# Bradford Level 2 Strategic Flood Risk Assessment - Site E14

## Final Draft

May 2025

Prepared for:

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

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| Prepared by | Laura Thompson BSc<br>Analyst |
| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

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| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Laura Thompson of JBA Consulting carried out this work.

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## Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E14. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E14

- Location: Exchange Court / Vicar Lane
- Existing site use: Car park
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 0.86 hectares
- Proposed development impermeable area: 0.73 hectares (assumed 85% impermeable area)
- Environment Agency (EA) river model: Bradford Beck 2024
- Watercourse: Bradford Beck
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk
    - Modelling of latest EA climate change allowances for peak rainfall intensities

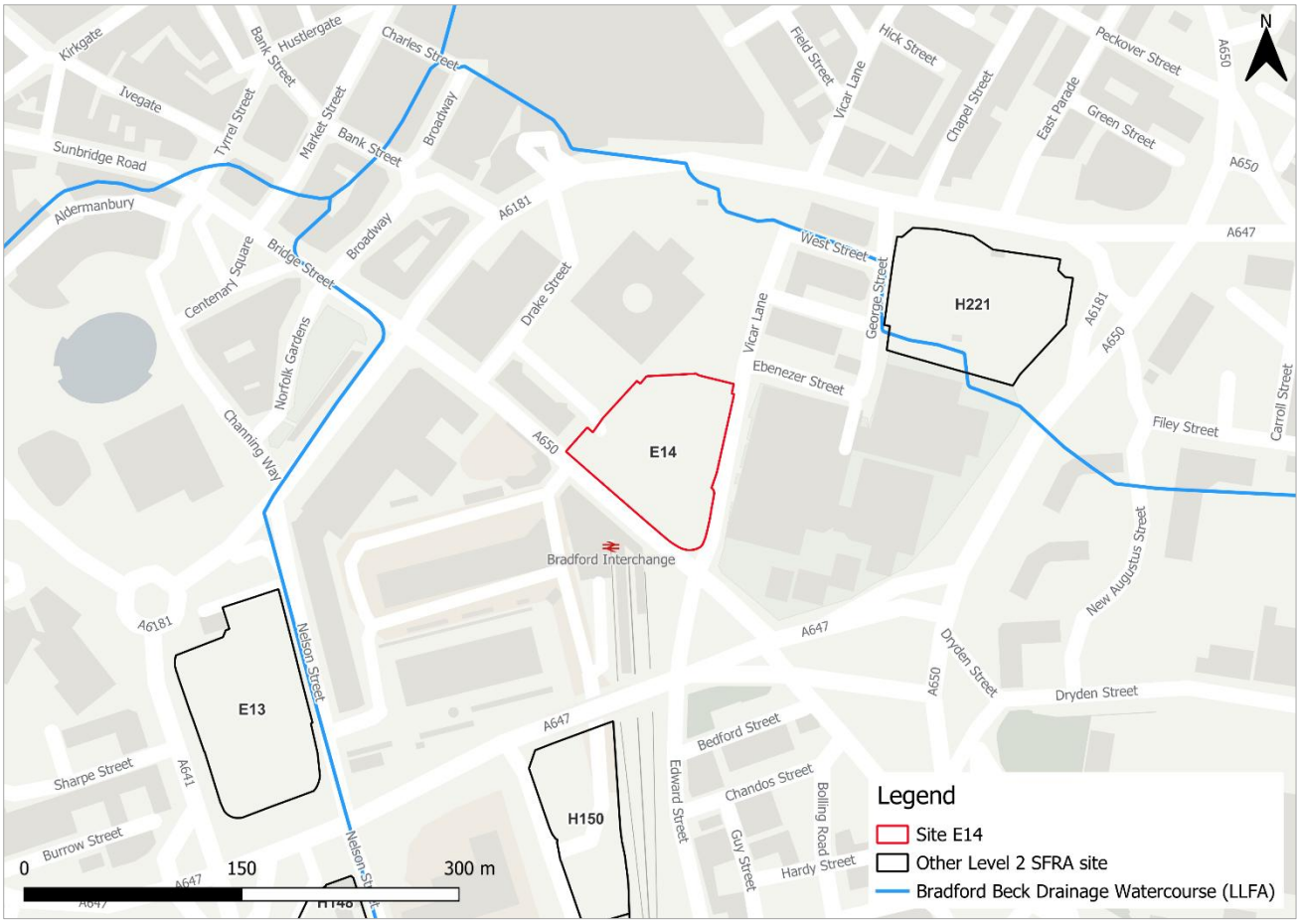



Figure 1-1: Existing site location boundary

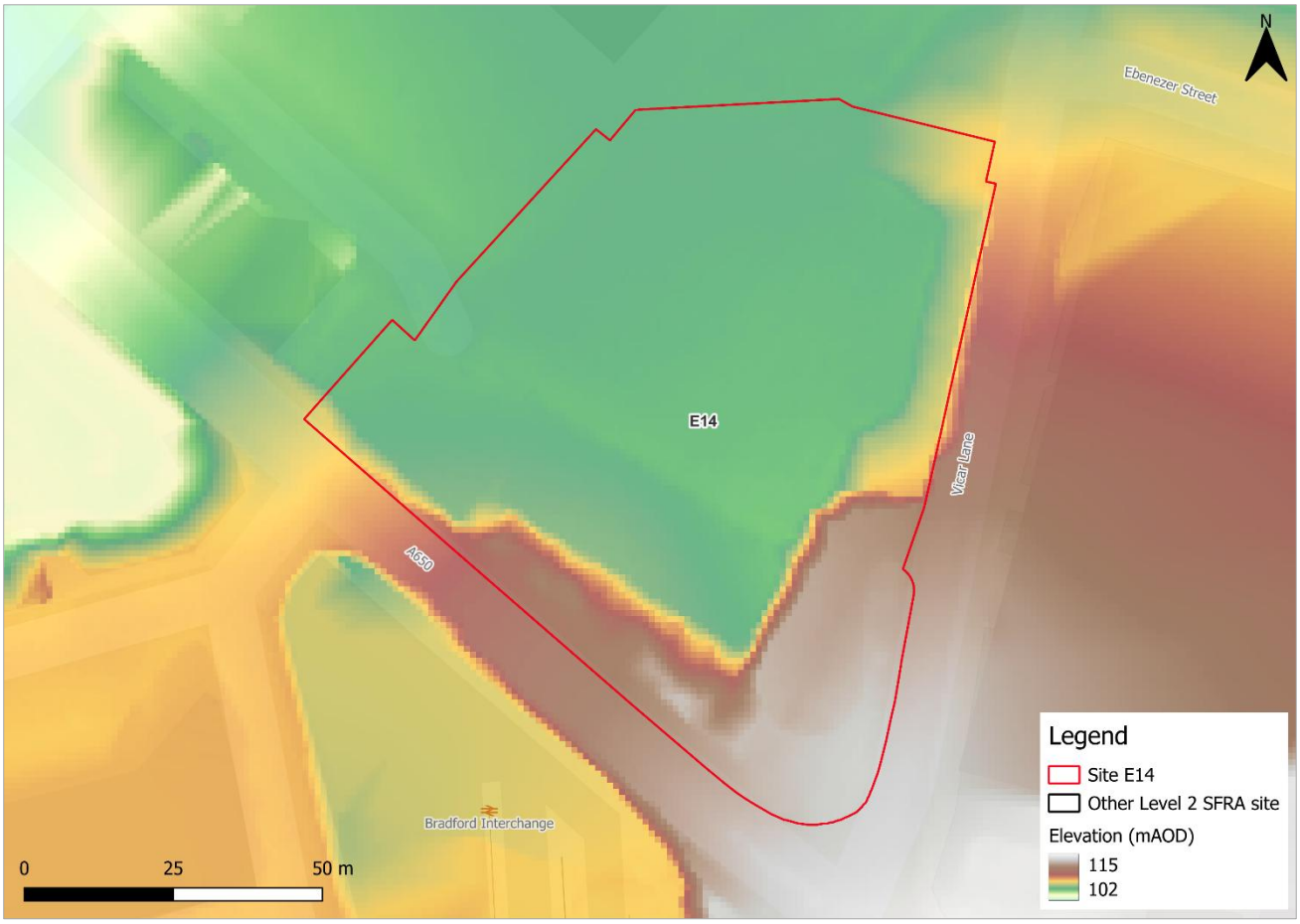



Figure 1-2: Topography




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is wholly located within Flood Zone 1 and is therefore at low risk of flooding from rivers.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

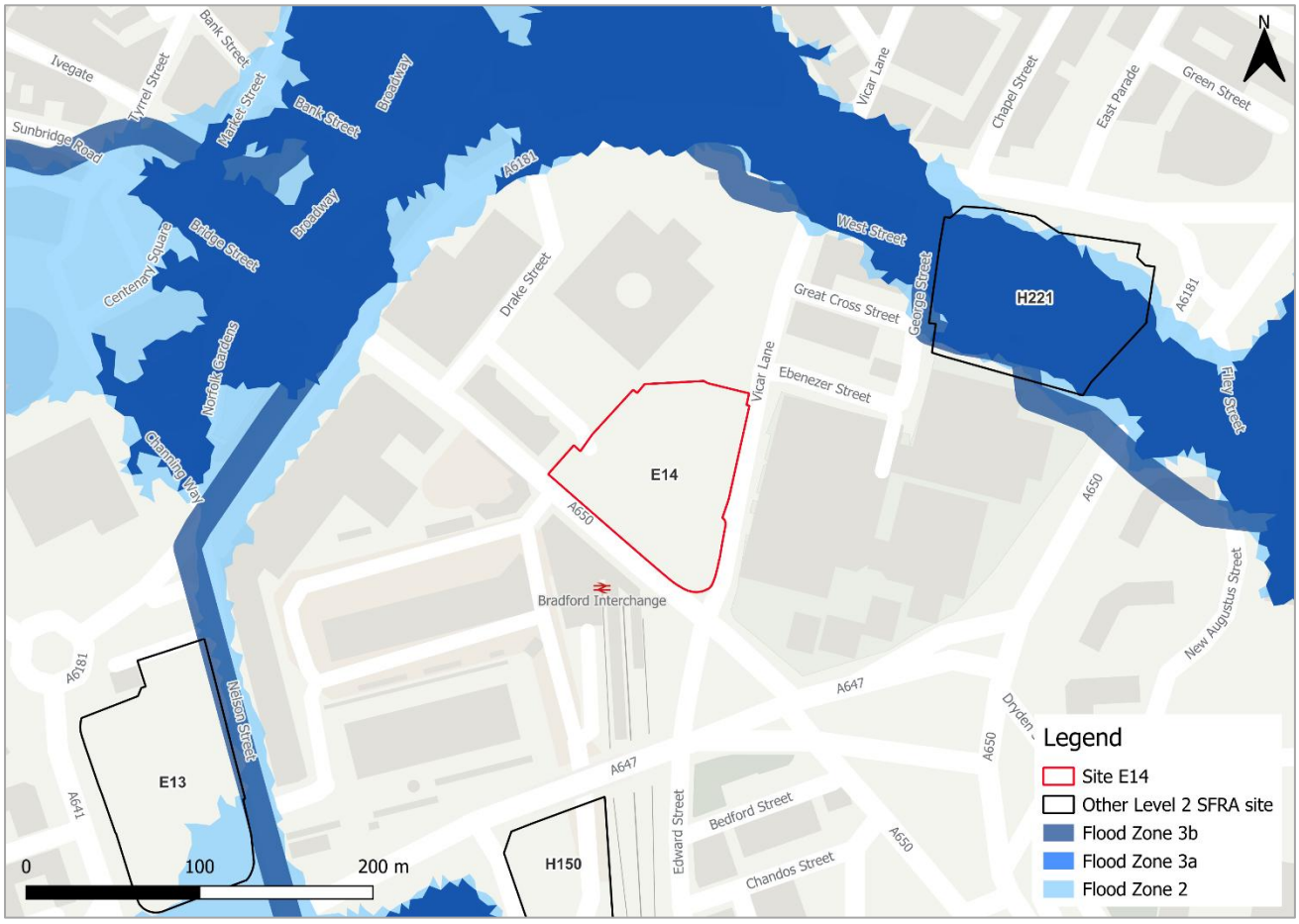



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.2.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

## 2.4 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is also not located within a FAA.

Based on available information, safe access and escape routes could likely be achieved during a flood event via multiple points surrounding the site.

## 2.5 Observations, mitigation options and site suitability - fluvial

- The site is wholly located within Flood Zone 1 and therefore at low risk of flooding from rivers.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 2% of the site is within the high risk surface water flood zone. A further 4% of the site is at medium surface water risk and a further 17% of the site is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is confined to an area of shallow ponding within a topographic low spot in the centre of the. In the medium and low risk events, this area of risk increases in both depth and extent.

Greatest flood depths within the site in the low risk event are between 0.3 and 0.6 m (Figure 3-1) with areas of moderate hazard (Figure 3-2). Safe access and escape routes should be possible via multiple points surrounding the site in all events.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 77 | 17 | 4 | 2 |




Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

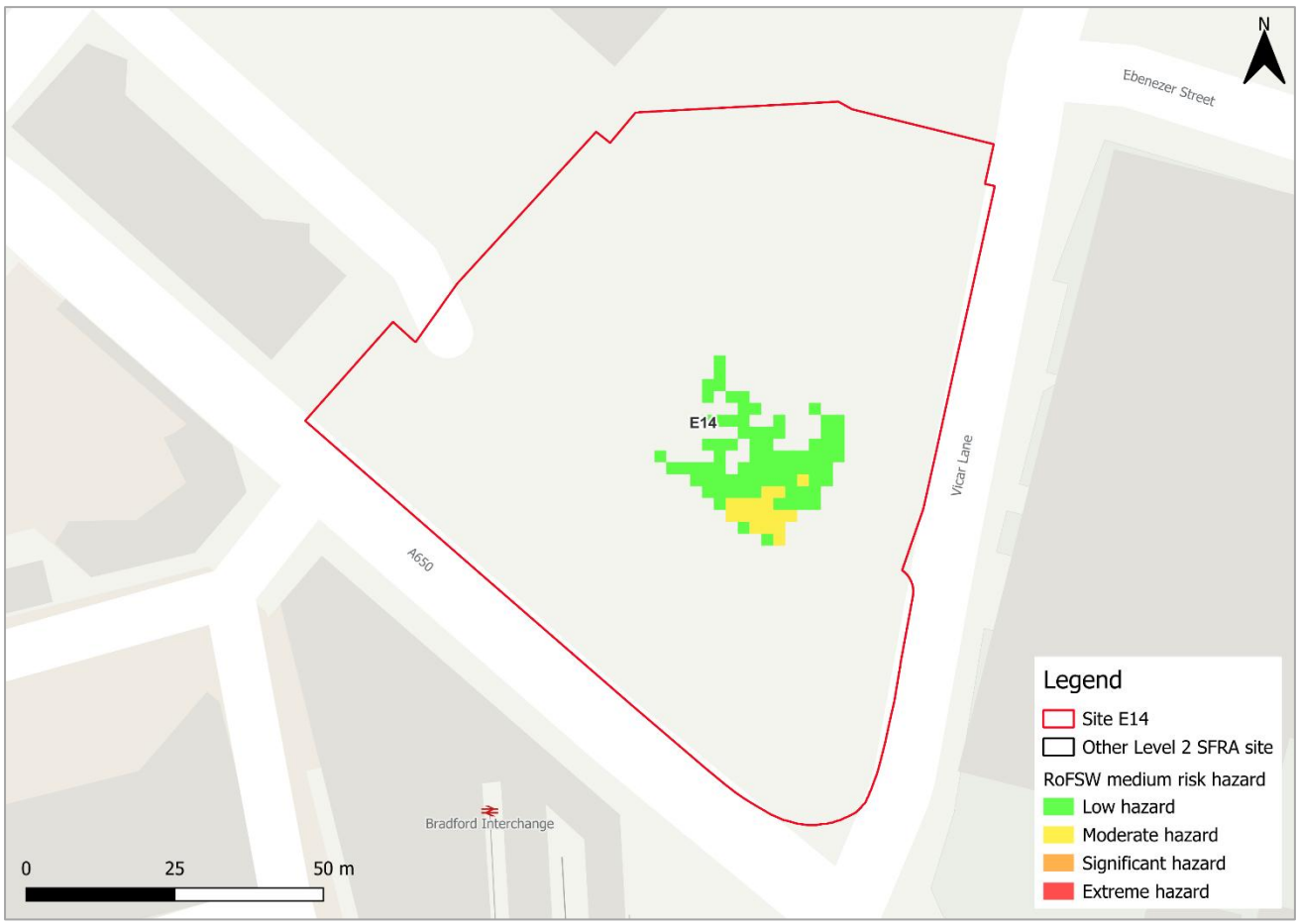



Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

Figure 3-3 shows the modelled surface water flood depths for the medium risk event +45% climate change. Risk is modelled to be greater than for present day conditions, with the

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

medium risk climate change event showing a similar level of risk to the low risk present day event. There are some additional flow paths along Vicar Lane to the east of the site. Maximum depths within the site are between 0.3 and 0.6 m with areas of hazard categorised as moderate (Figure 3-4). Safe access and escape routes should remain achievable via multiple points surrounding the site.

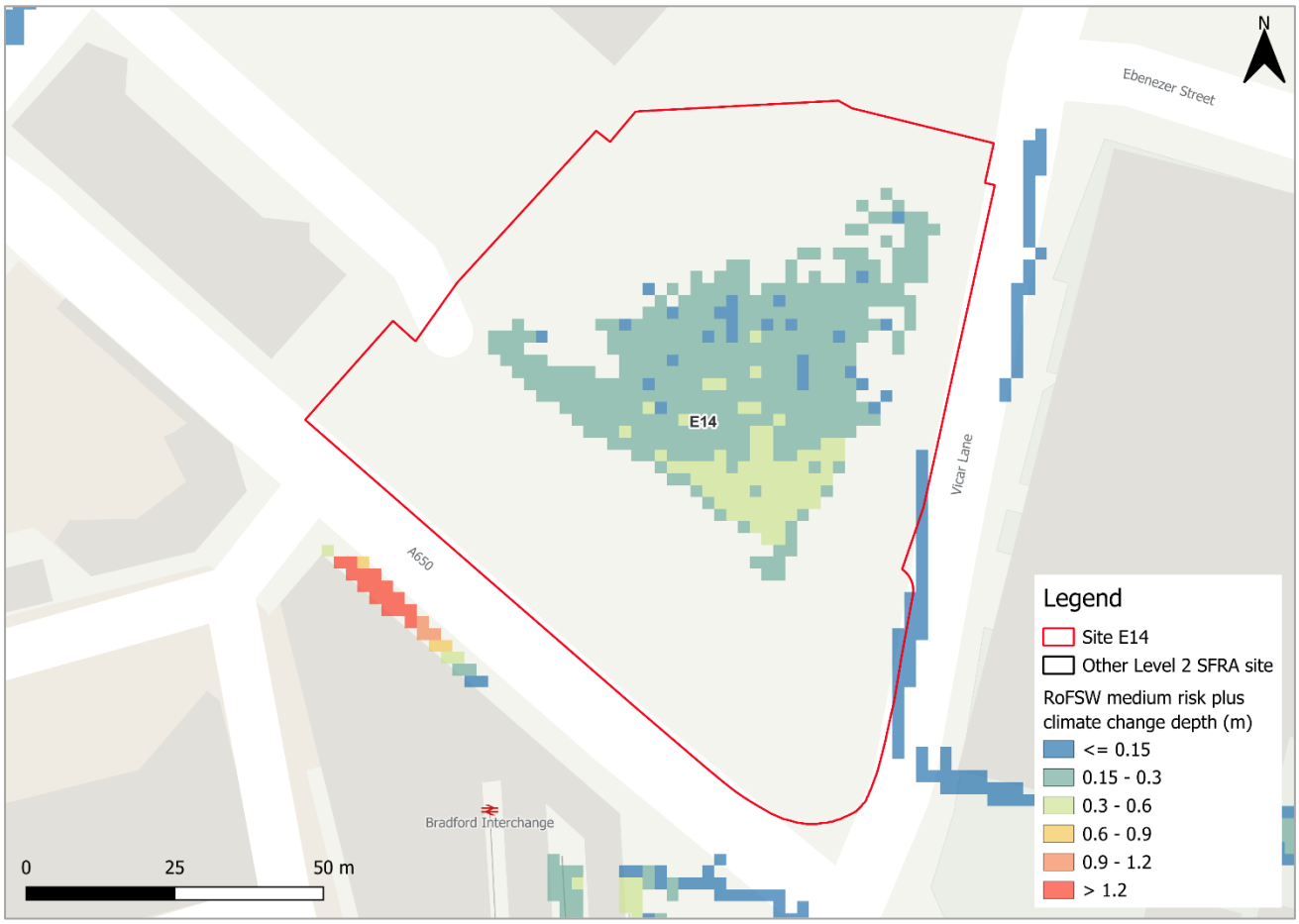



Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)

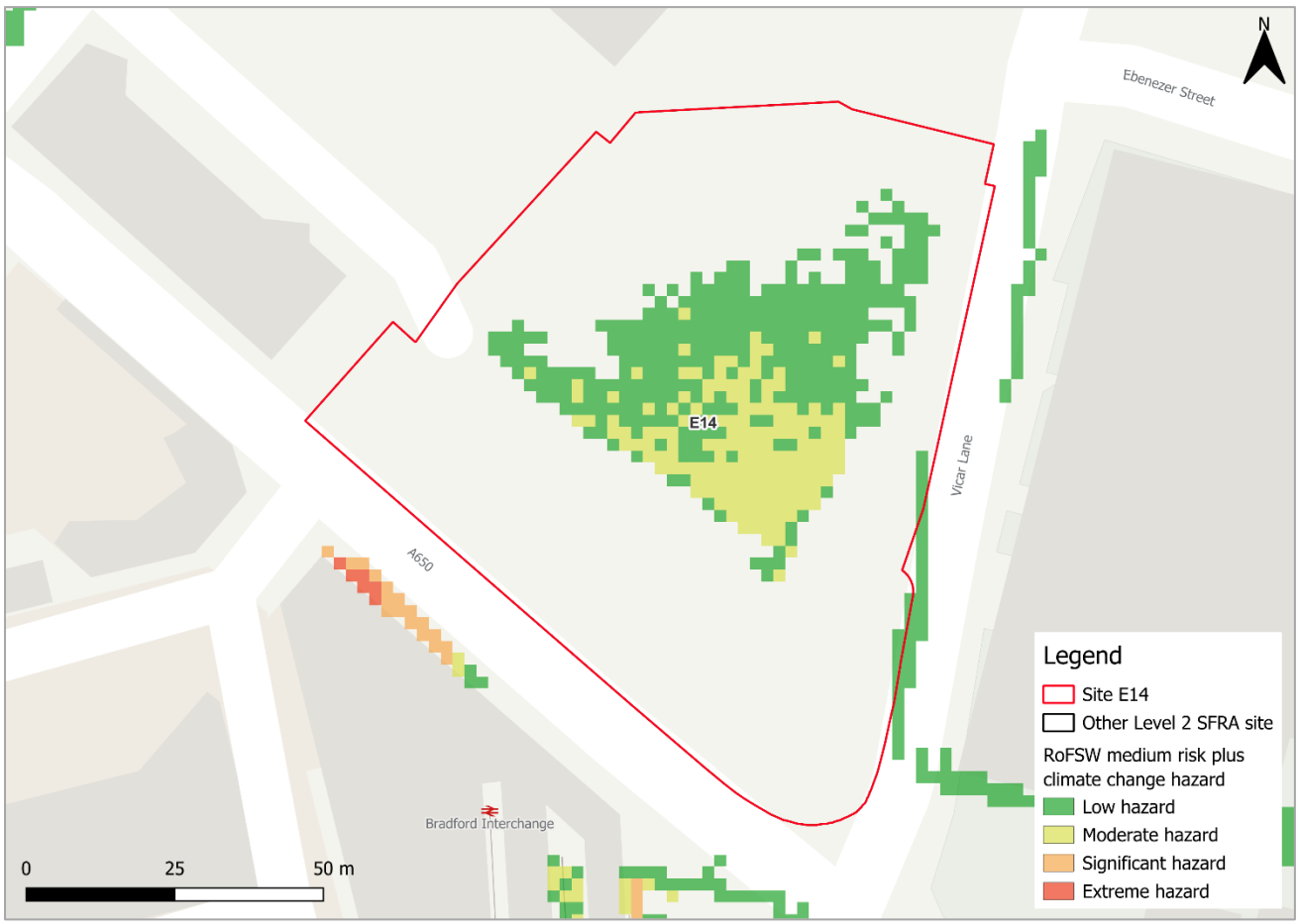



Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Current risk is confined to the areas of lower elevation within the centre of the site. In the medium risk event, this area is flooded up to depths of 0.6m with hazards categorised as moderate.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed employment development or whether further capacity will be required.
- A full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. Within the majority of the site, there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS in these areas. There is a small area within the south of the site where groundwater may emerge at significant rates and has the capacity to flow overland and / or pond within any topographic low spots. In this area, ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Flood risk from canals

The site is not likely to be at risk from a canal breach.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

## 5.3 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded or blocked, or it cannot discharge due to high water levels in the receiving watercourse.

According to Yorkshire Water's records, there have been no incidents of sewer flooding in the area over the last two years.

## 5.4 Observations, mitigation options and site suitability - residual risk

- The site is not likely to be at residual flood risk.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

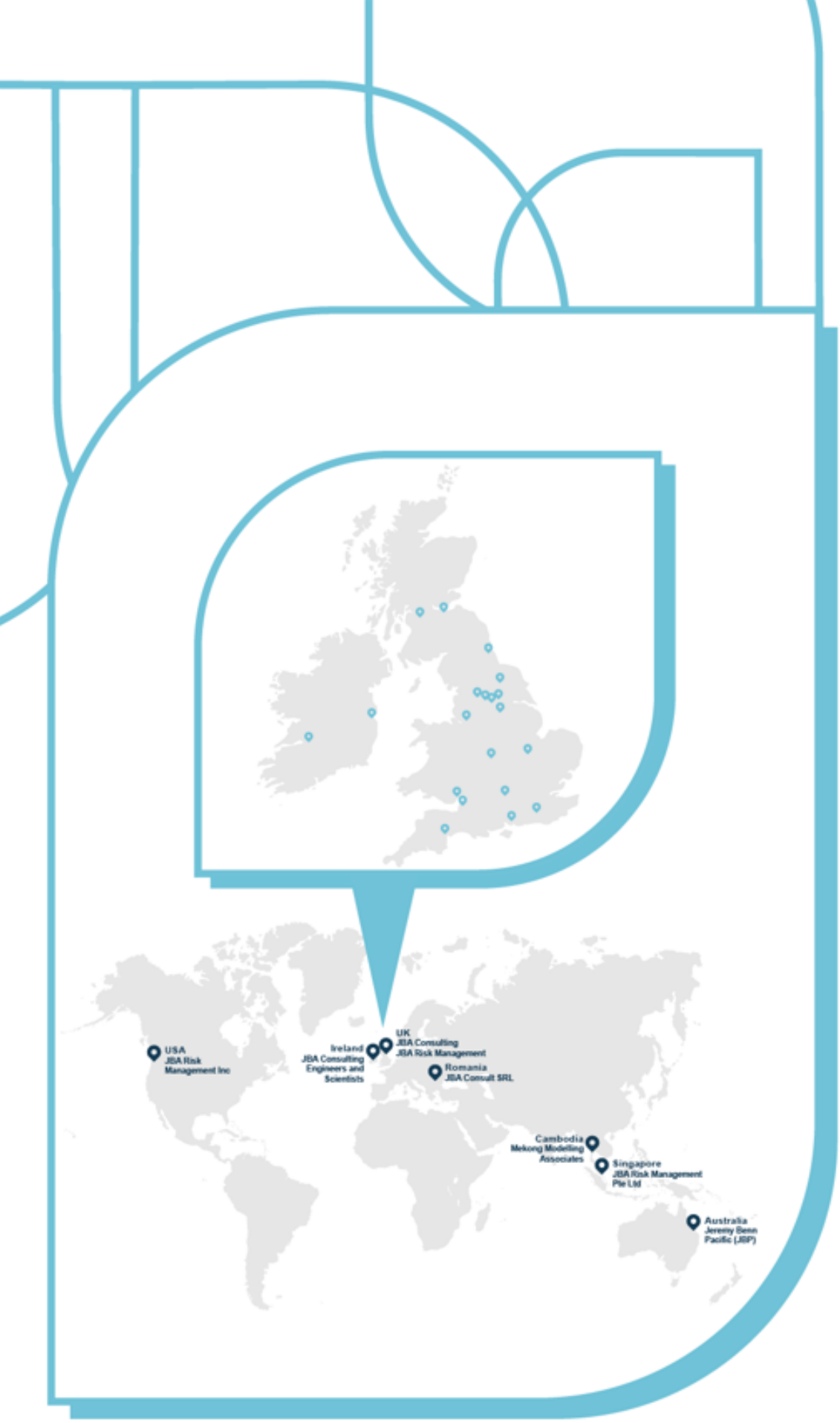
- It should be appropriate to develop this site for more vulnerable purposes given its location in Flood Zone 1 and the majority of the site being at very low surface water flood risk.
- Surface water should be retained onsite which may reduce the developable area. However, the use of appropriate SuDS should be able to mitigate risk for less vulnerable development. This may require surface water modelling based on layout plans and design and consultation with the LLFA on required runoff rates, likely to be brownfield or betterment. The use of infiltration SuDS should be investigated.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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Broughton
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North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
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# Bradford Level 2 Strategic Flood Risk Assessment - Site E16

## Final Draft

May 2025

Prepared for:

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

# Document Status

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E16. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E16

- Location: Florence Street, Bradford
- Existing site use: Commercial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area:0.42 hectares
- Proposed development impermeable area: 0.36 hectares (assumed 85% impermeable area)
- Watercourse: N/A
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk




Figure 1-1: Existing site location boundary

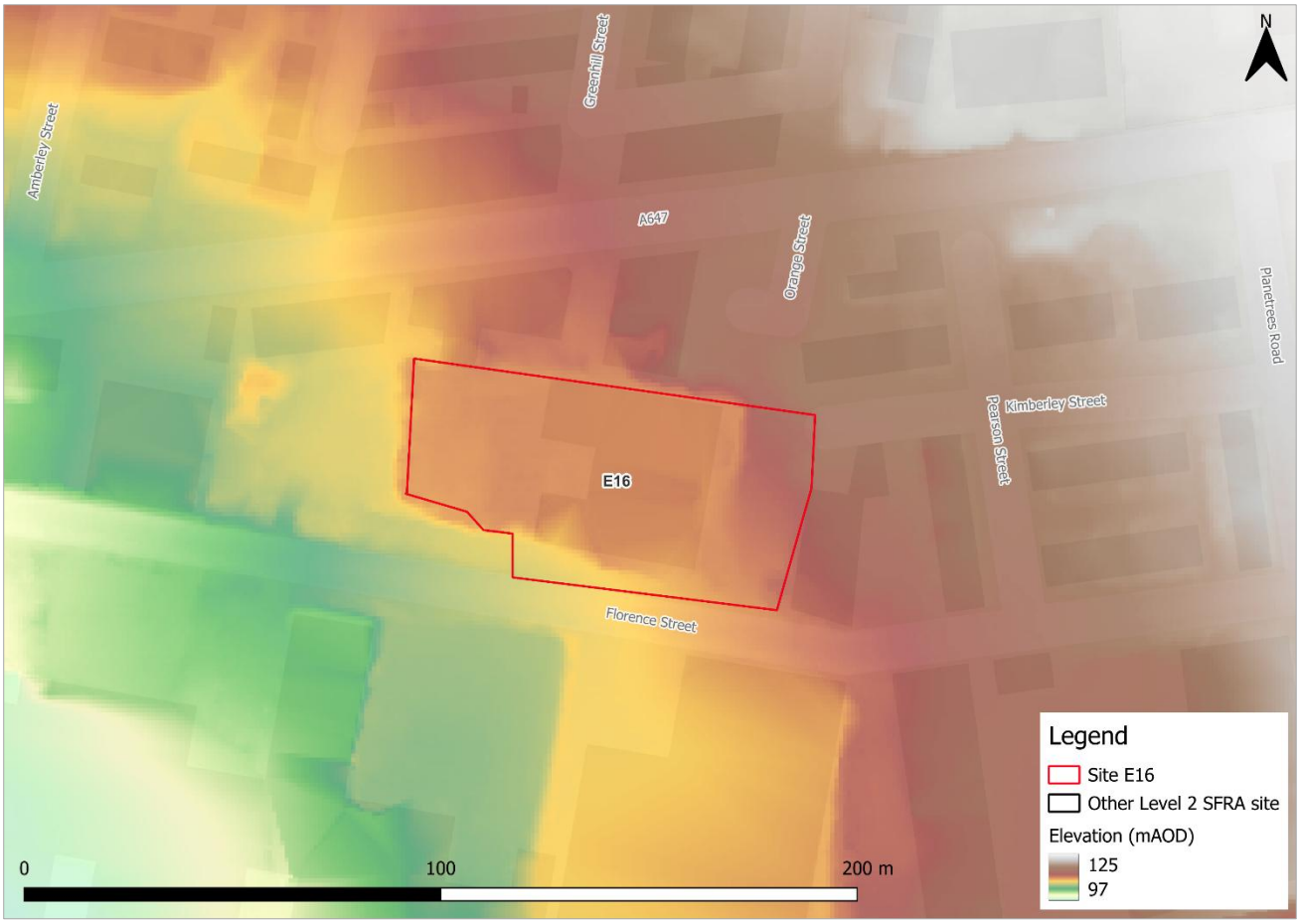



Figure 1-2: Topography




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is located wholly within Flood Zone 1 indicating it is at low risk of flooding from rivers.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

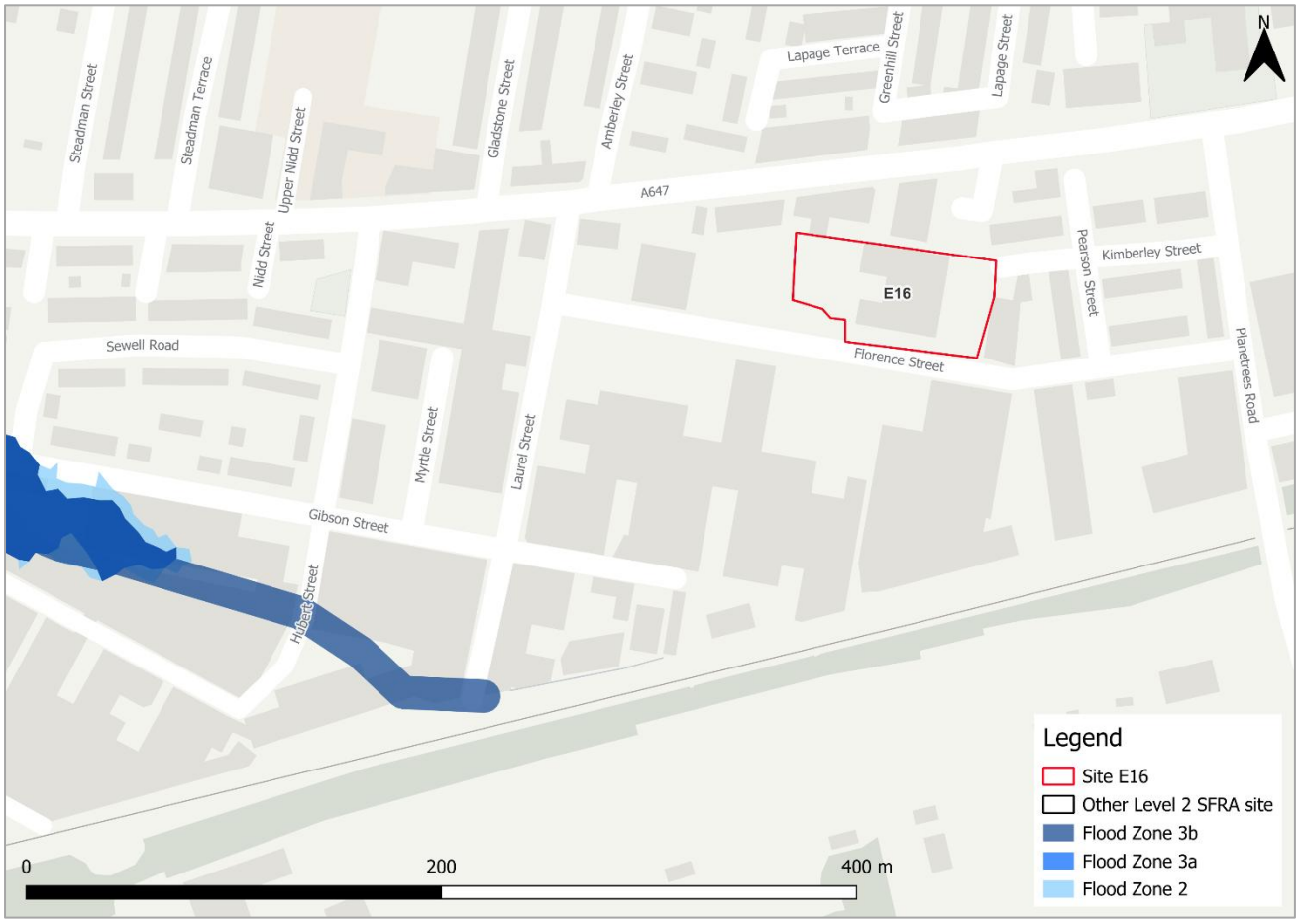



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Flood defences

The site does not benefit from any formal engineered flood defences according to the EA's spatial flood defences dataset.

### 2.2.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events within the vicinity of the site.

## 2.4 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is not located within a FAA.

## 2.5 Observations, mitigation options and site suitability - fluvial

- The site is wholly located within Flood Zone 1 1 indicating it is at low risk of flooding from rivers.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map surface water flood risk to the site is largely very low. However, 3% of the site is within the high surface water risk zone. 8% is within the medium risk zone and a further 14% is within the low risk zone, as shown in Table 3-1.

In the high risk event, surface water is confined to ponding at the northern site boundary. In the medium risk event, this ponding joins a flow path along Orange Street. Two additional areas of ponding also form within the site, constrained by the footprint of the current building. During this event ponding also forms on Florence Street, south of the site. In the low risk event, the flow path within the site joins to the flow paths on Orange Street, Florence Street and the A647.

Greatest flood depths within the site during the medium risk event are between 0.3 and 0.6 m (Figure 3-1) with some areas, along the northern site boundary, with a significant flood hazard rating (Figure 3-2). Safe access and escape via Florence Street should be achievable during all events given the shallow depth of flooding on the road.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 75 | 14 | 8 | 3 |

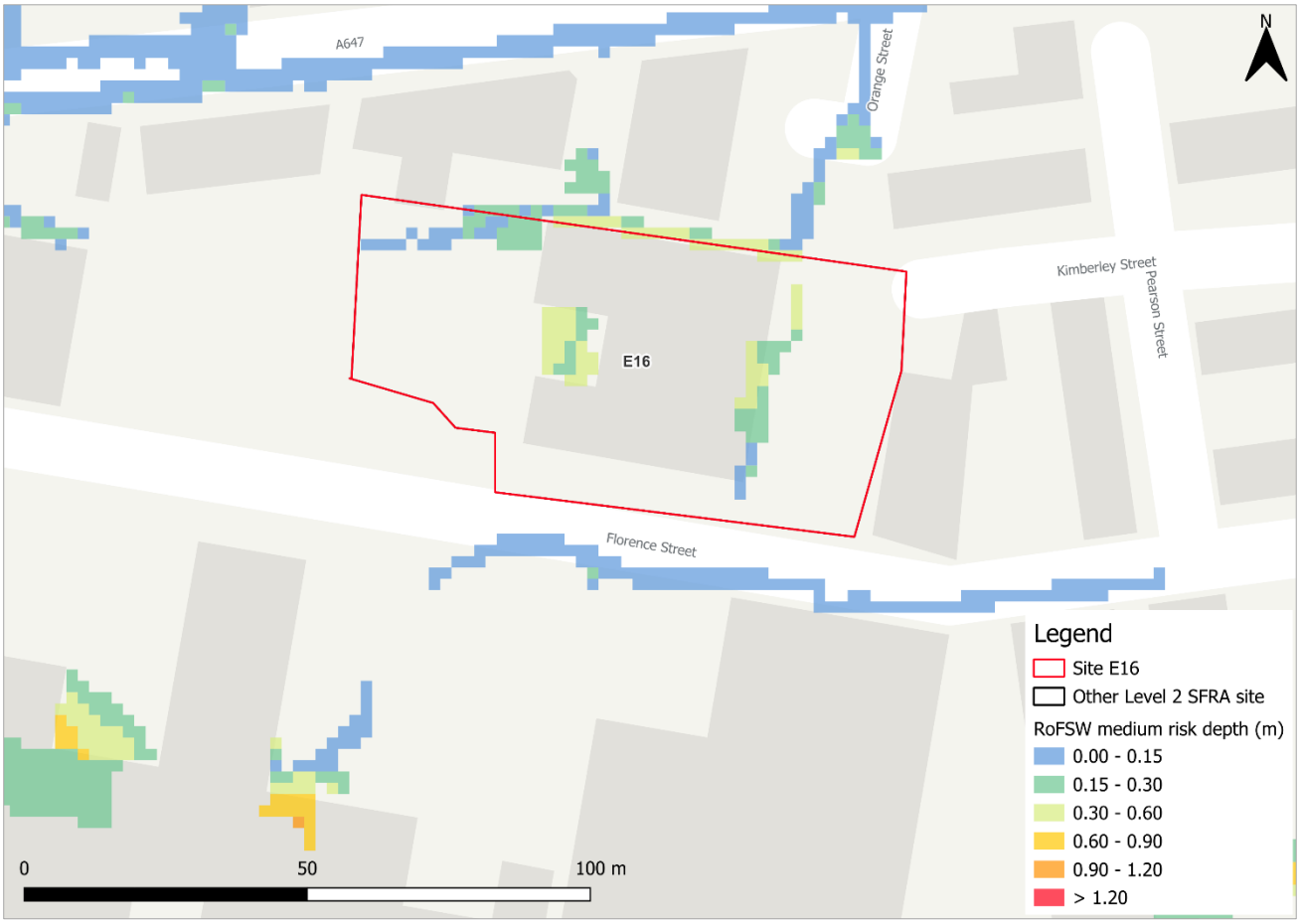



Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)




Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

Figure 3-3 shows modelled surface water flood depths for the medium risk event +45% climate change. Risk is modelled to be greater than for present day conditions, with the

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

medium risk climate change event showing a greater level of risk than the low risk present day event. The flow paths through the north and eastern side of the site expand in size. Maximum flood depths increase to between 0.6 and 0.9 m (Figure 3-3) and maximum flood hazard remains significant (Figure 3-4). Safe access and escape may remain achievable via Florence Street during this event, given the shallow flood depths on the road.

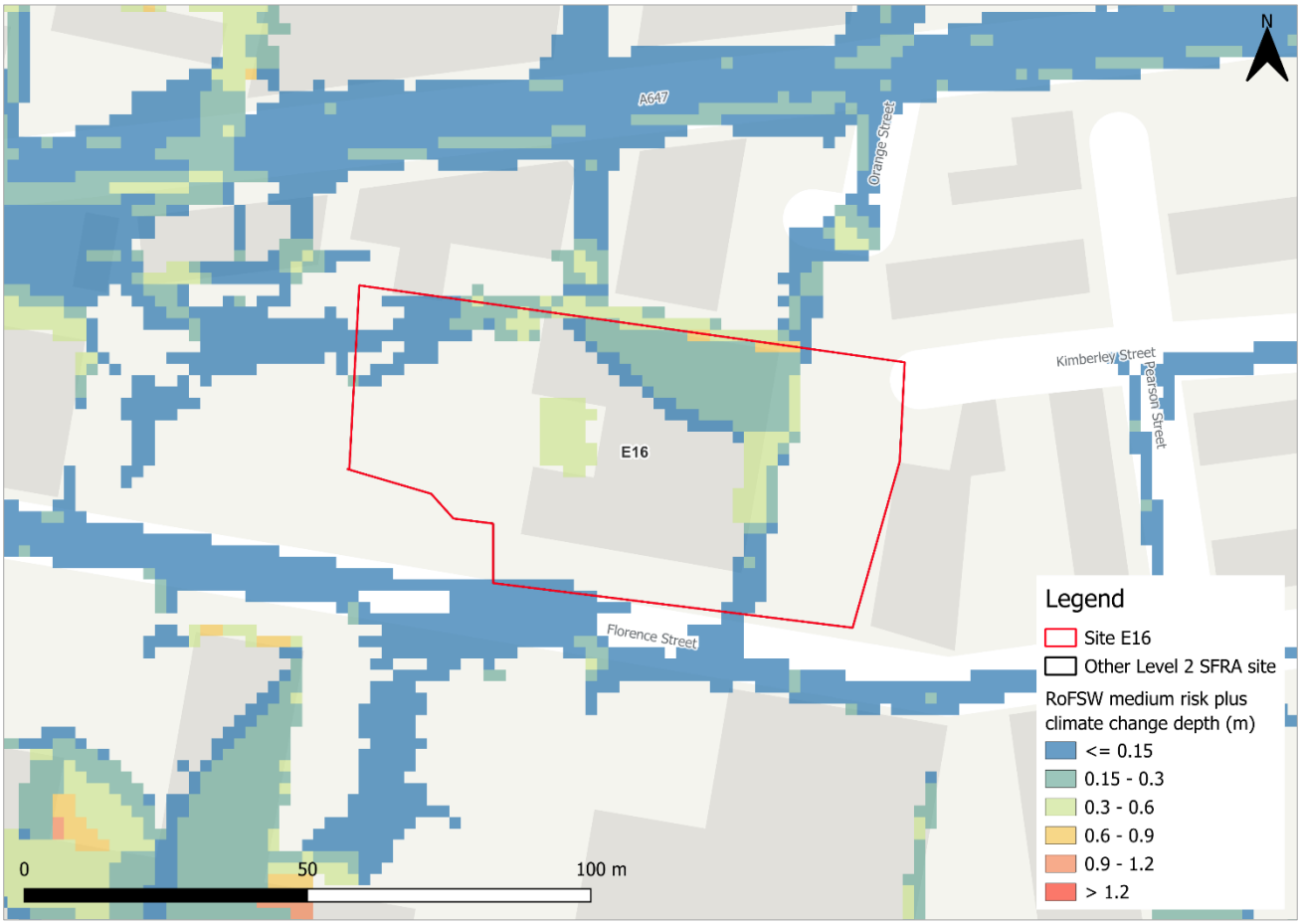



Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)




Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is largely very low. However, there is significant risk to the northern site boundary during all events. Safe access and escape should achievable via Florence Street given the shallow depths of flooding along the road during all three events.
- The modelled medium risk surface water climate change outputs indicate a greater risk than the present day low risk event. Safe access and escape should be achievable via Florence Street given the shallow depths of flooding along the road during this event.
- A full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. Runoff rates should be restricted to brownfield rates or betterment on existing if possible. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.

- The use of appropriate SuDS should be investigated. There is no risk of groundwater emergence at the site judging from the Groundwater Emergence Map in Figure 4-1, therefore infiltration SuDS are likely to be suitable across the entire site.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications.

There is no risk of groundwater emergence across the site.




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Flood risk from canals

The site is not likely to be at risk from a canal breach.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk of reservoir flooding.

## 5.3 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded or blocked, or it cannot discharge due to high water levels in the receiving watercourse.

According to Yorkshire Water's records, there have been no incidents of sewer flooding in the area over the last two years.

## 5.4 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

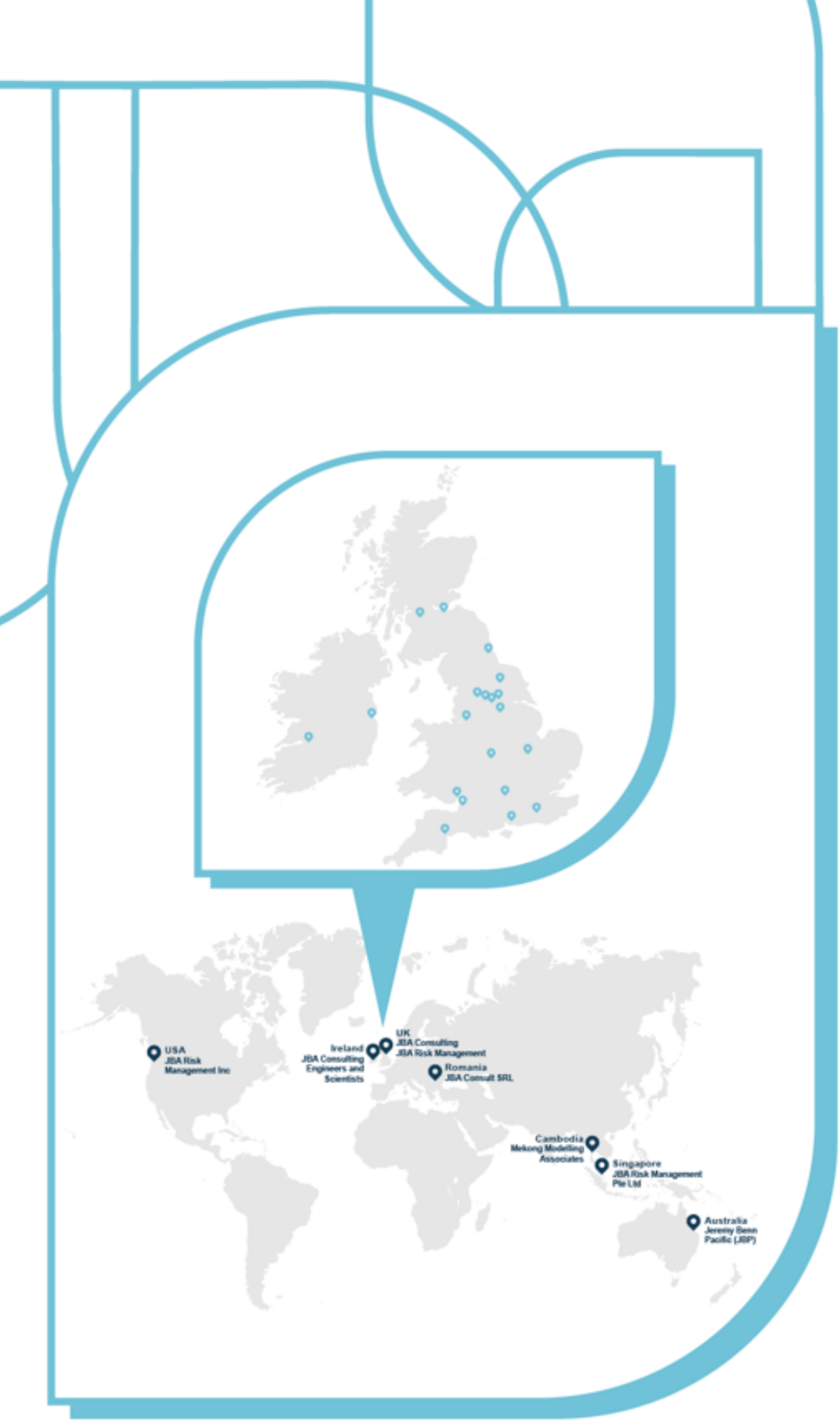
- It should be appropriate to develop this site for less vulnerable purposes given its location in Flood Zone 1. However, there is significant risk from surface water in the medium and low risk events, currently affecting the northern and eastern sides of the site. A drainage strategy will be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development.
- Surface water should be retained onsite. This may require surface water modelling based on layout plans and consultation with the LLFA on required runoff rates, likely to be brownfield or betterment. The use of infiltration SuDS should be investigated for suitability across the site.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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# Bradford Level 2 Strategic Flood Risk Assessment - Site E40

## Final Draft

May 2025

Prepared for:

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

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| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

| | |
|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Kaylyn Carroll of JBA Consulting carried out this work.

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## Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E40. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E40

- Location: Former site of the Bradmet Centre, Usher Street, BD4 7DS
- Existing site use: Brownfield, used for car parking
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 0.38 hectares
- Proposed development impermeable area: 0.32 hectares (assumed 85% impermeable area)
- Watercourse: N/A
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk
    - Modelling of latest EA climate change allowances for peak rainfall intensities




Figure 1-1: Existing site location boundary

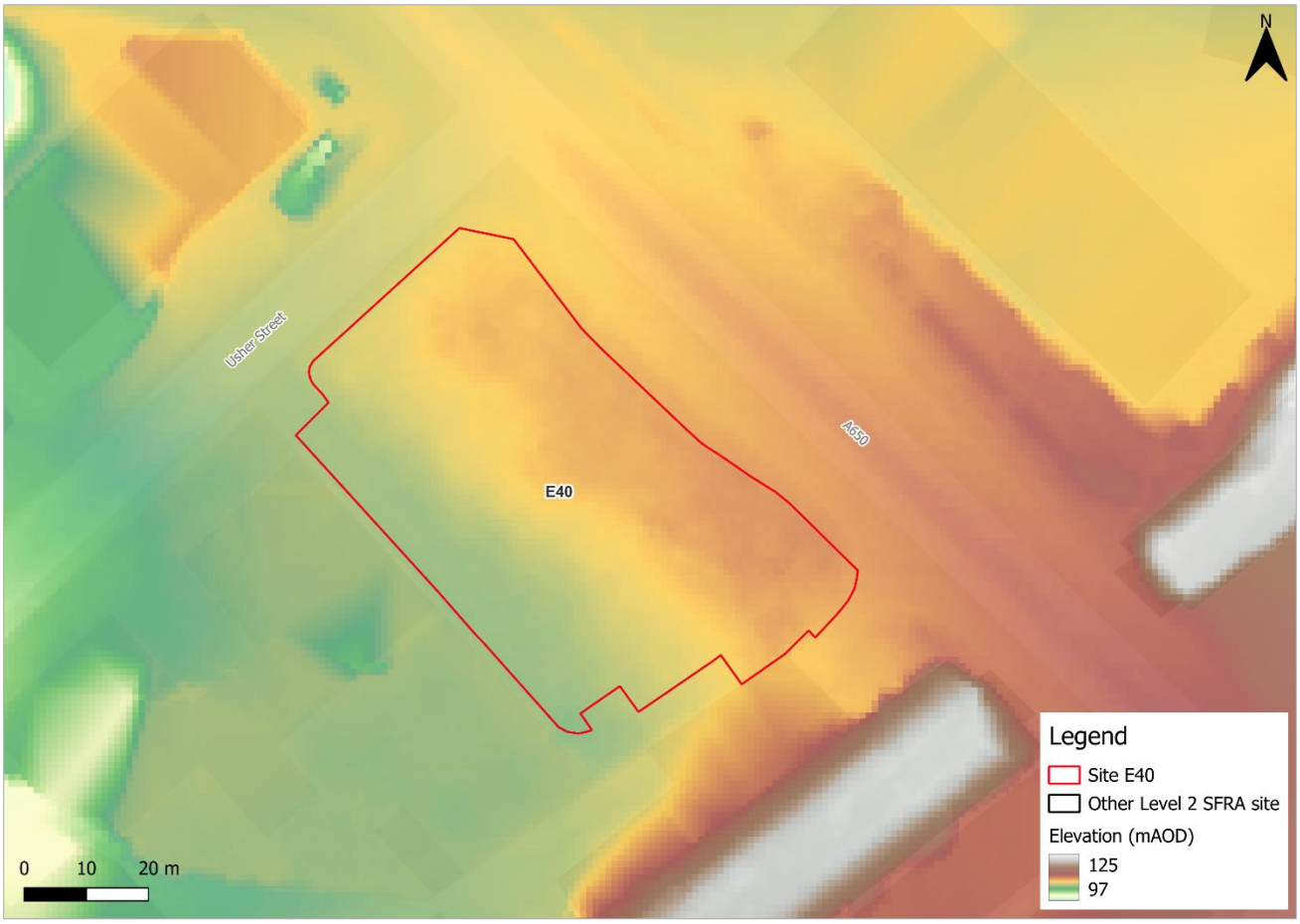



Figure 1-2: Topography




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is wholly within Flood Zone 1 indicating the site is at low risk of flooding from rivers.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

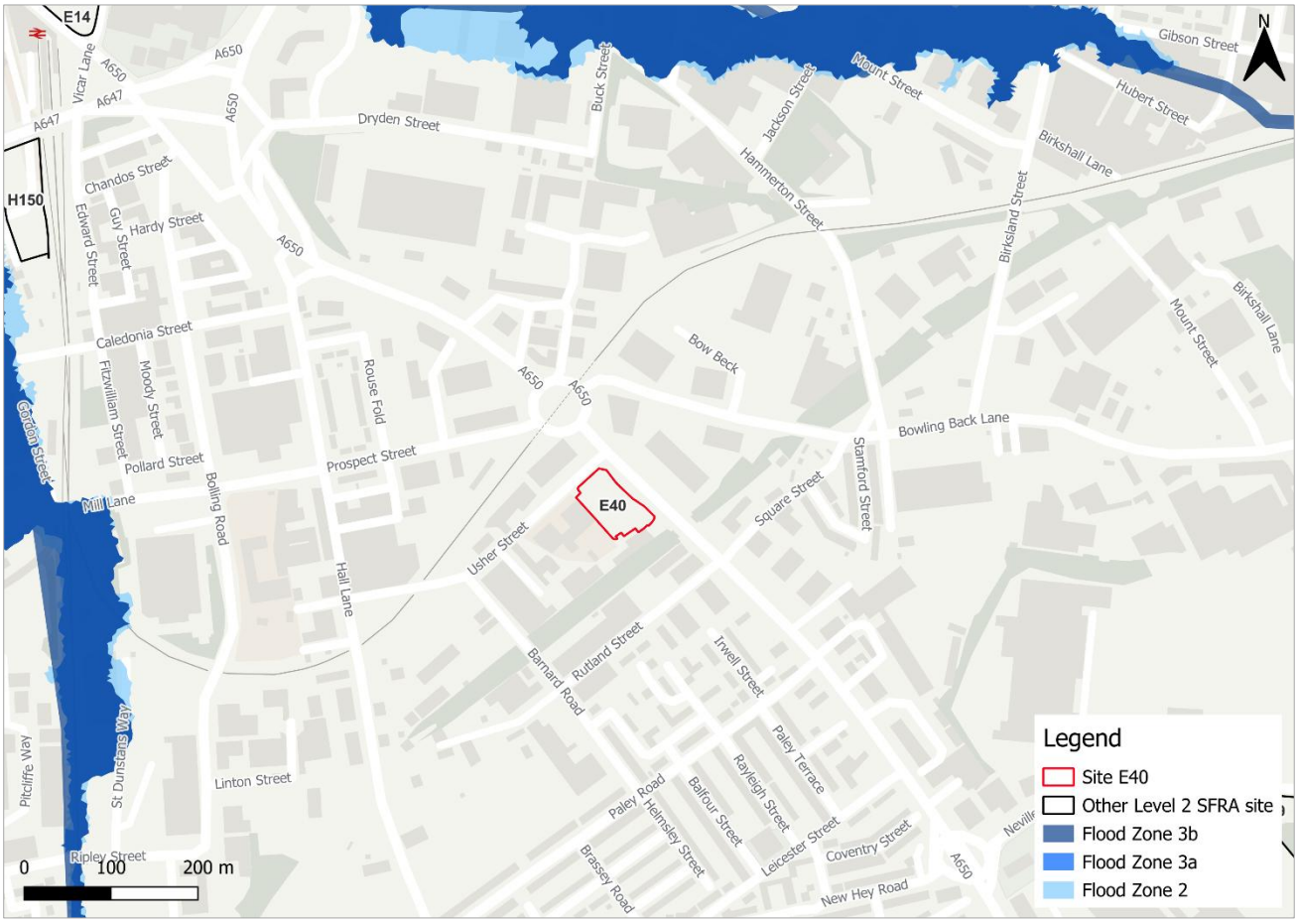



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.2.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events at the site.

## 2.4 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is also not located within a FAA.

Based on available information, safe access and escape routes could likely be achieved during a flood event via the A650 and Usher Street during the high and medium risk event. Further investigation is required to identify safe access and escape routes from the site during the low risk event due to surface water risk.

## 2.5 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1 indicating the site is at low risk of flooding from rivers.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low, with 69% of the site at very low risk. 17% of the site is at low risk, 6% at medium risk and a further 8% at high risk. This is shown in Table 3-1. Given this site has now been fully cleared the surface RoFSW mapping is unlikely to be representative of current risk from surface water on this site.

However, the mapping shows that in the high risk event, surface water risk is located along the southern and western site boundary. In the medium risk event, there is a flow path along the A650 which flows through the south of the site. In the low risk event, surface water risk is located along all site boundaries.

Greatest flood depths within the site in the medium risk event are between 0.6m and 0.9m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via A650 and Usher Street in the high and medium risk events.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 69 | 17 | 6 | 8 |




Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)




Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

Given this site has now been fully cleared, the surface RoFSW mapping is unlikely to be representative of current risk from surface water on this site. However, Figure 3-3 shows

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

the modelled surface water flood depths for the medium risk event plus 45% climate change. Risk is modelled to be greater than the present day medium risk event, yet similar risk to the present day low risk event. Maximum depths are 0.6m and 0.9m (Figure 3-3) with some areas of significant hazard (Figure 3-4).




Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)




Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Given this site has now been fully cleared and the land regraded, the surface RoFSW mapping is unlikely to be representative of current risk from surface water on this site. It is recommended that surface water modelling is carried out for this site as part of a drainage strategy for the site. Runoff rates should be restricted to brownfield rates or betterment on existing if possible.
- The use of appropriate SuDS should be investigated. There is no risk of groundwater emergence to the majority of the site judging from the Groundwater Emergence Map in Figure 4-1, therefore infiltration SuDS are likely to be suitable across most of the site.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications. The site is in an area where there is no risk of groundwater emergence. Therefore, groundwater conditions should be suited to infiltration SuDS.




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Flood risk from canals

The site is not at risk from canal breach.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk from a reservoir breach.

## 5.3 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded or blocked, or it cannot discharge due to high water levels in the receiving watercourse.

According to Yorkshire Water's records, there have been no incidents of sewer flooding in the area over the last two years.

## 5.4 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

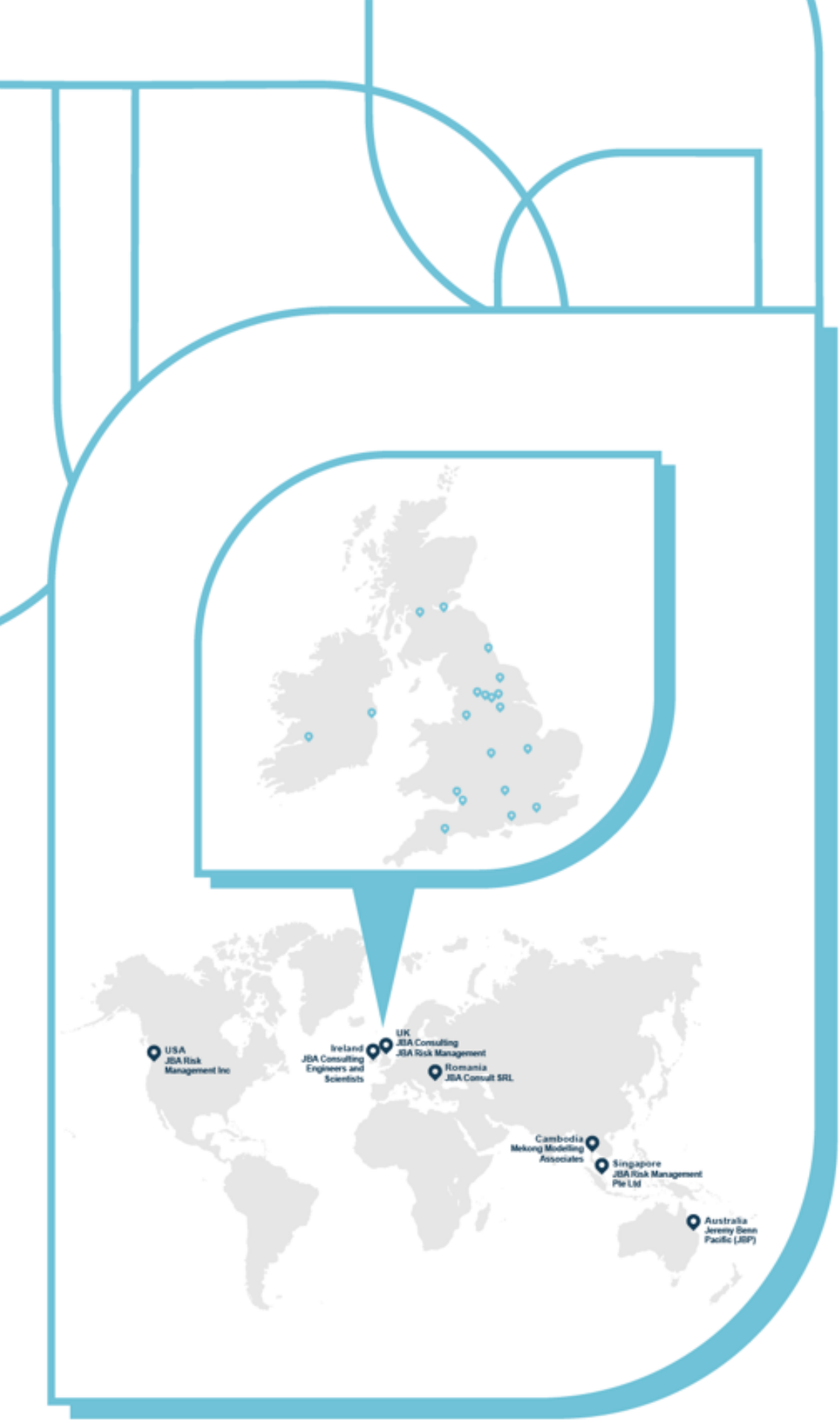
- It should be appropriate to develop this site for less vulnerable purposes given its location within Flood Zone 1.
- Given this site has now been fully cleared, the RoFSW mapping is unlikely to be representative of current risk from surface water on this site. It is recommended that surface water modelling is carried out for this site as part of a drainage strategy for the site. Runoff rates should be restricted to brownfield rates or betterment on existing if possible.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

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# Bradford Level 2 Strategic Flood Risk Assessment - Site E41

## Final Draft

**May 2025**

**Prepared for:**

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

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| Prepared by | Kaylyn Carroll BSc<br>Assistant Analyst |
| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

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|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Kaylyn Carroll of JBA Consulting carried out this work.

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The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by JBA has not been independently verified by JBA, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between 18 November 2024 and 16 May 2025 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

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## Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E41. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E41

- Location: Land South NuFarm Chemical Works
- Existing site use: Agricultural land
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 30.3 hectares
- Proposed development impermeable area: 25.7 hectares (assumed 85% impermeable area)
- Watercourse: Stubs Beck, tributary of River Spen
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk

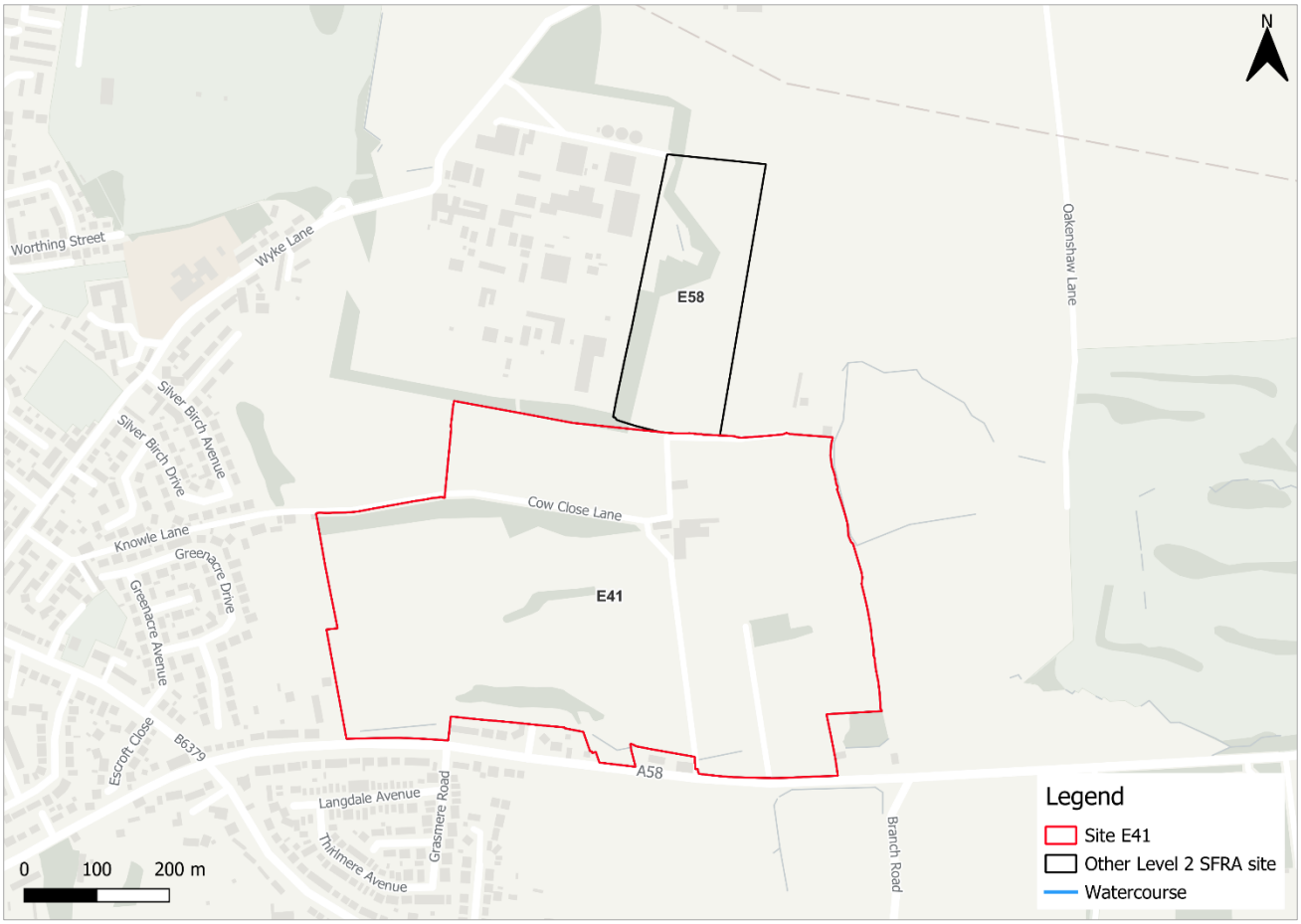



Figure 1-1: Existing site location boundary

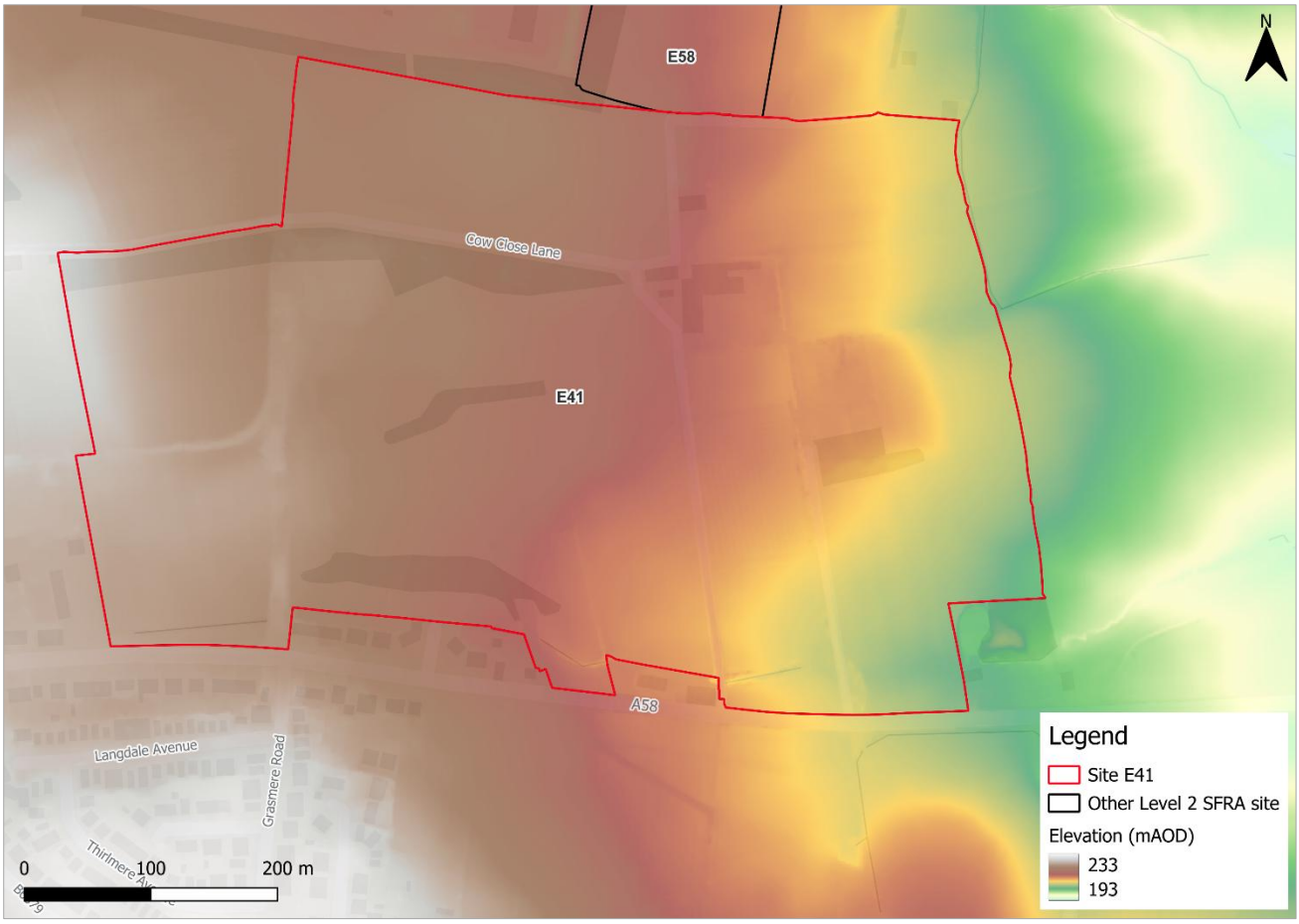



Figure 1-2: Topography

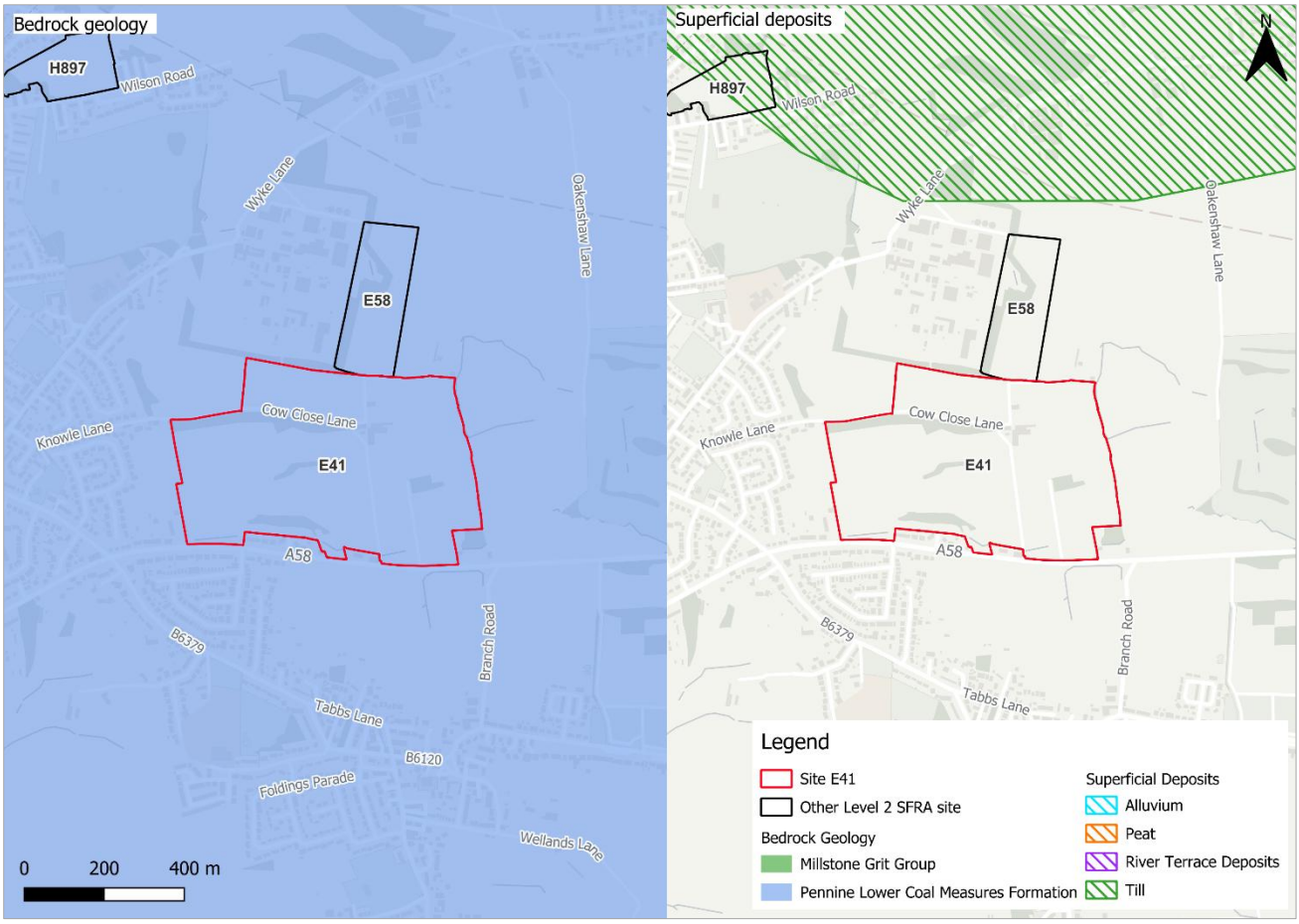



Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on

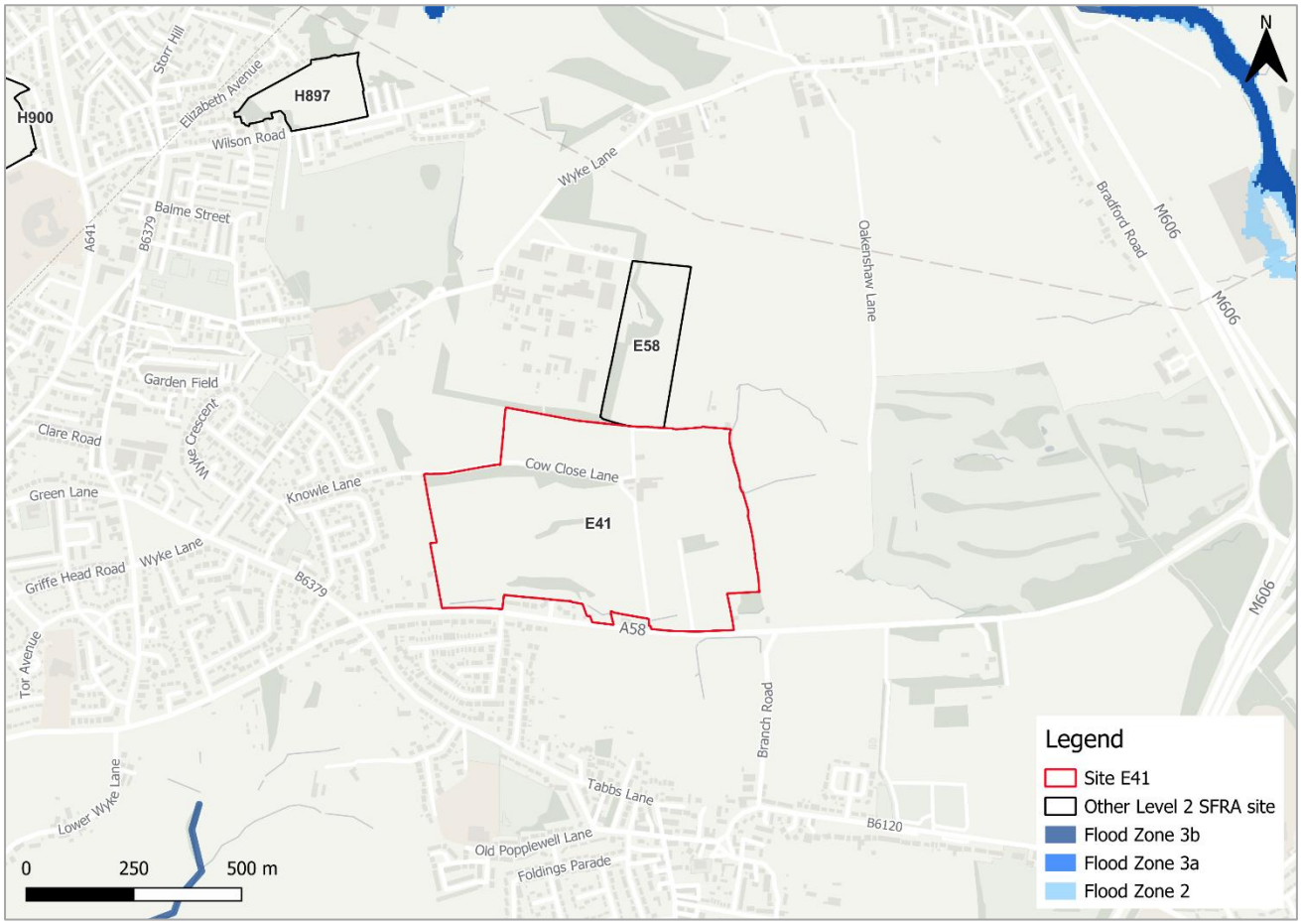



Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is wholly within Flood Zone 1 indicating the site is at low risk of flooding from rivers. However, mapping and LiDAR imagery (Figure 1-2), indicate that Stubs Beck may be culverted along the southern boundary of the site. This should be confirmed, and the exact location ascertained, through site investigation. Potential flood risk from this watercourse may need to be ascertained at the FRA stage. No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

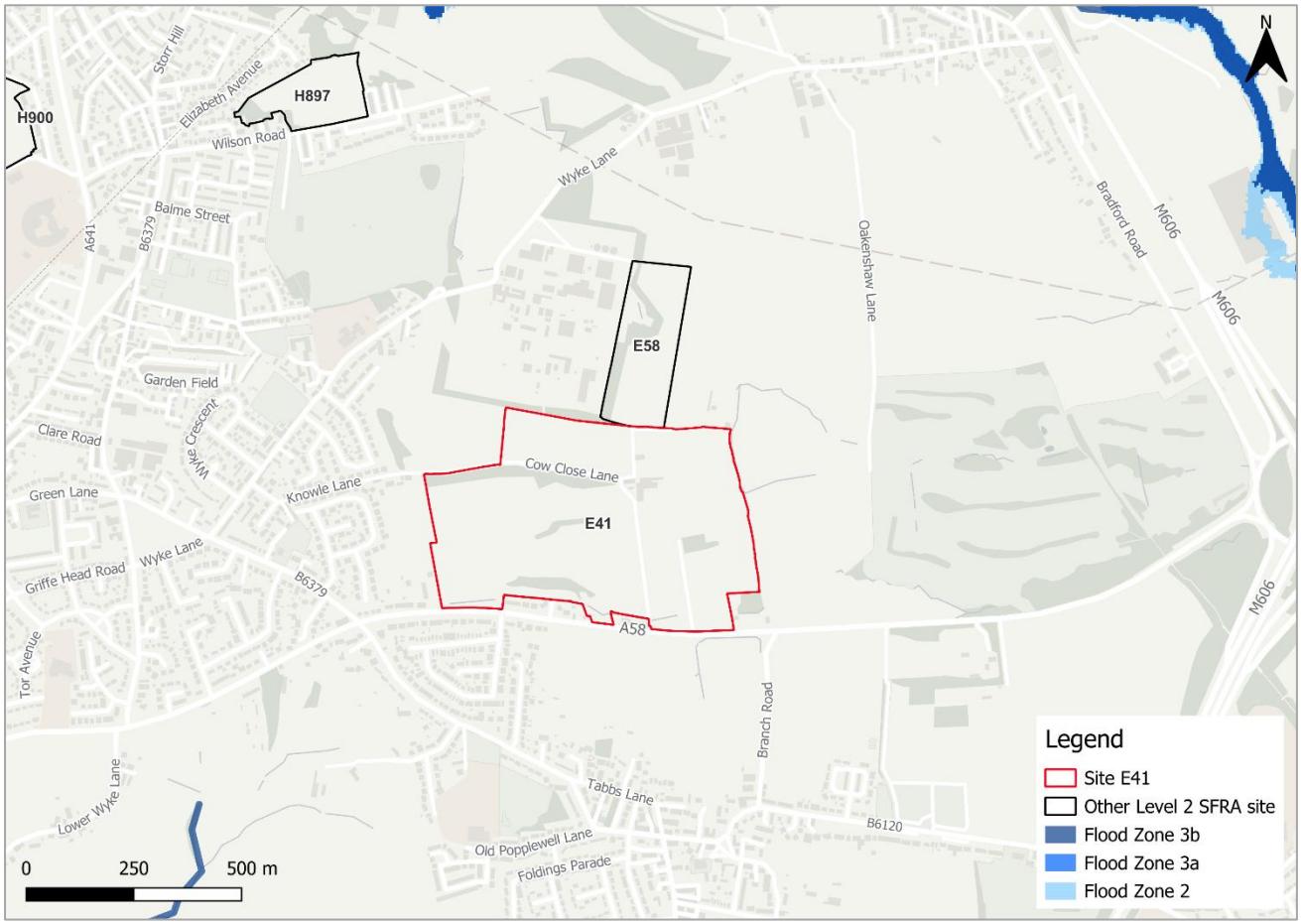



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. These areas are shown in Figure 2-2. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP. There is potential for riparian tree planting in the south and the east of the site and wider catchment tree planting in the south. There is also potential for run-off attenuation features within the 3.3% and 1% AEP events.

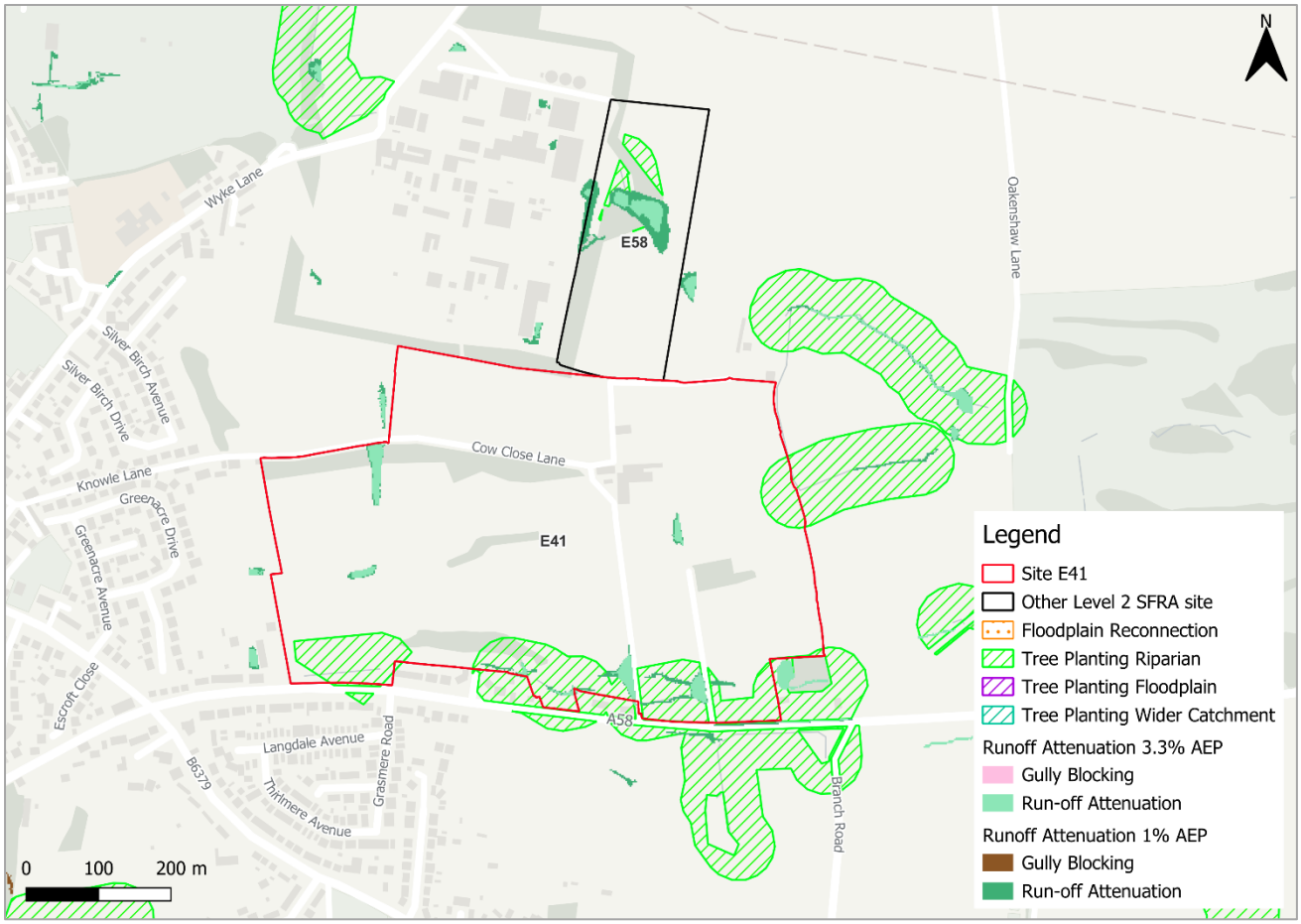



Figure 2-2: Natural Flood Management (NFM) potential mapping

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events at the site.

## 2.4 LLFA flood incidents

The LLFA have record of one flood incident west of the site (upstream of watercourse), which occurred in 2021. Developers should contact the LLFA for further information at the FRA stage, to assess potential flood risk to the site associated with these incidents.

## 2.5 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is also not located within a FAA.

Based on available information, safe access and escape routes could likely be achieved during a flood event via Cow Close Lane during all events.

## 2.6 Observations, mitigation options and site suitability - fluvial

- The site is wholly located within Flood Zone 1, indicating it is at low risk of flooding from rivers.
- Potential flood risk from the watercourse shown in mapping to enter the site may need to be ascertained at the FRA stage. No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse.
- If a watercourse is identified, it may need to be modelled to quantify the risk from any culverts.
- Assuming a culvert is located beneath the site, opportunities for opening up the culvert should be explored for inclusion in site design as a blue green corridor. This would remove any residual risk of flooding to the site as a result of culvert failure or blockage.
- Were development of this site to proceed, given the proximity of this site to neighbouring sites E58 and H897, it would be prudent to formulate a strategy to develop these sites in tandem and for consultation between each developer to take place to ensure a joined-up approach for sustainable development is in place.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk is predominantly very low with 92% of the site being at very low risk. 5% of the site is at low risk, 1% at medium risk and a further 2% at high risk. This is shown in Table 3-1.

In the high and medium risk events, there is scattered ponding across the site confined within topographic low spots. In the medium risk event, there is a flow path into the site from the south east.

Greatest flood depths within the site in the medium risk event are >1.2m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Cow Close Lane during all events.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 92 | 5 | 1 | 2 |

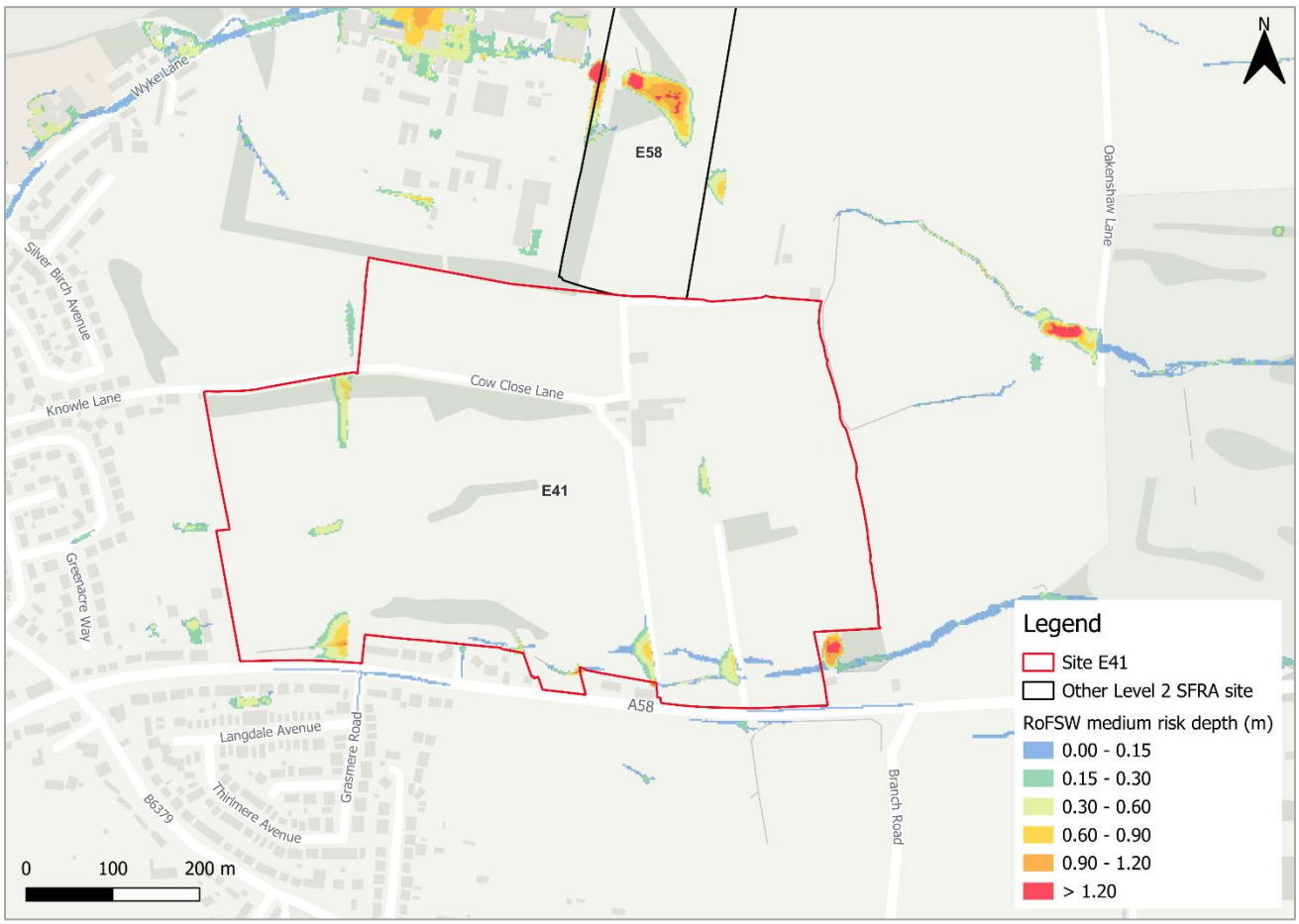



Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

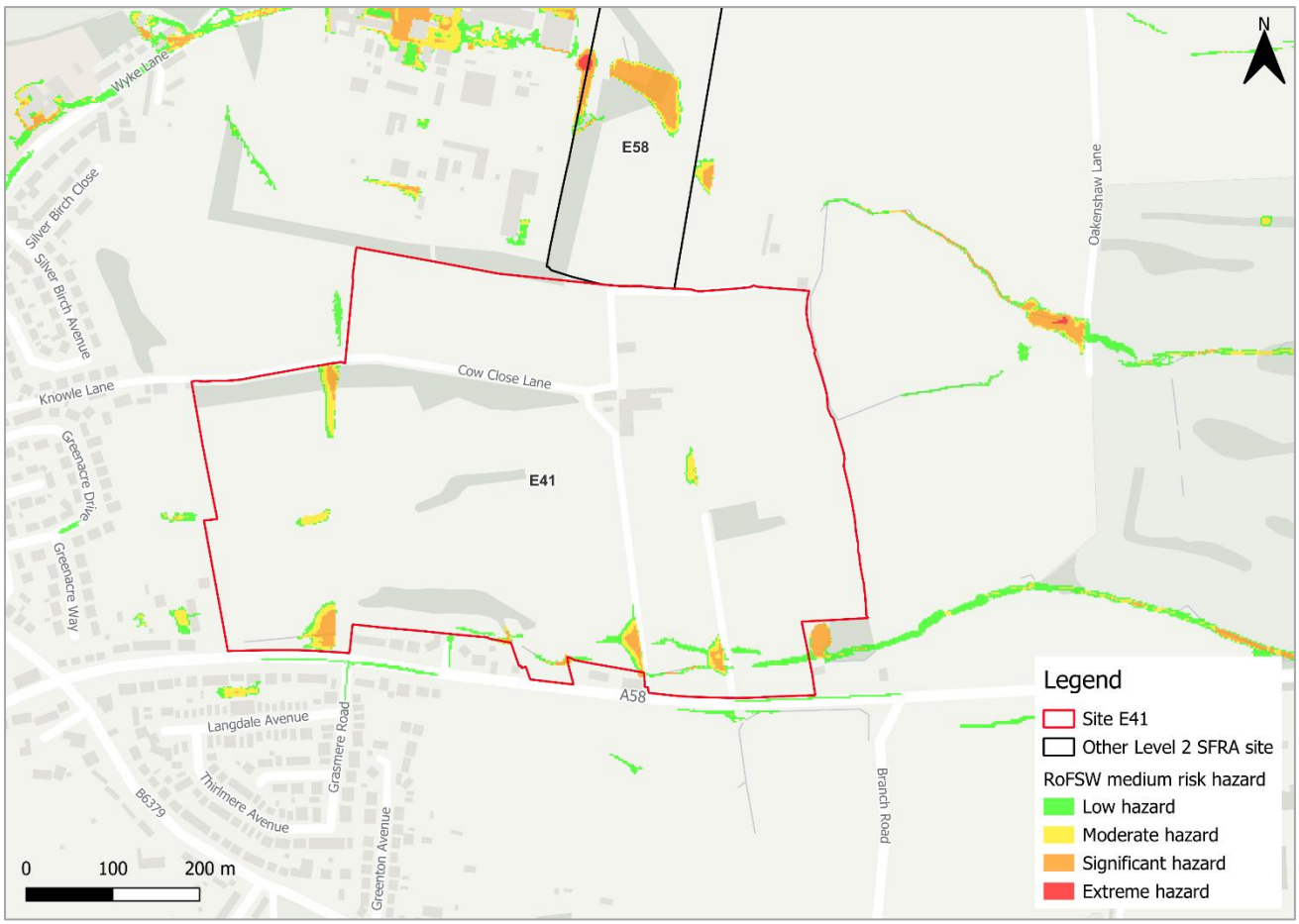



Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

Figure 3-3 shows the modelled surface water flood depths for the medium risk event plus 45% climate change. Risk is modelled to be greater than the present day medium risk, yet

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

similar to the low risk present day event. Maximum depths are >1.2m (Figure 3-3) with some areas of significant hazard (Figure 3-4).

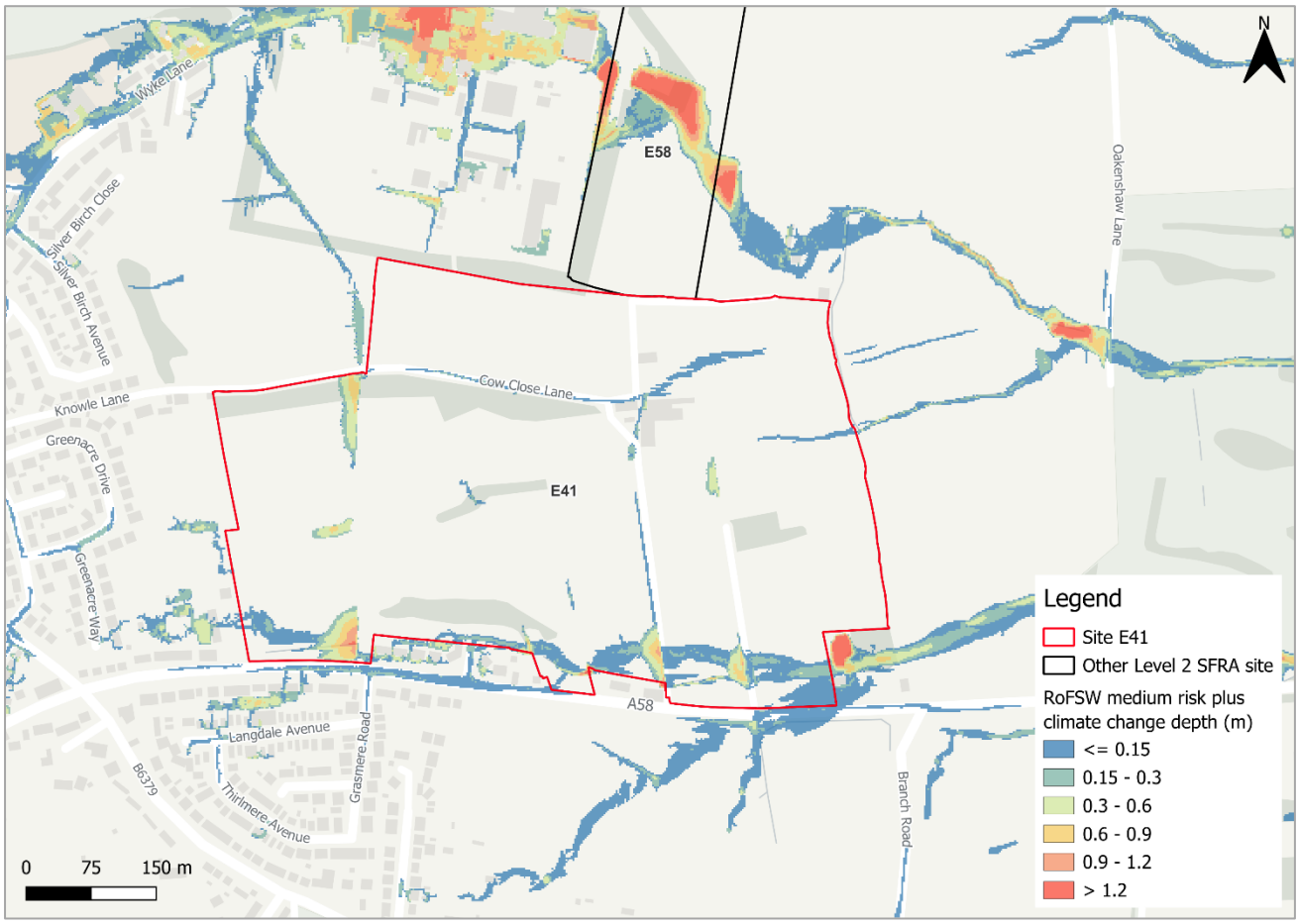



Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)

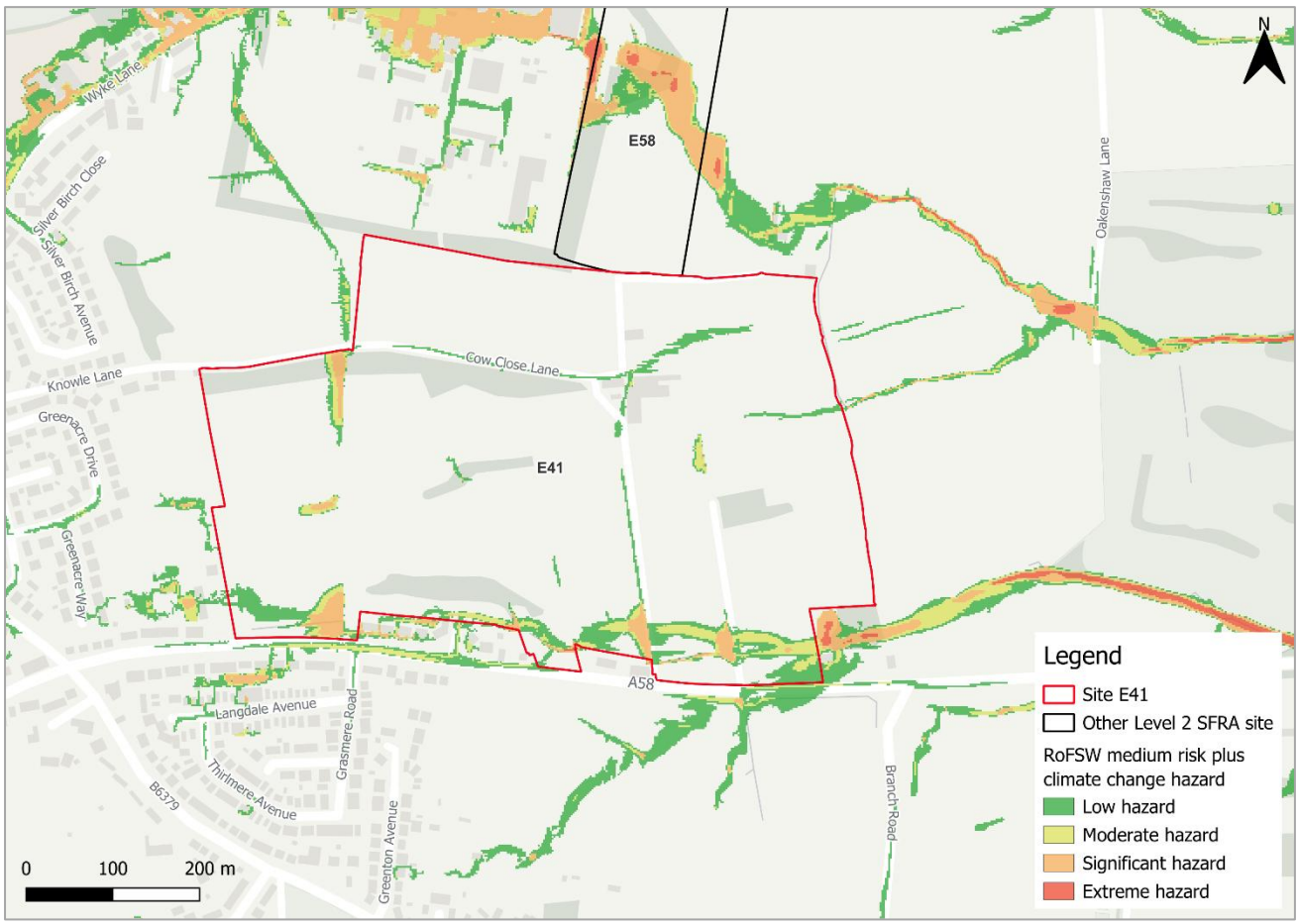



Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Current and future risk are shown to be sporadic and confined to topographic low spots across the site. Topographic flow routes and depressions should be considered and included in site design and ideally left in place to flood naturally when required. Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development.
- A full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. Runoff rates should be restricted to greenfield rates or betterment on existing if possible. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications. The risk of groundwater emergence varies across the site. There are areas of no risk and areas where groundwater may emerge at a moderate rate. Groundwater conditions may not be suited to infiltration SuDS across the majority of the site.

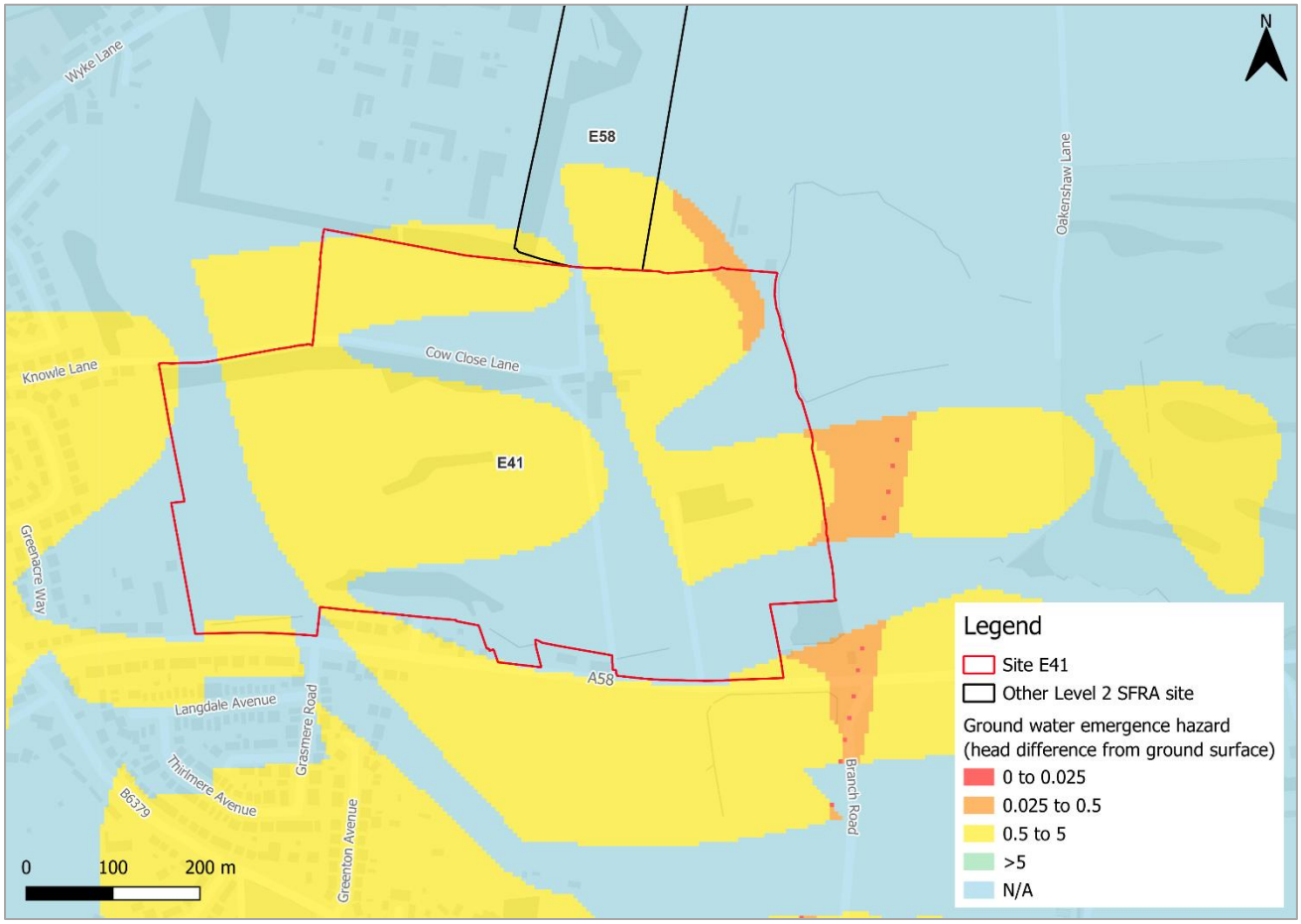



Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Potential culvert

Mapping and LiDAR imagery (Figure 1-2), indicates that there may be a watercourse culverted beneath the southern boundary of the site. If a watercourse is present, there will be a residual risk of flooding to the site were there to be a culvert failure or blockage. A model for this watercourse is not available. Therefore, residual risk could not be modelled for this Level 2 SFRA.

## 5.2 Flood risk from canals

The site is not at risk from a canal breach.

## 5.3 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk of flooding from reservoirs.

## 5.4 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded or blocked, or it cannot discharge due to high water levels in the receiving watercourse.

Yorkshire Water records indicate that there have been historical flood incidents in the area over the last two years. Developers should contact Yorkshire Water directly to check specific details at the FRA stage.

## 5.5 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.
- Mapping indicates there may be a watercourse culverted beneath the site. If present, the culvert represents potential residual risk of flooding to the site through culvert failure or blockage. This may need to be further investigated and modelled at the FRA stage.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

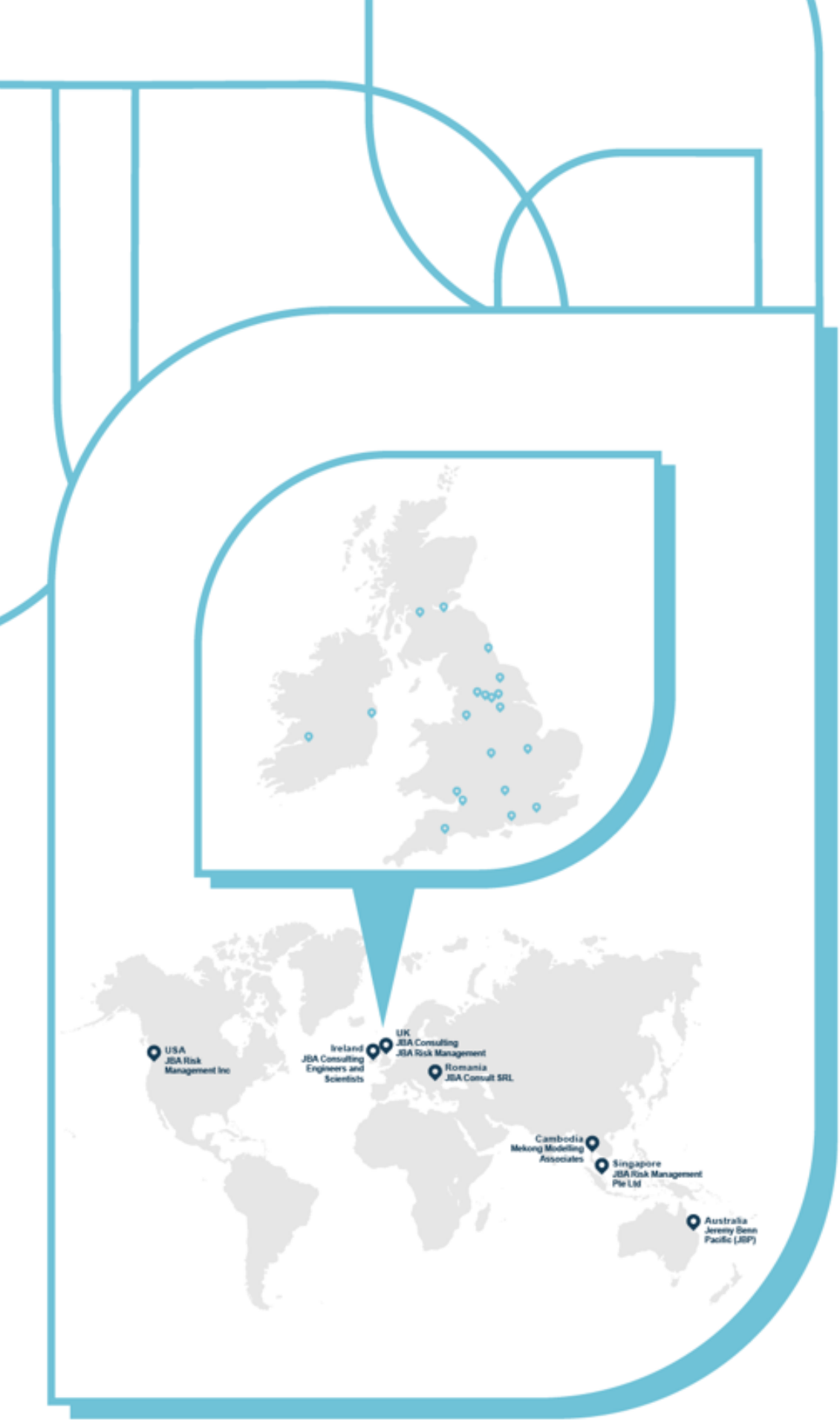
- It should be appropriate to develop this site for less vulnerable purposes given its location in Flood Zone 1.
- Mapping and LiDAR imagery indicates there may be a watercourse culverted beneath the site. If present, the culvert represents potential residual risk of flooding to the site through culvert failure or blockage. This may need to be further investigated and modelled at the FRA stage. Modelling should include for residual risk and options for culvert removal.
- No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse.
- Assuming the culvert is located beneath the site, opportunities for opening up the culvert should be explored for inclusion in site design as a blue green corridor. This would remove any residual risk of flooding to the site as a result of culvert failure or blockage.
- Surface water should be retained onsite. This will require detailed surface water modelling based on layout plans and detailed design and full consultation with the LLFA on required runoff rates, likely to be greenfield or betterment. The use of infiltration SuDS should be investigated for suitability across the site.
- Groundwater conditions across the site must be investigated further through the site specific FRA to ascertain groundwater levels and conditions.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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Registered Office
1 Broughton Park
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Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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Jeremy Benn Associates Limited

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# Bradford Level 2 Strategic Flood Risk Assessment - Site E54

## Final Draft

May 2025

Prepared for:

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

# Document Status

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| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

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## Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E54. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E54

- Location: Land to the East of Laisterdyke and South of Leeds Road
- Existing site use: Brownfield, cleared land
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 1.99 hectares
- Proposed development impermeable area: 1.69 hectares (assumed 85% impermeable area)
- Watercourse: N/A
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk

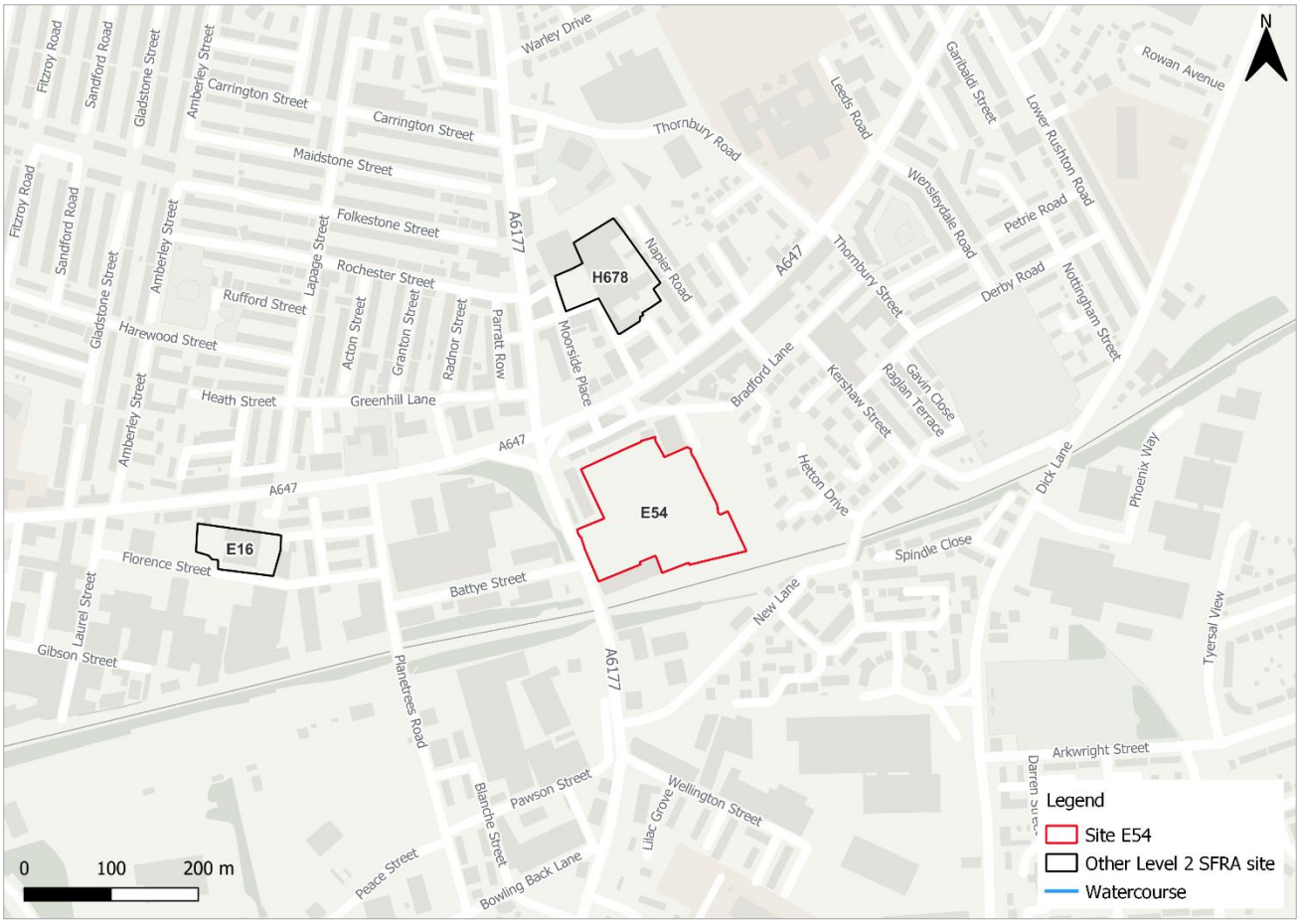



Figure 1-1: Existing site location boundary




Figure 1-2: Topography




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is wholly located within Flood Zone 1 indicating the site is at low risk of flooding from rivers.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

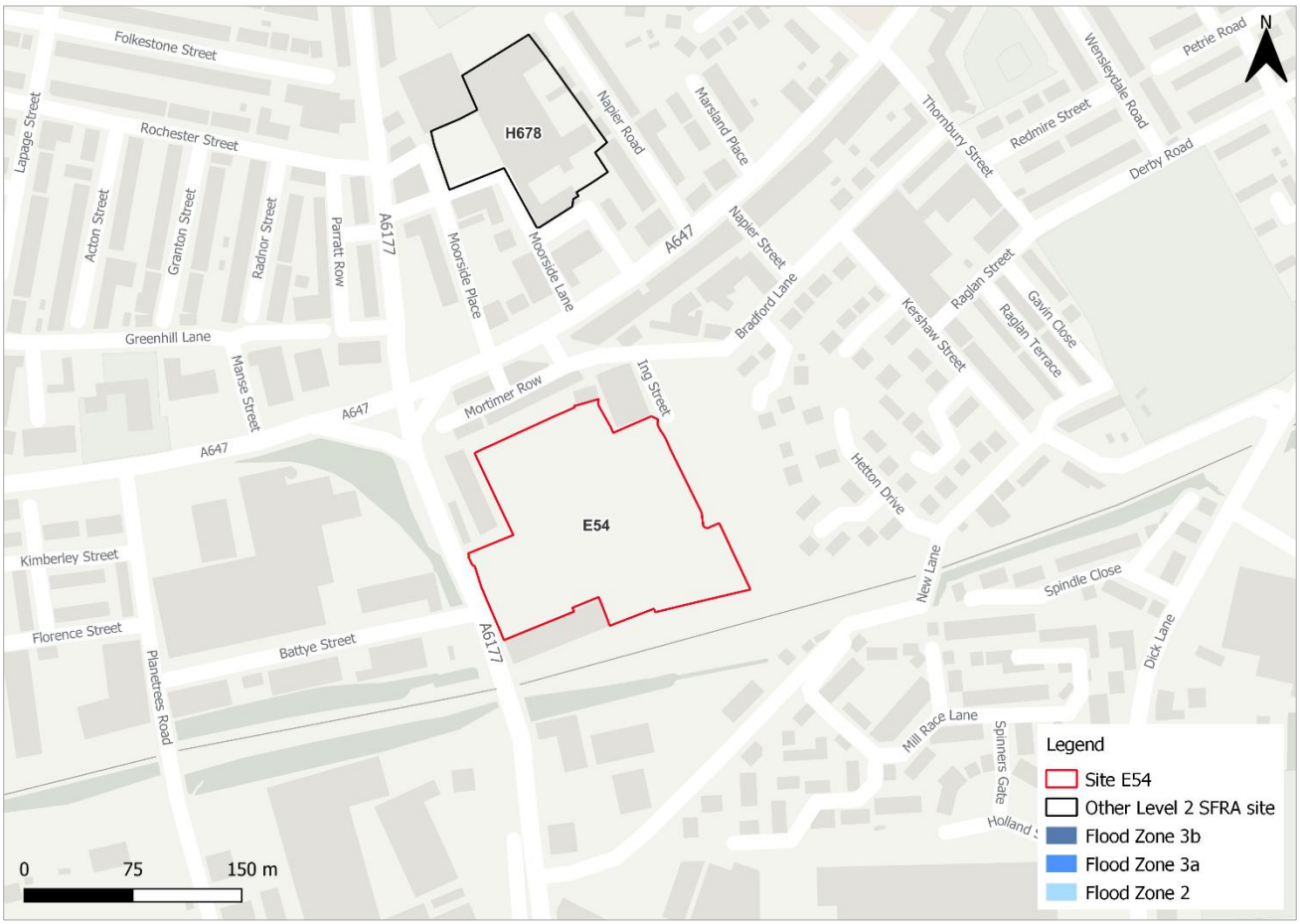



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.2.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events at the site.

## 2.4 LLFA flood incidents

The LLFA have record of a flood incident north of the site, which occurred in 2020. Developers should contact the LLFA for further information at the FRA stage, to assess potential flood risk to the site associated with these incidents.

## 2.5 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is not located within a FAA.

Based on available information, safe access and escape routes should be possible via multiple points surrounding the site.

## 2.6 Observations, mitigation options and site suitability - fluvial

- The site is wholly located within Flood Zone 1, indicating it is at low risk of flooding from rivers.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low with 90% of the site at very low risk. 3% of the site is at low risk, 2% at medium risk and a further 5% at high risk. This is shown in Table 3-1..

Mapping shows that in the high risk event, surface water is confined to the topographic low areas in the south east of the site. In the medium risk event, there are surface water flow paths along the A6177 and to the south of the site. In the low risk event, the risk of surface water is greater. There are flow paths along the A6177 to the west of the site, the A647 and Mortimer Row to the north of the site and to the south of the site though depths are shallow.

Greatest flood depths within the site in the medium risk event are between 0.3m and 0.6m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via the A6177 and Ing Street during the high and medium risk events.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 90 | 3 | 2 | 5 |

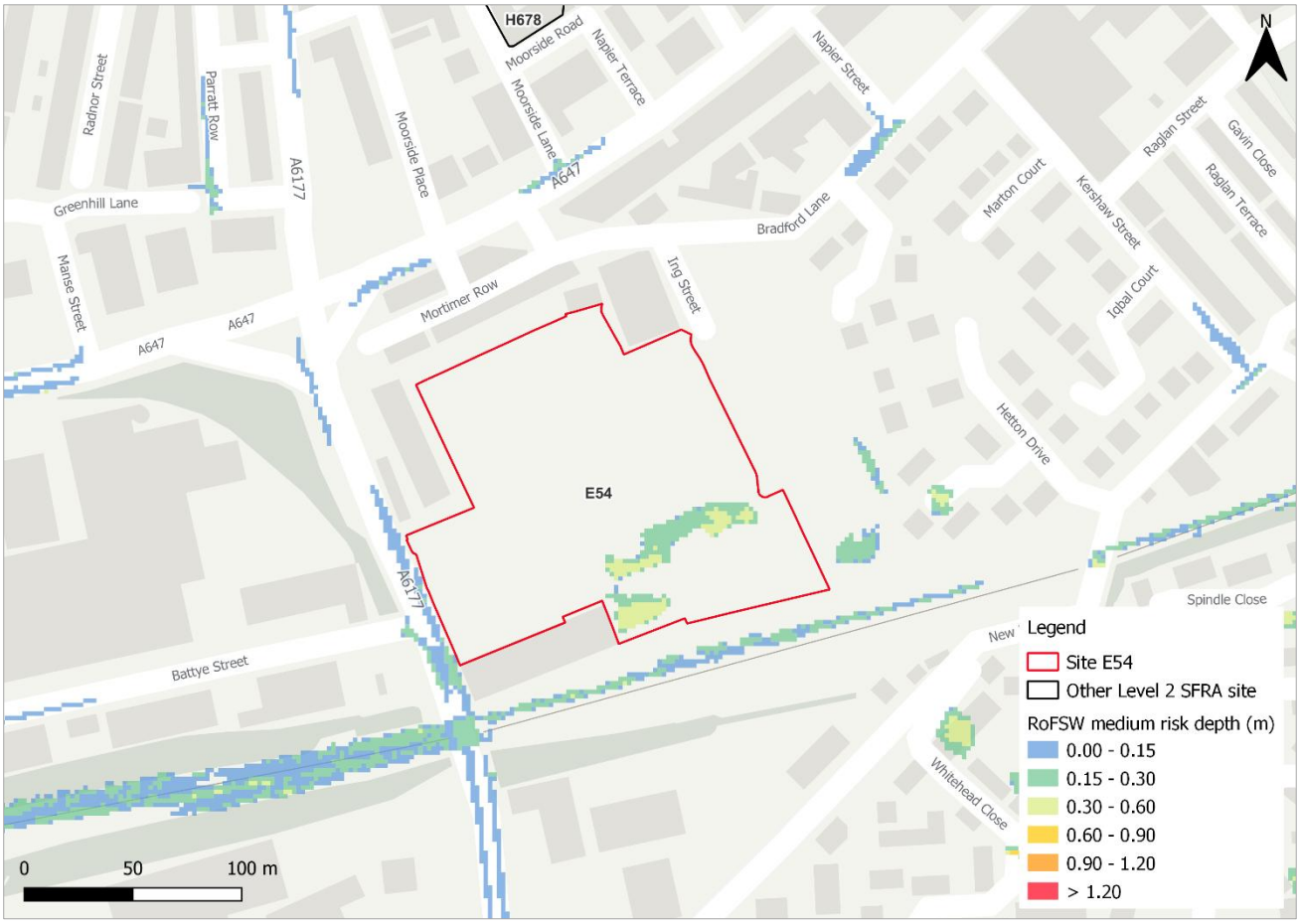



Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

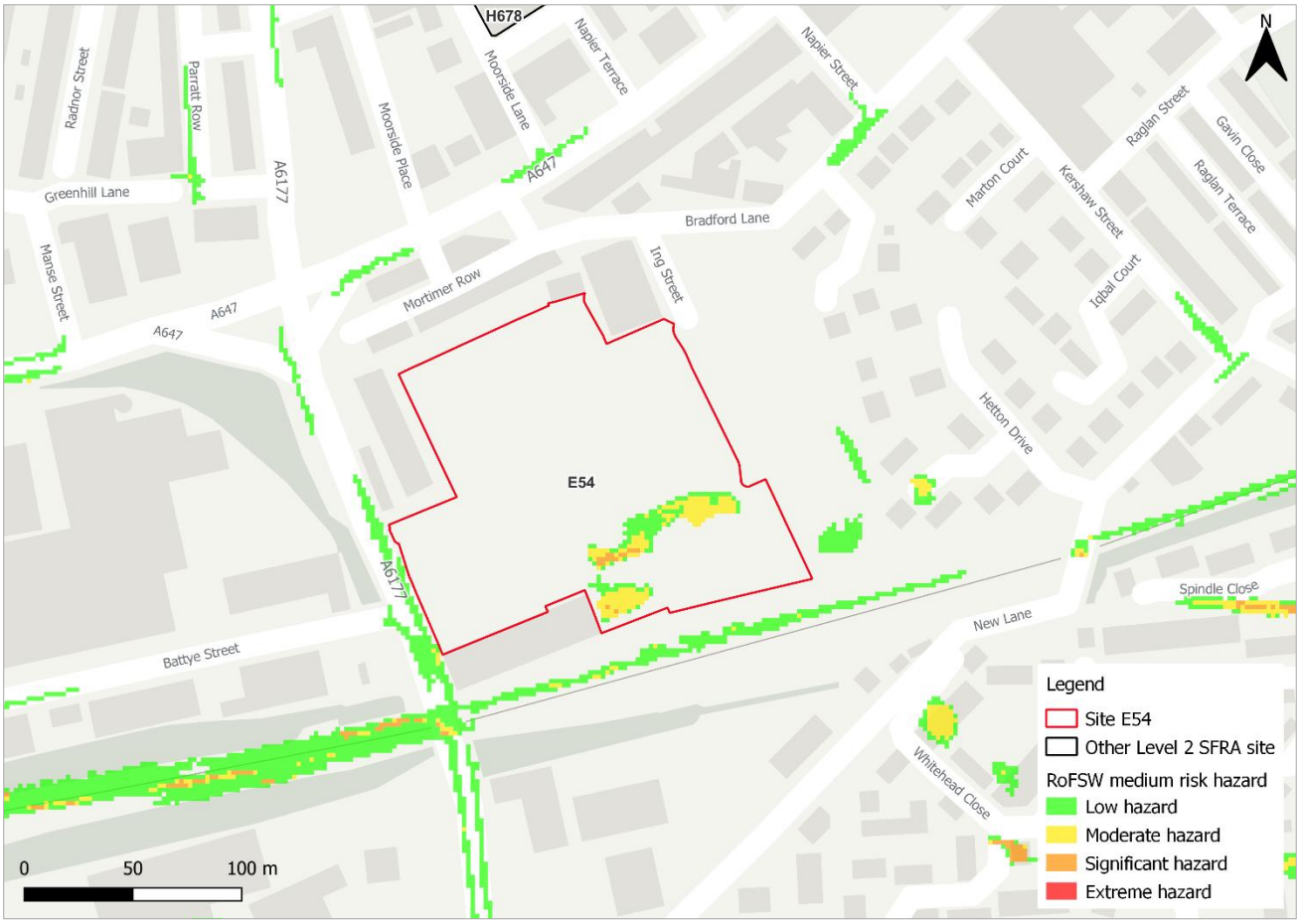



Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

However, Figure 3-3 shows the modelled surface water flood depths for the medium risk event plus 45% climate change. Risk is modelled to be greater than the present day

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

conditions, with the medium risk climate change event showing a similar, yet greater level of risk to the site than the medium present day risk event. Maximum depths are between 0.6m and 0.9m (Figure 3-3) with some areas of significant hazard (Figure 3-4).

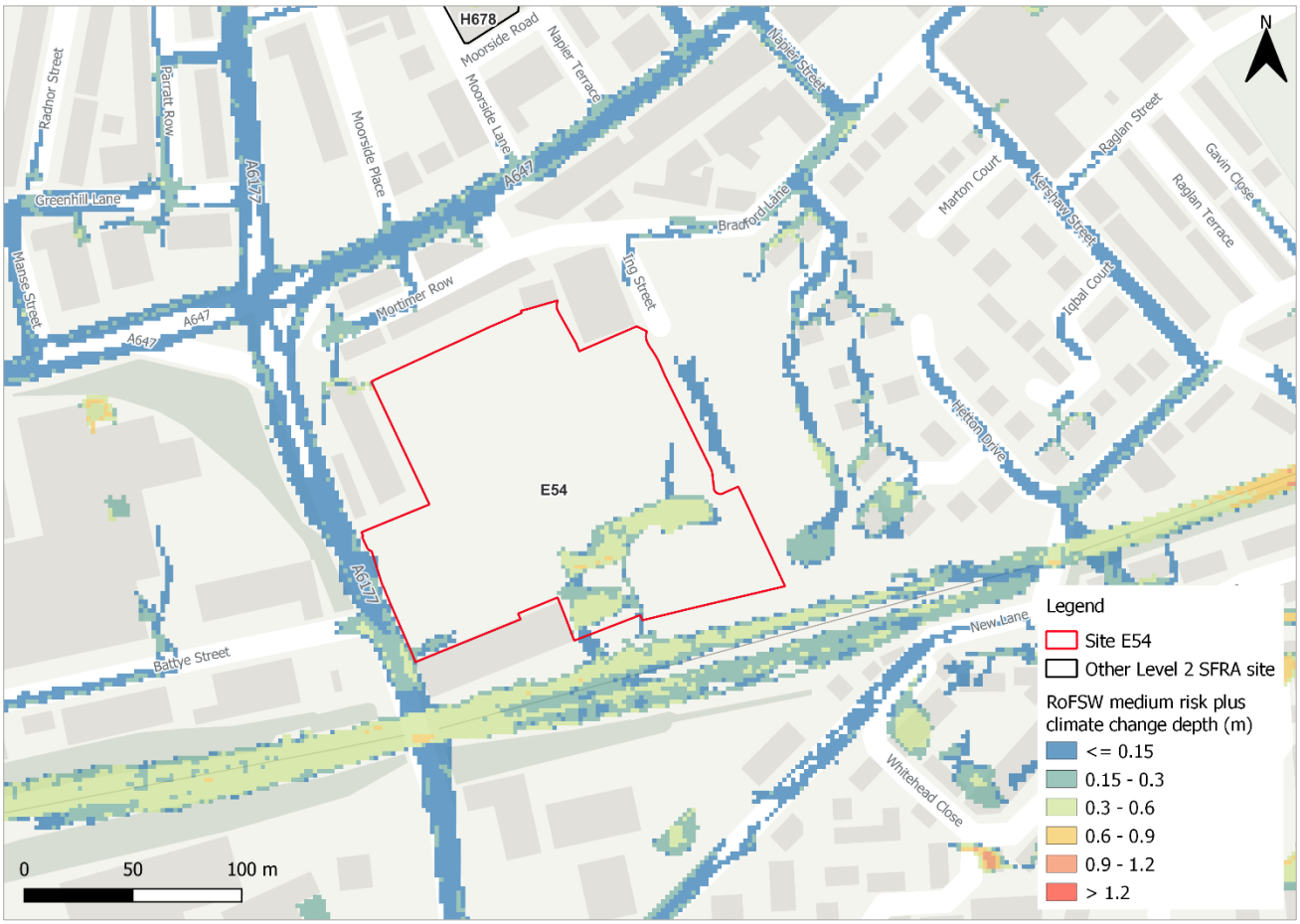



Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)

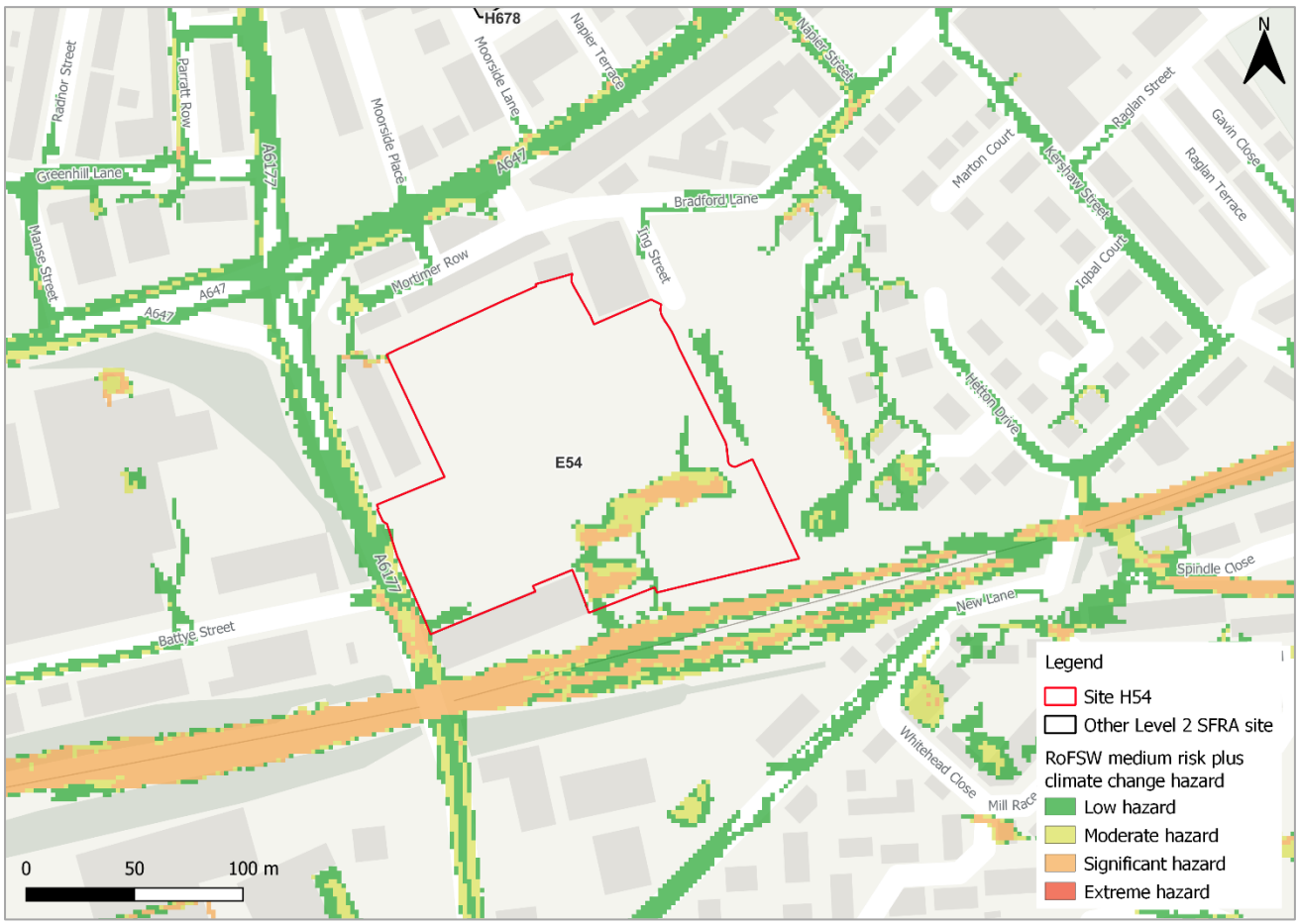



Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- The use of appropriate SuDS should be investigated. There is no risk of groundwater emergence to the majority of the site judging from the Groundwater Emergence Map in Figure 4-1, therefore infiltration SuDS are likely to be suitable across most of the site.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications. The majority of the site is in an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS. The very south eastern extent of the site has the risk of groundwater emerging at a moderate rate.

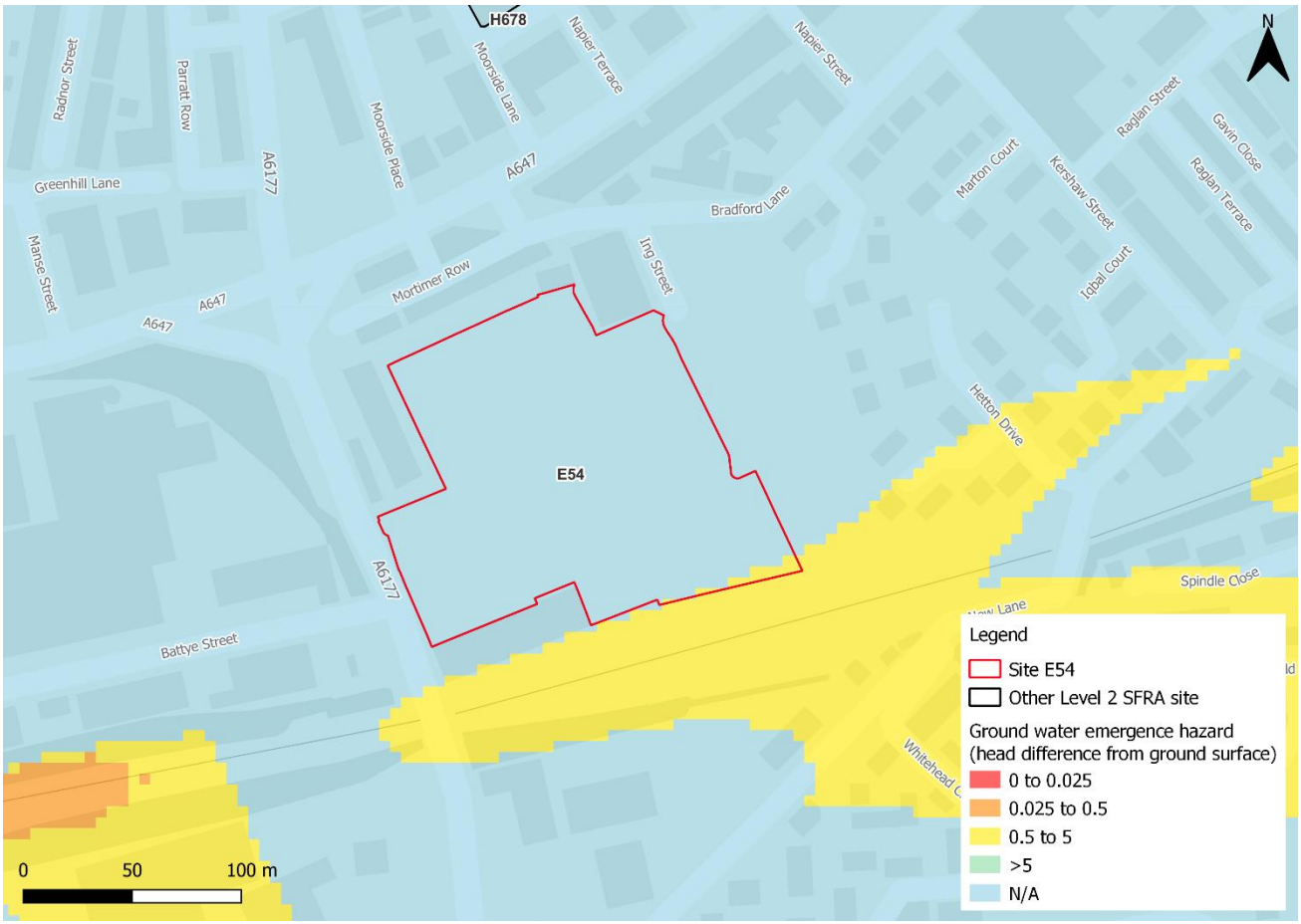



Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Flood risk from canals

The site is not likely to be at risk from a canal breach.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk from flooding from reservoirs.

## 5.3 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded or blocked, or it cannot discharge due to high water levels in the receiving watercourse.

According to Yorkshire Water's records, there have been no incidents of sewer flooding in the area over the last two years.

## 5.4 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

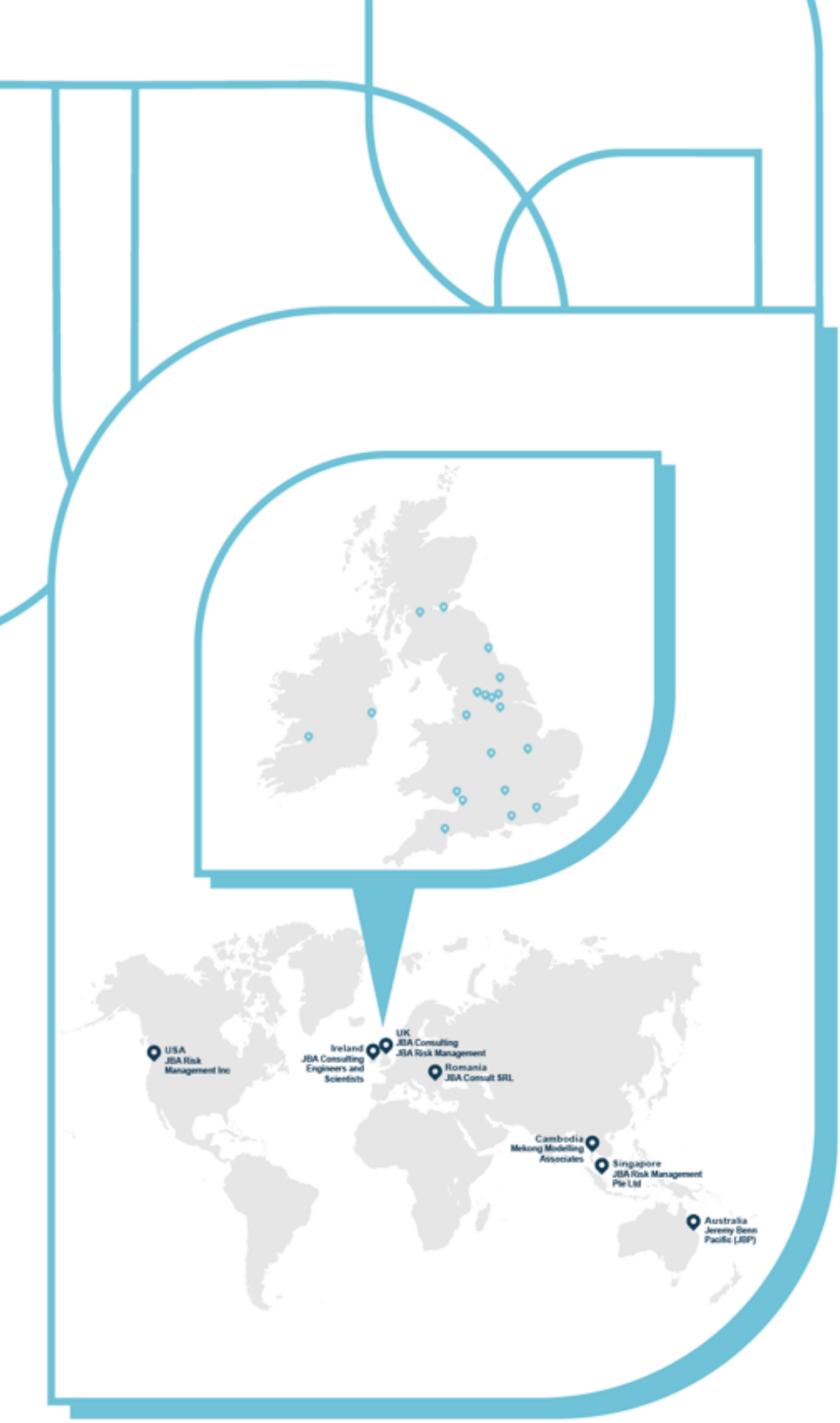
- It should be appropriate to develop this site for less vulnerable purposes given its location in Flood Zone 1.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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# Bradford Level 2 Strategic Flood Risk Assessment - Site E58

## Final Draft

May 2025

Prepared for:

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

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| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
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# Contract

| | |
|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Kaylyn Carroll of JBA Consulting carried out this work.

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between 18 November 2024 and 16 May 2025 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

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## Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E58. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E58

- Location: AH Marks Works, Wyke Lane
- Existing site use: Agricultural land
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 5.4 hectares
- Proposed development impermeable area: 4.6 hectares (assumed 85% impermeable area)
- Watercourse: N/A
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk

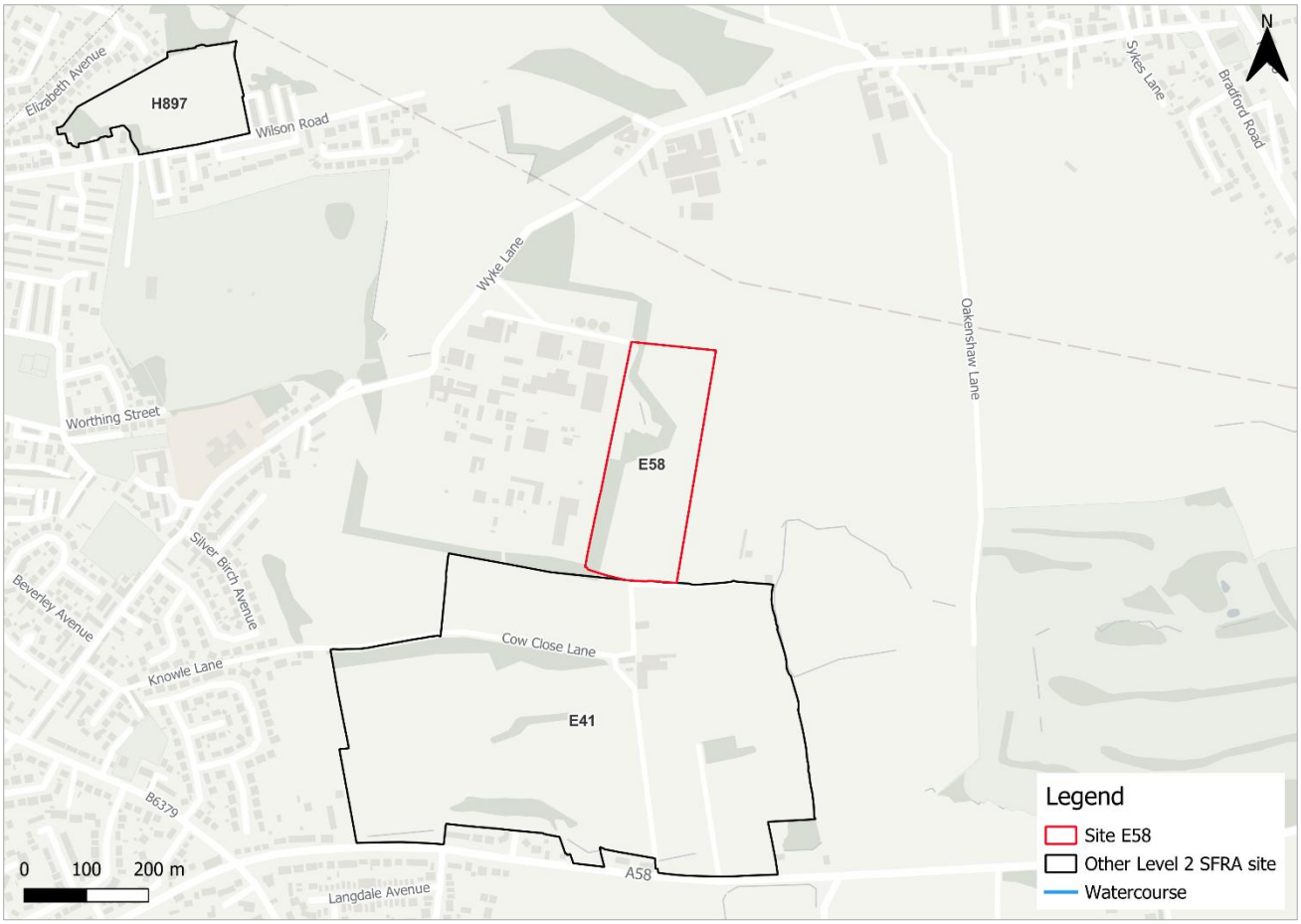



Figure 1-1: Existing site location boundary

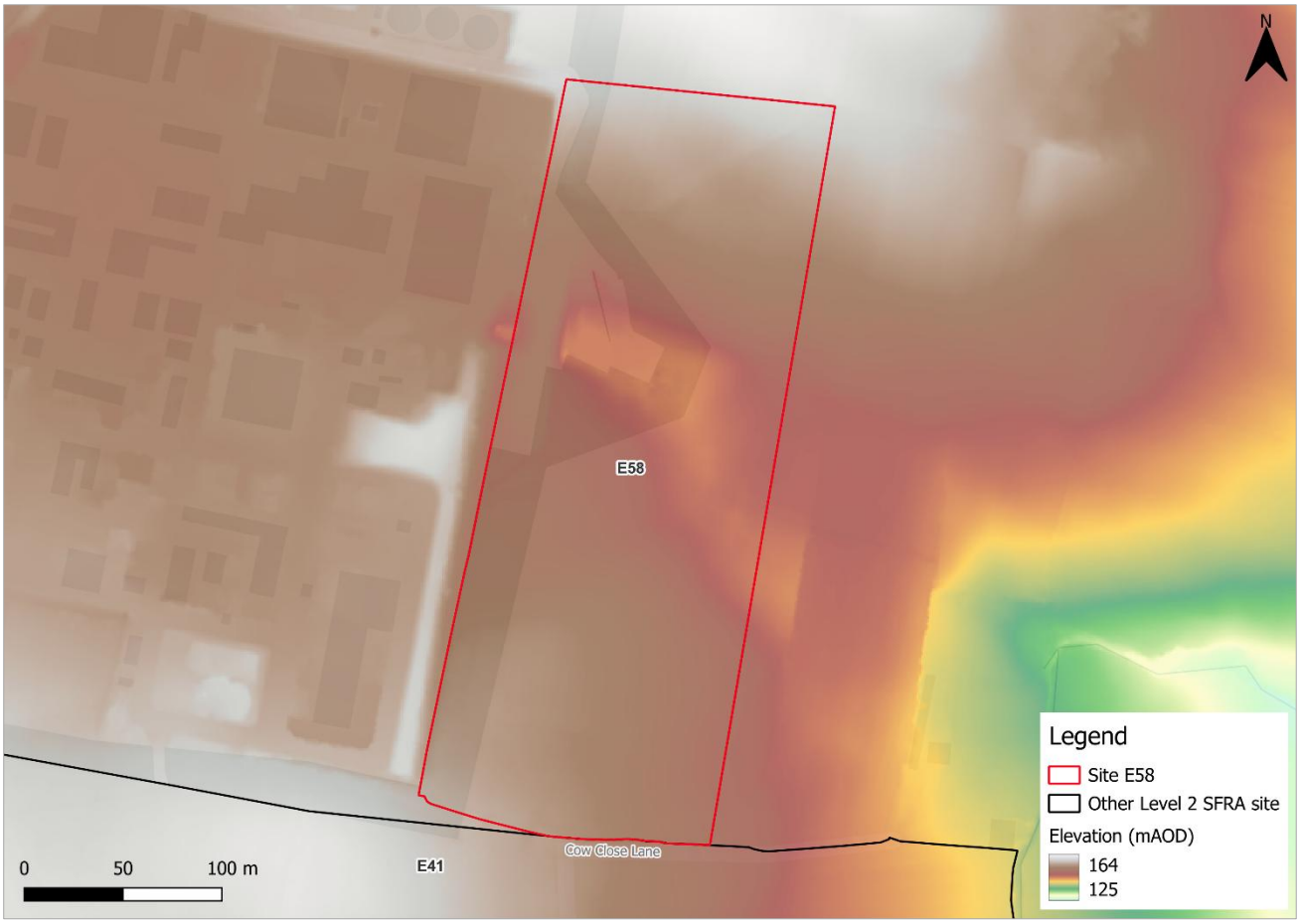



Figure 1-2: Topography




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is wholly within Flood Zone 1 indicating it is at low risk of flooding from rivers.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

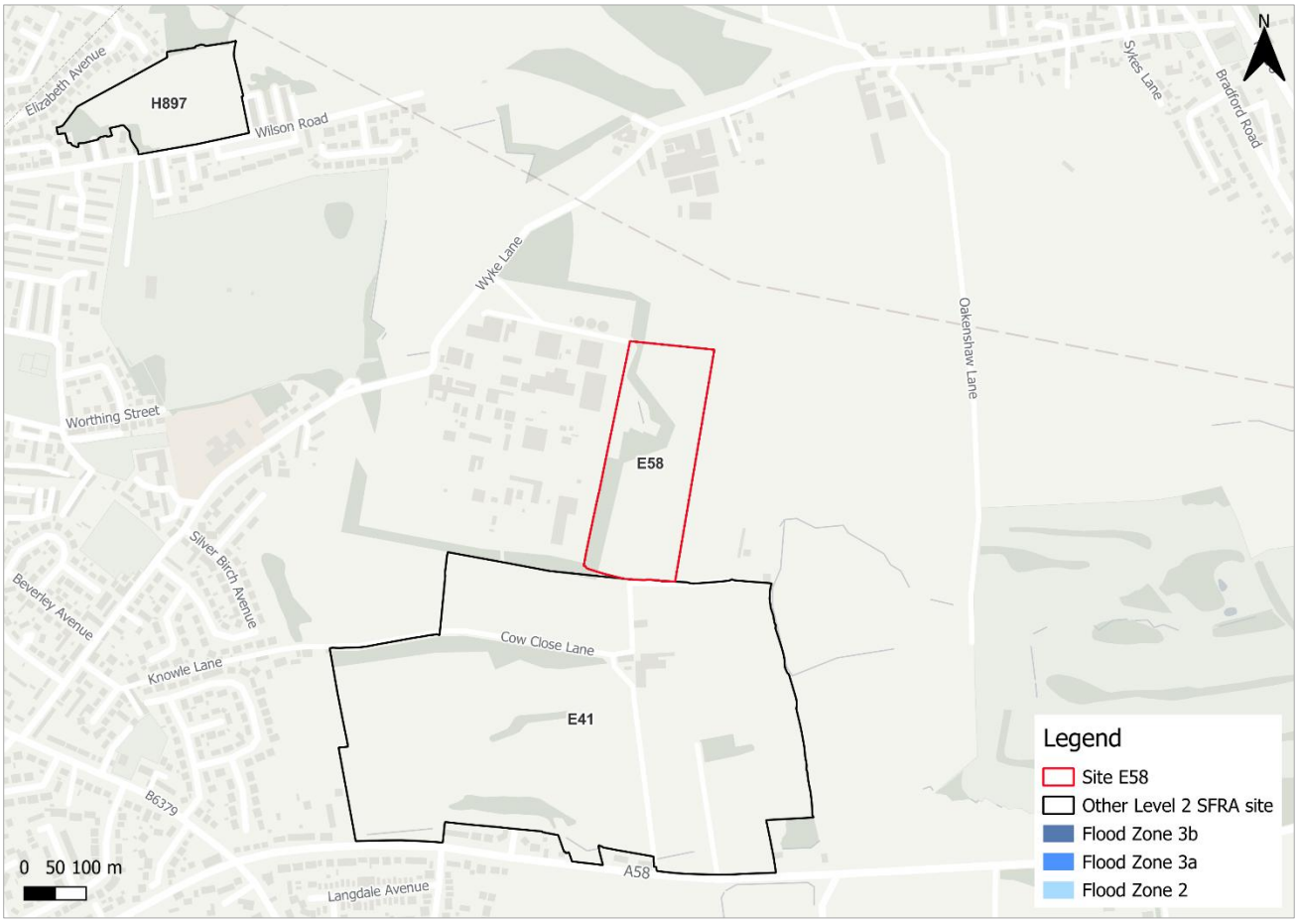



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Across the site there is potential for riparian tree planting and potential to implement run-off attenuation features to reduce runoff downstream. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP. These areas are shown in Figure 2-2.




Figure 2-2: Natural Flood Management (NFM) potential mapping

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events at the site.

## 2.4 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is not located within a FAA.

Based on available information, safe access and escape routes should be possible via multiple points surrounding the site.

## 2.5 Observations, mitigation options and site suitability - fluvial

- The site is wholly located within Flood Zone 1, indicating it is at low risk of flooding from rivers.
- Were development of this site to proceed, given the proximity of this site to neighbouring sites H897 and E41, it would be prudent to formulate a strategy to develop these sites in tandem and for consultation between each developer to take place to ensure a joined-up approach for sustainable development is in place.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low with 81% of the site at very low surface water risk, 10% at low risk, 6% at medium risk and a further 3% at high risk. This is shown in Table 3-1.

In the high risk event, surface water is confined to the topographic low spots across the site. In the medium risk event, surface water risk is greater than the high risk event, with greater ponding across the site and additional ponding on the west site boundary. In the low risk event, surface water risk is significantly greater. Surface water flows through the site, from west to east, and ponds within the low spots.

Greatest flood depths within the site in the medium risk event are >1.2m (Figure 3-1) with some areas of extreme hazard (Figure 3-2). Safe access and escape routes should be possible via Cow Close Lane and the private access road to the north west of the site.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 81 | 10 | 6 | 3 |

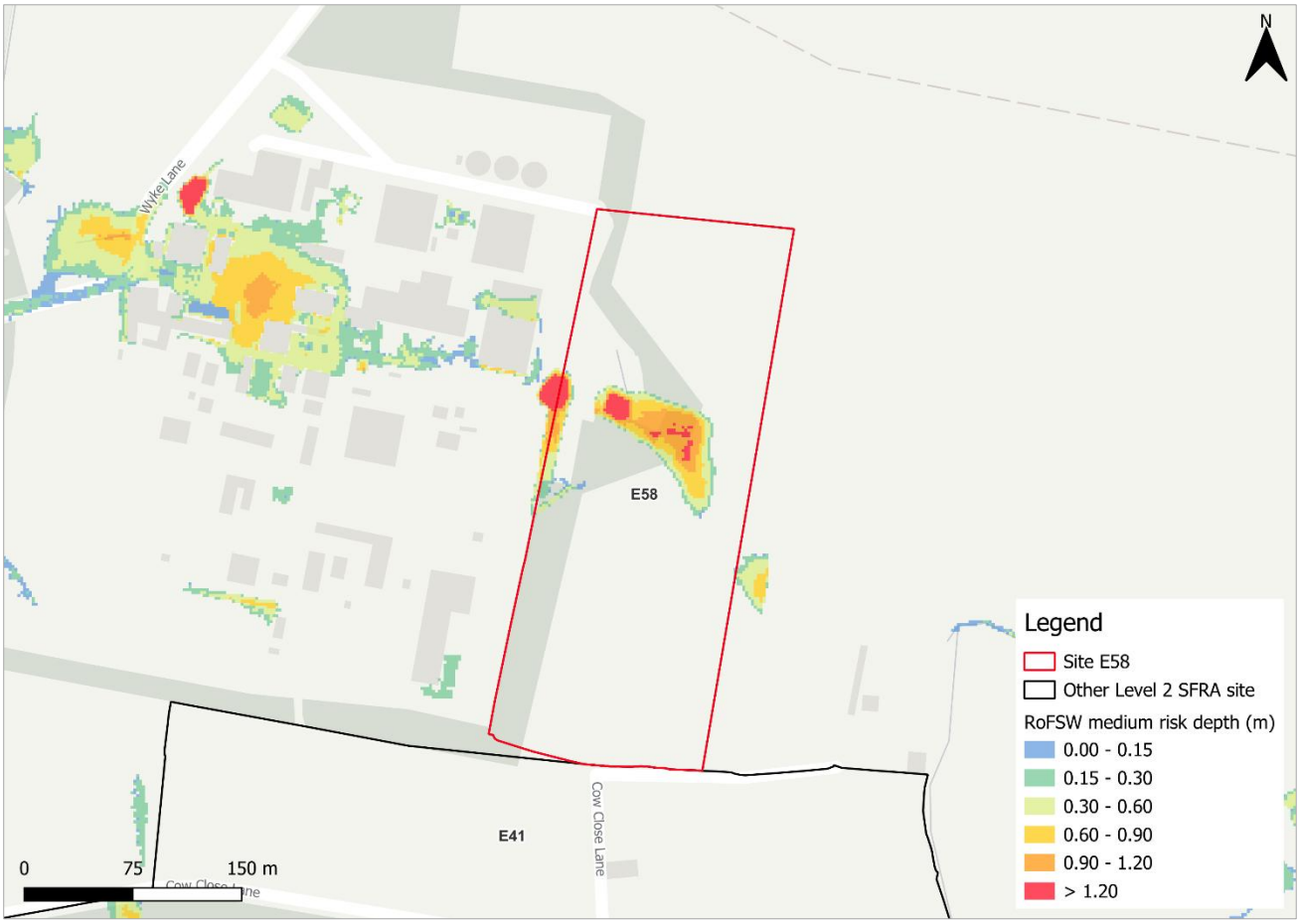



Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

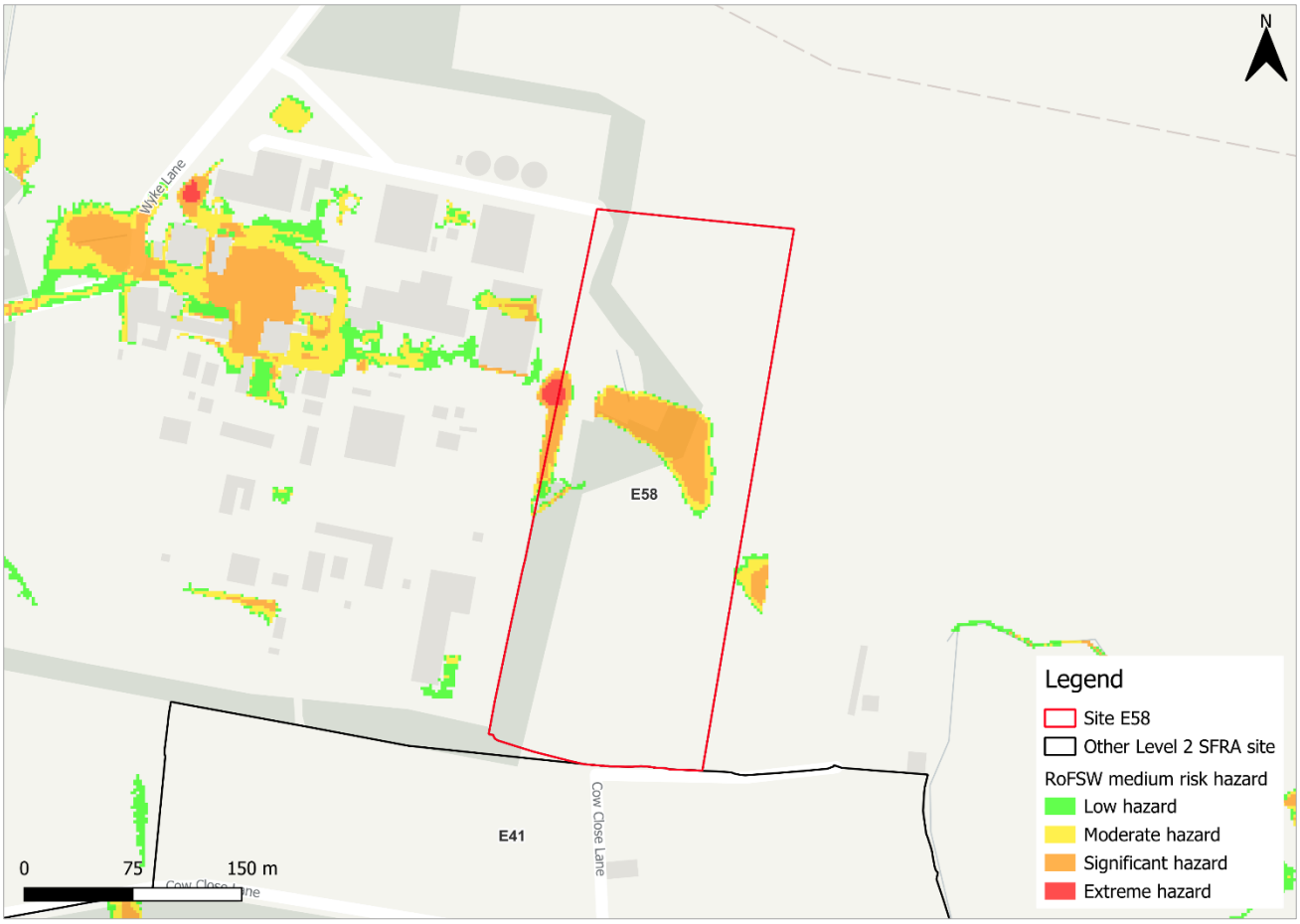



Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

Figure 3-3 shows the modelled surface water flood depths for the medium risk event plus 45% climate change. Risk is modelled to be greater than the present day conditions, with

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

the medium risk climate change event showing a similar level of risk to the present day low risk event and a greater level of risk than the present day medium risk event. Maximum depths are >1.2m (Figure 3-3) with some areas of extreme hazard (Figure 3-4). The clear flow route and ponded areas should be retained and included in site design and layout.

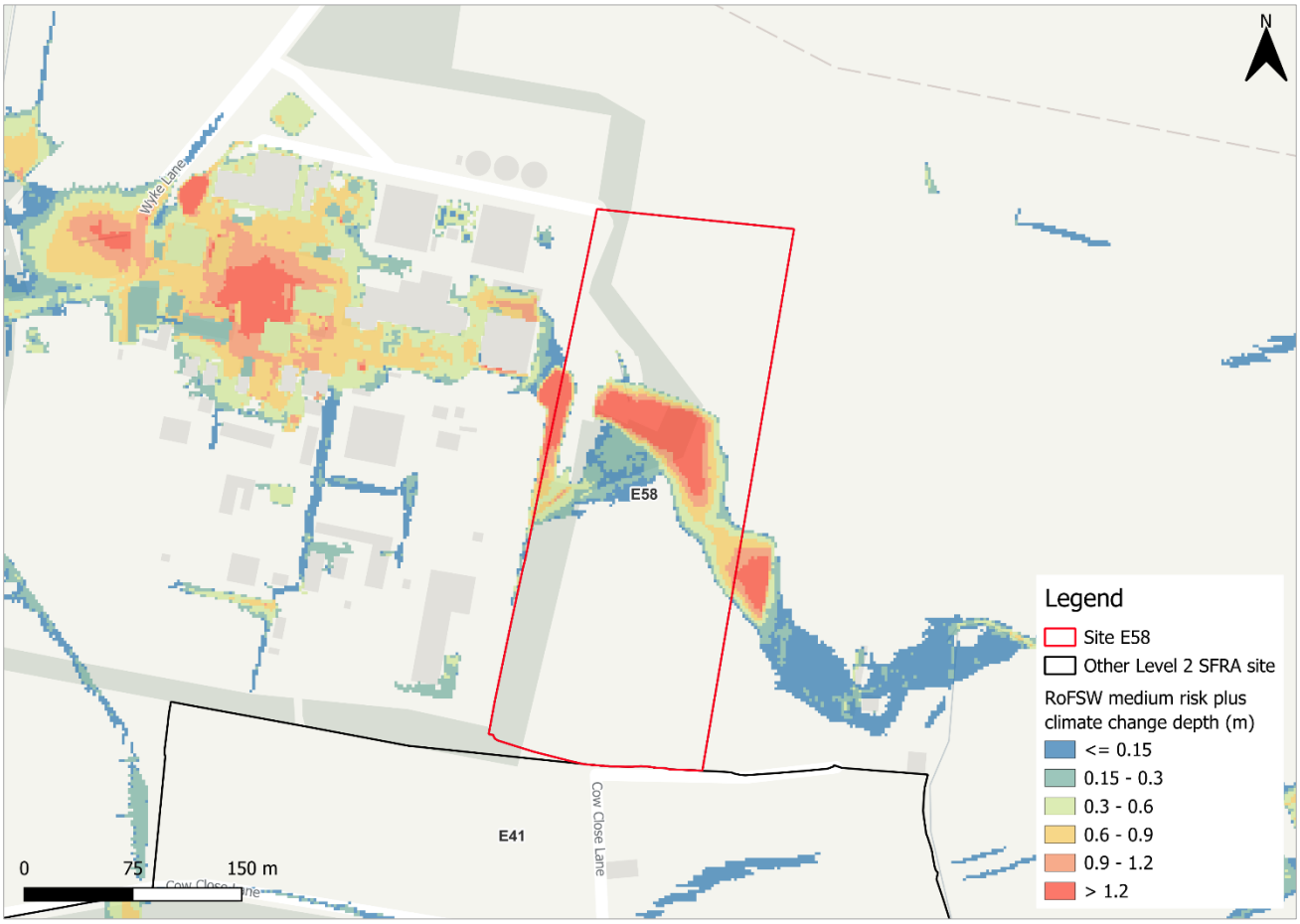



Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)

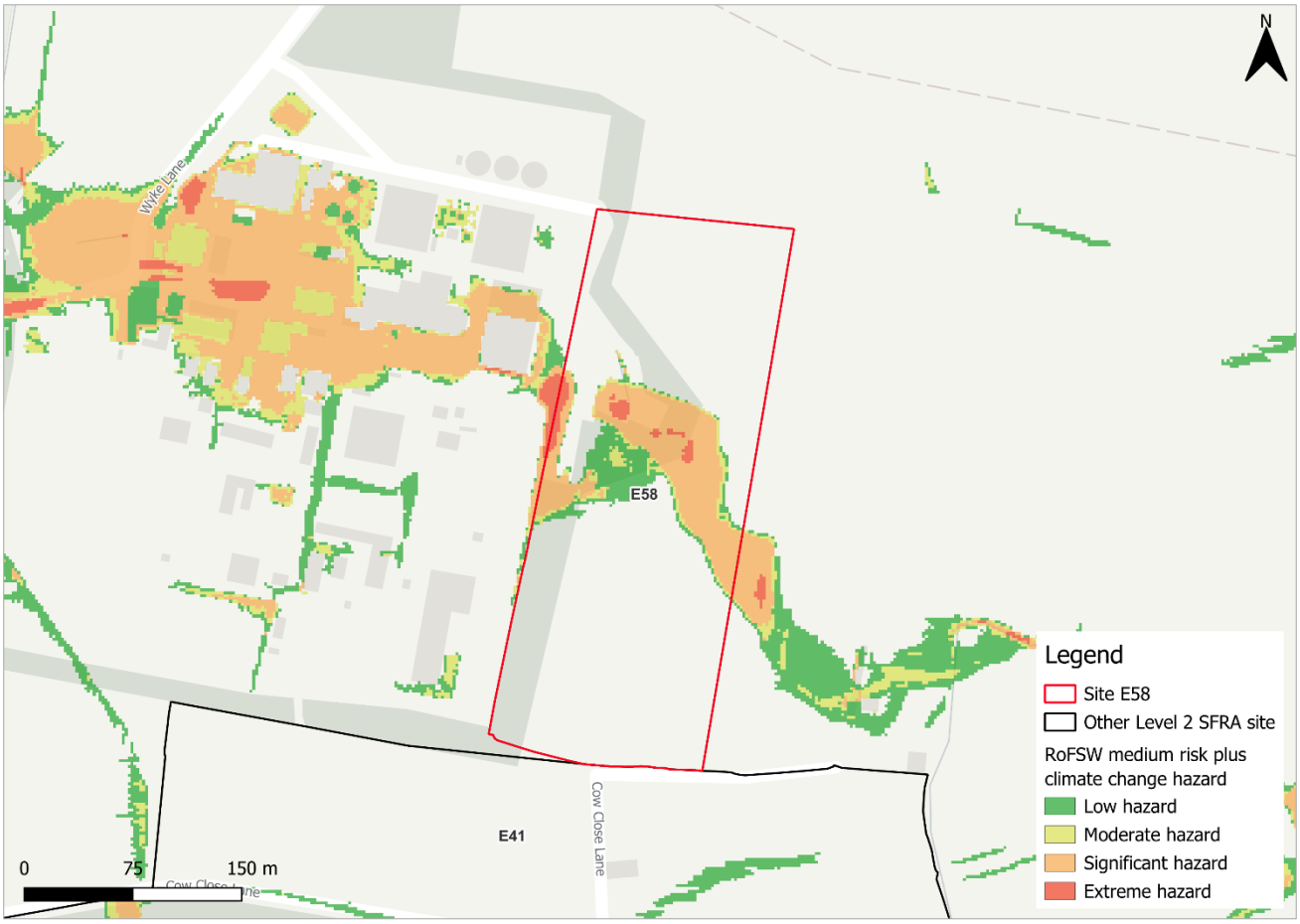



Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Current risk is located in the centre of the site where there is an existing pond. Surface water flows from west to east via a flow route which becomes more apparent with climate change.
- Topographic flow routes and depressions should be considered and included in site design and ideally left in place to flood naturally when required. Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development.
- A full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. Runoff rates should be restricted to greenfield rates or betterment on existing if possible. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- The use of appropriate SuDS should be investigated. There is no risk of groundwater emergence to the majority of the site judging from the Groundwater Emergence Map in Figure 4-1, therefore infiltration SuDS are likely to be suitable across most of the site.

- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications. The majority of the site is in an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS. The southern extent of the site has the risk of groundwater emerging at a moderate rate.




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Flood risk from canals

The site is not likely to be at risk from a canal breach.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk of flooding from reservoirs.

## 5.3 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded or blocked, or it cannot discharge due to high water levels in the receiving watercourse.

Yorkshire Water records indicate that there have been historical flood incidents in the area over the last two years. Developers should contact Yorkshire Water directly to check specific details at the FRA stage.

## 5.4 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

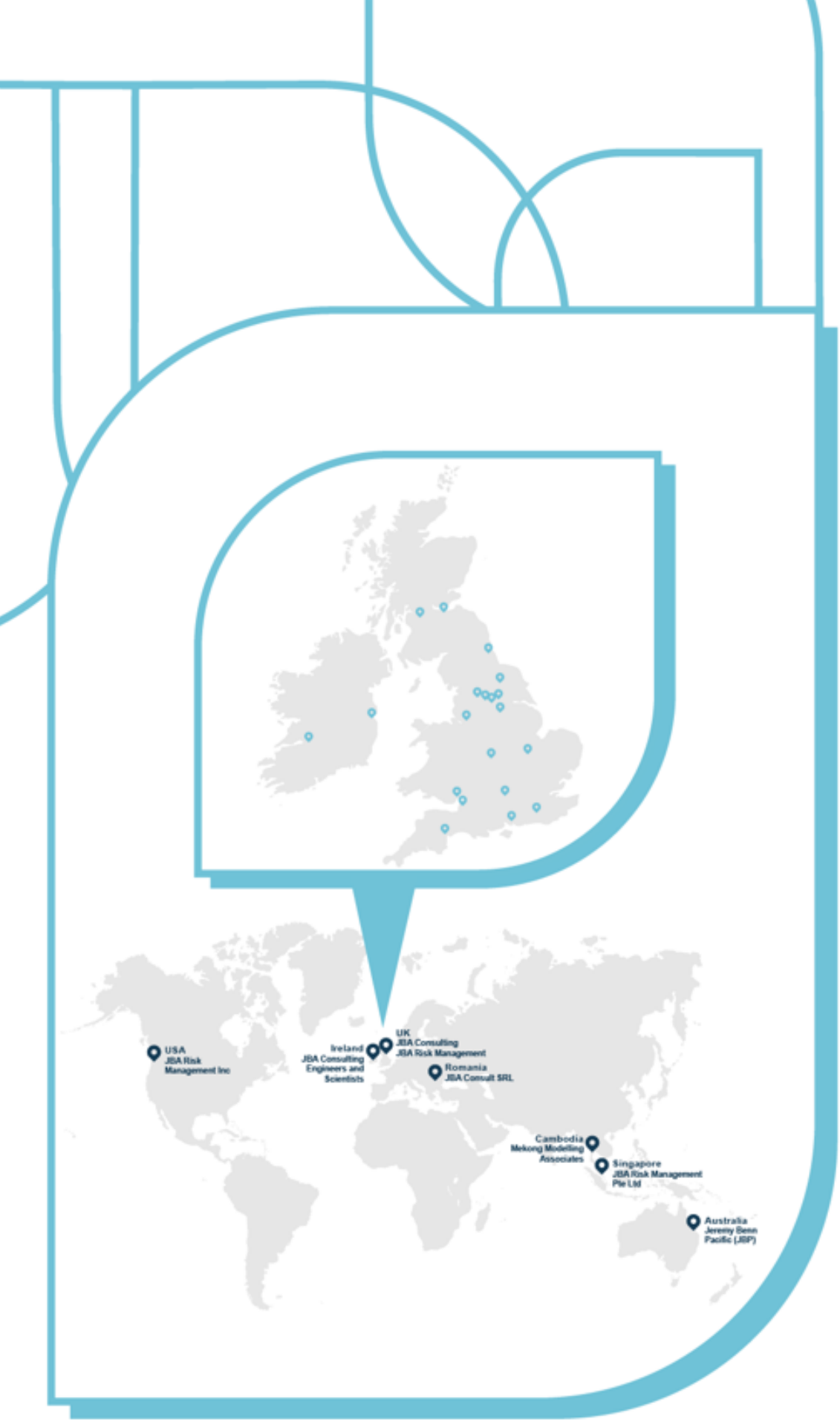
- This site could be allocated if development avoids the surface water flood risk areas within the centre of the site, including the existing pond and significant flow route. The risk areas should be included in site design and layout.
- Runoff rates should be restricted to greenfield rates or betterment on existing if possible.
- Any FRA should produce a detailed drainage strategy which should include ground investigation for infiltration SuDS suitability.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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www.jbaconsulting.com
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# Bradford Level 2 Strategic Flood Risk Assessment - Site E59

## Final Draft

May 2025

Prepared for:

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

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| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

| | |
|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Kaylyn Carroll of JBA Consulting carried out this work.

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## Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E59. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

## 1.1 Site E59

- Location: Neville Road/ Lower Lane
- Existing site use: Brownfield
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 1.6 hectares
- Proposed development impermeable area: 1.3 hectares (assumed 85% impermeable area)
- Watercourse: N/A
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk

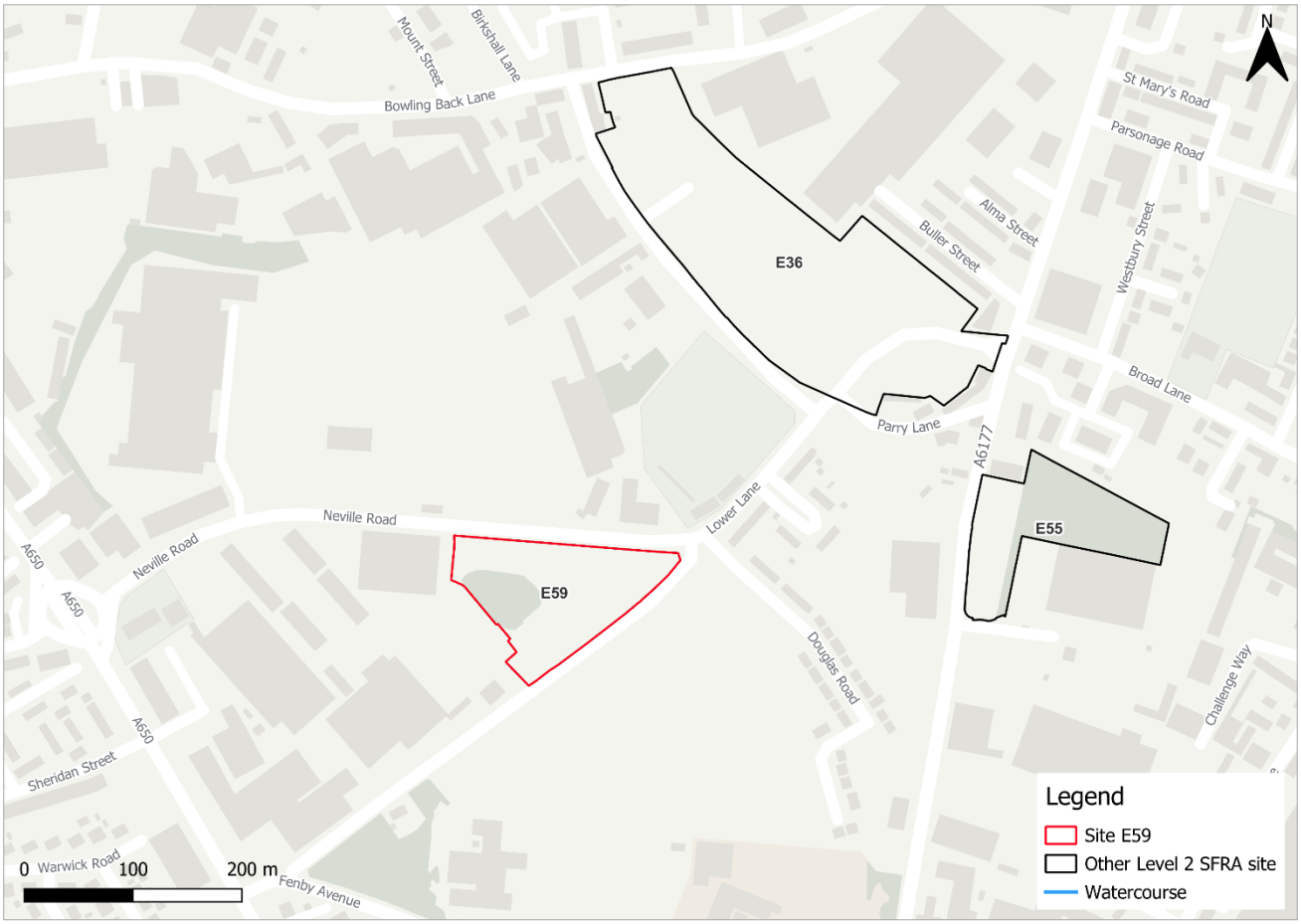



Figure 1-1: Existing site location boundary

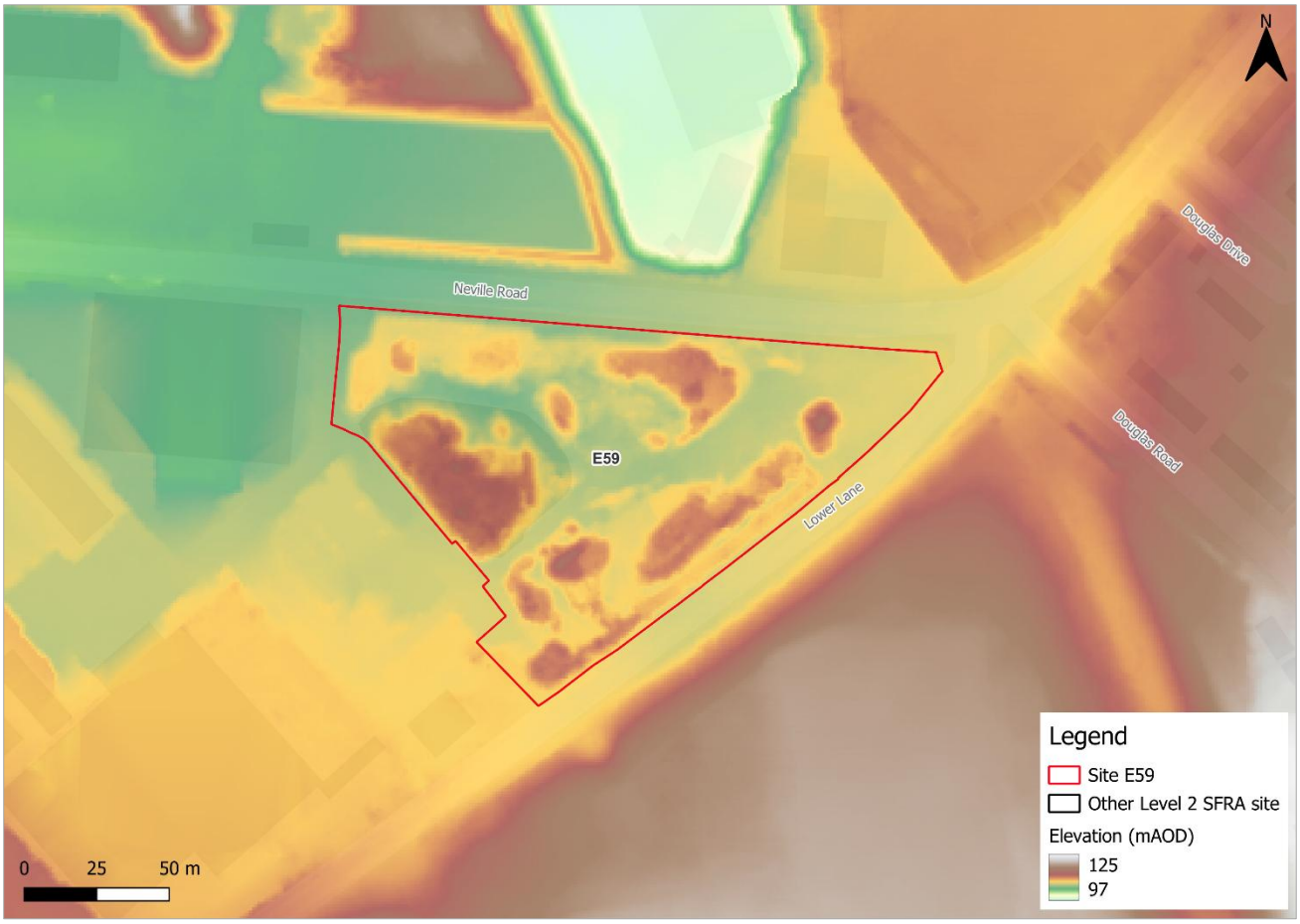



Figure 1-2: Topography




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on

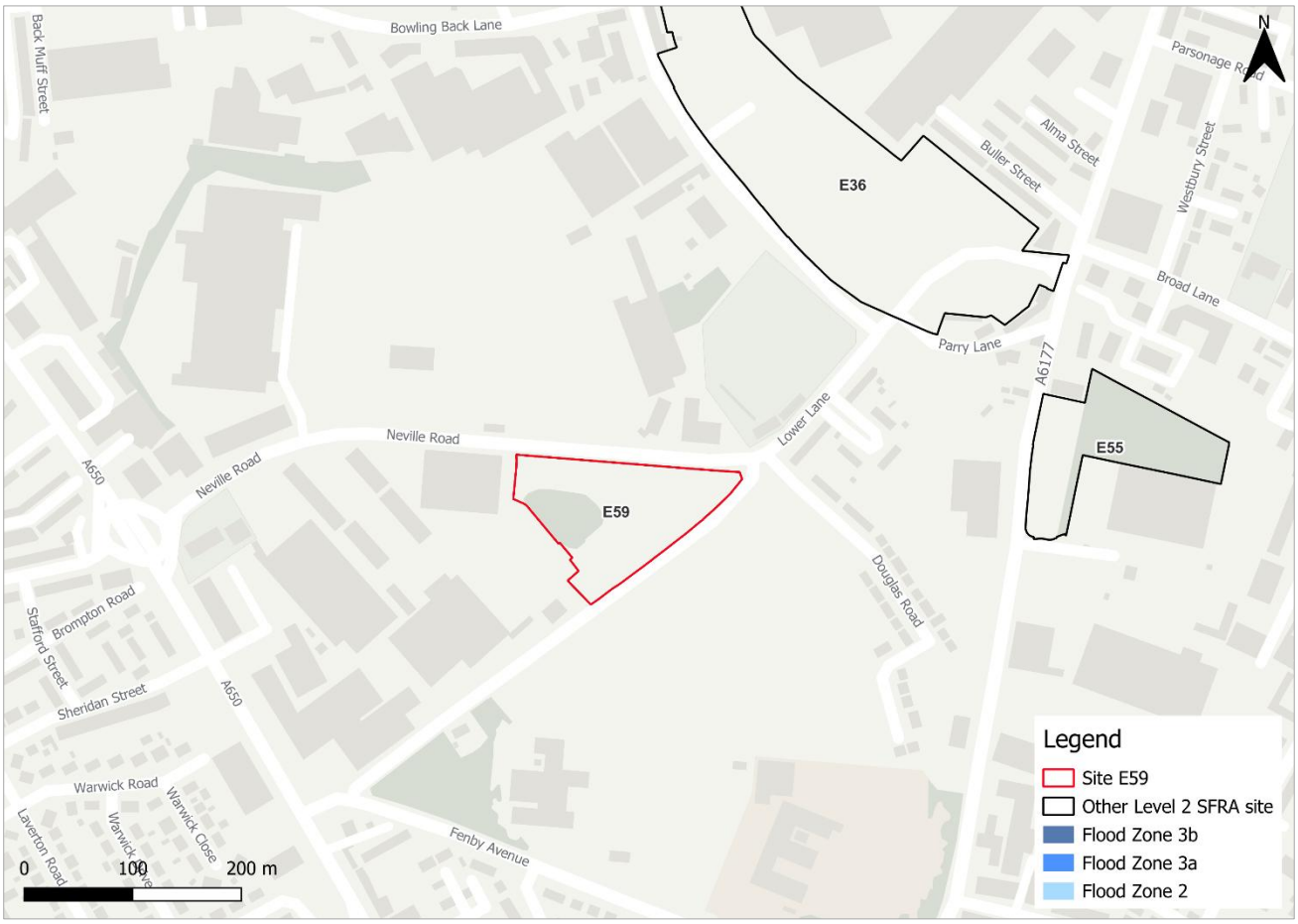



Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is wholly located within Flood Zone 1 indicating it is at low risk of flooding from rivers.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 100 | 0 | 0 | 0 |

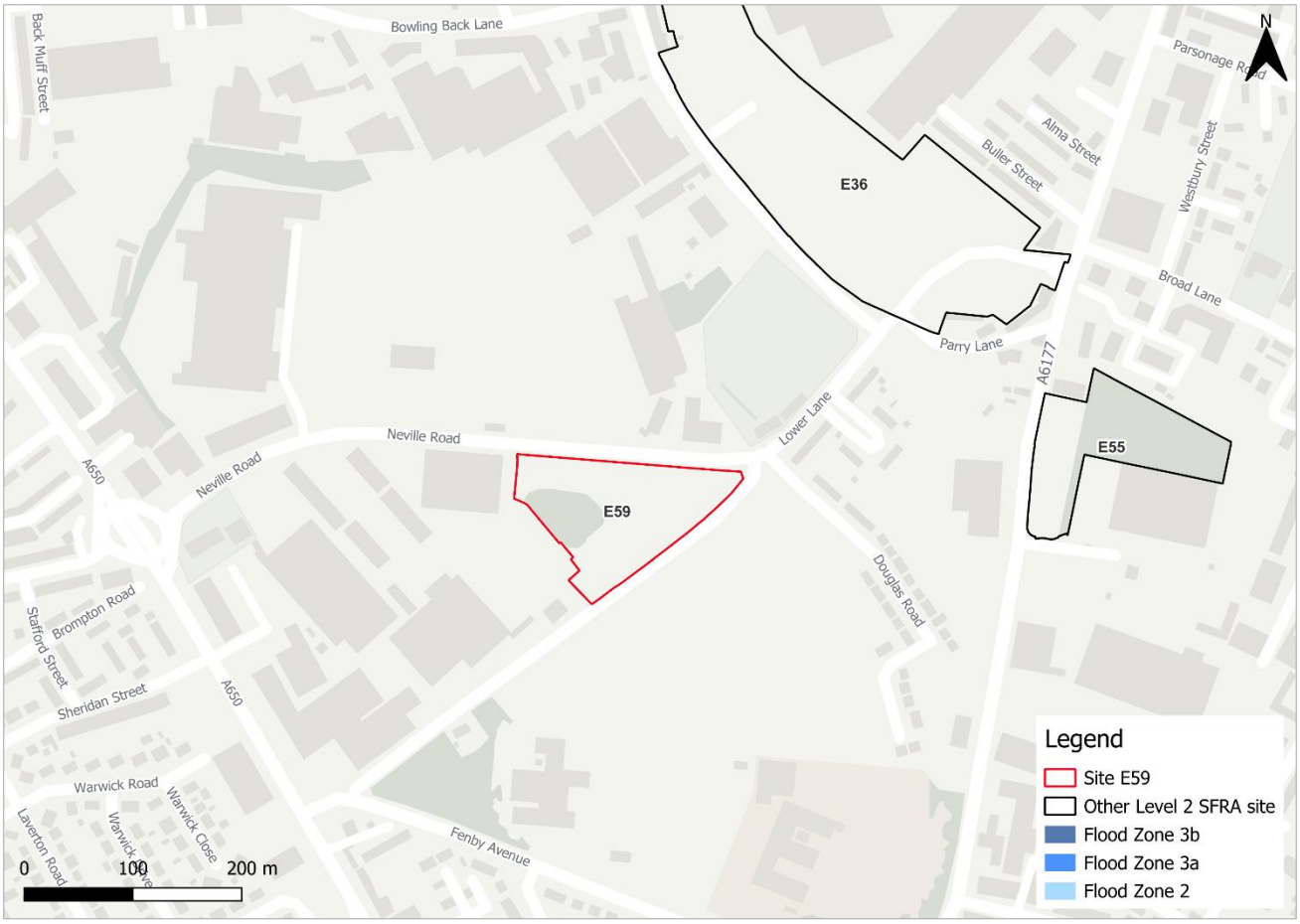



Figure 2-1: Existing risk from rivers to the site

## 2.2 Flood risk management

### 2.2.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.2.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.3 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events at the site.

## 2.4 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within an FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in an FWA. This site is not located within a FAA.

Based on available information, safe access and escape routes could likely be achieved during a flood event via Neville Road and Lower Lane in the high and medium risk events. Further investigation is required to identify safe access and escape routes from the site during the low risk event due to surface water risk.

## 2.5 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within Flood Zone 1 indicating it is at low risk of flooding from rivers.

# 3 Flood risk from surface water

## 3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 15% of the site is at low surface water risk, 12% at medium surface water risk and a further 10% at high surface water risk, shown in Table 3-1.

Mapping shows that in the medium surface water risk event, surface water risk is present across the site. There is surface water ponding within the site within topographic low spots and flow paths along both Neville Street and Lower Lane.

Greatest flood depths within the site in the medium risk event are >1.2m (Figure 3-1), with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Neville Road and Lower Lane during the high and medium risk events. However, further investigation is required to identify safe access and escape routes from the site during the low risk event due to surface water risk.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 63 | 15 | 12 | 10 |

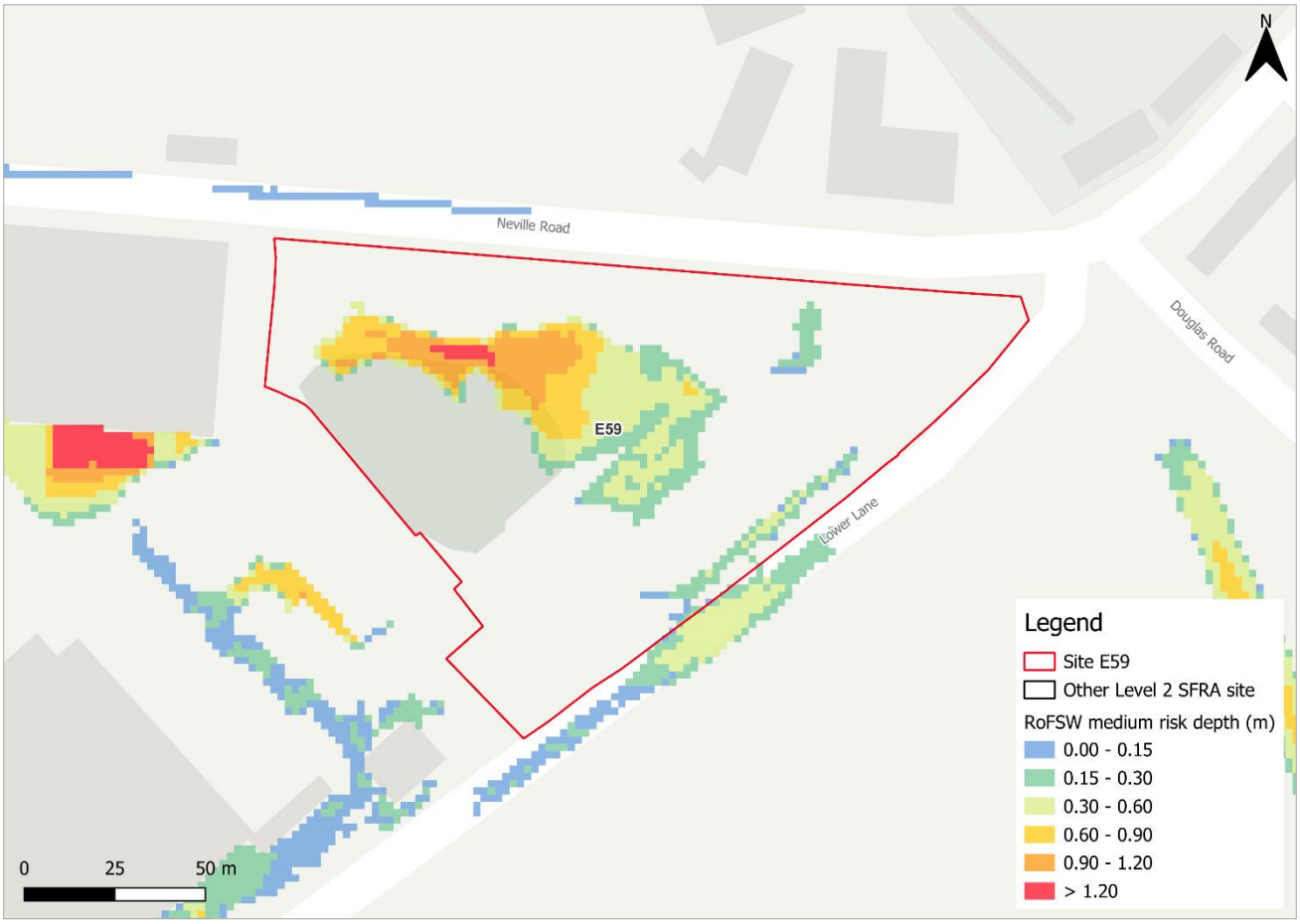



Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

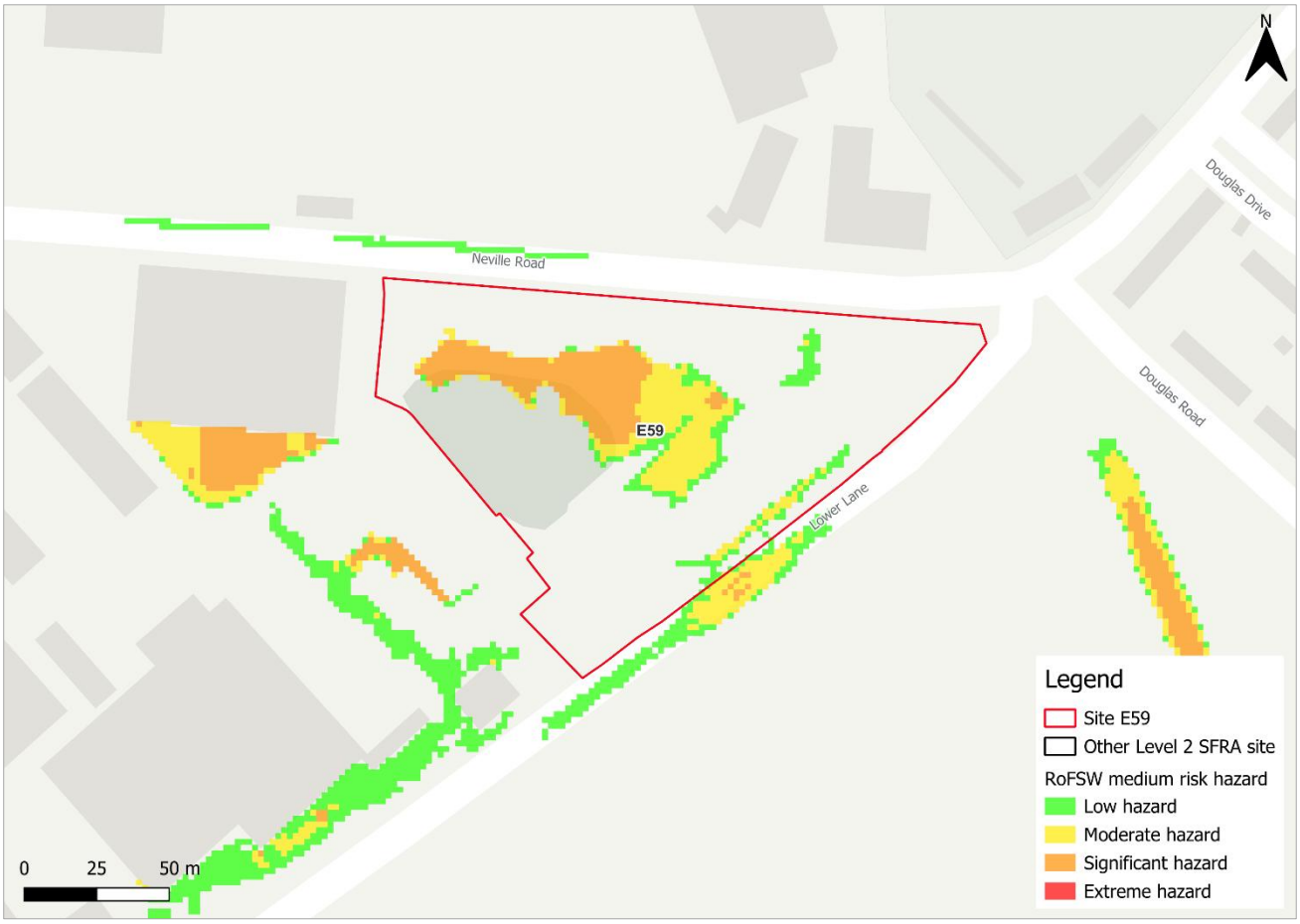



Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Aire and Calder management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---|---|---|
| 3.3% (high risk) | 25% | 40% |
| 1% (medium risk) | 30% | 45% |

Figure 3-3 shows the modelled surface water flood depths for the medium risk event plus 45% climate change. Risk is modelled to be significantly greater than the present day

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

medium risk event, yet similar to the present day low risk event. Maximum depths are >1.2m (Figure 3-3), with some areas of significant hazard (Figure 3-4).

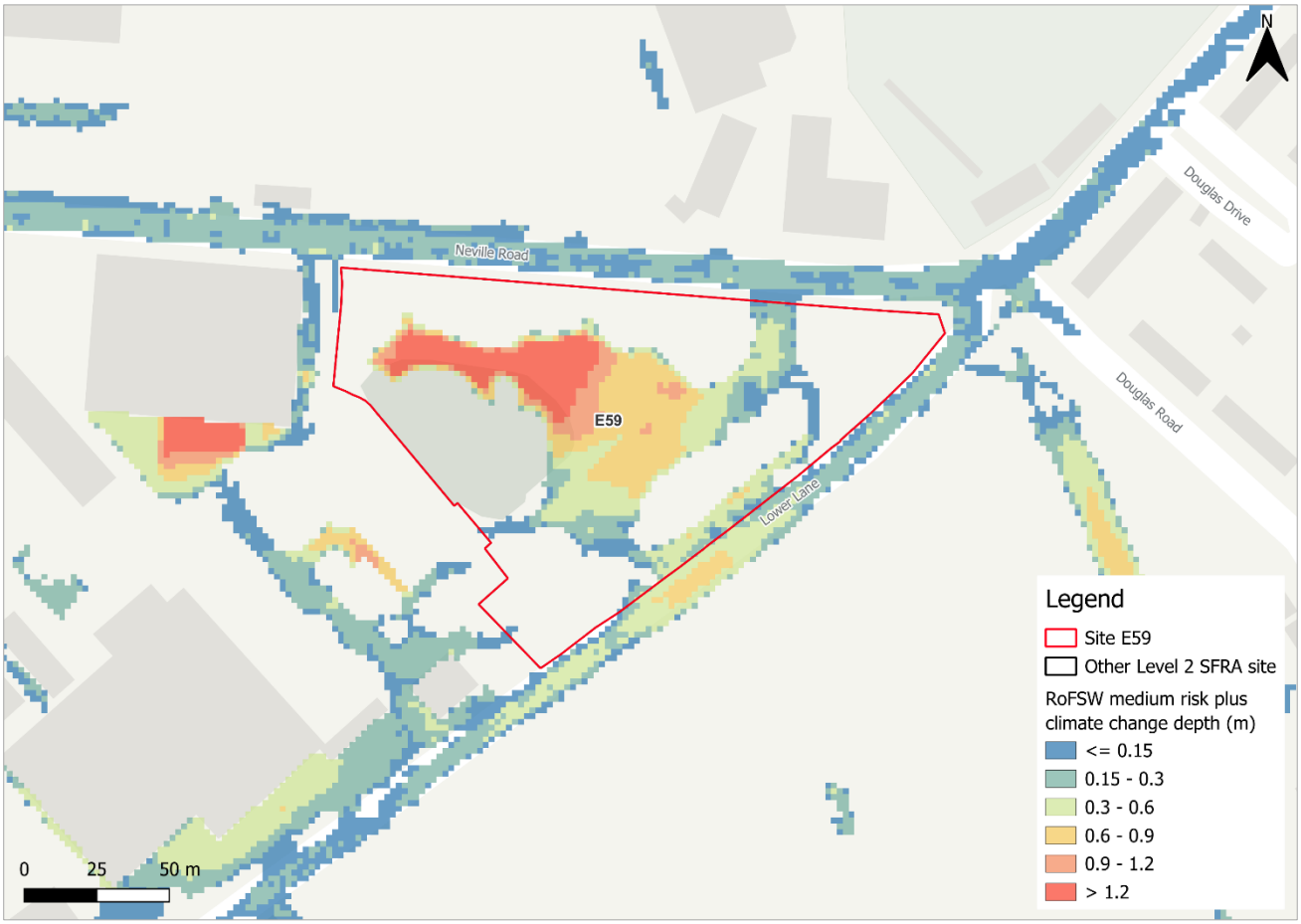



Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)




Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Surface water flood risk is present across the site. Greatest flood depths during the medium risk event are >1.2m, with some areas of significant hazard. Safe access and escape routes should be possible via Neville Road and Lower Lane during the high and medium risk events.
- Modelled surface water flood depths for the medium risk event plus 45% climate change are significantly greater than the present day medium risk event. Flooding is modelled to be similar to the present day low risk event. Further investigation is required to identify safe access and escape routes from the site during this event due to the flooding present on all surrounding roads.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications. The majority of the site is in an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS. The eastern area of the site has the risk of groundwater emerging at a moderate rate.




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

## 5.1 Flood risk from canals

The site is not likely to be at risk from a canal breach.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk of flooding from reservoirs.

## 5.3 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded, blocked or it cannot discharge due to a high water level in the receiving watercourse.

According to Yorkshire Water's records, there have been no incidents of sewer flooding in the area over the last two years.

## 5.4 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is 75 years for non-residential development.

## 6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

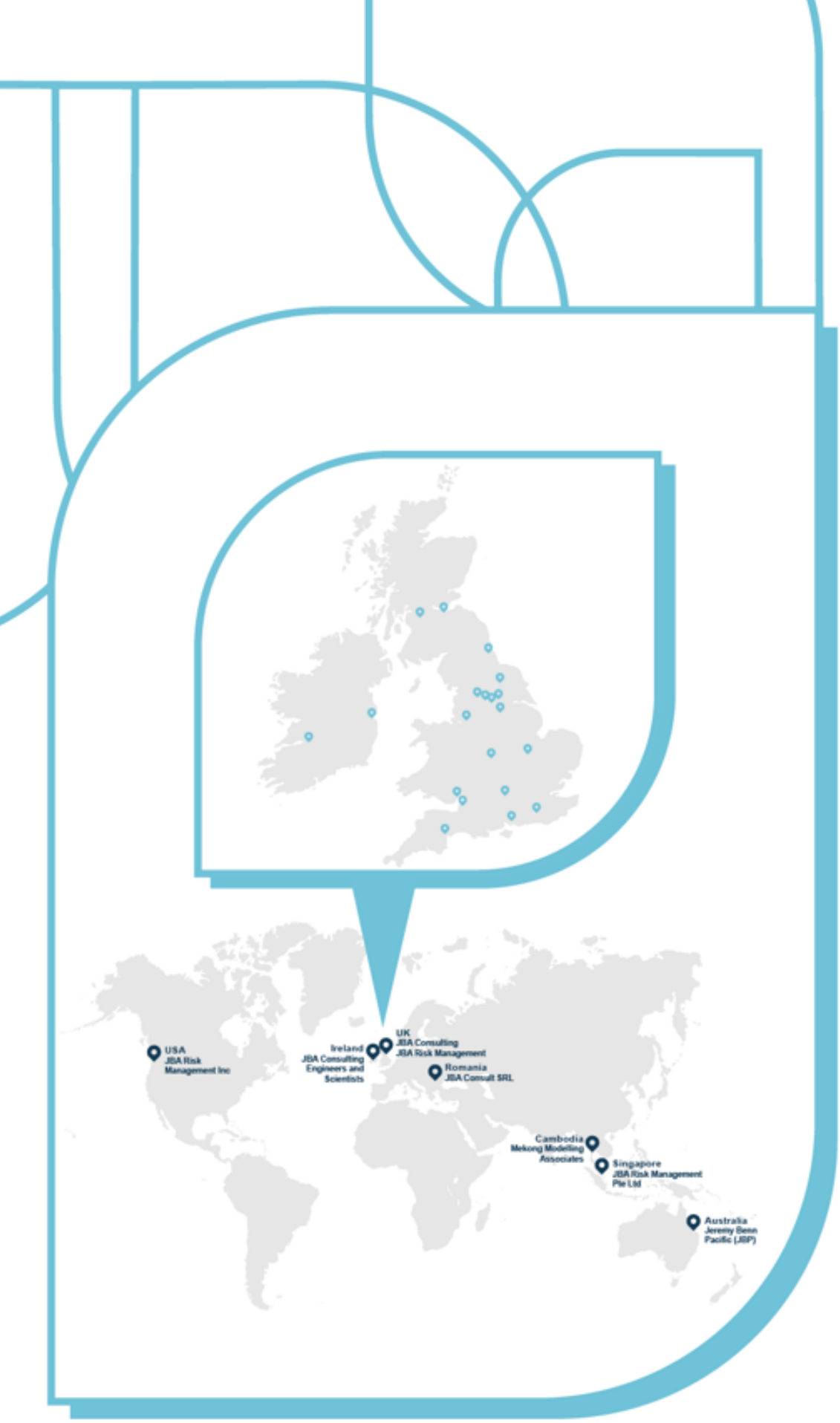
- It should be appropriate to develop this site for less vulnerable purposes given its location in Flood Zone 1.
- The RoFSW is therefore unlikely to be representative of current risk from surface water on this site. It is recommended that surface water modelling is carried out for this site as part of a drainage strategy for the site. Runoff rates should be restricted to brownfield rates or betterment on existing if possible.
- Any FRA should produce a detailed drainage strategy which should include ground investigation for infiltration SuDS suitability.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

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North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
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# Bradford Level 2 Strategic Flood Risk Assessment - Site E75

## Final Draft

**July 2026**

**Prepared for:**

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

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| Prepared by | Georgina Williams BSc MSc<br>Assistant Analyst |
| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

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| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Georgina Williams of JBA Consulting carried out this work.

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## Acknowledgements

We would like to thank the Environment Agency for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E75. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site E75

- Location: Former Site of Dunoon House, Newall Street, Bradford
- Existing site use: Brownfield
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 0.4 hectares
- Proposed development impermeable area: 0.37 hectares
- Watercourse: Bowling Beck
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of modelled fluvial flood depths, velocities and hazards
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk




Figure 1-1: Existing site location boundary

The topography of the site is varied, with areas of higher elevation within the south of the site sloping towards the north (Figure 1-2).

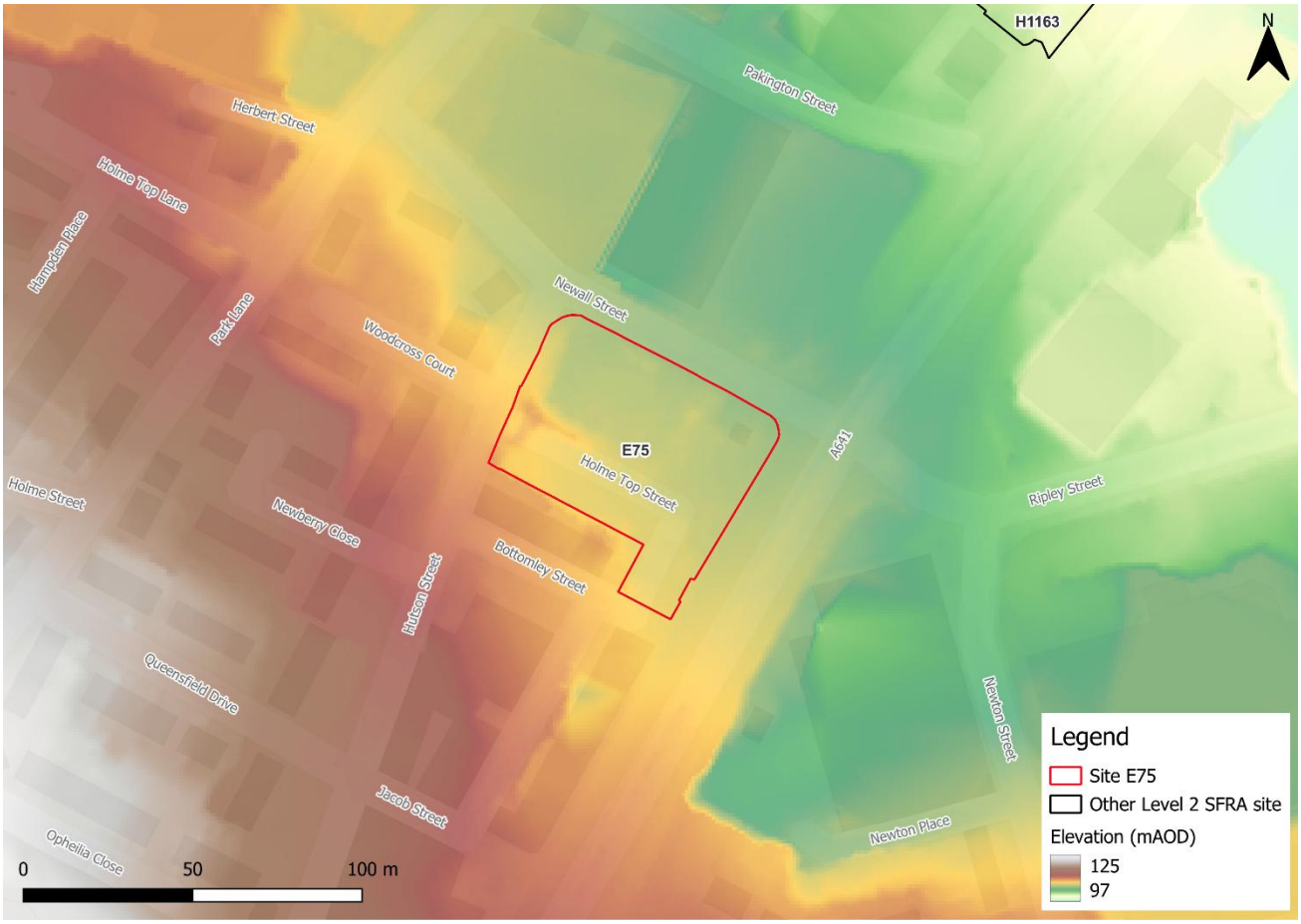



Figure 1-2: Topography

The underlying bedrock within the site is defined as 'Pennine Lower Coal Measures Formation', which comprises mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 1-3). This is overlain with superficial deposits of till. Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, however this can be highly variable. Sandstone has a higher permeability.




Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (January 2026) and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.3).

Fluvial flood risk to the site comes from Bowling Beck, which is culverted to the east of the site. The eastern boundary of the site is situated within Flood Zone 2 and is therefore at medium risk of fluvial flooding. The remaining area of the site is within Flood Zone 1 and therefore at low risk.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 76 | 24 | 0 | 0 |

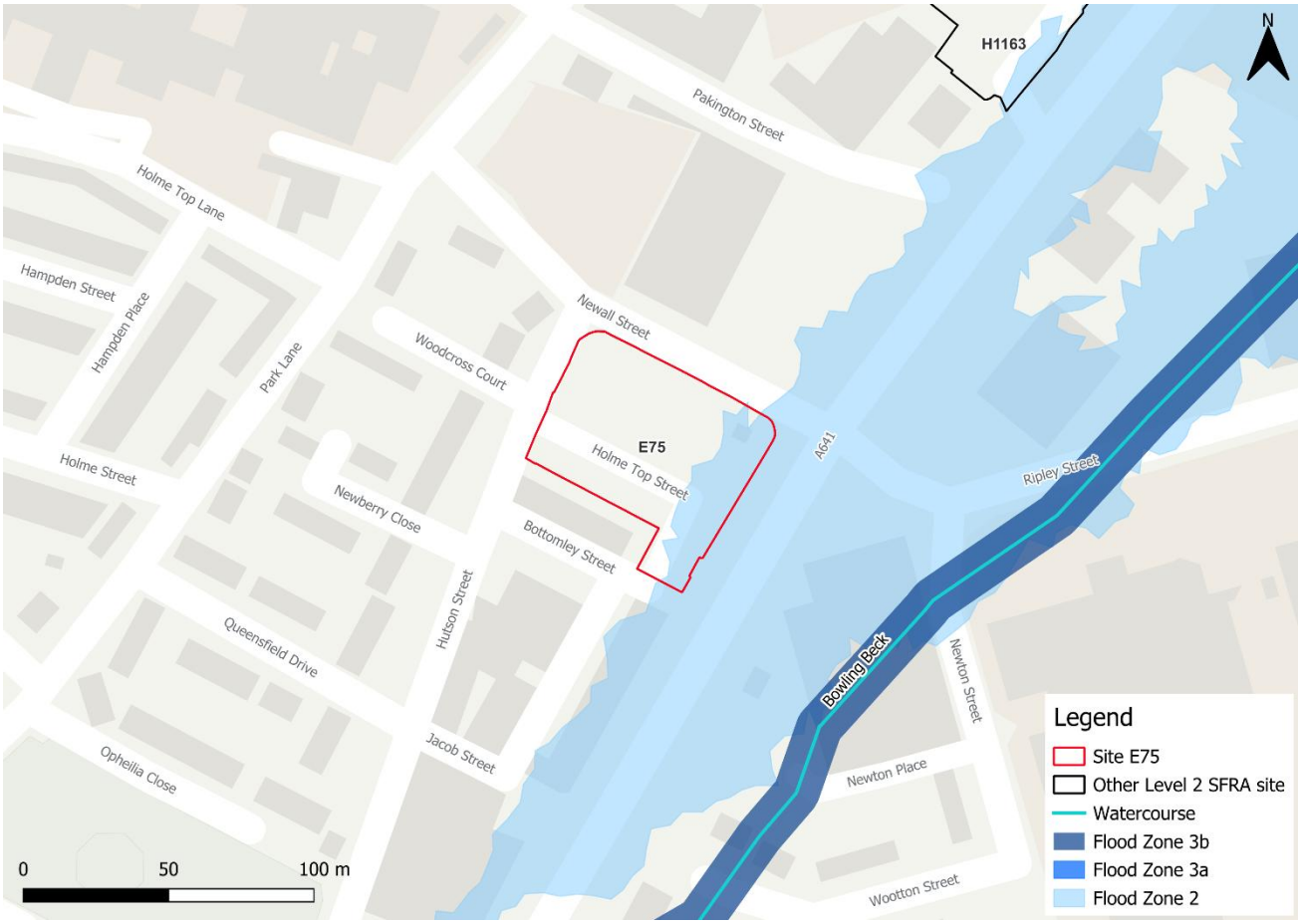



Figure 2-1: Existing risk from rivers to the site

### 2.1.2 Bradford Beck 2026 model outputs - present day

The Bradford Beck 2026 model does not cover the reach of the watercourse present to the east of the site. Therefore, flood depth, hazard and velocity data cannot be considered as part of this Level 2 SFRA. Any site-specific FRA should produce a detailed model of the reach of Bradford Beck within the vicinity of the site.

## 2.2 Impacts from climate change

The EA's SFRA guidance states that SFRAs should assess the central allowance for less vulnerable, more vulnerable, highly vulnerable and water compatible development.

Table 2-2: Climate change allowances for peak river flows for the Aire and Calder Management Catchment

| Return period (AEP event) | Central allowance 2080s (% increase) | Higher central allowance 2080s (% increase) | Upper end allowance 2080s (% increase) |
|---|---|---|---|
| 3.3% (functional floodplain) | 23% | 31% | 51% |
| 1% | 23% | 31% | 51% |

### 2.2.1 Bradford Beck 2026 model outputs - climate change

As documented in Section 2.1.2, the Bradford Beck 2026 model does not cover the site. Therefore, detailed climate change modelling is unavailable for consideration.

### 2.2.2 Flood Map for Planning - Climate Change

The EA's Flood Map for Planning plus Climate Change (2070-2125) dataset also does not cover the site (Figure 2-2). The impact of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Any site-specific FRA should produce a detailed model of the culverted reach of Bowling Beck within the vicinity of the site, including for the most up to date climate change allowances (Table 2-2).

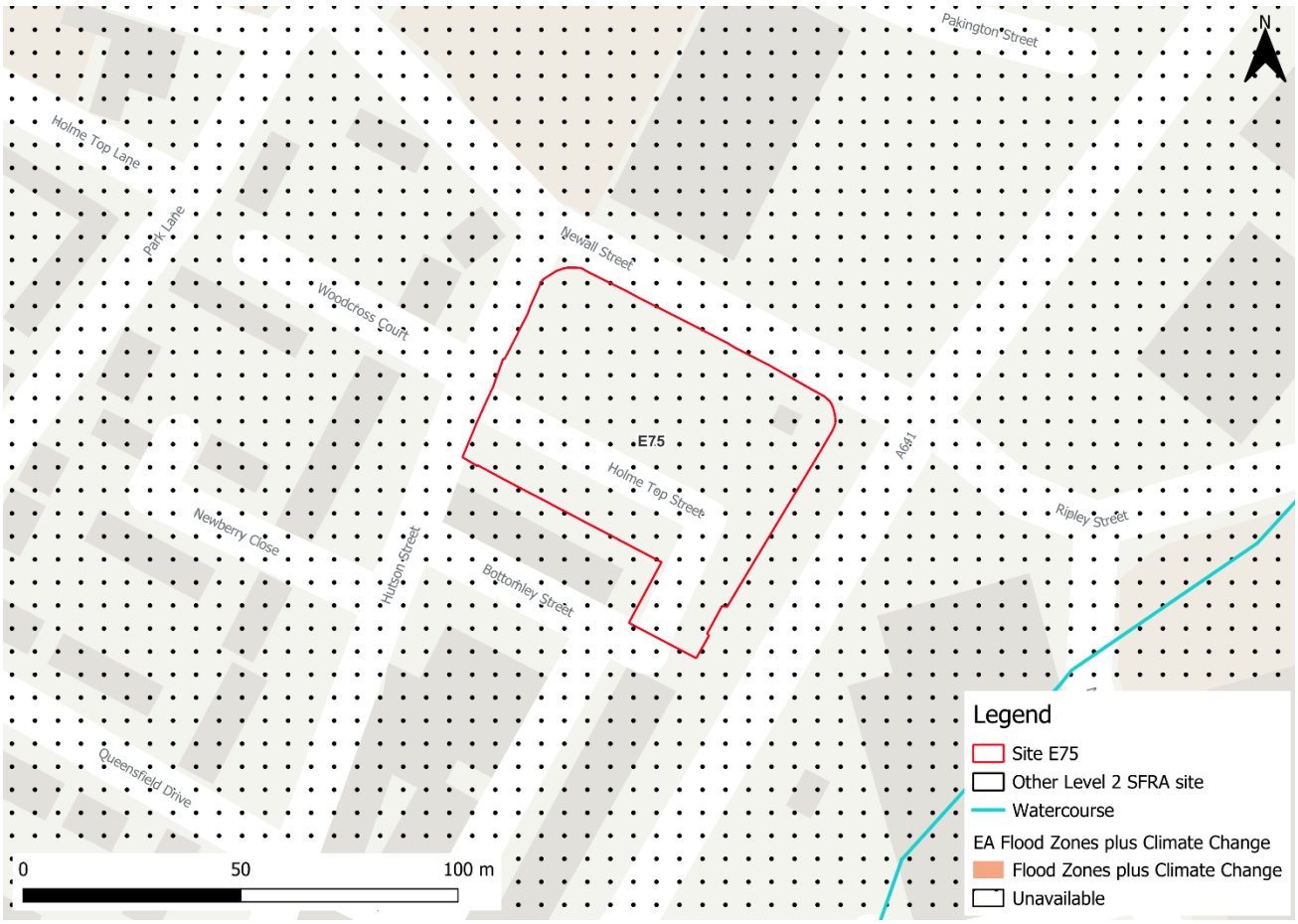



Figure 2-2: EA Flood Zones plus Climate Change dataset

## 2.3 Flood risk management

### 2.3.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events within the vicinity of the site.

## 2.5 Emergency planning

### 2.5.1 Flood warnings

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The east of the site is located within a FWA, namely 123FWF785 - Bradford Beck and tributaries at Bradford.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The east of the site is also located within a FAA, namely 123WAF961 - Middle River Aire catchment.

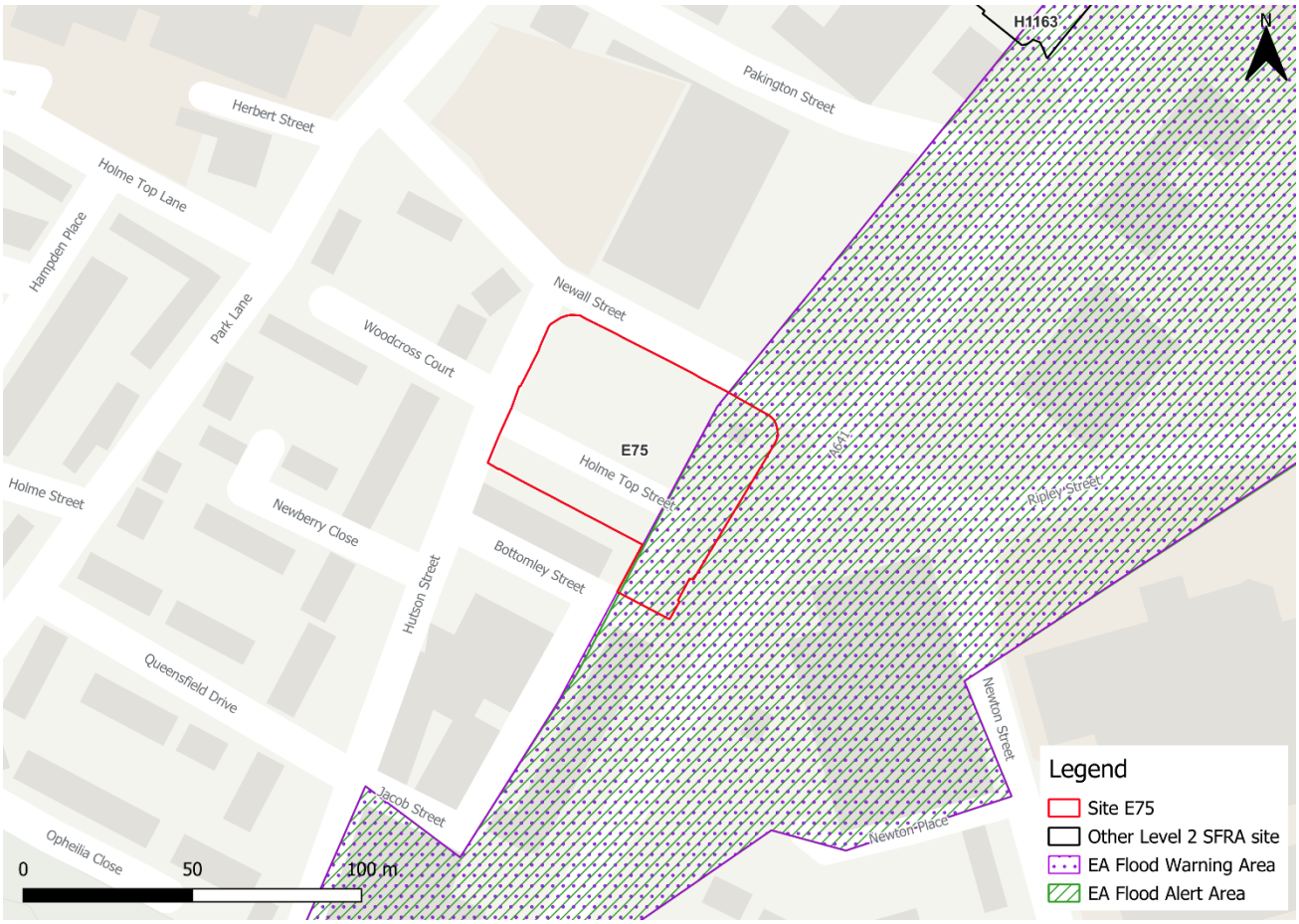



Figure 2-3: EA Flood Warning Areas and Flood Alert Areas

### 2.5.2 Access and escape routes

Based on available information, safe access and escape routes would likely be achievable via Hutson Street to the west of the site (Figure 2-4).




Figure 2-4: Potential access and escape routes

## 2.6 Observations, mitigation options, site suitability and sequential approach to development management - fluvial

- Observations:
  - The site is partially located within Flood Zone 2 of the EA's Flood Map for Planning, along the eastern boundary of the site.
  - Ideally, all development would be directed to the area of the site within Flood Zone 1. The area shown to be within Flood Zone 2 could be used as a blue green corridor offering multifunctional benefits.
  - However, there are no detailed model outputs available to confirm onsite flood depths, hazard and velocities, as the Bradford Beck 2026 model does not cover the reach of culverted watercourse to the east of the site.
  - Any site-specific FRA should produce a detailed model of the reach of Bowling Beck within the vicinity of the site, accounting for climate change.
- Mitigation:
  - EA flood warnings and alerts should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs.
- Access and escape:

- Based on available information, safe access and escape routes appear to be available via Hutson Street to the west of the site.

# 3 Flood risk from surface water

## 3.1 Existing risk

At the time of writing, the EA's latest national Risk of Flooding from Surface Water (RoFSW) does not include depth and hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation RoFSW depth and hazard mapping in addition to the NaFRA2 extents, as agreed with the EA. Surface water depth and hazard should be confirmed at the site-specific FRA stage.

### 3.1.1 Risk of Flooding from Surface Water - NaFRA2 extents

Based on the EA's national scale RoFSW map (January 2026), surface water risk to the site is predominantly very low, as shown in Table 3-1. Surface water flood risk is confined to an area of ponding within the centre of the site in the medium and low risk events, with a flow path along the eastern boundary of the site in the low risk event (Figure 3-1), also within Flood Zone 2. Safe access and escape routes should be achievable via Huston Street.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 91 | 7 | 3 | 0 |

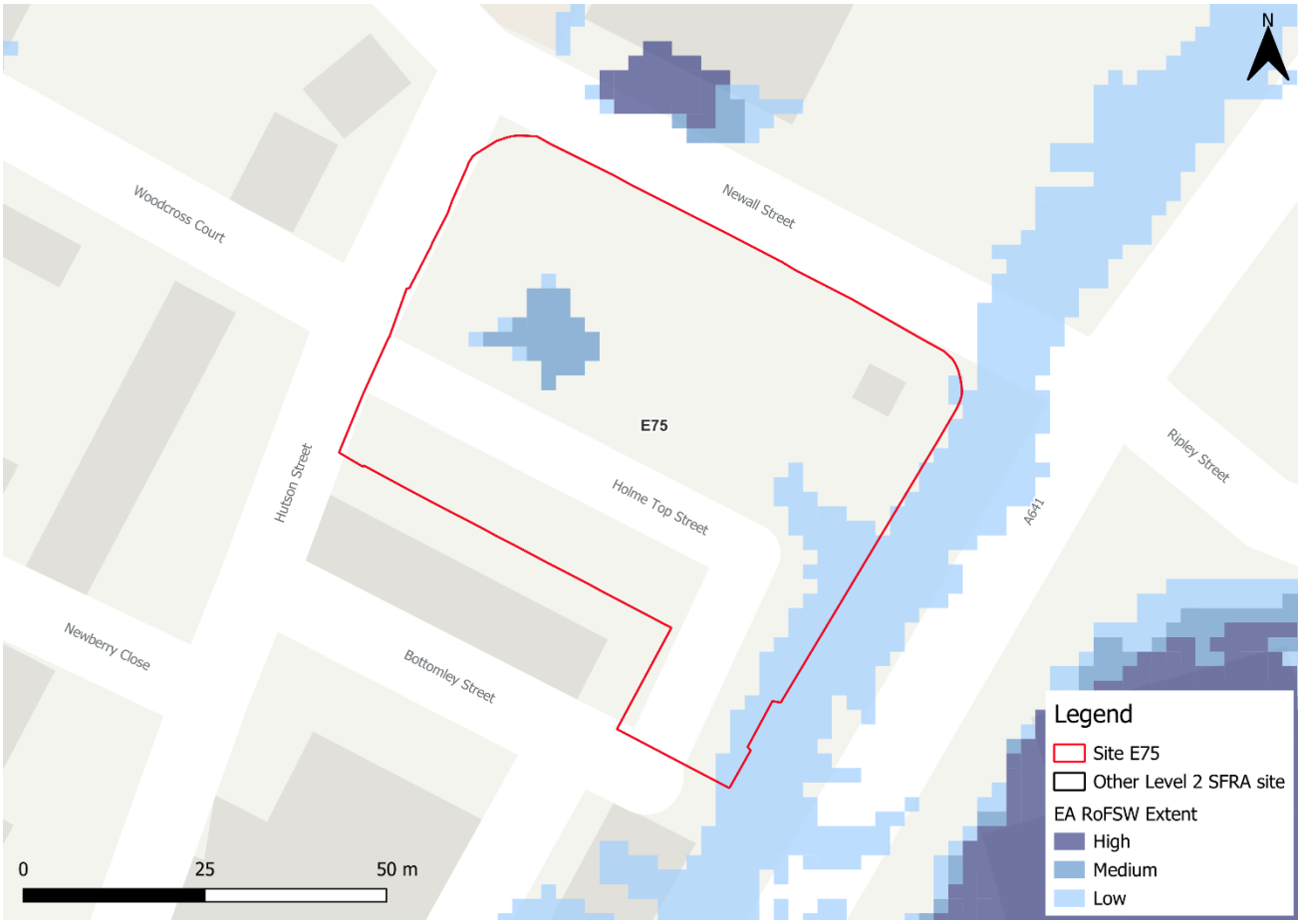



Figure 3-1: Surface water flood extents (NaFRA2 - Risk of Flooding from Surface Water map)

### 3.1.2 Risk of Flooding from Surface Water - third generation depths and hazard

Based on the EA's national scale third generation RoFSW map, the greatest flood depths within the site in the medium risk event are shallow between 0.15 and 0.3 m (Figure 3-2), with hazard categorised as 'low' (Figure 3-3).

There are clear differences between the NaFRA2 RoFSW map and the third-generation depth and hazard mapping. The NaFRA2 RoFSW map does not map flooding less than 0.075m (7.5cm) in depth. Therefore, where the map may show no flooding, there may be shallow flooding up to a depth of 0.075m. In contrast, the third generation RoFSW does not map flooding with a hazard rating of less than 0.575. This could explain the differences observed between the NaFRA2 and third generation RoFSW. Assessment of surface water should be carried out at the site-specific FRA stage to establish current and future surface water flood risk conditions.




Figure 3-2: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)




Figure 3-3: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

At the time of writing, the available national surface water climate change mapping is unsuitable for consideration in development planning. This Level 2 SFRA considers the low risk surface water event as a conservative proxy for the medium risk event plus climate change, as agreed with the EA. The impact of climate change on surface water flood risk should be considered at the site-specific FRA stage.

Using the low risk event as a proxy, the medium risk surface water event is likely to increase in extent within the site when accounting for climate change (Figure 3-4). The third generation map indicates maximum flood depths are likely to increase to between 0.6 and 0.9 m (Figure 3-4), with areas of hazard categorised as 'significant' (Figure 3-6). Safe access and escape routes should remain possible via Hutson Street with consideration to the shallow surface water depths and low hazard present during the proxy climate change event.

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

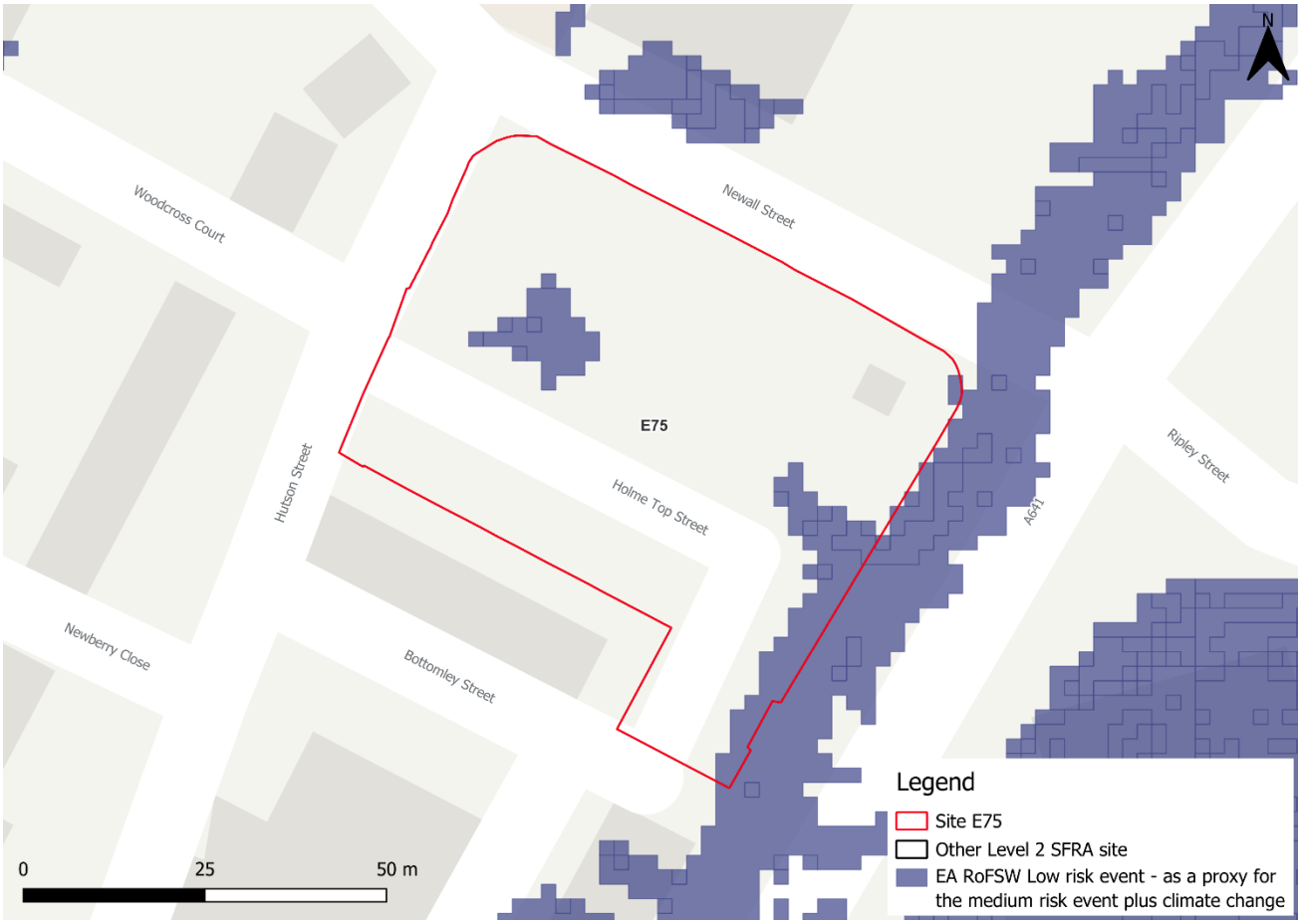



Figure 3-4: Low risk event surface water flood extent, as a proxy for the medium risk event plus climate change (NaFRA2 - Risk of Flooding from Surface Water map)

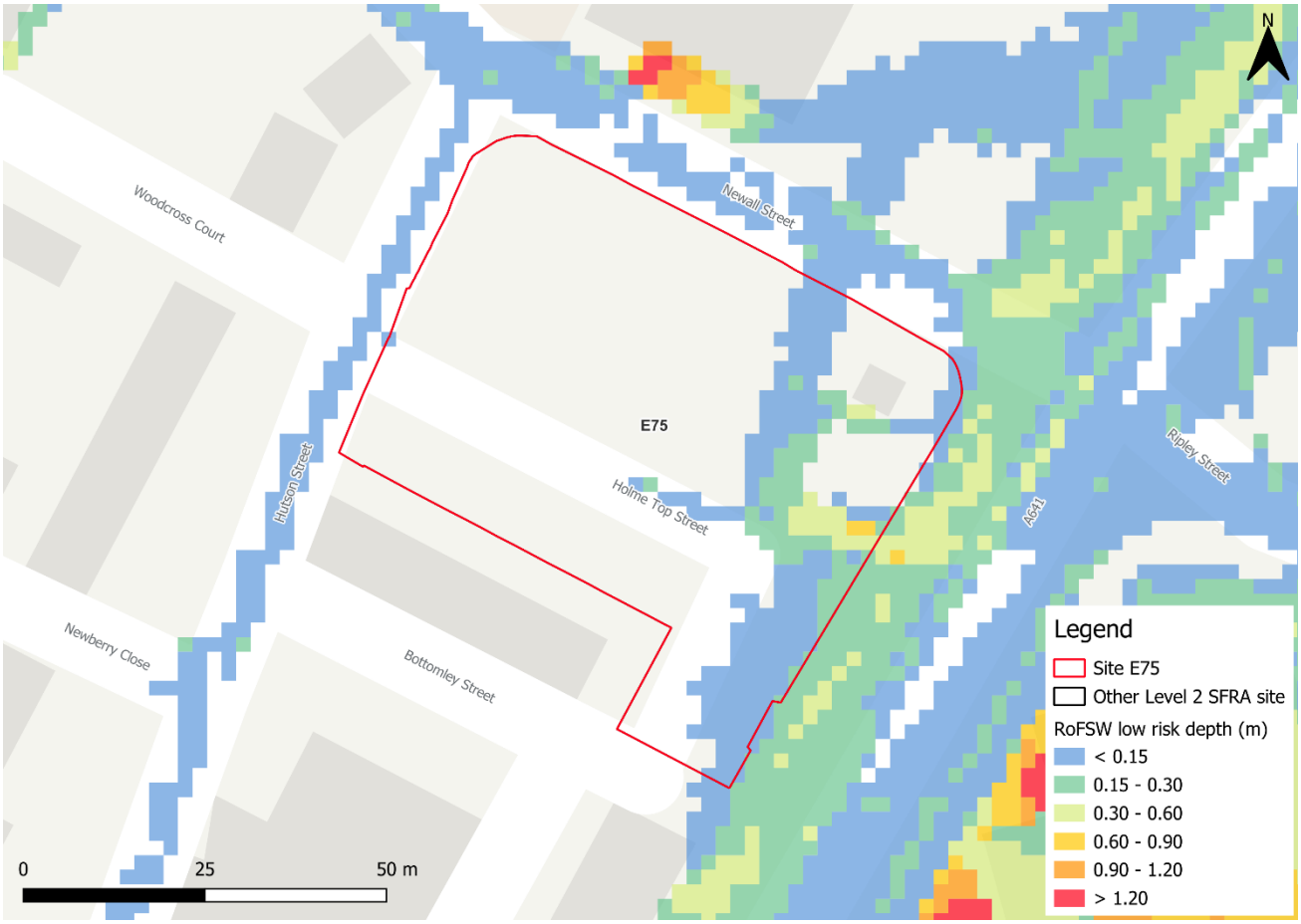



Figure 3-5: Low risk event surface water flood depths, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

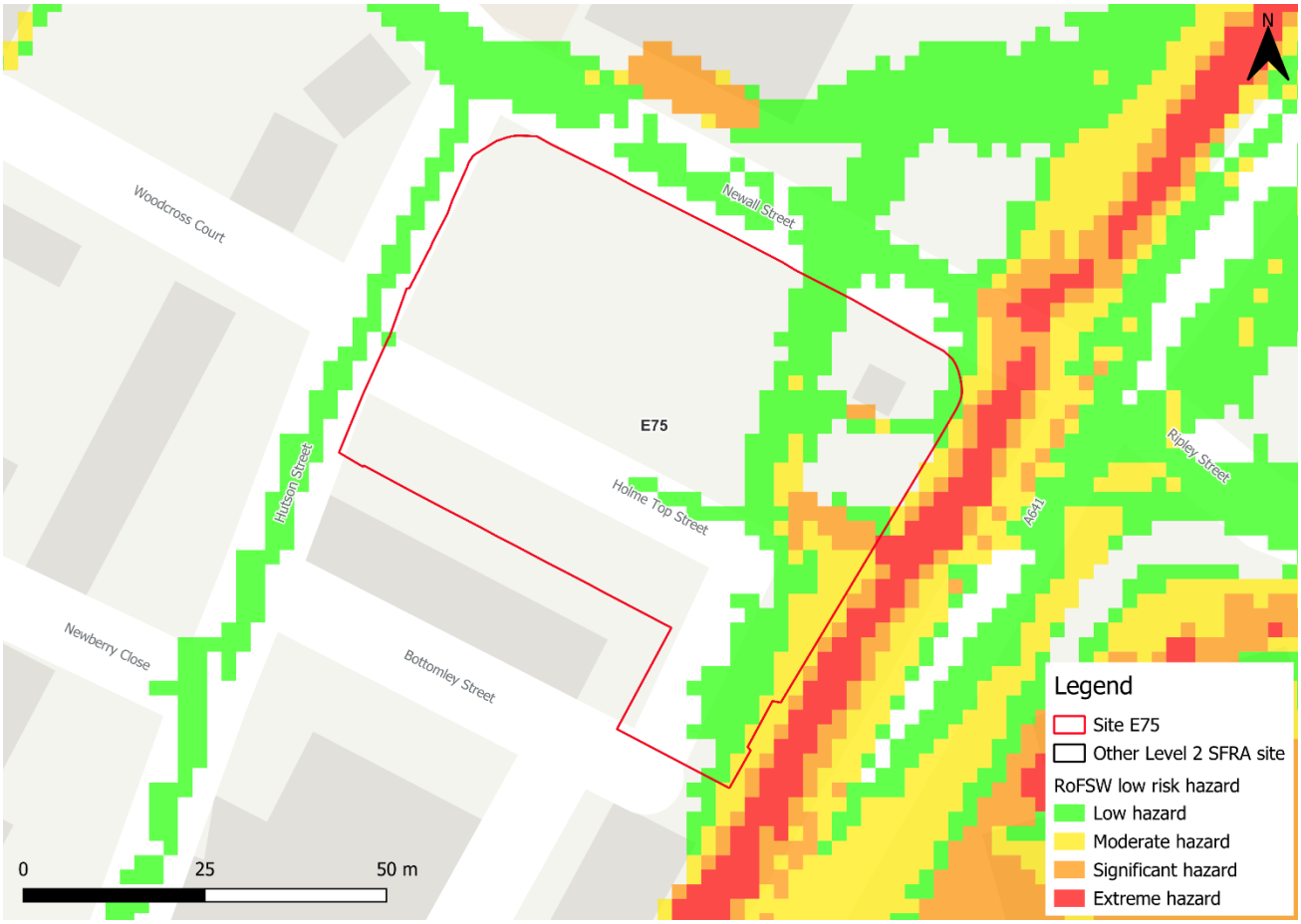



Figure 3-6: Low risk event surface water flood hazard, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 91% of the site being at very low surface water flood risk. Surface water risk in the medium risk event is confined to an area of ponding within the centre of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. In addition to the area of ponding within the centre of the site, there is flow path along the eastern boundary of the site though this is within the area of Flood Zone 2.
- Topographic flow paths should be considered and included in site design and ideally left in place to flood naturally when required. Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development.
- Safe access and escape routes should be possible during all events via Hutson Street, with consideration to the modelled shallow surface water flood depths and low hazard during the proxy climate change event.
- The drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield rates will likely

apply, though the developer should consult local LLFA guidance and the National SuDS guidance.

- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications.

The entire site is located within an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS, however this should be considered further through the drainage strategy given the likely low permeability of the underlying bedrock (Figure 1-3).




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

Although a site may be afforded some protection from defences and / or drainage infrastructure, there is always a residual risk of flooding from asset failure i.e. defence breaches, or blockages of culverts or drainage assets. Residual risk at this site may come from a blockage or structural failure of the Bowling Beck culvert to the east of the site.

## 5.1 Potential blockage

A blockage or structural failure of the Bowling Beck culvert to the east of the site may cause water in the channel to overtop and cause flooding to the site, depending on the severity of the blockage and the magnitude of the flood event. The inlet of the culvert is marked on Figure 5-1.

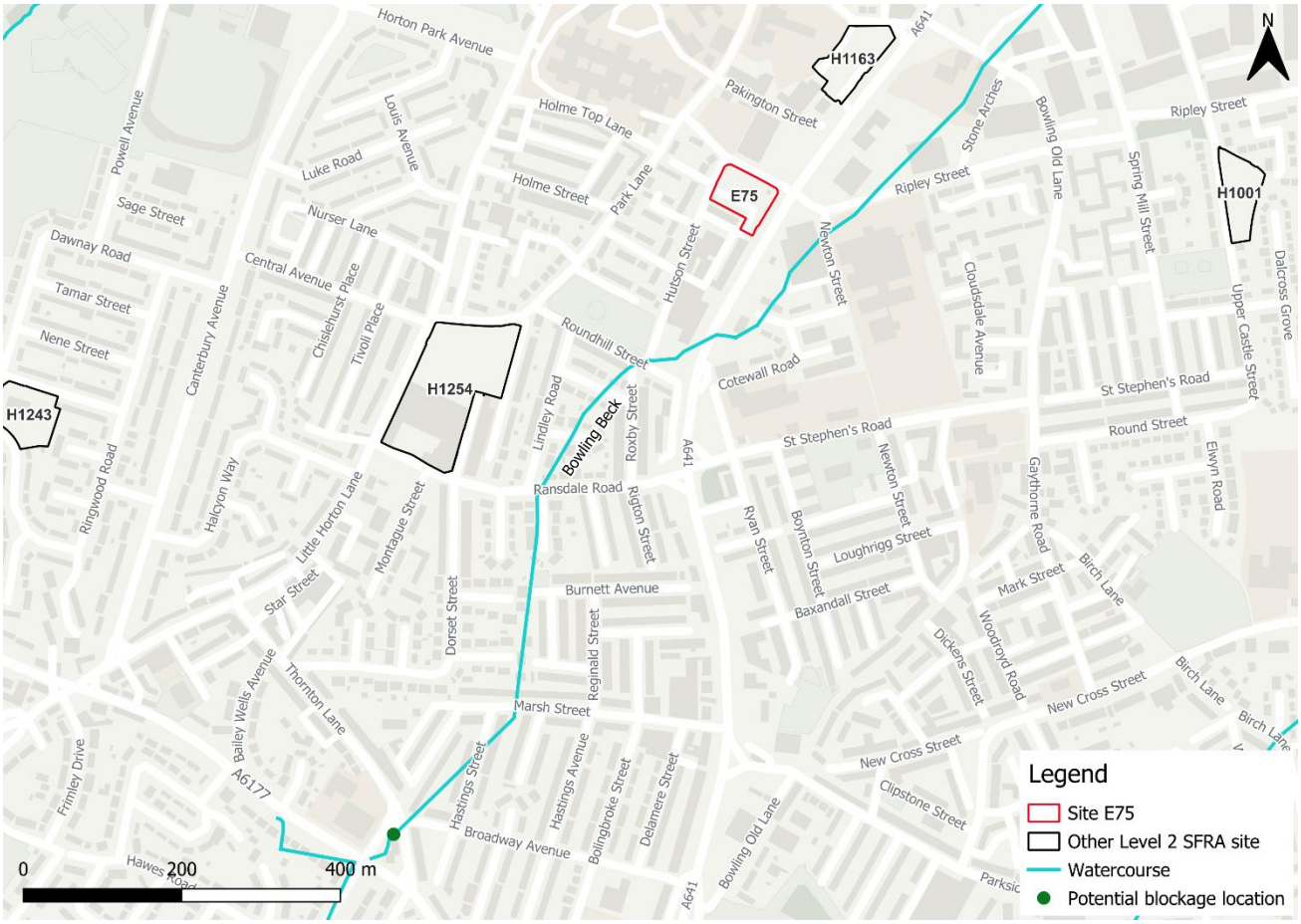



Figure 5-1: Potential blockage location

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A

'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

### 5.3 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a blockage or structural failure of the Bowling Beck culvert to the east of the site. The site-specific FRA could consider modelling a blockage scenario to understand whether there would be any additional risk to the site as a result of a blockage.
- Areas adjacent to culverts and bridges are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked. Emergency plans must be in place for such areas and safe access and escape routes must be in place for the lifetime of development. Resistance and resilience measures may also need to be put in place to manage residual flood risk when avoidance measures have been exhausted.
- The LPA should use the information on residual risk in this Level 2 SFRA to state in the local plan strategic policies a preferred mitigation strategy for ensuring development will be safe throughout its lifetime in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications (para 042, FRCC-PPG).

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is generally considered to be 75 years for non-residential development.

## 6.2 Recommendations summary

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- It should be appropriate to develop this site for more vulnerable purposes given its location largely within Flood Zone 1 and nominal surface water flood risk.
- Ideally, all development would be directed to the area of the site within Flood Zone 1. However, detailed flood modelling of Bowling Beck would be required at the site-specific FRA to confirm onsite flood depths, velocities and hazards for both present day and for the impacts of climate change.
- The detailed model should also be used to understand whether there may be any impacts to the site as a result of a blockage of the Bowling Beck culvert to the east of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on existing and future flood risk from Bowling Beck is fully ascertained.

## 6.3 Site-specific FRA requirements and further work

At the planning application stage, the following should be considered:

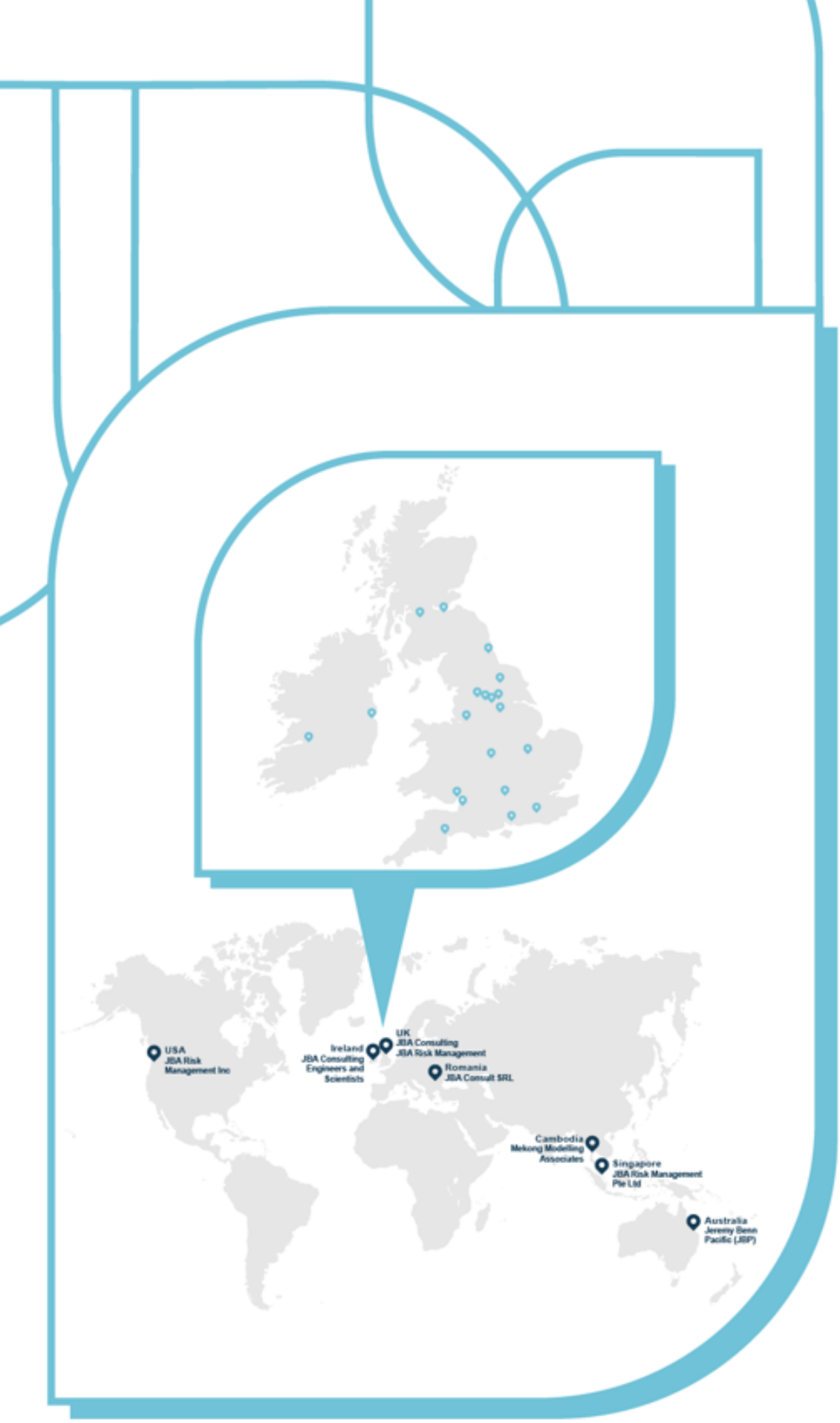
- Full detailed flood modelling of Bowling Beck to assess up to date risk to the site, including for the impacts of climate change. This should also include for culvert blockage scenarios.
- Further modelling to understand the impacts of climate change on surface water flood risk to the site, through a drainage strategy.
- A condition and capacity assessment of the Bowling Beck culvert to the east of the site.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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Jeremy Benn Associates Limited

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# Bradford Level 2 Strategic Flood Risk Assessment - Site E76

## Final Draft

**July 2026**

**Prepared for:**

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

# Document Status

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| Revision | P02 |
| Prepared by | Georgina Williams BSc MSc<br>Assistant Analyst |
| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

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|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Laura Thompson of JBA Consulting carried out this work.

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## Acknowledgements

We would like to thank the Environment Agency for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E76. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site E76

- Location: Land At Beckside Road, Former Rushworth Works, Bradford
- Existing site use: Commercial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 0.24 hectares
- Proposed development impermeable area: 0.24 hectares
- Watercourse: West Brook
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of modelled fluvial flood depths, velocities and hazards
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk




Figure 1-1: Existing site location boundary

The topography of the site is generally consistent throughout the site, with a slightly gradual slope in elevation from east to west (Figure 1-2).

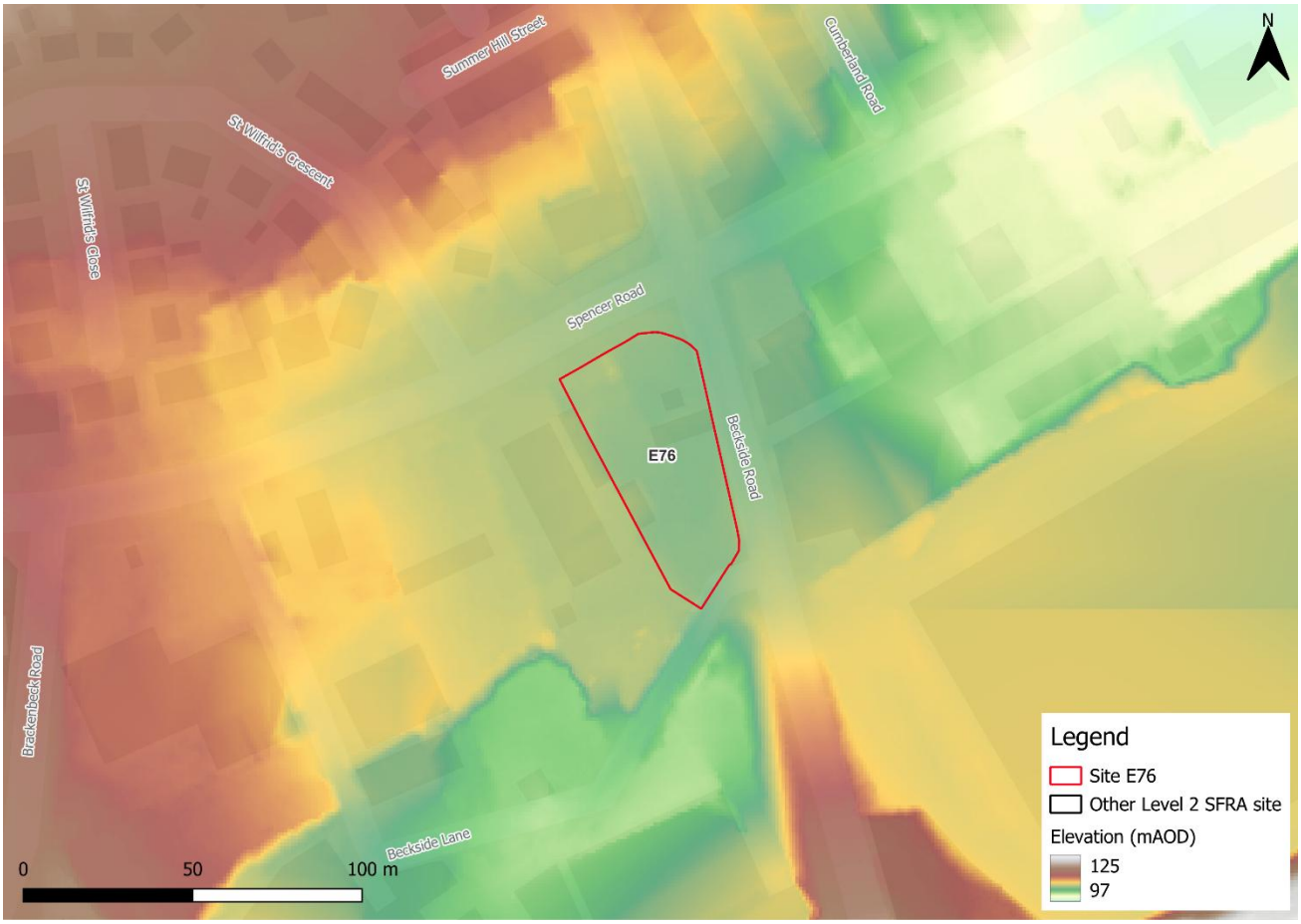



Figure 1-2: Topography

The underlying bedrock within the site is defined as 'Pennine Lower Coal Measures Formation', which comprises mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 1-3). This is overlain with superficial deposits of till. Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, however this can be highly variable. Sandstone has a higher permeability.

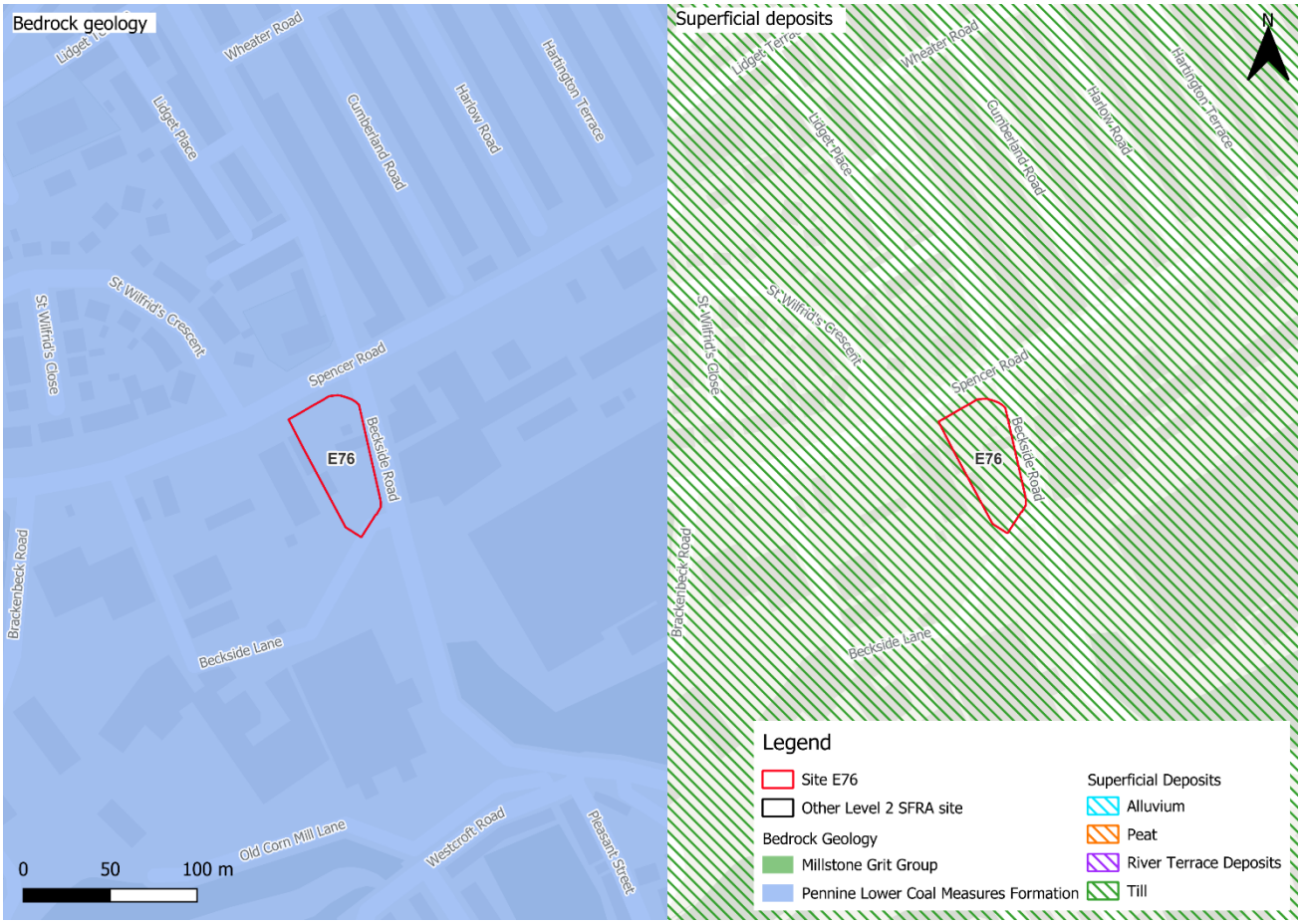



Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (January 2026) and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2.1).

Functional floodplain is present through the centre of the site. However, this is based on an 8m buffered polygon of the West Brook culverted channel to indicate the presence of the watercourse beneath the site. The mapped watercourse location may not represent the actual location of the culverted channel. Noting that, functional floodplain policy applies to the path of the culvert beneath the site and not the mapped functional floodplain, where these differ. The path of the culverted channel should be confirmed through a survey as part of the site-specific FRA. The remaining area of the site is within Flood Zone 1 and therefore at low risk.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 88 | 0 | 0 | 12 |

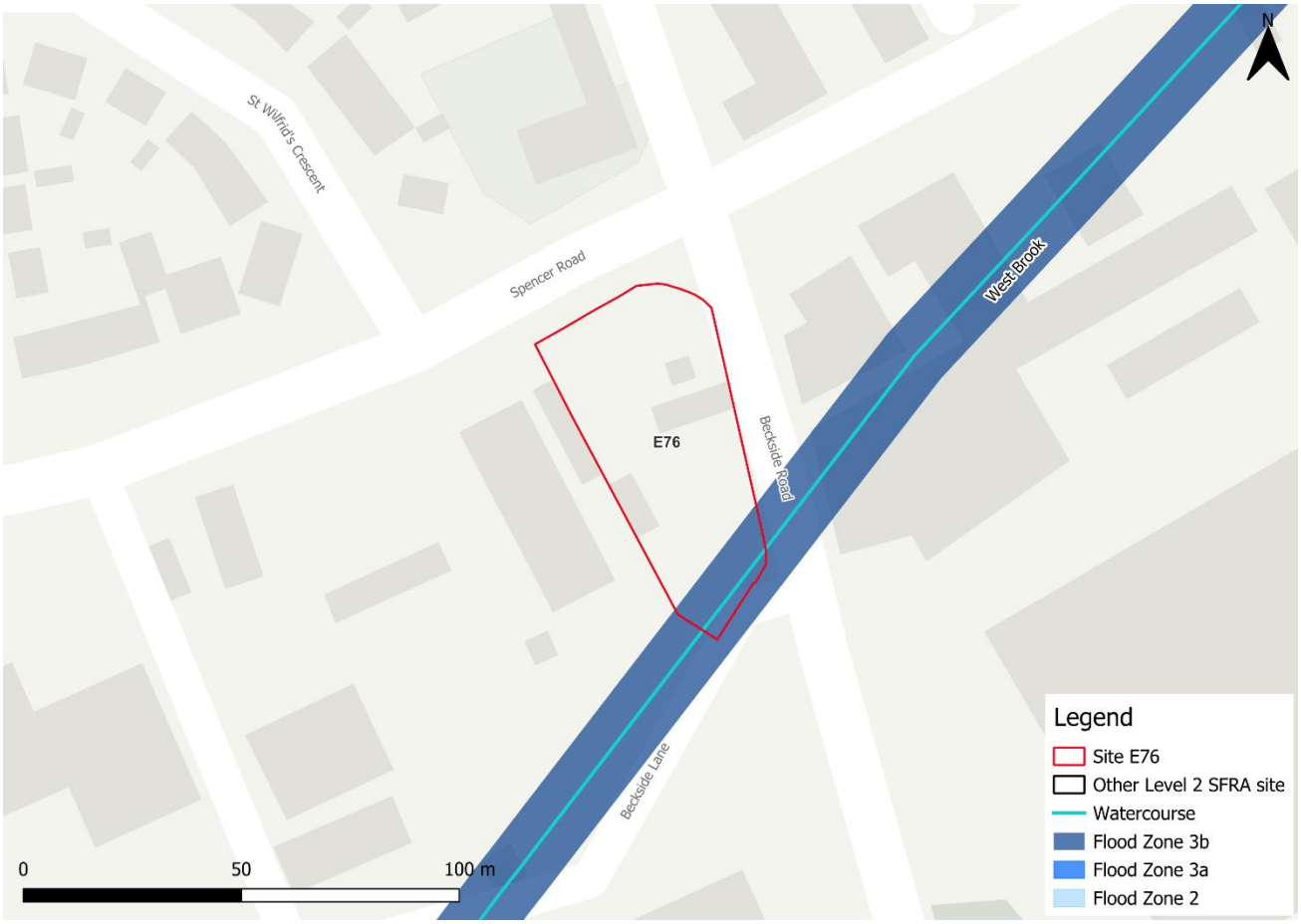



Figure 2-1: Existing risk from rivers to the site

### 2.1.2 Bradford Beck 2026 model outputs - present day

The Bradford Beck 2026 model does not cover the reach of the watercourse present beneath the site. Therefore, flood depth, hazard and velocity data cannot be considered as part of this Level 2 SFRA. Any site-specific FRA should produce a detailed model of the reach of Bradford Beck within the vicinity of the site.

## 2.2 Impacts from climate change

The EA's SFRA guidance states that SFRAs should assess the central allowance for less vulnerable, more vulnerable, highly vulnerable and water compatible development.

Table 2-2: Climate change allowances for peak river flows for the Aire and Calder Management Catchment

| Return period (AEP event) | Central allowance 2080s (% increase) | Higher central allowance 2080s (% increase) | Upper end allowance 2080s (% increase) |
|---|---|---|---|
| 3.3% (functional floodplain) | 23% | 31% | 51% |
| 1% | 23% | 31% | 51% |

### 2.2.1 Bradford Beck 2026 model outputs - climate change

As documented in Section 2.1.2, the Bradford Beck 2026 model does not cover the site. Therefore, detailed climate change modelling is unavailable for consideration.

### 2.2.2 Flood Map for Planning - Climate Change

The EA's Flood Map for Planning plus Climate Change (2070-2125) dataset also does not cover the site (Figure 2-2). The impact of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Any site-specific FRA should produce a detailed model of the reach of West Brook within the vicinity of the site, including for the most up to date climate change allowances (Table 2-2).

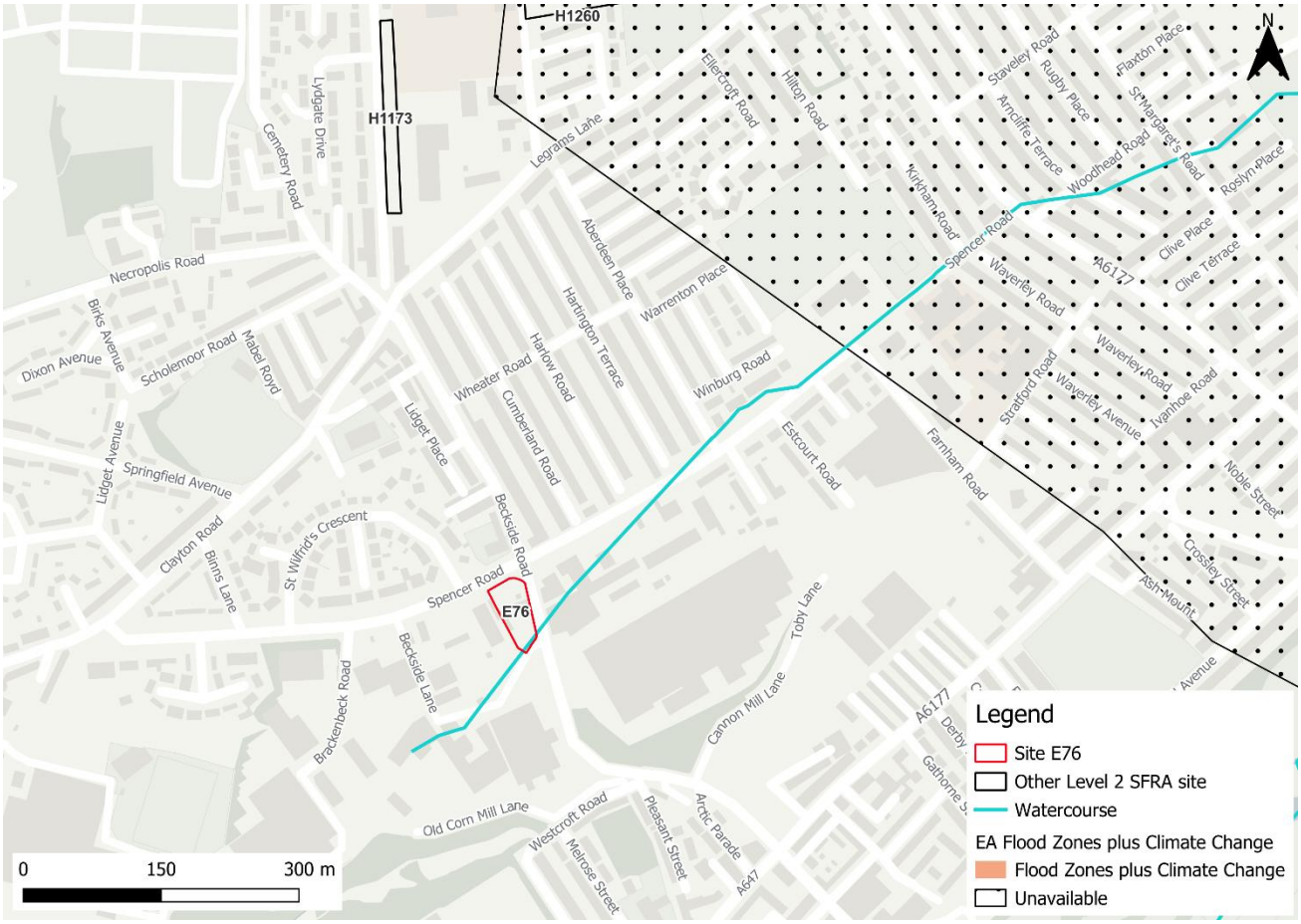



Figure 2-2: EA Flood Zones plus Climate Change dataset

## 2.3 Flood risk management

### 2.3.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

## 2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events within the vicinity of the site.

## 2.5 Emergency planning

### 2.5.1 Flood warnings

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. This site is not located within a FAA.

### 2.5.2 Access and escape routes

Based on available information, safe access and escape routes would likely be achievable via both Spencer Road to the north of the site and Beckside Road to the east of the site (Figure 2-3).

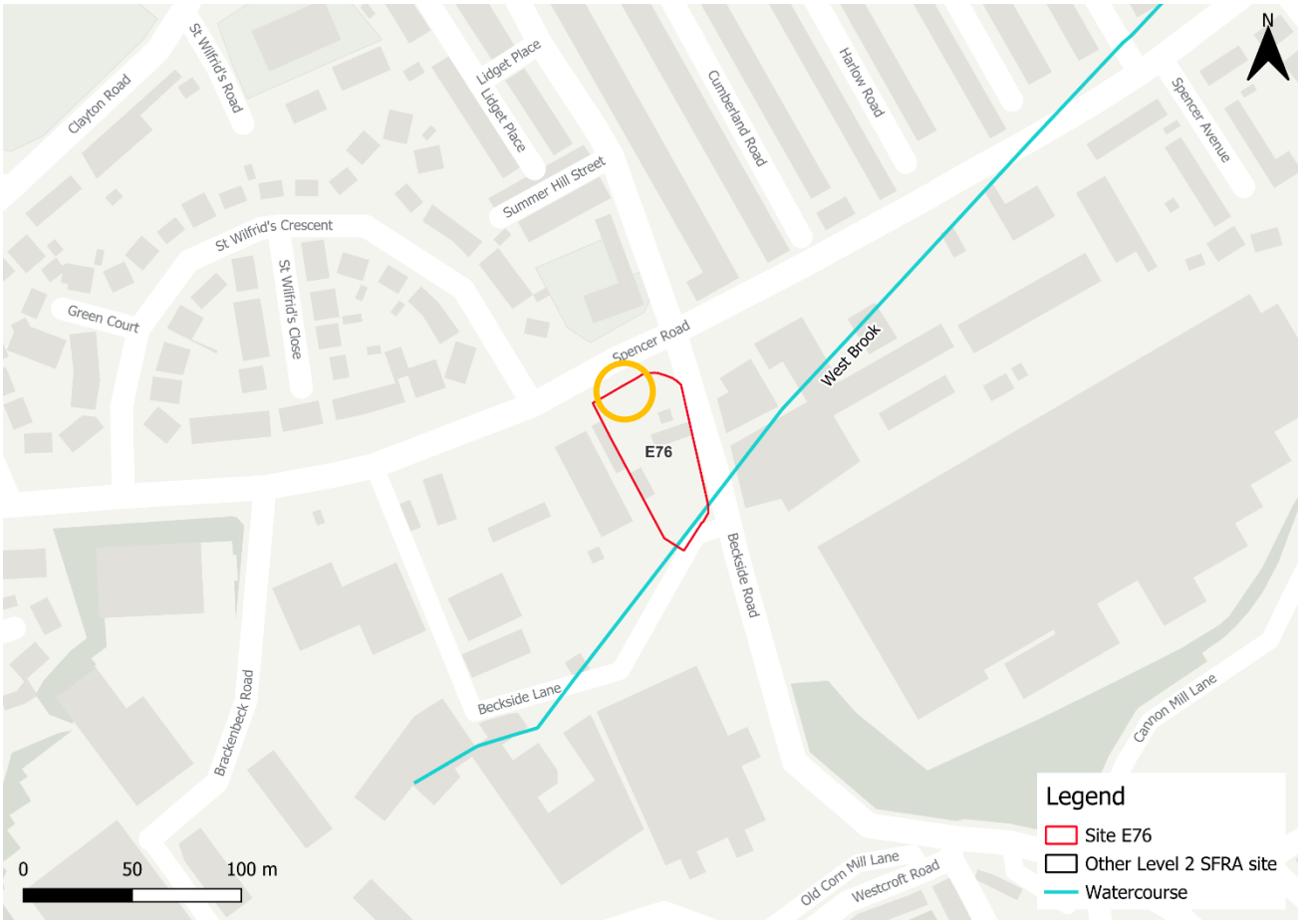



Figure 2-3: Potential access and escape routes

## 2.6 Observations, mitigation options, site suitability and sequential approach to development management - fluvial

- Observations:
  - The site is shown to be within the functional floodplain through the south of the site, representing the potential presence of the culverted West Brook watercourse beneath the site. Consideration should be given as to whether deculverting and daylighting this section of culvert is feasible, supported by detailed modelling. The watercourse should be considered within site design with the potential for a blue green corridor on the location of the culvert, once confirmed.
  - If West Brook remains culverted beneath the site, there should be no development above the culvert. The location and course of the culvert should be confirmed through a survey.
  - There are no detailed model outputs available to confirm onsite flood depths, hazard and velocities, as the Bradford Beck 2026 model does not cover the reach of watercourse beneath the site.
  - If works are proposed on or near West Brook, a separate permission may be required. The type of permission needed from the Lead Local Flood Authority will depend on the activity and location proposed.

- Based on available information, further work is required in order to allocate this site. There may be opportunities to deculvert and daylight the West Brook culvert beneath the site which could impact flood risk on the site. Any site-specific FRA should produce a detailed model of the reach of West Brook to confirm modelled flood extents and depths within the site.

- Access and escape:
  - Based on available information, safe access and escape routes would likely be achievable via both Spencer Road to the north of the site and Beckside Road to the east of the site.

# 3 Flood risk from surface water

## 3.1 Existing risk

At the time of writing, the EA's latest national Risk of Flooding from Surface Water (RoFSW) does not include depth and hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation RoFSW depth and hazard mapping in addition to the NaFRA2 extents, as agreed with the EA. Surface water depth and hazard should be confirmed at the site-specific FRA stage.

### 3.1.1 Risk of Flooding from Surface Water - NaFRA2 extents

Based on the EA's national scale RoFSW map (January 2026), surface water risk to the site is predominantly low, as shown in Table 3-1.

Surface water risk in the high and medium risk events is confined to an area of ponding within the centre of the site (Figure 3-1). In the low risk event, there is a significant flow path through the centre of the size, covering 63% of the site boundary. This likely flows into the into the area of lower elevation to the south of the site, currently at significant risk of surface water flooding. Flow path direction should be confirmed at the site-specific FRA stage. Safe access and escape routes should be achievable via Beckside Road to the southeast of the site.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 26 | 63 | 3 | 8 |

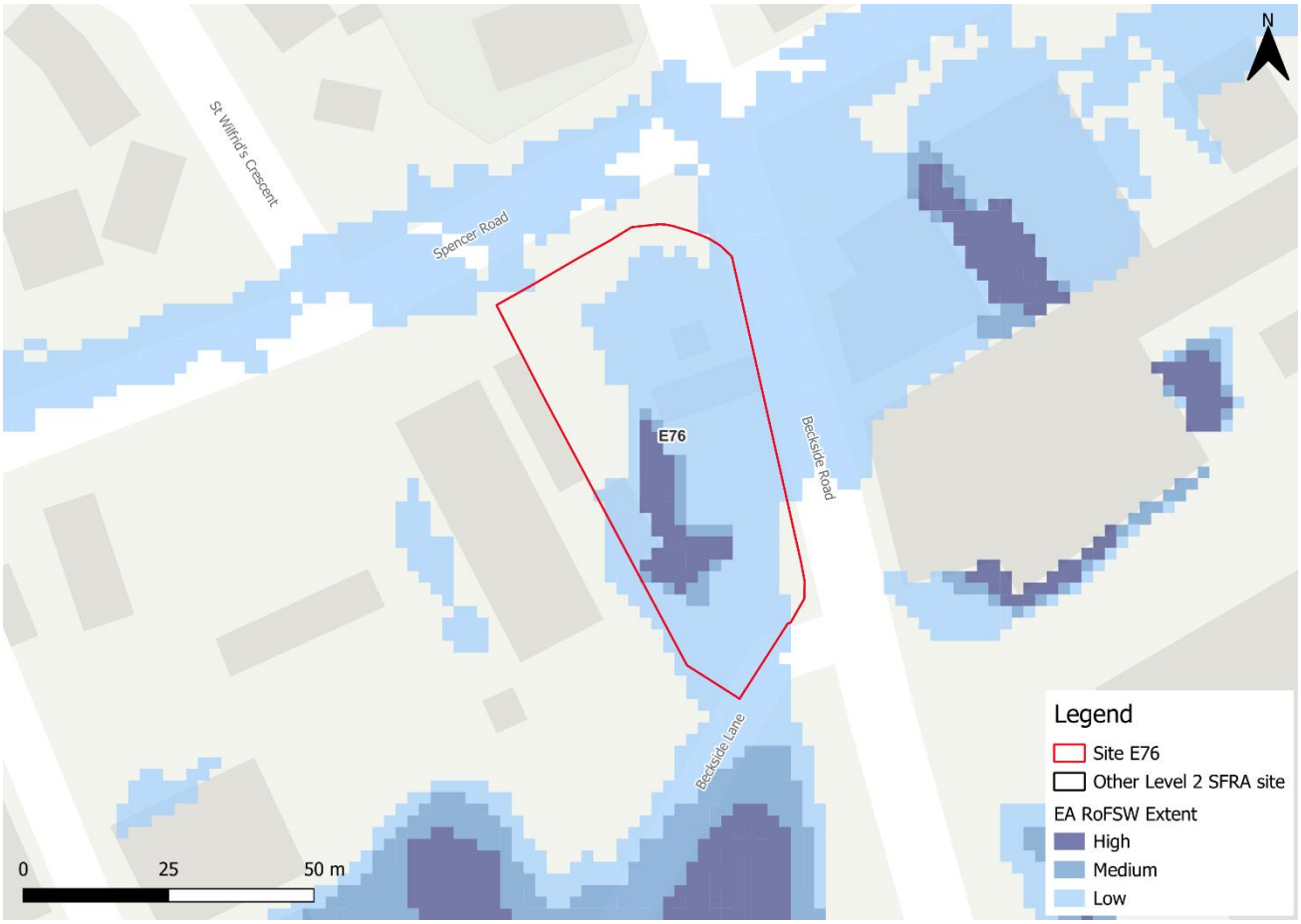



Figure 3-1: Surface water flood extents (NaFRA2 - Risk of Flooding from Surface Water map)

### 3.1.2 Risk of Flooding from Surface Water - third generation depths and hazards

Based on the EA's national scale third generation RoFSW map, the greatest flood depths within the site in the medium risk event are between 0.3 and 0.6 m (Figure 3-2), with some areas of hazard categorised as 'significant' (Figure 3-3). Safe access and escape routes may be achievable via Beckside Road to the southeast of the site.

There are clear differences between the NaFRA2 RoFSW map and the third-generation depth and hazard mapping. The NaFRA2 RoFSW map does not map flooding less than 0.075m (7.5cm) in depth. Therefore, where the map may show no flooding, there may be shallow flooding up to a depth of 0.075m. In contrast, the third generation RoFSW does not map flooding with a hazard rating of less than 0.575. This could explain the differences observed between the NaFRA2 and third generation RoFSW. Assessment of surface water should be carried out at the site-specific FRA stage to establish current and future surface water flood risk conditions.




Figure 3-2: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)




Figure 3-3: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

At the time of writing, the available national surface water climate change mapping is unsuitable for consideration in development planning. This Level 2 SFRA considers the low risk surface water event as a conservative proxy for the medium risk event plus climate change, as agreed with the EA. The impact of climate change on surface water flood risk should be considered at the site-specific FRA stage.

Using the low risk event as a proxy, the medium risk surface water event is likely to increase significantly in extent within the site when accounting for climate change (Figure 3-4). The third generation map indicates maximum flood depths are likely to increase to between 0.9 and 1.2 m (Figure 3-5), with a large area of 'extreme' hazard (Figure 3-6). Safe access and escape routes should remain achievable via Beckside Road to the southeast of the site.

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

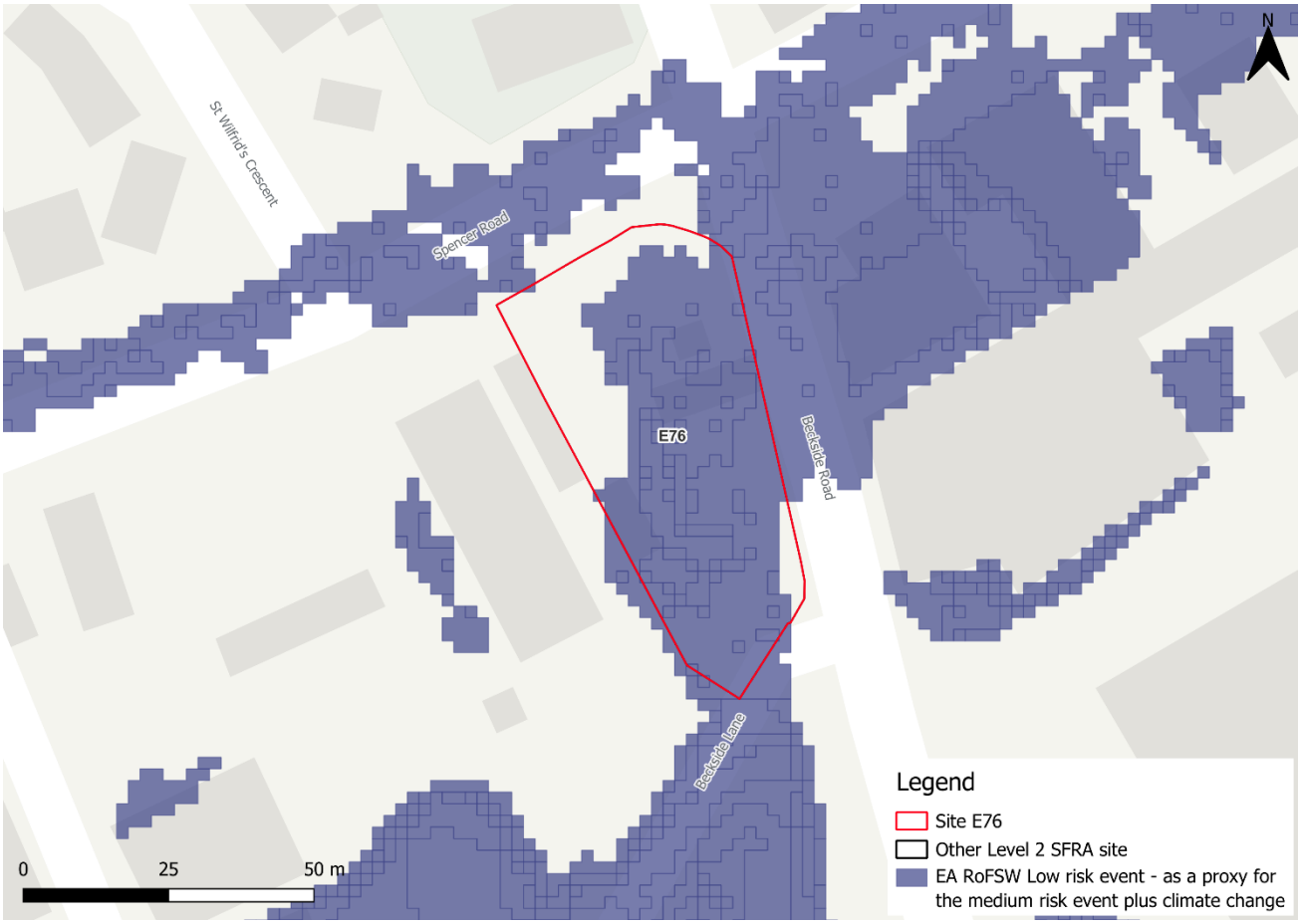



Figure 3-4: Low risk event surface water flood extent, as a proxy for the medium risk event plus climate change (NaFRA2 - Risk of Flooding from Surface Water map)

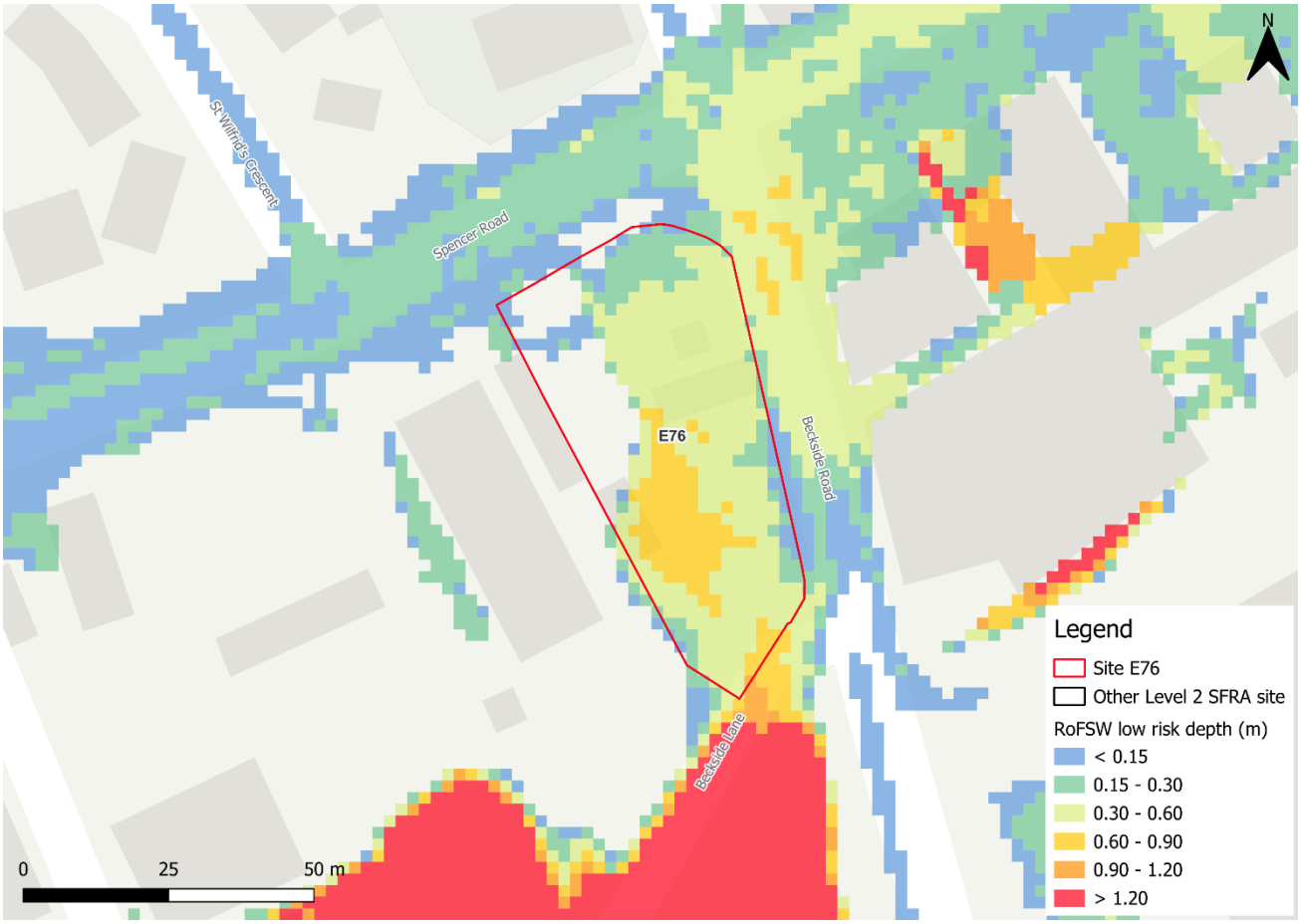



Figure 3-5: Low risk event surface water flood depths, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

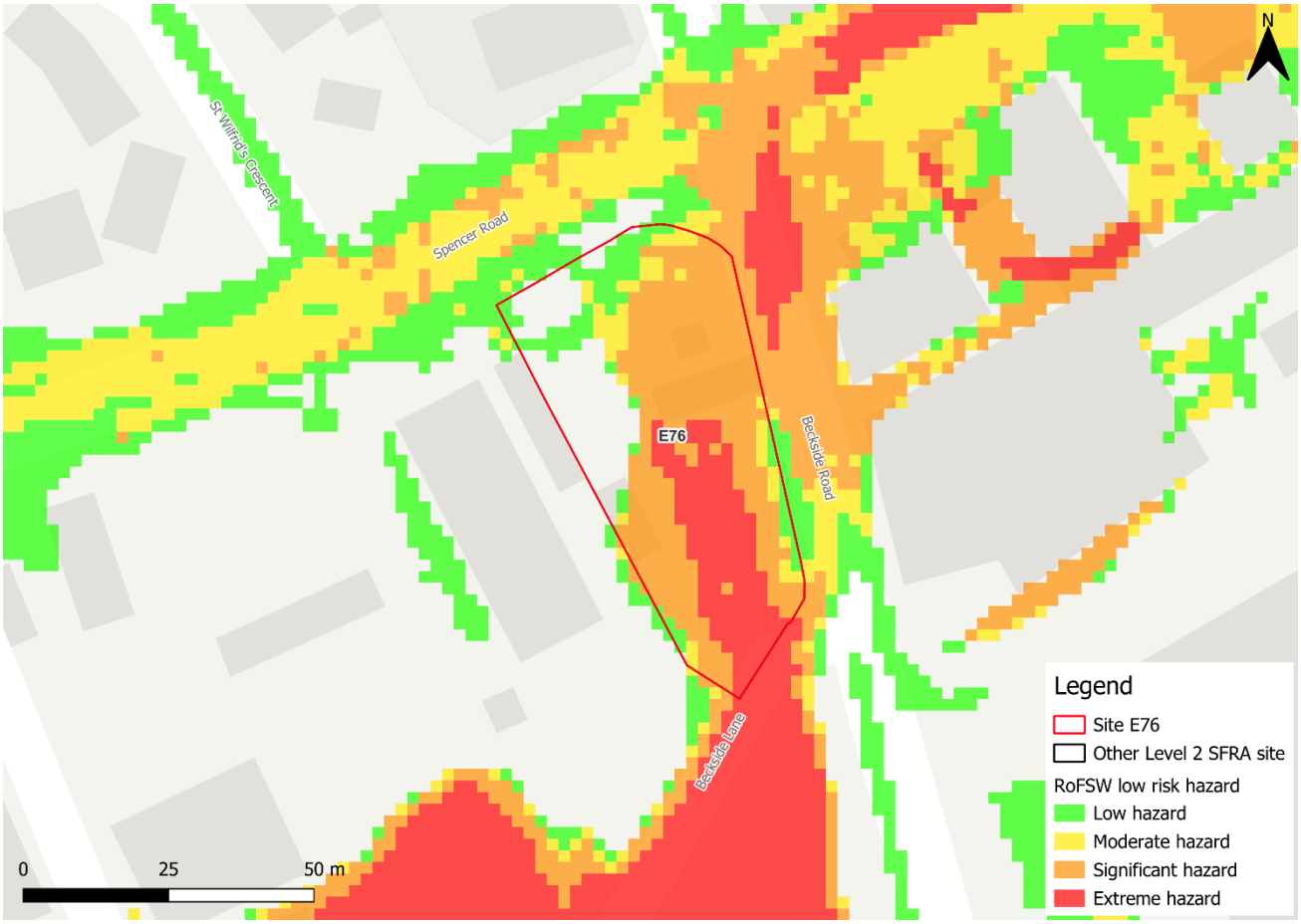



Figure 3-6: Low risk event surface water flood hazard, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options, site suitability and sequential approach to development management - surface water

- Current risk to the site is predominantly low, with 63% of the site being at low surface water risk. Surface water risk in the high and medium risk events is confined to an area of ponding within the centre of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. There is a significant flow path through the centre of the site in the low risk event, indicating potential significant risk in the future.
- Given the modelled surface water risk to the site, it may be challenging to allocate this site given the proxy climate change depths and hazards. Updated modelling of surface water risk to establish depths and hazard would be required through a drainage strategy to confirm.
- Safe access and escape routes should be possible via Beckside Road, however this route becomes inundated to shallow depths in the proxy climate change event.

- Any change in site layout where current buildings are to be demolished and changes to road layouts will require detailed surface water modelling to ascertain flow routes and low-lying areas.
- The drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield rates will likely apply, though the developer should consult local LLFA guidance and the National SuDS guidance. A wider drainage strategy for the local area may be appropriate.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications.

Within the majority of the site, there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS in these areas, however this should be considered further through the drainage strategy given the likely low permeability of the underlying bedrock (Figure 1-3). Within a small area in the north of the site, groundwater may emerge at significant rates and has the capacity to flow overland and / or pond within any topographic low spots. In this area, ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.




Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

Although a site may be afforded some protection from defences and / or drainage infrastructure, there is always a residual risk of flooding from asset failure i.e. defence breaches, or blockages of culverts or drainage assets. Residual risk at this site may come from a blockage or structural failure of the culverted West Brook culvert beneath the site.

## 5.1 Potential blockage / structural failure

West Brook appears to be culverted from source, with its first section of open channel being at the confluence between the two West Brook watercourses at Shearbridge Road, approximately 1.3 km downstream of the site. However, a blockage of the culverted watercourse could cause surcharging through manhole covers and/or gullies, posing a potential risk to the site.

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

## 5.3 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a blockage or structural failure of the West Brook culvert beneath the site. The site-specific FRA could consider modelling a blockage scenario to understand whether there would be any additional risk to the site as a result of a blockage.
- Areas adjacent to culverts and bridges are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked. Emergency plans must be in place for such areas and safe access and escape routes must be in place for the lifetime of development. Resistance and resilience measures may also need to be put in place to manage residual flood risk when avoidance measures have been exhausted.
- The LPA should use the information on residual risk in this Level 2 SFRA to state in the local plan strategic policies a preferred mitigation strategy for ensuring development will be safe throughout its lifetime in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications (para 042, FRCC-PPG).

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is generally considered to be 75 years for non-residential development.

## 6.2 Recommendations summary

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- There should be no development above the West Brook culvert which runs beneath the site. The location and path of this culvert should be confirmed through a survey as part of the site-specific FRA.
- There may be opportunities to deculvert and daylight the West Brook culvert beneath the site which could impact flood risk on the site. Any site-specific FRA should produce a detailed model of the reach of West Brook to confirm modelled flood extents and depths within the site.
- Given the extent of surface water flood risk in the low risk event, a full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA. Runoff volumes must not exceed existing brownfield rates and, if possible, betterment should be achieved. An area-wide drainage strategy or Surface Water Management Plan should be considered.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on existing and future surface water flood risk is fully ascertained.
- Groundwater conditions within the north of the site should be investigated further through the site-specific FRA to ascertain groundwater levels and conditions.

## 6.3 Site-specific FRA requirements and further work

At the planning application stage, the following should be considered:

- Full detailed flood modelling of West Brook to assess up to date risk to the site, including for deculverting and culvert blockage scenarios.
- Further modelling to understand the impacts of climate change on surface water flood risk to the site.
- A condition and capacity assessment of the culvert beneath the site.

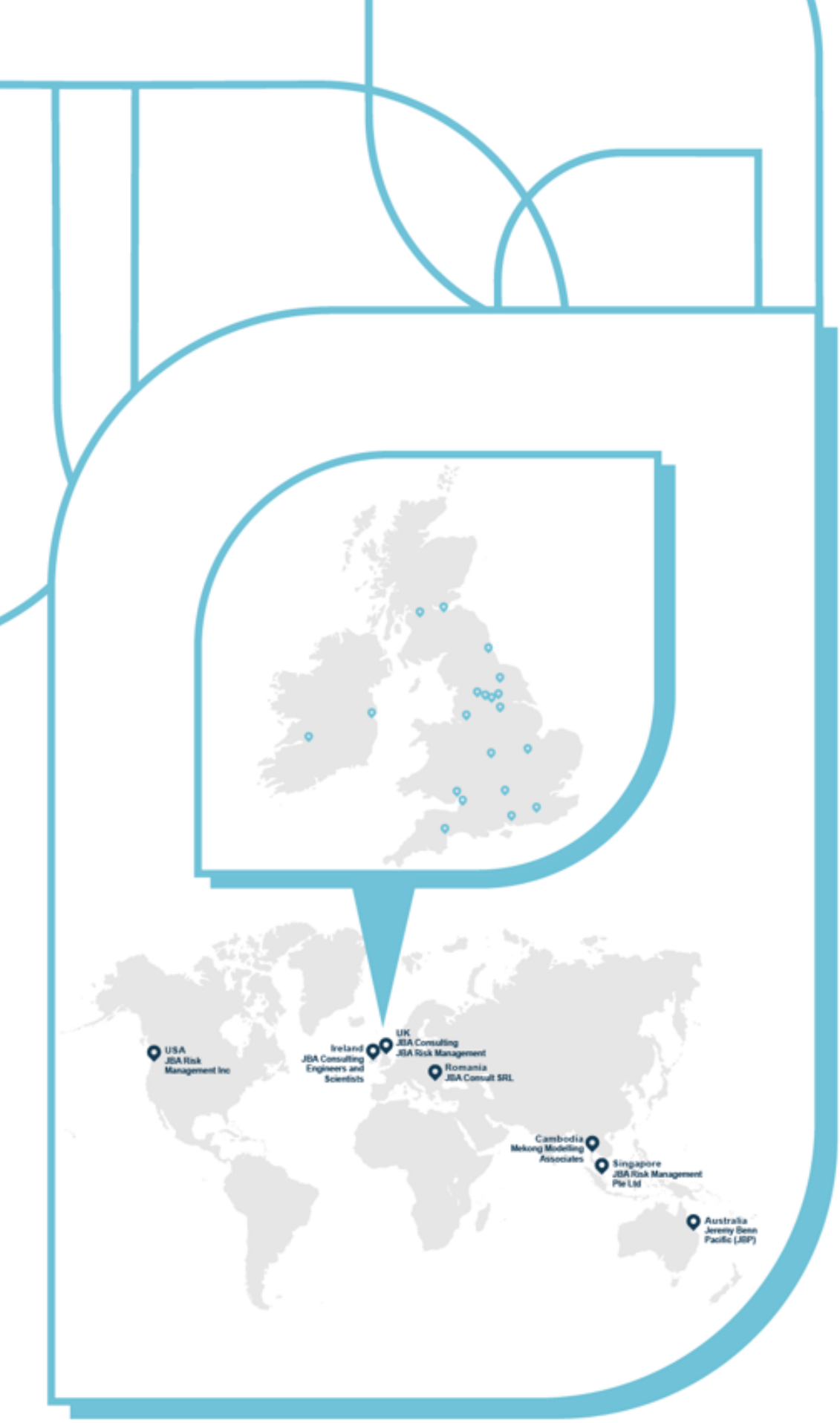
3 Para 178 National Planning Policy Framework 2024

- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

# 7 Licencing

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North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
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# Bradford Level 2 Strategic Flood Risk Assessment - Site E85

## Final Draft

**July 2026**

**Prepared for:**

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

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| Reviewed by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM<br>Associate Director |

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# Contract

| | |
|---|---|
| JBA Project Manager | Mike Williamson |
| Address | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code | 2024s1078 |

This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Georgina Williams of JBA Consulting carried out this work.

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## Acknowledgements

We would like to thank the Environment Agency for their assistance with this work.

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site E85. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site E85

- Location: Ingleby Road
- Existing site use: Greenfield
- Existing site use vulnerability: Water compatible
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 3.3 hectares
- Proposed development impermeable area: 2.77 hectares
- Watercourse: Bradford Beck
- CBMDC river model: Bradford Beck 2026
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assessment of modelled fluvial flood depths, velocities and hazards
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk
    - Modelling of residual risk from Bradford Beck culvert beneath A6177

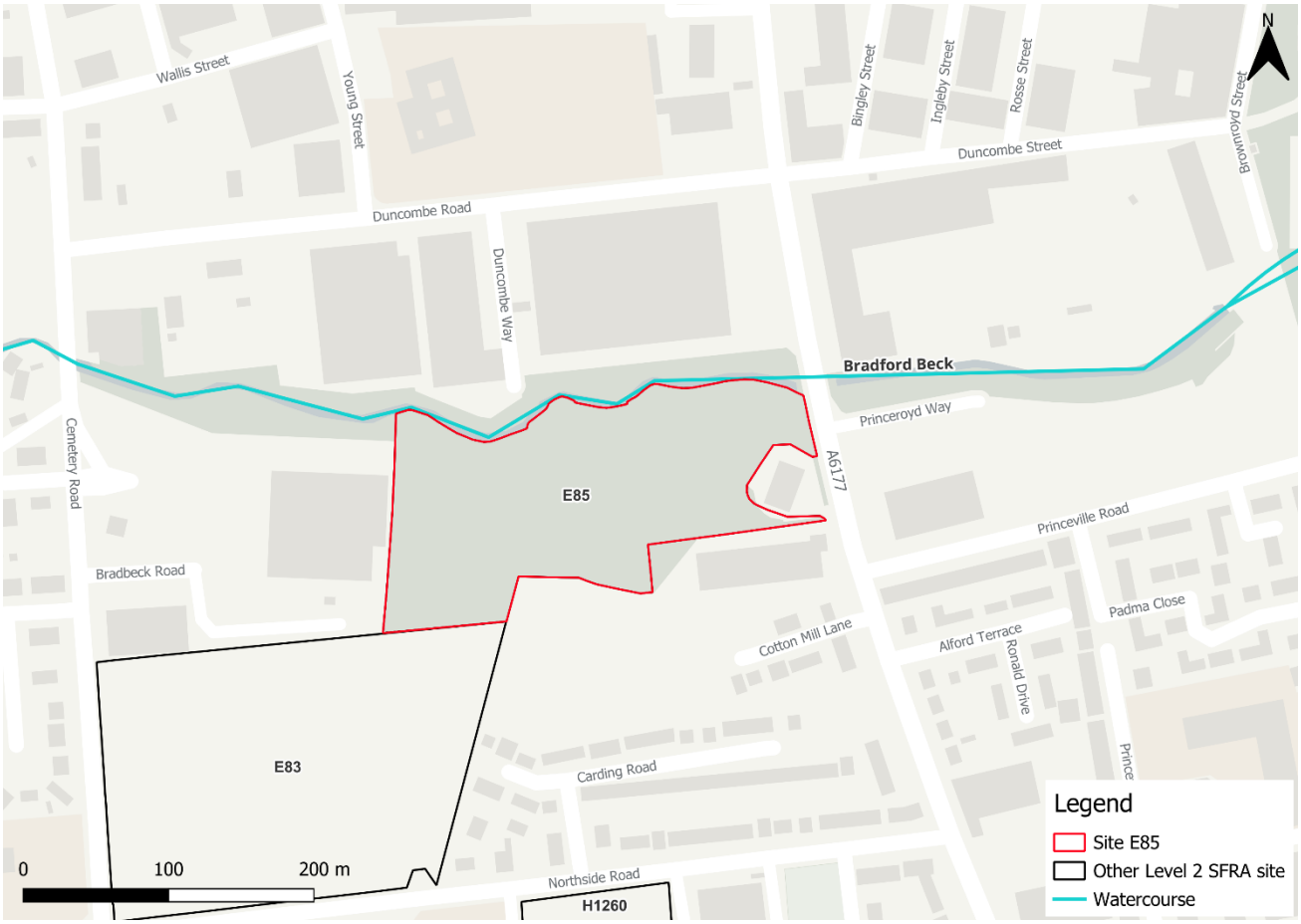



Figure 1-1: Existing site location boundary

There are areas of higher elevation within the south of the site, which slopes northwards towards Bradford Beck adjacent to the northern boundary of the site (Figure 1-2).

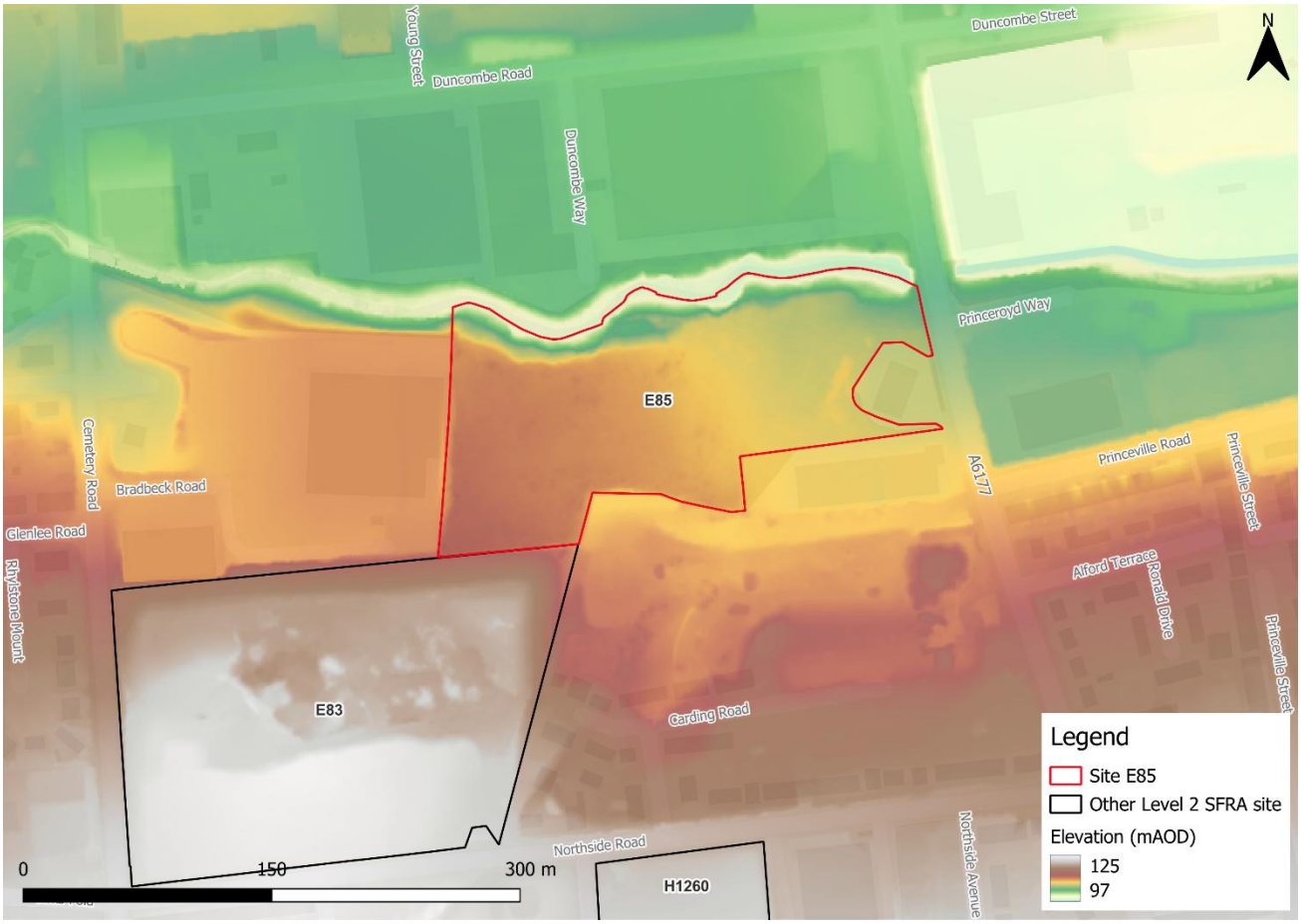



Figure 1-2: Topography

The underlying bedrock within the site is defined as 'Pennine Lower Coal Measures Formation', which comprises mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 1-3). This is overlain with superficial deposits of till. Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, however this can be highly variable. Sandstone has a higher permeability.

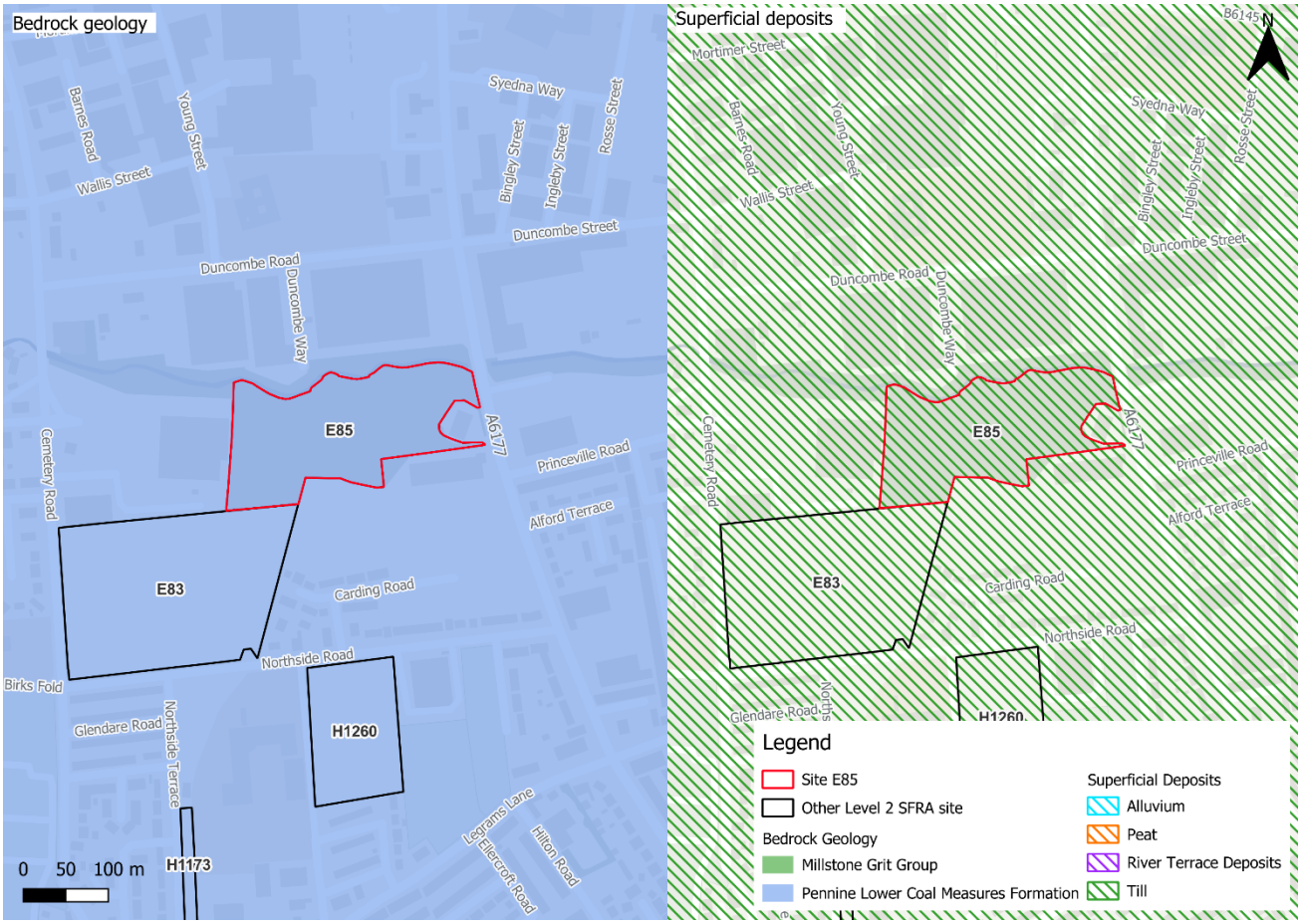



Figure 1-3: Soils and geology

# 2 Flood risk from rivers

## 2.1 Existing risk

### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (January 2026) and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.3).

Fluvial flood risk to the site comes from Bradford Beck, which runs adjacent to the northern boundary of the site. There is an area of functional floodplain along the northern site boundary, however this is largely confined to the Bradford Beck channel. This is based on the 3.3% AEP defended extent from the Bradford Beck 2026 model and an 8m buffer of the Bradford Beck channel. There should be no development within the functional floodplain. The majority of the site is within Flood Zone 1 and is therefore at low risk of fluvial flooding.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

| Flood Zone 1 (% area) | Flood Zone 2 (% area) | Flood Zone 3a (% area) | Flood Zone 3b (% area) |
|---|---|---|---|
| 93 | 2 | 1 | 5 |

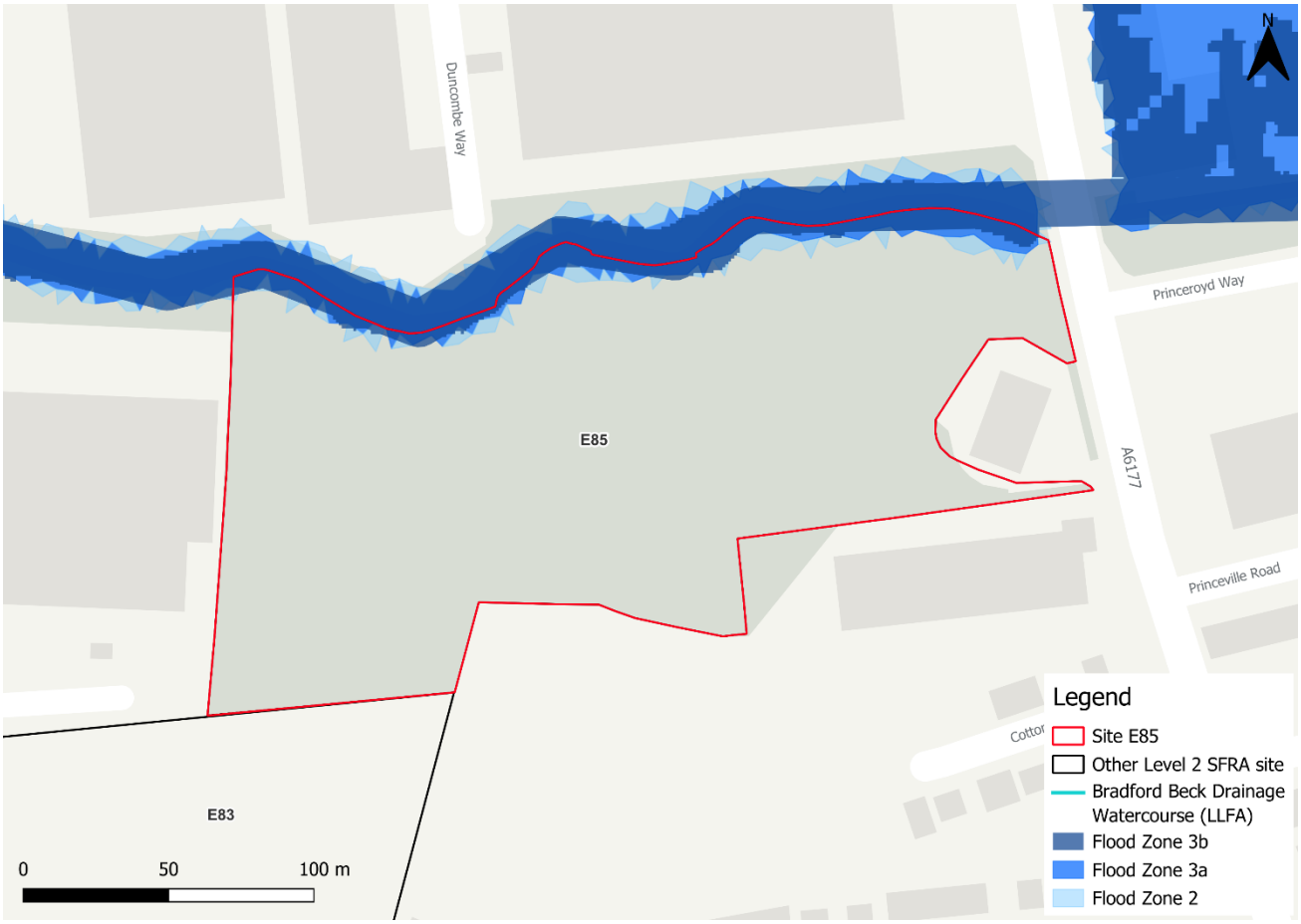



Figure 2-1: Existing risk from rivers to the site

### 2.1.2 Bradford Beck 2026 model outputs - present day

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event. Modelled risk to the site is similar to that shown by Flood Zone 3a, impacting the northern boundary of the site. However, it is noted that the current Flood Zone 3a does not yet account for the latest Bradford Beck model outputs. Onsite modelled flood depths (Figure 2-2), velocities (Figure 2-3) and hazards (Figure 2-4) are significant, however fluvial risk is confined to the Bradford Beck channel adjacent to the northern site boundary.

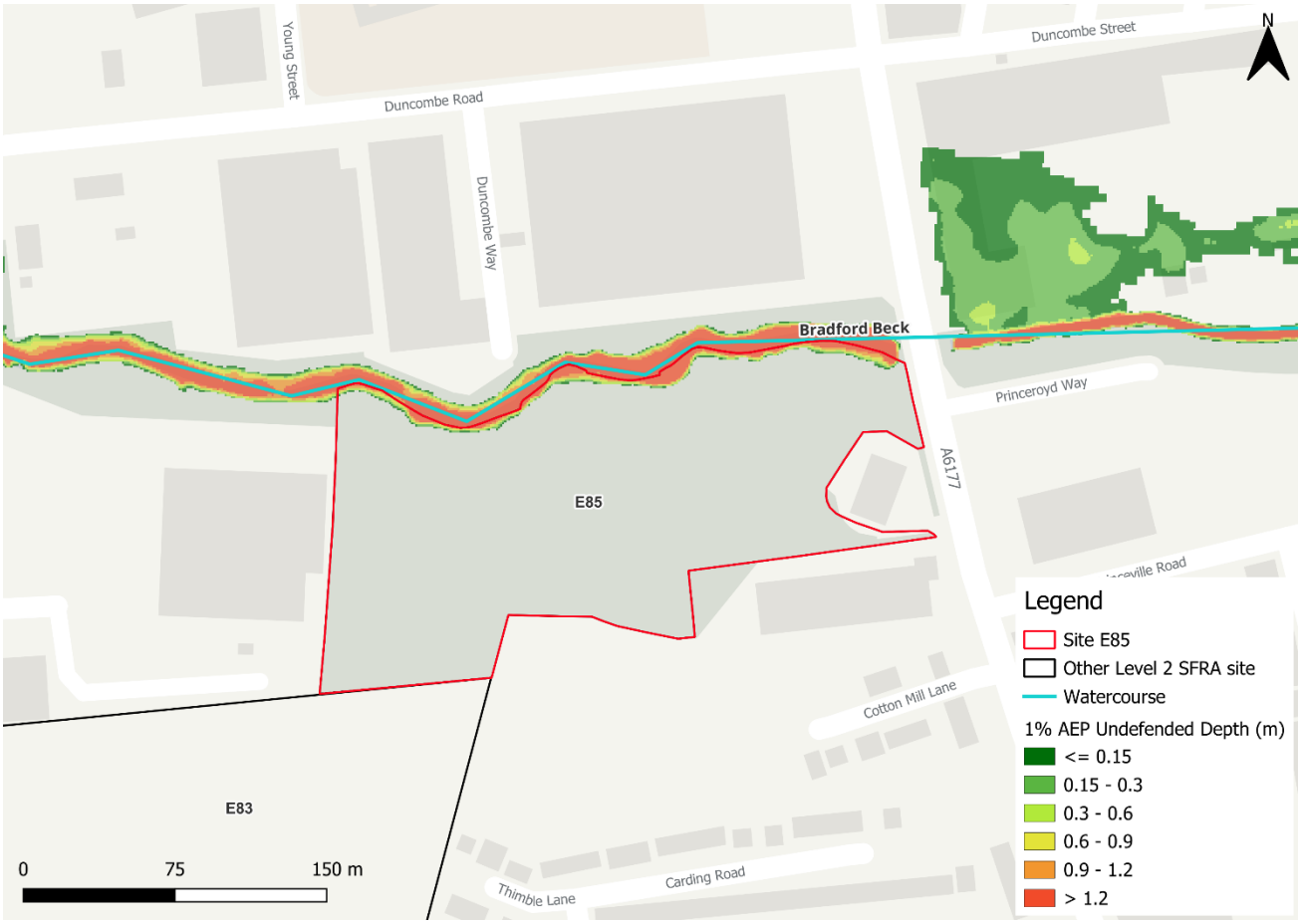



Figure 2-2: Flood depths for 1% AEP undefended flood event

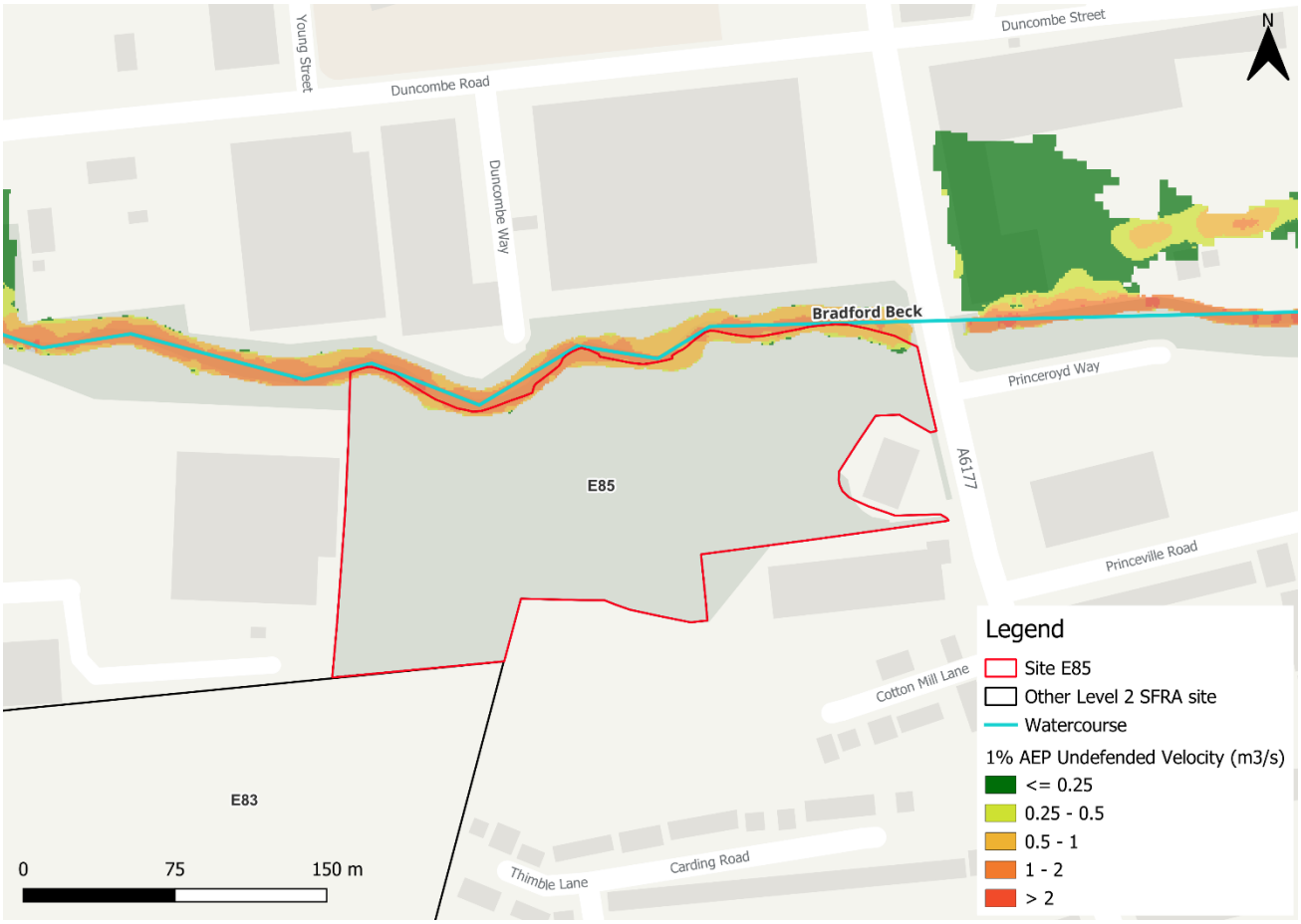



Figure 2-3: Flood velocities for 1% AEP undefended flood event

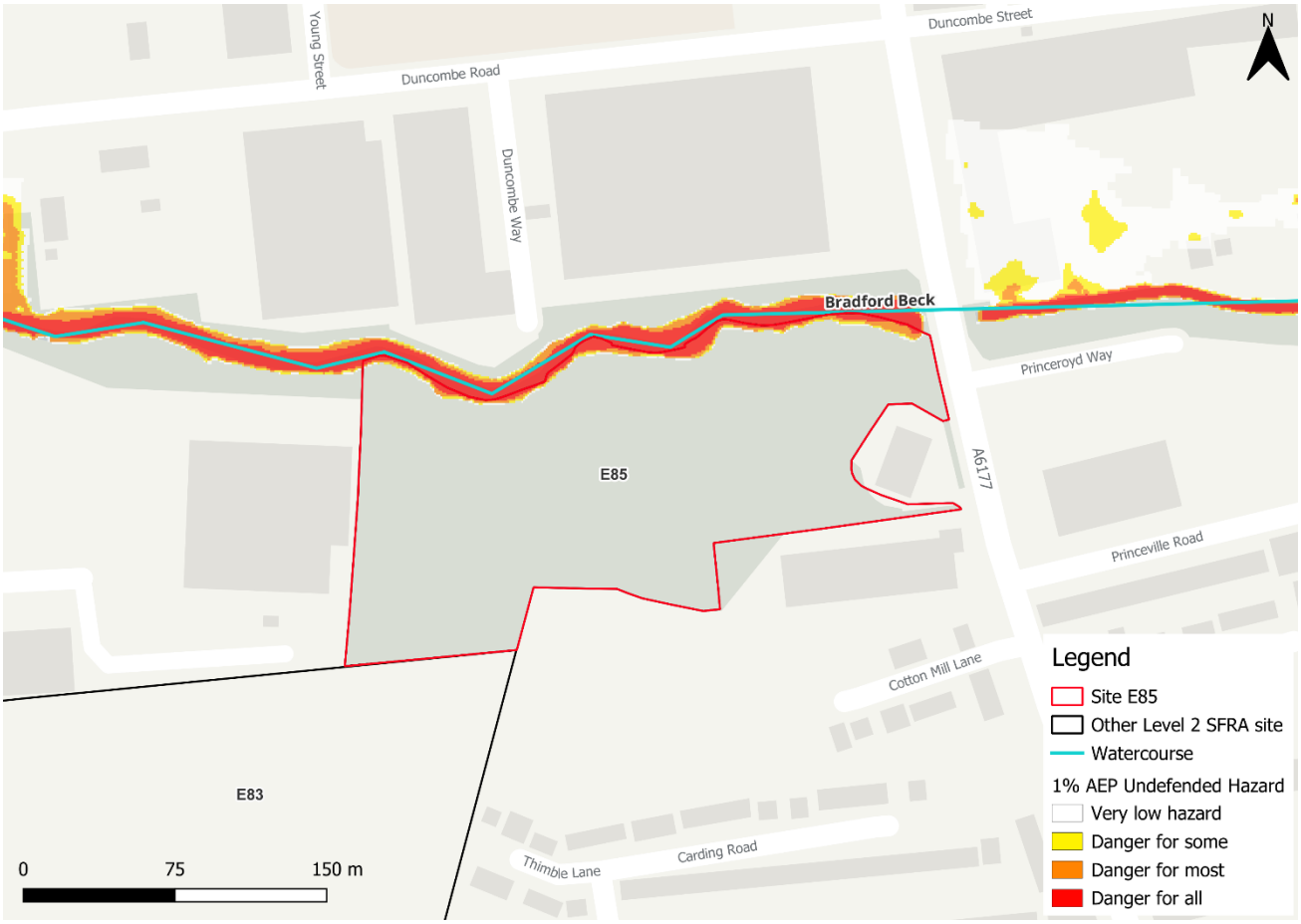



Figure 2-4: Flood hazard[1] for 1% AEP undefended flood event

## 2.2 Impacts from climate change

The EA's SFRA guidance states that SFRAs should assess the central allowance for less vulnerable, more vulnerable, highly vulnerable and water compatible development (Table 2-2). The impacts of climate change on flood risk from the Bradford Beck 2026 model have been modelled without flood defence infrastructure in place. As documented in Section 2.3.1, there are no formal engineered flood defences that would benefit the site.

1 Fluvial hazard ratings based on Table 4 of the SUPPLEMENTARY NOTE ON FLOOD HAZARD RATINGS AND THRESHOLDS FOR DEVELOPMENT PLANNING AND CONTROL PURPOSE – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008.

Table 2-2: Modelled climate change allowances for peak river flows for the Aire and Calder Management Catchment

| Return period (AEP event) | Central allowance 2080s (% increase) | Higher central allowance 2080s (% increase) | Upper end allowance 2080s (% increase) |
|---|---|---|---|
| 3.3% (functional floodplain) | 23% | 31% | 51% |
| 1% | 23% | 31% | 51% |

### 2.2.1 Bradford Beck 2026 model outputs - climate change

Fluvial risk remains confined to the Bradford Beck channel along the northern boundary of the site in the 1% AEP undefended event +23% for climate change. Flood depths (Figure 2-5), velocities (Figure 2-6) and hazards (Figure 2-7) remain significant.

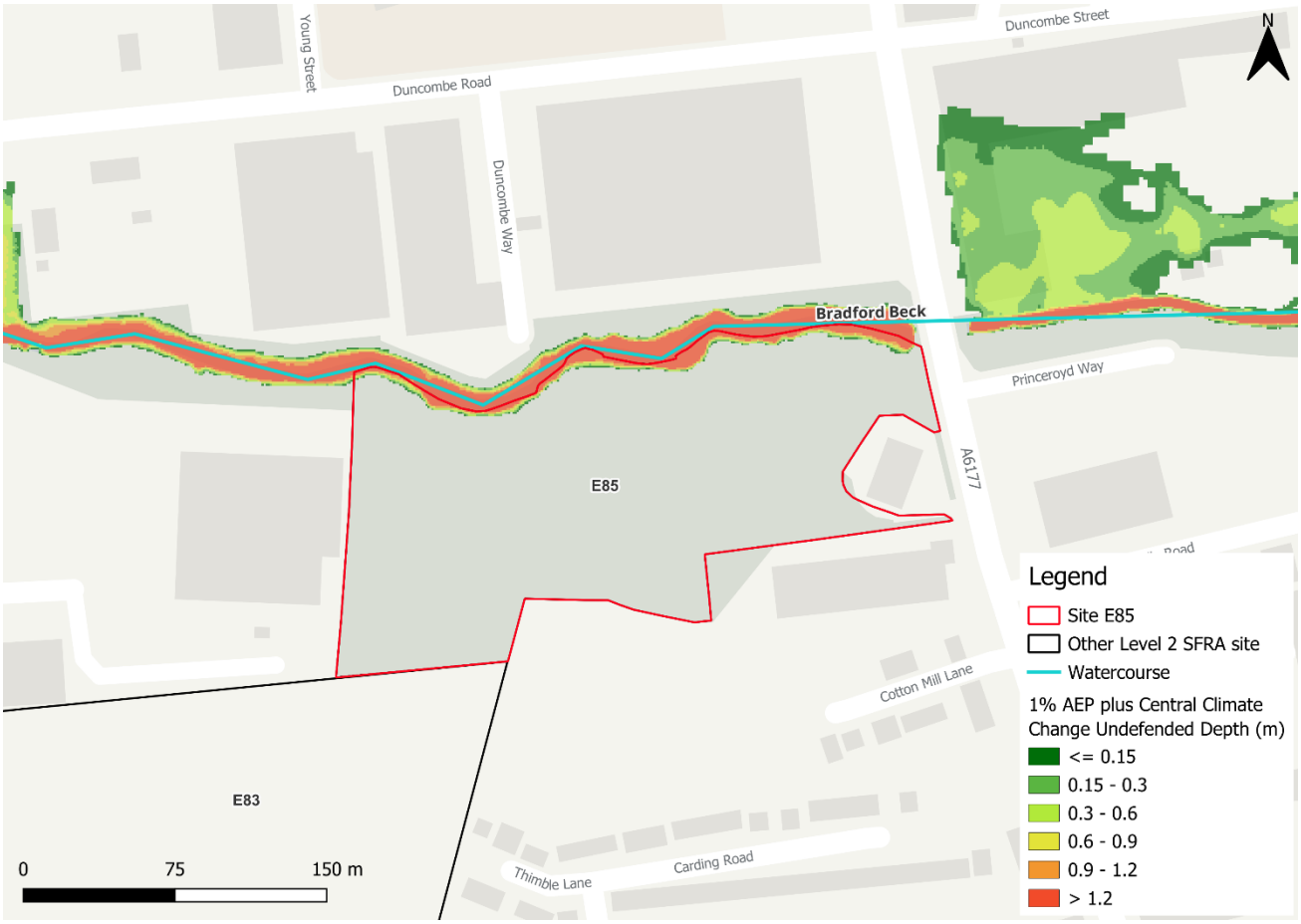



Figure 2-5: Flood depths for 1% AEP undefended flood event +23% (central climate change allowance)

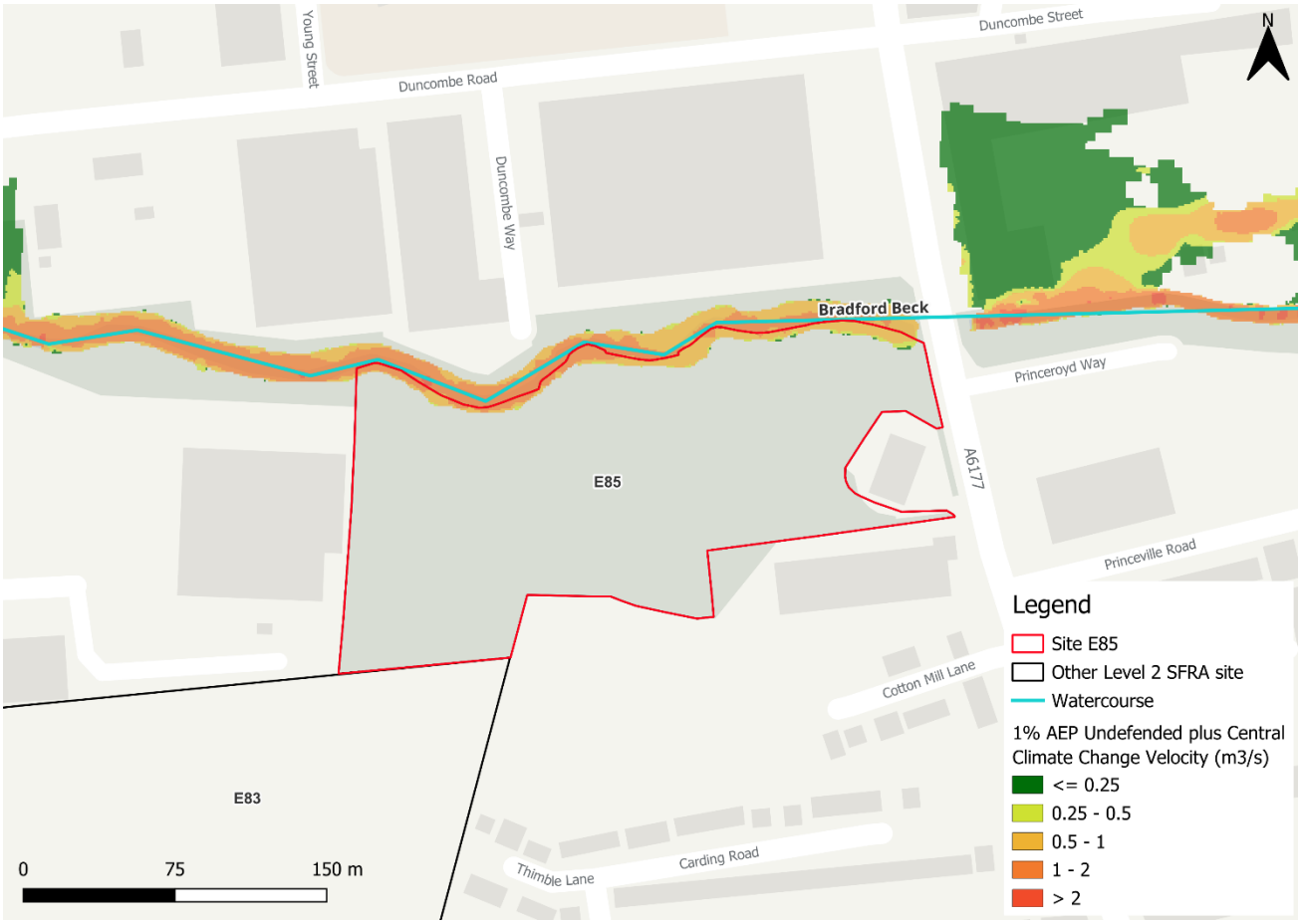



Figure 2-6: Flood velocities for 1% AEP undefended flood event +23% (central climate change allowance)

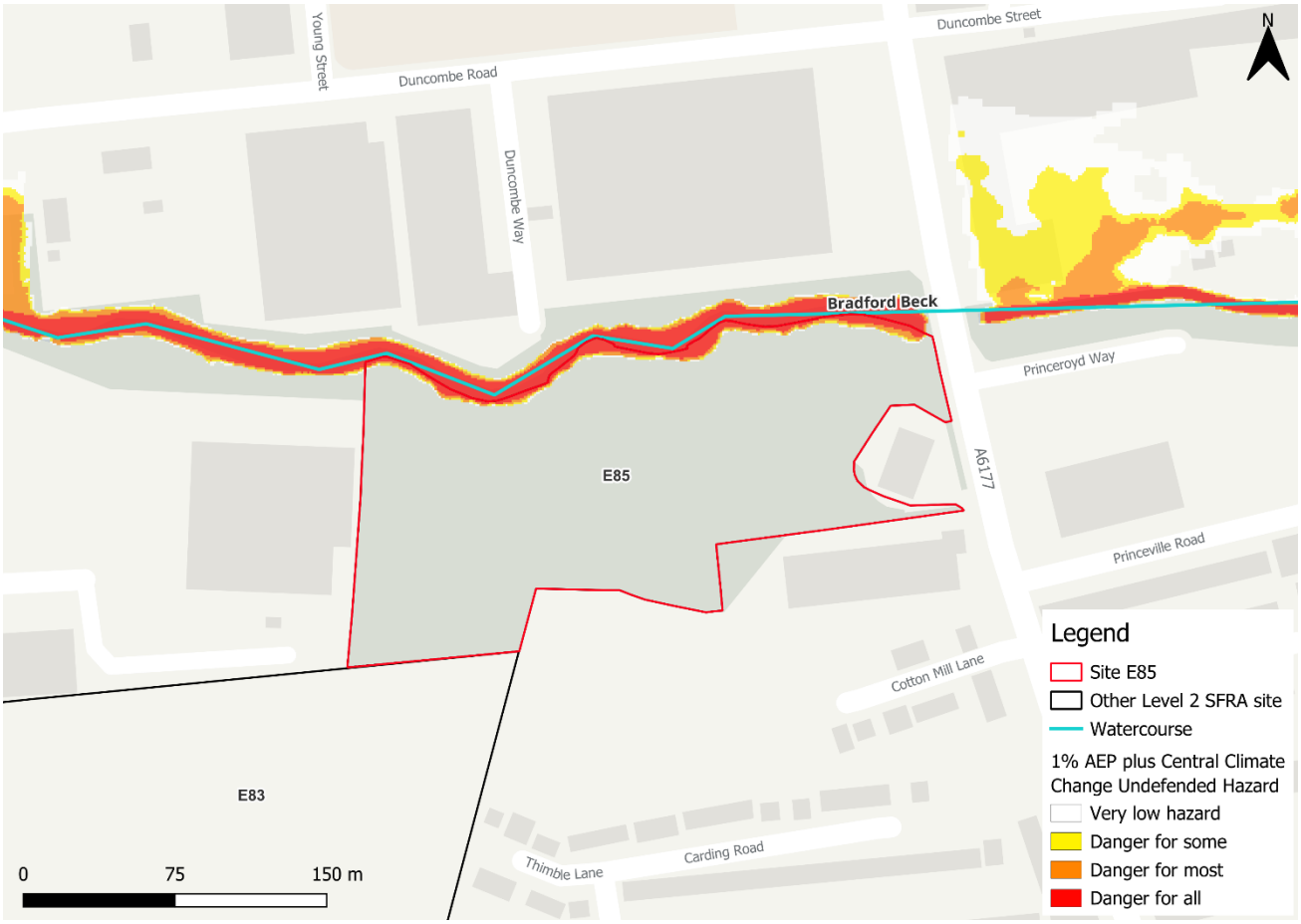



Figure 2-7: Flood hazard for 1% AEP undefended flood event +23% (central climate change allowance)

### 2.2.2 Flood Map for Planning - Climate Change

Climate change data in this area is unavailable from the EA's Flood Map for Planning plus Climate Change (2070-2125) dataset, as shown in Figure 2-8.

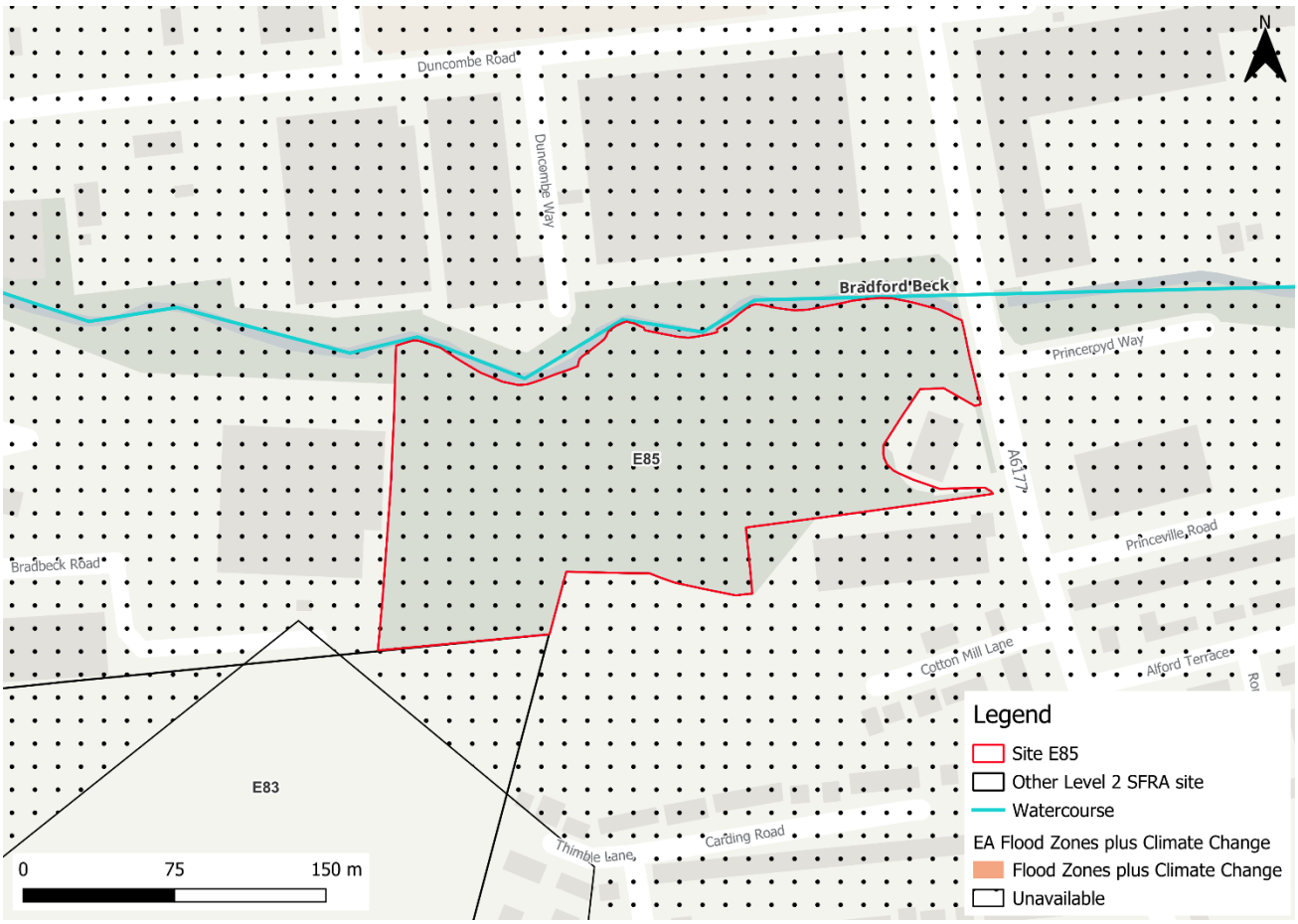



Figure 2-8: EA Flood Zones plus Climate Change

## 2.3 Flood risk management

### 2.3.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

### 2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) that may help to reduce flood risk to the site and surrounding areas. Within the site there is potential for floodplain reconnection, which can decrease the magnitude of the flood peak and reduce downstream flood depths especially for high frequency, low return period floods. These areas are shown in Figure 2-9. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

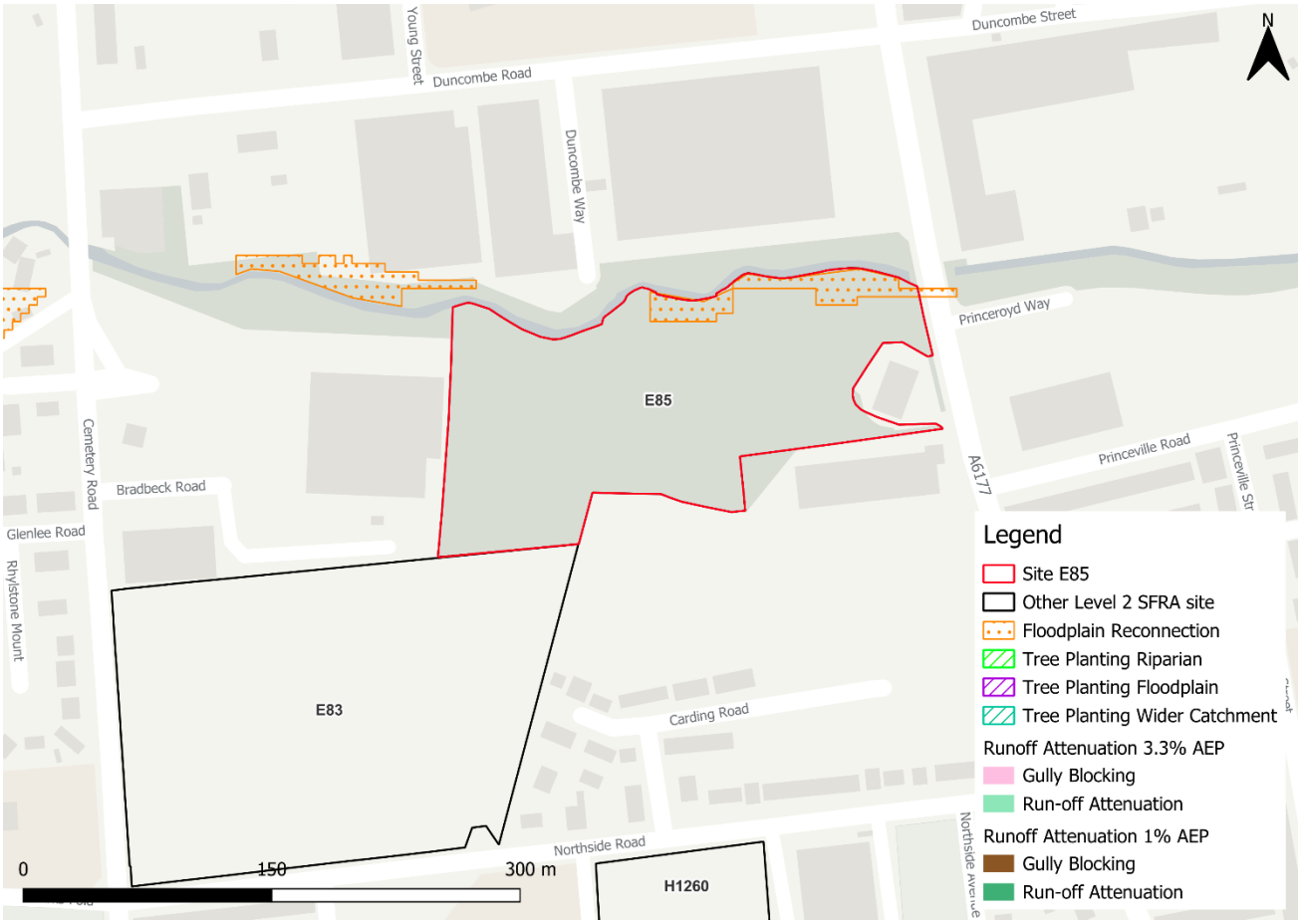



Figure 2-9: Natural Flood Management (NFM) potential mapping

## 2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events within the vicinity of the site.

## 2.5 Emergency planning

### 2.5.1 Flood warnings

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The southeast corner of the site is located within a FWA, namely 123FWF785 - Bradford Beck and tributaries at Bradford.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The southeast corner of the site is also located within a FAA, namely 123WAF961 - Middle River Aire catchment.

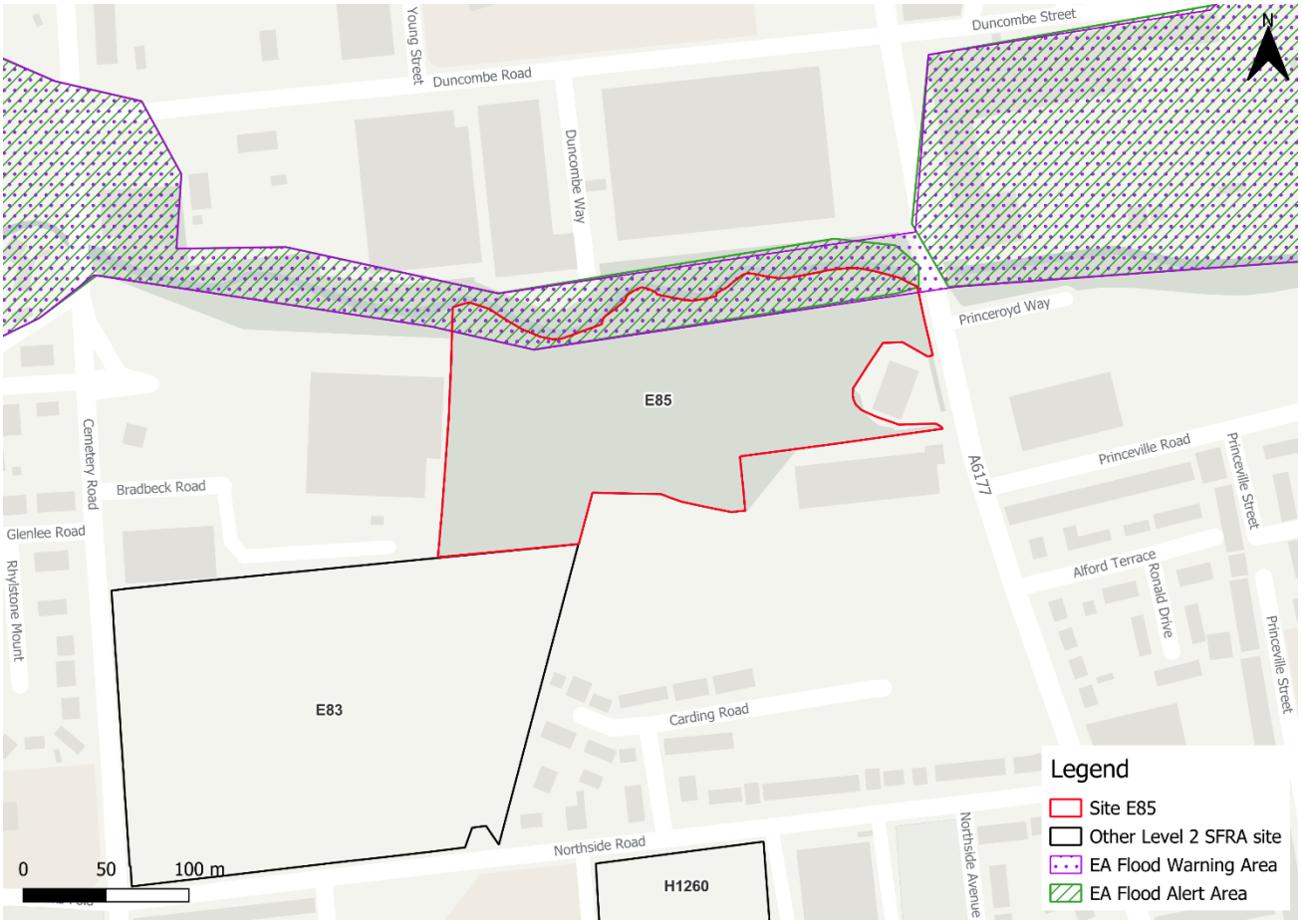



Figure 2-10: EA Flood Warning Areas and Flood Alert Areas

### 2.5.2 Access and escape routes

Based on available information, safe access and escape routes would likely be achievable via the A6177 to the east of the site (Figure 2-11).

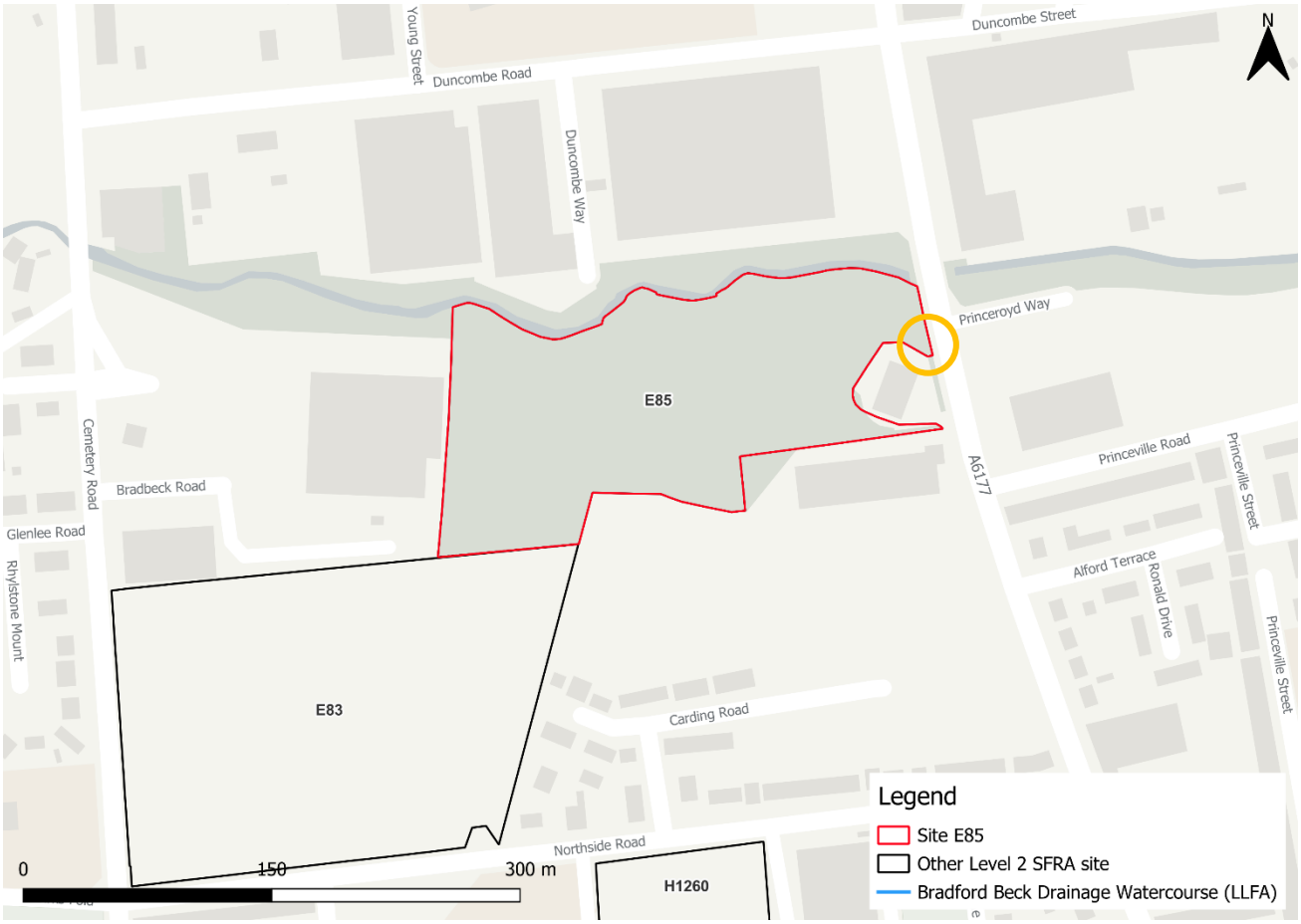



Figure 2-11: Potential access and escape routes

## 2.6 Observations, mitigation options, site suitability and sequential approach to development management - fluvial

- Observations:
  - The proposed development of the site would see a change in the risk classification from water compatible to less vulnerable, according to the NPPF.
  - Given the change in use and therefore vulnerability of the site, the LPA must consider whether the change of use is acceptable and whether the development can be designed to be safe, including for adequate emergency planning provision, accounting for the information provided in this Level 2 SFRA (para 014 FRCC-PPG).
  - The site is modelled to be within the functional floodplain along the northern boundary of the site, adjacent to Bradford Beck. Development is not permitted within the functional floodplain. This area should be included as a green / blue corridor in site design offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.

- If works are proposed on or near a river or flood defence, a separate permission may be required. The type of permission needed from the Lead Local Flood Authority will depend on the activity and location proposed.
- The Bradford Beck 2026 model shows the 1% AEP undefended event to remain within the channel along the northern boundary of the site.
- The 1% AEP event with an allowance for climate change is what the EA considers to be the design event for a development to mitigate fluvial flood risk. Fluvial risk is modelled to remain confined to the Bradford Beck channel in the 1% AEP undefended +23% climate change event.

- Mitigation:
  - EA flood warnings and alerts should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs.
  - Were development of this site to proceed, given the proximity of this site to neighbouring site E83 it would be prudent to formulate a strategy to develop these sites in tandem and for consultation between each developer to take place to ensure a joined-up approach for sustainable development is in place.
- Access and escape:
  - Based on available information, safe access and escape routes would likely be achievable via the A6177 to the east of the site.

# 3 Flood risk from surface water

## 3.1 Existing risk

At the time of writing, the EA's latest national Risk of Flooding from Surface Water (RoFSW) does not include depth and hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation RoFSW depth and hazard mapping in addition to the NaFRA2 extents, as agreed with the EA. Surface water depth and hazard should be confirmed at the site-specific FRA stage.

### 3.1.1 Risk of Flooding from Surface Water - NaFRA2 extents

Based on the EA's national scale RoFSW map (January 2026), surface water risk to the site is predominantly very low, as shown in Table 3-1.

Surface water risk in the medium risk event is confined to a small area of ponding along the southern boundary of the site (Figure 3-1). In the low risk event, risk is confined to scattered areas of ponding across the site. Safe access and escape routes may be achievable via the A6177 to the east of the site.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

| Very low risk (% area) | Low risk (% area) | Medium risk (% area) | High risk (% area) |
|---|---|---|---|
| 93 | 5 | 1 | 1 |

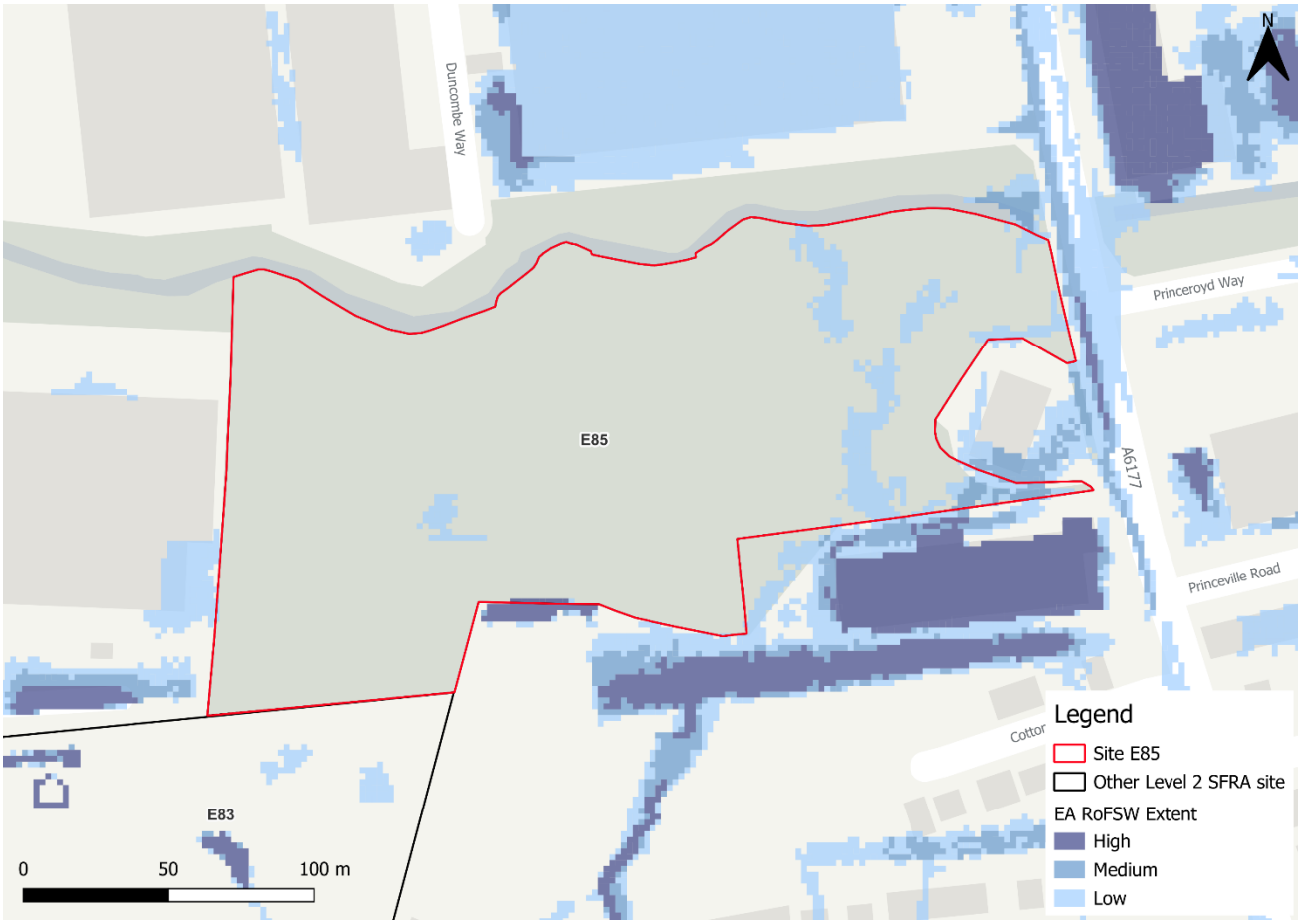



Figure 3-1: Surface water flood extents (NaFRA2 - Risk of Flooding from Surface Water map)

### 3.1.2 Risk of Flooding from Surface Water - third generation depths and hazards

Based on the EA's national scale third generation RoFSW map, the greatest flood depths within the site in the medium risk event are between 0.6 and 0.9 m (Figure 3-2) in a very small area along the southern boundary of the site. Flood hazard in this area is categorised as 'significant' (Figure 3-3).

Safe access and escape routes via the A6177 may be achievable given the low flood depths and hazards along this route, based on the third generation mapping. Safe access and escape routes should be confirmed through a drainage strategy.

There are differences between the NaFRA2 RoFSW map and the third-generation depth and hazard mapping. The NaFRA2 RoFSW map does not map flooding less than 0.075m (7.5cm) in depth. Therefore, where the map may show no flooding, there may be shallow flooding up to a depth of 0.075m. In contrast, the third generation RoFSW does not map flooding with a hazard rating of less than 0.575. This could explain the differences observed between the NaFRA2 and third generation RoFSW. Assessment of surface water should be carried out at the site-specific FRA stage to robustly establish current and future surface water flood risk conditions.

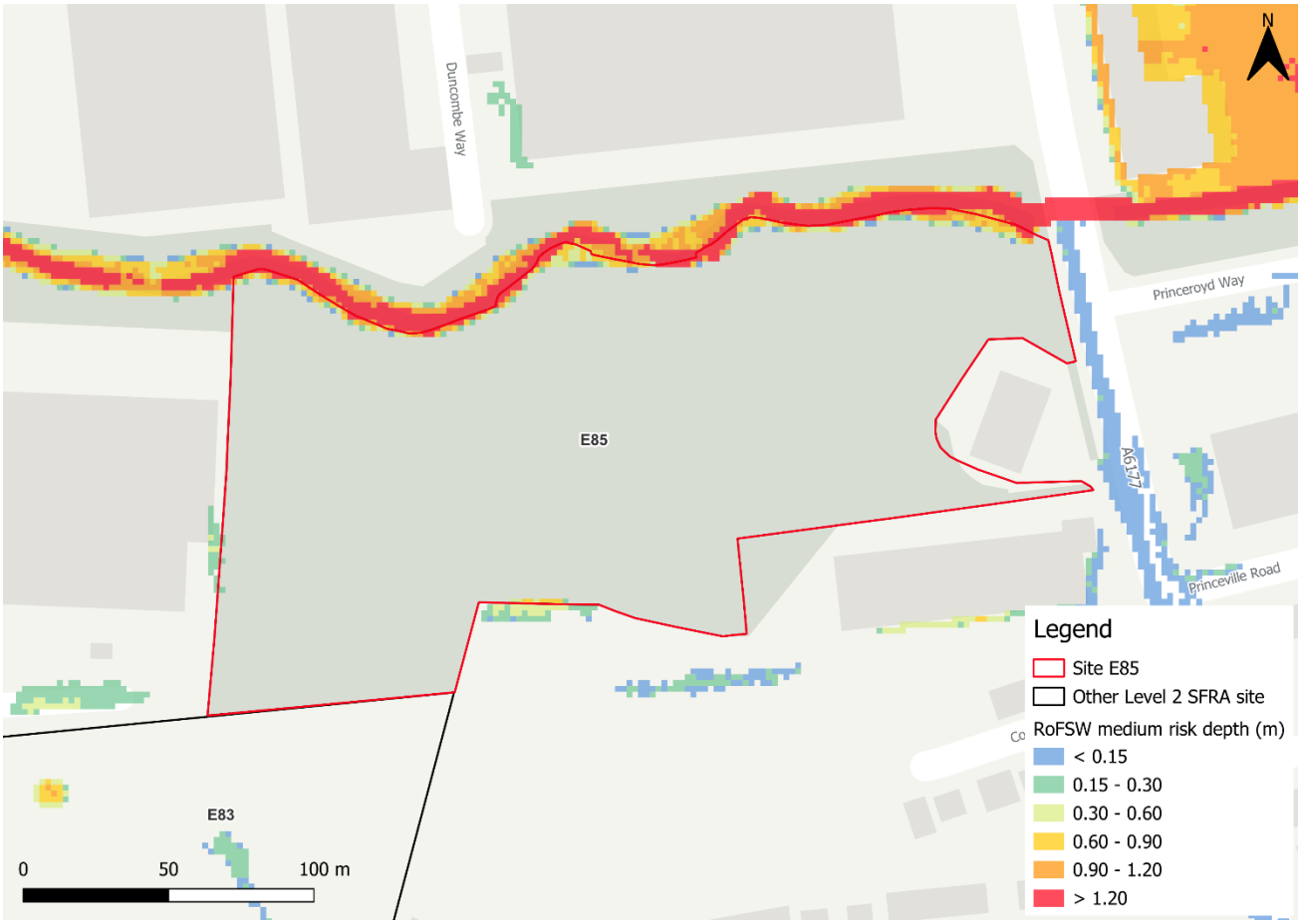



Figure 3-2: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)




Figure 3-3: Medium risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

## 3.2 Impacts from climate change

At the time of writing, the available national surface water climate change mapping is unsuitable for consideration in development planning. This Level 2 SFRA considers the low risk surface water event as a conservative proxy for the medium risk event plus climate change, as agreed with the EA. The impact of climate change on surface water flood risk should be considered at the site-specific FRA stage.

Using the low risk event as a proxy, the medium risk surface water event is likely to increase significantly in extent within the site when accounting for climate change (Figure 3-4). The third generation map indicates maximum flood depths are likely to remain at between 0.6 and 0.9 m (Figure 3-5), with an area of 'significant' hazard (Figure 3-6).

Safe access and escape routes via the A6177 may be achievable given the low flood depths and hazards along this route, based on the third generation mapping. Safe access and escape routes should be confirmed through a drainage strategy.

2 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

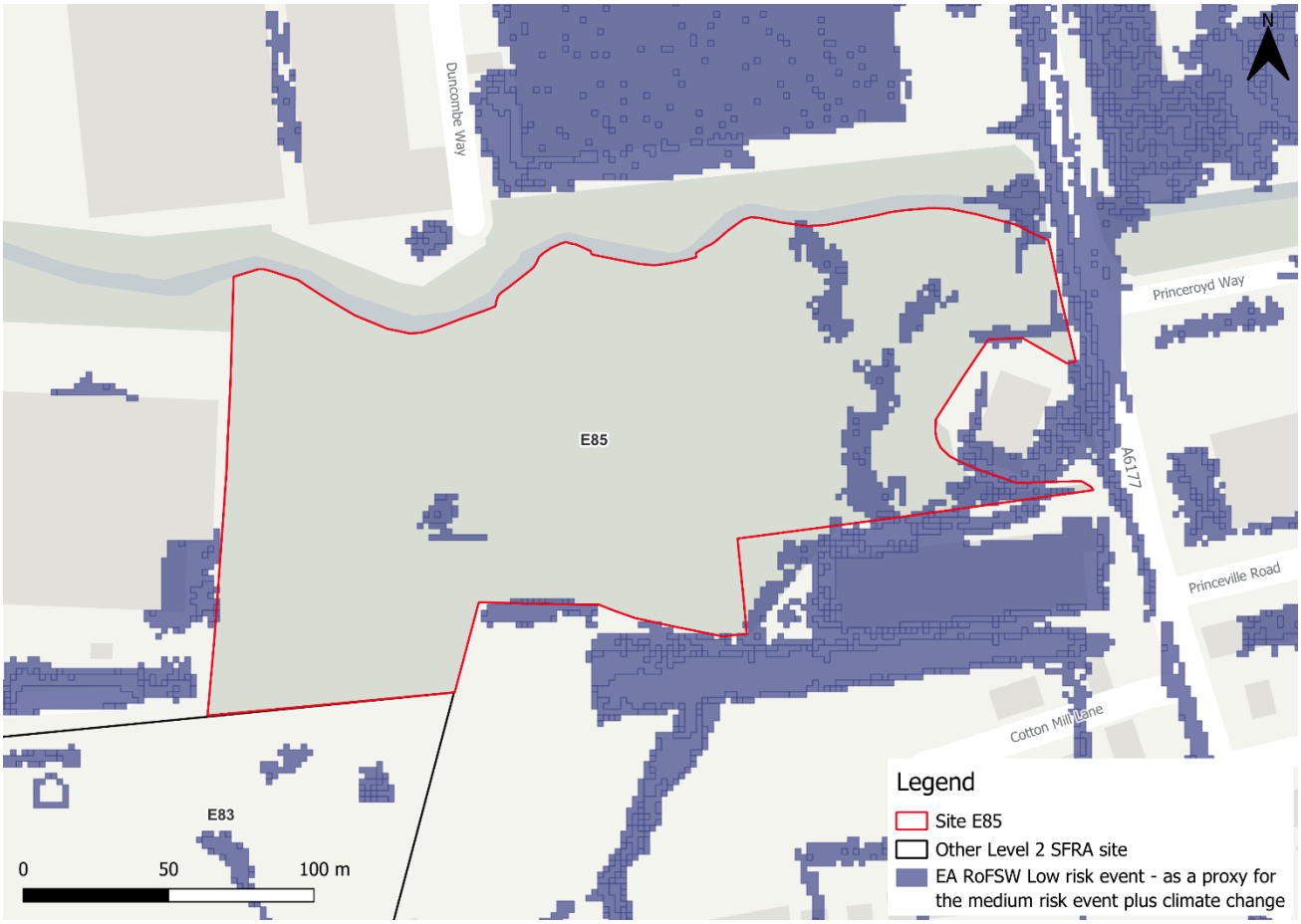



Figure 3-4: Low risk event surface water flood extent, as a proxy for the medium risk event plus climate change (NaFRA2 - Risk of Flooding from Surface Water map)

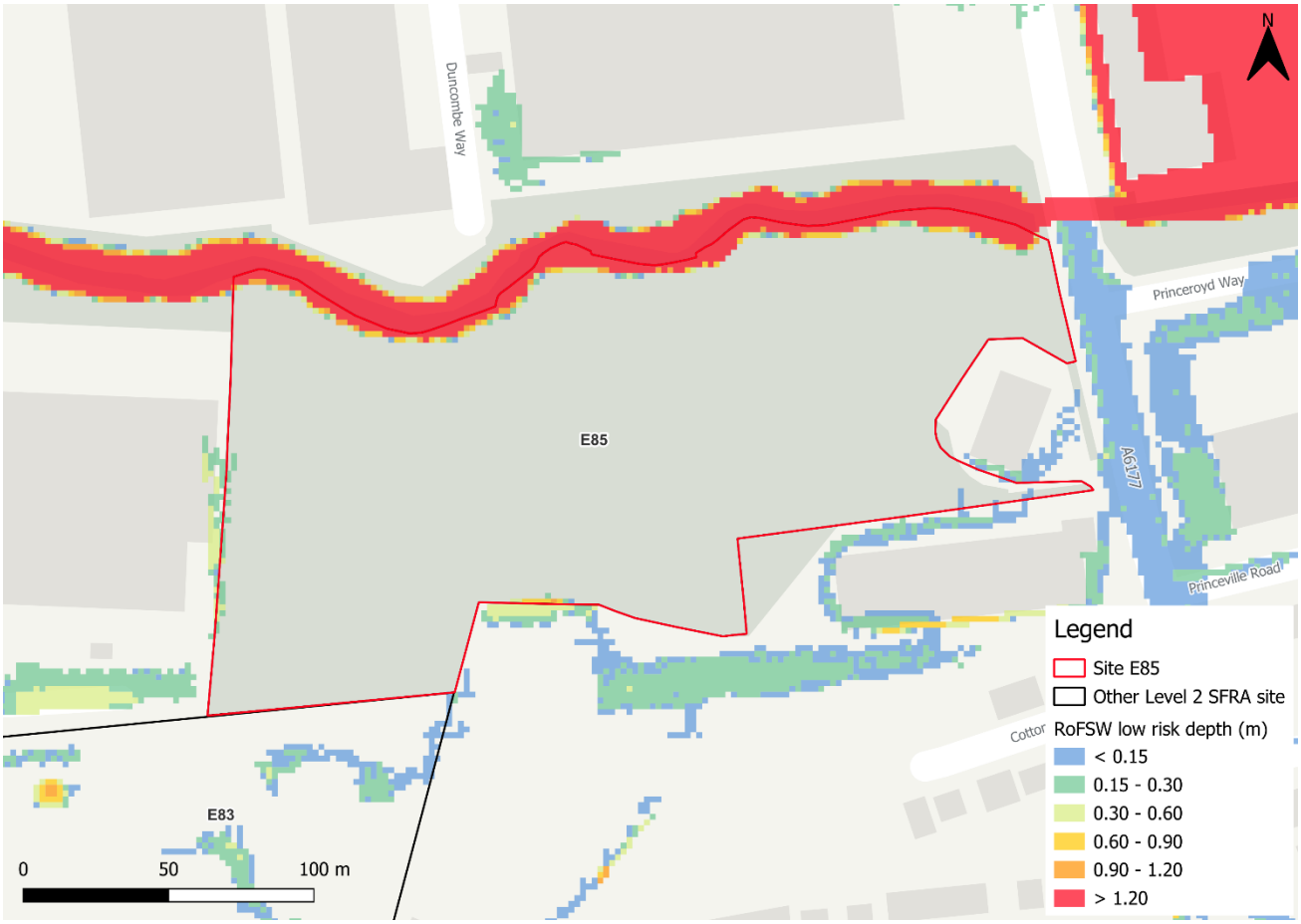



Figure 3-5: Low risk event surface water flood depths, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

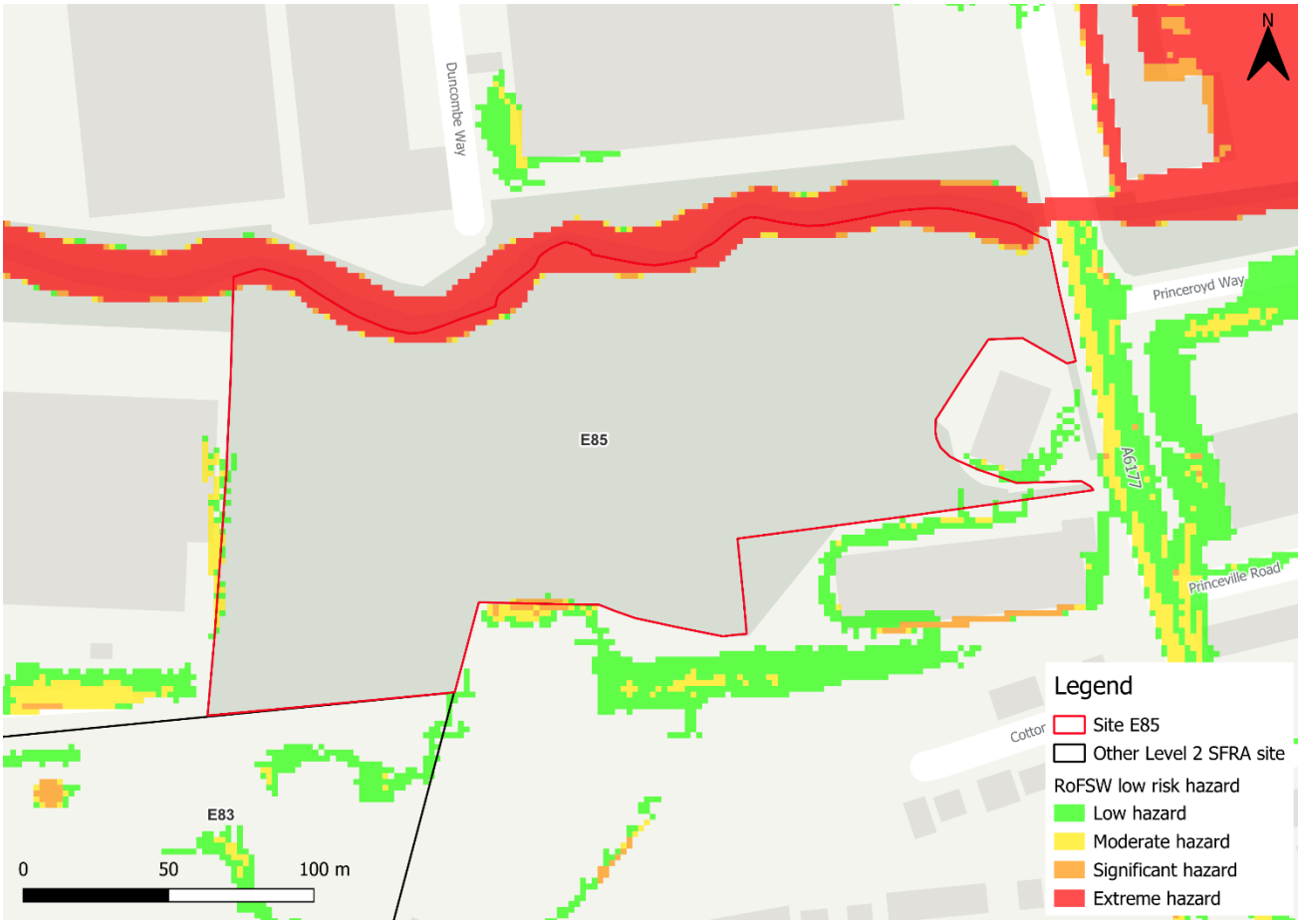



Figure 3-6: Low risk event surface water flood hazard, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

## 3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with approximately 93% of the site being at very low risk. Surface water in the present day medium risk event is largely confined to the northern boundary of the site within Bradford Beck channel.
- Development should avoid the risk areas along the watercourse. A multifunctional blue green corridor should be put in offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. Surface water flood risk in this event is confined to areas of ponding within topographic low spots across the site.
- Topographic low spots and flow paths should be incorporated into site design and layout. Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development.
- Safe access and escape routes via the A6177 may be achievable given the low flood depths and hazards along this route, based on the third generation

mapping. Safe access and escape routes should be confirmed based on site-specific surface water modelling through the FRA.

- The drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield rates will likely apply, though the developer should consult local LLFA guidance and the National SuDS guidance.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

# 4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications.

Within the majority of the site, there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS in these areas, however this should be considered further through the drainage strategy given the likely low permeability of the underlying bedrock (Figure 1-3).

There is a small area within the southwest of the site where groundwater may emerge at significant rates and has the capacity to flow overland and / or pond within any topographic low spots. In this area, ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

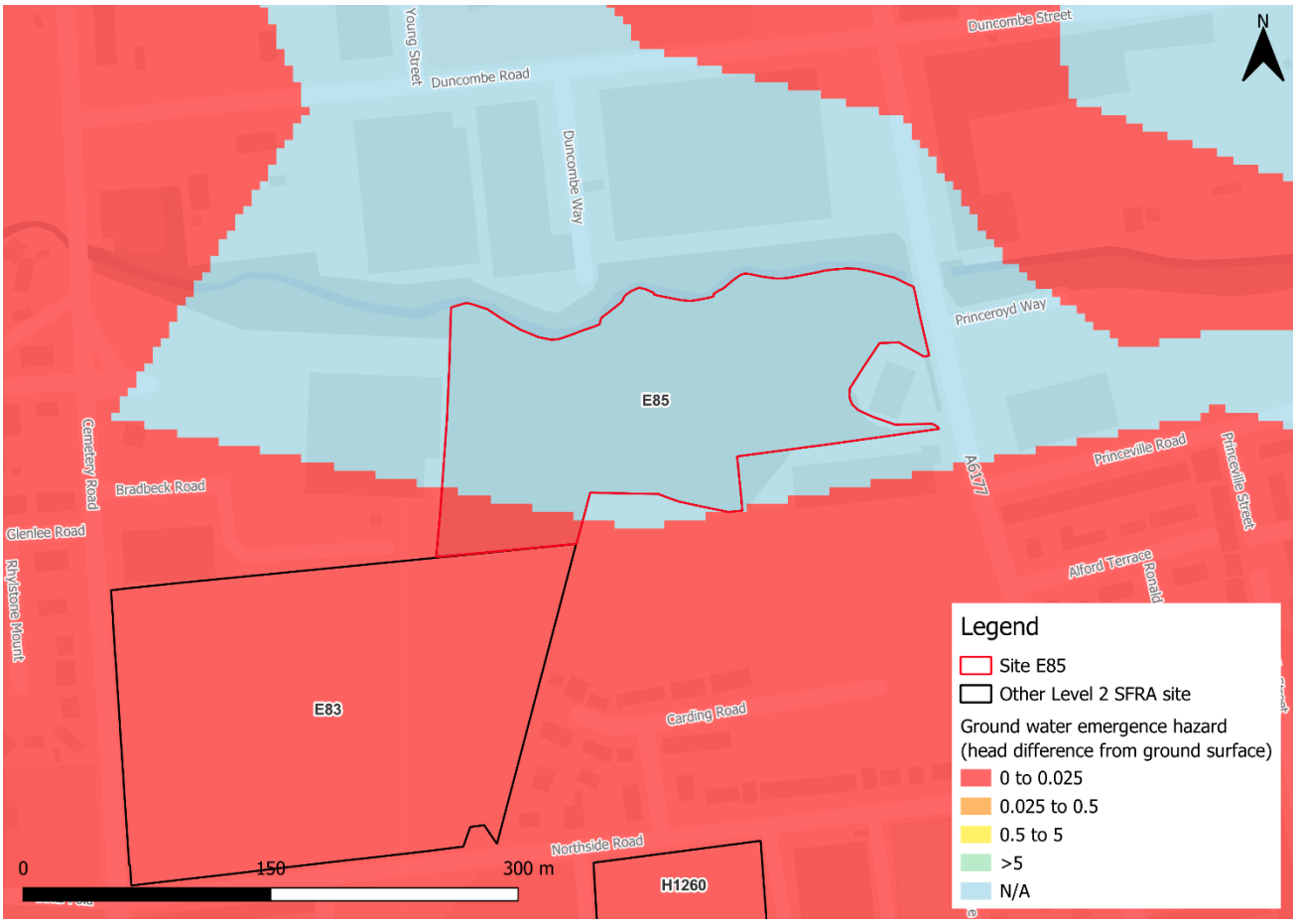



Figure 4-1: JBA 5m Groundwater Emergence Map

3 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

| Groundwater head difference (m)* | Class label |
|---|---|
| 0 to 0.025 | Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. |
| 0.025 to 0.5 | Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event.<br>Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. |
| 0.5 to 5 | Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event<br>There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. |
| >5 | Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event.<br>Flooding from groundwater is not likely. |
| N/A | No risk.<br>This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. |
| *Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD. | |

# 5 Residual risk

Although a site may be afforded some protection from defences and / or drainage infrastructure, there is always a residual risk of flooding from asset failure i.e. defence breaches, or blockages of culverts or drainage assets. Residual risk at this site comes from the potential blockage of the structure beneath the A6177 to the east of the site.

## 5.1 Potential blockage

A blockage of the structure beneath the A6177 may cause water in the channel to back up and cause flooding to the site, depending on the severity of the blockage and the magnitude of the flood event. Culvert course and condition surveys may be required, including for consultation with the culvert owner.

The Bradford Beck 2026 model includes for a scenario in which all culverts within the model are blocked by 50%. Figure 5-1 shows the modelled flood depths for this scenario. There is a very minor increase in the extent of flooding caused by a 50% blockage to the culvert beneath the A6177.

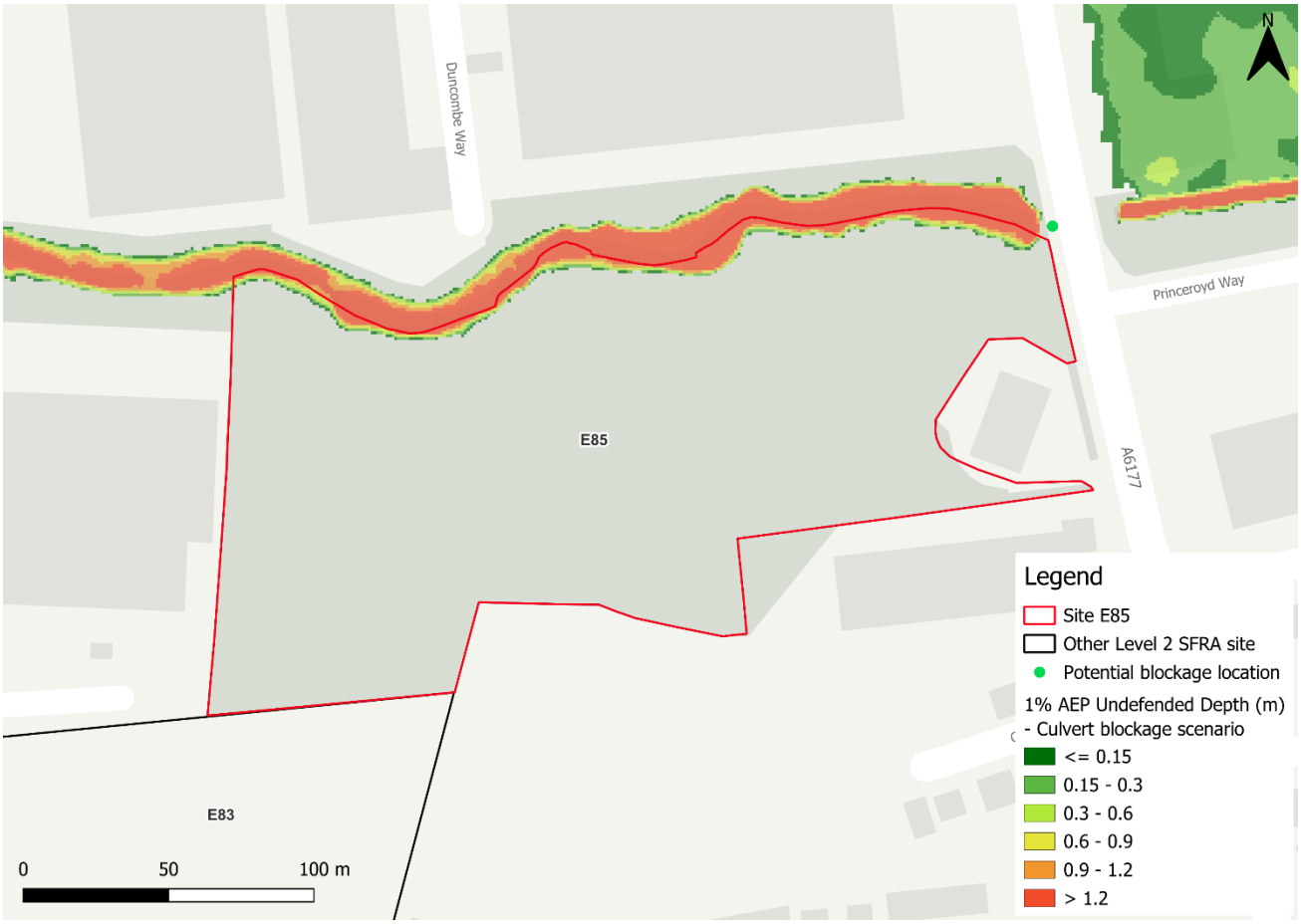



Figure 5-1: Flood depths for 1% AEP undefended flood event 50% culvert blockage scenario - structure beneath the A6177

## 5.2 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. Figure 5-2 shows the RFM in a 'dry day' and 'wet day' scenario. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is potentially at risk along the northern boundary from four reservoirs located in Bradford. Of these four reservoirs, two are operated by Yorkshire Water Services Ltd and two are operated by the City of Bradford Metropolitan District Council.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required from an all-reservoirs panel engineer. The Council should consult the relevant reservoir undertaker to ascertain whether the proposed development could affect the reservoir's risk designation, its design category or how it is operated. The Council, as category 1 responders, can access more detailed information about reservoir risk and reservoir owners using the Resilience Direct system.

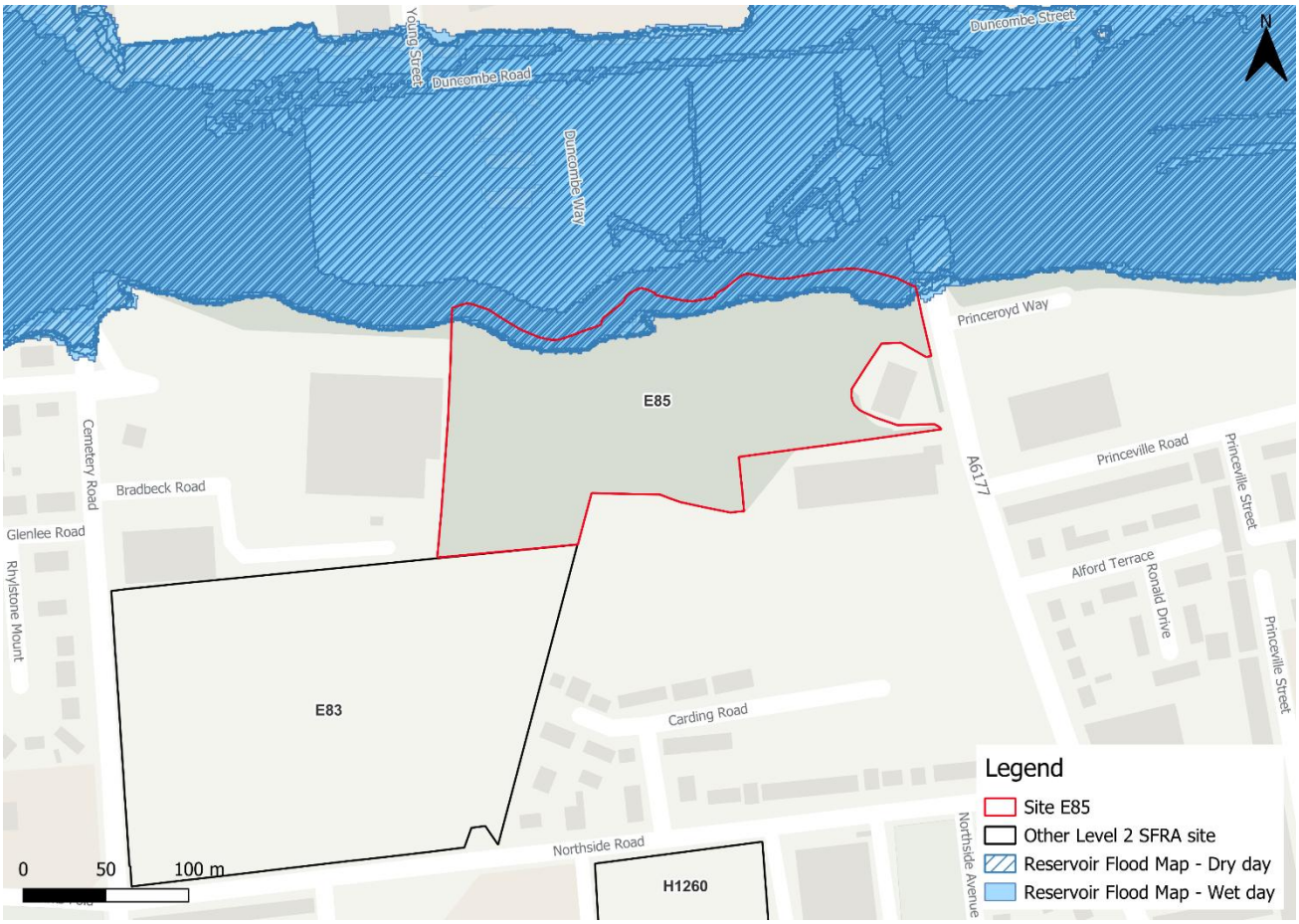



Figure 5-2: Flood risk from reservoirs

## 5.3 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a blockage of the culvert beneath the A6177 to the east of the site. The modelled 50% culvert blockage scenario indicates that there is unlikely to be significant impacts to the site. The site-specific FRA could consider modelling a higher blockage proportion to understand whether there would be any additional risk to the site.
- Areas adjacent to culverts and bridges are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked. Emergency plans must be in place for such areas and safe access and escape routes must be in place for the lifetime of development. Resistance and resilience measures may also need to be put in place to manage residual flood risk when avoidance measures have been exhausted.
- The LPA should use the information on residual risk in this Level 2 SFRA to state in the local plan strategic policies a preferred mitigation strategy for ensuring development will be safe throughout its lifetime in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications (para 042, FRCC-PPG).
- The site is also at potential residual risk from a breach of four reservoirs. All four reservoirs impact the site in the 'dry day' flood extent. However, only Upper Chellow and Lower Chellow, are modelled to impact the site based on the 'wet day' flood extent, which represents a prediction of the credible worst case scenario, therefore it's unlikely that any actual flood would be this large.
- Given the potential reservoir risk to the site, developers should consider[4]:
    - Consulting with the local resilience forum for advice on emergency planning,
    - Consulting with relevant reservoir owners to understand the impact development may have on their reservoirs, and
    - Using this Level 2 SFRA to understand whether any proposed development will be safe throughout its lifetime.

4 Reservoir flood maps: when and how to use them | Environment Agency | 2021

# 6 Overall site assessment

## 6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[5] as it is proposed for less vulnerable uses, however it must still be proven that the development can be safe for its lifetime, which is generally considered to be 75 years for non-residential development.

## 6.2 Recommendations summary

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- It should be appropriate to develop this site for less vulnerable purposes given its location largely within Flood Zone 1 and nominal surface water flood risk.
- There should be no development within the existing area of functional floodplain present on site.
- It is recommended that the area of the site within the functional floodplain is converted to open space offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.
- The Flood Map for Planning requires updating with the latest modelling for Bradford Beck.
- Surface water flood depths and hazards along the A6177 should be confirmed through the site-specific FRA to ensure safe access and escape routes are available.
- Groundwater conditions within the south of the site should be investigated further through the site-specific FRA to ascertain groundwater levels and conditions.

## 6.3 Site-specific FRA requirements and further work

At the planning application stage, the following should be considered:

- Further modelling to understand the impacts of climate change on surface water flood risk to the site.
- A condition and capacity assessment of the culvert beneath the A6177.
- Consultation with the relevant reservoir owners to understand the impact of development on reservoir risk designation.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA guidance; the CBMDC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood

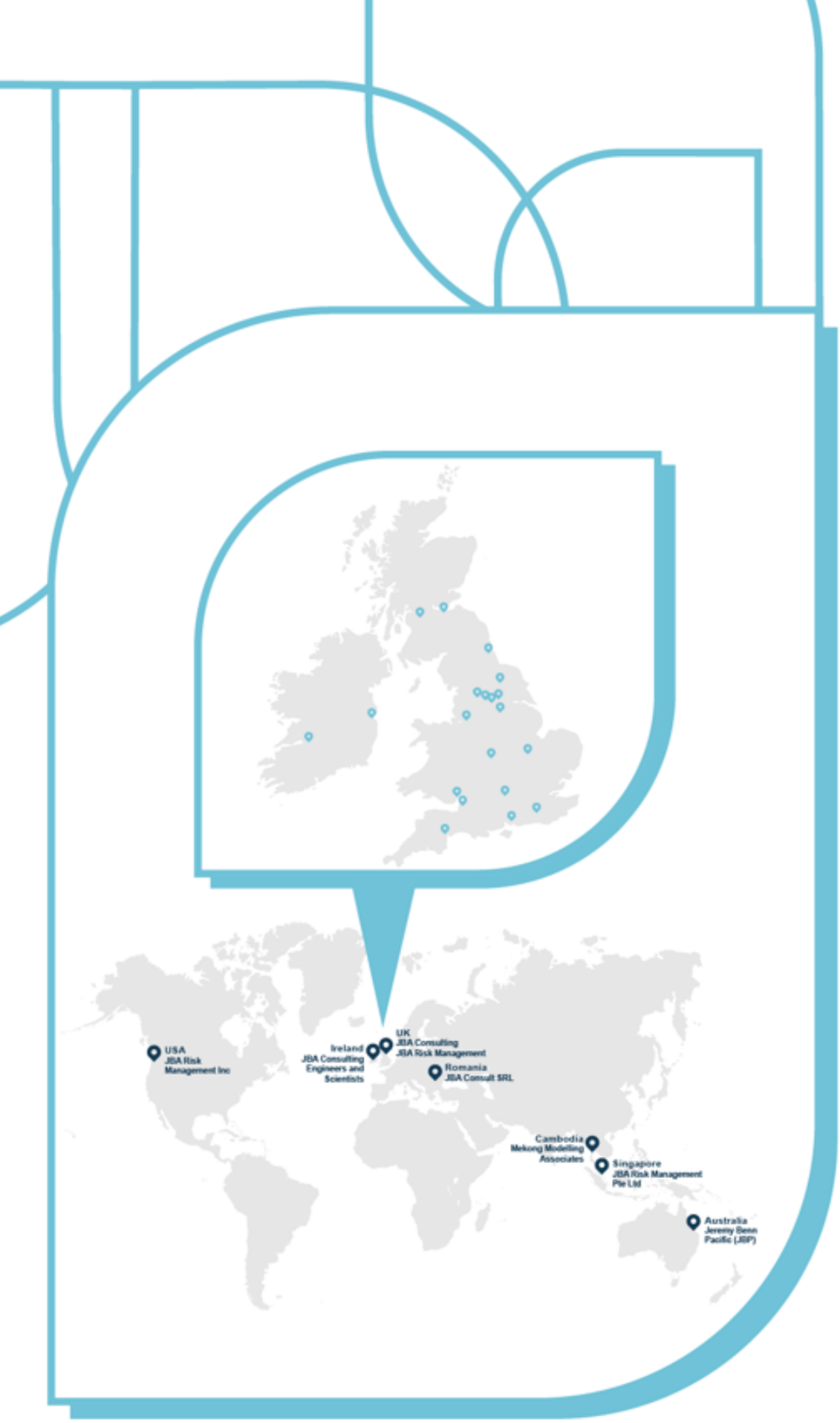
5 Para 178 National Planning Policy Framework 2024

authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

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