Ffordd y Mileniwm - Flood Consequences Assessment

Final

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Contract

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This report describes work commissioned by WEPCo Ltd, by an instruction dated 24th October 2023. The Client's representative for the contract was Anne McDonald of WEPCo Ltd. Hannah Booth of JBA Consulting carried out this work.

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1 Introduction

1.1 Terms of Reference

JBA Consulting (JBA) were commissioned by WEPCo Ltd to undertake a Flood Consequences Assessment (FCA) to support the development of the land to the north of Ffordd y Mileniwm, Barry. This FCA demonstrates the suitability of the proposed development and describes the flood mitigation measures recommended to manage flooding at the site.

1.2 FCA Requirements

This FCA follows Welsh Government guidance on development and flood risk set out in Technical Advice Note 15: Development and Flood Risk (TAN-15). Where appropriate, the following aspects of flood risk should be addressed in all planning applications over their expected lifetime:

- The likely mechanisms of flooding
- The likely source of flooding
- The depths of flooding through the site
- The speed of inundation of the site
- The rate of rise of flood water through the site
- Velocities of flood water across the site
- Overland flow routes
- The effect of access and egress and infrastructure, for example, public sewer outfalls, combined sewer outflows, surface water sewers and effluent discharge pipes from wastewater treatment work
- The impacts of the development in terms of flood risk on neighbouring properties and elsewhere on the floodplain

2 Site Description

2.1 Site Summary

The site is situated to the north of Ffordd y Mileniwm in Barry, as shown in Figure 2-1. The site is 1.05ha in size and is currently brownfield land. The site is bounded by Hood Road train station and railway line to the north, brownfield land and the railway line to the west, brownfield land and the Ffordd Y Mileniwm to the south and Hood Road to the east.

The site is accessed from Ffordd Y Mileniwm to the south and Hood Road to the east. Further information on the site is provided in Table 2-1.

Table 2-1 Site Summary

Site name	Barry Waterfront Campus
Site area	1.05ha
Existing land use	Brownfield land
Purpose of development	College Campus
OS NGR	ST 11111 67377
Local Planning Authorities	Vale of Glamorgan Council
Lead Local Flood Authority	Vale of Glamorgan Council

Figure 2-1 Site location

2.2 Site topography

A topographic survey was undertaken by Technics Geospatial Consultant Surveyors in June to August 2023 and is provided in Appendix A. The Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data has been used as an alternative illustration of the site topography, as shown in Figure 2-2.

The topographic survey shows that the site generally slopes in a north westerly direction. The highest area of the site is in the southern part of the site and is 9.65mAOD with ground levels generally falling in a north westerly direction towards the western area of the site where ground levels are lowest at 8.06mAOD.

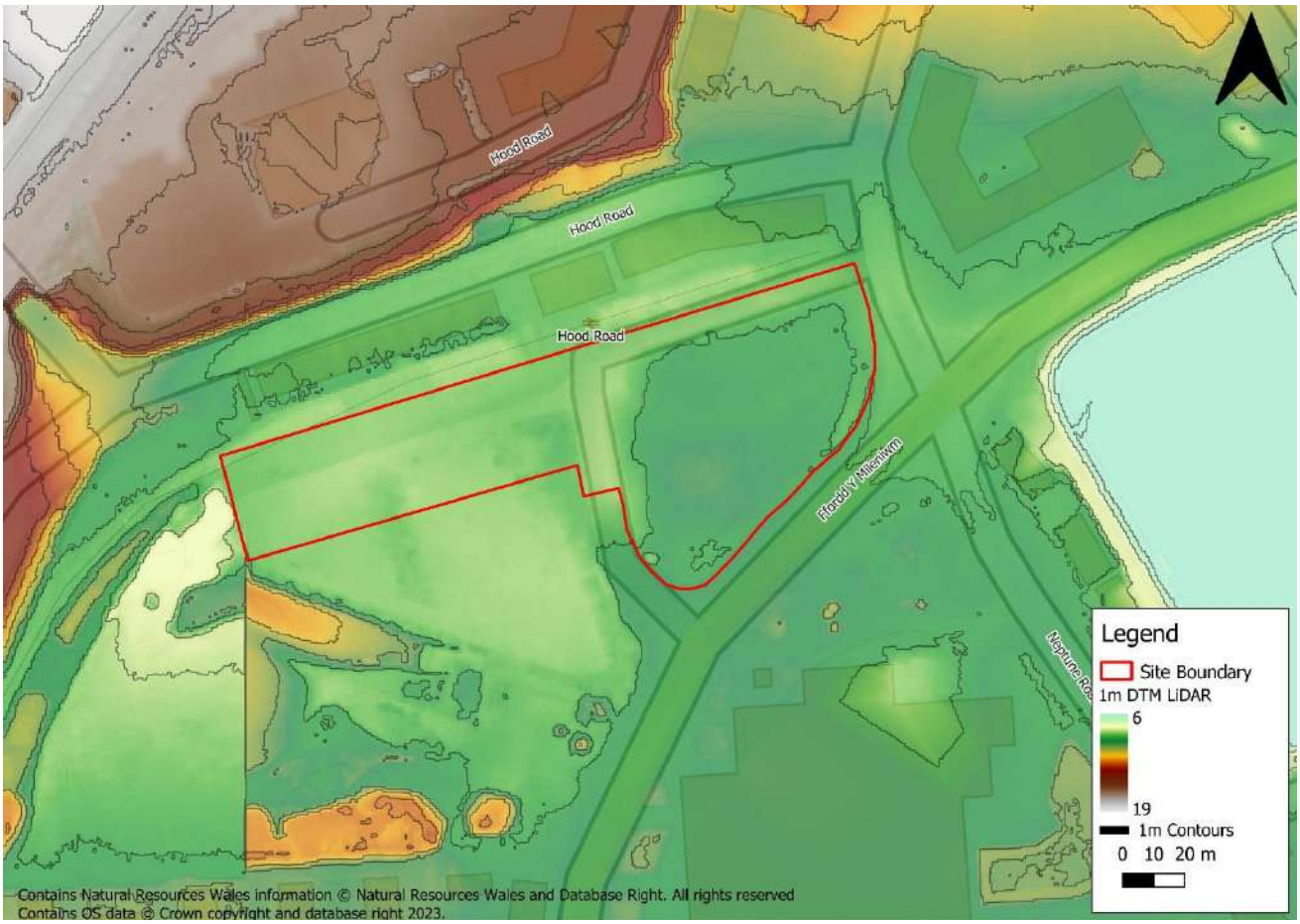

Figure 2-2 1m LiDAR Topography

2.3 Soils and geology

The geology of the site has been assessed using the BGS Geology of Britain Viewer[1]. The bedrock geology is shown to be mudstone and limestone from the Penarth Group. Superficial deposits are comprised of clay, silt and sand forming tidal flat deposits. The south of the site is underlain by tidal flat deposits comprised of clay and silt.

1 https://www.bgs.ac.uk/map-viewers/geoindex-onshore/

The soils on the site have been assessed using the Cranfield University Soilscapes Viewer[2] and are predominantly shown to be freely draining, slightly acid but base rich soils.

2.4 Watercourses & flood defences

Figure 2-3 shows the locations of nearby waterbodies and watercourses. The site is located 60m west of the Barry Docks. The nearest NRW Main River is the Cadoxton River which flows in a southerly direction 1.9km east of the proposed development site.

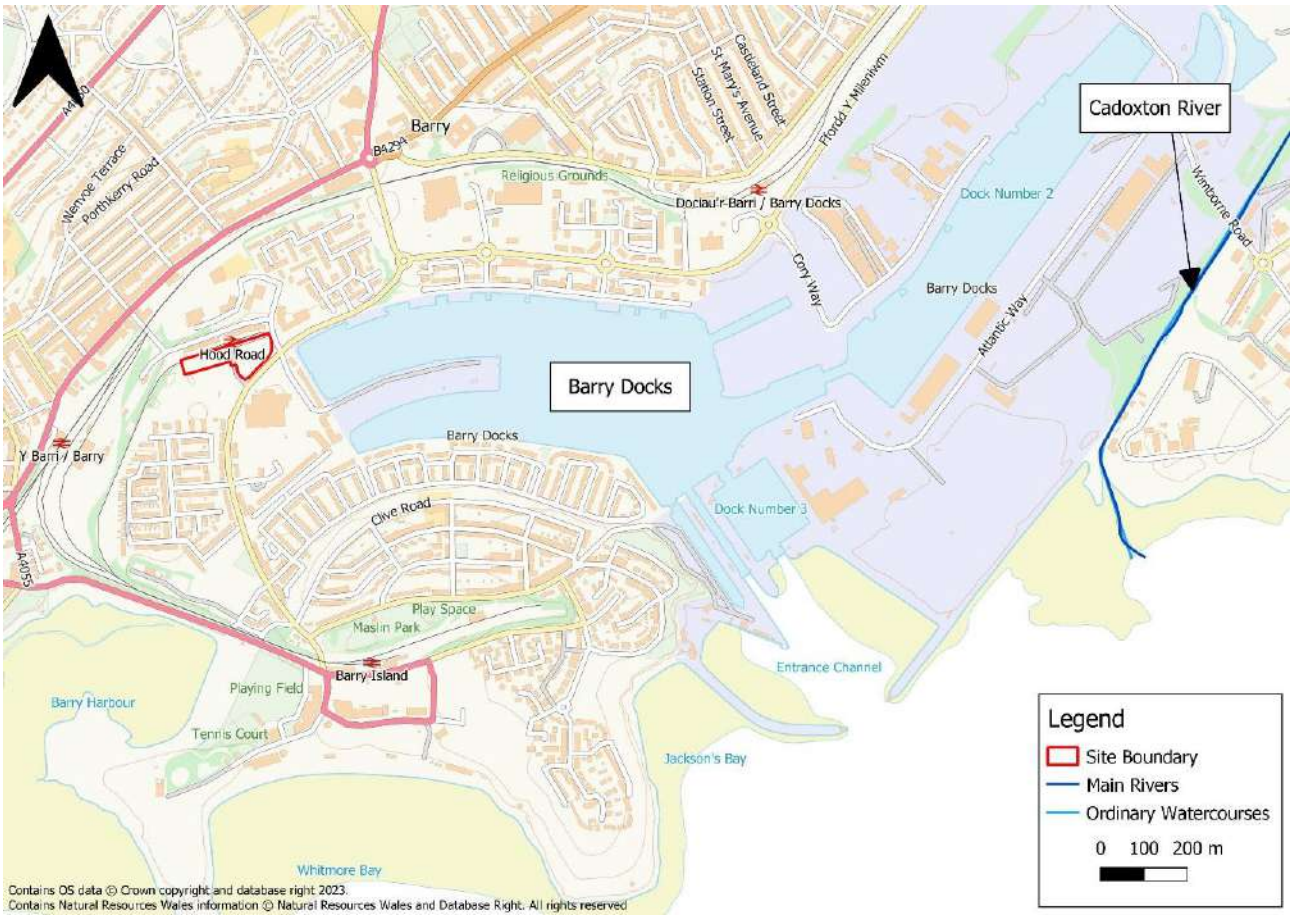

Figure 2-3 Watercourses

2.5 Proposed development

The development proposals for the site comprise the construction of a new college campus known as the Barry Waterfront Campus. The site comprises a new college building in the east, car parking and a multi-use games are in the west, bicycle parking along the northern boundary, and landscaping incorporated across the site. A plan of the proposed development site is shown in Figure 2-4 and Appendix B

2 https://www.landis.org.uk/soilscapes/

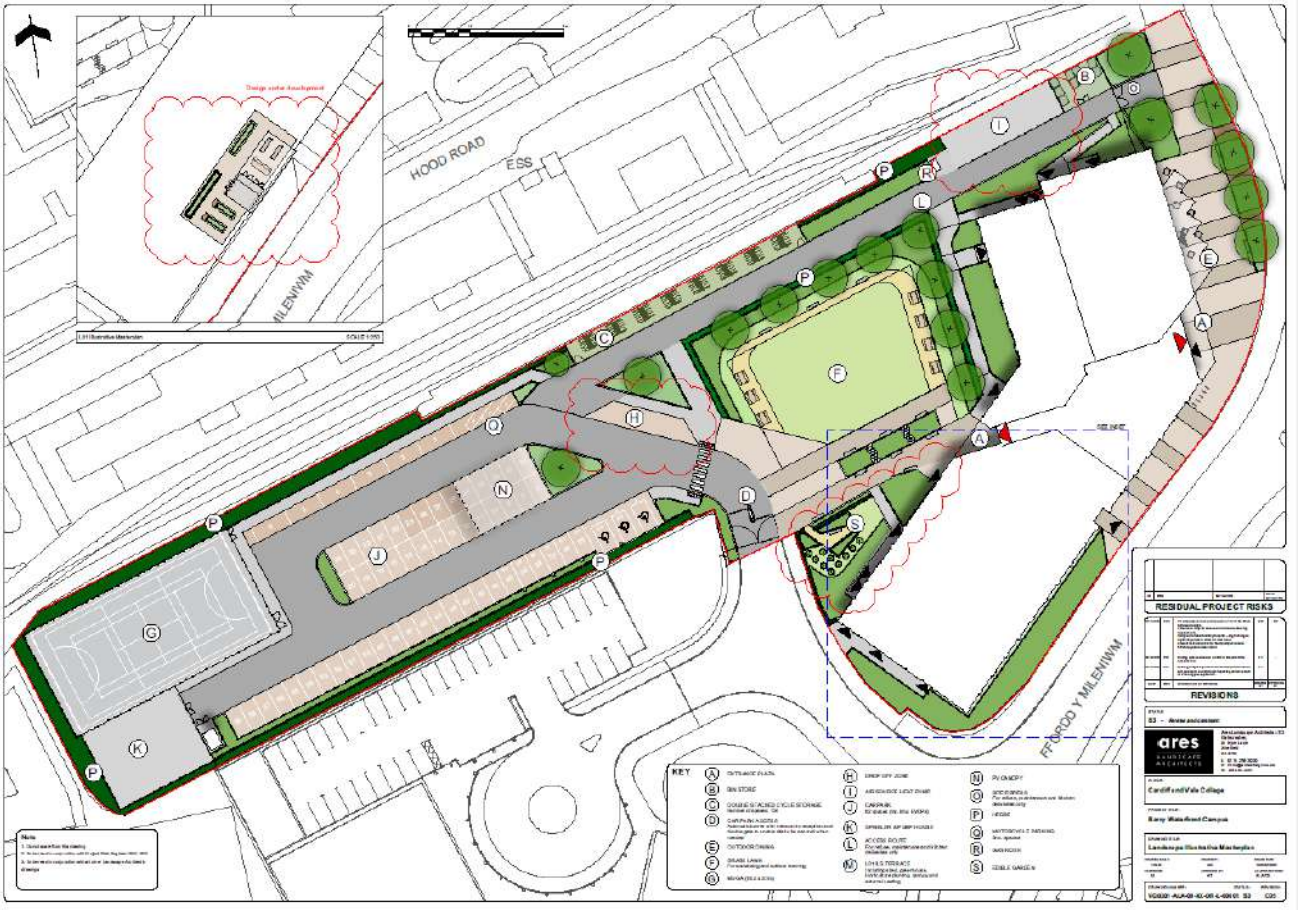

Figure 2-4 Proposed Development Plan

3 Planning Policy and Flood Risk

3.1 Planning Context

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. These policies have the aim that all development in Wales is sustainable and improve the social, economic, environmental, and cultural wellbeing of Wales as set out in the Wellbeing of Future Generations Act 2015.

Technical Advice Note 15 (TAN-15), introduced by the Welsh Government in 2004, provides technical guidance relating to development planning and flood risk in Wales. The initial requirements of TAN-15 are to identify the vulnerability classification(s) and flood zones relevant to the proposed development, and to apply this information to the application of the justification tests.

An update for TAN-15 was released in October 2021 and was due to come into force on the 1st December 2021. However, Welsh Government subsequently suspended the implementation of the new TAN-15, and it is now not expected to be implemented until early 2024. Although the new TAN-15 is not a material consideration, Welsh Government and NRW advise that some consideration is given to the draft Flood Map for Planning (FMfP) as best available information. Therefore, where a site is located in a FMfP flood risk zone it is recommended that an FCA is carried out.

As a result of the above, both the DAM and the FMfP are considered as part of this FCA, although only the policies of the current TAN-15 has been applied to assessment.

3.2 Vulnerability Classification

TAN-15 assigns one of three flood risk vulnerability classifications to a development, as shown in Table 3-1. The proposed development is for a college. Consequently, the development is classified as **'highly vulnerable**'.

Table 3-1 Development Categories Defined by TAN-15

Development category	Types
Emergency services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood.
Highly vulnerable development	All residential premises (including hotels and caravan parks), **public buildings, (e.g., schools, libraries, leisure centres)**, especially vulnerable industrial development and waste disposal sites.
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

3.3 Lifetime of development

The Welsh Government latest technical guidance[3] for climate change states:

When considering new development proposals, Technical Advice Note 15: Development, Flooding and Coastal Erosion (TAN15) states that it is necessary to take account of the potential impact of climate change over the lifetime of development. A rule of thumb is that residential development has a lifetime of 100 years while a lifetime of 75 years is assumed for all other developments.

As the proposals are for non-residential use, a 75-year lifetime of development has been considered in this assessment.

3.4 Development Advice Map Classification

The Development Advice Map (DAM) is used to trigger different planning actions based on a precautionary assessment of fluvial and tidal flood risk. Figure 3-1 shows that the site is predominantly located within Zone B with the rest of the site located in Zone A.

Zone B is not a flood zone as such, but is based on the British Geological Survey (BGS) sedimentary deposits drift data. Zone B of the DAM is used as part of a precautionary approach to indicate where site levels should be checked against the extreme 0.1% Annual Exceedance Probability (AEP) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further. DAM Zone A is defined as an area ‘considered to be at little or no risk of fluvial or tidal/coastal flooding’.

3 Flood Consequences Assessments: Climate change allowances. Welsh Government, Sept. 2021

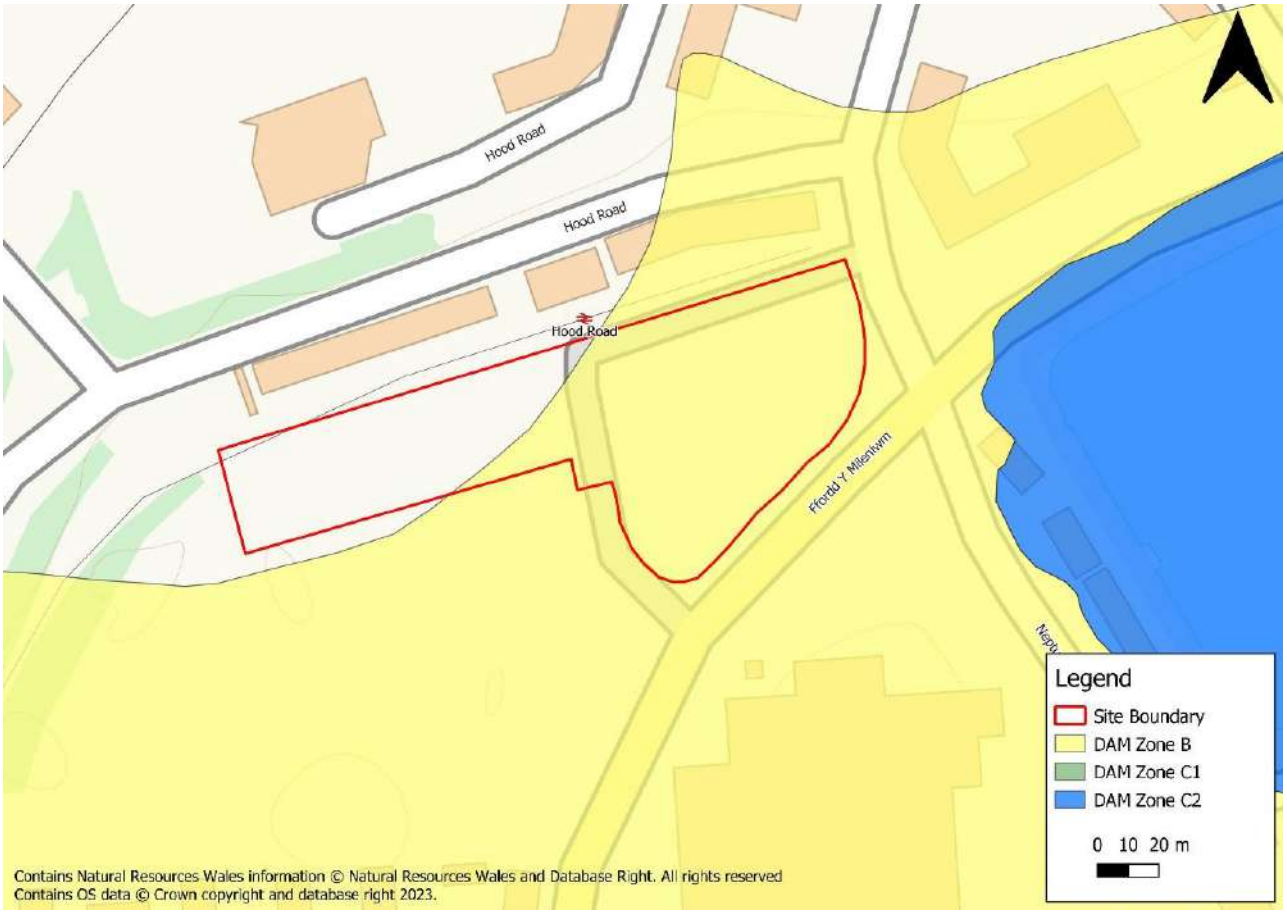

Figure 3-1 DAM classification

3.5 Flood Map for Planning Classification

3.5.1 Flood Map for Planning - Rivers

The proposed development site is located in Flood Zone 1 of the Flood Map for Planning for Rivers (shown as transparent on the map) and has therefore not been presented graphically. Flood Zone 1 indicates that there is a less than 0.1% AEP chance of flooding from fluvial sources in any given year, including climate change.

3.5.2 Flood Map for Planning - Sea

As shown in Figure 3-2, the proposed development site is mostly located in Flood Zone 1 of the Flood Map for Planning for the Sea. This means there is less than a 0.1% AEP chance of tidal flooding in any given year, including climate change. A small area in the north, eastern and centre of the site is located in Flood Zone 2 (between a 0.5% and 0.1% AEP chance of flooding from the sea in any given year, including climate change).

It should be noted that the climate change allowances represented within the FMfP is based on a lifetime of development of 100 years, whereas the proposed development has a lifetime of 75 years.

Therefore, the results from detailed modelling are discussed in Section 5 and are considered more appropriate to the detailed assessment of flood risk at a site-specific level.

Figure 3-2 Flood Map for Planning - Flood Risk from the Sea

4 Flood Risk Assessment

This section assesses the risk to the site from all sources of flooding, the risk of increased flooding to others, and how flood risk can be managed. Information is taken from publicly available data sources.

4.1 Review of Existing Flood Risk Data

The latest available information on flood risk at the site, published by NRW, is summarised in Table 4-1 below.

Table 4-1 Flood Risk Summary

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	✗	The site is at a very low risk of fluvial flooding (Section 4.3).
Flood Risk from the Sea	✗	The site is at very low risk of tidal flooding (Section 4.4).
Flood Risk from Surface Water and Small Watercourses	✓	The site is at a low to high risk of flooding from surface water and small watercourses (Section 4.5).
Flood Risk from Groundwater	✗	The site is at a medium risk of flooding from groundwater (Section 4.6)
Flood Risk from Reservoirs	✗	The site is at a very low risk of flooding from reservoirs (Section 4.7).
Flood Risk from Sewers	✗	The site is at a low risk of flooding from sewers (Section 4.8).

4.2 Historical Flooding

NRW's map of recorded flood extents does not show any evidence of historical flooding on the site. No other historical flooding records were identified at the site within the Vale of Glamorgan Council Preliminary Flood Risk Assessment (PFRA)[4]. The Local Flood Risk Management Strategy (LFRMS)[5] notes flooding occurred in Barry in 2007 however it is unknown if flooding occurred at the proposed development site.

4.3 Flood Risk from Rivers

The site is at **very low risk** of flooding from rivers, according to NRW's Flood Risk Assessment Wales (FRAW) Flood Risk from Rivers map. This means there is less than a

4 https://www.valeofglamorgan.gov.uk/Documents/Living/Highways%20&%20infrastructure/PFRA-08-June-2011.pdf

5 https://www.valeofglamorgan.gov.uk/Documents/Living/Environment/Flood-and-coastal-erosion-risk/VoGC-LFRMS.pdf

0.1% AEP chance of fluvial flooding in any given year. This area is shown as transparent on the map and has therefore not been shown graphically.

4.4 Flood Risk from the Sea

The site largely has a **very low risk** of flooding from the Sea according to NRW's FRAW Flood Risk from the Sea map shown in Figure 4-1. This means there is less than a 0.1% AEP chance of flooding from this source in any given year. However, this analysis ignores the influence of climate change induced sea level rise.

To better understand the risk of flooding posed by tidal flooding and the implications of climate change on the flood risk to the proposed development, further assessment using detailed flood modelling data was undertaken and is discussed below in Section 4.4.1.

Figure 4-1 Flood Risk Assessment Wales - Flood Risk from Sea

4.4.1 Barry Port Tidal Modelling

The site falls within the extents of the NRW Cadoxton Tidal Inundation model. JBA Consulting undertook a comprehensive update of this model in both 2017 and 2020. Following the 2020 update, the model was submitted to NRW to inform a Flood Map Challenge of the area. This challenge was accepted by NRW.

Following the successful Flood Map Challenge, and prior to an update of the flood maps, NRW acquired new LiDAR data for the Barry Docks area. This LiDAR, dated November 2020 and March 2022, better reflects the recent and significant ground level changes which have occurred within the Barry Docks area. As such, prior to updating the flood maps in 2023, NRW undertook a series of minor updates to the accepted JBA model.

The updates undertaken are:

- The latest LiDAR has been used to capture the recent and significant ground level changes in the area.
- The code extent of the model was extended to avoid glass-walling.
- The tidal boundary was updated to tie in the changes made to the code extent.
- Sweetener flows applied to the watercourse were updated.

As stated in Section 3.3, Welsh Government latest technical guidance for climate change states "A rule of thumb is that residential development has a lifetime of 100 years while a lifetime of 75 years is assumed for all other developments".

For all coastal locations, future sea level rise is a major consideration and should be applied to the extreme sea level estimates. The UKCP18 User Interface[6] has therefore been used in accordance with Welsh Government Guidance on Climate Change Allowances for Planning Purposes (September 2021)[3] to provide climate change uplifts for the study area. The model has been rerun for the 0.1% AEP 2098 event to simulate the impact of climate change. The site is shown to be flood free in the 2123 0.5% AEP flood event and therefore the model has not been rerun for the lesser 2097 0.5% AEP flood event. The flood modelling technical note is contained in full in Appendix C.

4.4.2 0.1% AEP event plus climate change

In the modelled 2098 0.1% AEP event, the site is shown to be flood free as shown in Figure 4-2. It is therefore concluded that there is a **very low risk** of tidal flooding.

6 UK Climate Projections User Interface. https://ukclimateprojections-ui.metoffice.gov.uk/ui/home

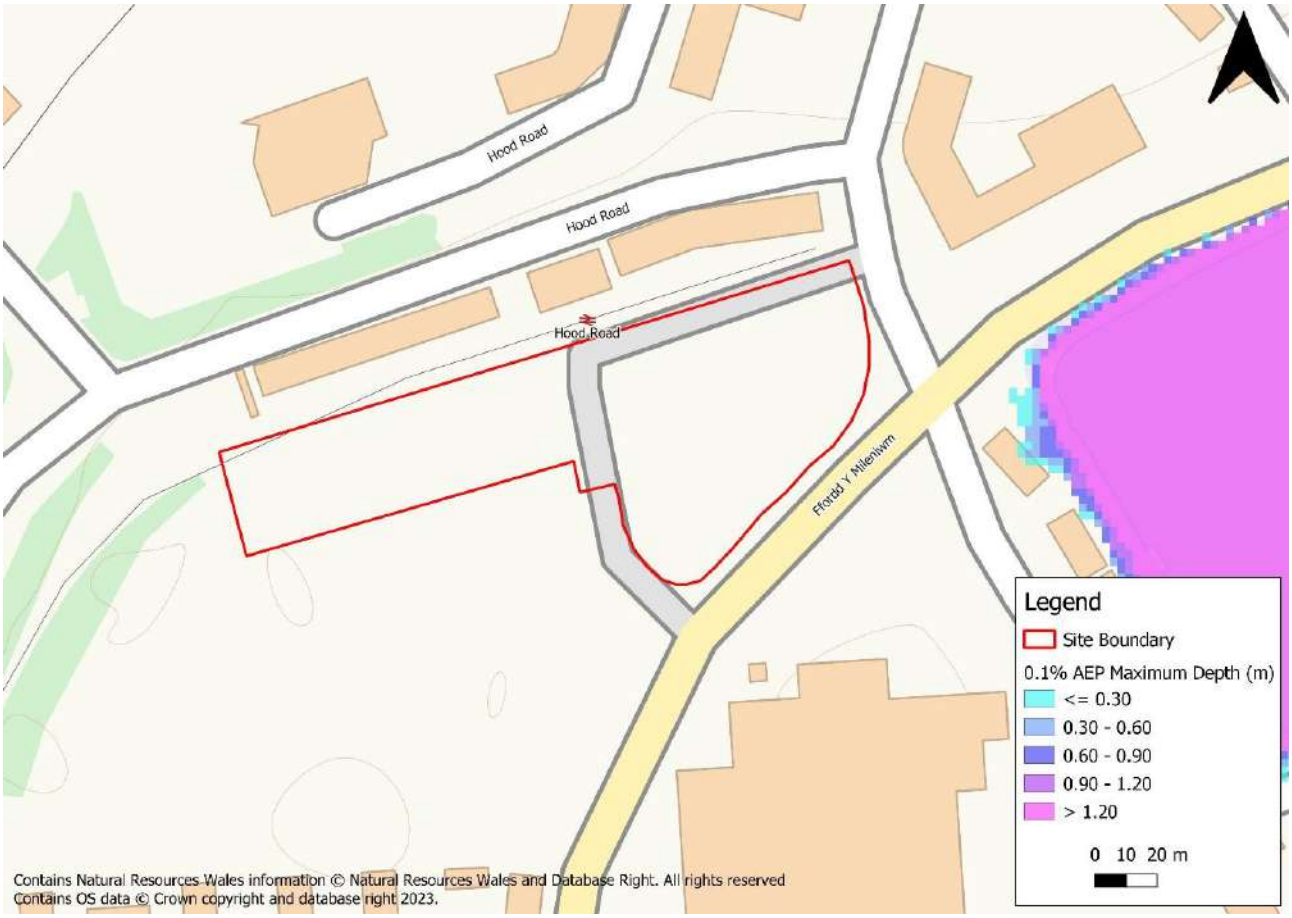

Figure 4-2 0.1% AEP plus climate change maximum depth

4.5 Flood Risk from Surface Water and Small Watercourses

The NRW FRAW flood risk from Surface Water and Small Watercourses mapping shows that the east of the proposed development site is at **very low risk** of flooding from these sources, as shown in Figure 4-3. This means that there is a less than 1 in 1000 (<0.1% AEP) chance of flooding in any given year.

The western part of the site and the access road running through the site is at **Low to High risk** of Surface Water and Small Watercourse flooding. Low risk of flooding indicates areas with a chance of flooding between an 0.1% AEP (1 in 1000) and 1% AEP (1 in 100) and high risk indicates areas which have a chance of flooding of greater than 3.3% AEP. Flooding on the site should be mitigated during the design stage of the proposed development works.

Further guidance from the Vale of Glamorgan on the management of surface water flood risk has been requested by the developer prior to undertaking a more detailed assessment of the risks of surface water flooding. After which the risk of surface water flooding will be managed through careful site and drainage design, to be undertaken by others.

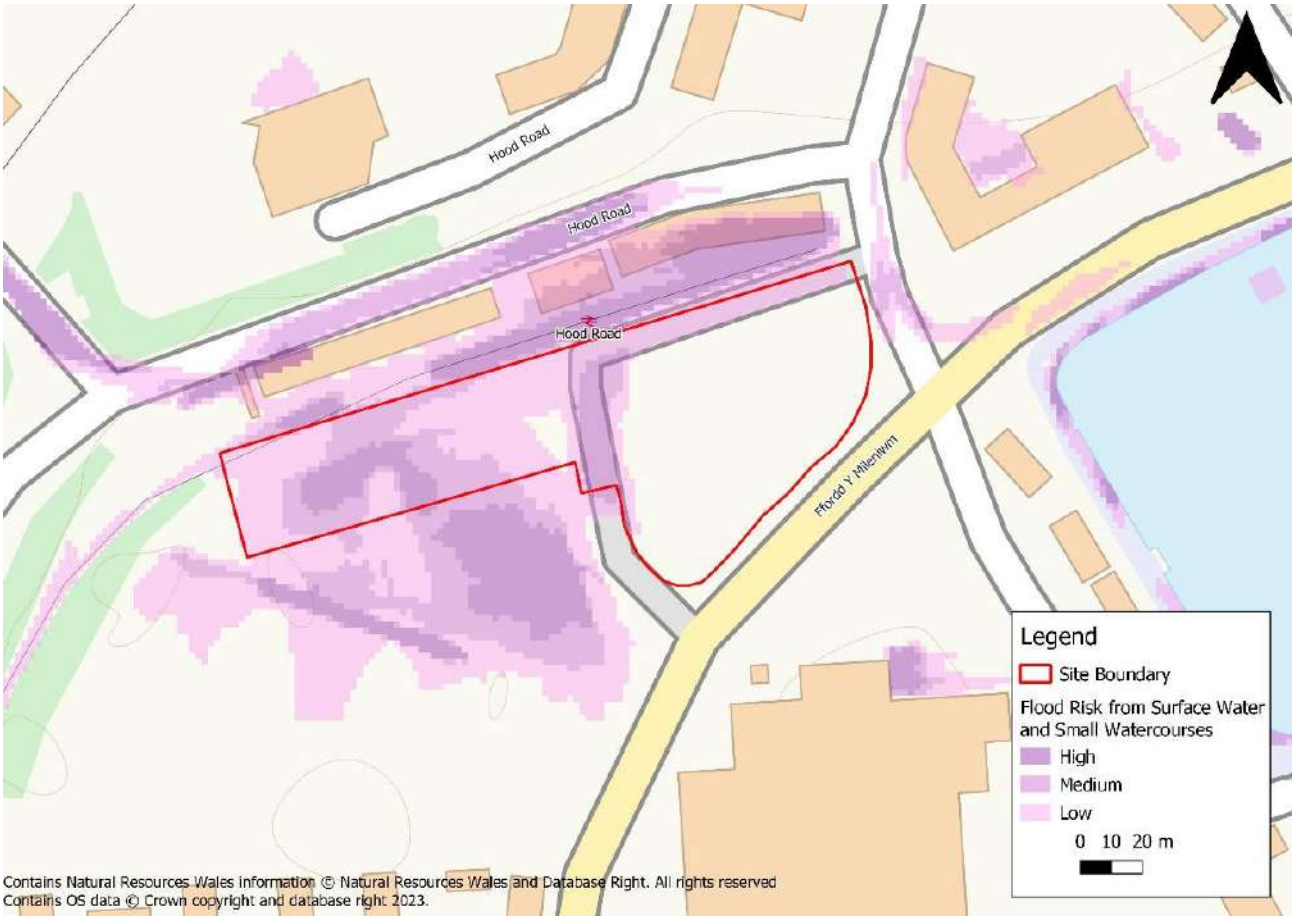

Figure 4-3 FRAW - Risk of flooding from Surface Water and Small Watercourses

4.6 Flood Risk from Groundwater

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerges at the ground surface or within manmade structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in damage to property. This risk of groundwater flooding depends on the nature of the geological strata underlying the site and the local topography.

The Vale of Glamorgan Council Local Flood Risk Management Strategy (LFRMS)[7] shows that the site is located in a 1km area which has a >50% to <75% susceptibility to groundwater flooding. The LFRMS further states that groundwater flooding has previously occurred in flood events in Barry however the specific location of flooding is unknown. Therefore, it is concluded there is a **medium risk** of flooding to the site.

7 Vale of Glamorgan County Council (2013) Local Flood Risk Management Plan. Retrieved from- https://www.valeofglamorgan.gov.uk/en/living/Flooding/Flood-and-Coastal-Erosion/Local-Flood-Risk-Management-Strategy.aspx

4.7 Flood Risk from Reservoirs

The NRW FRAW Flood Risk from Reservoirs map illustrates that the proposed development site is at **very low risk** of reservoir flooding, shown as a transparent layer on the FRAW mapping and therefore not presented graphically below.

4.8 Flood Risk from Sewers

The Vale of Glamorgan Council LFRMS[7] does not identified flood risk at or near the site. Therefore, it is concluded that there is a **low risk** of sewer flooding.

5 Assessment of Acceptability Criteria

Table 5-1 details the acceptability criteria required by TAN15 and the site's compliance in against these criteria.

Table 5-1 Acceptability Criteria

TAN-15 Justification Criteria	Comments	Achieved?
Developer is required to demonstrate that the site is designed to be flood free for the lifetime [Ref: TAN-15 A1.5] of development for a 1 in 100 (1%) chance (fluvial) or a 1 in 200 (0.5%) chance (tidal) flood event including an allowance for climate change in accordance with TAN-15 table A1.14.	The site is predicted to be flood free during the 0.5% AEP events for the lifetime of the development, up to 2098.	✓
The development should be designed so that in an extreme (1 in 1000) event there would be less than 600mm of water on access roads and within the property.	The site is predicted to be flood free during the 0.1% AEP events for the lifetime of the development, up to 2098.	✓
No flooding elsewhere.	The site does not flood up to the 2098 event and therefore cannot have an impact on flooding to other areas.	✓
Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a 1 in 1000 chance of occurring in any given year).	The site is not protected by the presence of flood defences.	✓
The developer must ensure that future occupiers of development are aware of the flooding risks and consequences.	Upon sale or transfer of the land to new occupiers, the developer should inform occupiers of flood risk to the site.	✓

TAN-15 Justification Criteria	Comments	Achieved?
Effective flood warnings are provided at the site.	Not Applicable. The site is not at risk of tidal or fluvial flooding, and therefore outside of established flood warning area.	✓
Escape/evacuation routes are shown by the developer to be operational under all conditions.	The evacuation routes are expected to be flood free during 0.1% AEP plus climate change event for the lifetime of the development.	✓
The development is designed by the developer to allow the occupier of the facility for rapid movement of goods/possessions to areas away from flood waters.	Not Applicable. The site is not at risk of tidal or fluvial flooding for the lifetime of the development, up to 2098.	✓
Development is designed to minimise structural damage during a flood event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of a flood.	Not Applicable. The site is not at risk of tidal or fluvial flooding for the lifetime of the development, up to 2098.	✓

6 Conclusions

JBA Consulting (JBA) were commissioned by WEPCo Ltd to undertake a Flood Consequences Assessment (FCA) to support the development of a new college on the land to the north of Ffordd y Mileniwm, Barry.

The educational development proposals are classified as ‘highly vulnerable’ development.

The site is located within Zone A and Zone B of the Development Advice Map (DAM).

The proposed development site is mostly located in Flood Zone 1 of the Flood Map for Planning for the Sea. A small area of the site is located in Flood Zone 2.

NRW’s Flood Risk Assessment Wales maps shows the site has a very low risk of fluvial and reservoir flooding. The site has a low risk of sewer flooding a medium risk of groundwater flooding.

The site is at low to high risk of surface water flooding. This will be managed through careful site and drainage design, to be undertaken by others.

Updated detailed tidal modelling undertaken by JBA Consulting in October 2023 shows that the proposed development is predicted to be flood free up to the extreme 0.1% AEP plus climate change event, allowing for a 75 year lifetime of development (2098).

This FCA has demonstrated that all acceptability criteria set out in TAN15 have been satisfied. Consequently, we conclude on the grounds of flood risk, the proposed development meets the principles and requirements set out in TAN15 and the aims of Planning Policy Wales.

A Topographic Survey