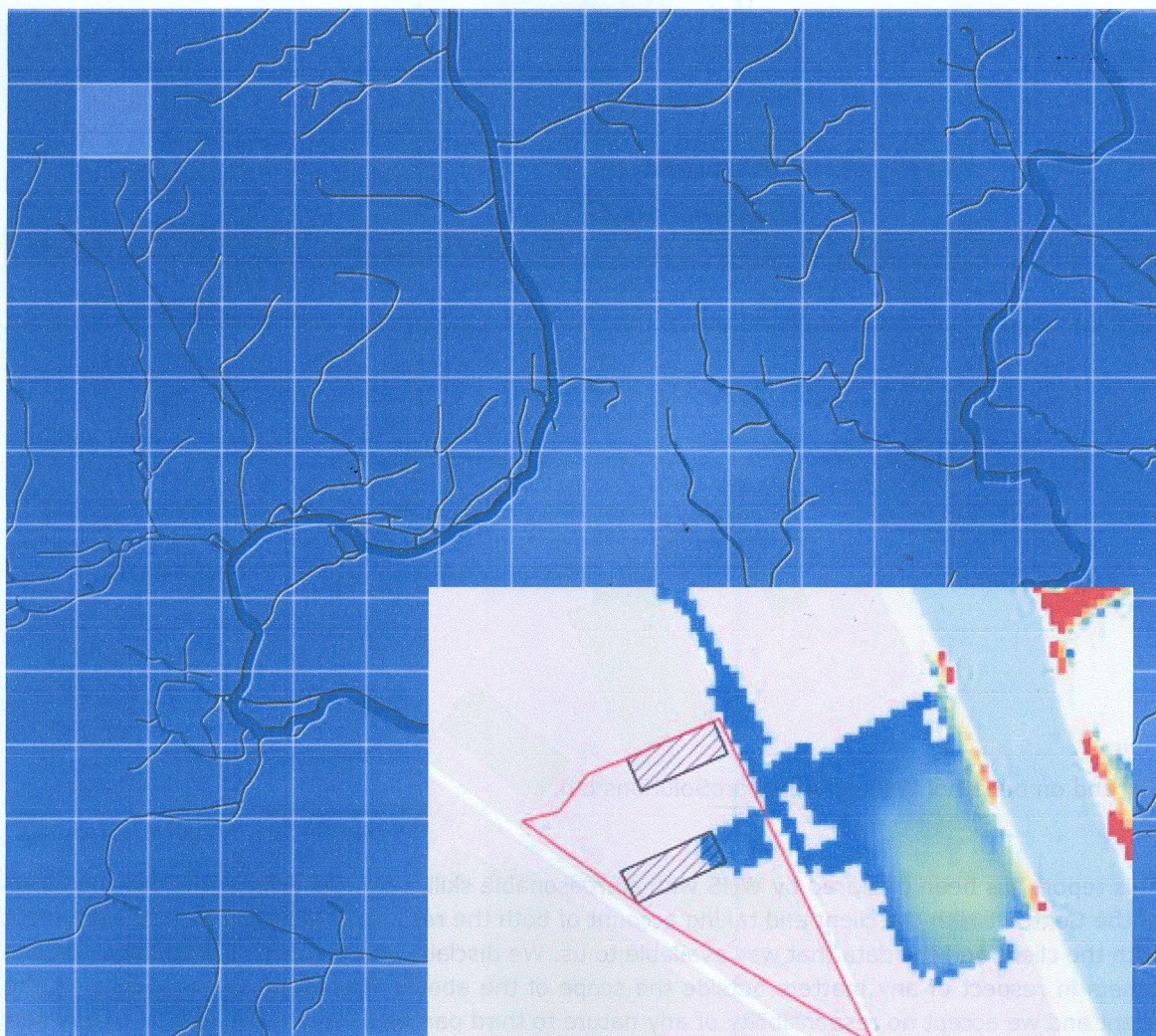


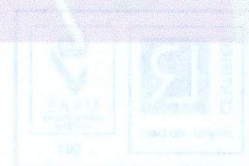
Plans Drawn

December 2019

FCA for Storage Units at Abercanaid Industrial Estate



WHS



Plans Drawn

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For and on behalf of Wallingford HydroSolutions Ltd.

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WHS

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1 Introduction

1.1 Background

Wallingford HydroSolutions Ltd has been commissioned by Anthony Collins at Plans Drawn to undertake a Flood Consequences Assessment (FCA) for the development of 9 proposed storage units in the Abercanaid Industrial Estate, Merthyr Tydfil (NGR: 305294, 204902).

The site is located on the western bank of the River Taff, with the dominant mechanism of flooding being fluvial. According to the NRW fluvial flood risk maps the site lies in Flood Zones 2 and 3, an area at risk of flooding during the 1 in 100-year event and 1 in 1000-year events. The Development Advice Map defines this site to be in Zone C2, an area at risk without significant flood defence infrastructure.

Wallingford Hydrosolutions (WHS) has previously built a NRW-approved hydraulic model of the area (2017 Willows-Taff Model). This model provides a more refined picture of the flood risk posed to the site than online flood maps built using J-FLOW. The site is only shown to be at risk of flooding in the 1000-year event with minor flooding encroaching into the red line boundary during the 100-year with a 25% allowance for climate change.

This FCA seeks to demonstrate that the proposed development can remain compliant with TAN15 for the lifetime of development and that the risk of flooding can be managed to an acceptable level.

1.2 Scope

Due to the location of the site within DAM Zone C2, a site-specific FCA is required. This report will seek to address the requirements of an FCA as set out in TAN15 and provide a document appropriate for submission with the planning application for the site.

In summary, this report will;

- Collate and analyse flood risk information obtained from a desk-based review of available data to identify and quantify the flood risks associated with the development.
- Review existing hydraulic modelling results to determine flood depths and velocities at the site.
- Incorporate the storage units into the 2017 WHS Taff-Willows model and run for the 100-year plus climate change and 1000-year event to determine 3rd party impacts of development.
- Reviewing the acceptability of consequences.

1.3 Sources of Data

The main data source used to inform this FCA is the 2017 WHS Taff-Willows flood model, supplied by WHS and the model owner. The full list and associated footnote references can be found below.

- WHS Willows Taff Model¹
- Technical Advice Note 15²
- NRW Flood Maps³
- Site layout plans⁴

¹ The Willows: Hydraulic Model. WHS1506. Wallingford HydroSolutions Ltd. May 2017.

² Technical Advice Note 15 Development and Flood Risk. Welsh Government. July 2004.

³ Natural Resources Wales (2019) Detailed Map View and Development Advice Map <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>

⁴ Proposed 9 no. Storage Units. Proposed site layout. DWG no: 2 of 4. Drawn by A.Collins. October 2019.

2 Site Description

2.1 Location

The site is located the Abercanaid Industrial Estate, Merthyr Tydfil, South Wales (NGR: 305294, 204902). This site is located on commercial land close to the River Taff and is in an urbanised setting. The wider area has a series of drains and minor water courses running across the industrial area, with general access available from the A4054 roundabout west across the river Taff. A site layout is provided in Figure 2-1.

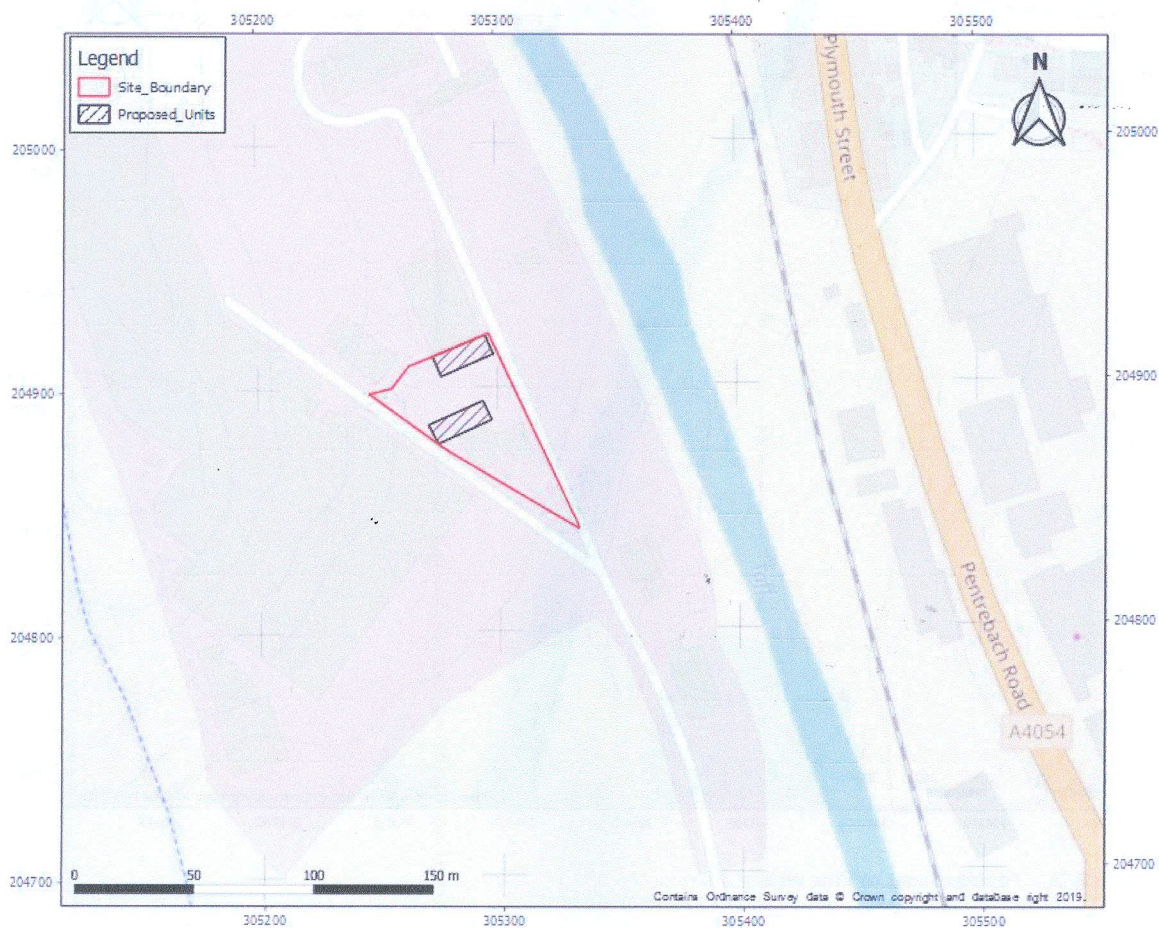


Figure 2-1 - Site Layout

2.2 Topography

The site is located on the valley floor of a south-draining valley typical of the South Wales valleys landscape. Levels across the site range from 157mAOD in the south west to 159mAOD in the north east. The site is abutted to the west by an area of the floodplain that is significantly lower. The topography can be seen in Figure 2-2.



Figure 2-2 - Topography of the wider site

2.3 Proposed Development

The proposed development will comprise of 9 industrial storage units that are placed in the northern half of the site. It is proposed by the owner that these be rented out for self-storage usage. Plans of the development have been submitted separately⁴ as part of the planning application reference PA/19/0045.

3 Flood Risk

3.1 NRW Flood Map

The NRW Fluvial flood Maps, shown in Figure 3-1, are based on coarse scale national mapping. They suggest that the entirety of the proposed development is located in flood zone 3, meaning that it would flood in a 1 in 100-year event. The dominant source of flood risk to the site is fluvial risk from the River Taff.

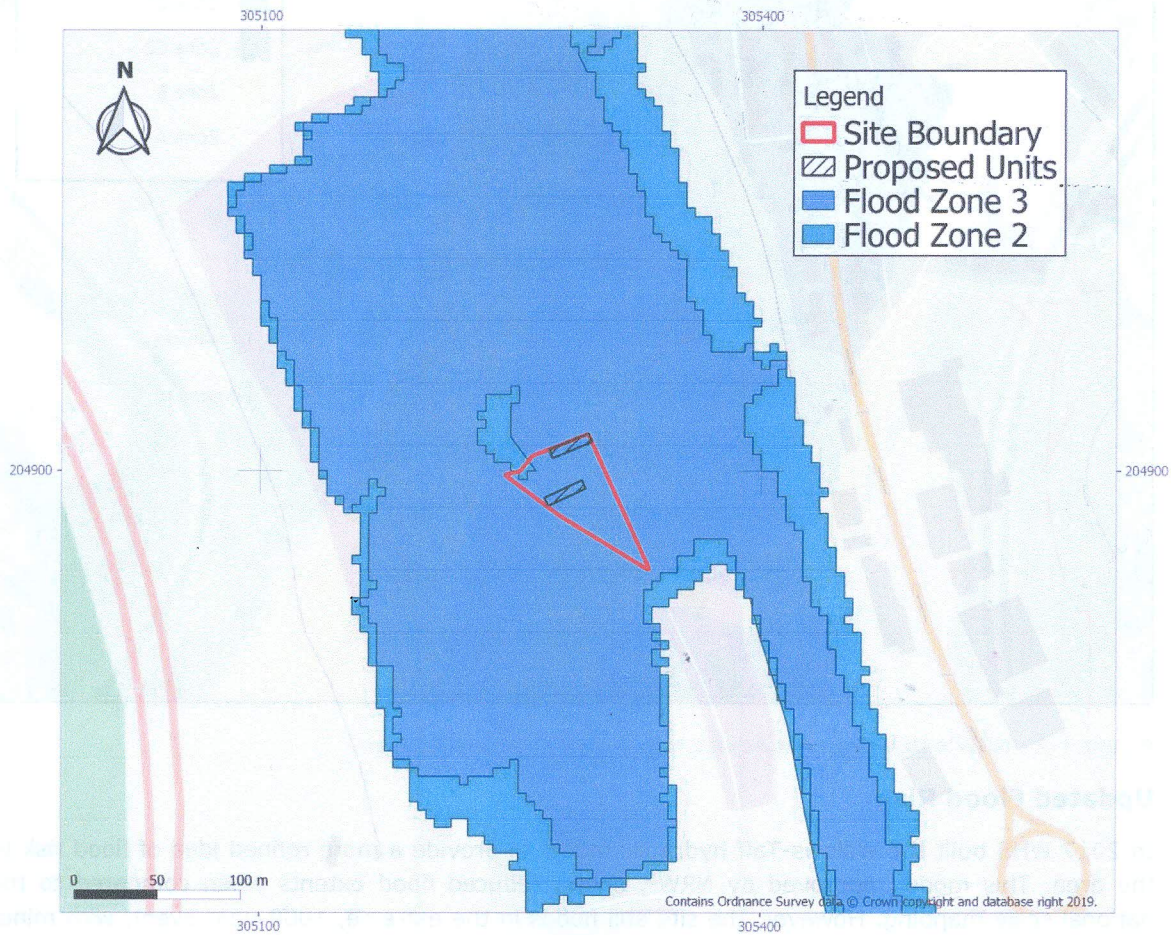


Figure 3-1 - Flood Zone designation of the site from NRW Fluvial Flood Mapping

3.2 DAM Flood Map

The site lies within Zone C2 according the NRW's Development Advice Map (DAM) indicating that only less vulnerable development should be considered within the site (not served by significant flood defence infrastructure). The classification is shown in Figure 3-2.

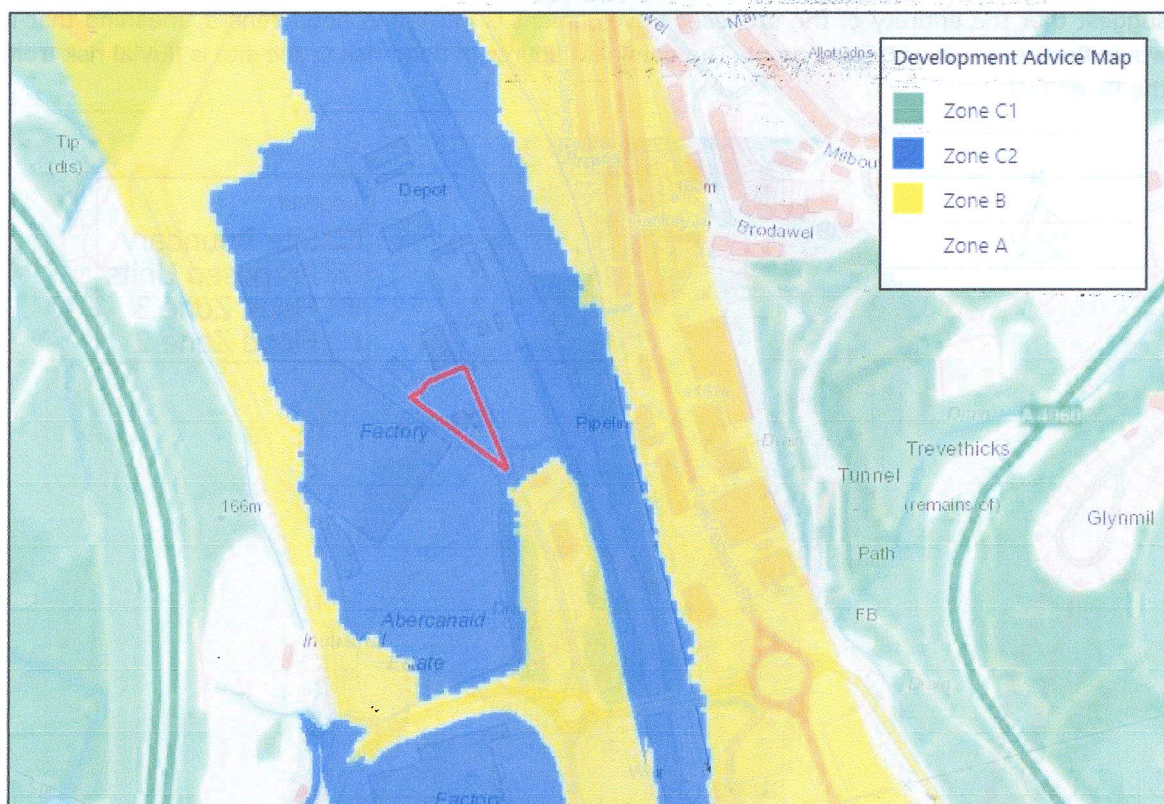


Figure 3-2 - NRW's Development Advice Map's Zone C2 classification

3.3 Updated Flood Risk

In 2017 WHS built the Willows-Taff hydraulic model to provide a more refined idea of flood risk to the area. This model, approved by NRW⁵, shows reduced flood extents when compared to the national scale mapping. However, the site still floods in the extreme, 1000-year event, with minor flooding also predicted in the 100-year with a 25% allowance for climate change.

Liaison with NRW has confirmed that the 2017 Taff-Willows hydraulic model for the River Taff in Merthyr Tydfil is suitable for site specific use⁵. The results from the model have been obtained under written permission from the model owner and have been used to inform this FCA. The model extent stretches from NGR: 304744, 205920 at the upstream end to NGR: 306050, 203677 at the downstream end. The model includes the effects of bridges and structures along this 2.6km stretch of the Taff. The results of the modelling to the site are presented below and provide the most-refined indication of flood risk to the site that is currently available.

⁵ Email Sent by Christopher Nutt, Flood Risk Analyst, Natural Resources Wales. 18/11/19.

3.3.1 1 in 100-year Event

The site remains flood free during this event, with flows remaining in bank.

3.3.2 1 in 100-year plus 25% Climate Change Flood Event

As shown, there is minor flooding encroaching into the site. Maximum flood depths reach 0.09m in south eastern corner of the proposed development, however are more around 0.01m on average. Velocities reach a maximum of 0.08m/s however are generally in the region of 0.04-0.05m/s. A maximum water level for this event is 157.61mAOD.

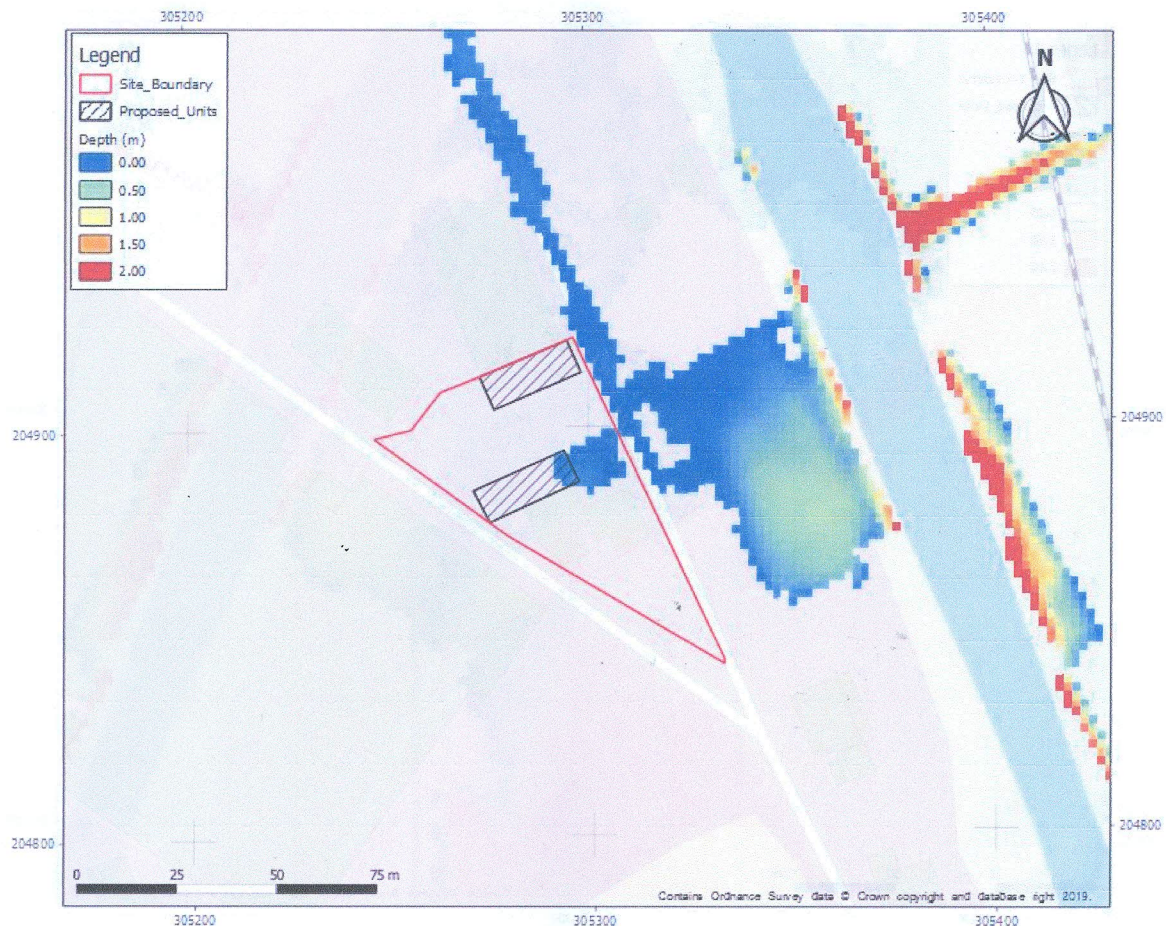


Figure 3-3 – Model results for the 1-in-100-year +25% Climate Change allowance event

3.3.3 1 in 1000-year Flood Event

The results from the 1-in-1000-year event are presented below in Figure 3-4. Flood depths at the low point in the red line boundary that exists south of the proposed units reach a maximum of 1.2m. More commonly, flood depths are in the region of 0.5-0.7m. Within the proposed storage units themselves, flood depths peak at 0.9m locally, but are mostly below 0.6m, reducing even further among the northernmost units (0.1m-0.3m). Velocities peak at 0.3m/s and a maximum flood level for this event is 158.37mAOD.

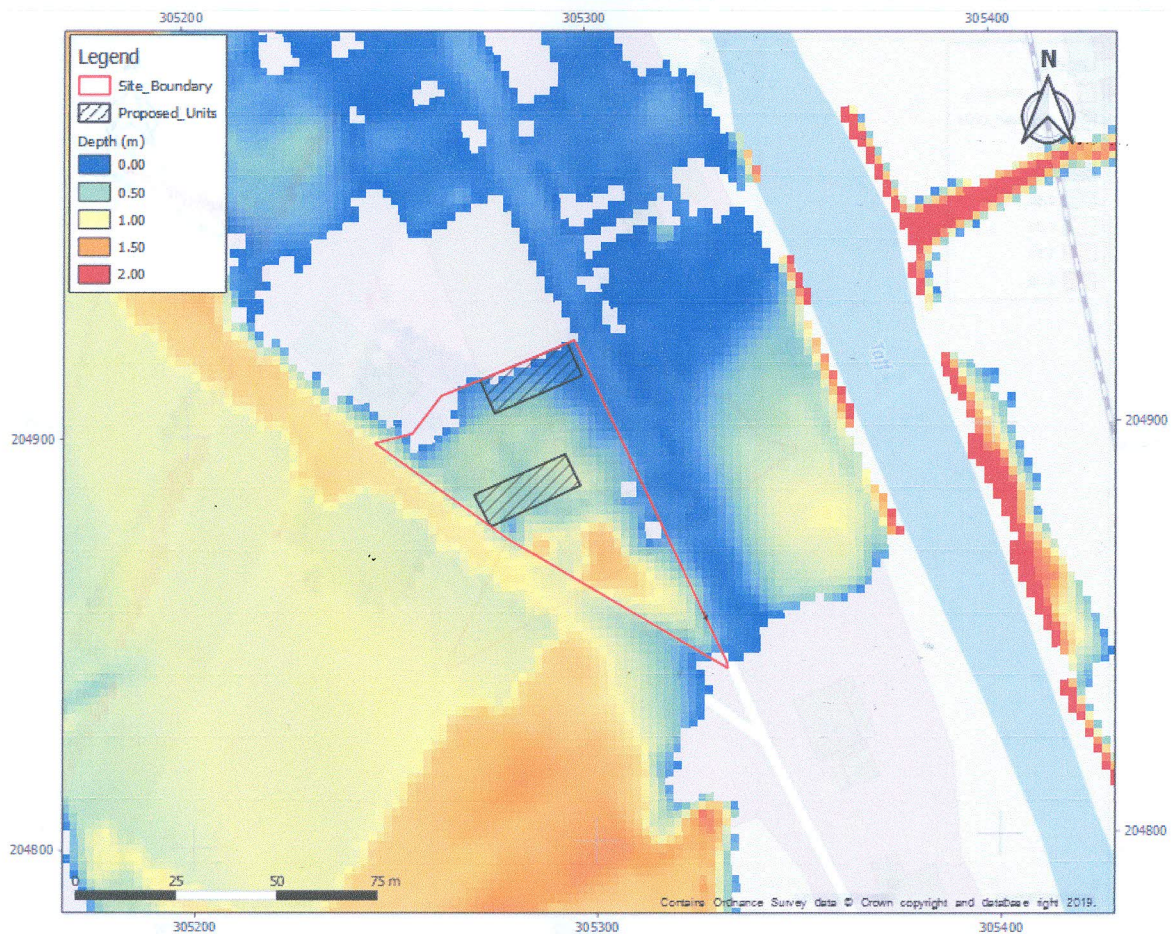


Figure 3-4 - Model results for the 1-in-1000-year event

3.4 Surface Water Flooding

The NRW surface water flood map has been reviewed to identify the risk of pluvial flooding at the site (see Figure 3-5). The site is observed to be at some risk of pluvial flooding in the 1-in-30-year at the depression south of the proposed units. Approximately 50% of the site is expected to flood in an extreme, 1 in 1000-year rainfall event. Overall the risk to the site from surface water is considered low.

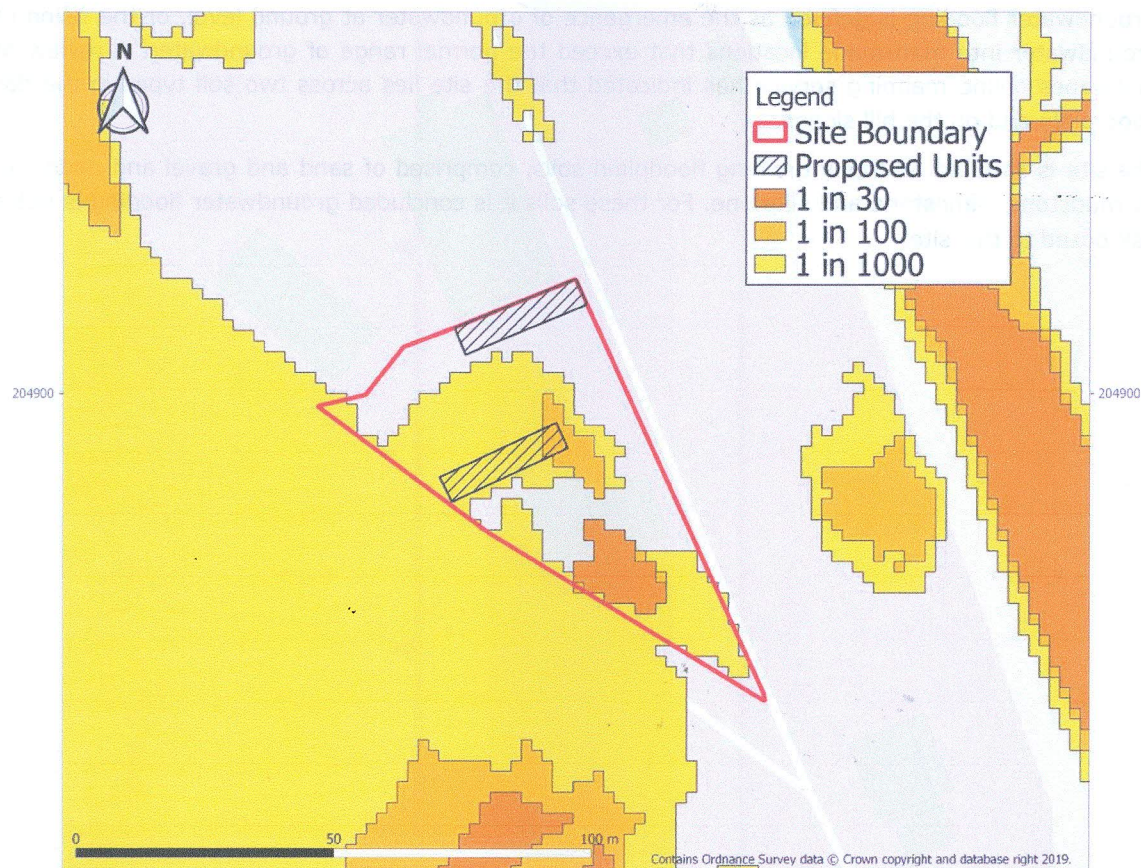


Figure 3-5 - Surface water flood risk

3.5 Historical Flooding

There are no historical flooding records that have affected the site but the wider area has cases of past flooding. These include the Pentrebach floods ~50m downstream of the site between the 2nd and 8th of December 1979. Floods 2km upstream of the site include the Merthyr Tydfil floods also in early December 1979.

3.6 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at ground level, or the rising of groundwater into man-made locations that exceed the normal range of groundwater. A review of Soilsmap online mapping service has indicated that the site lies across two soil types in the flat flood plain and on the hill slopes.

The site is situated on freely draining floodplain soils, comprised of sand and gravel and underlain by mudstone, sandstone and siltstone. For these soils it is concluded groundwater flooding is not a risk posed to this site.

4 Flood Consequence Assessment

This FCA serves to quantify the current level of risk posed with regards to the developments use and its impact on flood risk elsewhere.

4.1 Planning Policy

TAN 15 outlines the requirements for planning policy in Wales in relation to development and flooding. TAN 15 requires that the development site will remain safe over its lifetime and will not increase flood risk elsewhere while ensuring minimal risk to life for site users.

The proposed site is shown to lie within Flood Zone C2 according to the Development Advice Map. The nature of the development can be classed as "less vulnerable" due to it being industrial storage infrastructure development as per paragraph 5.1 in TAN15.

This section demonstrates that the risks and consequences of flooding have been considered, with particular regard to flood risk impacts on 3rd party land.

4.2 Justification for Development

The storage units are built on the pre-established commercial site of the Abercanaid Industrial Estate with the main purpose of storing industrial materials and ensuring operation of the industrial site. This site is located next to an adjacent site hosting storage container and is a site with similar permitted operations.

As mentioned, the nature of the development is classed as "less vulnerable" and the site, while concrete and urban, is not developed densely, therefore repair and maintenance costs in the event of flooding should be manageable and relatively inexpensive when compared to other types of development.

4.3 3rd Party Flood Impacts

In order to quantify any 3rd party impacts of the development, the nine storage units have been incorporated into the hydraulic model and compared to the baseline model to identify changes in flood risk. The model has been run for both the 1 in 100-year event with 25% climate change and the 1 in 1000-year events. In summary, the results show that changes in flood levels are negligible, due to the area of the wider floodplain and the fact that the proposed units do not block any key conveyance routes across the floodplain. Please see the following figures showing changes in flood level.

In terms of the modelling, the units have been incorporated as "stubby buildings" as per the buildings in the existing model. This represents the units as a 300mm slab level to represent their effects of conveyance and storage.

Storage Units at Abercanaid Industrial Estate FCA

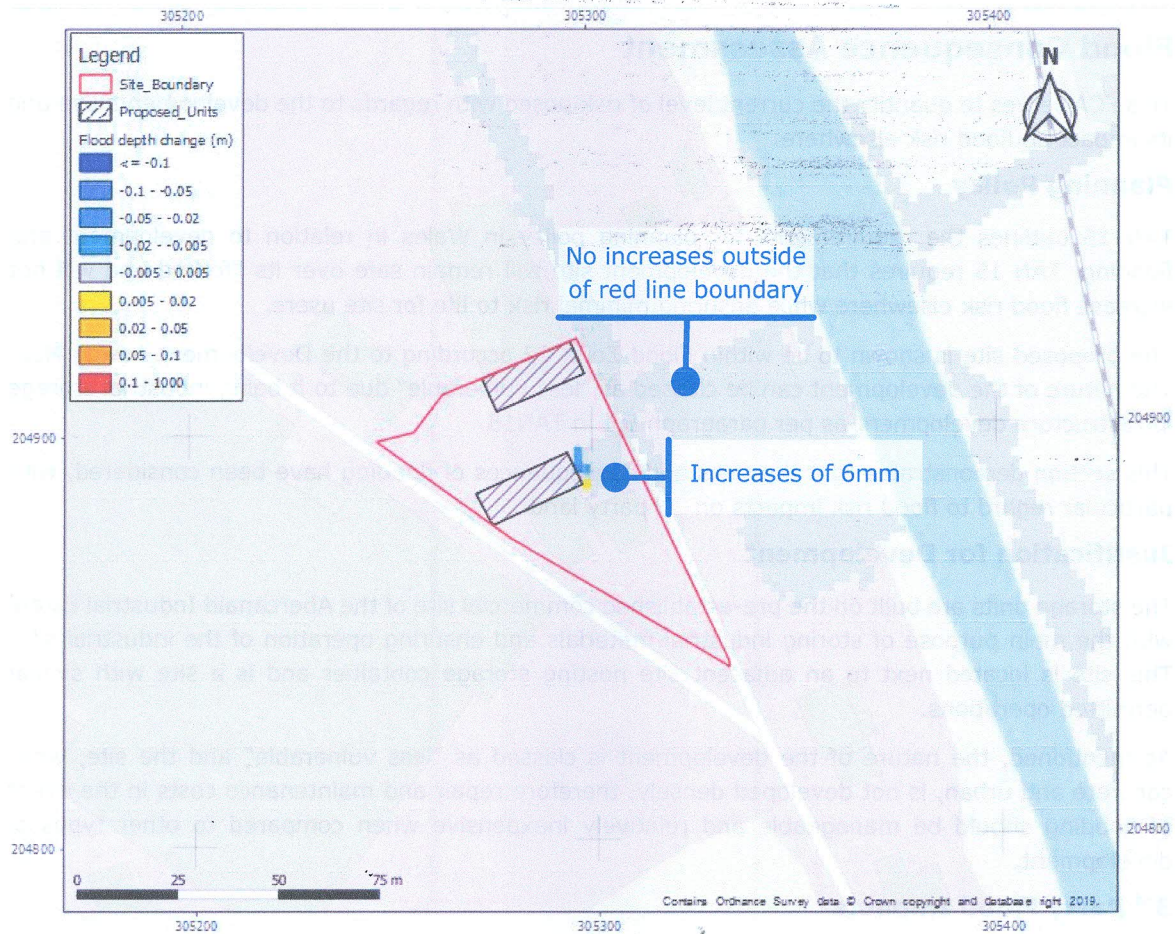


Figure 4-1 - Changes in flood level during the 1 in 100-year event with 25%-allowance for climate change

Storage Units at Abercanaid Industrial Estate FCA

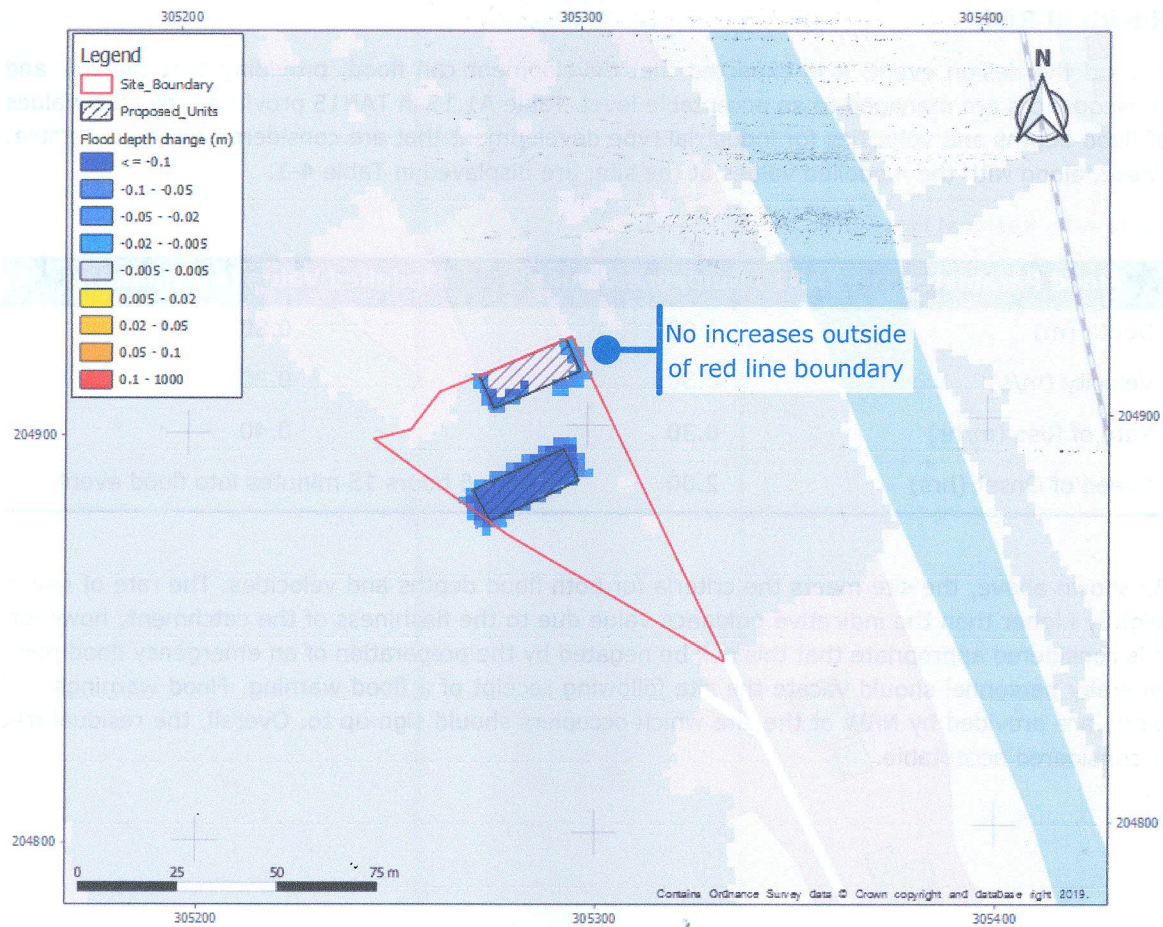


Figure 4-2 - Changes in flood level during the 1 in 1000-year event

4.4 Finished Floor Levels

As per the guidance given in TAN15, all development, with exception to emergency services, should be flood free in the 1 in 100-year plus climate change event, also known as "the design event". A flood level for this event has been provided in Section 3.3.2 as 157.61mAOD. It is therefore recommended that the units are raised above this level to 157.91mAOD, which includes a 300mm freeboard to minimise flood consequences.

4.5 Residual Risk

Beyond the design event, it is expected that development can flood, providing that the risk and consequences are managed to an acceptable level. Table A1.15 in TAN15 provides indicative values of flood depths and velocities for industrial type development that are considered to be acceptable. These, along with the modelled values at the site, are displayed in Table 4-1.

Table 4-1 - Residual Flood Risk

Flood Parameter	TAN15 Guidance Value	Modelled Value (maximum)
Depth (m)	1.00	0.80
Velocity (m/s)	0.30	0.30
Rate of Rise (m/hr)	0.30	0.40
Speed of Onset (hrs)	2.00	6 hours 15 minutes into flood event

As shown above, the site meets the criteria for both flood depths and velocities. The rate of rise is slightly higher than the indicative guidance value due to the flashiness of the catchment, however, it is considered appropriate that this risk be negated by the preparation of an emergency flood plan, whereby personnel should vacate the site following receipt of a flood warning. Flood warnings and alerts are provided by NRW at the site which occupiers should sign up to. Overall, the residual risk is considered acceptable.

4.6 Access and Egress

It is proposed that the minor road to the east of the development be followed in a north to south direction for access and egress to and from the site. This relates to evacuation routes for site personnel or to enable access for emergency services if required. This progresses southward where a crossing can enable access to the A4054.

The proposed access route is subject to very minor flooding in a 1 in 100-year plus climate change event, over a road length of approximately 30m. Here, flood depths peak at 0.02m and a hazard rating of 0.01, which falls within the lowest flood hazard category and is considered safe. During the extreme 1 in 1000-year event, the road length floods across and 80m length. Here, flood depths peak at 0.30m and hazard ratings are limited to 0.40, again, falling in the lowest hazard category. Overall, the access/egress route is considered safe in the events assessed for all users. It is shown in Figure 4-3.

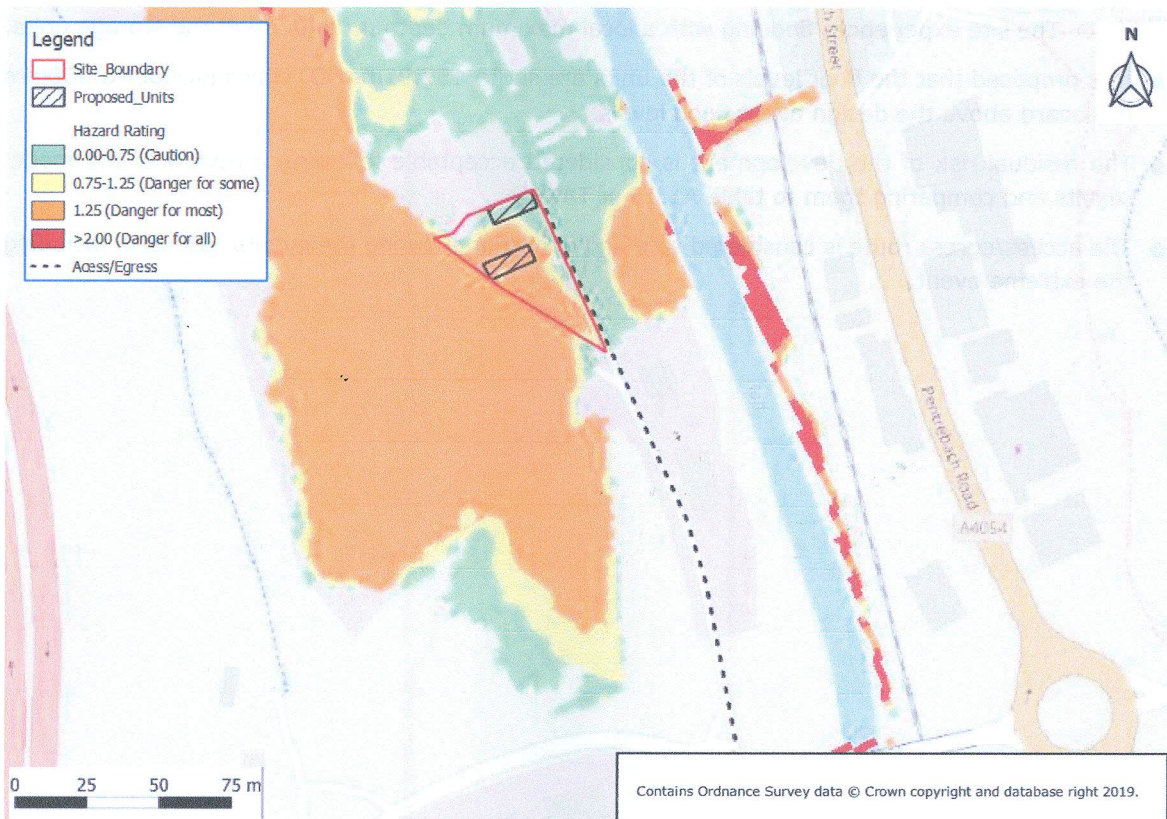


Figure 4-3 - Access/Egress

5 Conclusion

This FCA provides a robust understanding of flood risk to the site using the best available data. Please see the key points below.

- It is proposed that 9 storage units are located on an industrial site west of the river Taff.
- According to coarse scale national mapping, the site lies in flood zone 3.
- The pluvial flood risk is considered largely low to medium. The storage units have been located to avoid areas at high risk.
- A refined assessment of flood risk has been carried out based on a hydraulic model completed by WHS in 2017.
 - This shows that the site remains flood free in a 1 in 100-year event, with minor flooding encroaching into the site during a 1 in 100-year with climate change event.
 - The site experiences flooding with a local maximum depth up to 0.9m at the storage units.
- It is proposed that the floor levels of the units are set to 157.91mAOD, which includes a 300mm freeboard above the design event flood levels.
- The residual risk of the development is considered acceptable following a review of the model results and comparing them to table A1.15 of TAN15.
- The access/egress route is considered safe and operational during the events assessed, including the extreme event.

Appendix A – NRW Liaison