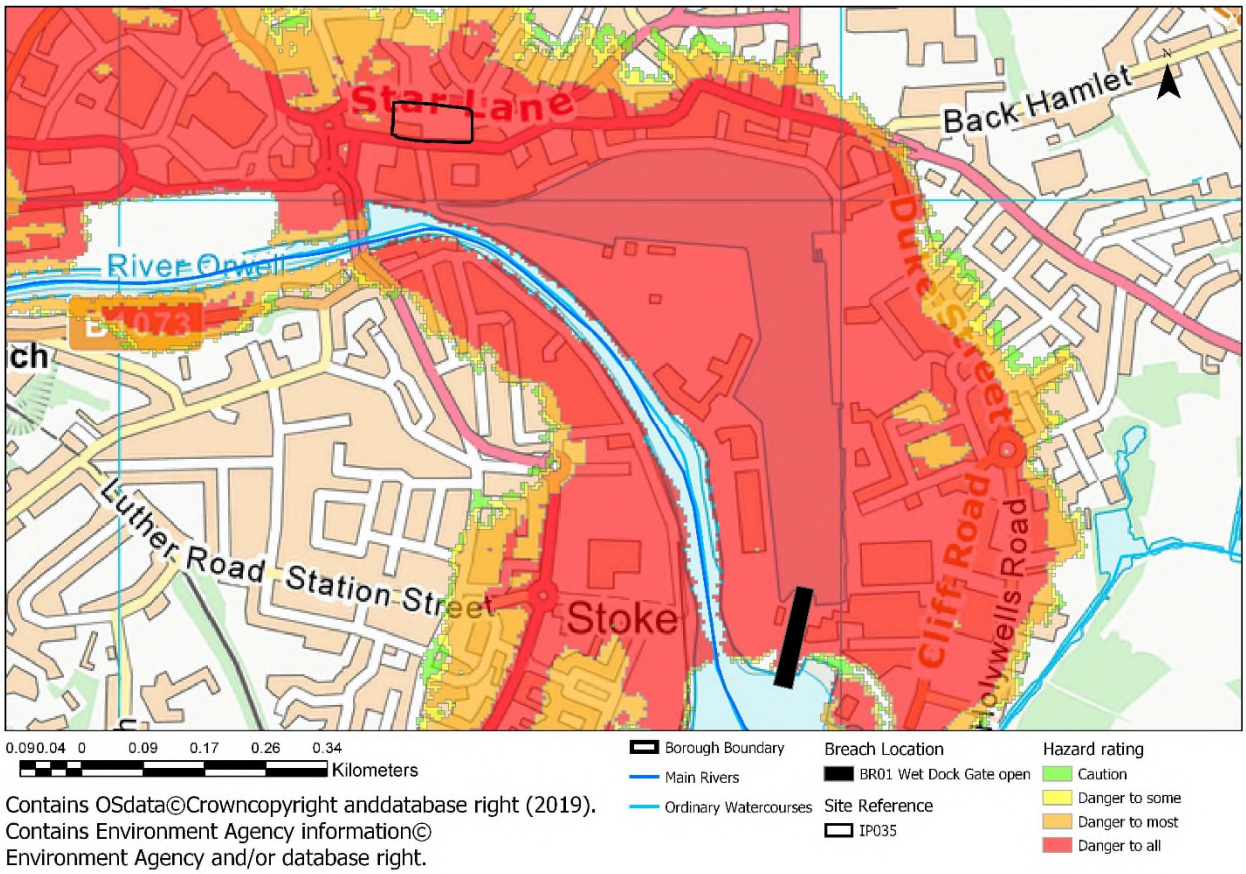
The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents in this location associated with the surface water drainage systems being blocked or overwhelmed.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Key Street/Star Lane/Burtons Site**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**






**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

Safe access likely to be achievable to the north along Lower Brook Street. Onset of flooding in the event of a breach could be within 1 hour (Appendix D). FFL should be set above maximum water level 4m AOD in Compartment H (Table 7-1).

**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

The RoFSW mapping shows that the site and surrounding roads are at high risk 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.

**Site Name: Key Street/Star Lane/Burtons Site**

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**


**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.

Due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**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).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 4m AOD in Compartment H (Table 7-1), whichever is greater.

**Site Name: Key Street/Star Lane/Burtons Site**

*Access / Egress*

Access to the site may be from Foundation Street, College Street and Star Lane which are also at residual risk of flooding from the River Orwell. The egress route away from the site is likely to be along Star Lane and then north out of the floodplain into an area of Flood Zone 1.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the southern part of the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change.

*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.

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

| Tidal and Fluvial Flood Risk | | | | |
|---|---|---|---|---|
| **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% |

**Flood Zones and Flood Defences**

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.

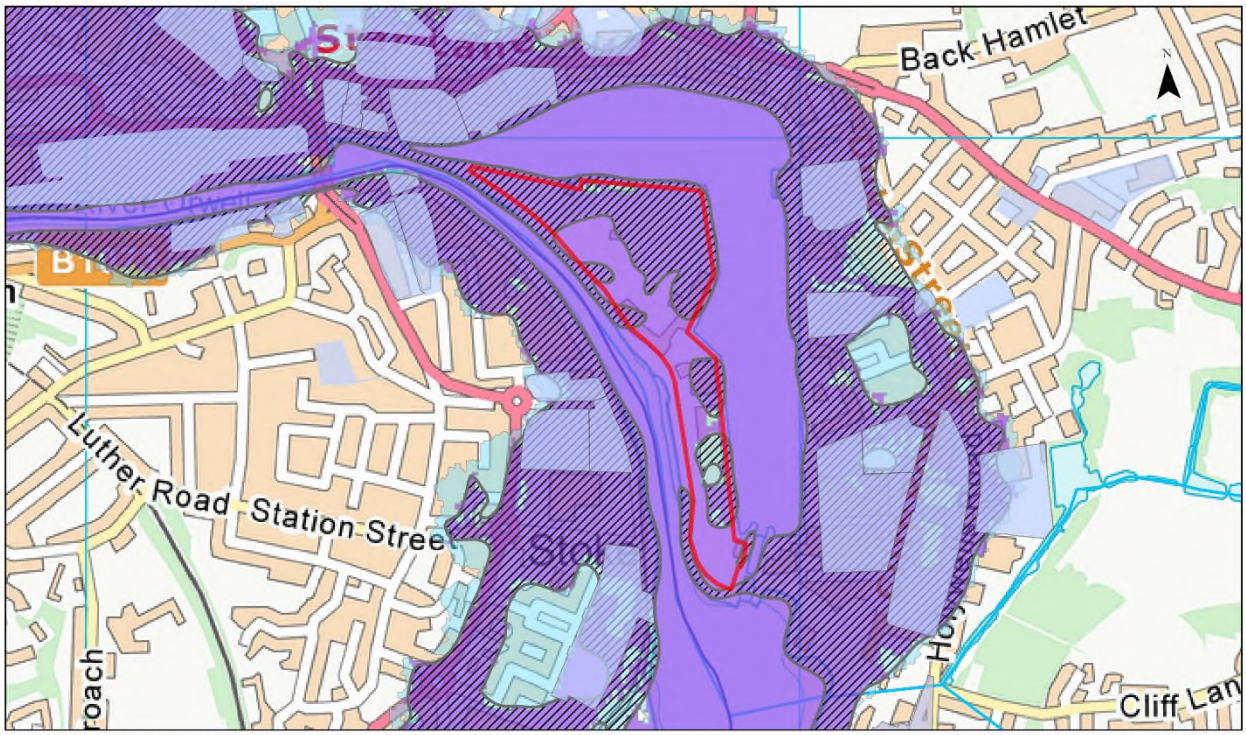
**Climate Change**

Modelling of the River Orwell shows that tidal flood water remains in bank in this location during the 0.5% AEP event including an allowance for climate change i.e. overtopping does not occur in this scenario. (These modelled scenarios take account of the presence of defences).

**Historic Records**

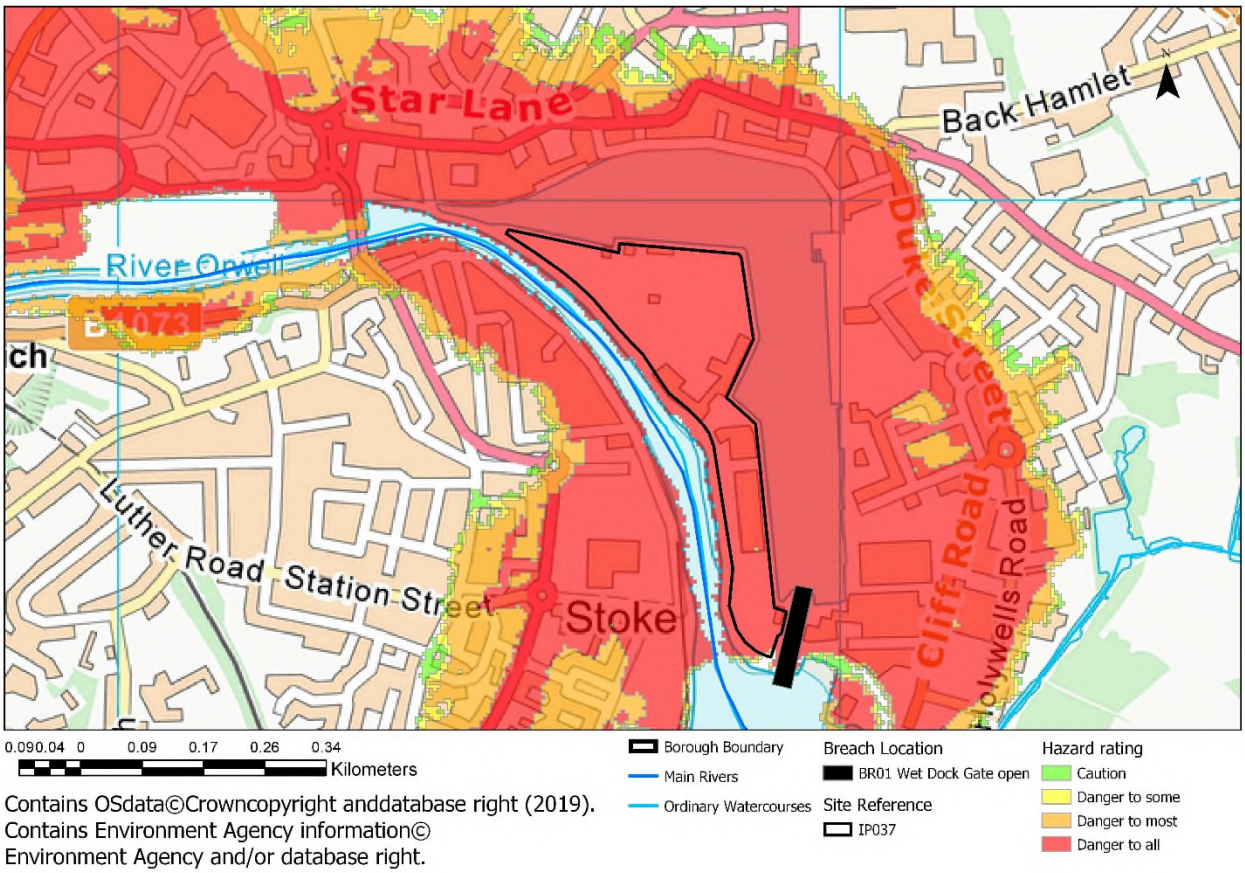
The Level 1 SFRA Figure 10 shows that this area has historically experienced flooding in 1953. Ipswich BC do not hold records of flood incidents on the site itself.

**Map 1 – Environment Agency Flood Map for Planning Data**



**Site Name: Island Site**

**Map 2 - Residual Flood Risk – Flood Hazard Mapping at Breach location BR01 Wet Dock Gate Open 0.5% scenario including climate change to 2118**




**Residual Flood Risk – Flood Hazard**

This site is protected by the IFDMS and is at residual risk of flooding in the event of failure or exceedance of flood defences.

Hazard mapping above shows hazard ratings with Wet Dock Gate open at BR01 for the 0.5% scenario including climate change to 2118. This breach location has been chosen as it creates the highest residual risk on site – greater than if a breach were to occur at BR02 (refer to main SFRA report for mapping of residual flood risk from all breach locations).

The site is considered as 100% danger to all in this scenario. Environment Agency mapping shows the site partially defended from flooding and it has very limited opportunities for safe access in the event of a breach. Options such as the provision of a bridge over the New Cut to link to the West Bank should be considered in order for this site to come forward for development.

Consideration of the potential increase in pressure on emergency services if the number of people in this location are to be increased. Consideration of the site vulnerability and development type and lifetime must be included in any proposals.

Safe refuge should be provided above 5.3m AOD. Finished Floor Level for habitable rooms should be set above 5.3m AOD (Table 7-1).

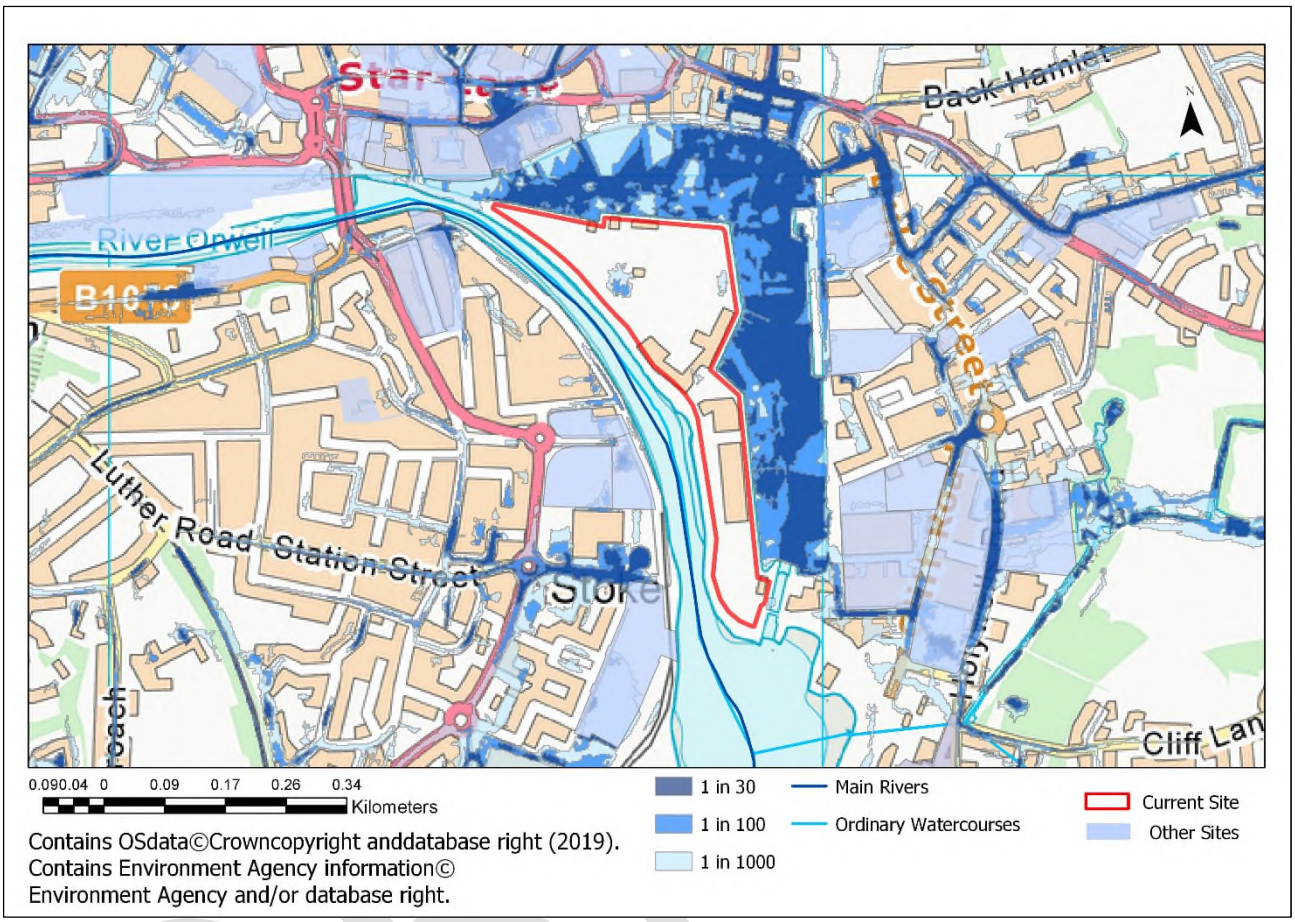
**Site Name: Island Site**

**Surface Water Flood Risk**

**Risk of Flooding from Surface Water (RoFSW)**

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

**Map 3 - Environment Agency Risk of Flooding from Surface Water mapping (RoFSW)**




**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.

The underling geology in this location is White Chalk subgroup and Lambeth Group which may be permeable and suitable for infiltration techniques within SuDS. However, due to the brownfield nature of the site, it is likely that made ground is at the surface, a site level ground investigation including soakage tests will be required to inform drainage design.

The brownfield nature of the site could provide an opportunity to create a betterment on the current drainage discharge from the site.

**Other sources**

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

**Site Specific Recommendations**

*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 the watercourse.

*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.

**Site Name: Island Site**

SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

*Finished Floor Levels*

The Environment Agency will seek finished floor levels for new development set 300mm above the 1% AEP including an allowance for climate change for fluvial flood risk. In areas at risk of tidal flooding, the Environment Agency will seek finished flood levels for new development to be set 300mm above the 0.5% AEP event including an allowance for climate change, or 300mm above the maximum water level 5.3m AOD (Table 7-1), whichever is greater.

*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. The egress route away from the site would be along either of these routes towards an area out of the tidal floodplain in Flood Zone 1.

In the event of a failure of the flood defence measures protecting this area, safe dry egress from the site may not be possible. It will therefore be necessary to include provision of a safe place of refuge for residents above the 0.1% AEP flood levels including an allowance for climate change (>5.3mAOD Table 7.1)

*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.

Consideration of the potential increase in pressure on emergency services if the number of people in this location are to be increased is required. Consideration of the site vulnerability, development type/suitability and lifetime must be included in any proposals.

*Flood Risk Assessment*

The site is located within an area of residual risk. At the site level a flood risk assessment should obtain breach modelling data from the Environment Agency and interpret flood depth and velocity along with hazard to inform site layout and design through the planning process.

**Flood Risk Assessment of Site IP034 578 Wherstead Road (Former Bourne Nurseries)**

The site was put forward into the Local Plan process by the landowner through the Local Plan call for sites exercise in 2017.

To support its consideration as a potential development site through the Council's Strategic Housing and Employment Land Availability Assessment, the landowner submitted a site specific Flood Risk Assessment.

The Council commissioned consultants Aecom to undertake an update of the Ipswich Strategic Flood Risk Assessment in August 2019. As part of this commission, Aecom made an independent assessment of the site specific Flood Risk Assessment for site IP034. This is appended to this report as Appendix 1.

The assessment concluded as follows:

## Concluding comments

The applicant has considered the risks in detail and how to design the development to mitigate flood risk from all sources.

The applicant discusses detailed conversations with the fire brigade although no formal correspondence with them has been obtained. The comments indicate that the fire brigade 'were generally positive' despite the access roads being potentially inundated to impassable levels during a flood event for up to 6 hours. It is recommended that formal consultation with the fire brigade be sought to confirm this.

Numerous correspondence with the Environment Agency have been included and addressed. It is noted that the applicant has not included the following requesting they be conditioned to detailed design stage

- Emergency flood plan

- Detail of flood resilience measures

- Detailed design of flood compensation storage

Although commentary has been provided to suggest all these things could be feasible. IBC should decide whether they feel it acceptable to condition these elements in consideration of their Local Policy.

The applicant has provided an independent modelling report which indicates depth, velocity and hazard in a range of flood return periods and a breach scenario, which further demonstrates inundation of access routes.

In conclusion

- The applicant has demonstrated the residential dwellings can be safe from flooding and safe refuge can be provided on site.

- It is recommended that the fire brigade and emergency planning teams are consulted with regards to the length of time access routes may be inundated

- It is recommended that full details of flood resilient design and flood compensation storage are provided before full planning permission is granted

- A flood evacuation plan has not been provided. This may be required to satisfy The Environment Agency at outline planning stage.

In response to these conclusions, the Council sought views from the Suffolk Fire and Rescue Service. They responded as follows:

SUFFOLK FIRE AND RESCUE SERVICE (SFRS) GENERIC ADVICE FOR PROPOSED DEVELOPMENTS IN FLOOD ZONES

When a developer proposes development in flood zones 2 and 3 (as determined by the local Strategic Flood Risk Assessment and the developer's Flood Risk Assessment (FRA) supports invacuation[1] of occupants in the event of flooding, the FRA needs to suitably detail the provision of a flood emergency kit for however long occupants would be expected to remain invacuated. This kit should include information warning of the dangers of using portable heaters and candles etc during potential utility failures.

If access roads to the development may be inundated the following advice should be considered by planners and developers:

1. Standard modern Fire and Rescue Service (FRS) vehicle design and crew safety considerations has resulted in SFRS fire appliances being unable to operate in or drive through water any deeper than 20cm.

2. In any event where working in water is required the Crew/Incident Commander must carry out a dynamic risk assessment to confirm the situational risk vs benefit before adopting tactics involving working in water.

3. Whilst every effort will always be made by SFRS to respond to fires and rescues, due to the nature and scale of significant flood events a dynamic risk assessment may determine that FRS resources are unable to respond normally along flooded routes where the depth of flood water at any point is greater than 20cm. This may prevent or delay emergency response. Strategic and tactical risk assessments and resource limitations may also cause response times to vary significantly from normal operating procedures.

4. One consideration compounding the water safety issues for emergency responders would be the fact that fire hydrants in the area may also be rendered unserviceable due to inundation.

5. It is noted that the issues of potentially flooded access routes may be an existing situation for existing properties in the flood zone areas(s) being developed. Notwithstanding this, any new development proposals should actively consider the provision of a suitable and appropriately installed fire sprinkler system(s) (designed to be resilient and operate in flood conditions) in order to:

a. Significantly enhance occupant safety by mitigating effects of any fire occurring during flood events which may result in occupant invacuation and restrict the normal capabilities of the Fire and Rescue Service response.

[1] Invacuation is the removal of people to an indoor place of safety when there is an emergency outside.

b. (This would actually have the beneficial effect of enhancing the fire safety of building occupants at all times);

c. Significantly limit fire damage and environmental impact of any fire in the new property; and

d. Reduce additional burden of risk for emergency responders attempting to use best efforts responding to the new property for life critical incidents.

Conclusion

The Council has considered the detailed evidence on flood risk submitted by the landowner to support the site's allocation.

The site lies close to the Orwell Estuary which does not benefit from flood defences that would aid the residents of this site.

Whilst safe refuge and appropriate floor levels could be achieved on the site, safe access/egress in the event of a flood could not, with access routes blocked by deep and, in places, fast flowing water. The land owner's site specific Flood Risk Assessment indicates that escape routes off site have been investigated but water would reach a depth greater than 20cm (and up to 2m in places).

The Suffolk Fire and Rescue Service has confirmed that 20cm is the maximum depth that could be considered suitable for emergency vehicles. Furthermore, flooding of any depth may require dynamic risk assessments and may render fire hydrants inactive which would delay and/or put at risk future site occupants.

Therefore, the Council has concluded that currently the development of this site would not be safe and it should not be allocated at this stage. The National Planning Policy Framework requires that development should be made safe for its lifetime without increasing flood risk elsewhere. Adopted and emerging Ipswich Borough Council Local Plan policy reflects this requirement through policy DM4. Safety is defined through the Development and Flood Risk Supplementary Planning Document 2016 based on the Ipswich Strategic Flood Risk Assessment.

Should the situation change – for example, through a safe escape route being identified – then this position could be reviewed.

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# Technical Note

| | | | |
|---|---|---|---|
| **Project name** | Flood Risk Asssessment Review – Bourne Nurseries | **AECOM project no.** | 60612179 |
| **Client** | Ipswich Borough Council | **Date:** | 23 September 2019 |

**Prepared by** Miguel Headley
**Checked by** Amy Ruocco
**Approved** Emily Craven

| **Introduction** | |
|---|---|
| This assessment has been carried out with reference to the following;<br>- Ipswich Borough Council Flood Risk SPD (2014)<br>- Environment Agency Standing Advice on Flood Risk Assessments<br>- National Planning Policy Framework (NPPF), and,<br>- Planning Practice Guidance (PPG) | |
| **NPPF Development classification**: | |
| Essential Infrastructure<br>Highly Vulnerable<br>More Vulnerable<br>Less Vulnerable<br>Water compatible | ☐<br>☐<br>☒<br>☐<br>☐ |
| Flood Risk documents submitted for Review with planning application<br>• Bourne Nurseries, Wherstead Road, Ipswich, Ip2 8LS, Proposed Residential Scheme (Paul Snape Consulting, July 2018); | |

| **Section A: Initial Assessment of Flood Risk to the Site** | | |
|---|---|---|
| **Fluvial** | | |
| 1 | Is the site in an Environment Agency flood zone? | Yes FZ3 ☒ Yes FZ2 ☐ No ☐ |
| 2 | Is the site within 250m of a Main River? | Yes ☒ No ☐ |
| 3 | Is the Site within 250m of an ordinary watercourse? | Yes ☐ No ☒ |
| 4 | Where the answer to 3 is **yes**, considering local topography, is there a potential for fluvial risk from an ordinary watercourse? | Yes ☐ No ☐ uncertain ☐ |
| 5 | Are there any known historic floods from a main river or ordinary watercourse within 250m of the site? | Yes ☒ No ☐ uncertain ☐ |
| 6 | Is the proposed development located in a 'Dry Island'? | Yes ☐ No ☒ uncertain ☐ |

| | | |
|---|---|---|
| **Surface Water** | | |
| 7 | Risk of flooding from surface water (approximate) | High [ ]% Low [10]%<br>Medium [ ]% Very low [90]% |
| 8 | If site is at risk, how deep is the highest risk flooding predicted to be? | Over 900mm ☐ Below 300mm ☒<br>300-900mm ☐ N/A ☐ |
| 9 | Are there any known historic floods from surface water within 250m of the site? | Yes ☐ No ☐ uncertain ☒ |
| 10 | Is the site in an area of critical Drainage (Environment Agency) | Yes ☐ No ☐ uncertain ☒ |
| **Groundwater** | | |
| 11 | According to the SFRA, what is the potential for Groundwater flooding? | <25% ☐ 25-50% ☒<br>50-75% ☐ 75-100% ☐ |
| 12 | Are there any known historic floods from groundwater within 250m of the site? | Yes ☐ No ☒ uncertain ☐ |
| **Sewers** | | |
| 13 | Are there any known historic floods from sewers within 250m of the site? | Yes ☐ No ☐ uncertain ☒ |
| 14 | Are there any planned sewer upgrades which may influence the site? | Yes ☐ No ☐ uncertain ☒ |
| **Artificial sources** | | |
| 15 | According to Environment Agency mapping, is there any flood risk from reservoirs? | Yes ☐ No ☒ uncertain ☐ |

**Comments**

Surface Water Flood Risk

The Environment Agency (EA) Flood Risk from Surface Water mapping, shows a small section of the eastern part of the site to be located in an area of low flood risk of surface water flooding. The remainder of the site is located in the very low risk < 0.1% (AEP) of flooding from surface water.

Fluvial Flood Risk

The Environment Agency Flood Map for planning shows the site to be Flood Zone 3. Section 3.6.5 of the Flood Risk Assessment mentions the most recent (i.e. *2015 – at the time of writing*) modelling tidal levels from the EA (*i.e. 5.53m AOD defended, 5.57m AOD undefended – 0.1% AEP +CC)* was used to determine the proposed site levels. It is acknowledged that the hydraulic modelling report for Site 34 was published in 2012 (*Document Ref: AMA 231 Rev 0)* and sets out a summary of the flood durations for the 1 in 200 year + CC event. However, the most recent modelling information from the EA (i.e. the product 4 information in Appendix E) was used to determine the proposed site levels (i.e. 5.7 mAOD).

A breakdown of the proposed levels across the site is as follows:

- The FRA proposes to set Finish Floor Levels at 5.7m AOD which is the above the minimum required in the Ipswich Borough Council SPD (*i.e. 5.6m AOD*).
- The FRA proposes to also set the safe refuge area to 5.7m AOD which is above the predicted flood levels for the 0.1% + CC event.
- To address EA comments in Document Ref: *PSC-092-FRA-L1*, the FRA proposes to incorporate flood resilient and construction measures up to the proposed level of 5.7m

AOD.

Appendix E of the FRA provides a summary of the product 4 information for the 2015 Belstead Brook model. The fluvial floodplain for the Belstead Brook show flood levels to the 4.38m AOD from the 1 in 100 year + CC event and 1 in 100 year + CC event.

The EA correspondence (Document Ref: AE/2017/122169/03-L01) has asked the applicant to verify if the proposed levels for the site (i.e. 5.7m AOD) would result in water being displaced in Flood Zone 3. Section 3.7.18 of the FRA mentions "*compensatory storage would be provided for any loss of volume within the fluvial floodplain and the actual flood volume is likely to increase*". Paragraph 3.7.15 discusses a review of the volume of storage which would be available within the underground car parking and concludes that level for level storage is possible. Appendix H indicates an increase in storage volume but it cannot be clearly determined whether this is level for level compensation.

**Other comments - 2011 hydraulic 1D and 2D modelling**

*1D Model*

- Section 2.1 of the modelling report indicates ground levels were taken from Environment Agency 50cm LIDAR DTM (June 2008). The 1 in 200 year + CC AEP Hazard Map + CC show Site 34 to be located in a region characterised as "*Hazard to all*".

- The **Safe access / escape routes for building users**' Section in the 2011 SFRA quotes "*if development is proposed close to defences where breaches have not been considered… then a development SFRA will need to infer hazard ratings*". The 1D hydraulic model of Site 34 considers a "*50m wide breach in the flood embankment between cells 1and 2*". It is not clear if this represents an area without flood defences / where a flood breach was not modelled in the 2011 SFRA.

- In the Environment Agency letter (Ref: AE/2012/114629/03-L01) to the application further clarification was requested in relation to this modelling scenario, however, no subsequent response was provided. Furthermore, the modelling study mentions the results in Table 5 of the modelling report are meant to represent the "*50m wide breach in the flood embankment*" modelling scenario, however the text in Table 5 appear to represent another scenario (*i.e. 1:200 year CC with culvert blockage*) which is not explored in the report.

*2D Model*

- The tide levels boundary conditions for Cell1 (*Modelling report, Appendix A - Map 01*) were set using the 1D model output stage time data conditions, and the south east boundary condition was configured in the model by applying "various levels taken from the 1D model in Cell 2a". It is assumed the shortcomings associated with the uncertainties in the 1D were inherited by the 2D model (e.g. 50m wide breach in the flood embankment between cells 1and 2").

- The hazard mapping results in the modelling report show the velocity of the flow along the escape route (*Modelling Report, Appendix A - Map 05*) from the safe refuge to Wherstead Road to be greatest towards the east and south of the site, and the maximum depth to be at least 3.9m (map 04) in the southern part of the site along Corporation Avenue. Most of the Eastern part of the site is modelled to have depths of around 2.25m in a 1 in 200 + CC event.

| Section B: Environment Agency standing advice checklist for developments in Flood Zone 2 & 3 | | Comments |
|---|---|---|
| **1. Development site and location** | | |
| Is the site location provided? (address/grid ref) | Yes ☒ No ☐ Partial ☐ | |
| Is the current use stated? | Yes ☒ No ☐ Partial ☐ | |
| Is the correct flood zone stated? (in line with Section A) | Yes ☒ No ☐ Partial ☐ | |
| **2. Development proposals** | | |
| Are development proposals stated including any change of use? | Yes ☒ No ☐ Partial ☐ | |
| Is vulnerability classification stated and correct? | Yes ☒ No ☐ Partial ☐ | |
| Stated lifetime of development | Assumed 100Years | |
| **3. Climate Change** | | |
| Does the FRA consider impacts of climate change? | Yes ☒ No ☐ Partial ☐ | |
| Has the appropriate climate change impact range been considered for fluvial risk? | Yes ☐ No ☒ Partial ☐ | Product 4 information from the 2015 Belstead Brook Model has been used, which includes a 20% uplift. In accordance with EA guidance since 2016, climate change range from 35% - 65% uplift should be considered for this development. Applicant has provided reasonable justification for not carrying out this analysis in para 3.7.17 |
| Has the appropriate climate change impact range been considered for surface water risk? | Yes ☐ No ☐ Partial ☒ | 30% climate change has been considered. Guidance recommends considering a range up to 40% |
| **4. Site specific flood risk** | | |

| | | |
|---|---|---|
| Have the main flood risks to the site been fully and accurately described (in line with section A) | Yes ☒ No ☐ Partial ☐ | |
| Is the expected depth and level for the design flood specified in metres above Ordnance Datum? | Yes ☒ No ☐ | *5.53m AOD defended, 5.57m AOD undefended – 0.1% AEP +CC* |
| Are properties expected to flood internally in the design flood and to what depth? (Internal flood depths should be provided in metres) | Yes ☐ No ☒ N/A ☐ | Proposed Finished Floor Level is 5.7m AOD - above the undefended flood level |
| Does FRA state how the development will be made safe from flooding and the impacts of climate change (mitigation)? | Yes ☒ No ☐ Partial ☐ | Safe Refuge provided at 5.7m AOD |
| Does the FRA cover how the development and any flood protection measures will not cause increase in flood risk elsewhere over lifetime of development? | Yes ☐ No ☐ Partial ☒ | Section 3.7.15 discusses how compensation storage will be provided but more design detail is required to support this. |
| Has the FRA identified opportunities to reduce causes and impacts of flooding through the development (if relevant)? | Yes ☐ No ☐ Partial ☐N/A ☒ | |
| **5. Surface water management** | | |
| Are the existing surface water drainage arrangements described? | Yes ☒ No ☐ Partial ☐ | Discharge to the existing combined sewer in Wherstead Road. |
| Are the existing rates and volumes of surface water run-off generated by the site stated? | Yes ☐ No ☒ Partial ☐ | |
| Are proposals for managing and discharging surface water from the site described? | Yes ☒ No ☐ Partial ☐ | The drainage hierarchy is demonstrated in Table 1 - Section 6.7. |
| Where development is major or site is in an area at risk of flooding have SuDS been proposed? | Yes ☒ No ☐ | The results of the desk study in Section 6.3 show the site to be underlain by Chalk. The FRA quotes infiltration testing for the site to be 1.8 x 10m-$^{5}$m. The drainage strategy proposes a combination of permeable paving |

| | | |
|---|---|---|
| | | and swales. |
| Does the FRA describe how run-off from the development will be prevented from causing an impact elsewhere? | Yes ☒ No ☐<br>Partial ☐ | |
| If relevant , is there an operation and/or maintenance plan for the proposed SuDS | Yes ☐ No ☒<br>Partial ☐ | The drainage strategy indicates that the landowner will be responsible for the maintenance of SuDS. No maintenance plan has been provided. |
| **6. Occupants and users of the development** | | |
| Does the FRA cover details of number of occupants of proposed development and changes from present? | Yes ☐ No ☐<br>Partial ☒ | |
| Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, is the extent of change described? | Yes ☒ No ☐<br>N/A ☐ | Current use is a plant nursery. Site proposals for 113 residential units. |
| Where appropriate, is it demonstrated how the occupants and users that may be more vulnerable to the impact of flooding (e.g. residents who will sleep in the building; people with health or mobility issues etc.) will be located primarily in the parts of the building and site that are at lowest risk of flooding? If not, are there any overriding reasons why this approach is not being followed? | Yes ☒ No ☒<br>N/A ☐ | All residential floors will be above the design flood with access to alternative safe refuge. |
| **7. Exception test (if required)** | | |
| Would the proposed development provide wider sustainability benefits to the community? If so, could these benefits be considered to outweigh the flood risk to and from the proposed development? | Yes ☐ No ☐<br>N/A ☐ | This part of the Exception test has not been addressed. |

| | | |
|---|---|---|
| How can it be demonstrated that the proposed development will remain safe over its lifetime without increasing flood risk elsewhere? | Yes ☒ No ☐ N/A ☐ | |
| Will it be possible for the development to reduce flood risk overall (e.g. through the provision of improved drainage)? | Yes ☒ No ☐ N/A ☐ | |
| **8. Residual risk** | | |
| Does the FRA adequately describe flood risks remaining after flood risk management measures and mitigation have been implemented? | Yes ☒ No ☐ Partial ☐ | |
| Does the FRA describe how and by whom these risks will be managed over the lifetime of the development? | Yes ☐ No ☒ Partial ☐ | An emergency flood plan has not been completed. Applicant states this would be provided at the detailed design stage |
| **A.1 Proximity to main rivers or ordinary watercourses** | | |
| Is the development within 20m of a main river, flood defence structure or culvert? | Yes ☐ No ☒ Unknown ☐ | |
| Does the development propose to alter, place structures within or discharge to an ordinary watercourse | Yes ☐ No ☒ Unknown ☐ | |
| If either of the above questions answer 'Yes' have the appropriate permits or consents been sought or acknowledged within the FRA? | Yes ☐ No ☐ Partial ☐ N/A ☒ | |

**Concluding comments**

The applicant has considered the risks in detail and how to design the development to mitigate flood risk from all sources.

The applicant discusses detailed conversations with the fire brigade although no formal correspondence with them has been obtained. The comments indicate that the fire brigade 'were generally positive' despite the access roads being potentially inundated to impassable levels during a flood event for up to 6 hours. It is recommended that formal consultation with the fire brigade be sought to confirm this.

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