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Cardiff Council Strategic Flood Consequences Assessment - Wholesale Fruit Market Bessemer Road (15)

Version 1

Prepared for
Cardiff Council

Date
May 2026

Document Status

Issue date	May 2026
Issued to	Cardiff Council
BIM reference	RSX-JBA-XX-XX-RP-HM-0015-S3-P01-Wholesale_Fruit_Market_Bessemer_Road
Revision	S3-P01
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Contract

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This report describes work commissioned by Cardiff Council, by an instruction dated 23/01/2026. The Client's representative for the contract was Stuart Williams of Cardiff Council. Bethany of JBA Consulting carried out this work.

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1 Introduction

JBA Consulting has been commissioned by Cardiff Council to prepare an independent Flood Risk Appraisal as part of a Stage 2 Strategic Flood Consequences Assessment (SFCA) for sites considered for allocation in its Replacement Local Development Plan.

This assessment will evaluate the risk of flooding from all sources to 'Wholesale Fruit Market, Bessemer Road', the proposed development site, as well as the appropriateness of development at the site in accordance with Welsh Government policy, as outlined in Technical Advice Note 15 (TAN-15). Furthermore, recommendations will be provided, where appropriate, to mitigate the risk of flooding at the proposed development site as well as recommendations for further works.

2 Site Description

The key characteristics of the site are summarised in Table 2-1 and the location and site boundary are shown in Figure 2-1.

Table 2-1 Site Summary

Site name	Wholesale Fruit Market Bessemer Road
Site ID	15
Site area (ha)	4.59
Existing land use	Brownfield land
OS NGR	ST 16875 74842
Access location	Bessemer Road

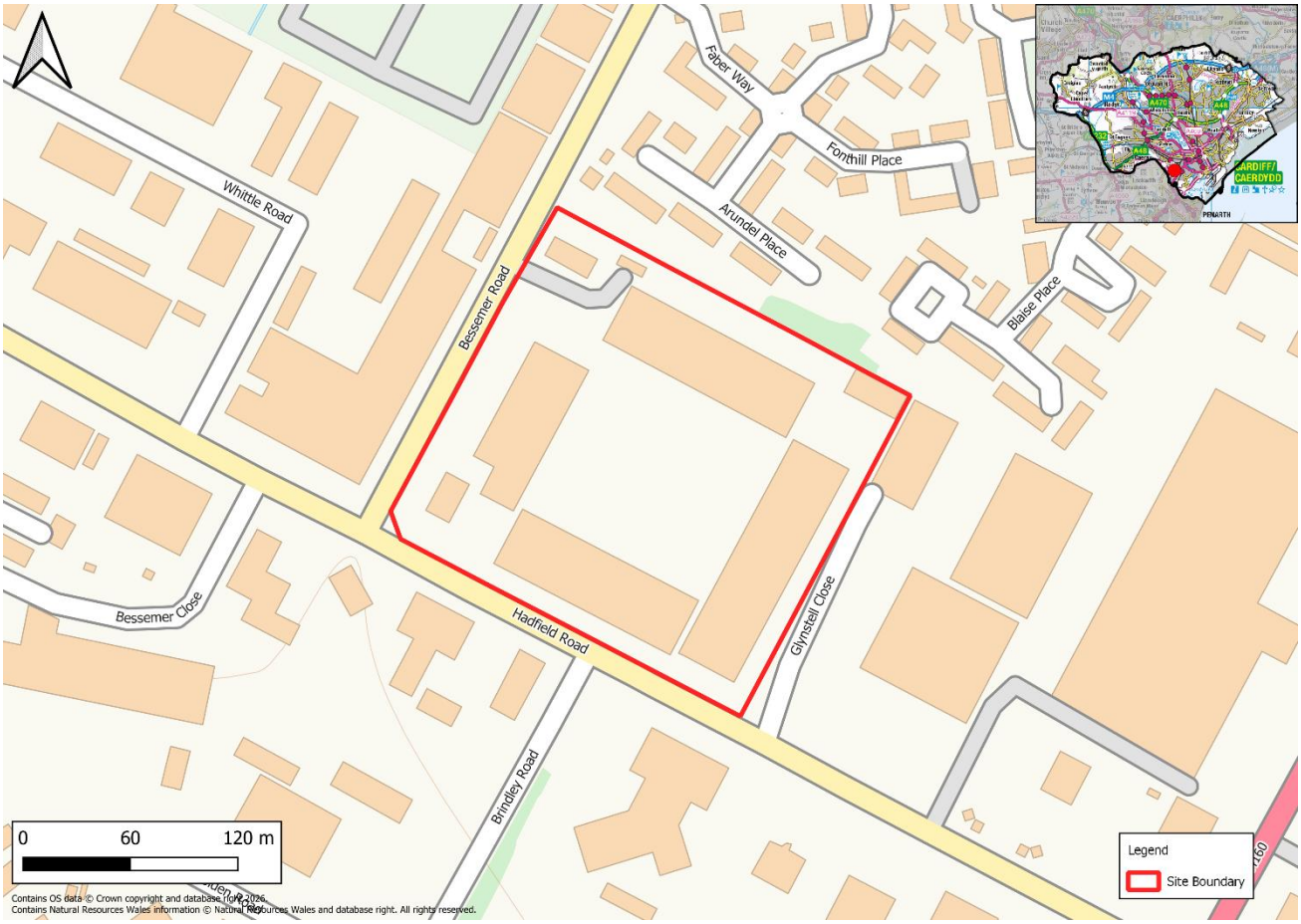

Figure 2-1: Proposed development site

2.1 Development proposals

The proposals at this site are for residential development and is classified as a Highly Vulnerable Development. The site is located on brownfield land, comprising the Wholesale Fruit Centre.

No proposed site layout has been provided to inform this appraisal.

2.2 Topography

The Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data[1] across the site has been reviewed and is shown in Figure 2-2. The LiDAR data indicates that the site is predominantly flat, with site elevations ranging between 7.73mAOD and 9.37mAOD. The higher elevations appear to be associated with the existing buildings. As the site is in a developed urban area, the LiDAR data is unlikely to be representative of the actual site topography. This may have an impact on some of the flood risk datasets used in the assessment.

1 https://datamap.gov.wales/maps/lidar-data-download/

In the wider vicinity of the site, the land slopes from north-west to south-east, at a reasonably flat gradient of under 1%.

Along Bessemer Road to the west of the site, ground levels reach a maximum elevation of 9.53mAOD, before sloping in a northerly direction away from Hadfield Road.

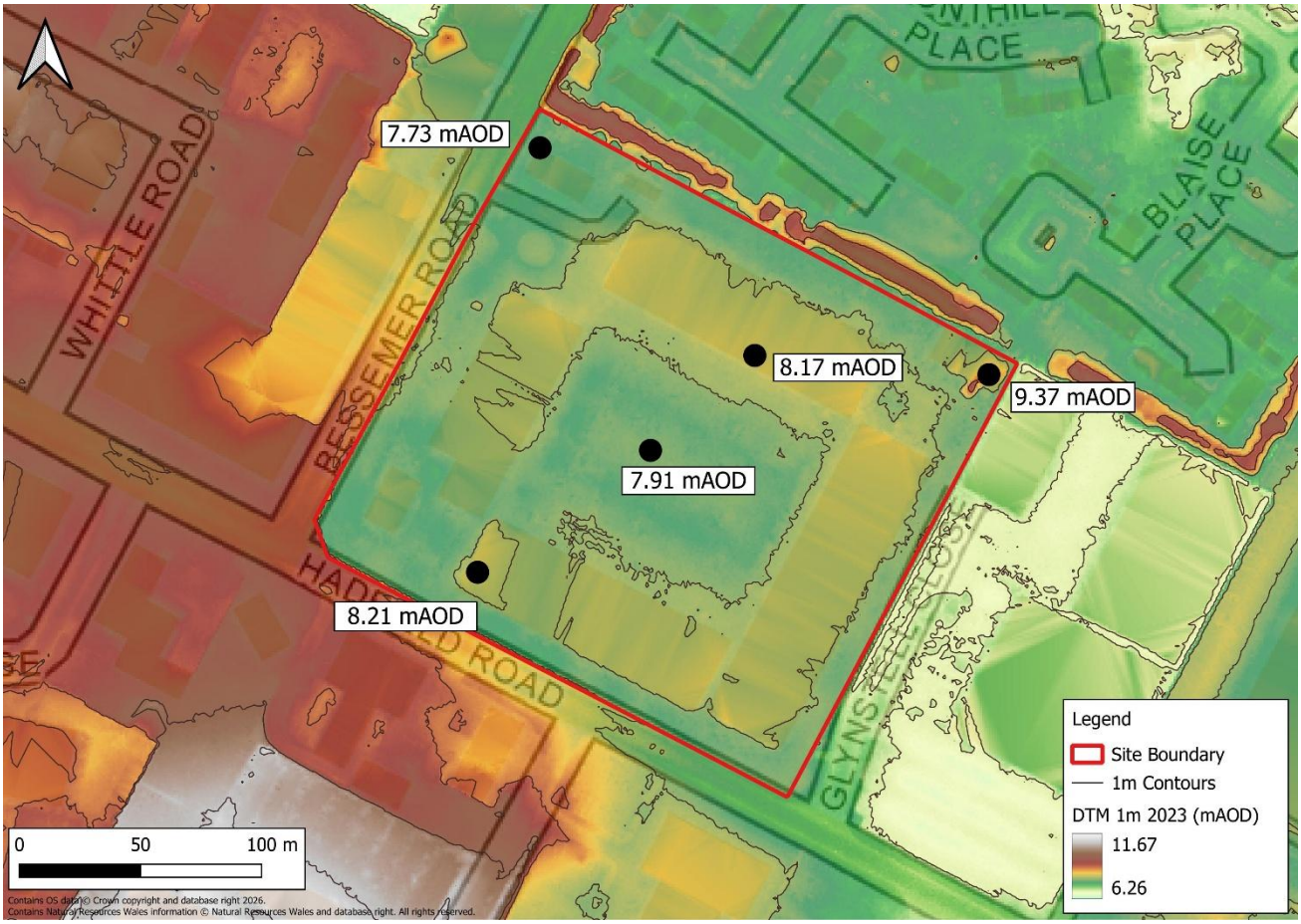

Figure 2-2: 1m Lidar

2.3 Watercourses and Flood Defences

Figure 2-3 shows the locations of the nearest waterbodies and watercourses to the site. The site is located approximately 1.6km north of Cardiff Bay.

The River Taff is an NRW designated Main River, located 1km east of the site. Flood defences along the River Taff protect the site from fluvial flooding, including embankments, high ground and flood defence walls.

The nearest NRW Main River to the proposed development site is the River Ely, located approximately 425m west of the site. The River Ely flows in south-easterly direction past the site. Two ordinary watercourses, the Nant Cydfin and an unnamed watercourse, join the River Ely 750m downstream of the site. Water levels in the lower reaches of the River Ely are manged by the Cardiff Bay Barrage. The Barrage creates a 2km^2 freshwater waterbody, protecting the bay and central areas of Cardiff from tidal flooding. As shown in Figure 2-3, the site is located within an area that benefits from this defence.

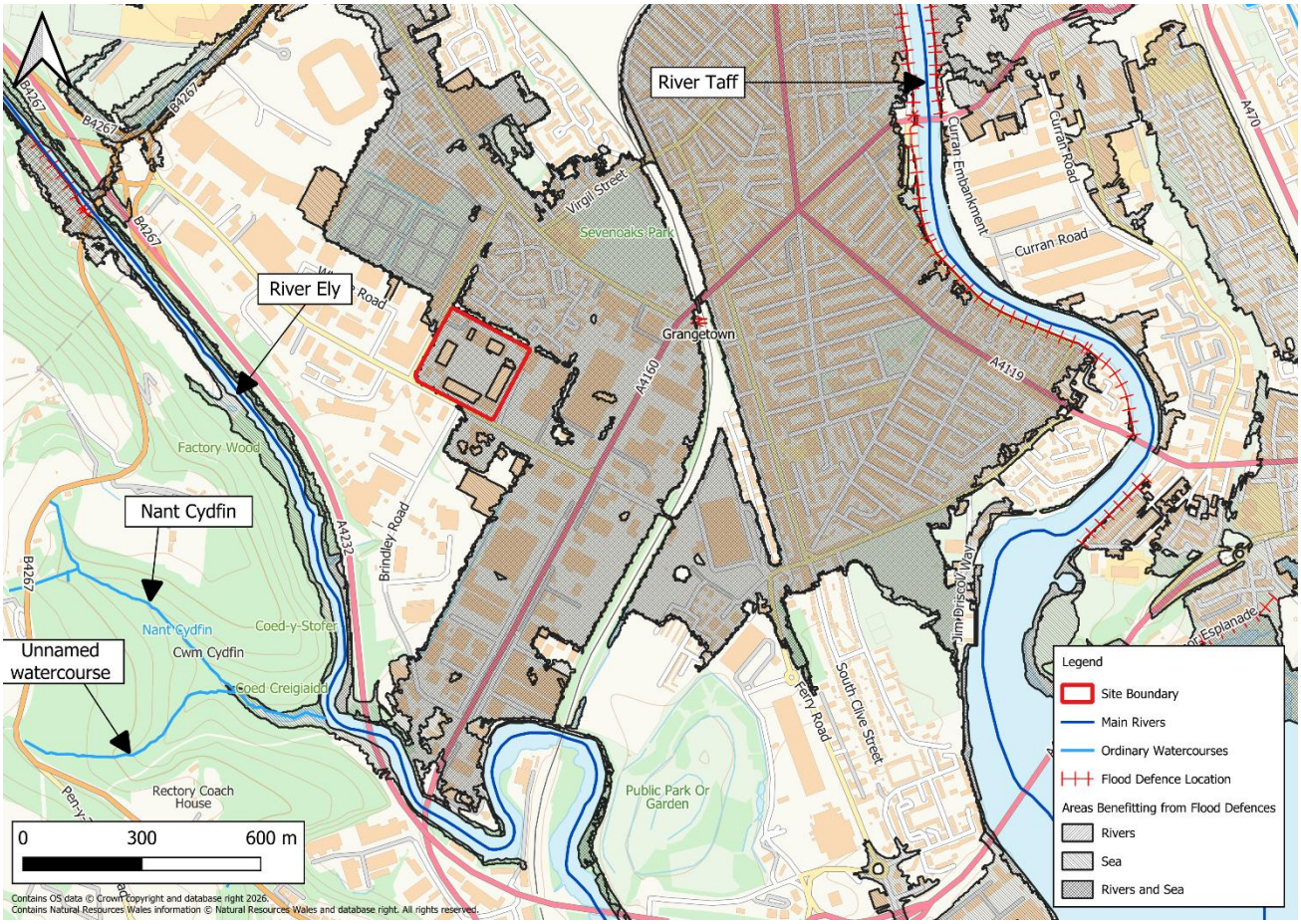

Figure 2-3: Watercourses and Defences

3 Planning Policy and Flood Risk

TAN-15 provides a framework within which flood risk arising from rivers, the sea and surface water can be assessed. TAN-15 adopts a risk-based approach, which emphasises the ability to avoid or minimise risk depending on the type of development proposed.

The following table identifies the form of development, vulnerability classification and Flood Map for Planning classification (as defined in TAN-15) for the proposed development site.

Table 3-1 TAN-15 Development Classification Summary

TAN-15 Classification	Classification
Development Proposal	Residential
Form of Development	Redevelopment
Vulnerability Classification	Highly Vulnerable
Flood Map for Planning - Rivers	Flood Zone 2 (Figure 3-1)
Flood Map for Planning - Sea	TAN-15 Defended Zone (Figure 3-2)
Flood Map for Planning - Surface Water and Small Watercourses	Flood Zones 1, 2 and 3 (Figure 3-3)

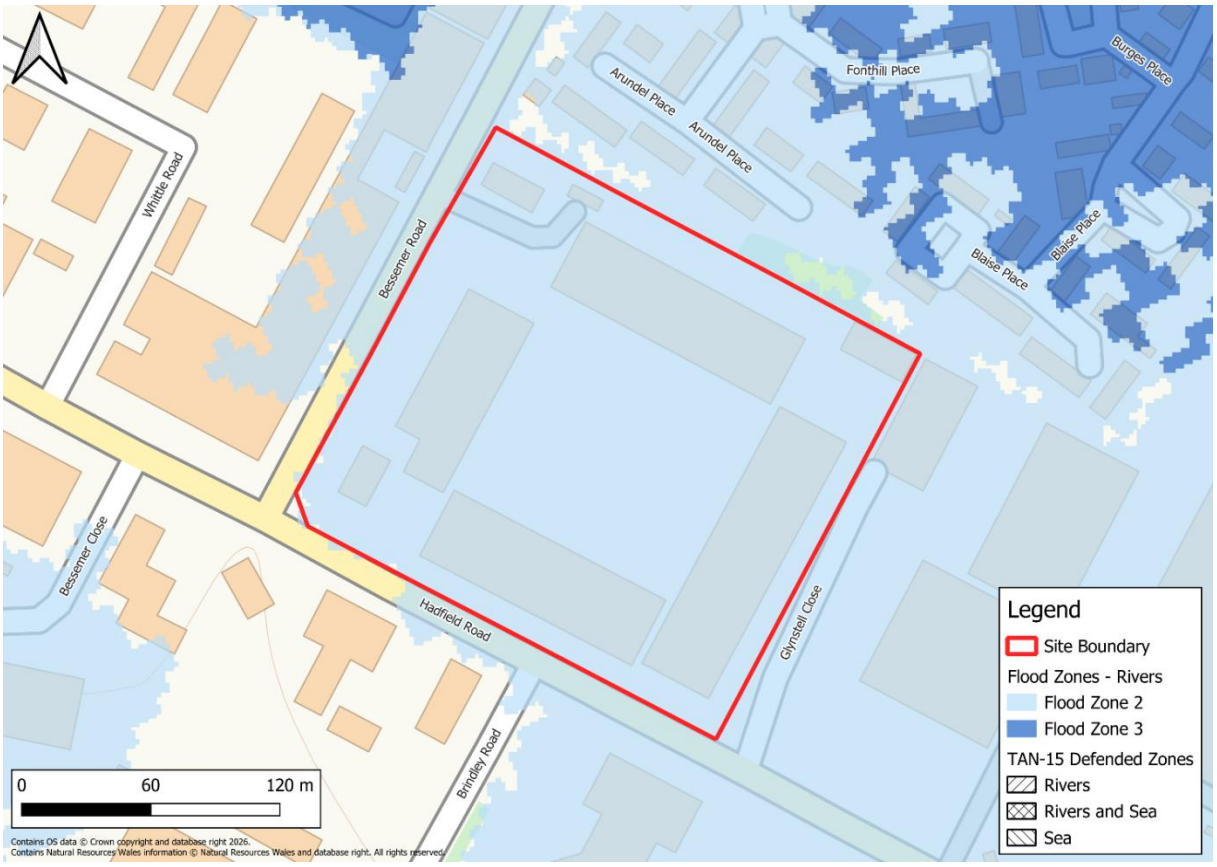

Figure 3-1: Flood Map for Planning - Rivers

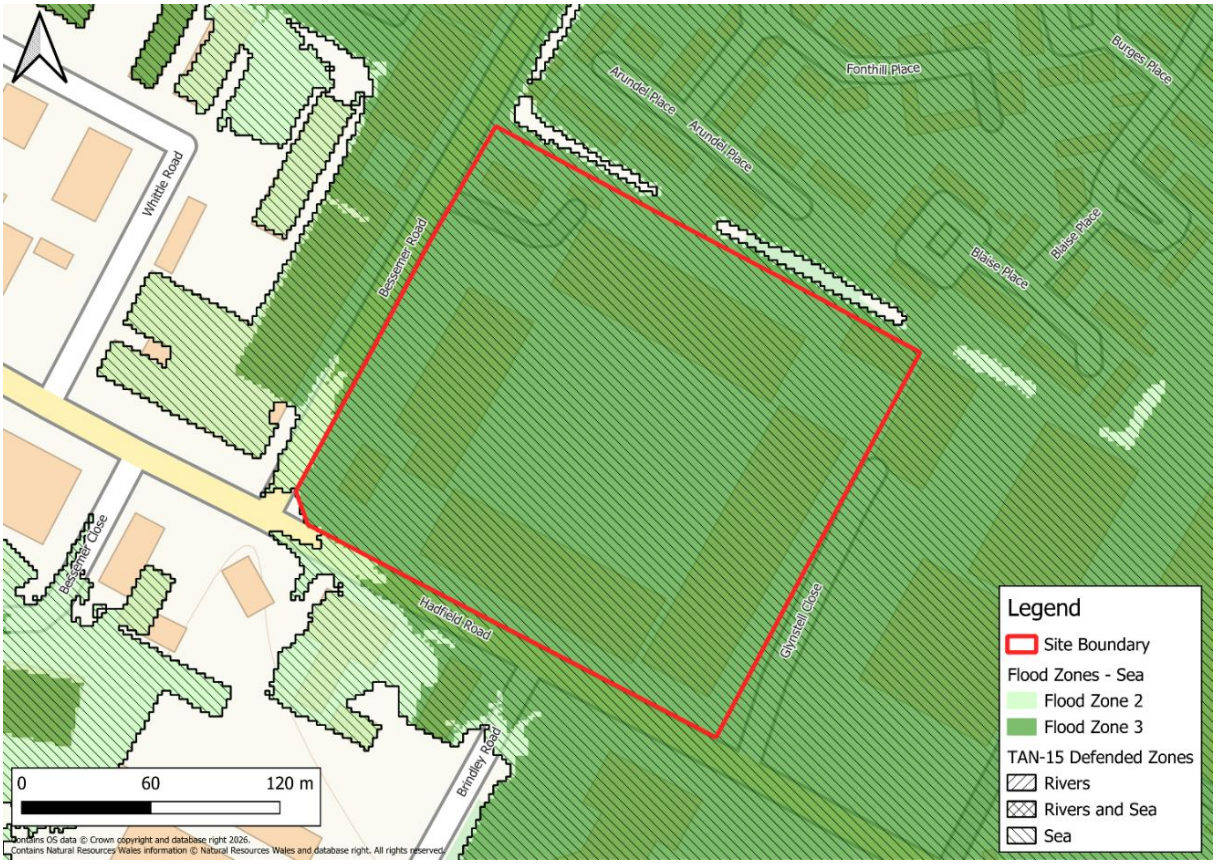

Figure 3-2: Flood Map for Planning - Sea

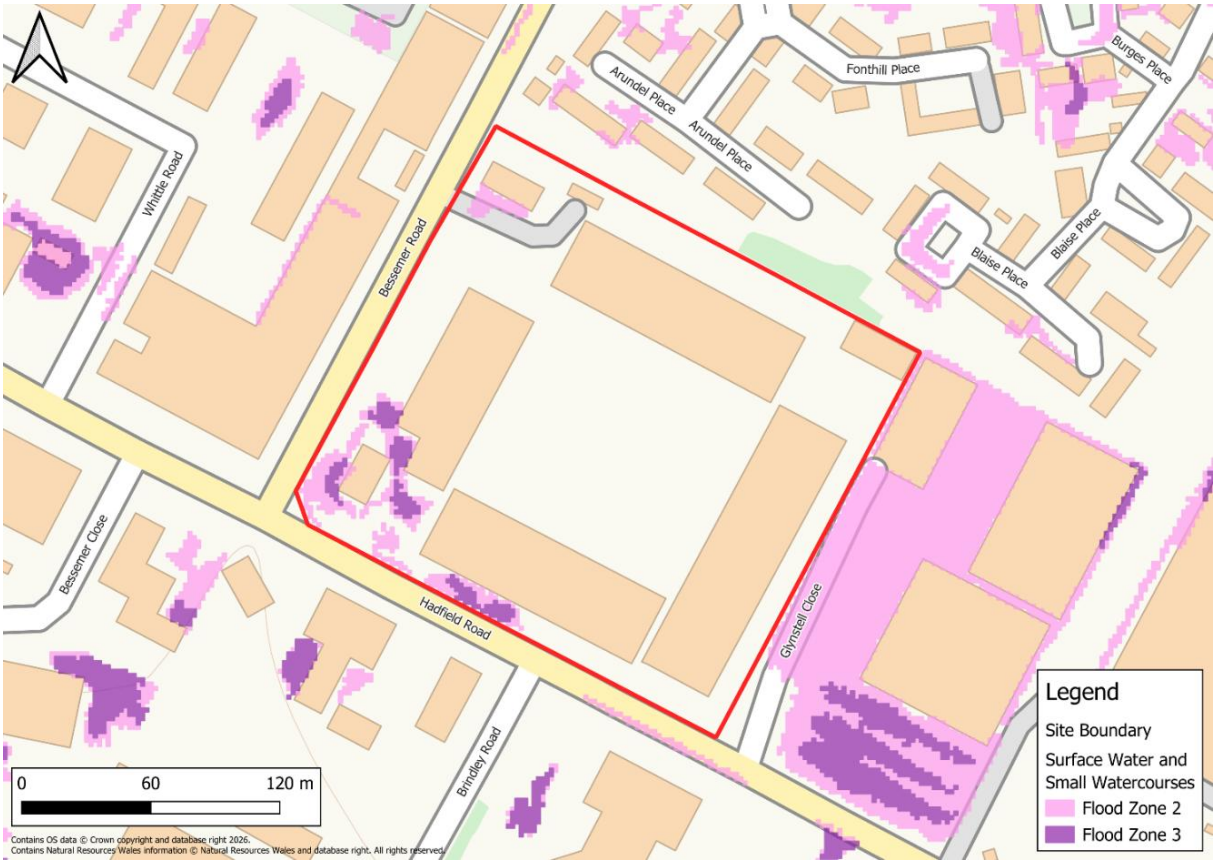

Figure 3-3: Flood Map for Planning - Surface Water and Small Watercourses

4 Assessment of Flood Risk

The latest available information on flood risk at the site, published by Natural Resources Wales (NRW) and datasets used in the SFCA is summarised in Table 4-1 below.

Table 4-1 Summary of Flood Risk

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	✓	The site's location within Flood Zone 2 of the FMfP for Rivers indicated that the site is at a **moderate** risk of flooding from this source. **Fluvial flood risk is further assessed in Section 4-1**.
Flood Risk from the Sea	✓	The site is at **very low** risk of tidal flooding. **Tidal flood risk is further assessed in Section 4-2**.
Flood Risk from Surface Water and Small Watercourses	✓	The site is predominantly located within Flood Zone 1. Some ponding is identified in the western part of the site within Flood Zones 2 and 3 of the FMfP for Surface Water and Small Watercourses. The site is at a **low to moderate** risk of flooding from this source. **Surface Water and Small Watercourse flood risk is further assessed in Section 4-3**.
Flood Risk from Groundwater	×	JBA's Groundwater risk of emergence map shows that the site is located in an area of **'Very Low'** risk of groundwater emergence.
Flood Risk from Reservoirs	✓	The NRW Flood Map for Planning shows that the site is located in an area at risk of reservoir flooding. **Reservoir flood risk is further assessed in Section 4-4**.
Flood Risk from Sewers	×	The Cardiff SFCA has identified there to be no historic sewer flood incidents within the Grangetown electoral ward. Therefore, it is concluded that the risk of flooding is **low.**

4.1 Flood Risk from Rivers

4.1.1 Baseline flood risk

The Flood Map for Planning - Flood Risk from Rivers (Figure 3-1) indicates that the development site is entirely located within Flood Zone 2 for Rivers.

The proposed development site is located within an area covered by the River Taff and Ely hydraulic model. The baseline model was initially prepared by Mott MacDonald in 2013 and has been updated by JBA for a series of site-specific assessments, most recently in 2024.

Figure 4-1 shows that the site and access road are not predicted to flood during the 1% AEP plus climate change event. During this event, floodwater is largely confined within the banks of the River Ely and River Taff.

The flood risk at the site during the 0.1% AEP plus climate change event is illustrated in Figure 4-2. The results show that flooding is predicted across the entire site during the extreme event. Flooding occurs due to the River Taff overtopping its banks north of the South Wales railway line in Cardiff City Centre. Flood water flows towards the site from a northerly direction and exits the south-western site boundary. The River Ely to the west of the site largely remains in bank during this scenario.

Flood depths are predicted to be predominantly below 500mm. However, areas of deeper flooding are shown in the north-western and south-western corners of the site, reaching a maximum of 790mm. These higher depths are associated with the slightly lower ground levels of the hardstanding areas surrounding the existing commercial units. The maximum flood level on site during the 0.1% AEP plus climate change event is 8.46mAOD.

The access road is predicted to flood up to 790mm, located adjacent to the site entrance. The southern extent of Bessemer Road and the Western Extent of Hadfield Road are flood-free, providing a direct connection to the A4232. Therefore, alternative vehicular or pedestrian access should be considered along the south-western site boundary to facilitate flood free movements in the event of a flood.

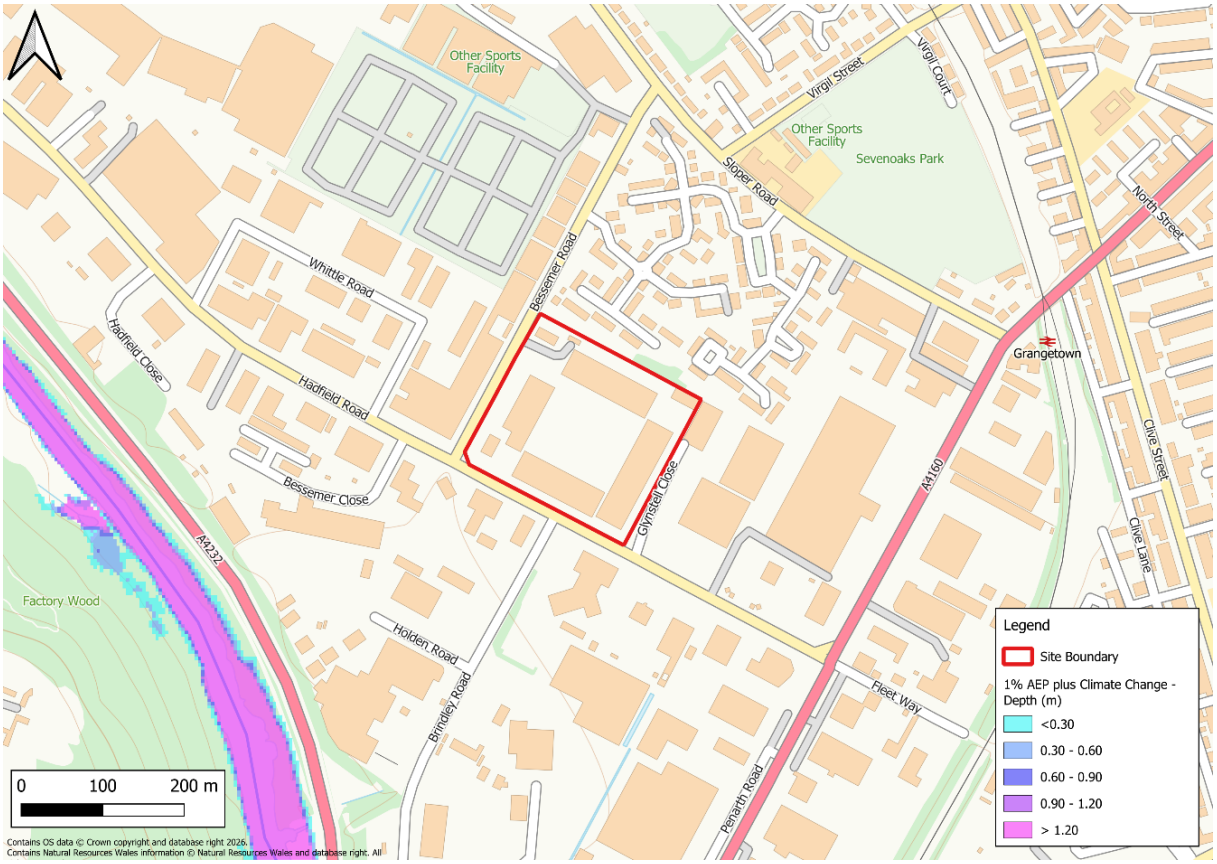

Figure 4-1: 1% AEP plus Climate Change - Flood depths - River Taff and Ely Model

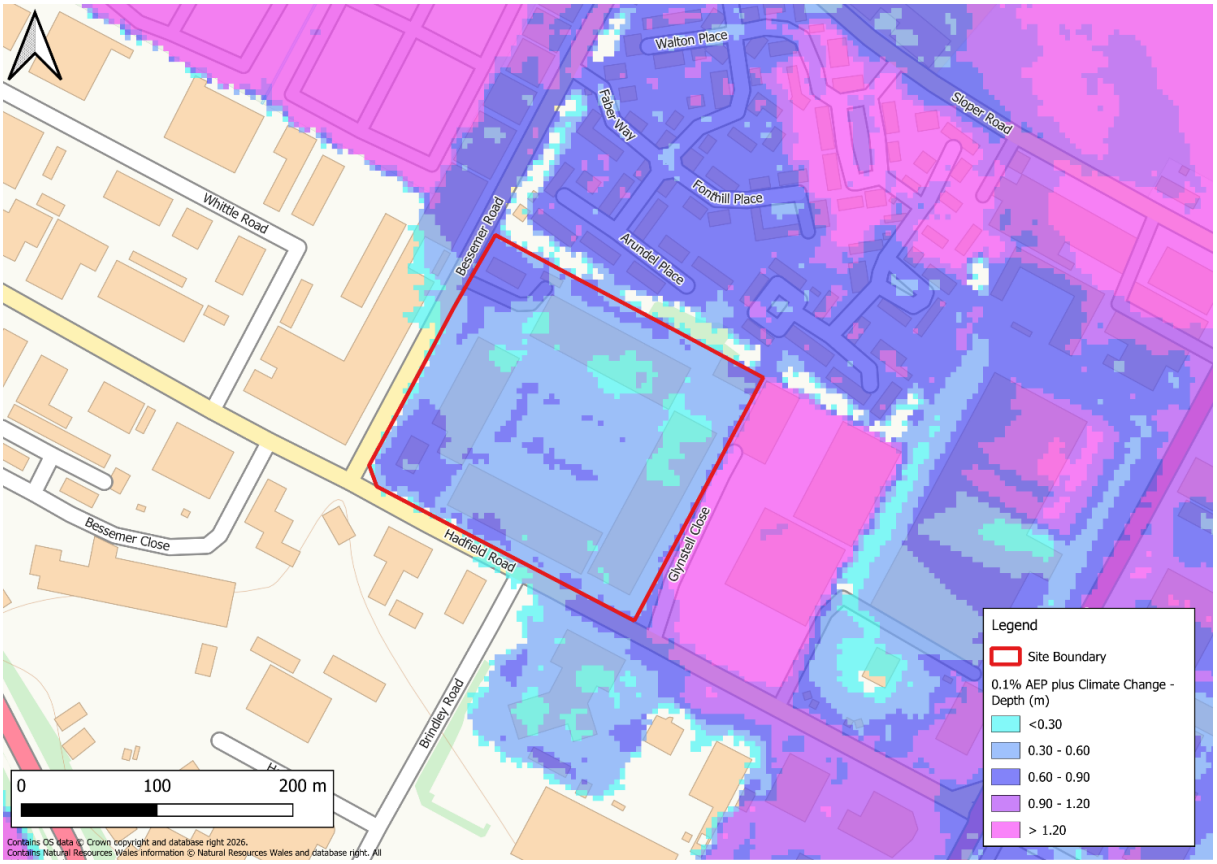

Figure 4-2: 0.1% AEP plus Climate Change - Flood depths - River Taff and Ely Model

4.1.2 Breach flood risk

As the site currently benefits from being in a TAN-15 Defended Zone, breach modelling has been undertaken in accordance with Section 10.26 of TAN-15.

To understand the residual risk of breaching the fluvial defences on the banks of the River Taff, three breach locations have been assessed and modelled separately. The three breach locations were chosen as the model results identified that these are some of the first defence locations susceptible to overtopping and therefore may be most prone to failure. The breach locations have been discussed and agreed with NRW. The modelled breach locations are shown in Figure 4-3.

During the 1% AEP plus climate change event, the results demonstrate that the site and access road remain flood-free under all three breach scenarios and have therefore not been presented graphically.

Figure 4-4 shows the peak flood depths for the Breach 1 0.1% AEP plus climate change scenario. The flood extent and depths within the site are broadly similar to the baseline scenario, with depths reaching a maximum of 770mm in the north-western corner. During this scenario, the peak flood level is predicted to decrease slightly compared to the baseline to 8.45mAOD. Breach 1 allows some flow to be diverted onto the left bank of the River Taff, increasing flooding within the Gabalfa district of Cardiff. Therefore, the volume of water overtopping the right bank and propagating towards the site is marginally reduced, leading to slightly lower peak water levels at the site compared to the baseline scenario.

The peak flood depths for the Breach 2 0.1% AEP plus climate change scenario are presented in Figure 4-5. Relative to the baseline scenario, the breach 2 results show that maximum depths increase to 840mm in the north-western corner of the site, and the maximum water level increases to 8.51mAOD.

Figure 4-6 shows the peak flood depths for the Breach 3 scenario during the 0.1% AEP plus climate change event. The results are identical to the Breach 2 scenario, with peak flood depths reaching 840mm and the maximum flood level reaching 8.51mAOD.

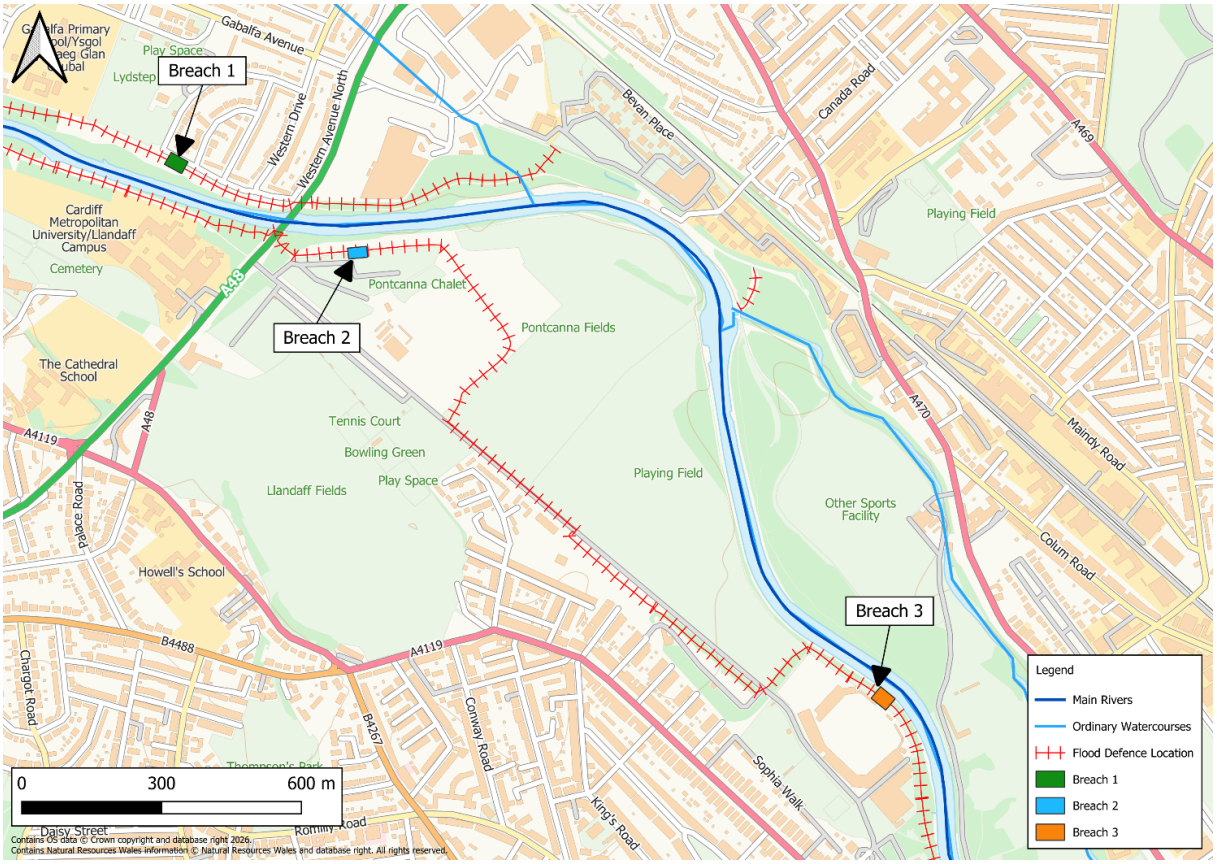

Figure 4-3: River Taff and Ely model breach locations

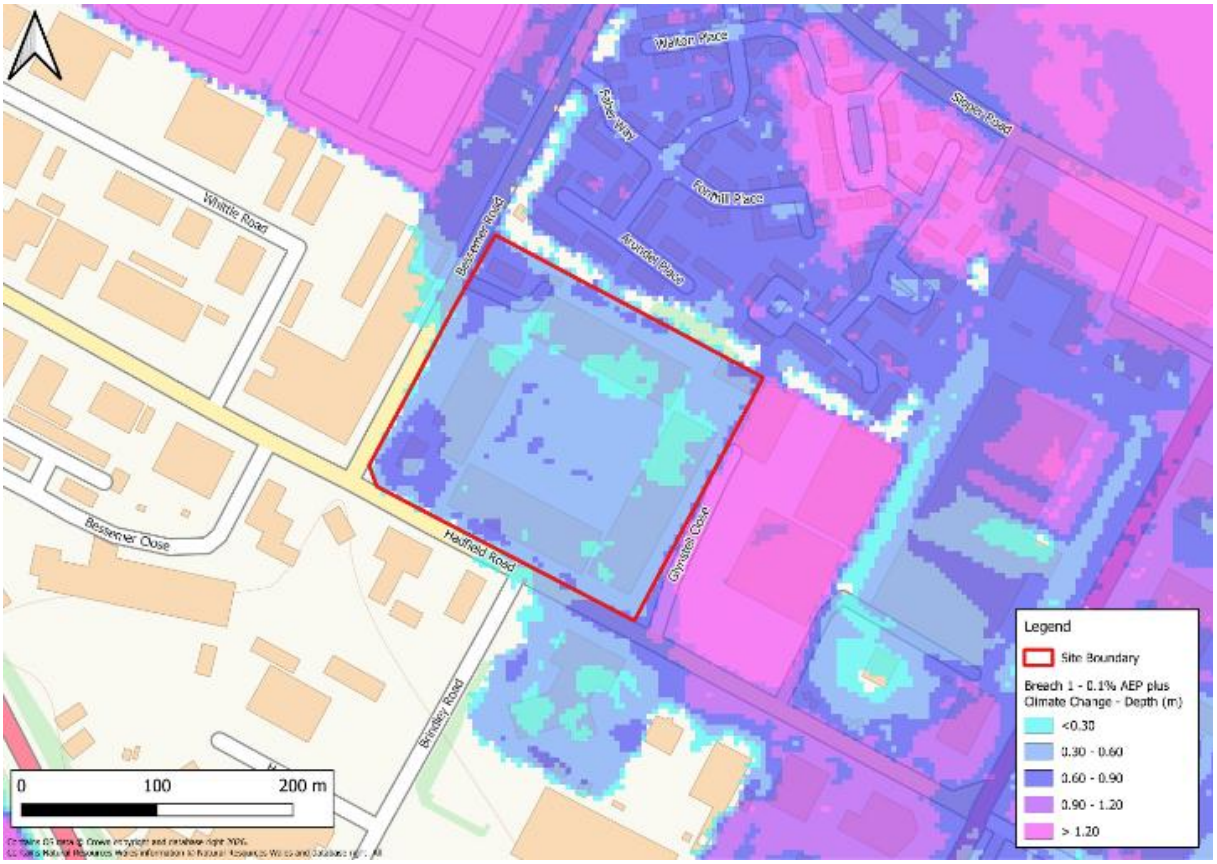

Figure 4-4: Breach 1 - 0.1% AEP plus Climate Change scenario - River Taff and Ely Model

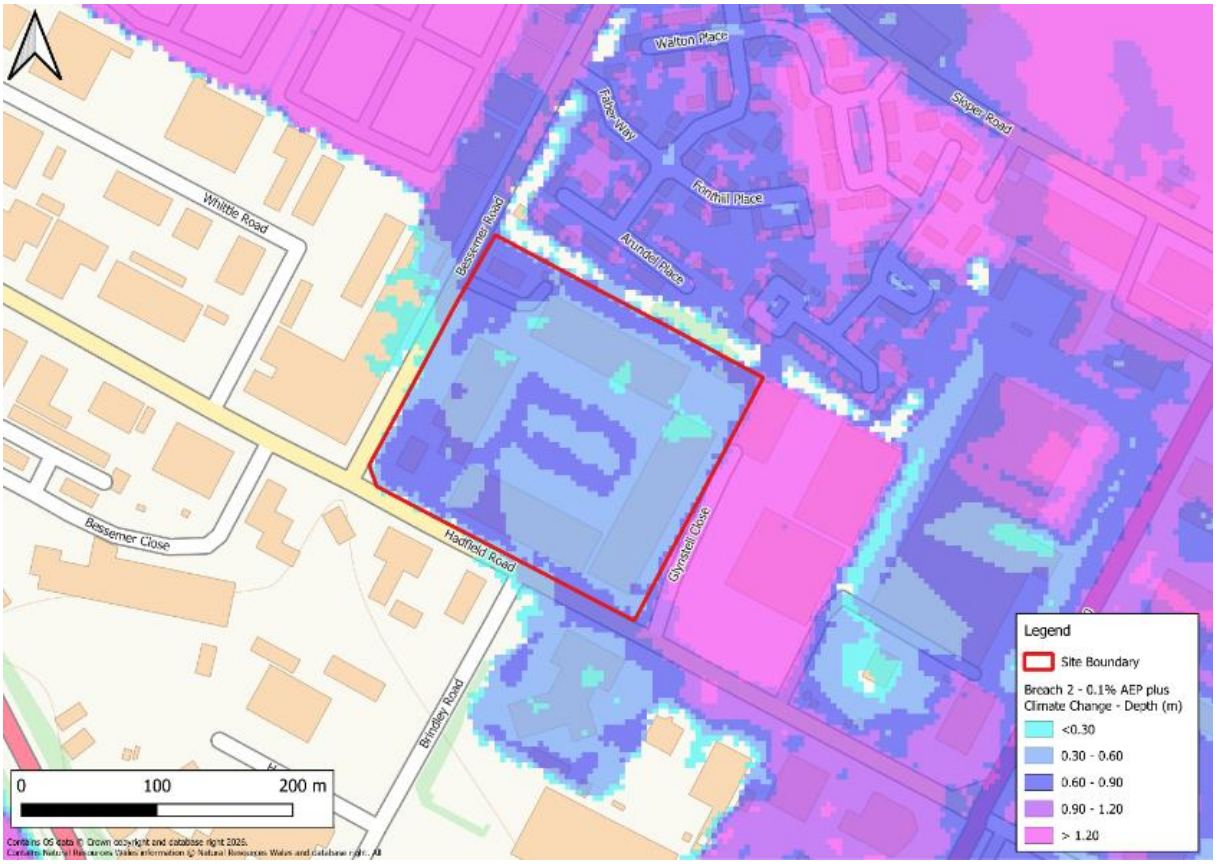

Figure 4-5: Breach 2 0.1% AEP plus Climate Change scenario - River Taff and Ely Model

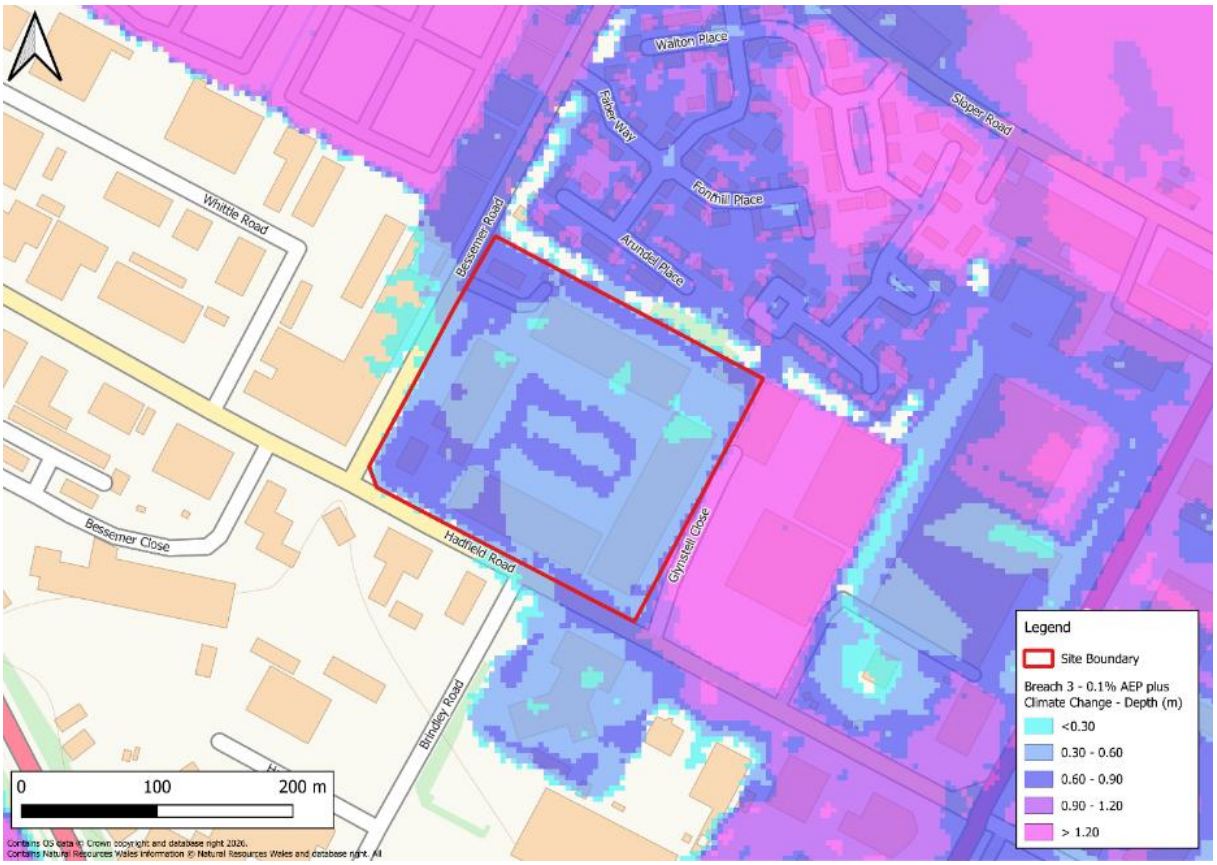

Figure 4-6: Breach 3 0.1% AEP plus Climate Change scenario - River Taff and Ely Model

4.2 Flood Risk from the Sea

The Flood Map for Planning - Flood Risk from the Sea (Figure 3-2) indicates that the development site is entirely located within the TAN-15 Defended Zone for the Sea and Flood Zone 3. The site is located within a TAN-15 Defended Zone due to the area being protected from the Cardiff Bay tidal barrage, as detailed in Section 2.3. The Cardiff Bay Barrage provides substantial tidal protection to Cardiff with a standard of protection greater than that required to protect against the 0.1% AEP plus climate change event. As such, no further assessment is considered necessary and the tidal flood risk to the site is concluded to be very low.

4.3 Flood Risk from Surface Water and Small Watercourses

The Flood Map for Planning - Surface Water and Small Watercourses (Figure 3-3) indicates that the development site is predominantly located within Flood Zone 1. The site is partially located within Flood Zones 2 and 3, associated with topographic depressions in the south-western part of the site.

In the absence of detailed hydraulic modelling of the site, the NRW National Flood Hazard Mapping (NFHM) has been used to provide a further assessment of surface water and small watercourse flood risk to the site. The NFHM is used to define the FMfP surface water and small watercourses Flood Zones, but inspection of the NFHM data provides additional information on flood depth, velocities and hazard, and provides greater insight into the mechanisms and accuracy of the flood mapping. During the 1% AEP plus climate change event, isolated areas of surface water ponding are shown in the south-western corner of the site, reaching depths of 260mm (Figure 4-7). Flood depths in these areas of ponding increase to a maximum of 321mm in the 0.1% AEP plus climate change event (Figure 4-8). An additional area of ponding is predicted in the north-western corner of the site during the extreme event, to shallow depths up to 284mm.

As the surface water flood risk is relatively minor and associated with local topographic depressions, ponding within the site can likely be managed through the implementation of SuDS in line with the Statutory Standards for SuDS in Wales.

The main access and egress road is Bessemer Road, located to the west of the site. Bessemer Road is flood-free during both the 1% AEP and 0.1% AEP plus climate change events, providing a direct connection to Hadfield Road, which leads to Penarth Road (A4160).

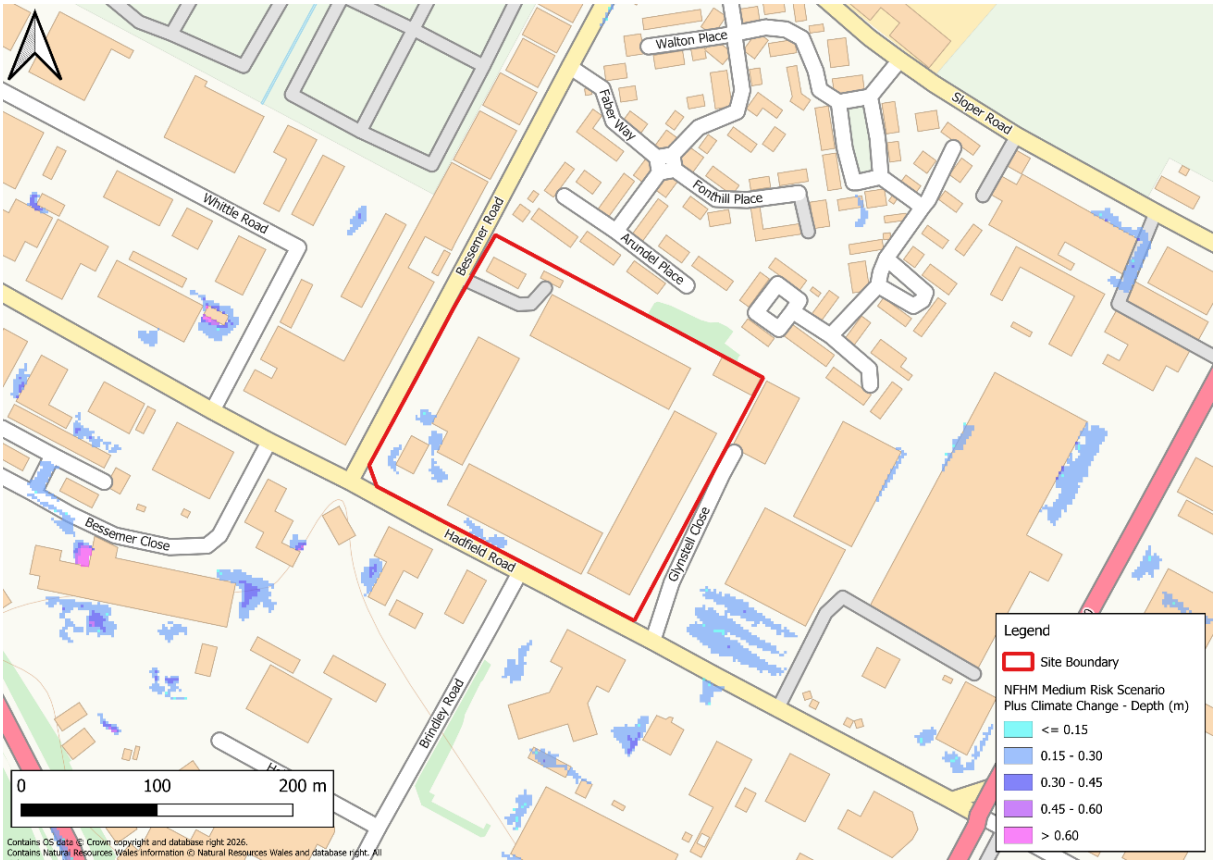

Figure 4-7: Flood Risk from Surface Water - 1% AEP + Climate Change - Flood depths

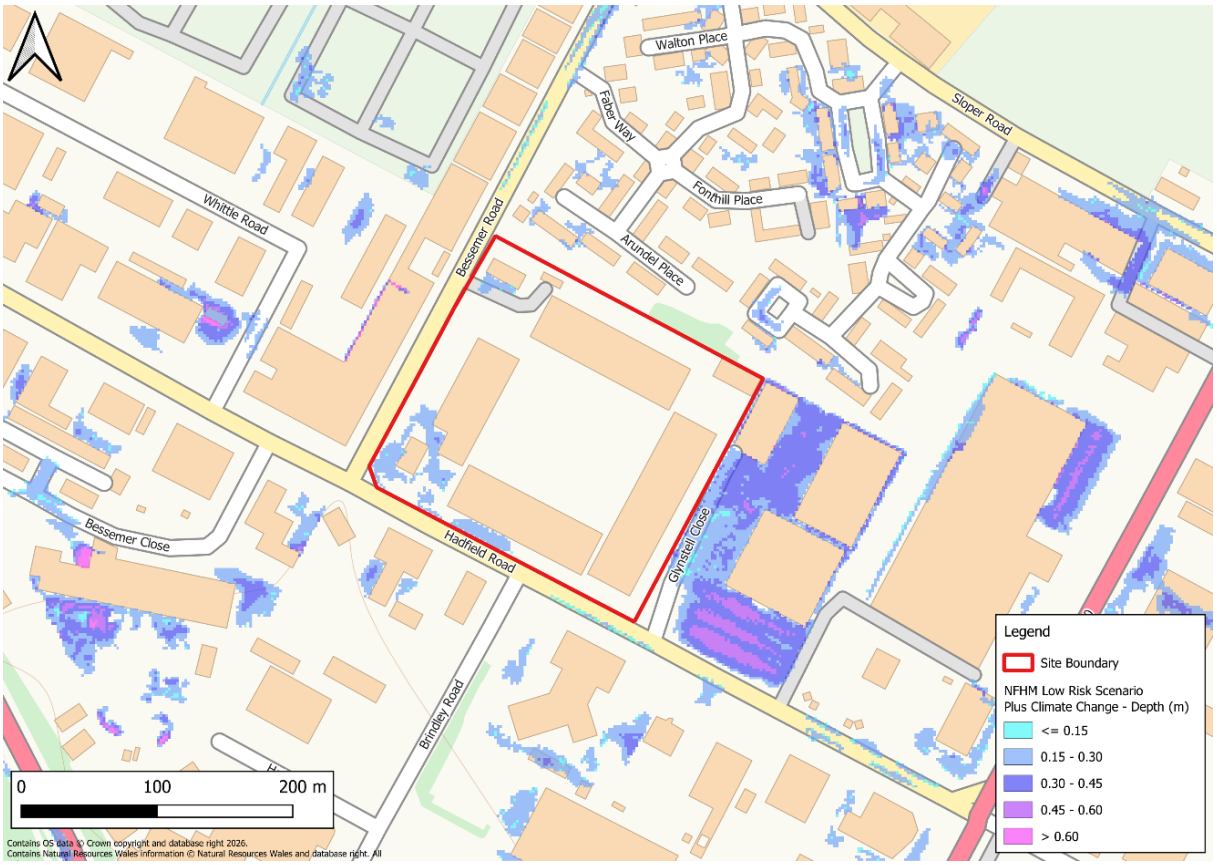

Figure 4-8: Flood Risk from Surface Water - 0.1% AEP + Climate Change - Flood depths

4.4 Flood Risk from Reservoirs

Figure 4-9 below shows the reservoir flood extent within the site. This indicates that almost the entire site is at risk of flooding from the Pontsticill Reservoir.

However, the regulated nature of reservoir management means that a failure event is very unlikely. It should also be noted that reservoir failures are rare and there has been no loss of life in the UK from reservoir flooding since 1925.

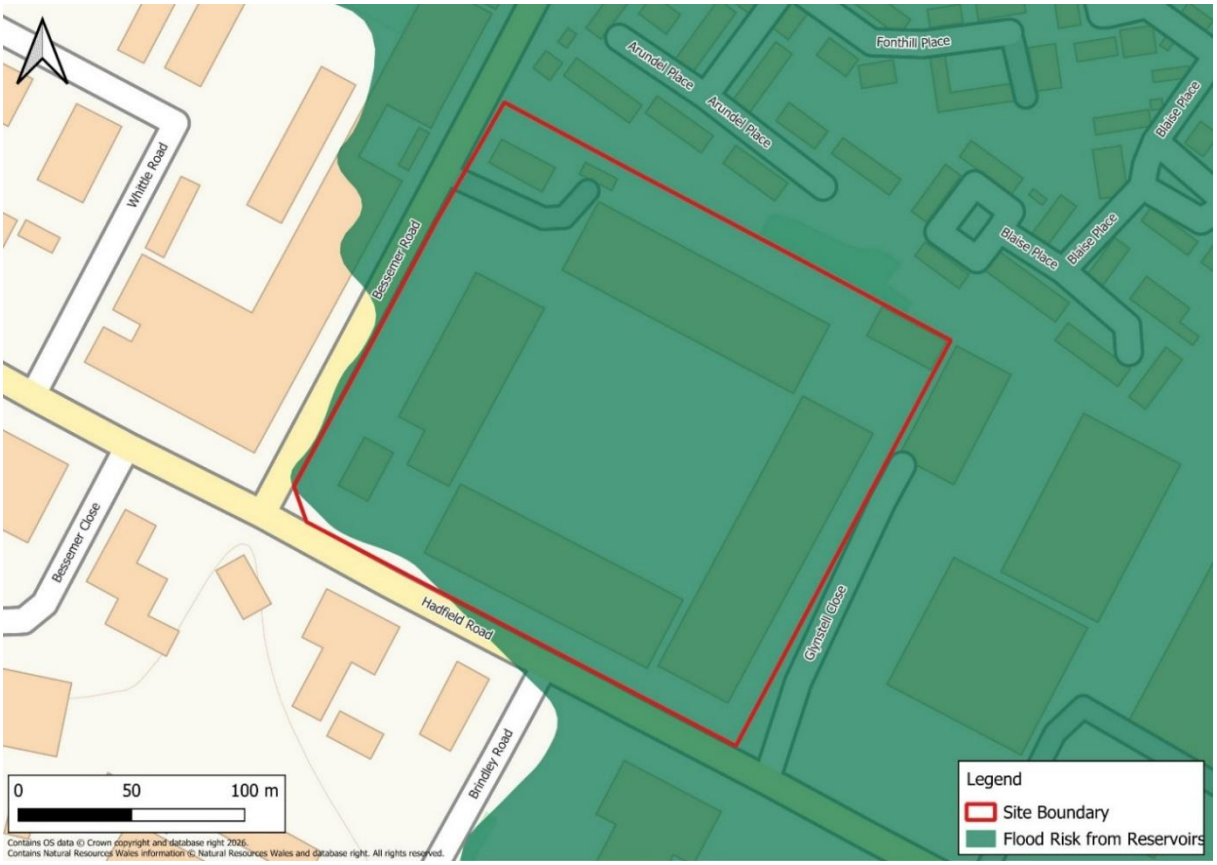

Figure 4-9: Reservoir flood extent

5 Application of Flood Zones to Development Management Decisions

When considering a site for development, Section 10 (Flooding and the plan-led system) and Figures 5 (flood frequency) and 6 (tolerable conditions) of Section 11 of TAN-15 outline the requirements for the type of development permitted in any given flood zone.

The site is affected by flood risk from fluvial, tidal and surface water and small watercourse sources, which are reflected in the mapped Flood Zones across the site. Where a site falls into two or more flood zones the planning authority must make an assessment of the proposal, taking into account each of its proposed land uses, against each of the flood zones to which it applies, in accordance with the criteria requirements of this TAN.

5.1 Flood Risk from Rivers

The site is entirely located in Flood Zone 2 of the FMfP for Rivers. It is possible to allocate sites within Flood Zone 2 where the proposals assist the implementation of the strategy of the LDP to regenerate or revitalise existing settlements or to achieve key economic or environmental objectives. Section 10.18 of TAN-15 states:

"In Zone 2 allocations may be made for new development and redevelopment of any vulnerability that is necessary to implement the strategy of an LDP, a strategy to regenerate or revitalise existing settlements or to achieve key economic or environmental objectives, provided that a Strategic Flood Consequences Assessment has identified an acceptable level of risk."

Risks associated with fluvial flooding are significant for the most extreme event, exceeding indicative depths of acceptable flooding during the 0.1% AEP plus climate change breach and baseline scenarios. In accordance with TAN15 ‘redevelopment’ proposals may be considered with more flexibility to meet the frequency thresholds and tolerable conditions of Figures 5 and 6. The site may therefore be considered more favourably given the site location, and the opportunities to increase the resilience of existing infrastructure in this area. Proposals should avoid an intensification of development or increase in risk across the site.

In order for the site to be deemed appropriate for residential purposes, mitigation measures shall need to be considered and supported by detailed flood modelling, presented in a site specific FCA for any future redevelopment proposals. It shall be for the LPA and NRW to determine if proposals are acceptable, and the degree to which the flexibility offered by TAN-15 to redevelopment proposals can be applied.

Access and Egress is a key consideration for proposed developments under TAN15. Access and egress during the extreme scenario should be carefully considered to facilitate flood free movements in the event of a flood.

5.2 Flood Risk from the Sea

The proposed development is located within a TAN-15 Defended Zone for the Sea and Flood Zone 3. The presence of the site within the TAN-15 Defended Zone supplants the sites' location within Flood Zones 3, regardless of the source of risk.

The site is located on brownfield land and is therefore considered as redevelopment.

For a proposed redevelopment site within a TAN-15 Defended Zone, Section 10.17 of TAN-15 states:

"On brownfield sites redevelopment proposals should not over intensify use neither should they reduce the area's ability to absorb flood water nor cause problems with flooding elsewhere. All applications should consider opportunities to incorporate flood resilient design as appropriate and any proposal involving highly vulnerable development must be compliant with the tolerable conditions set out in section 11."

Sites within the TAN-15 Defended Zone should also meet the acceptability criteria, as set out in Section 11 of TAN-15. The site is considered to be at low risk of tidal flooding due to protection from the Cardiff Bay Tidal Barrage. The Cardiff Bay Barrage provides substantial tidal protection to Cardiff with a standard of protection greater than that required to protect against the 0.1% AEP plus climate change event. As such no further assessment in the form of breach is considered necessary and the tidal flood risk to the site is not expected to be a constraint to development.

5.3 Flood Risk from Surface Water and Small Watercourses

The site is predominantly located within Flood Zone 1 of the FMfP for Surface Water and Small Watercourses, where all forms of development are permissible.

Localised areas of surface water ponding on the site are located within Flood Zones 2 and 3 of the FMfP.

Sections 10 and 11 of TAN-15 do not explicitly apply to the surface water and small watercourse zones in which this proposed development site lies. Instead, it is for the applicant to demonstrate alignment with the risk-based principles of TAN15 and the general acceptability criteria of Section 11.4.

It is considered that surface water flood risk can likely be managed through the implementation of SuDS in line with the Statutory Standards for SuDS in Wales.

Access and egress are key considerations within TAN-15. Flood-free access and egress are possible during the extreme event via Bessemer Road to the west of the site, providing a direct connection to Hadfield and leading to Penarth Road (A4160).

Given the extent and nature of the surface water flood risk to the site, it is considered unlikely that a standalone FCA focussing on surface water flood risk may not be required. Instead, surface water flood risk can be appropriately addressed through a comprehensive Flood Risk and Surface Water Drainage Strategy to support the planning application.

6 Summary and recommendations

The site is located within the TAN-15 Defended Zone for the Sea. The site is protected from tidal flooding by the Cardiff Bay Tidal Barrage; therefore, the risk of tidal flooding is low.

The site is predominantly within Flood Zone 1 for Surface Water and Small Watercourses, with only small, localised areas located within Flood Zones 2 and 3, associated with topographic depressions.

The site is also located within Flood Zone 2 of the FMfP for Rivers.

Consequently, any planning application will require a Flood Consequences Assessment (FCA) to comprehensively assess the flood risk from all sources. Given the risk of fluvial flooding to the site, re-development may be difficult. In order for the site to be deemed appropriate for residential purposes, mitigation measures shall need to be considered and supported by detailed flood modelling, presented in a site specific FCA for any future redevelopment proposals. It shall be for the LPA and NRW to determine if proposals are acceptable.

The following recommendations are made for the site:

- Any planning application for the site should be accompanied by a site-specific FCA which demonstrates how the proposals meet the requirements of TAN-15.
- Given the risk of fluvial flooding to the site, re-development may be difficult. In order for the site to be deemed appropriate for residential purposes, mitigation measures shall need to be considered and supported by detailed flood modelling, presented in a site specific FCA for any future redevelopment proposals. It shall be for the LPA and NRW to determine if proposals are acceptable.
- Surface water flood risk on the site should be managed via SuDS techniques, which are implemented in line with the Statutory Standards for SuDS in Wales.
- A Drainage Statement shall be required demonstrating how surface water shall be managed on site, in line with the Statutory Standards for SuDS in Wales, and TAN-15.

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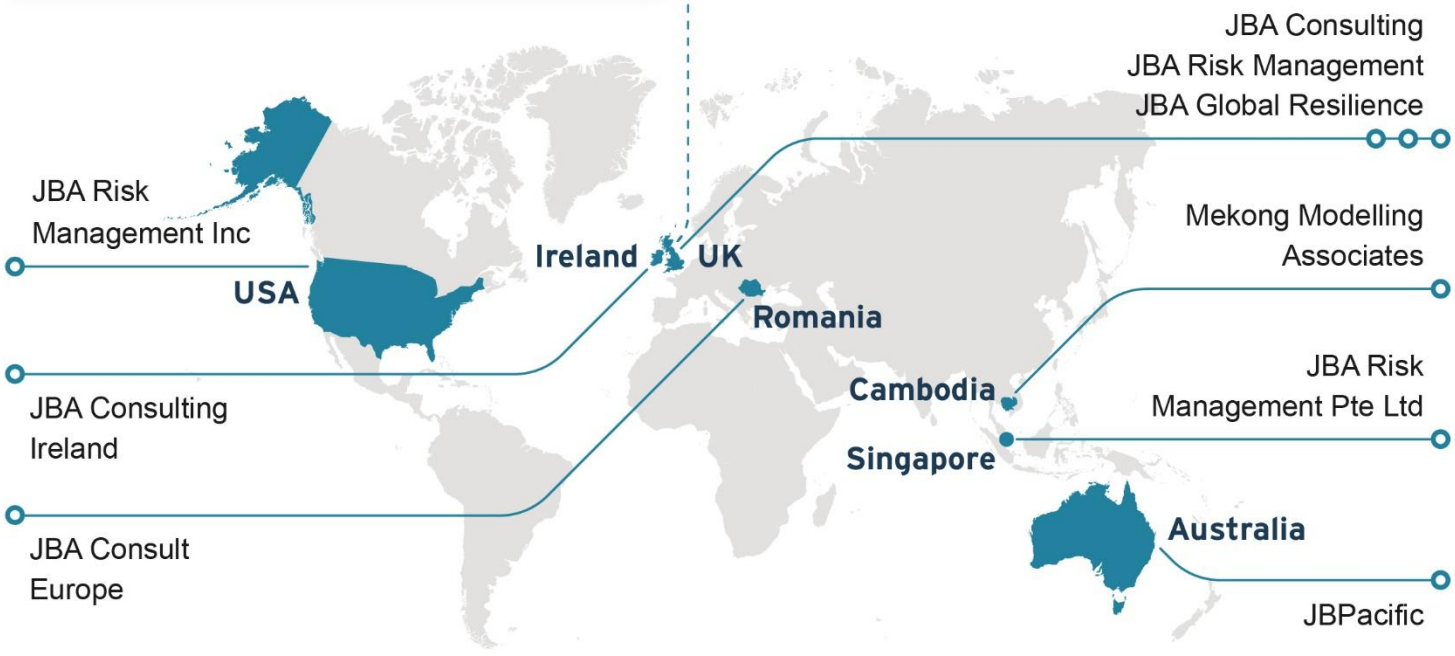

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