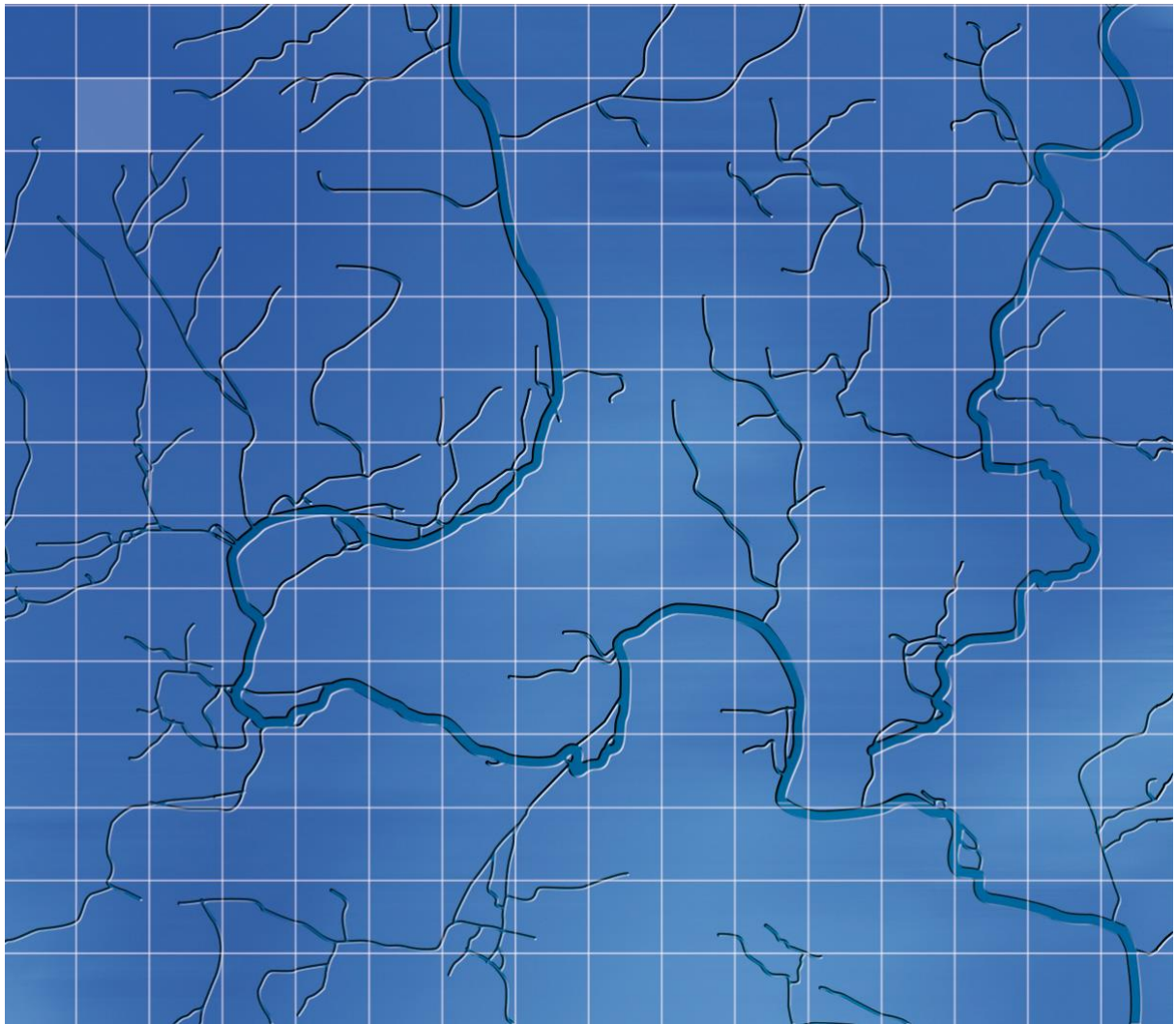


Merthyr Tydfil County Borough Council

June 2024

Afon Taff Secondary School FCA



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Afon Taff Secondary School FCA

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For and on behalf of Wallingford HydroSolutions Ltd.

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Registered Office Stables 4, Howbery Business Park, Wallingford, OX10 8BA
www.hydrosolutions.co.uk

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1 Introduction

1.1 Background

Wallingford HydroSolutions Ltd has been commissioned by Merthyr Tydfil County Borough Council to carry out a Flood Consequence Assessment (FCA) in accordance with Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15). This is required to support the proposed upgrade for an outdoor football field to an outdoor 3G football field, complete with two small team shelters. It is located within the grounds of the Afon Taff Secondary School, Yew Street, Troed-y-Rhiw (E:307252 N:201779).

Natural Resources Wales (NRW) online Development Advice Map (DAM) indicates that the site currently lies entirely within Flood Zone C2, an area at risk of flooding from the 0.1% AEP flood event without significant flood defences. It is indicated by NRW mapping that fluvial flooding from the river Taff is the dominant risk to the site. This FCA seeks to demonstrate that the risk of flooding can be managed to an acceptable level.

1.2 Scope

This FCA will identify all sources of flood risk to the site and outline evacuation response and mitigation measures to reduce risk to the development and ensure that it can remain safe for its lifetime. This FCA will demonstrate that the flood risk to the site can be appropriately managed in line with Technical Advice Note 15 (TAN 15) guidance to secure approval from NRW. It also includes recommendation for the most appropriate mitigation options to reduce flood risk on site.

In summary this FCA will:

- Provide a comprehensive review of all publicly available flood risk data assessing the risk to the development site.
- Quantify the flood risk associated with the existing development through presenting the results of the existing hydraulic modelling study.
- Where applicable, present mitigation options to reduce flood risk on site.
- Ensure that development will not increase risk elsewhere.
- Review access/egress route.

1.3 Data Sources

- Site red line boundary provided by the client¹
- Hydraulic model data obtained from NRW to quantify fluvial flood risk from the Afon Taff at the Merthyr Vale Colliery Site.
- NRW Surface Water Flood Mapping².
- British Geological Survey³ (BGS) Geology of Britain viewer and Landis Soils Map⁴ – to quantify groundwater flood risk to the site.

¹ Merthyr Tydfil County Borough Council. 2023. Afton Taf Pre-App Location 2. Document titled: Afon Taf Pre-App Location 2 Boundary.pdf

² Natural Resources Wales. Flood and Coastal Erosion Risk Maps. Available at: flood-risk-maps.naturalresources.wales/?locale=en Accessed [22/05/2024]

³ BGS. Geology of Britain viewer. Available at: mapapps.bgs.ac.uk/geologyofbritain/home.html [Accessed: 22/05/2024]

⁴ Cranfield Soil and Agrifood Institute (2020) Soils Map, Available at: www.landis.org.uk/soilsmap [Accessed: 22/05/2024]

- Planning Policy Wales⁵ and Technical Advice Note 15⁶
- 1m LiDAR data, flown in 2021⁷

2 The Site

2.1 Location

The site is located to the south of Troed-y-Rhiw, and is within the grounds of Afon Taff Secondary School, shown below in Figure 1. The site is located approximately 40m to the east of the River Taff. The structures added as part of the redevelopment are described in section 2.3.



Figure 1 - Site Location

⁵ Planning Policy Wales Edition 10. Welsh Government. December 2018.

⁶ Technical Advice Note 15. Development and Flood Risk. Welsh Assembly Government. July 2004.

⁷ LiDAR data. Data Map Wales. Available at: datamap.gov.wales/maps/lidar-viewer [Accessed: 13/05/2024]

2.2 Topography

Figure 2 illustrates the ground levels in the area surrounding the site. The site lies at the bottom of a river valley, and due to this; is flat, with ground levels within the red line boundary ranging from 134.26m to 134.70m, with the site sloping marginally to the south east.

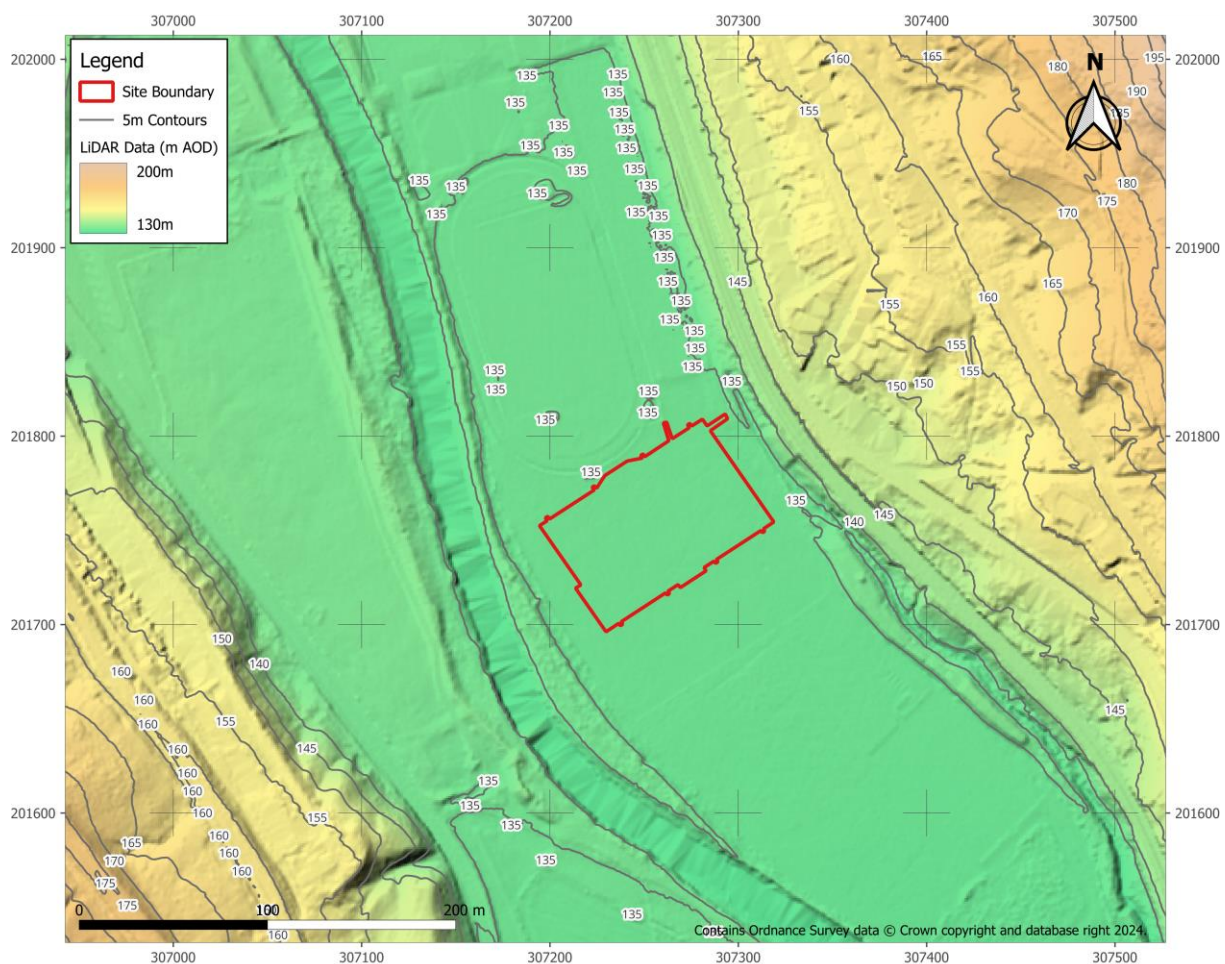


Figure 2 - Site Topography

2.3 Proposed Development

Figure 3 shows the additional structures constructed as a part of the redevelopment. The additional buildings cover an approximate area of 29m², out of the total site boundary of 7129m². This development will also include the construction of pathways and access roads located to the north of the development, which total approximately 460m² in area. The construction involves primarily a 3G football pitch, associated lighting and team shelters.



Figure 3 – Proposed Development

3 Sources of Flood Risk

3.1 Development Advice Map

To assess the risk of fluvial flooding at the site, the NRW Development Advice Map (DAM) has been reviewed. The Development Advice Map shows areas at risk of flooding for the purposes of land-use planning. The DAM should be used alongside Planning Policy Wales and Technical Advice Note (TAN) 15 to guide new development away from areas at risk of flooding wherever possible. Figure 4 shows the DAM in the location of the site and indicates that the site lies entirely within zone C2, defined as an area at risk during a 0.1% AEP flood event which is not served by significant flood defences. It is noted that the River Taff adjacent to the development is protected by an embankment, however it is insufficient to protect the area from fluvial flooding for the 0.1% AEP event.

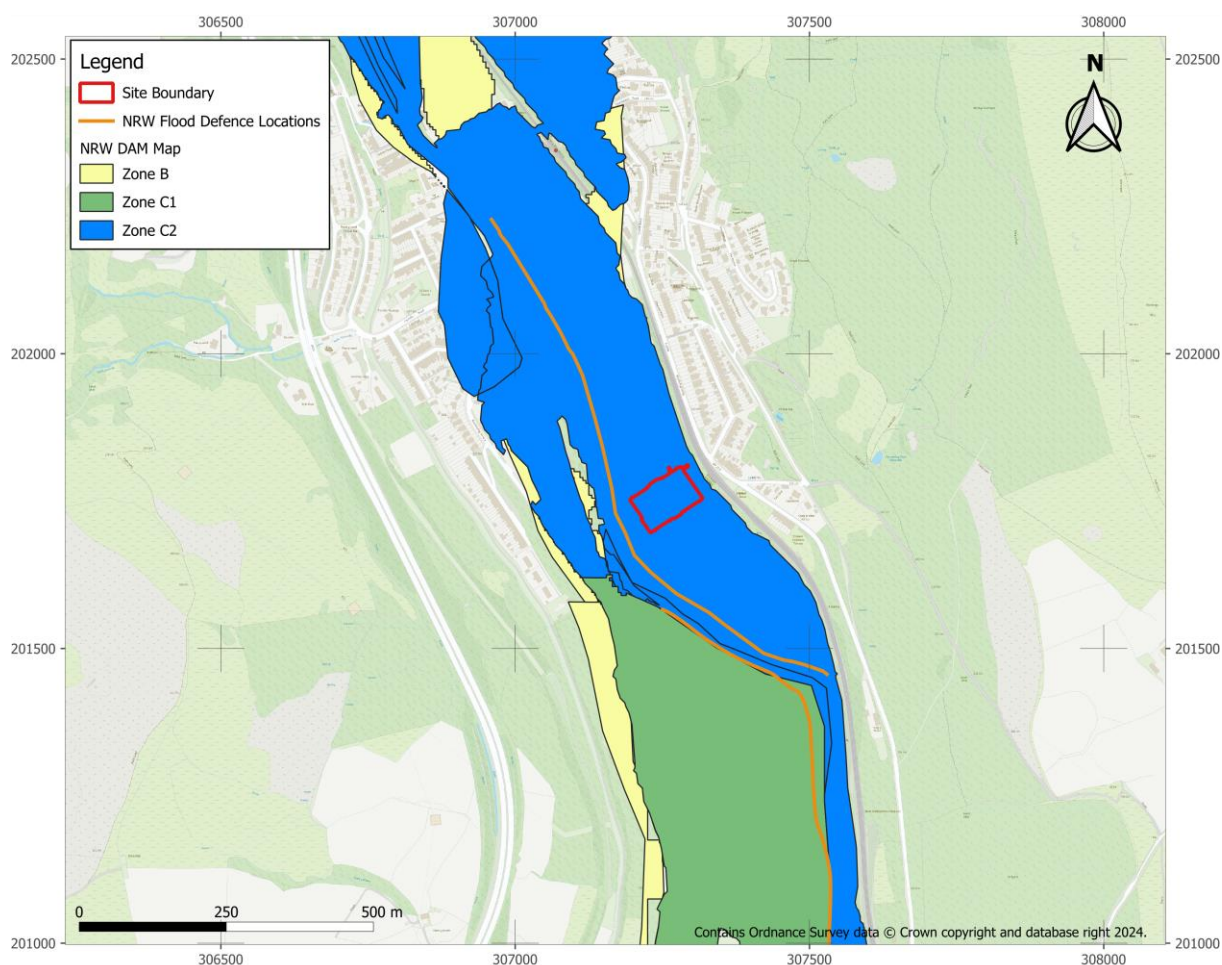


Figure 4 - Development Advice Map

3.2 Hydraulic Modelling at Merthyr Vale Colliery Site (2017)

The Merthyr Vale Colliery Site study was provided following a data request to Natural Resources Wales (NRW). The model was developed in 2017 to support a development in the area.

The model is a 1D/2D combined model which utilises flood modeller and TuFLOW software. The provided product 6 outputs include defended, undefended and blockage runs. The model estimates key parameters for various fluvial event return periods – which include likely flood depths and velocities and hazard ratings, as per the UK hazard formula. Defended scenario flood depths for the 1.0%, 1.0%+CC and 0.1% AEP events are pertinent to this analysis, all of which were received from NRW.

3.2.1 1.0% AEP Flood Event (defended scenario)

The maximum flood depths for the 1.0% AEP defended scenario can be seen in Figure 5, the entire site is inundated, with a maximum depth of 0.15m and an average depth of 0.07m. The average height of flooding is 134.47m AOD and the maximum height is 134.67m AOD.

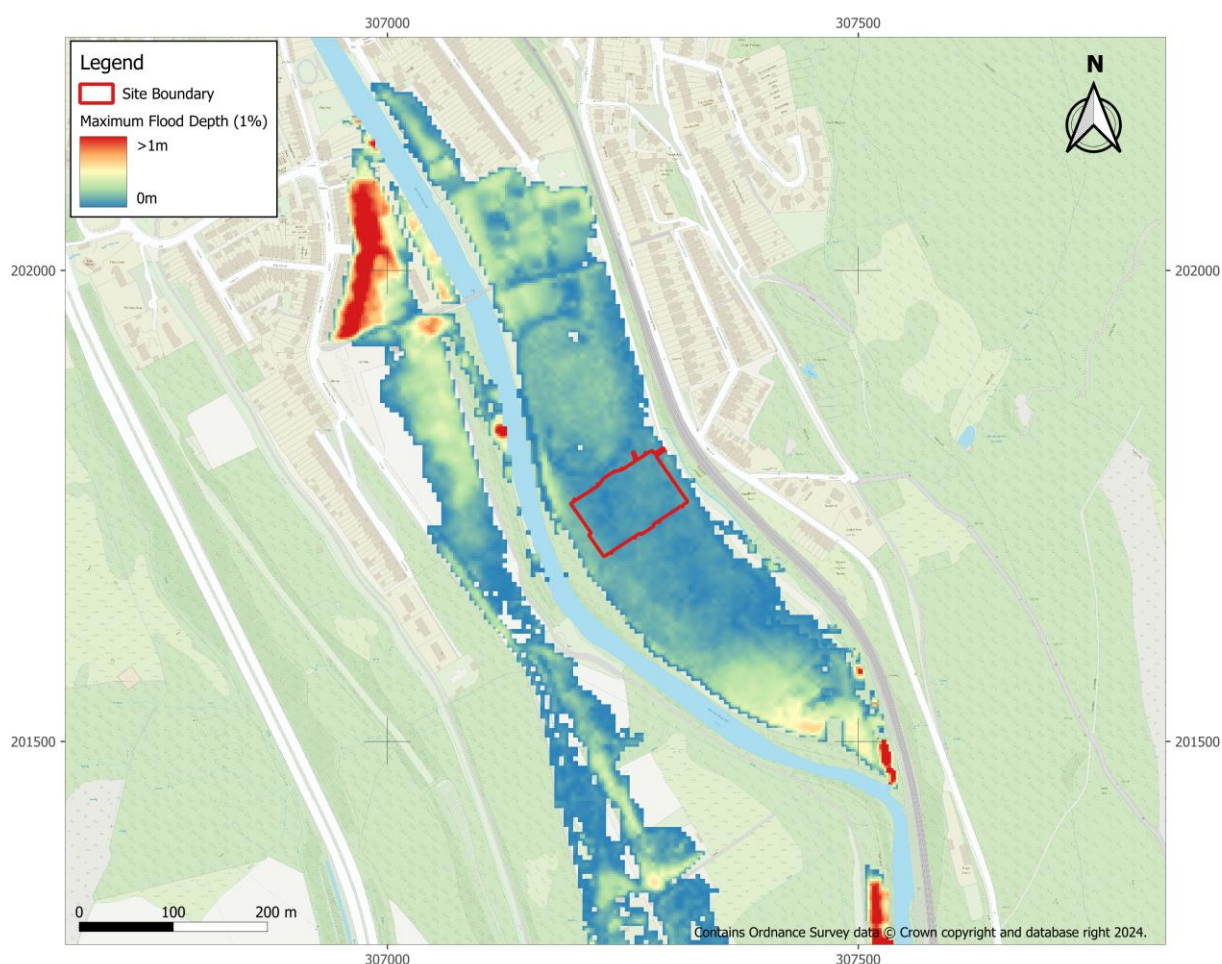


Figure 5 – 1.0% AEP Flood Model Max Depths (Defended). Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

3.2.2 1.0% AEP + CC Flood Event (defended scenario)

The maximum flood depths for the 1.0% + 25% climate change scenario are displayed in Figure 6 below. These results show that the site is entirely inundated, the maximum flood depth within the site is 0.18m and the average flood depth is 0.09m. The average height of flooding is 134.49m AOD and the maximum height of flooding is 134.68m AOD.



Figure 6 - 0.1% AEP + CC Flood Model Max Depths (Defended) Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

3.2.3 0.1% AEP Flood Event (defended scenario)

The maximum flood depths for the 0.1% AEP scenario are displayed in Figure 7. The results show that the entire site is inundated by between 1.16m and 1.54m, with a mean water depth of 1.36m. The average flood level within the red line boundary is 135.76m AOD and the maximum flood level is 135.78m AOD.

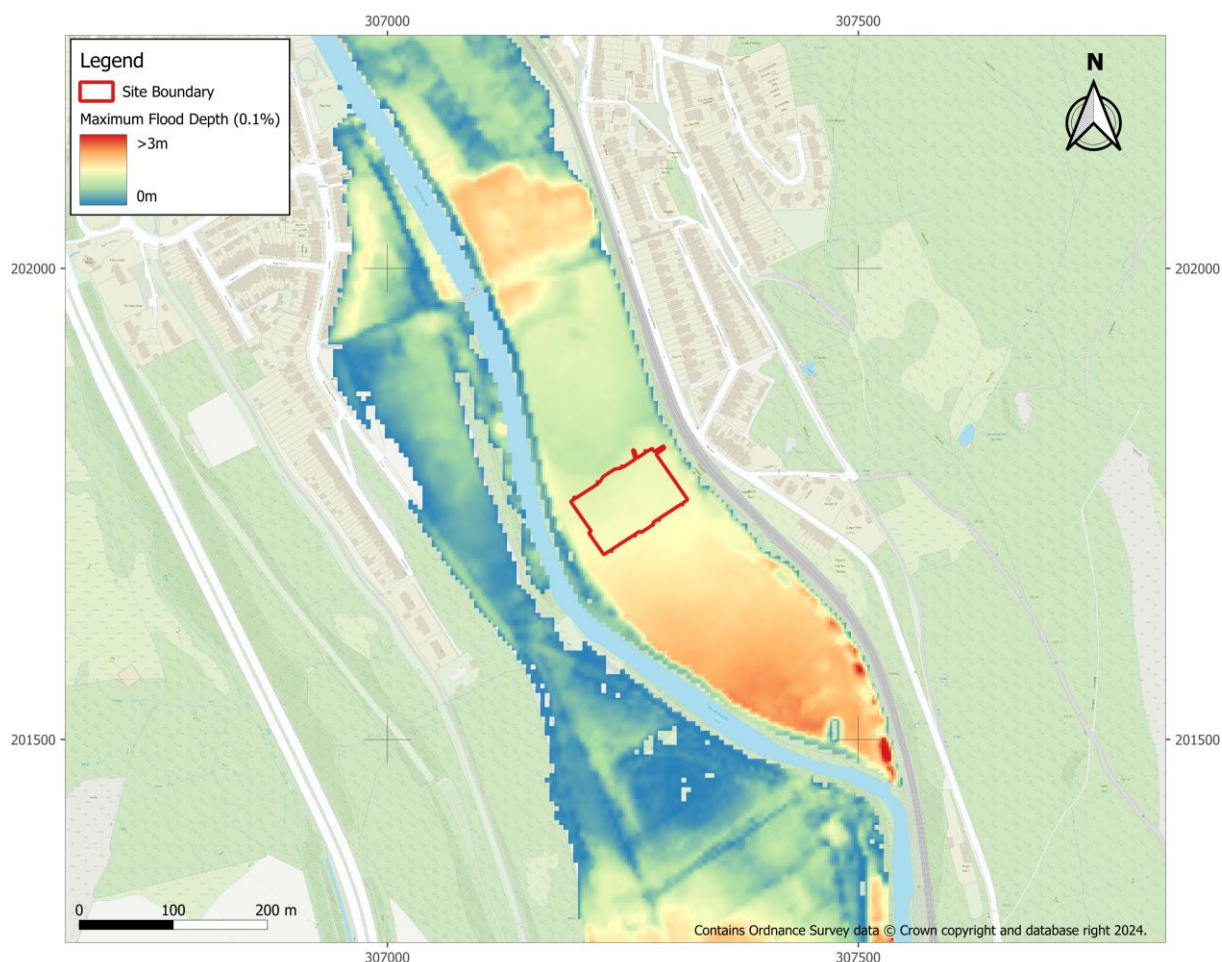


Figure 7 - 0.1% AEP Flood Model Max Depths (Defended) Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

3.2.4 Summary of Fluvial Model Results

Table 1 below summarises key flood metrics from the events detailed above.

Table 1 - Summary of Modelled Flood Levels

<i>Event</i>	<i>Average Level (m AOD)</i>	<i>Max. Level (m AOD)</i>	<i>Average Depth (m)</i>	<i>Max Depth (m)</i>
<i>1%</i>	<i>134.47</i>	<i>134.67</i>	<i>0.07</i>	<i>0.15</i>
<i>1% + CC</i>	<i>134.49</i>	<i>134.68</i>	<i>0.09</i>	<i>0.18</i>
<i>0.1%</i>	<i>135.76</i>	<i>135.78</i>	<i>1.36</i>	<i>1.54</i>

3.3 NRW Surface Water Flood Map

The NRW surface water flood map has been reviewed to identify the risk of pluvial flooding at the site. The surface water flood map is shown below in Figure 8 and indicates that the site is free from surface water flooding for all events up to and including the 0.1% AEP event. The nearest area of potential flood risk exists approximately 20m to the north east of the site, where water is predicted to pool during the 0.1% AEP surface water flood event.

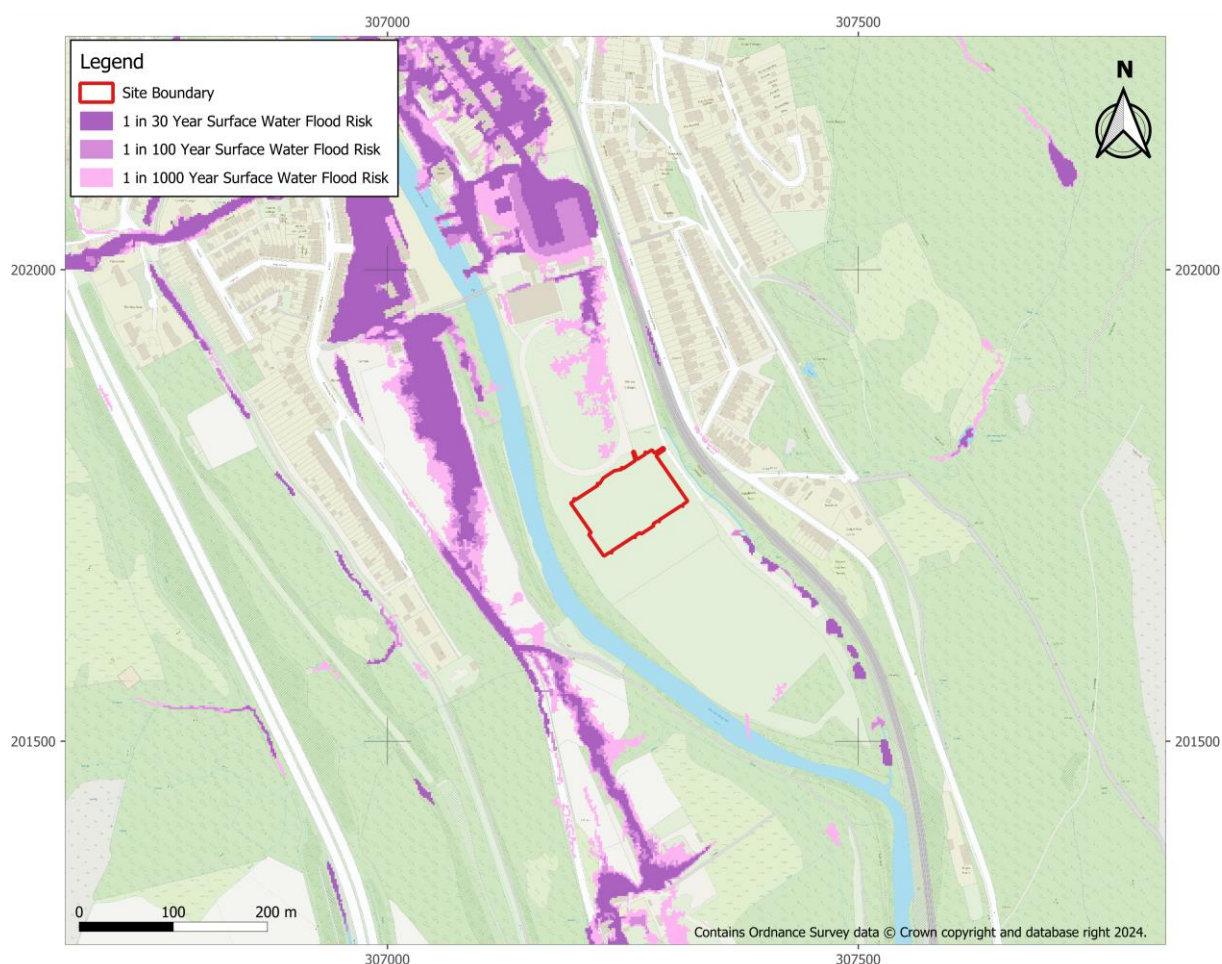


Figure 8 - Surface Water Flood Risk

3.4 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at ground level. A review of Soilscales online mapping service⁸ has indicated that the soils underlaying the site are within Landis Soilscale Group 12, floodplain soils of a loamy composition. These soils freely drain into the River Taff. Bedrock at this location consists of sandstone of the Rhondda Member, where Superficial deposits of alluvium are exclusively present. Because of the presence of alluvium throughout the site in addition to the soil classification, it can be inferred that groundwater levels are closely associated with river levels and it is unlikely that groundwater flooding will occur in isolation, as any raise in groundwater will cause the river level to increase. No boreholes publicly available via the BGS borehole records database are present within the floodplain to assess the depth of groundwater at this location. Groundwater flood risk is considered to be low, primarily due to the freely draining soils present.

3.5 Historic Flooding

The historic flood map⁹ has been reviewed to understand historic flood risk at the development site. The online mapping indicates that there have been no historic flood events recorded by NRW at the development site. The nearest flood extents identified are approximately ~150m to the south and ~300m to the north west of the development site. Both extents occurred in December 1979 and were likely during the same event. Both of which originated from the River Taff.

⁸ LandIS. 2024. Soilscales map. Available at: www.landis.org.uk/soilscales/ [Accessed 20/05/24]

⁹ Data Map Wales. 2024. Historic Flood Map. Available from: datamap.gov.wales/maps/new?layer=inspire-nrw:NRW_HISTORIC_FLOODMAP#/ [Accessed 20/05/2024]

4 Flood Consequence Assessment

4.1 Planning Policy

This FCA is required to fulfil the guidance outlined in TAN15, with particular regard to table A1.14 and A1.15. The former references the thresholds of flooding for types of development, while the latter outlines acceptable levels of flood consequences beyond the design event.

It should be noted that the parameters prescribed in TAN15 are indicative only and not definitive, meaning each site should be approached on a case-by-case basis. Within the context of the potential flooding mechanisms present.

4.2 Justification for Development

The development involves a change of use of a grass football field into a 3G football field, with small infrastructural additions (totalling approx. 29m²). Both the baseline and the proposed development can be considered to be in the 'less vulnerable' category – as an equipped play area, as per Figure 3 in TAN15. As such, there is no change in the vulnerability of the proposed site from the previous designation.

The development in this location is deemed achievable given that no change of use is proposed. The development will be inundated during all the assessed return periods (1.0%, 1.0%+CC and 0.1% AEP), which indicates that the development is part of the floodplain at this location.

The development itself aims to provide an upgraded area for pupils of the Afon Taff Secondary School to complete outdoor sports. The site will likely be active on a regular basis, weather permitting, however, this will be similar if not identical to its previous usage as a football field. Due to its use for outdoor sports and recreation, it is unlikely to be utilised during periods of high rainfall, reducing risk on-site. As the site is within the floodplain, it is recommended that resilience measures be incorporated into the new design. The following resilience measures are recommended:

- An evacuation response plan is assumed to be available for the school. This evacuation plan should be reviewed to ensure that it includes outdoor spaces such as the 3G pitch. This evacuation plan should include an appropriate route that can be utilised before the event occurs, which may be assisted by the flood warning system in place (see section 4.4).
- Electrical equipment associated with the 3G pitch should have an isolation switch installed, which should be located in a non-flood risk area.

4.3 3rd Party Impacts

Currently, the development area is entirely permeable. The proposed development will add approximately 489m² of impermeable area, mostly in pathways, as the 3g pitch will be permeable.

The site is within the flood plain with the direction of flooding being from north to south, because there is a greenfield area to the south, there will be sufficient soakaway area to manage any additional surface water generated from the proposed pathways.

It is considered that the impact of the proposed new structures (two team shelters and eight elevated lights) have negligible impact due to their small footprint within the proposed development area. As such, there is no requirement for the provision of compensatory storage, as the displacement of water by these proposed structures is relatively inconsequential. Furthermore, it is considered that impacts on flooding (if any) will be very localised and contained within the school ownership boundary.

4.4 Access/Egress

It is assumed that the school currently has evacuation procedures in place, which include access and egress routes to protect against high return period flood events. While this is the case, it is recommended that the current plan is adhered to if flooding occurs and evacuation is deemed necessary. If further detail is required for the proposed 3G pitch, a suggested route is provided below.

Figure 9 illustrates a suggested access route, alongside the modelled hazard ratings. All potential access and egress routes are inundated to some capacity during the 0.1% AEP event. During the lesser return period events, the pathway located to the north east of the development remains flood free for much of the route. Hence, the most suitable access and egress route from the site is considered to be along the unnamed road to the north east of the development, leading away from the site, to then join with Yew Street, to then turning west to cross Pont Rhun, and onto the west bank of the town, shown to be outside the NRW flood zones. As the site is in a wide valley, it is suggested that continuing westward up-slope would be the safest course of action after completion of the route.

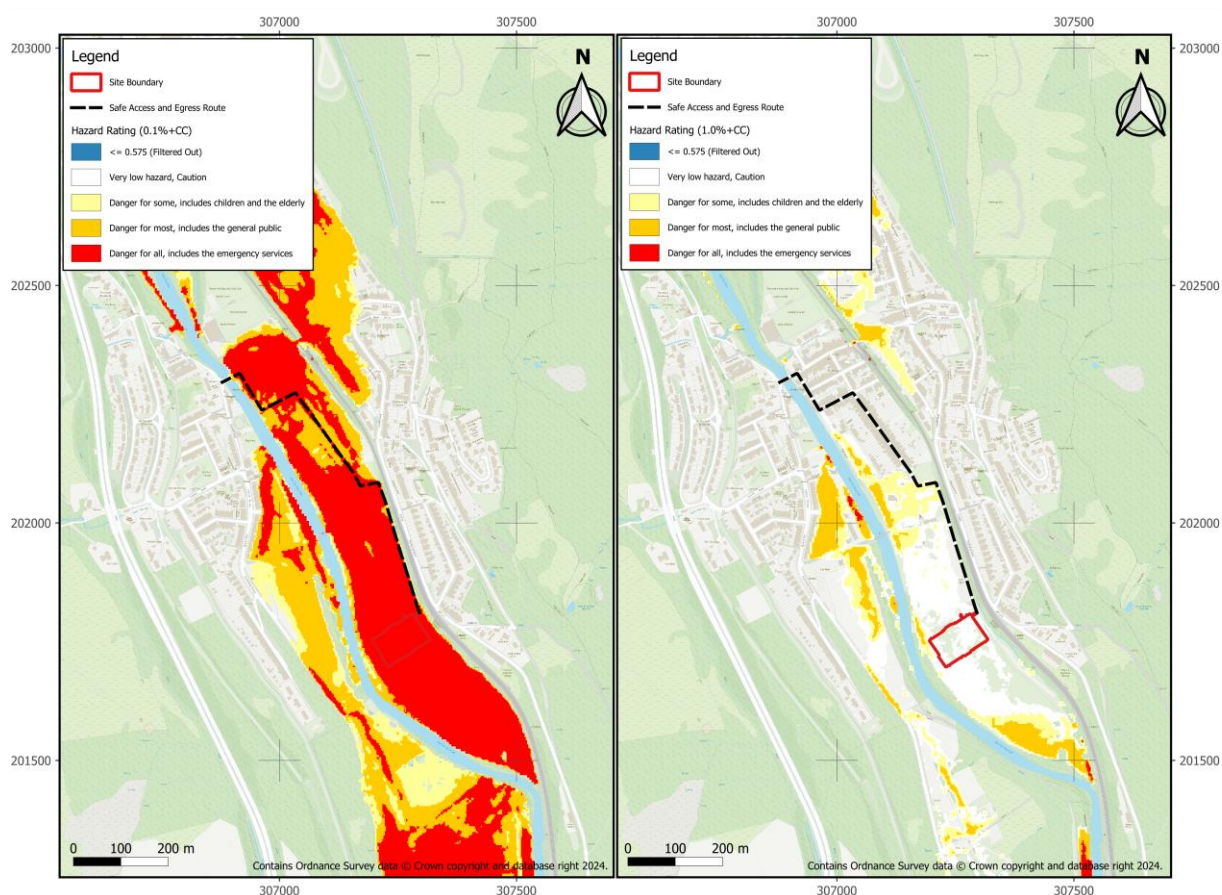


Figure 9 - Indicative site access and egress route (0.1% AEP event left, 1.0%+CC AEP event right)

A review of the NRW flood map indicates that the site lies in a flood warning area. It is recommended that the operator of this site sign up to this service to receive warnings of a potential flooding via a chosen method of communication. This will allow increased time for evacuation, as the entire school

is located upon the flood plain. A robust emergency flood plan should be in place to ensure that the occupants of the development are fully aware of what action to take when flooding is predicted. Though the access/egress routes are eventually impeded in flood waters, the flood warning system should provide enough time for occupiers to safely evacuate the site, this coupled with a robust flood evacuation plan should ensure the safety of occupiers from flooding.

5 Conclusions

This FCA has provided a robust understanding of flood risk at the site. The following key points have been identified and discussed during this FCA:

- The site lies in DAM zone C2, which indicates that the site lies on an area of the floodplain without significant defence infrastructure.
- Hydraulic Modelling at Merthyr Vale Colliery Site (2017) has been used to inform this FCA, which includes detailed fluvial 1D/2D modelling. The model results indicate that the site is entirely inundated for 1.0%, 1.0+CC and 0.1% AEP events.
- The site is predicted to be inundated with maximum flood levels across the site for 1.0% AEP+CC and 0.1% AEP events being 134.68m AOD and 135.78m AOD respectively.
- The 3rd party impacts associated with development are considered negligible. This is on account of the site being entirely within the floodplain, with the additional added infrastructure being minimal and the site located within an expansive greenfield area, which surrounds the site.
- An access/egress route is available, which is mostly flood-free for the 1.0% and 1.0%+CC although entirely inundated for the 0.1% AEP event. Risk to life can be adequately managed using the flood warning alert service and the formulation of an appropriate evacuation procedure of the site.