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Cardiff Council Strategic Flood Consequences Assessment - Land at Areas 9-12 St Mellons (013)

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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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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 January and May 2026 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.

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.

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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 Land at Areas 9-12 St Mellons, 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	Land at Areas 9-12 St Mellons
Site ID	13
Site area (ha)	3.99
Existing land use	Greenfield land
OS NGR	ST 23502 79975
Access location	Green Meadows

Figure 2-1: Proposed development site

2.1 Development proposals

The proposals at this site are for residential development. The site is located on greenfield land and is classified as a Highly Vulnerable Development.

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.

Levels across the site generally fall in a southerly direction. The highest ground level is 9.51mAOD, located in the north-western corner of the site. The lowest ground level of 5.76mAOD is located along the southern site boundary. There are localised high points across the site, which appear to correlate to areas of woodland and shrubland. An assessment of the LiDAR indicates a channelised area of low topography from north to south through the centre of the site, associated with the reen network.

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

Along the Green Meadows access road to the north of the site, ground levels are approximately 7.64mAOD and provides a direct connection to Hendre Road.

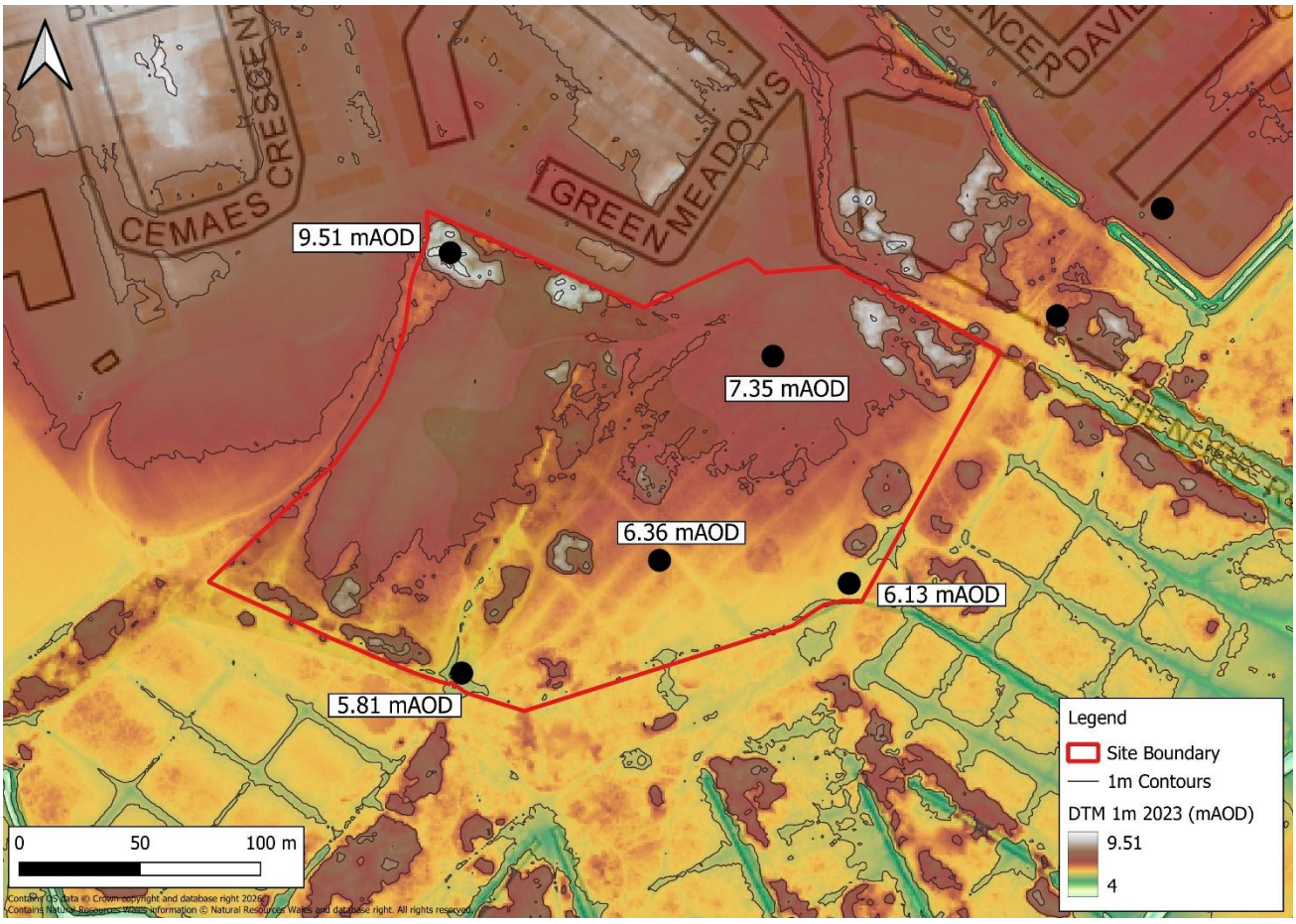

Figure 2-2: 1m LiDAR

2.3 Watercourses and Defences

Figure 2-3 shows the locations of the nearest NRW Main Rivers and ordinary watercourses. The site is situated in the Wentlooge Levels, part of the Caldicot and Wentlooge Drainage District, which is made up of an extensive network of tidally influenced reens and Main Rivers as classified by NRW. A number of unnamed reens are located to the south and east of the site, flowing to the Pil-Du Reen. The Pil-Du Reen is an ordinary watercourse, located approximately 170m south of the site. The flow direction of the reens in the vicinity of the site is likely to be towards the Main Rivers shown in Figure 2-3. This includes the Tarwick Reen. These watercourses discharge into the Severn Estuary, located approximately 1.6km from the site.

An NRW flood defence is located along the Gwent coastline in the form of an earth embankment. The embankment aims to mitigate the risk of tidal flooding to the Caldicot and Wentlooge Levels and is managed by NRW. The site is located within an area benefiting from this defence.

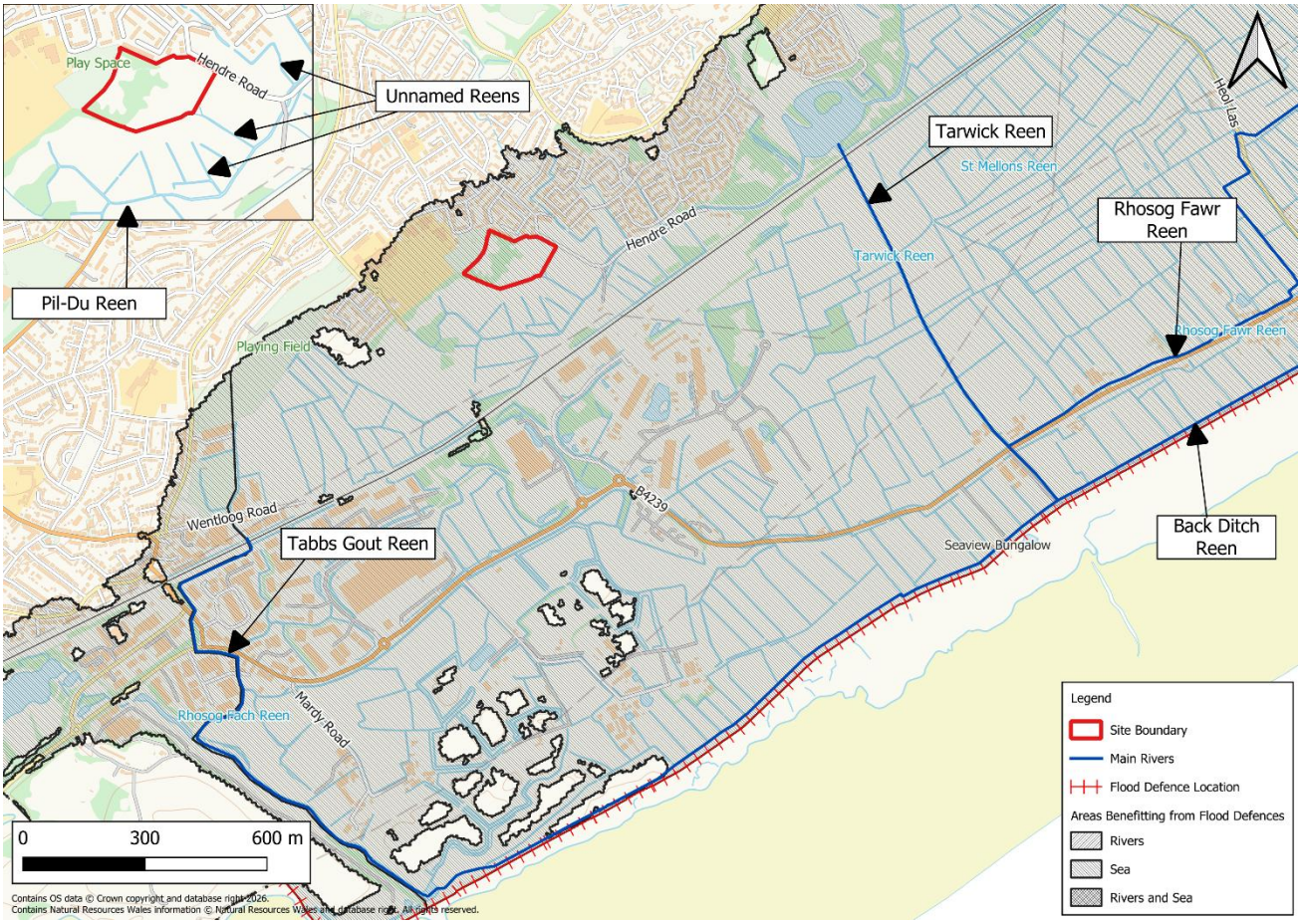

Figure 2-3: Watercourses and Defences

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 identified 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 development
Form of Development	New development
Vulnerability Classification	Highly Vulnerable
Flood Map for Planning - Rivers	Flood Zone 1
Flood Map for Planning - Sea	Flood Zone 3 and TAN-15 Defended Zone (Figure 3-1)
Flood Map for Planning - Surface Water and Small Watercourses	Flood Zone 2 and 3 (Figure 3-2)

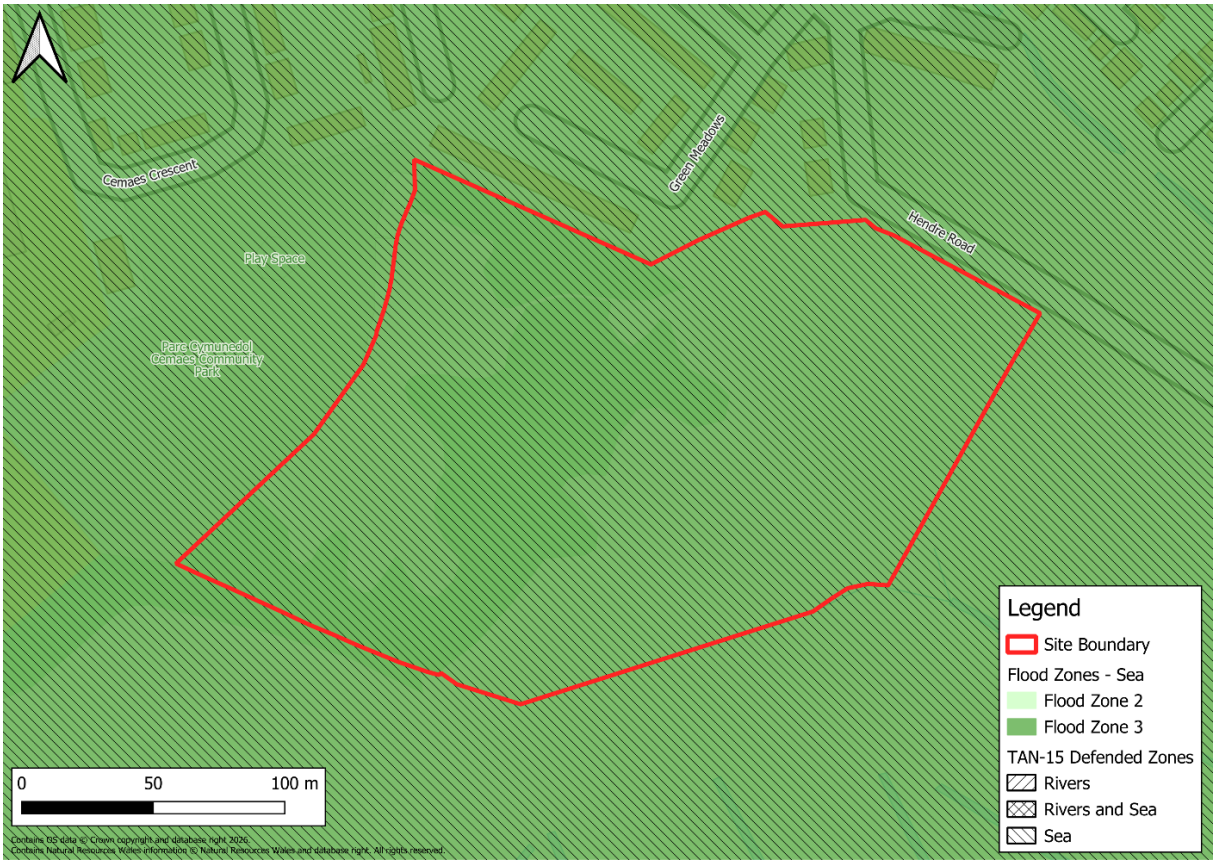

Figure 3-1: Flood Map for Planning - Sea

Figure 3-2: 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 1 of the FMfP for Rivers indicates that the site is at **very low** risk of fluvial flooding.
Flood Risk from the Sea	✓	The site's location within Flood Zone 3 and the TAN-15 Defended Zone of the FMfP for the Sea indicates that the site is at a **moderate** risk of tidal flooding. **Tidal flood risk is further assessed in Section 4.1.**
Flood Risk from Surface Water and Small Watercourses	✓	The site is predominantly at **very low** risk of surface water flooding. Small, localised areas are located within Flood Zones 2 and 3 of the FMfP for Surface Water and Small Watercourses, indicating that the site is at a **very low to moderate** risk of flooding from this source. **Surface Water and Small Watercourse flood risk is further assessed in Section 4.2**
Flood Risk from Groundwater	×	JBA's Groundwater risk of emergence map shows that the site is at a **'Very low'** risk of groundwater emergence.
Flood Risk from Reservoirs	×	The NRW Flood Map for Planning shows that the site is not located in an area at risk of reservoir flooding. Therefore, it is concluded that the risk of flooding is **very low**.
Flood Risk from Sewers	✓	The Cardiff SFCA has identified there to be 2 sewer flood incidents within the Trowbridge electoral ward. The site is greenfield and is unlikely to have any sewerage infrastructure which could overflow and cause sewer flooding. Therefore, it is concluded that the risk of flooding is **low**.

4.1 Flood Risk from the Sea

4.1.1 Baseline flood risk

The Flood Map for Planning - Flood Risk from the Sea (Figure 3-1) indicates that the development site is entirely located within the TAN-15 Defended Zone for the Sea. The site is located within a TAN-15 Defended Zone due to the area being protected from tidal flooding by the current coastal defences located across the Wentlooge Levels, as detailed in Section 2.3.

The proposed development site is located within an area covered by the Caldicot and Wentlooge hydraulic model, initially prepared by HR Wallingford in 2015, and further updated by JBA, most recently on behalf of Cardiff Council, in March 2022. The March 2022 updates included:

- Updated climate change allowances to align with Welsh Government Guidance
- Updated extreme sea level predictions
- Utilisation of the most recent modelling software and modelling approaches

This site assessment utilises the 2022 baseline model to represent the flood risk in the 2122 0.5% AEP and 2122 0.1% AEP events, accounting for a 100-year lifetime of development. Whilst the modelling used does not provide outputs for exactly 100 years from now (2126), the 2122 scenario is the closest available modelled epoch to the end of the development lifetime and is therefore considered an appropriate and representative output. Furthermore, the four-year difference between the latest modelling and 2126 is negligible within the context of the future multi-decadal climate change projections.

The detailed Caldicot and Wentlooge hydraulic model shows the site and access road are flood free from tidal sources during both the 0.5% AEP plus climate change event and the 0.1% AEP plus climate change event. The flood risk at the site during the tidal 0.1% AEP plus climate change (2122) event is presented in Figure 4-1.

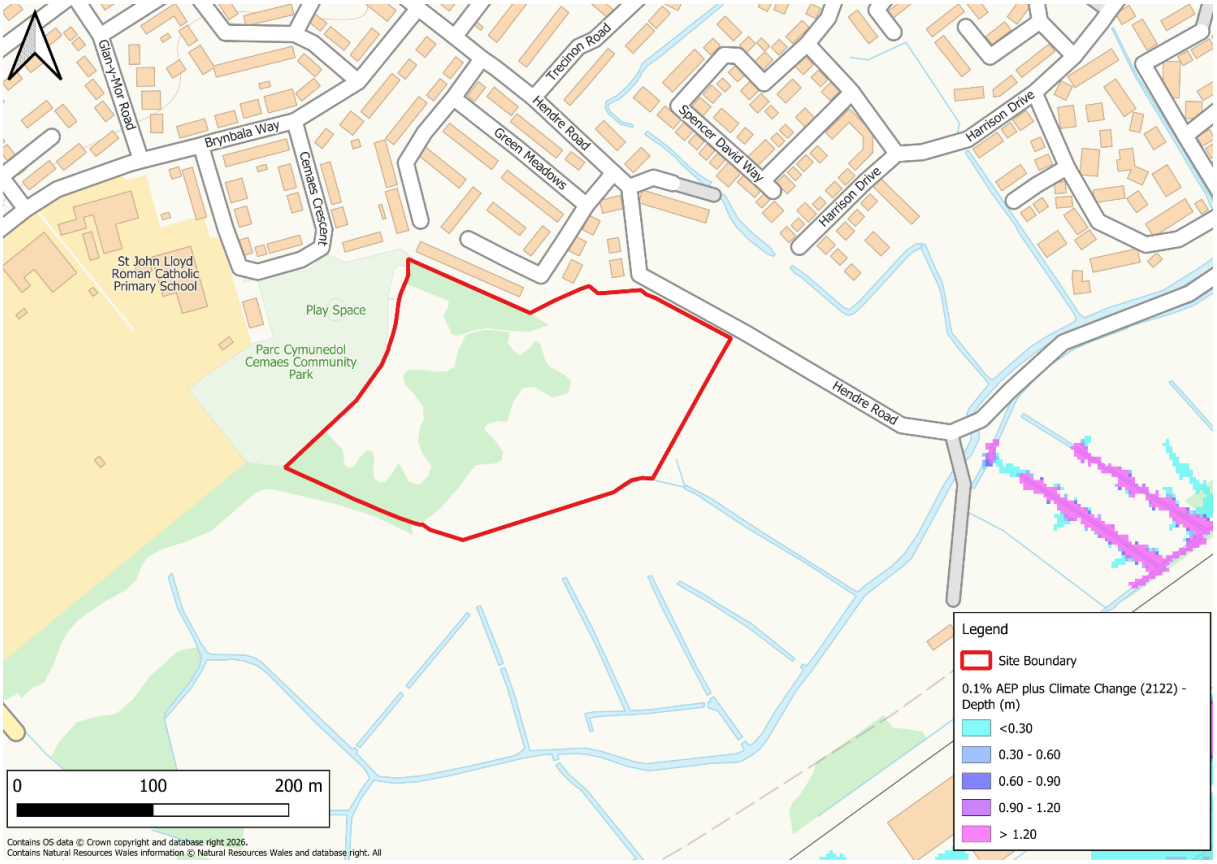

Figure 4-1: Baseline 0.1% AEP plus Climate Change (2122) - Flood depths - Caldicot and Wentlooge Model

4.1.2 Breach flood risk

As the site currently benefits from being in a TAN-15 Defended Zone from the sea, breach modelling has been undertaken in accordance with Section 10.26 of TAN-15 to consider the residual risk of failure in the NRW flood defences.

The 2022 JBA update to the Wentlooge model included the consideration of breach to the coastal defences. The model simulated a breach along the Wentlooge levels with a total of 8 breach locations. This approach is considered appropriate as due to the inherently low probability of a breach occurring, there is no single point along an embankment that can be identified as 'most likely' to fail. Embankments tend to have long continuous sections with a uniform construction and ground conditions. In theory, a breach could occur at multiple locations.

Simulating multiple breach scenarios ensures a conservative assessment of the residual risk and captures a range of flood pathways and hazard outcomes that could occur in the unlikely event that a breach should occur. Breach scenario 'B6' of the Wentlooge model has therefore been used as a conservative approach to assessing the risk at this location.

In 2026, JBA further updated the breach scenario in the Wentlooge model with updated extreme sea level predictions, accounting for exactly a 100-year lifetime of development

(2126). Therefore, the 2126 0.5% and 0.1% AEP breach events have been used to inform this assessment.

The site and access road along Green Meadows remain flood-free during the breach 0.5% AEP plus climate change (2126) scenario, as illustrated in Figure 4-2.

The flood risk at the site during the breach 0.1% AEP plus climate change (2126) scenario is presented in Figure 4-3. The results indicate that the northern extent of the site is flood-free during this scenario. Flooding is predicted in the southern extent and along the eastern site boundary, with depths generally up to 500mm. However, a small area along the southern boundary experiences a maximum flood depth of 654mm. The maximum flood level on site during this scenario is 6.56mAOD.

Safe access and egress are maintained during this scenario, with a flood-free route shown via Green Meadows to the north of the site, providing a connection to the western extent of Hendre Road.

TAN-15 provides indicative tolerable flood depth and velocity conditions for the 0.1% AEP event, including an allowance for climate change. Up to 600mm of flooding is considered tolerable within Highly Vulnerable Developments. However, these criteria are not directly applicable to breach scenarios, for which no tolerability thresholds are defined. In the breach 0.1% AEP plus climate change scenario, flood depths on site are predominantly below 600m, with only a small area along the southern boundary exceeding this threshold. The risk of flooding is residual and due to regular inspections and scheduled maintenance of flood defences, a breach is regarded as very unlikely.

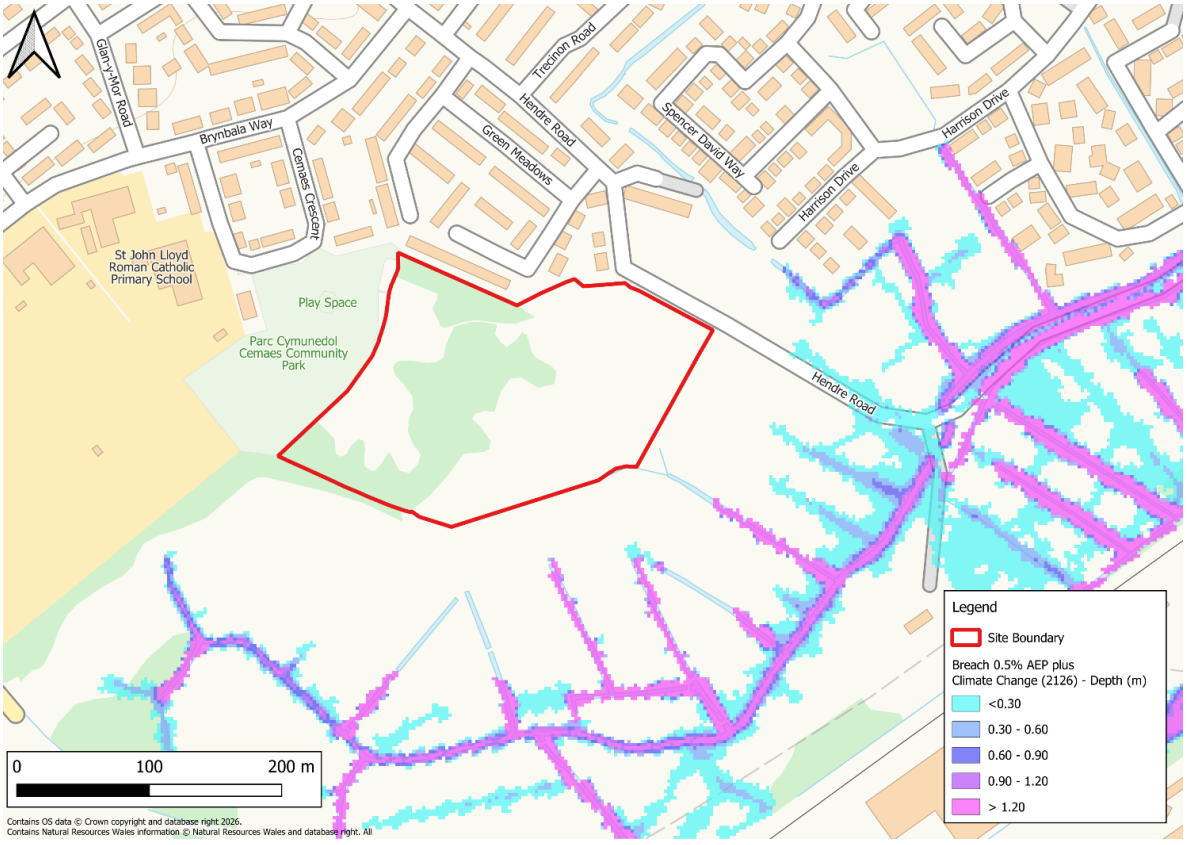

Figure 4-2: Breach 0.5% AEP plus Climate Change (2126) - Flood depths - Wentlooge

Model

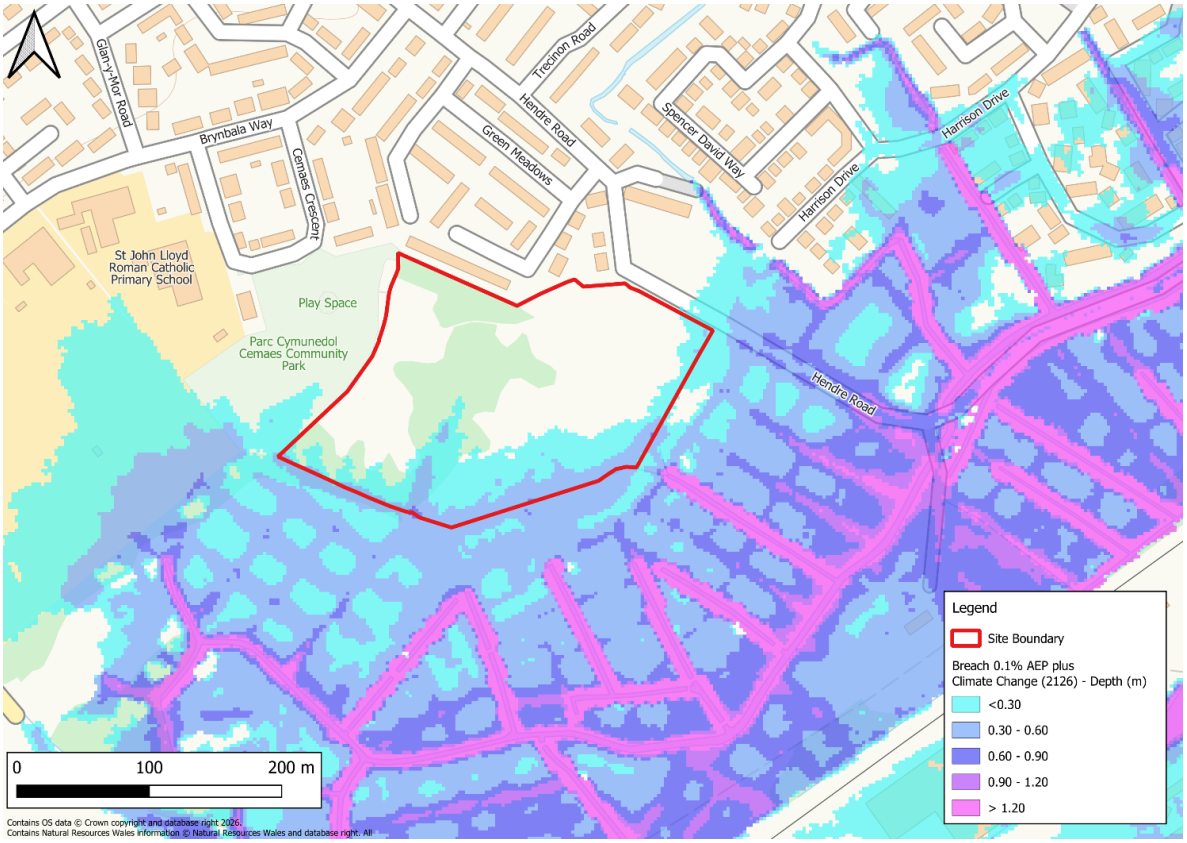

Figure 4-3: Breach 0.1% AEP plus Climate Change (2126) - Flood depths - Wentlooge Model

4.2 Flood Risk from Surface Water and Small Watercourses

The Flood Map for Planning - Surface Water and Small Watercourses (Figure 3-2) indicates that the development site is predominantly located within Flood Zone 1, associated with a very low risk of flooding from this source. The site is partially located within Flood Zones 2 and 3, associated with a drainage channel/reen, a surface water flow path and ponding within topographic depressions.

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. A drainage channel/reen is shown to flow from north to south through the centre of the site. During both the 1% AEP and 0.1% AEP events, flooding appears to be predominantly confined to the channel. A small area of overtopping is shown at the southern boundary to shallow depths up to 242mm and 336mm in the 1% AEP and 0.1% AEP plus climate change events respectively.

Areas of surface water ponding are shown within localised areas of lower topography across the site. Flood depths in the north-wester corner reach a maximum of 448mm during

the 1% AEP plus climate change event. During the 0.1% AEP event, flooding in this location increases to 615mm. The area of ponding extends into a surface water flow path during the extreme event, flowing in a southerly direction, although this is predominantly outside the site boundary. Additional areas of surface water ponding are shown in topographic depressions along the southern and eastern boundaries in the 1% and 0.1% AEP plus climate change events, reaching depths of 346mm and 384mm respectively.

It is envisaged that the reen through the centre of the site and the surface water overland flow path can be managed through good site layout design and should be retained on site. This may provide opportunities for enhancement through placement of blue-green infrastructure and SuDS in the vicinity of the watercourses. However, internal access across to the western extent of the site may be constrained due to the central drainage reen. This will require careful consideration during site layout design.

It is considered that surface water ponding at the site can be managed through the implementation of SuDS in line with the Statutory Standards for SuDS in Wales.

The main access and egress road is Green Meadows, located to the north of the site. Where access and egress are anticipated, Green Meadows is flood-free during the 1% AEP plus climate change event. Shallow flooding up to 130mm is shown during the extreme event, viable for access for pedestrians and high-sided vehicles. Green Meadows provides a direct connection to Hendre Road. The western extent of Hendre Road is flood-free during the 1% AEP plus climate change event and is predicted to flood to shallow depths <160mm in the extreme event, viable for access for pedestrians and high-sided vehicles.

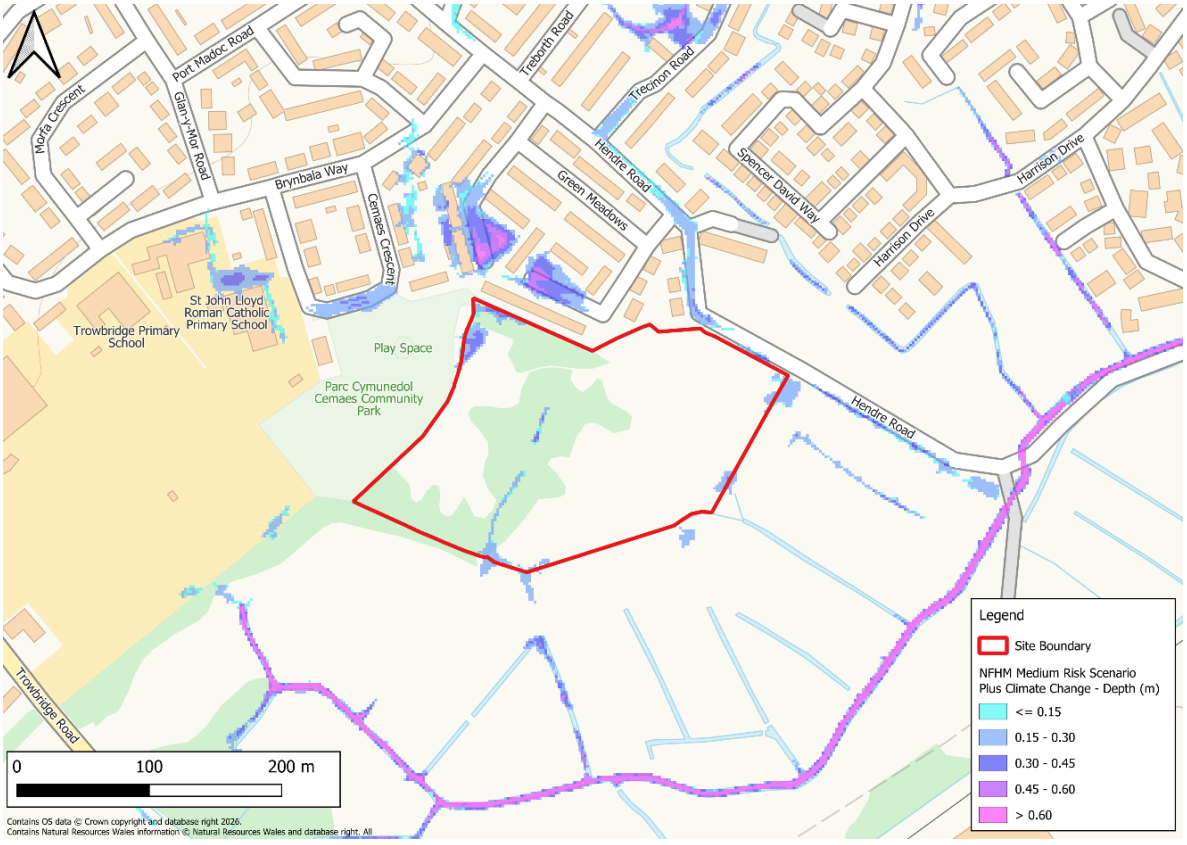

Figure 4-4: Flood Risk from Small Watercourses - 1% AEP + Climate Change - Flood

depths

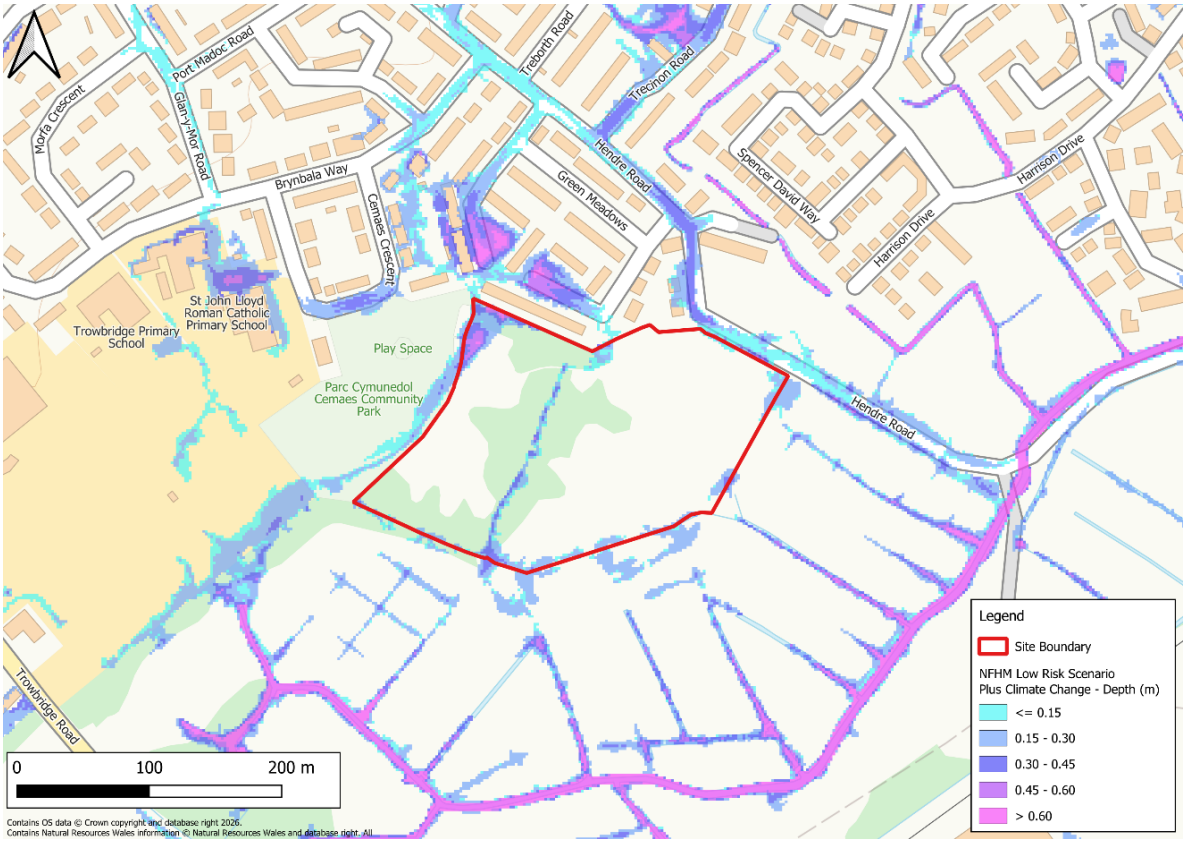

Figure 4-5: Flood Risk from Small Watercourses - 0.1% AEP + Climate Change - Flood depths

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 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 the TAN.

5.1 Flood Risk from the Sea

The proposed development is located within a TAN-15 Defended Zone for the Sea, with a standard protection of up to present day 1 in 200-year event provided.

When considering a site for allocation with the LDP, TAN-15 sets out the requirements for the form of development in any given flood zone. For 'New Development' on Greenfield land within a TAN-15 Defended Zone, Section 10.15 of TAN-15 states:

"As a general principle LDPs should seek to avoid intensification of uses in Defended Zones and replacement buildings or redevelopment schemes should be broadly the same scale as existing uses. Greenfield sites can provide important flood attenuation opportunities and have the ability to store a manage water in the event of flooding, they should not be built on unless they are replaced by suitable alternative sites which clearly contribute to flood management enhancement."

Section 10.16 of TAN-15 states:

"Before allocating land in Defended Zones, Local Planning Authorities will have undertaken a full flood risk assessment through an SFCA, and other additional studies, if necessary, to understand the probability and potential consequences of flooding in the area. They must understand the risk from all sources including rivers, sea surface and ground water. Based on this evidence Authorities should seek to prioritise redevelopment in areas of lower flood risk."

A detailed assessment of the Wentlooge model demonstrates that the proposed development site is at very low risk of tidal flooding, with the site predicted to be flood free in the defended scenario. Consequently, it could be considered that locating new development within the Defended Zone in this instance has negligible impact on the flood attenuation across the wider floodplain.

In the unlikely event of a breach of the Wentlooge coastal defences, the southern extent of the site is at risk of flooding during the 0.1% AEP plus climate change event. However, flood depths are predominantly below 600mm. A sequential approach to masterplanning

should be undertaken, building all highly vulnerable development initially in areas predicted to be flood free, and subsequently in areas within tolerable depths of acceptable flooding during the 0.1% AEP plus climate change breach scenarios, if required. Areas at flood risk may be suitable for water compatible uses such as areas of public open space.

Access and egress are key considerations within TAN-15. Flood-free access and egress is maintained via Green Meadows in all fluvial design events.

5.2 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.

Areas of the development site are located within Flood Zones 2 and 3 of the Flood Map for Planning - Flood Risk from Surface Water and Small Watercourses. These areas are associated with a drainage channel/reen that flows through the centre of the site, a surface water flow path and areas of ponding.

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 to ensure the following conditions are met:

- No increase in flooding elsewhere
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures agreed and in place
- Flood resistant and resilient design
- Acceptable consequences for type of use (see detailed guidance below):

A sequential approach to masterplanning and good site design can result in an avoidance of development in the flood zones. All highly vulnerable development should be built within areas of Flood Zone 1, with the existing drainage channel/reen retained as an open channel where possible, and the overland flow path retained. Opportunities to enhance the watercourse corridor should be considered through the provision of public open space and Blue Green infrastructure within this area of the site. Proposed site layouts should also consider access to the watercourse for management and maintenance, and it is therefore preferable that the watercourse corridor is retained within public areas. Any crossings to facilitate development are likely to require Land Drainage Consent under the Land Drainage Act 1991. Any application should be supported by hydraulic calculations which demonstrate sufficient capacity of any proposed crossings to manage flood flows.

It is considered that areas of surface water ponding can be adequately managed through the implementation of Sustainable Drainage Systems (SuDS).

Access and egress are key considerations within TAN-15. Access and egress are possible during the extreme event via the Green Meadows, leading to the western extent of Hendre

Road where flooding is shallow (<160mm) and viable for access for pedestrians and high-sided vehicles.

6 Summary and recommendations

The site is located within a TAN-15 Defended Zone of the FMfP for the Sea.

The site is also located within Flood Zones 2 and 3 of the FMfP for Surface Water and Small Watercourses, predominantly associated with an unnamed reen/drainage channel.

Consequently, any planning application will require a Flood Consequences Assessment (FCA) to comprehensively assess the flood risk from all sources. However, the extent and severity of flooding within the site is likely to be manageable by directing development away from the areas at risk and following the requirements of TAN-15.

It is therefore considered that this site is likely to satisfy the requirements of TAN-15, subject to the following recommendations:

- Any planning application for the site should be accompanied by an FCA which demonstrates how the proposals meet the requirements of TAN-15.
- A sequential approach to masterplanning may be required which locates the most vulnerable elements of development within Flood Zone 1.
- The existing reen/drainage channel and flow path should be retained on site. It is recommended that options are explored to enhance the existing watercourse corridor and overland flow routes by implementing Blue Green infrastructure and retaining the watercourse and overland flow route pathway in areas of public open space so that it can be accessed and maintained.
- Any watercourse crossings to facilitate access from west to east on the development site shall require Ordinary Watercourse Consent under the Land Drainage Act 1991. Any such application should be accompanied by a hydraulic assessment which demonstrates sufficient capacity of such crossing to convey flood flow.
- The surface water ponding on the site should be managed through the implementation of SuDS techniques in line with the Statutory Standards for SuDS in Wales.

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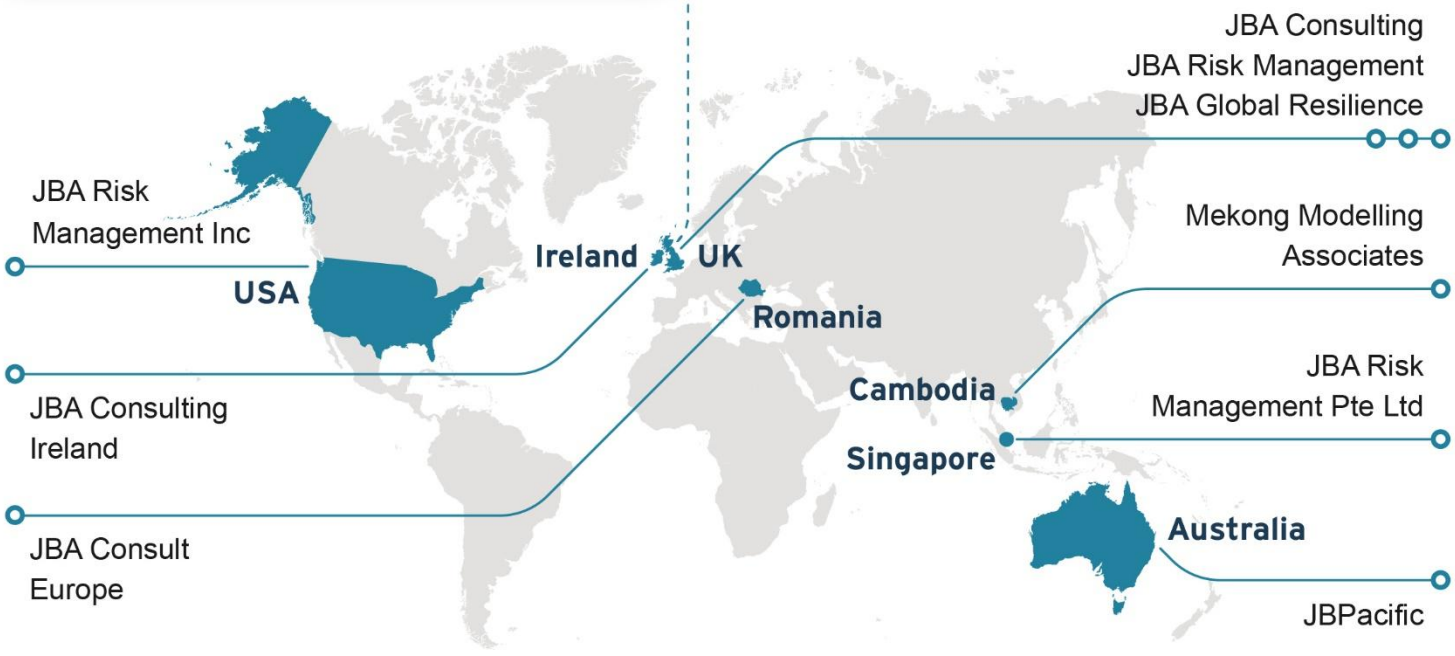

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