

TECHNICAL NOTE

JBA Project Code	2019s0875
Contract	Dragons Parc
Client	Huntley Wood Investments Ltd.
Day, Date and Time	06/07/2020
Author	Jonathan King MEng PhD
Reviewer / Sign-off	George Baker BEng AIEMA CEnv IEng MCIWEM C.WEM
Subject	Hydraulic Model Update

1 Introduction

1.1 Terms of reference

JBA Consulting were commissioned in September 2019 to prepare a Flood Consequence Assessment (FCA) in support of proposed engineering works as part of a flood mitigation strategy at land at Dragon Parc, Abercanaid.

Following submission of the planning application, Dwr Cymru Welsh Water (DCWW) objected to the scheme on the basis of proposed ground raising above a water distribution trunk main on site.

This document forms an addendum to the FCA and describes minor changes made to the development proposals and hydraulic model to address the concerns raised by DCWW.

1.2 Project background

The proposed engineering works covered by the planning application were designed to mitigate against the flood risk posed by the Nant Canaid. These were designed to improve the future development potential of the site and included:

- Site re-profiling to 157mAOD, with the southern section being raised to form a shallow gradient slope between 155.5mAOD and 157mAOD. The re-profiling was designed to raise ground elevations across the site to be above the 0.1% AEP fluvial flood level.
- A proposed 6m wide dry swale along the western boundary of the site with depth ranging between 0.19m in the north to 2m in the south.
- A pair of new 2.4m wide pre-cast box culverts at the southern end of the site that will convey water from the swale into a new outfall structure that will discharge into the Afon Taff.

On reviewing the planning application DCWW objected to the scheme on the basis of ground raising in the southern section of the site, within which a water distribution trunk main is located. The originally submitted design showed ground levels above the DCWW water distribution trunk main as being raised by approximately 1m. As the water main is already at depth, DCWW raised concerns that the additional depths would make it hard from them to maintain the asset in the future.

The proposed ground raising over the water main, with the exception of the access road, is not essential to the flood risk work, but was included in the design to smooth out some of the topography in the southern portion of site where existing ground levels change rapidly. Consequently, the design has been amended to remove, with the exception of the access road, any ground raising over the water main. This decision does not prejudice future site development proposals which will be subject to a separate design process.

The FCA addendum is based on the following updated plans:

- BMQ-JBAU-XX-XX-DR-C-0001-S3-P05-Channel_Plan
- BMQ-JBAU-XX-XX-DR-C-0002-S3-P04-Sections
- BMQ-JBAU-XX-XX-DR-C-0003-S3-P03-Sections

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2 Model development

2.1 Ground level modifications

Figure 2-1 shows the modelled ground model used with the original FCA model to describe the development proposals.

To address DCWW's concerns, the southern area within which the water main lies has been reprofiled to 155.6mAOD. This aligns with the existing ground level above the water main whilst still preventing flooding of the area in the 0.1% AEP fluvial flood event.

In addition, minor adjustments to the swale gradient and width have been made to increase the capacity of the swale in the vicinity of the water main. Amended model files are described in Table 2-1 and Figure 2-2.

Figure 2-3 and 2-4 show the changes in level between the proposed ground level as per the submitted planning application (PR_128) and the updated model (PR_142).

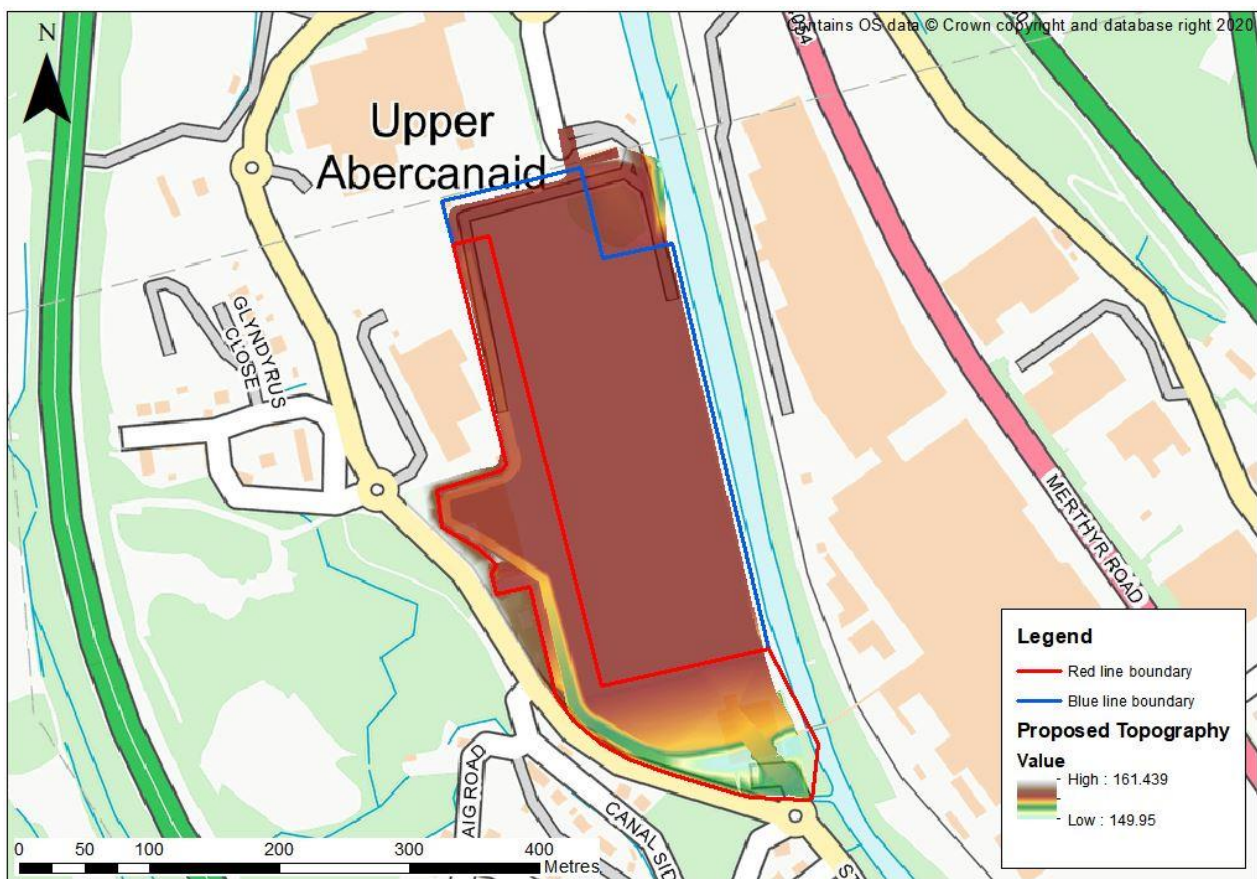


Figure 2-1: Proposed swale and reprofiling and planning boundaries (original planning application)

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Table 2-1: TUFLOW model files pertinent to the ground level modifications

File name	Description
BMQ-JBAU-XX-XX-IM-C-0004-S1-Proposed_Ground_Modelling_Output_1m.asc	Proposed ground level as per the submitted planning application
UpperAbercanaid_PR_142.tcf	TUFLOW control file
2d_zsh_Road_027_P.shp	Site access road
2d_zsh_Road_027_R.shp	Site access road
2d_zsh_Southern_029_R.shp	Reprofiled region above the DCWW water main
2d_zsh_WesternBufferChannel_141_P.shp	Proposed swale
2d_zsh_WesternBufferChannel_141_L.shp	Proposed swale

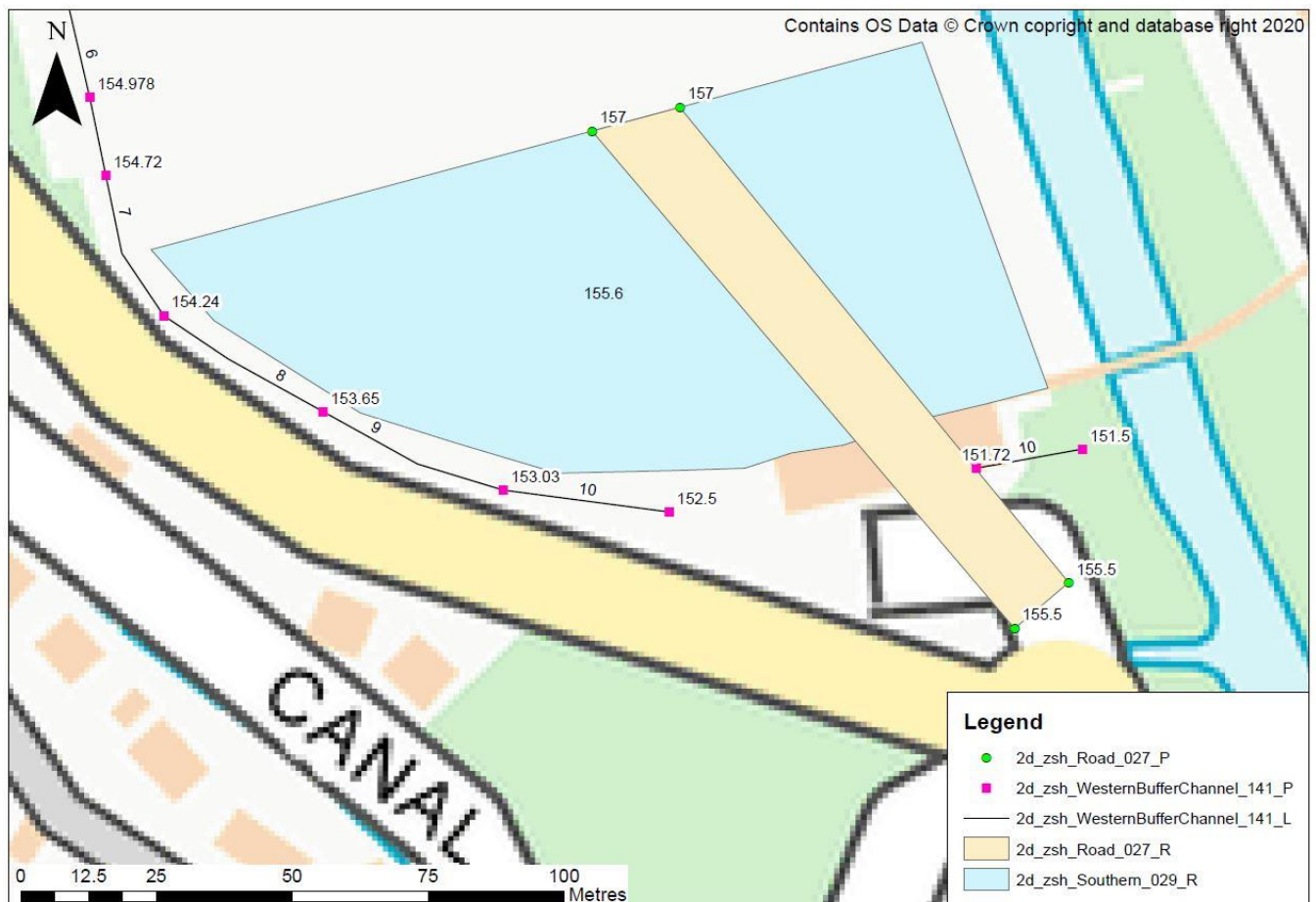


Figure 2-2: TUFLOW model files pertinent to the ground level modifications and Z-shape attributes; levels in mAOD, widths in m

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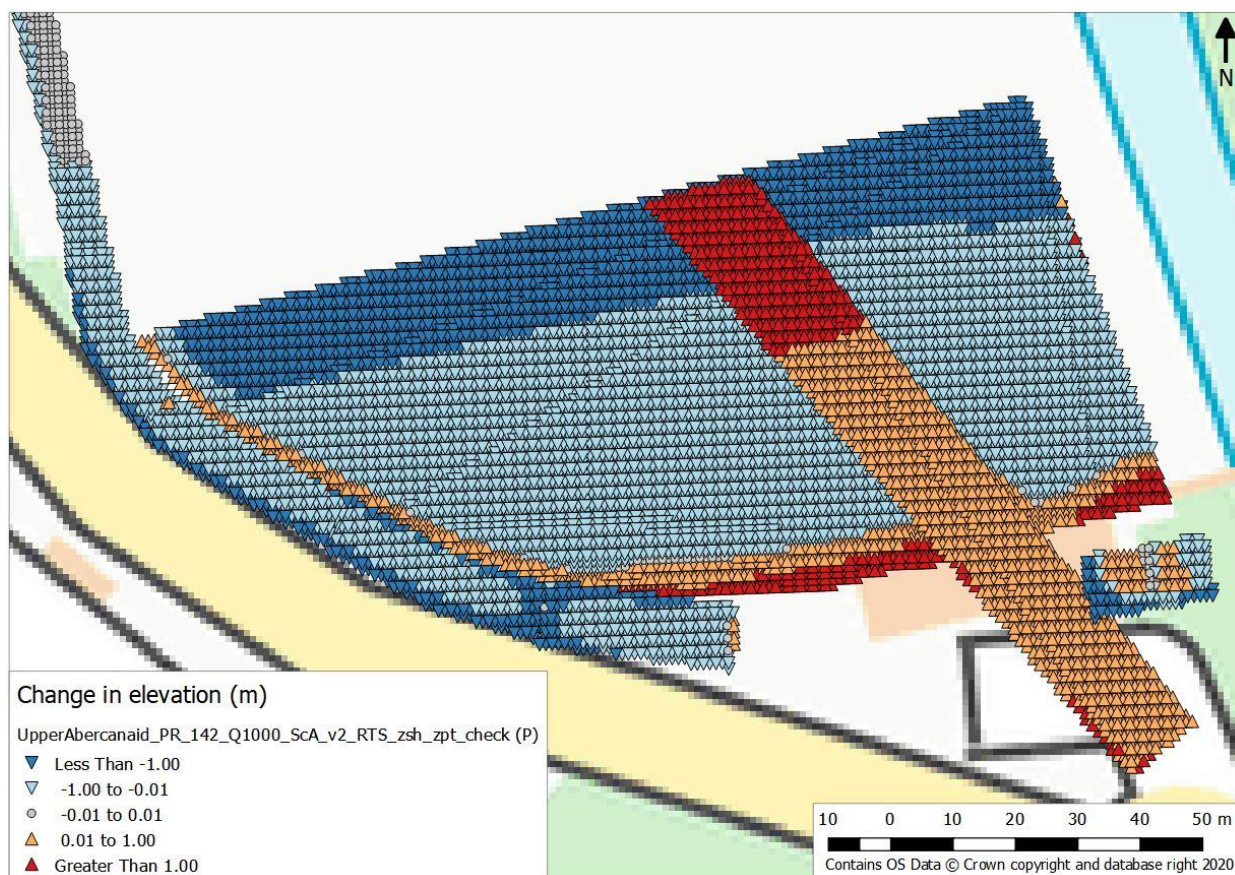


Figure 2-3: TUFLOW Z-shape check file

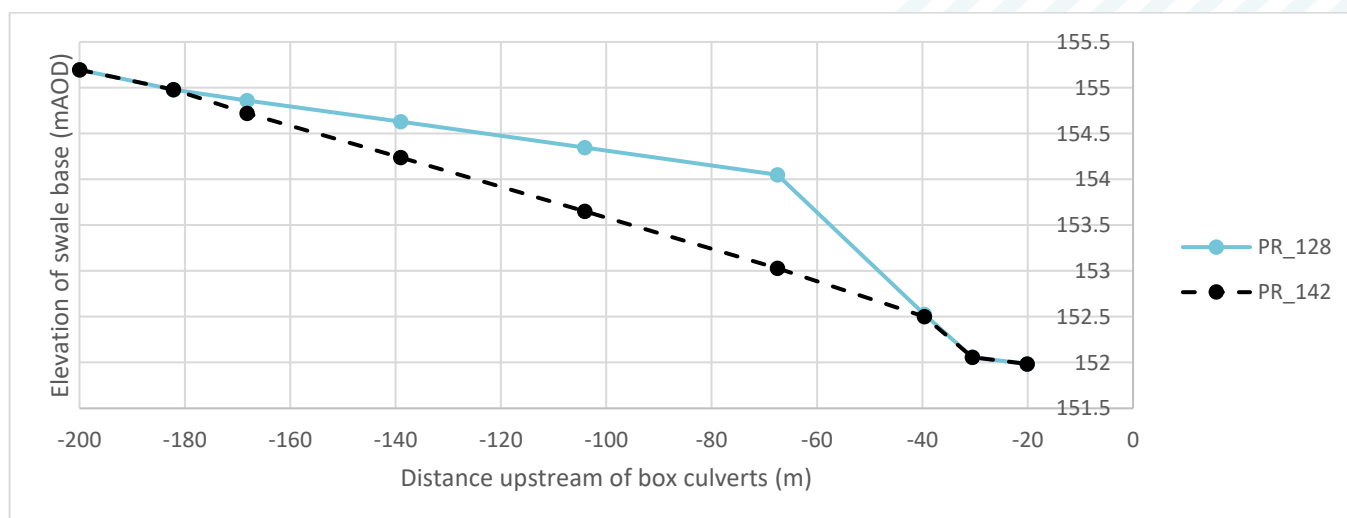


Figure 2-4: Comparison of in-channel bed levels between the planning application (PR_128) and modified proposal (PR_142)

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3 Model development

A comparison of maximum water levels between the model submitted with the original planning application (PR_128) and the updated model (PR_142) is shown in Figure 3-1 for the 0.1% AEP event.

The updated configuration results in lower in-channel water levels and does not cause any detriment outside of the site boundary. There is an increase of 17mm in the maximum water level upstream of the box culverts due of the increased channel conveyance upstream of this point.

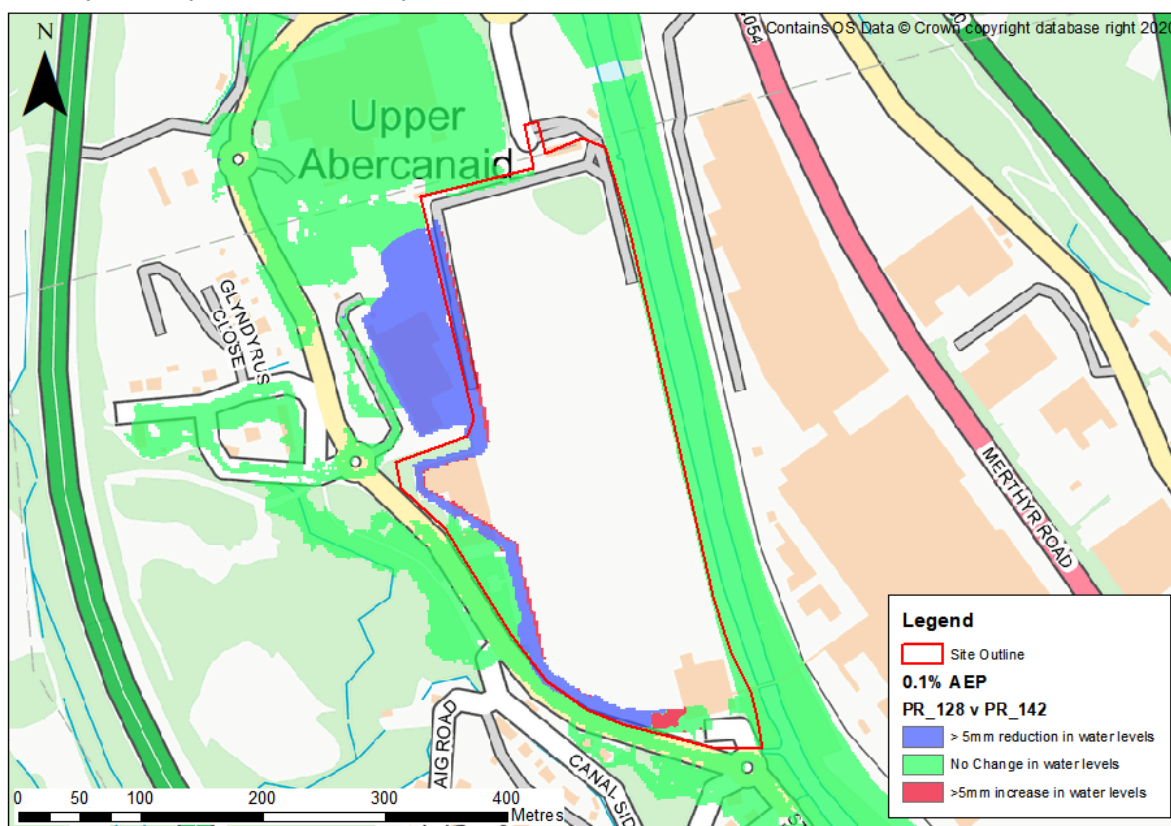


Figure 3-1: 1% AEP water level comparison

Since the model updates described herein have a negligible impact on water levels in the 0.1% AEP event, a detailed comparison for all events has been omitted for brevity. For completeness, updates to Figures 4-6 to 4-12 in the FCA are shown below.

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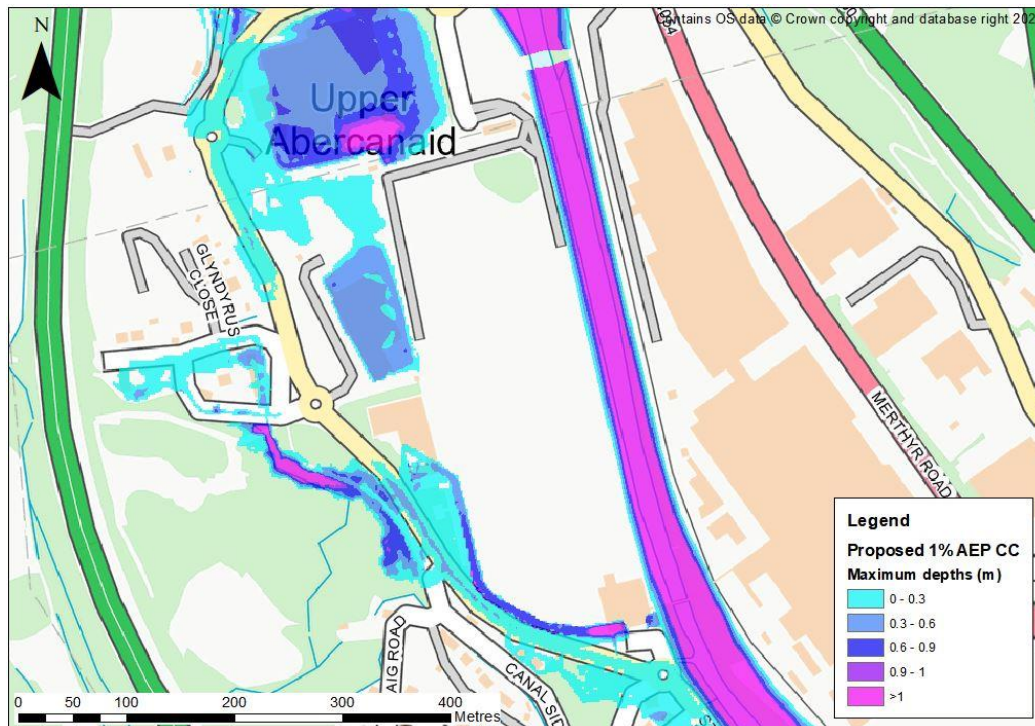


Figure 3-2: Proposed 1% plus climate change maximum depths

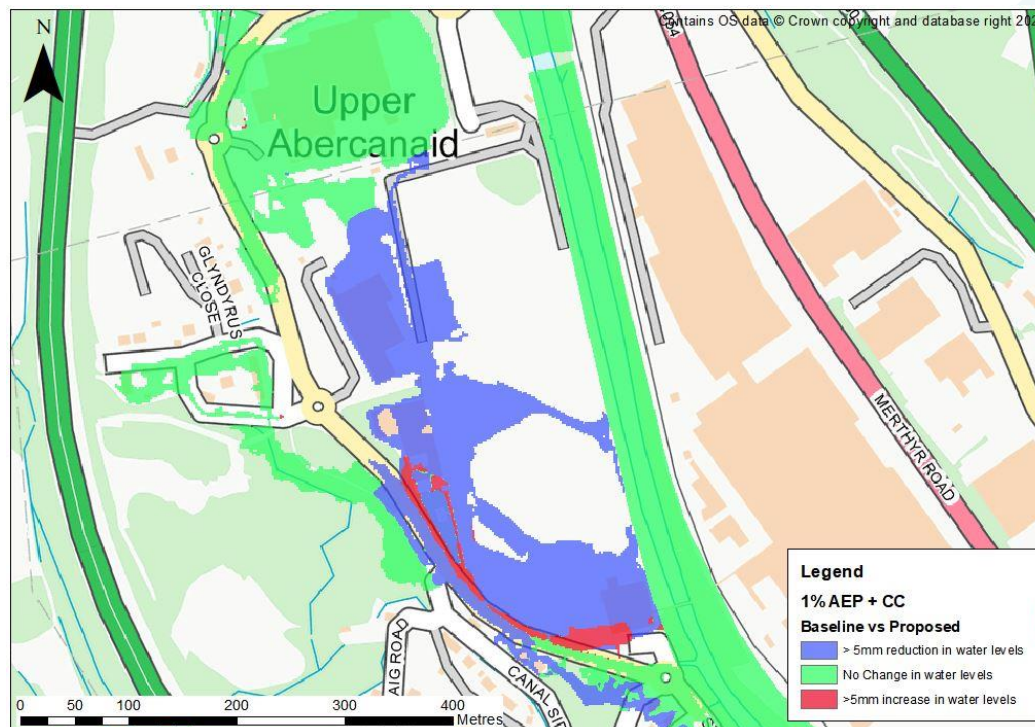


Figure 3-3: Baseline vs proposed 1% AEP plus climate change

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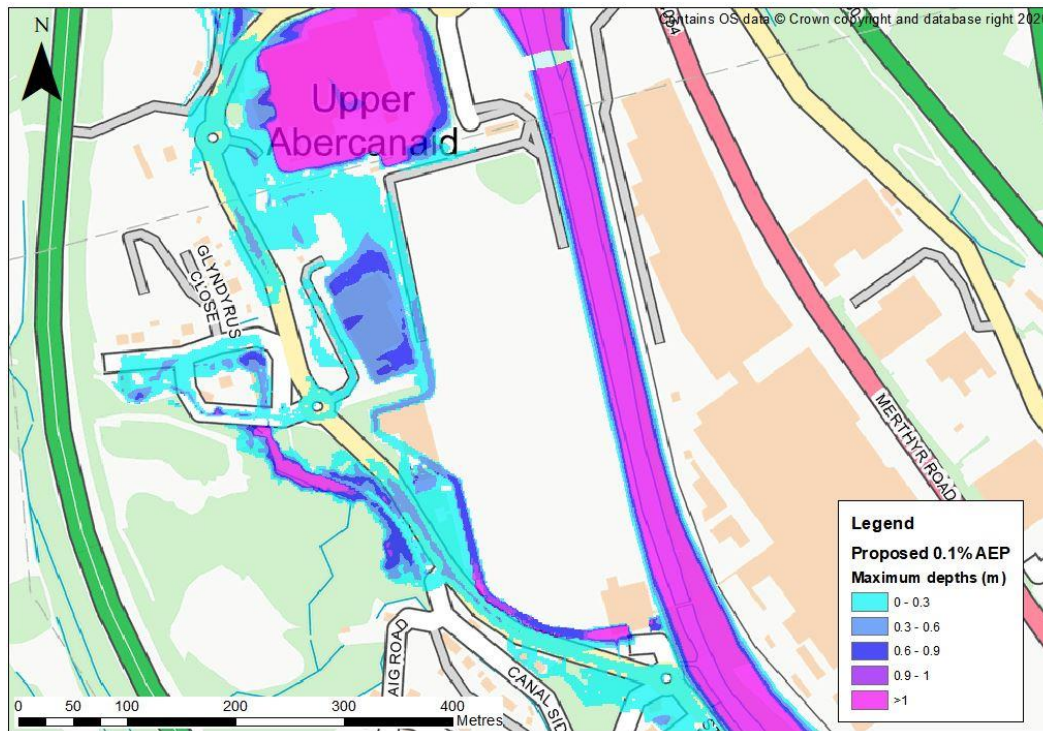


Figure 3-4: Proposed 0.1% AEP maximum depths

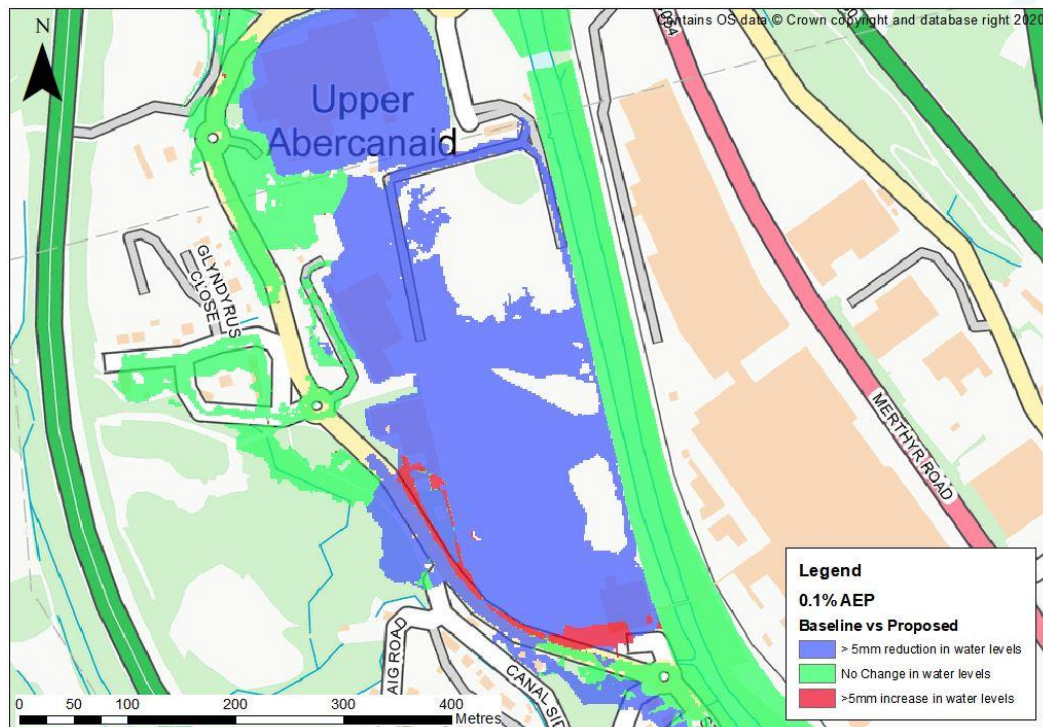


Figure 3-5: Baseline vs proposed 0.1% AEP

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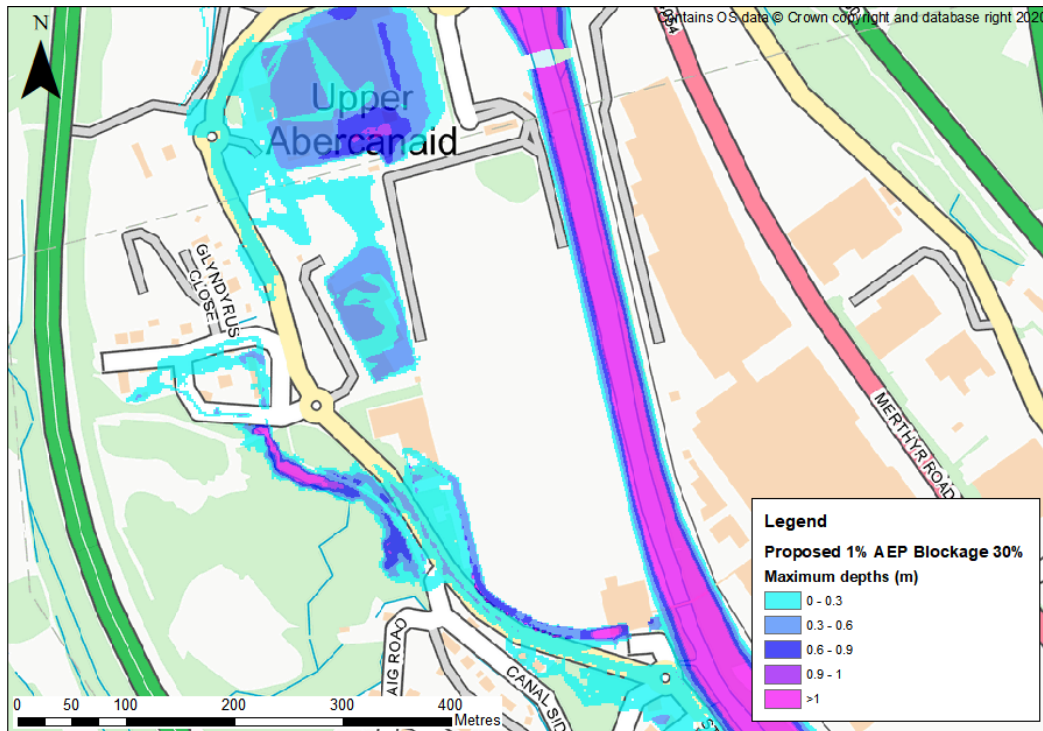


Figure 3-6: Post-development 1% AEP - 30% blockage

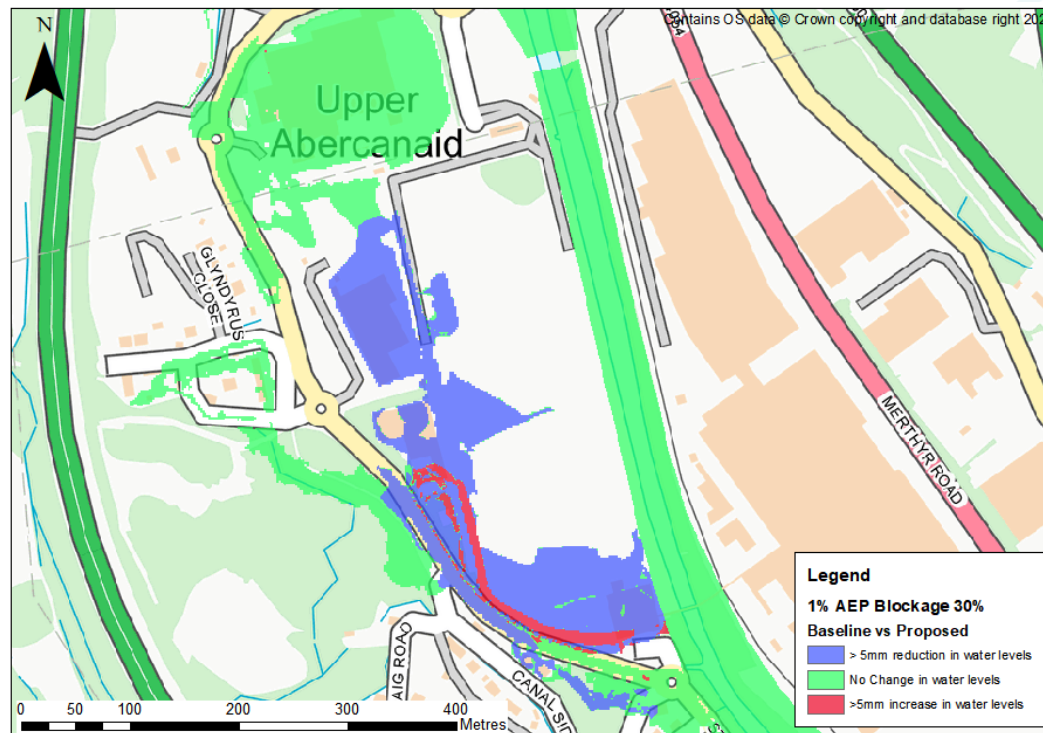


Figure 3-7: 1% AEP 30% blockage depth comparison

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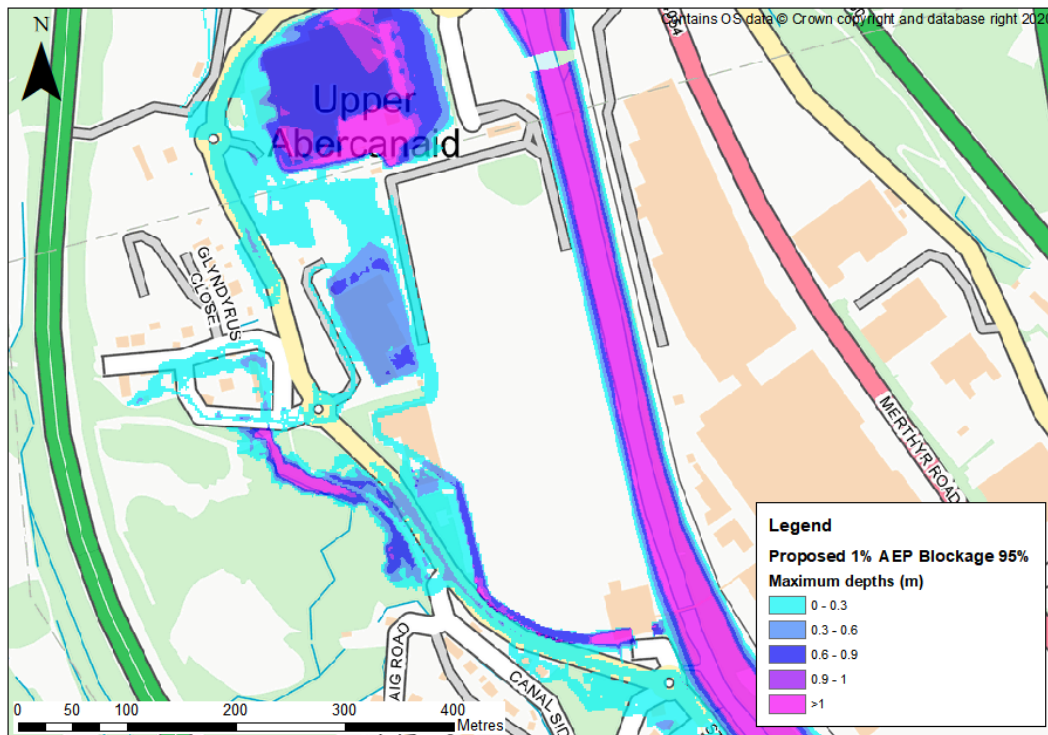


Figure 3-8: Post-development 1% AEP - 95% blockage

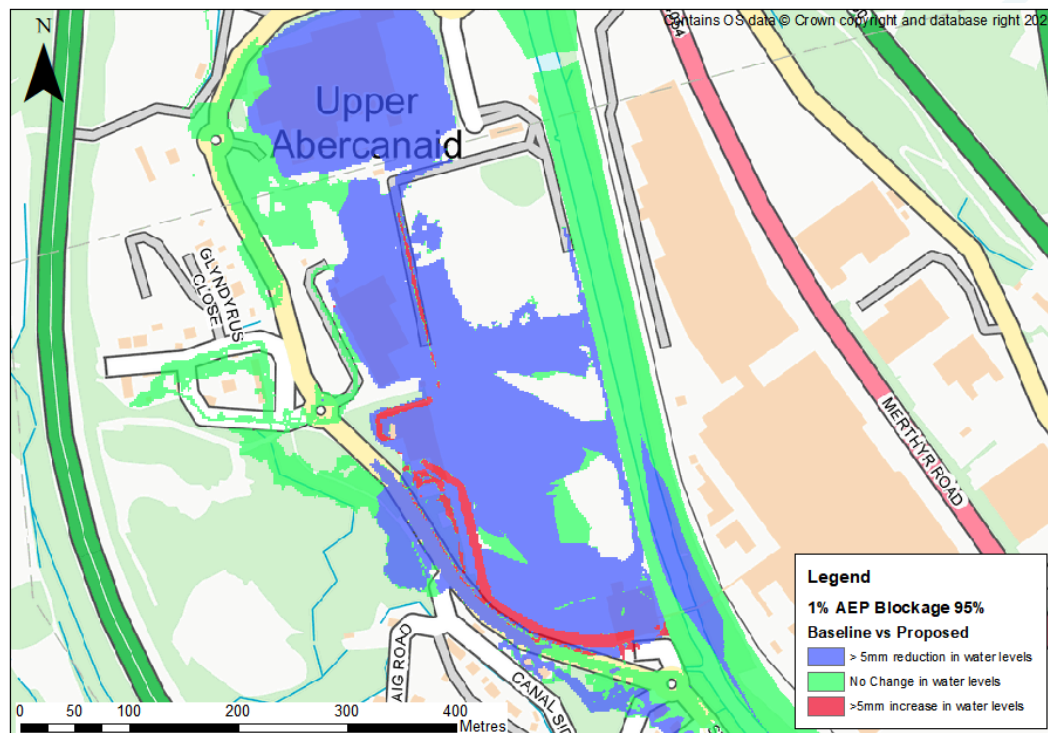


Figure 3-9: 1% AEP 95% blockage depth comparison

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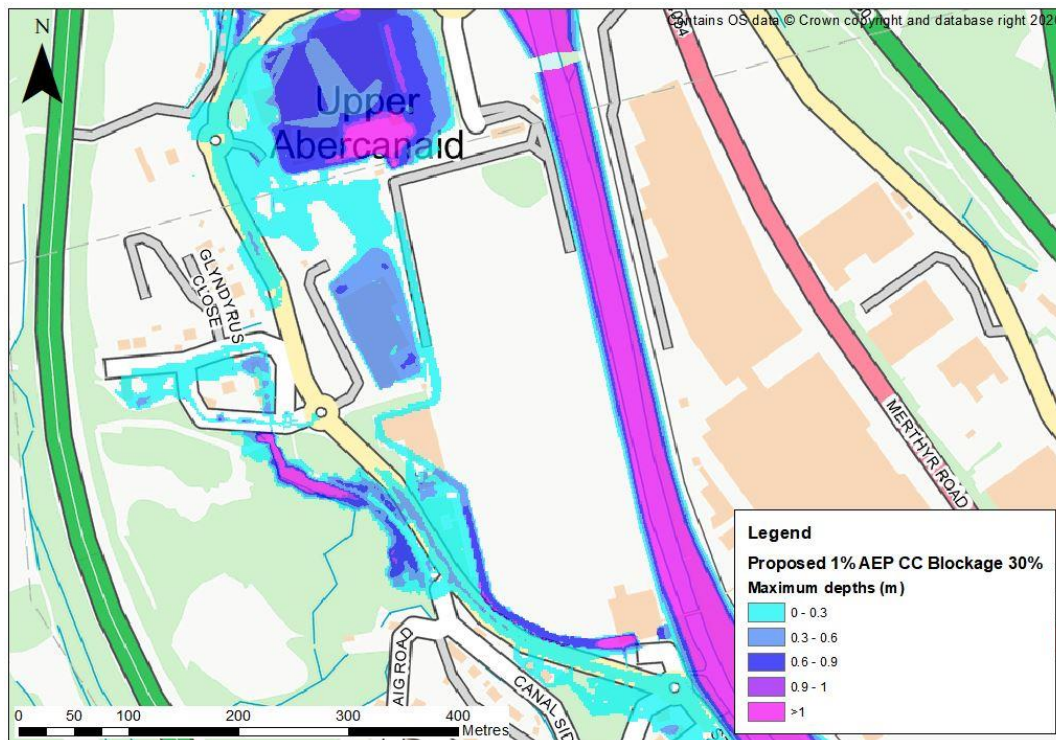


Figure 3-10: Post-development 1% AEP + CC - 30% blockage

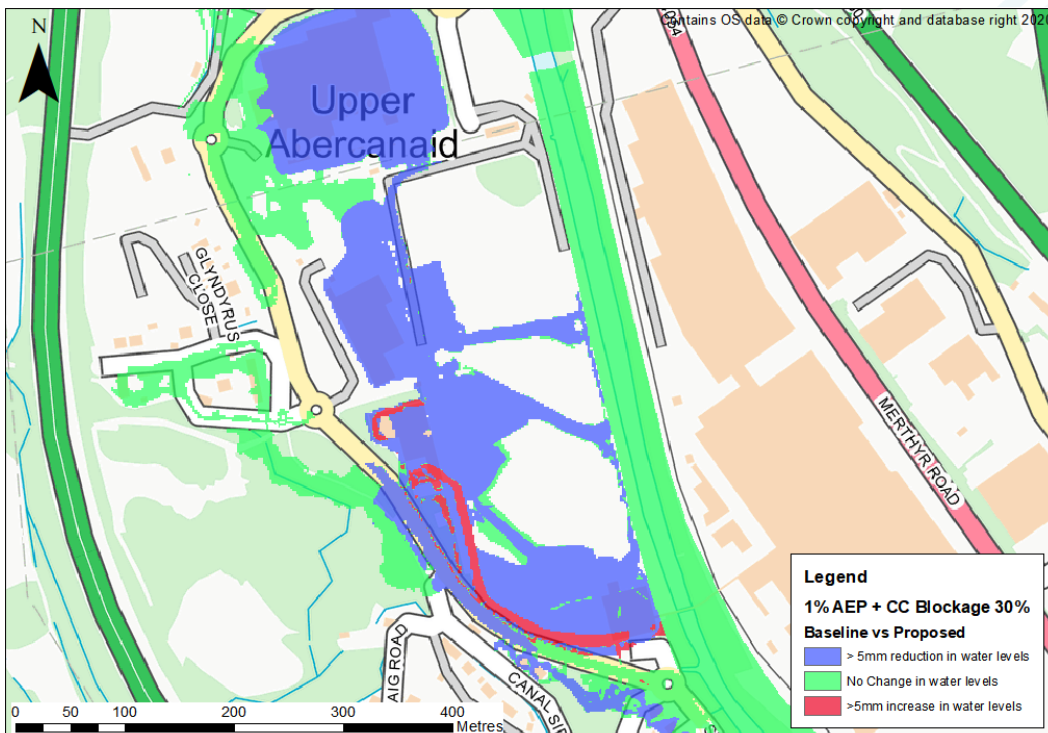


Figure 3-11: 1% AEP + CC 30% blockage depth comparison

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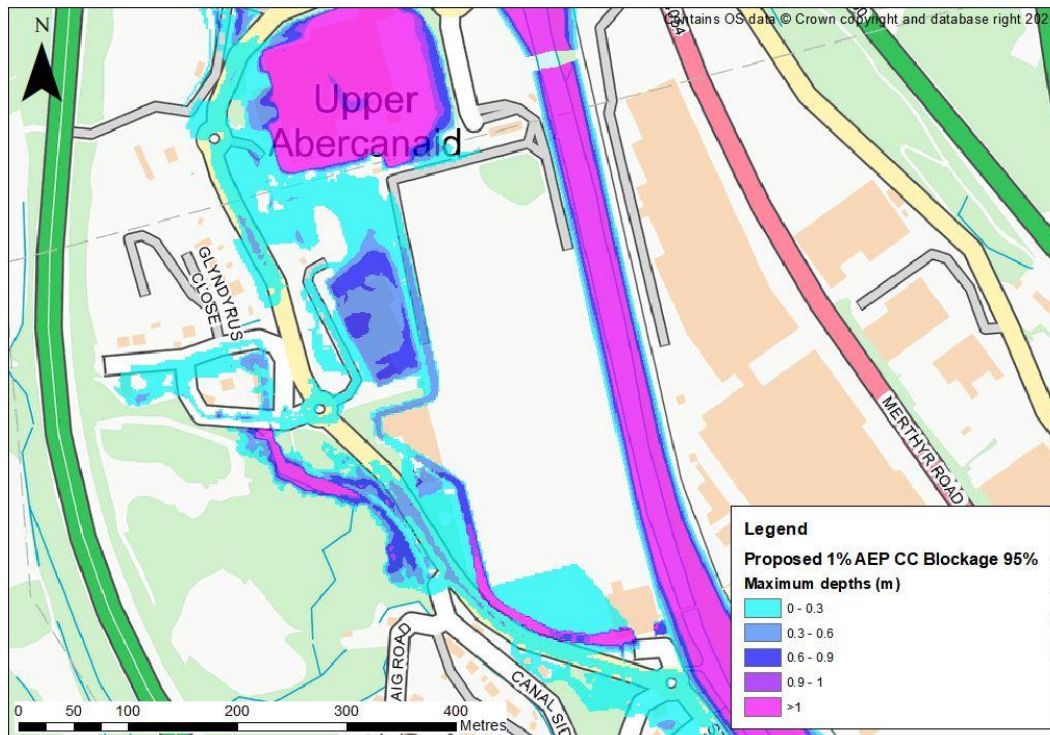


Figure 3-12: Post-development 1% AEP + CC - 95% blockage

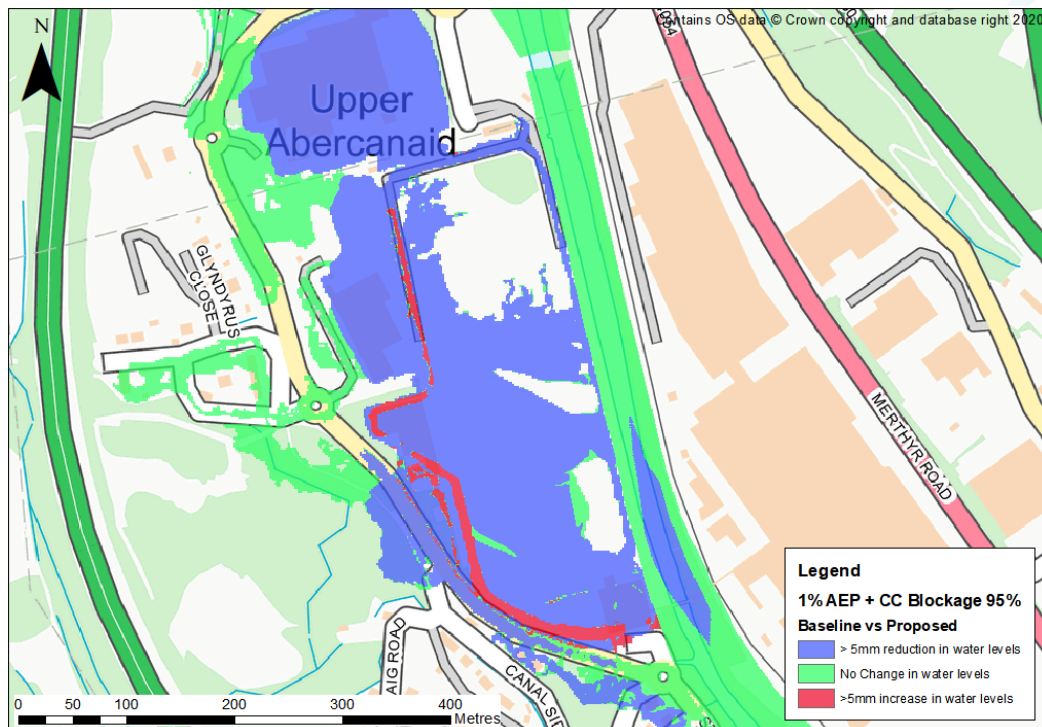


Figure 3-13: 1% AEP + CC 95% blockage depth comparison

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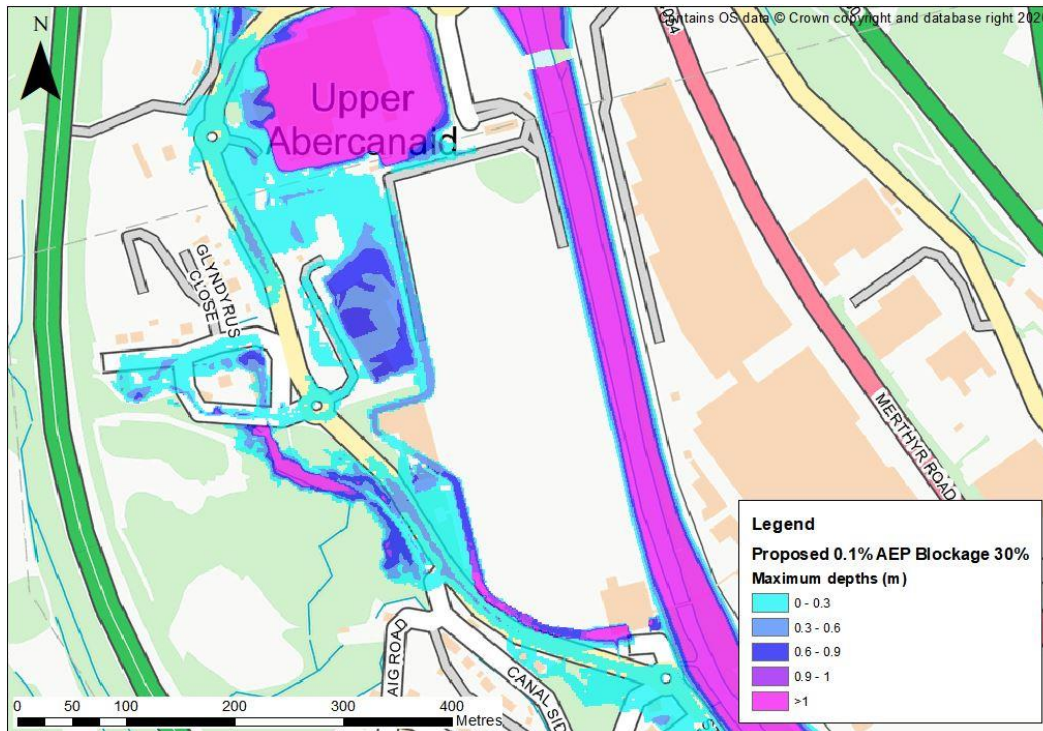


Figure 3-14: Post-development 0.1% AEP - 30% blockage

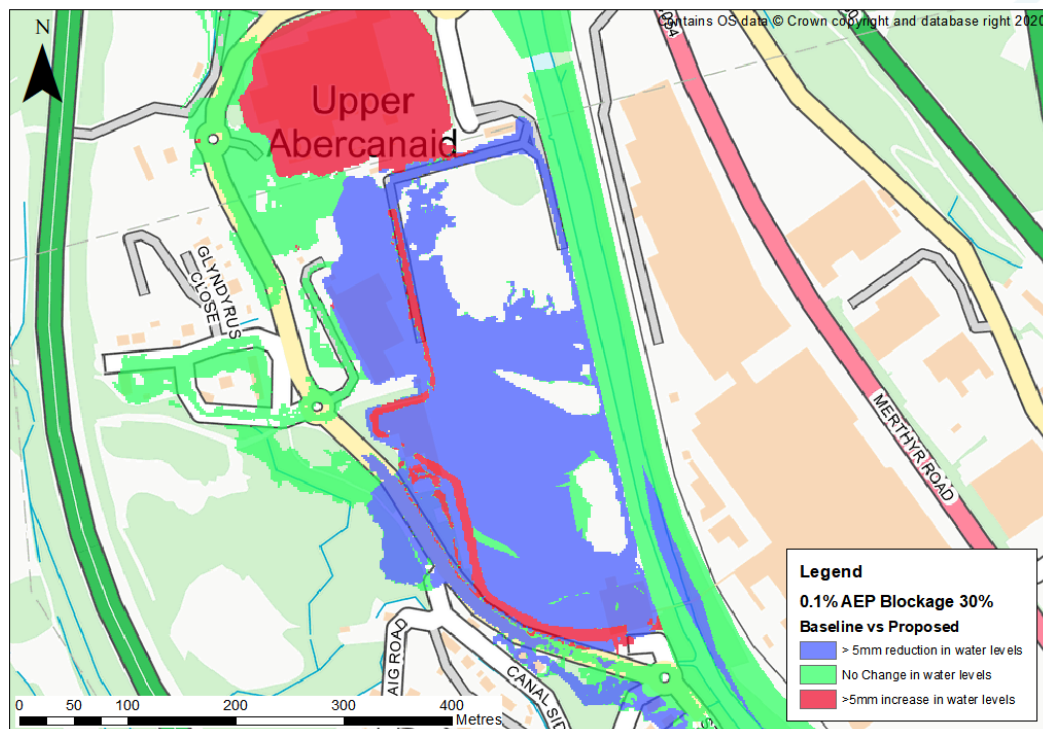


Figure 3-15: 0.1% AEP 30% blockage depth comparison

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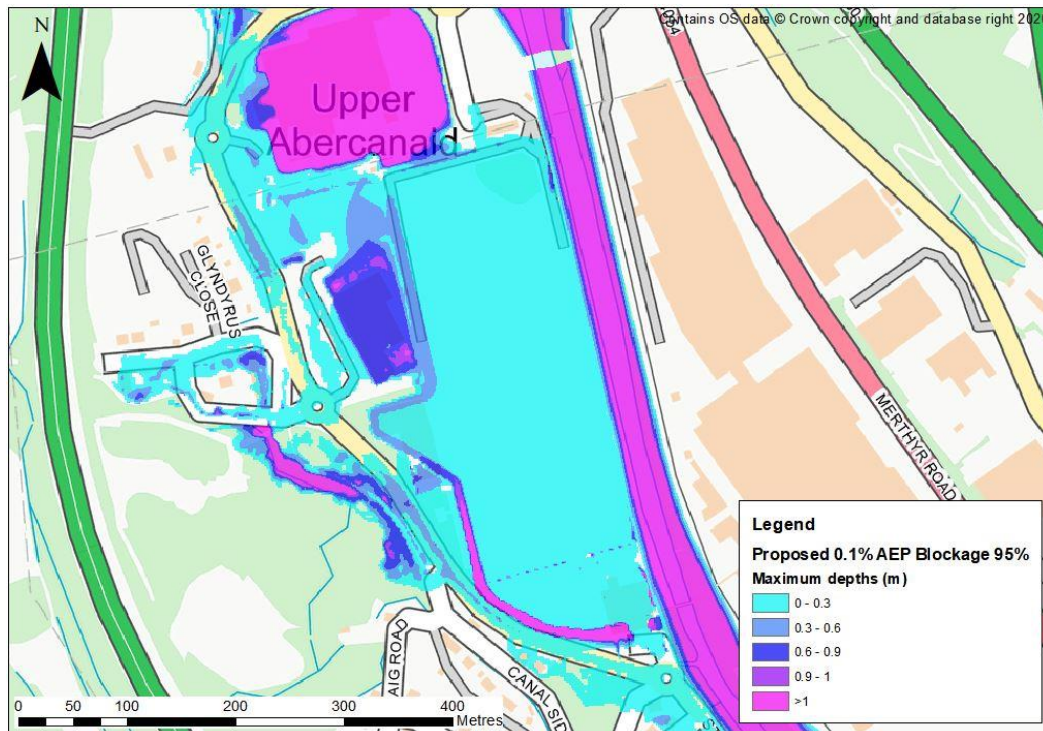


Figure 3-16: Post-development 0.1% AEP - 95% blockage

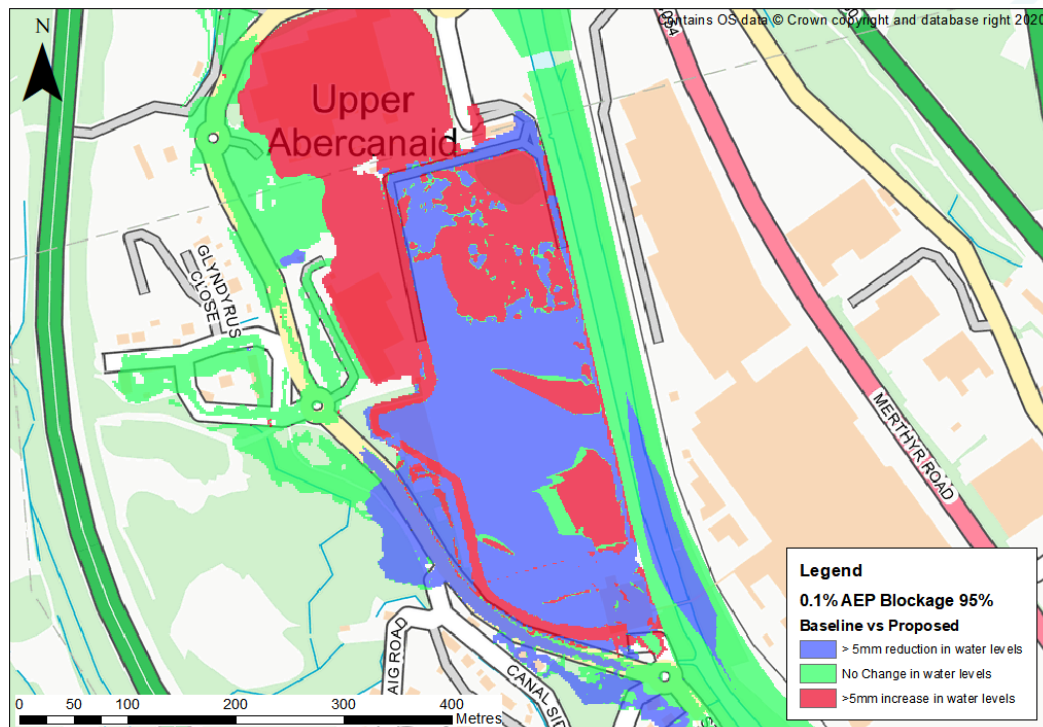


Figure 3-17: 0.1% AEP 95% blockage depth comparison

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4 Conclusion

JBA Consulting were commissioned in September 2019 to prepare a FCA in support of proposed engineering works as part of a flood mitigation strategy at land at Dragon Parc, Abercanaid. Following submission of the planning application, DCWW objected to the scheme on the basis of ground raising above one of their assets.

The ground raising to which DCWW objected was not essential to the flood risk work and therefore the proposal was updated to address their concerns. This was achieved by lowering ground levels in the southern portion of the site and increasing the conveyance capacity of the proposed swale.

The hydraulic model was updated to represent the revised ground profile and run for the design events described in the FCA; 1% AEP, 1% AEP + CC, 0.1% AEP; including 30% and 95% blockage scenarios. As a result of the changes, a reduction in in-channel water levels is predicted, with no changes to the flood extent and modelled water levels outside of the site boundary.