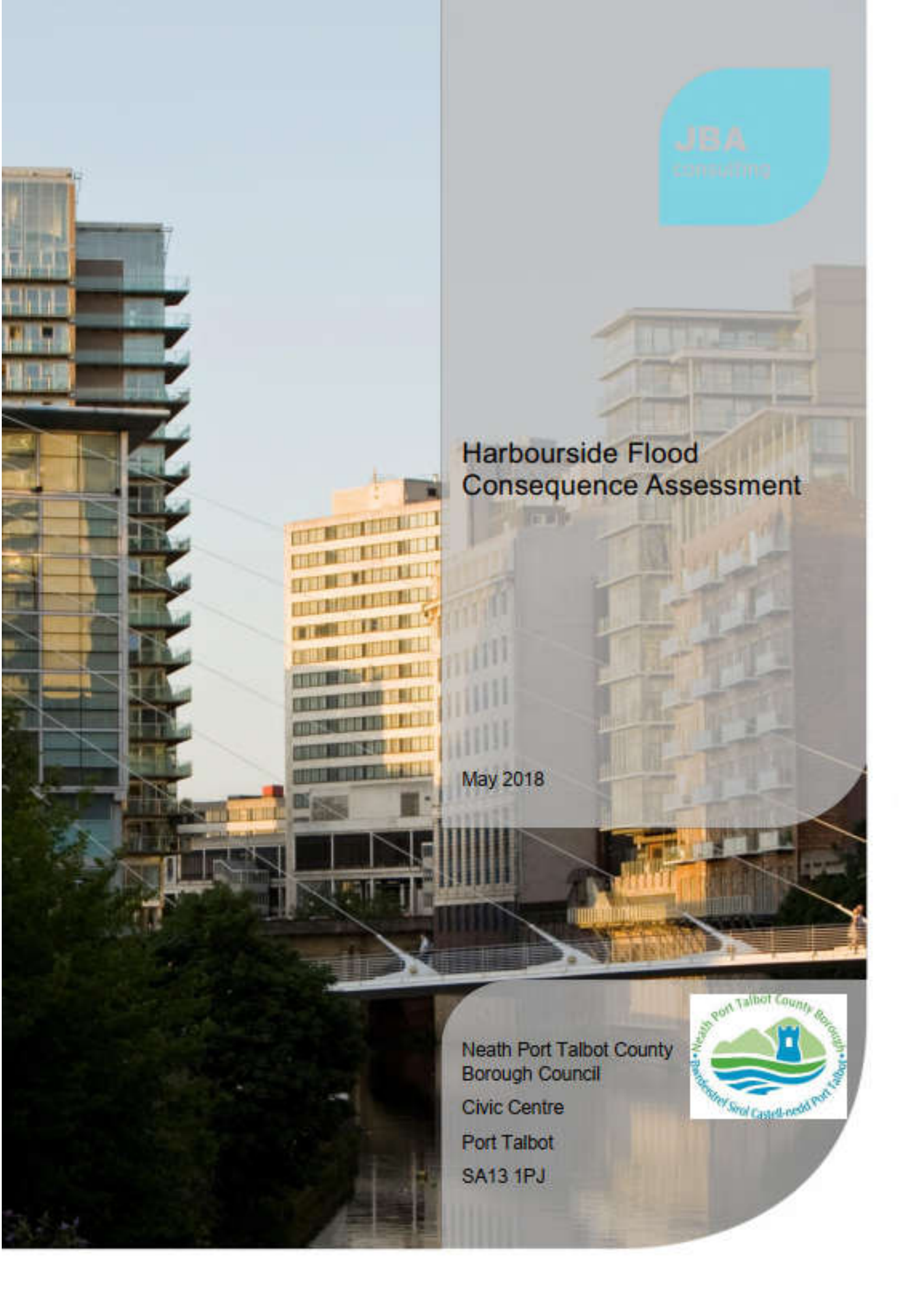


The background of the cover is a photograph of a modern urban scene. On the left, a tall building with a glass facade and balconies is visible. In the center, a bridge with a white railing and a walkway crosses a river. To the right, another modern building with a glass facade and balconies is visible. The sky is a clear, pale blue.

JBA
consulting

Harbourside Flood Consequence Assessment

May 2018

Neath Port Talbot County
Borough Council
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Contract

This report describes work commissioned by Ken Stacey on behalf of Neath Port Talbot County Borough Council, in October 2017. Neath Port Talbot County Borough Council's representative for the contract is Ken Stacey.

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Purpose

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Abbreviations

AEP	Annual Exceedance Probability
DAM	Development and Flood Risk Advice Maps
FCA	Flood Consequence Assessment
LDP	Local Development Plan
NPTCBC	Neath Port Talbot County Borough Council
NRW	Natural Resources Wales
TAN-15.....	Technical Advice Note 15: Development and Flood Risk

1 Introduction

1.1 Terms of reference

JBA Consulting has been commissioned by Neath Port Talbot County Borough Council (NPTCBC) to prepare a Flood Consequence Assessment (FCA) for the proposed development of a portion of the strategic Harbourside regeneration area. This Harbourside regeneration area is located to the south of Port Talbot town centre and north of the docks.

This FCA has been prepared in accordance with Planning Policy Wales and Technical Advice Note 15: Development and Flood Risk (TAN-15).

1.2 FCA requirements

This FCA follows Welsh Government guidance on development and flood risk, as set out within TAN-15. Where appropriate, the following aspects of flood risk will be addressed over the expected lifetime of any potential future development:

- 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 floodwater across the site;
- Overland flood routes;
- The effect of access and egress and infrastructure; and
- The impact of the development in terms of flood risk on neighbouring properties and elsewhere on the floodplain.

2 Harbourside site introduction

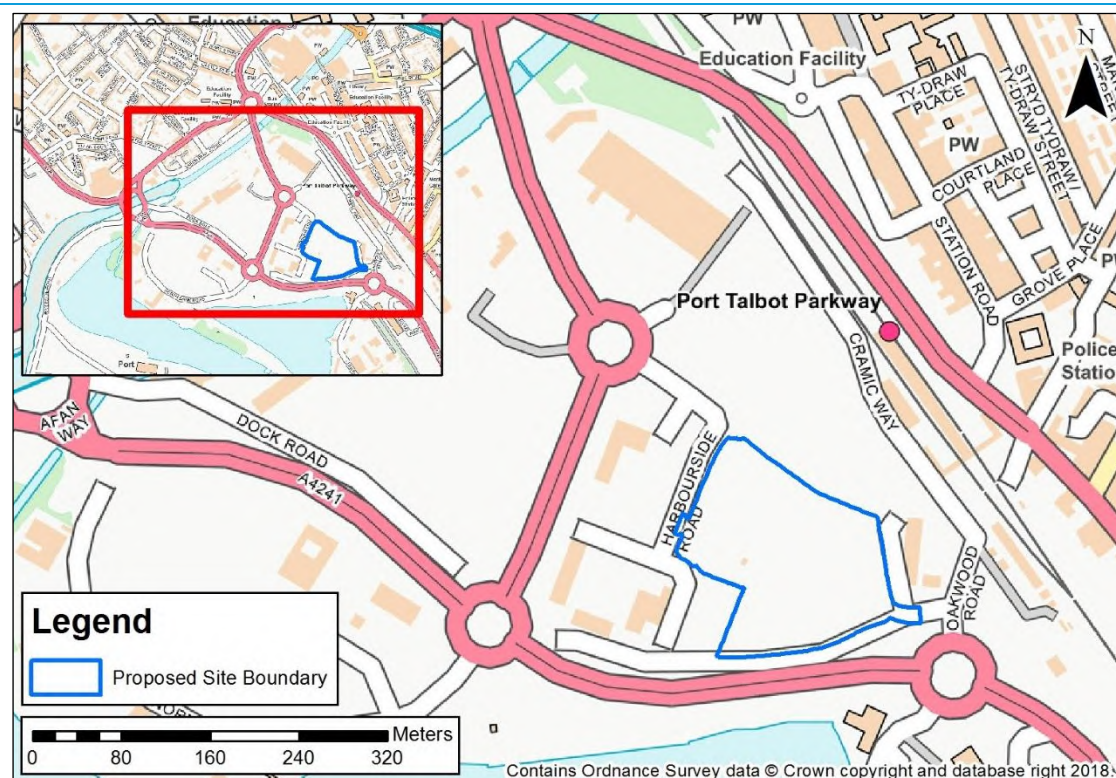
2.1 Site description

The application is for the proposed development of a portion of the strategic Harbourside regeneration area. This Harbourside regeneration area is located to the south of Port Talbot town centre and north of the docks. The proposed development is for an employment site and associated infrastructure.

The site is bound to the south by the A4241, Harbour Way. To the east and west the site is bound by existing development, with a station car park and brownfield site to the north. The location of the site is described in Table 2-1.

Table 2-1 Harbourside site description

Site name	Harbourside
Proposed site area	0.025km ² / 2.5ha
Purpose of development	Strategic development
Existing land-use	Brownfield site, currently undeveloped
OS NGR	SS 765 895
Country	Wales
County	West Glamorgan
Local Planning Authority	Neath Port Talbot County Borough Council
Lead Local Flood Authority	Neath Port Talbot County Borough Council



Harbourside site location map

2.2 Site topography

The topography of the site can be categorised into two distinct areas, as shown in Figure 2-1. The first is an elevated area which lies in the west of the site, in which the topography predominantly slopes from the north to the south with elevations ranging from 8.5-9.3mAOD. The remaining area of the site has a much less defined topography, with elevations ranging from 6.1-7.2mAOD.

As a result of the topography, and surrounding existing development and roads, the site sits in a semi-natural depression in the landscape.

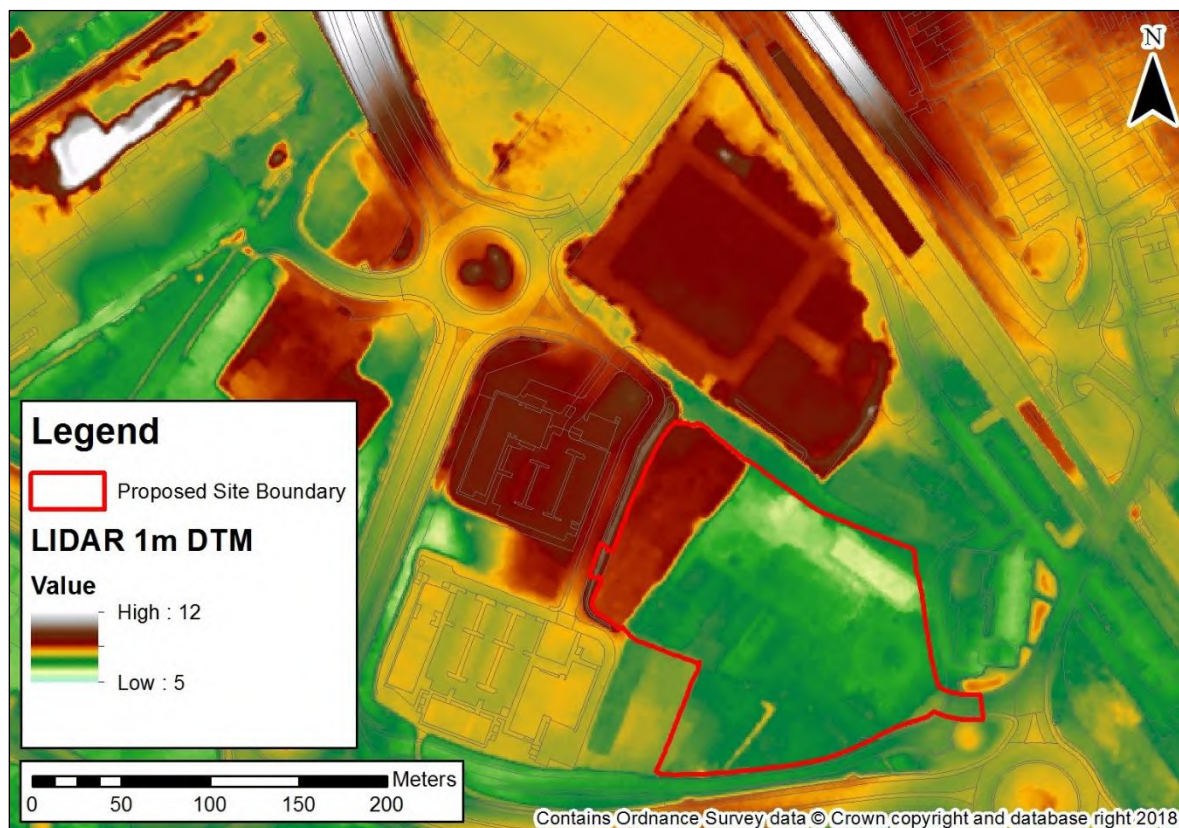


Figure 2-1 Harbourside site topography, as shown by 1m DTM LIDAR

2.3 Site geology and soils

The British Geological Survey (BGS, 2017) Geology of Britain Viewer was consulted to identify the local geological conditions. The full site area is underlain by the South Wales Middle Coal Formation (coal-bearing mudstone and siltstone, with minor sandstones). This is overlain by superficial tidal flat deposits of normally consolidated clay, silt and sand.

The soil on the site is described as loamy and clayey soils of coastal flats which are mostly drained to shallow groundwater, as determined from the Cranfield University (2017) Soilscape Viewer. Although in practice the site is extensively made-ground.

2.4 Watercourses

The proposed Harbourside strategic development site is located in close proximity to Port Talbot Docks, adjacent to Harbour Way which bounds the site to the south. At the southern boundary of the site, the docks are located approximately 60-70m away.

The River Afan is located 380m to the northwest of the site and Ffrwd Wylt 850m to the east. Both watercourses flow in a south-westerly direction, ultimately, into the Severn Estuary. The Ffrwd Wylt discharges into the Port Talbot Docks via a culvert under the A4241 (Harbour Way), before flowing into the Severn Estuary. The River Afan has a Dock Feeder into the docks as well directly discharging into the estuary.

The site is approximately 2km north of the coastline.

2.5 Development proposal

It is proposed to develop the site for employment use, with the current application relating to the preparation of former brownfield land, construction of an access road and upgrading of existing highway to adoptable standards within the Harbourside strategic employment site. This will enable future development and make the land viable for future employment and business opportunities.

Figure 2-2 shows the application site extracted from NPTCBC's masterplan for the Harbourside Strategic Employment Site. The full masterplan is contained within Appendix A.

The Harbourside Strategic Employment Site will provide land for small scale industrial and office users maximising the advantage of proximity to the town centre and excellent transport links.

Regeneration of the Harbourside Strategic Employment Site will be the catalyst for the redevelopment of the town's former docks quarter improving the attractiveness of the area and will create a new business hub. The development will attract further private investment to help drive employment growth and increase the availability and accessibility of sustainable employment opportunities, maximising job creation for all.

The current application is for the site to be levelled to 7.5mAOD. Consequently, much of the site will be ground raised, although an area to the west will be lowered. A total of six buildings are proposed, with a 200mm property threshold. A proposed access through road will run through the site, linking Harbourside Road and Oakwood Road. This proposed road will generally slope from the west to the east, as to tie into the topography of the adjoining highways. Additionally, a new drainage network will run from the south of the site directly into the docks, through a three 1m by 1.5m culvert pipes under the A4241 (Harbour Way) which feed into the docks via a section of open channel. This final design has been developed to ensure the flood risk is appropriately managed. The flood relief culvert designs are provided in Appendix B.

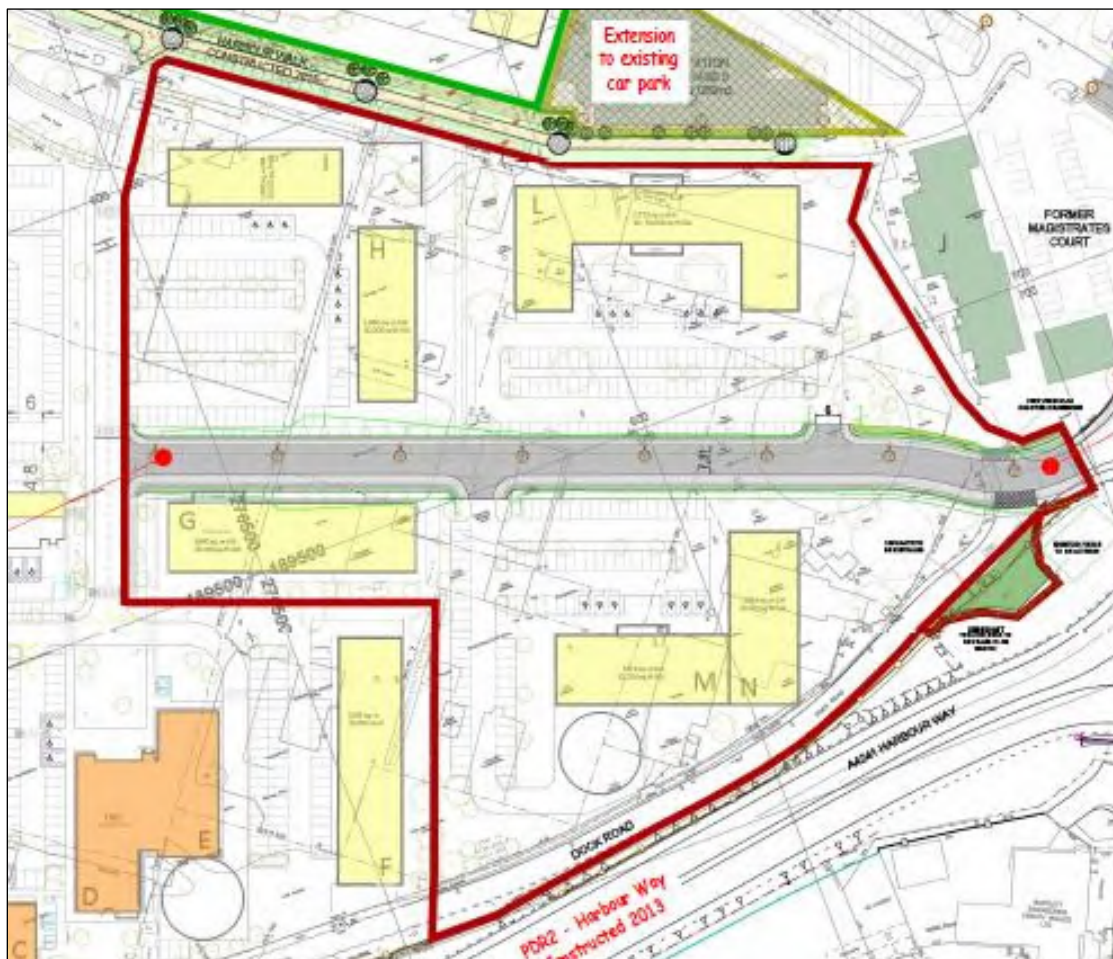


Figure 2-2: Extract of Harbourside masterplan provided by NPTCBC

2.6 Review of existing flood risk data

A review of the existing data on flood risk has been undertaken. This information has been collated from the NPTCBC Local Flood Risk Management Strategy (2013) and publicly available data from NRW. Table 2-2 summarises these high-level findings.

Table 2-2 Summary of the flood risk to the Harbourside site based on existing flood risk data

Source of flooding	Onsite presence	Description
Fluvial (undefended)	✓	The site is located in Flood Zones 1, 2 and 3. The site is afforded some protection by the NRW flood defences on the Afan although the area is not formally designated as being in an Area Benefitting from Defences due to the flood risk from the Ffrwd Wylt.
Tidal (undefended)	✗	The site is not at risk of tidal flooding.
Surface water	✓	The site is generally subject to very low to medium risk of surface water flooding, although localised areas of greater risk are present due to its current topography.
Reservoirs	✓	There is a risk of reservoir failure in the southern area.
Groundwater	✗	The site is at low risk of flooding from groundwater.
Canals	✗	The site is not at risk of flooding from canals.
Sewers	✗	The site is at low risk of flooding from sewers.

2.6.1 Undefended fluvial and tidal flood risk

Figure 2-3 shows NRW Flood Zones 2 and 3 (the Flood Map) for the Harbourside site. NRW attribute data confirms that this flooding is entirely fluvial in nature.

The site is generally located within Flood Zone 3, meaning that the site is predicted to flood in a 1% AEP or more frequent fluvial event. However, the west of the site is categorised within Flood Zone 1, located at a higher topographic elevation, meaning that this area of the site is at risk of flooding in less frequent events than the 0.1% AEP event. There is a narrow buffer of land between these two designations which is within Flood Zone 2, and thus is predicted to flood in events less frequent than the 1% AEP fluvial event. All flooding in the study area is attributed to fluvial risk from the River Afan and the Ffrwyd Wylt.

It should be stressed that the Flood Map shows estimates of flood risk without the presence of flood defences, and thus does not account for any reduction in flood risk afforded by the NRW River Afan flood defences throughout Port Talbot.

A detailed assessment of actual (defended) fluvial flood risk to the site is provided in Section 4.

The site is not at risk from tidal flooding in even the most extreme 0.1% AEP plus climate change event.

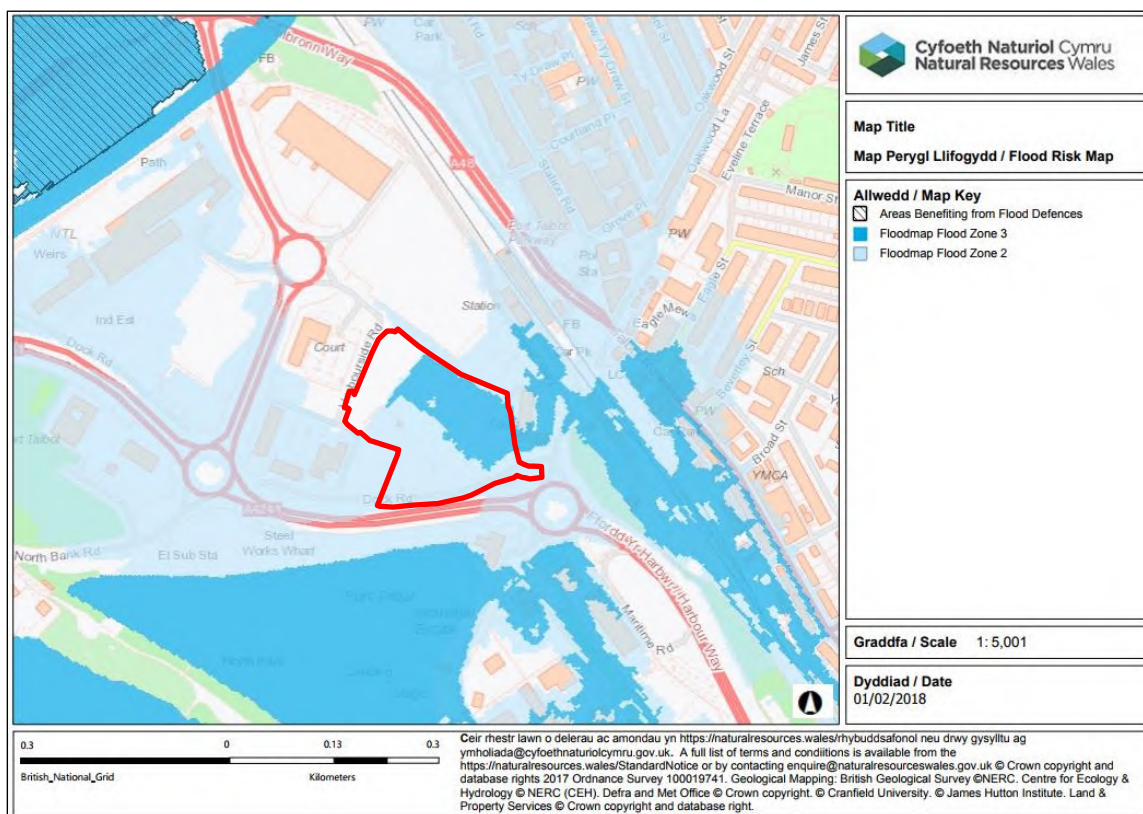


Figure 2-3 NRW Flood Zone mapping for the Harbourside site and the surrounding area (NRW, 2018)

2.6.2 Surface water flood risk

The Harbourside site can be split into two main areas in regards to the risk of flooding from surface water. The west of the site is generally at very low risk of surface water flooding due to its elevated topography. However, the majority of the site, at lower topographic elevations, is at some risk of surface water flooding. This risk is typically low to medium risk, although localised areas of high risk of flooding are present. This distribution of surface water flood risk is shown in Figure 2-4.

The development proposals are likely to alter the rate and volume of surface runoff, due to the increased area of impermeable surfaces, and thus may alter the category of risk applied within the site. However, the development proposal will incorporate topographic changes and mitigation measures to appropriately manage to risk of surface water flooding.

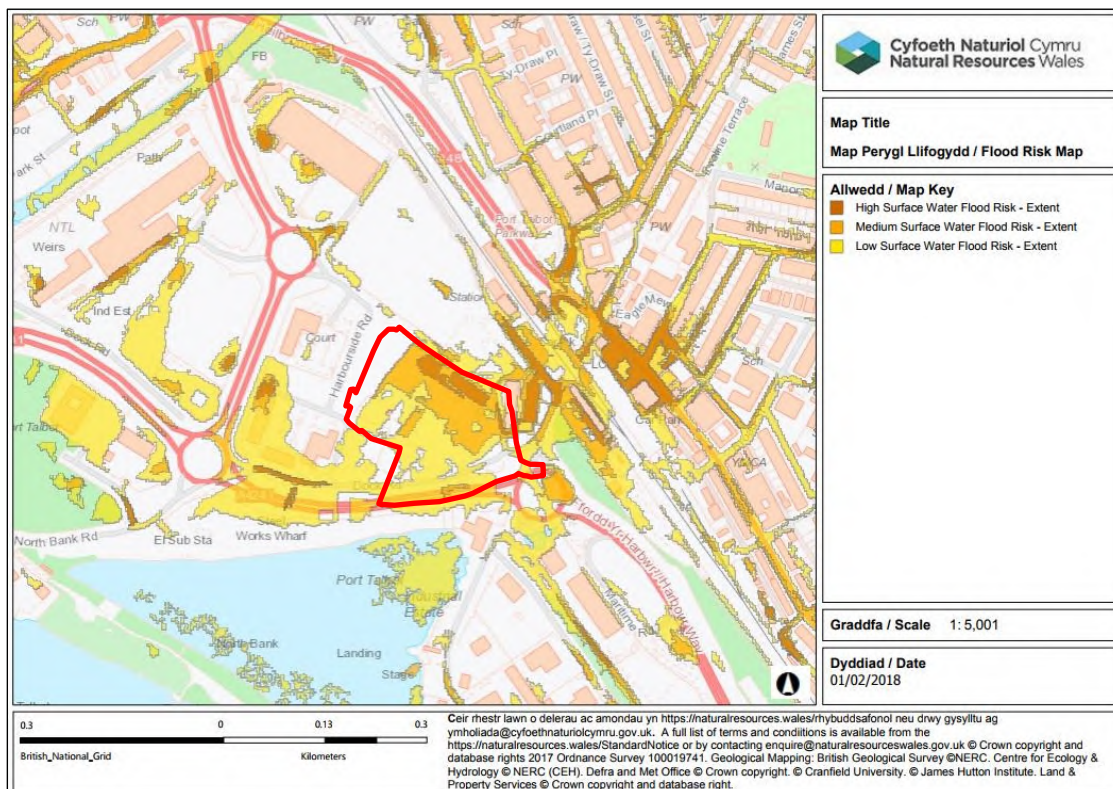


Figure 2-4 Surface water flood risk to the Harbourside site and the surrounding area (NRW, 2018)

2.6.3 Risk of flooding from reservoirs

NRW flood risk mapping suggests that the majority of the site is at risk of flooding as a result of a catastrophic failure of the Cwmwernderi Reservoir. Should this exceptionally improbable event occur relatively shallow flooding of the site is predicted by NRW mapping, as shown in Figure 2-5.

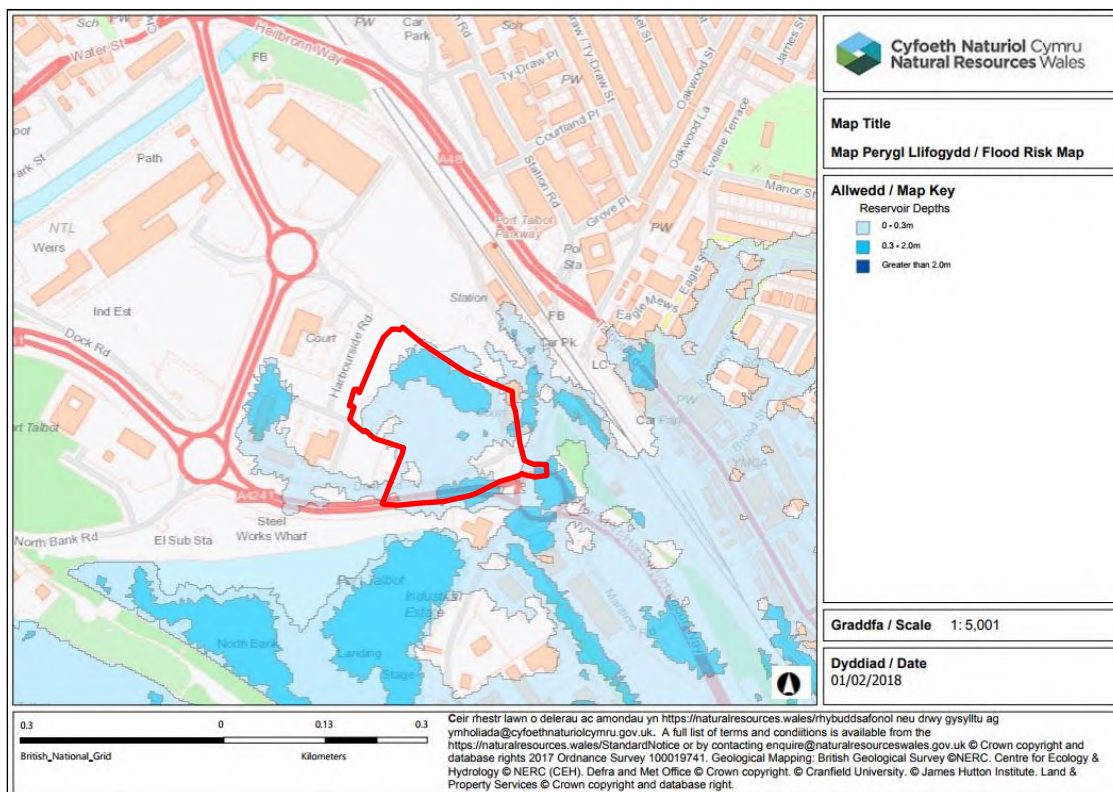


Figure 2-5 Reservoir depths associated with the risk of flooding as a result of reservoir failure (NRW, 2018)

2.6.4 Risk of flooding from groundwater

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

The Neath Port Talbot County Borough Council (NPTCBC) Local Flood Risk Management Strategy (2013) states that “*Historically, there are no specific areas of groundwater flooding recorded in the Neath Port Talbot area.*”

From the information above, and our knowledge of the site, the risk of groundwater flooding is assessed to be low.

2.6.5 Risk of flooding from canals

There are no canals in the surrounding area of Port Talbot, Baglan Moors, or within the River Afan catchment. The nearest canal is the Neath Canal to the west of Briton Ferry and Neath, which is situated approximately 6.5km to the north-east of the site. Therefore, the Harbourside strategic development site not at risk of flooding from canals.

2.6.6 Risk of flooding from sewers

Flood risk from sewers is a result of excess surface water within the sewer drainage network. The NPTCBC Local Flood Risk Management Strategy (2013) states that 430 sewer events have been recorded by Dŵr Cymru Welsh Water. However, no sewer flooding issues are associated within the Harbourside area.

2.6.7 Flood history

Table 2-3 provides information on any historical records of the Harbourside strategic development site flooding, assessed with data obtained from NRW flood risk mapping and the NPTCBC Local Flood Risk Management Strategy (2013).

Table 2-3 Historical flood records for the Harbourside site

Source of flooding	Onsite flooding records	Description
Fluvial	x	There are no known records of fluvial flooding affecting the site, based on NRW historical records.
Tidal	x	The site is not at risk of tidal flooding.
Surface water	x	There are no known records of surface water flooding affecting the site.
Reservoirs	x	There are no known records of flooding as a result of reservoir failure affecting the site.
Groundwater	x	There are no known records of groundwater flooding affecting the site.
Canals	x	The site is not at risk of flooding from canals.
Sewers	x	There are no known records of sewer flooding affecting the site.

3 Planning policy

3.1 Welsh Government development and flood risk

Planning Policy Wales identifies flood risk as a material consideration in land-use planning. This is supported by Technical Advice Note 15: Development and Flood Risk (TAN-15) which provides advice on matters including the use of Development Advice Maps (DAM) to determine flood risk issues, how to assess the flooding consequences of proposed development and action that can be taken through development plans and development control (management) procedures to mitigate flood risk when planning for new development.

TAN-15 assigns one of three flood risk vulnerability classifications to development, these are: emergency services, highly vulnerable development, and less vulnerable development. Emergency services incorporates all developments which need to be operational and accessible at all times, for example hospitals and buildings used to provide emergency shelter during floods. Highly vulnerable development includes all residential properties and a select list of industrial development (including power stations) and waste disposal sites, with less vulnerable development comprising of all other types of development. Due to the general employment development nature of the proposed development, the Harbourside strategic development site is categorised as **less vulnerable development**.

Figure 3-1 presents Welsh Government's DAM. The DAM is used to attribute different planning actions based on a precautional assessment of flood risk. This shows the Harbourside site to be situated within Zones B and C1.

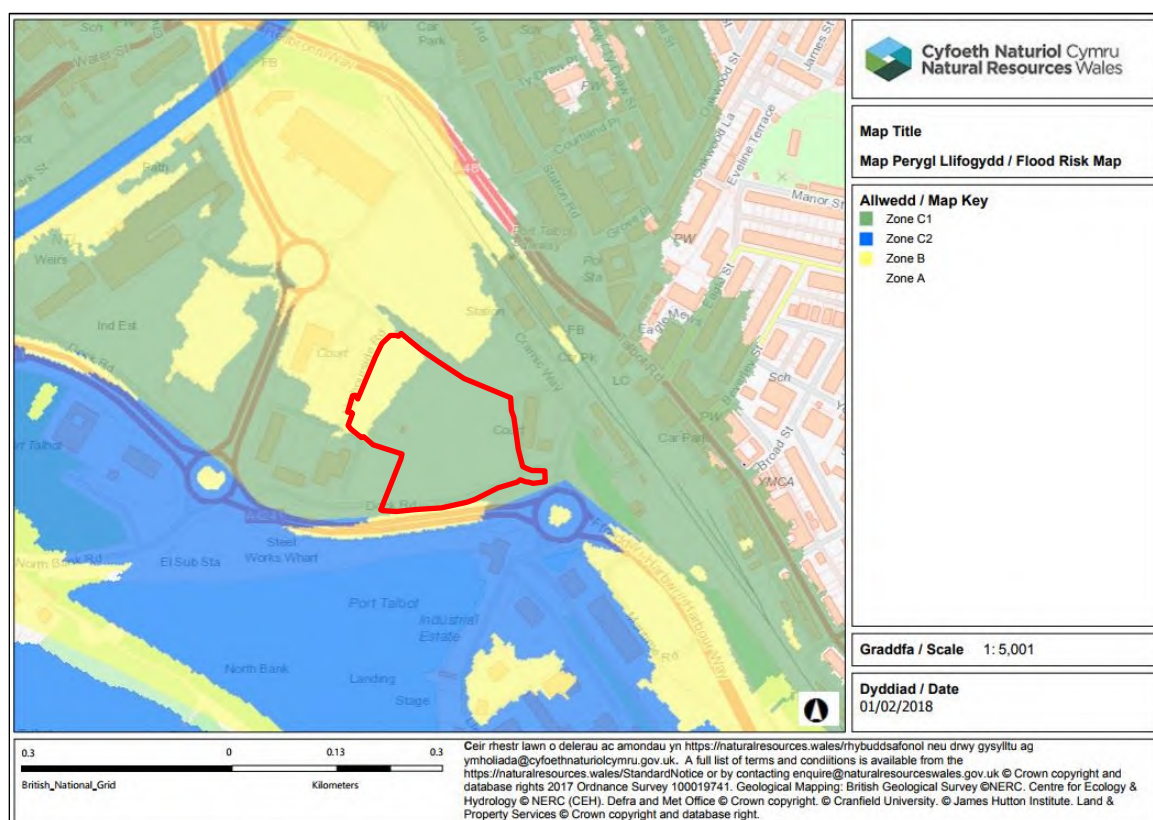


Figure 3-1 Welsh Government Development Advice Map for the Harbourside site (NRW, 2018)

Flood Zone B identifies areas which have sedimentary deposits as indicating evidence of previous flooding. TAN-15 states that this forms a precautionary approach in which maximum water levels for the 0.1% AEP event should determine whether or not an FCA is required.

Flood Zone C1 categorises areas described as areas in the floodplain which are "served by significant infrastructure". TAN-15 states that development may occur in Zone C1, providing the proposal satisfies the requirements of the Justification Test, including the acceptability of consequences.

3.2 Local planning context

The Local Development Plan (LDP) is a land use document in which the NPTCBC sets out its land use development aspirations over a 15-year period. The current LDP, entitled 'Neath Port Talbot County Borough Council Local Development Plan (2011-2026)' was adopted by NPTCBC in January 2016.

The site is location in Harbourside, Port Talbot, and has been identified as an area which will "provide major regenerative effects to Port Talbot". NPTCBC wish to realise the diverse potential opportunities for sustainable economic development in the area, highlighting Harbourside as one of the key regeneration areas in which to transform "underused and unsightly former industrial land". Redevelopment of the Harbourside area will "increase resilience of the areas and [the ability] to complete more effectively with out of town and regional centres".

The site is included within the Harbourside Strategic Regeneration Areas (SRA2), under the Coastal Corridor Strategic Area, which will provide opportunities for large scale redevelopment and regeneration of brownfield sites over the LDP period and beyond. SRA2 is for mixed-use development of brownfield, former docklands site. The site of interest has been designated within a strategic employment site, and thus the proposed development is contained within the scope of the LDP. This development will adhere to Policy SP 11 which focuses on economic growth of the Coastal Corridor Strategic Area: "new and expanding employment developments will be encouraged, [allocating] 96 hectares of land for employment... to meet economic development and employment needs". The development of this site will facilitate further development and growth within Harbourside.

3.3 Justification test

TAN-15 states all development types may be considered in Flood Zones C1 of the DAM, subject to satisfying the requirements of the Justification Test, including the Acceptability of Consequences. A development will be justified if it can be demonstrated that:

1. Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement;
- or**
2. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;
- and**
3. It concurs with the aims of Planning Policy Wales and meets the definition of previously developed land;
- and,**
4. The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable.

This Justification Test for the proposed site has been undertaken, with the results summarised in Table 3-1. All of the criteria have been satisfied for the proposed development.

Table 3-1 Justification Criteria assessment for the Harbourside strategic development site

TAN-15 Justification Criteria	Comments	Achievable?
<i>Should be located only in an area of flood risk which is developed and served by significant infrastructure, including flood defences (Zone C1 of the DAM)</i>	The site is designated within Zones B and C1 of the DAM.	✓
<i>Its location is necessary to assist a local authority regeneration initiative or strategy, or contribute to key employment objectives, necessary to sustain an existing settlement or region</i>	The Harbourside site is to be part of a strategic employment site to meet the aims of the LDP (See Section 0).	✓

<i>The site meets the definition of previously developed land (i.e. it is not a Greenfield site) and concurs with the aims of Planning Policy Wales (i.e. the presumption in favour of sustainable development)</i>	The site is a brownfield site, and has previously been developed. ✓
<i>A Flood Consequence Assessment has been produced to demonstrate that the potential consequences of a flood event up to the extreme flood event (1 in 1000 chance of occurring in any year) have been considered and meet the [Acceptability Criteria] ... in order to be considered acceptable</i>	This report provides a thorough FCA, which will be provided and discussed with the Local Planning Authority and NRW. See Section 4 for a detailed assessment of the fluvial flood risk to the site. This demonstrates that the proposed development satisfies the Acceptability Criteria. ✓

4 Detailed Assessment of Fluvial Flood Risk

4.1 Flood model

JBA Consulting has undertaken many recent improvements to the flood modelling of Port Talbot. In September 2016, JBA Consulting was commissioned by NPTCBC to undertake a comprehensive flood modelling exercise for all of Port Talbot. Under this project, a unified detailed flood model of Port Talbot was developed, based upon the 2010 model developed by Hyder Consulting for NRW. A range of 1D and 2D model elements were updated upon review of the existing model. These include: updated hydrology, construction of a new 1D-2D model element for Baglan Brook and Ffwrdd Wyllt, and incorporation of new survey data for Port Talbot town centre, Baglan Brook and Ffwrdd Wyllt. Full details on these model updates are available from NPTCBC and NRW.

The updated Port Talbot flood model was thoroughly reviewed and accepted by NRW in July 2017. Consequently, this model has formed the basis of the baseline model for the assessment of flood risk to the Harbourside site. Nonetheless, the following changes have been made specific to this study:

- Updated the TUFLOW version to the latest 2017-09-AC;
- Inclusions of the operation of the Seaway Parade pumping station, as recommended by NRW;
- Inclusion of the proposed development schematisation (ground levelling, access through road, buildings, and culvert and channel sections between the site; and
- Updated initial conditions of the model to account for the above changes.

The updated fluvial flood model results are presented in the following sections.

4.2 Pre-development fluvial flood risk

The detailed modelling of fluvial flood risk at the Harbourside site includes the presence of formal NRW flood defences along the River Afan throughout Port Talbot. Due to these defences, the actual flood risk within Port Talbot differs to the 'undefended' NRW Flood Map.

The 1% AEP plus climate change and the 0.1% AEP events required by TAN-15 are presented in Figure 4-1 and Figure 4-2 respectively. During both events, the western portion of the site remains flood free, although the majority of the site is at risk of flooding in both key events. During the extreme 0.1% AEP event, flood depths are predicted to exceed 1.5m within the site boundary. Therefore, in the current conditions, only the western part of the site is compliant with all aspects of the Acceptability Criteria set out in TAN-15.

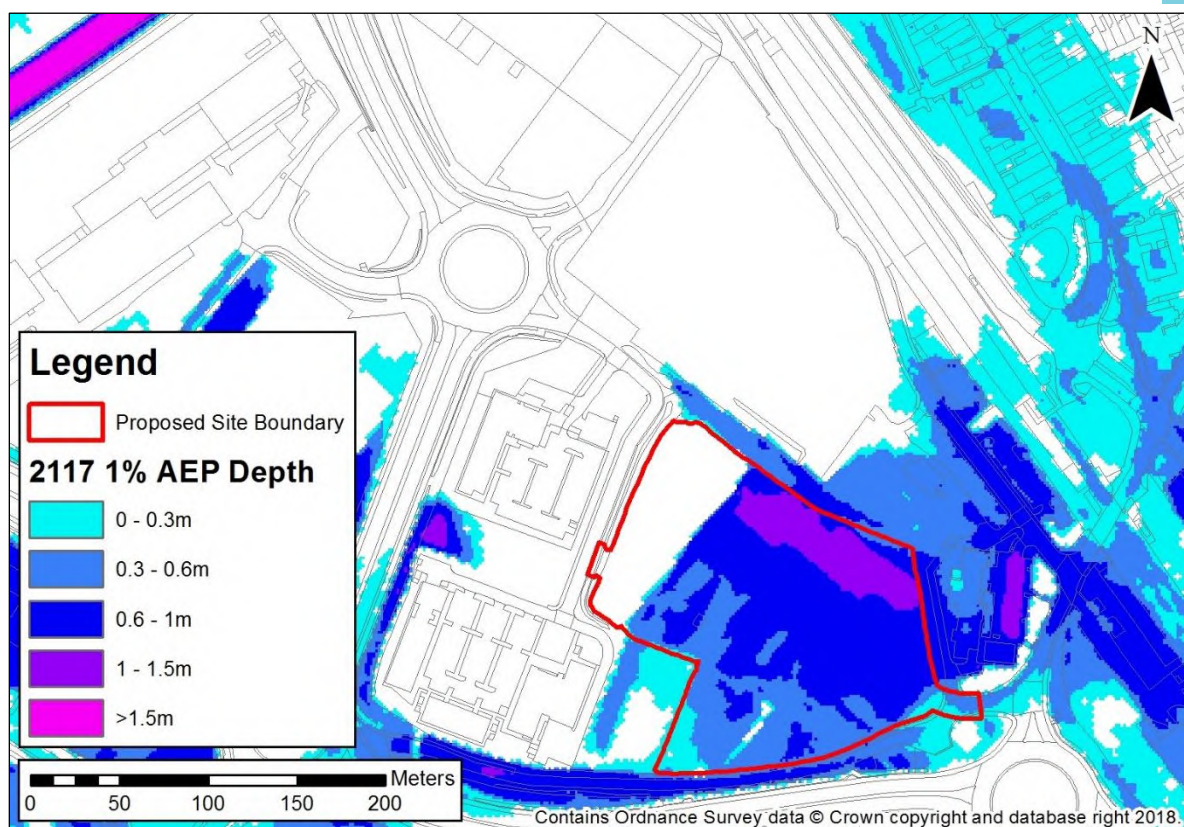


Figure 4-1 Maximum flood depths for the 1% AEP plus climate change fluvial event at the Harbourside site

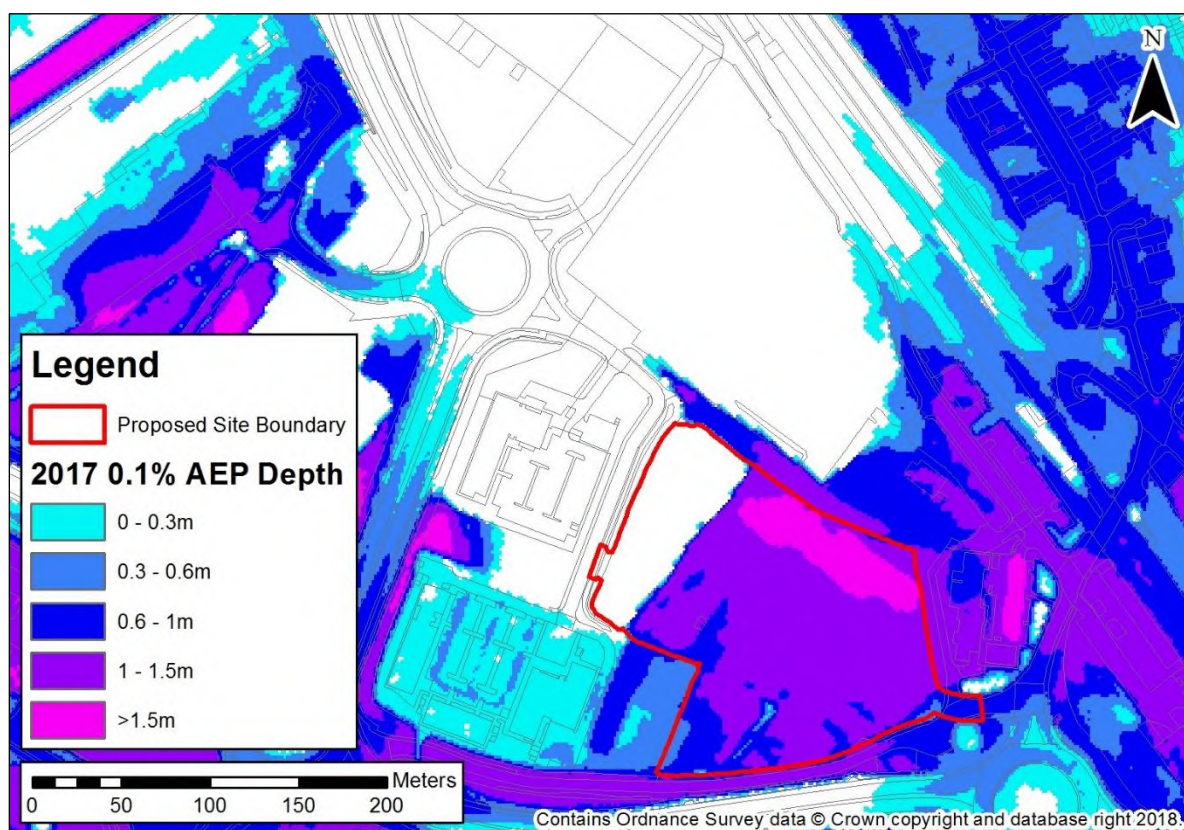


Figure 4-2 Maximum flood depths for the 0.1% AEP fluvial event at the Harbourside site

4.3 Post-development fluvial flood risk

The proposals for the development at the Harbourside site comprises of ground levelling to 7.5m AOD upon which six buildings are planned for, along with a site access through road. Because of the flood risk, it is also proposed to include a new drainage path for flood water from the south of the site into the docks via three culvert pipes under the A4241 (Harbour Way) which feed into an open channel, and subsequently the docks. Further details of the proposal are presented in Section 2.5.

As set out in Section A1.15 of TAN-15, development should be flood free during the 1% AEP plus climate change event. Additionally, during the 0.1% AEP event flooding must be within tolerable limits, which include maintaining flood depth below 600mm for commercial development such as is proposed.

Figure 4-3 presents the flood risk to the Harbourside site during the 1% AEP plus climate change event. This shows that the proposed buildings will be flood free during this event, and therefore compliant with TAN-15.

The flood risk for the extreme 0.1% AEP event is presented in Figure 4-4. This is, again, compliant with TAN-15 as the proposed buildings are subject to maximum flood depths of 400mm. This remains under the maximum tolerable threshold of 600mm for development of this kind. Within the remaining land raised area, flood depths of less than 600mm are predicted. To the west of the site, where the access through road must tie into existing junction levels, flood depths are up to 1000mm, although access remains dry to the east of the site.

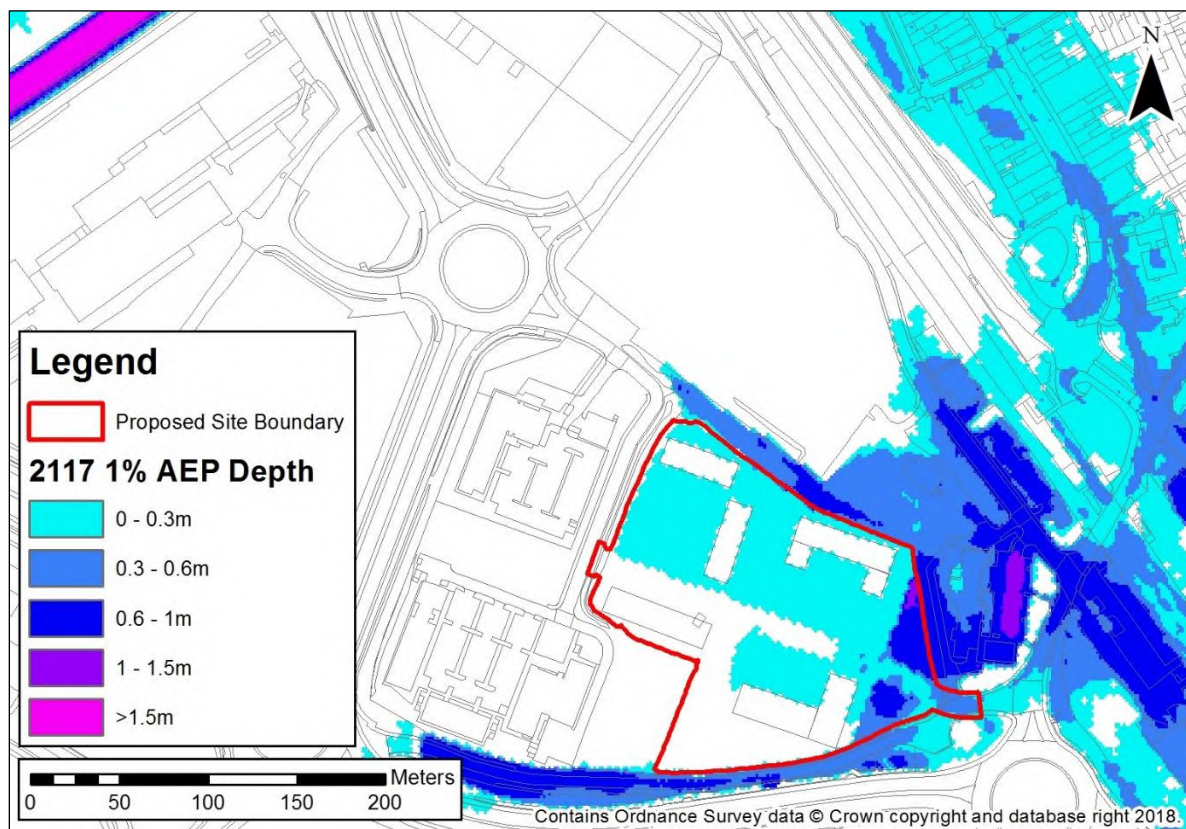


Figure 4-3 Maximum flood depths for the 1% AEP plus climate change fluvial event at the Harbourside site post-development

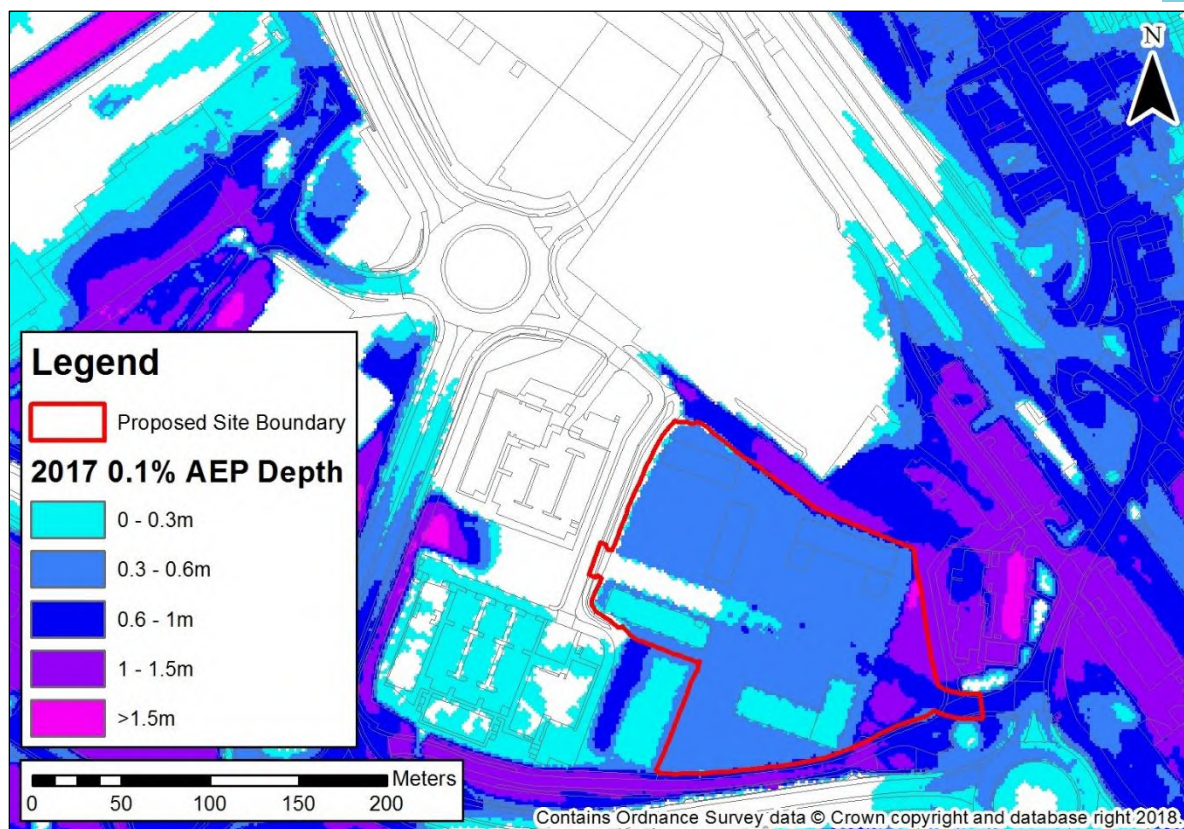


Figure 4-4 Maximum flood depths for the 0.1% AEP fluvial event at the Harbourside site post-development

The flood hazard rating of the Harbourside site has also been assessed, as a function of velocity and depth calculated by the hydraulic modelling. Figure 4-5 presents the hazard during the 1% AEP plus climate change event. The majority of the site is subject to low hazard with localised areas of moderate to significant hazard to the east of the site. This is described as 'danger for some (i.e. children)' and 'danger for most' respectively. This is a reduction in hazard on the site from the current conditions which has a flood hazard rating of moderate to significant across much of the site.

The flood hazard ratings for the extreme 0.1% AEP event is presented within Figure 4-6. The site is at low to significant risk, with the majority of the site at Moderate risk. A band of extreme risk is present east of the land raising area. This extreme hazard rating is described as 'danger to all'. No development is proposed in this area of extreme flood hazard.

Overall the proposed development has resulted in a reduction in flood hazard across the site, and a wider reduction in flood hazard across the area as a result of the flood mitigation culverts.

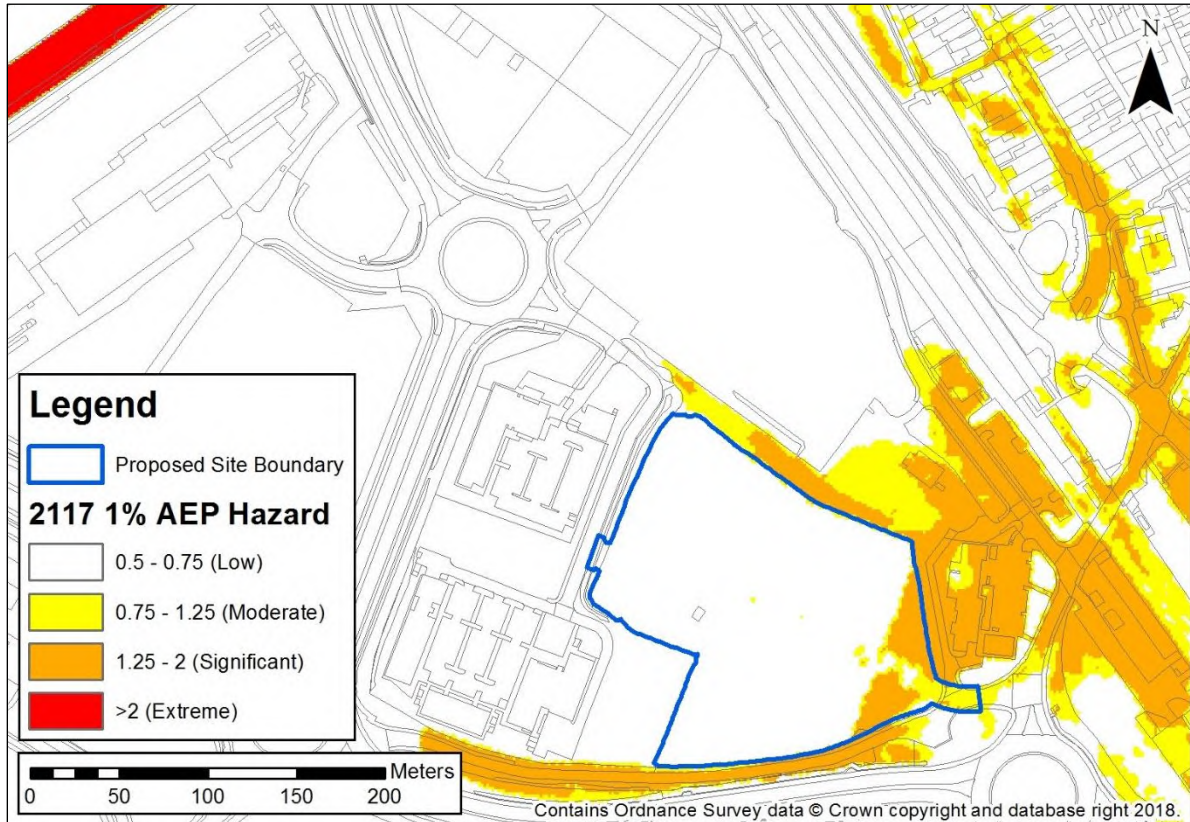


Figure 4-5 Hazard rating for the 1% AEP plus climate change fluvial event at the Harbourside site post-development

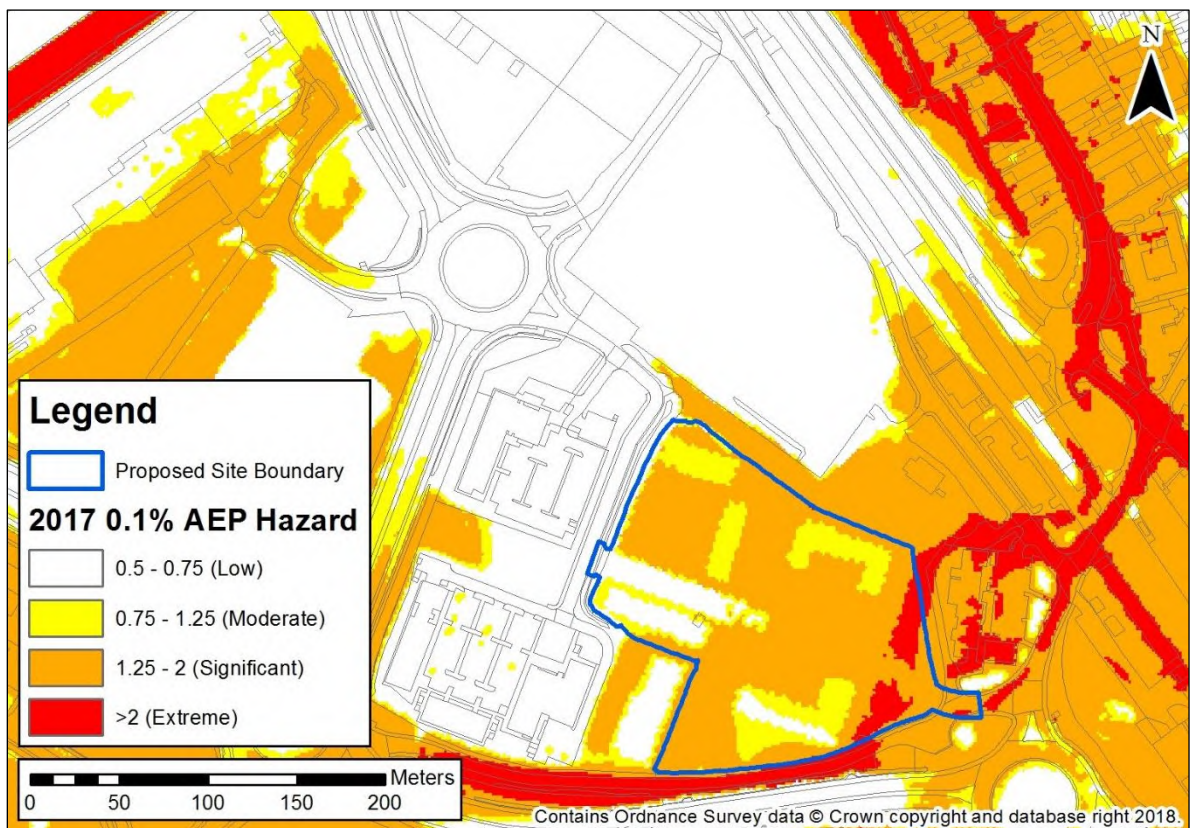


Figure 4-6 Hazard rating for the 0.1% AEP fluvial event at the Harbourside site post-development

4.3.1 Third-party impact

TAN-15 states that development should have minimal impact on flood risk generally. Section A1.12 of TAN-15 states that in order to be acceptable, development should not cause flooding elsewhere. Such potential for development to increase the flood risk to others is referred to in this report as third-party impacts. Guidance on the consideration of third party impacts is provide in NRW's Good Practice Guide¹ (2015). This guidance specifies that any increase in flood depths greater than 5mm will potentially be considered as a negative impact and must be fully and carefully justified.

Figure 4-7 and Figure 4-9 present the changes in water level greater than 5mm with the Harbourside area as a consequence of the proposal development, with Figure 4-8 presenting the change in flood extents during the 1% AEP plus climate change event.

The 1% AEP plus climate change event, as shown in Figure 4-7, shows minimal increased water levels with the development. The largest area of change is to the west of the site, where ground levels will be reduced to 7.5mAOD allowing this previously dry area to flood. Off-site there is also a small area of land subject to up to 680mm flooding; this is associated with the proposed topographic changes with the creation of a section of open channel between the proposed culverts and the docks. Notwithstanding this, the proposed drainage from the Harbourside site to the docks results in a general reduction in flood depths across the wider Harbourside area. Part of this is a result of the beneficial change in flood extent offsite during this event. The area of land to the west of the Harbourside site will no longer be at flood risk during this event, as shown in Figure 4-8. This area incorporates Dock Road and North Bank Road, either side of the A4241 (Harbour Way), and adjoining brownfield land and industrial development.

Figure 4-9 shows that the proposed development has a slightly greater impact on flood levels in the extreme 0.1% AEP event. Similar to the 1% AEP plus climate change event, an area in the western area of the site is subject to increased flooding as a result of the ground lowering. However, a new area with flood levels increasing by more than 5mm is formed to the north of the development site. In this area flood levels are increased by a maximum of 15mm. This compares to a modelled flood depth of up to 1m in this area. Consequently, the minimal changes in flood depths with have negligible negative impact on flood risk within this localised area of Cramic Way and adjacent car parks. Additionally, there is negatable change in predicted flood extent to third-parties, as shown in Figure 4-10

It should also be noted that during the 1% AEP plus climate change event, the flood hazard has actually been reduced offsite. Much of this benefit is located to the west of the site which is predicted to be flood free with the development proposal. During the extreme 0.1% AEP event, there is no significant increase or decrease in flood hazard ratings to third parties.

We conclude that the proposals will have an overall beneficial impact on flood risk. Whilst there is an area to the north of the site that is predicted to experience a minimal (up to 15mm) increase in flood depths in the extreme 0.1% AEP event, this is more than offset against the reductions in flood risk across a wider area (including this same area in the 1% AEP plus climate change event).

¹ Good Practice Guide: Producing flood risk hydraulic models and flood consequence assessments for development planning purposes. GPG 101. Natural Resources Wales, September 2015

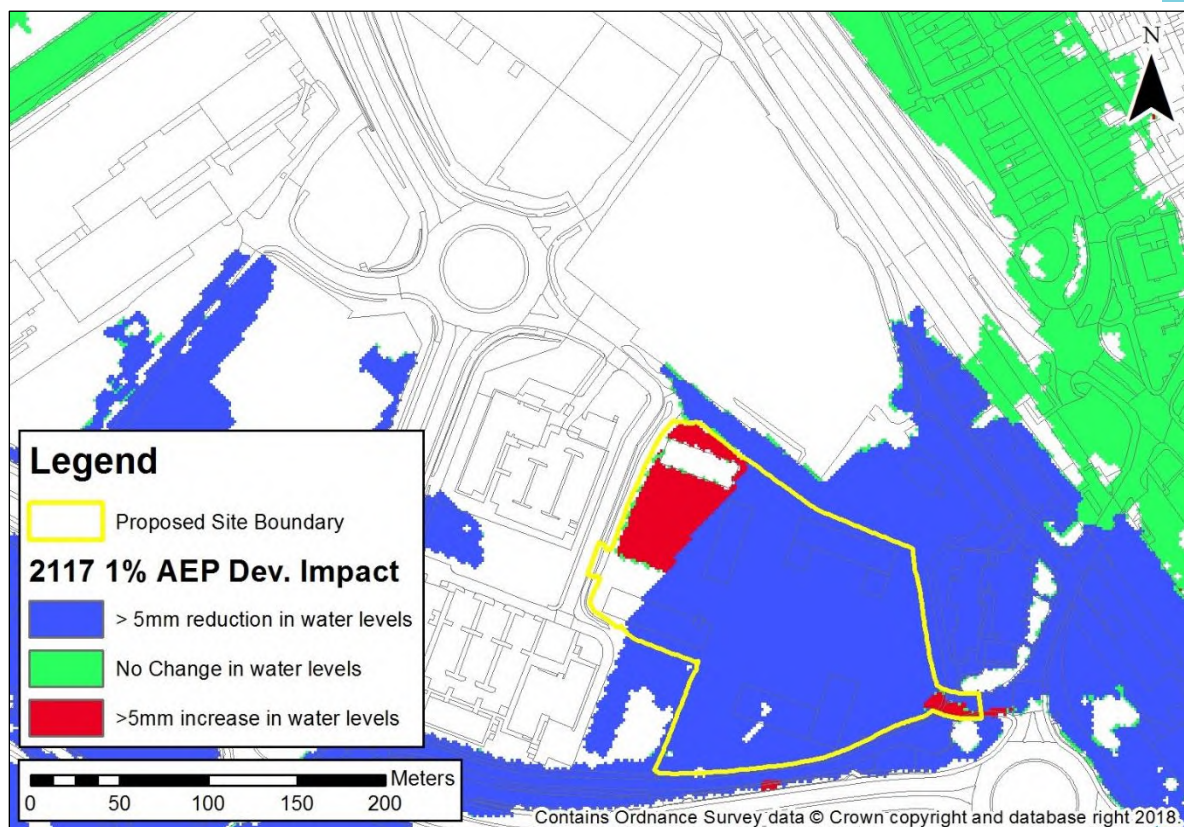


Figure 4-7 Change in maximum water levels for the 1% AEP plus climate change fluvial event pre- and post- development at the Harbourside site

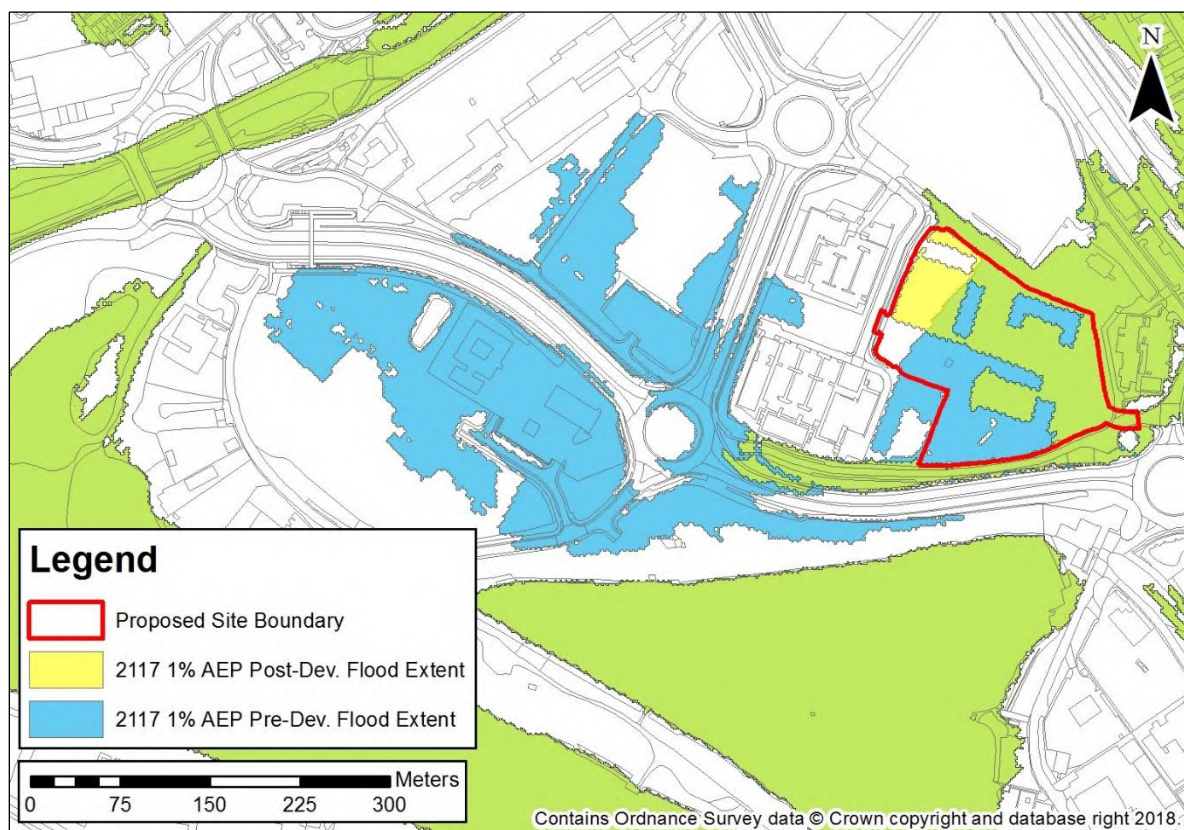


Figure 4-8 Change in flood extents for the 1% AEP plus climate change fluvial events pre- and post- development at the Harbourside site

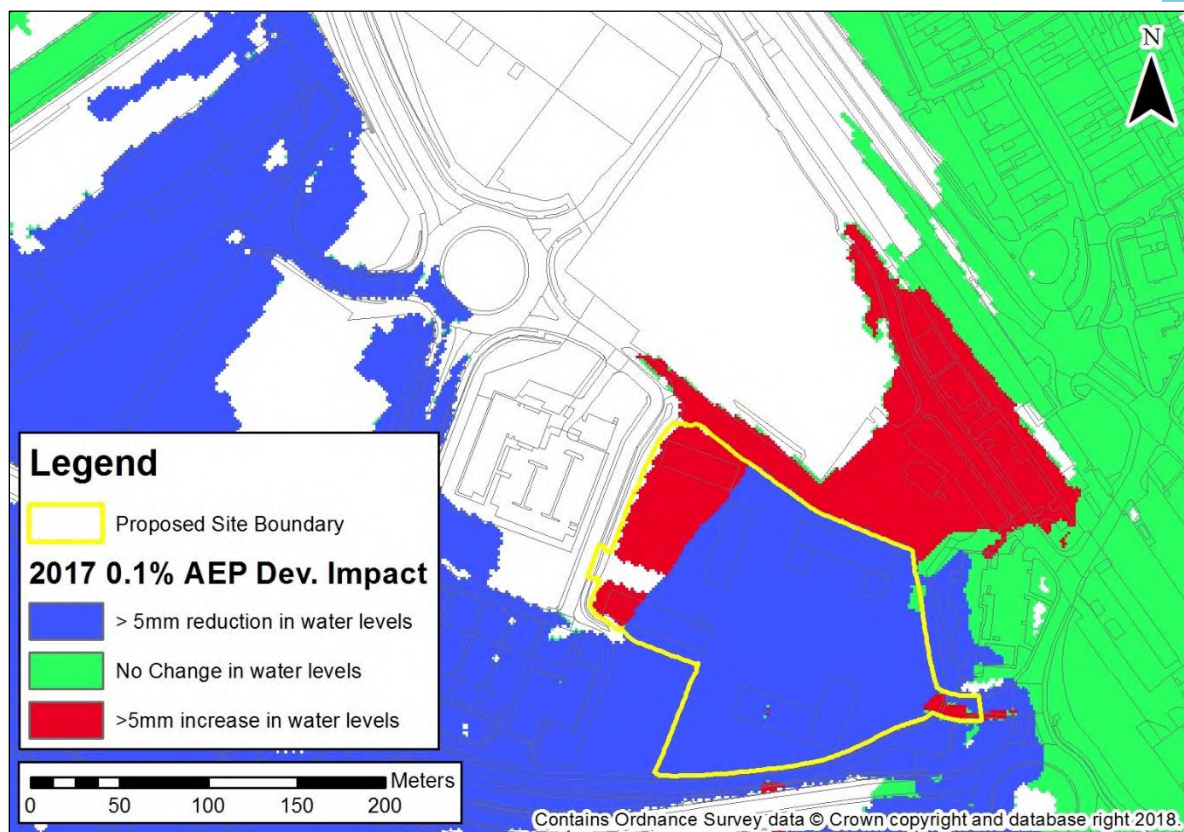


Figure 4-9 Change in maximum water levels for the 0.1% AEP fluvial event pre- and post-development at the Harbourside site

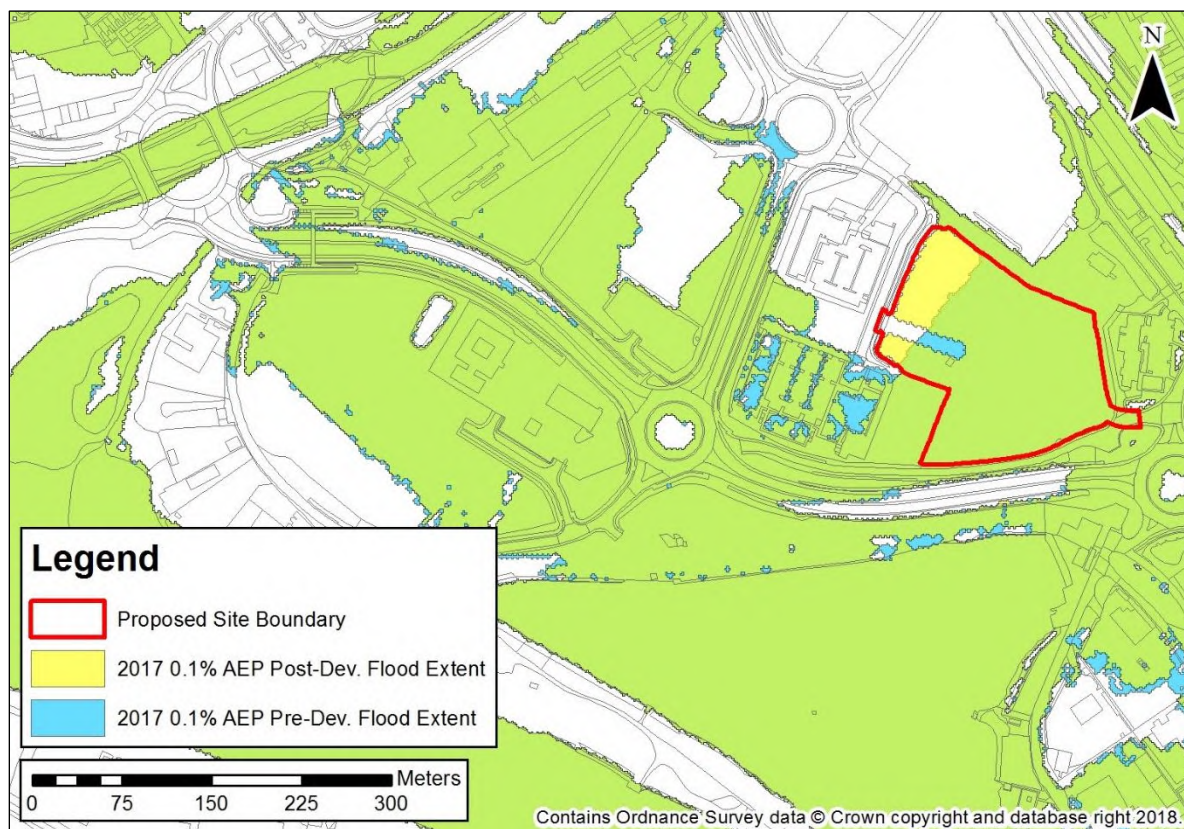


Figure 4-10 Change in flood extents for the 0.1% AEP fluvial events pre- and post-development at the Harbourside site

4.4 Residual flood risk

The NRW Flood Map shows that without the presence of formal flood defences the proposed Harbourside development site would be at greater risk of fluvial flooding. Therefore, it is necessary, and appropriate, to consider the residual risks associated with the potential failure of assets that are critical to the management of flood risk. Such assets include not only formal flood defences, but also assets such as bridges, tidal outfalls and pumping stations.

In consultation with NRW it has been agreed to investigate two such asset failure scenarios; blockage of High Street bridge and blockage of the proposed new culverts under Harbour Way. The assets of this scenario are reported in the following sections.

4.4.1 High Street bridge blockage

High Street bridge on the River Afan is the most significant hydraulic constriction on the River Afan, and the bridge most vulnerable to blockage during a flood event. The bridge comprises of three masonry arches, as shown in Figure 4-11, and is located adjacent to the Aberafan [Shopping] Centre and Tesco's, on the western and eastern banks respectively. A blockage of 25% has been assessed against this bridge and agreed with NRW.



Figure 4-11 Upstream face of the High Street bridge over the River Afan

As expected during this scenario, the blockage at this bridge has increased the flood risk to the Harbourside site. For both the 1% AEP plus climate change event and the more extreme 0.1% AEP event, the site is flooded, as shown in Figure 4-12 and Figure 4-13 respectively, with just the western part of the proposed access through road remaining flood free. However, where land raising and development is proposed, flood depths are predicted to remain within the 600mm threshold deemed tolerable for commercial and retail development, as set out in Section A1.15 of TAN-15.

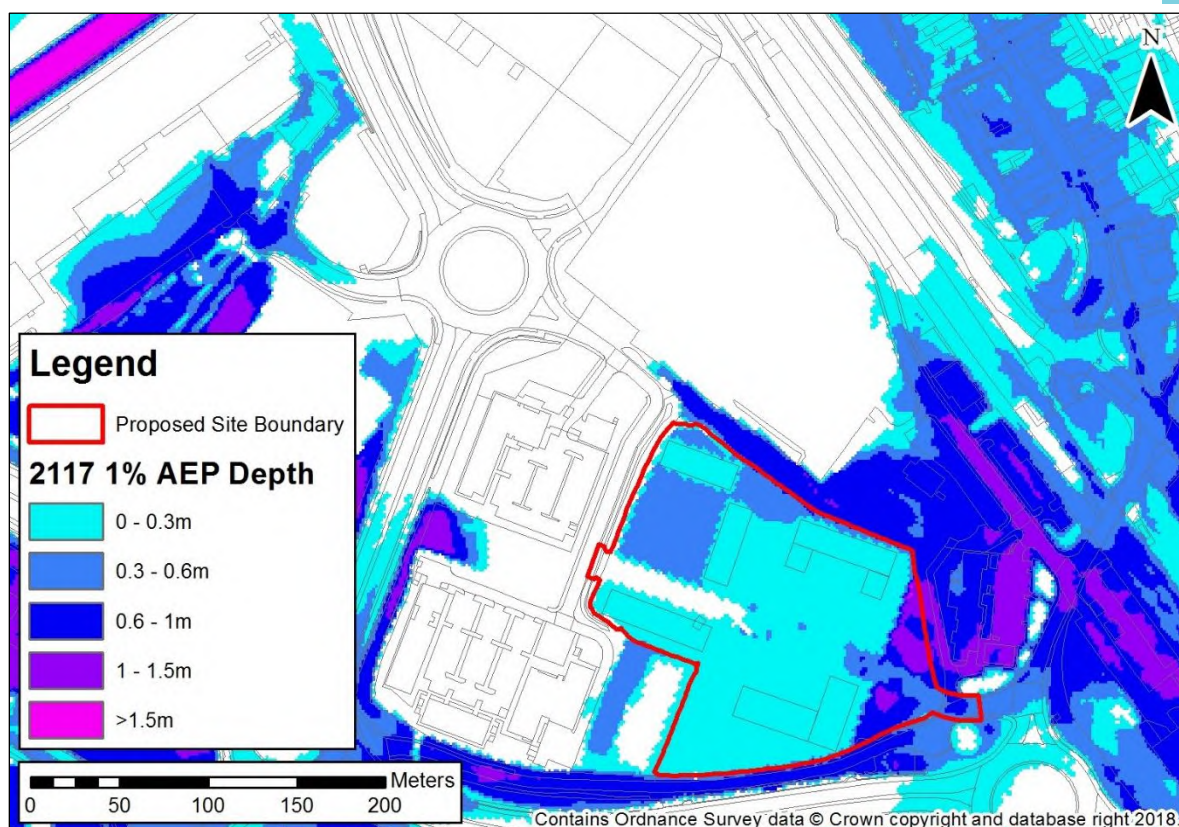


Figure 4-12 Maximum flood depths for the 1% AEP plus climate change fluvial event at the Harbourside site post-development, with blockage to the High Street bridge

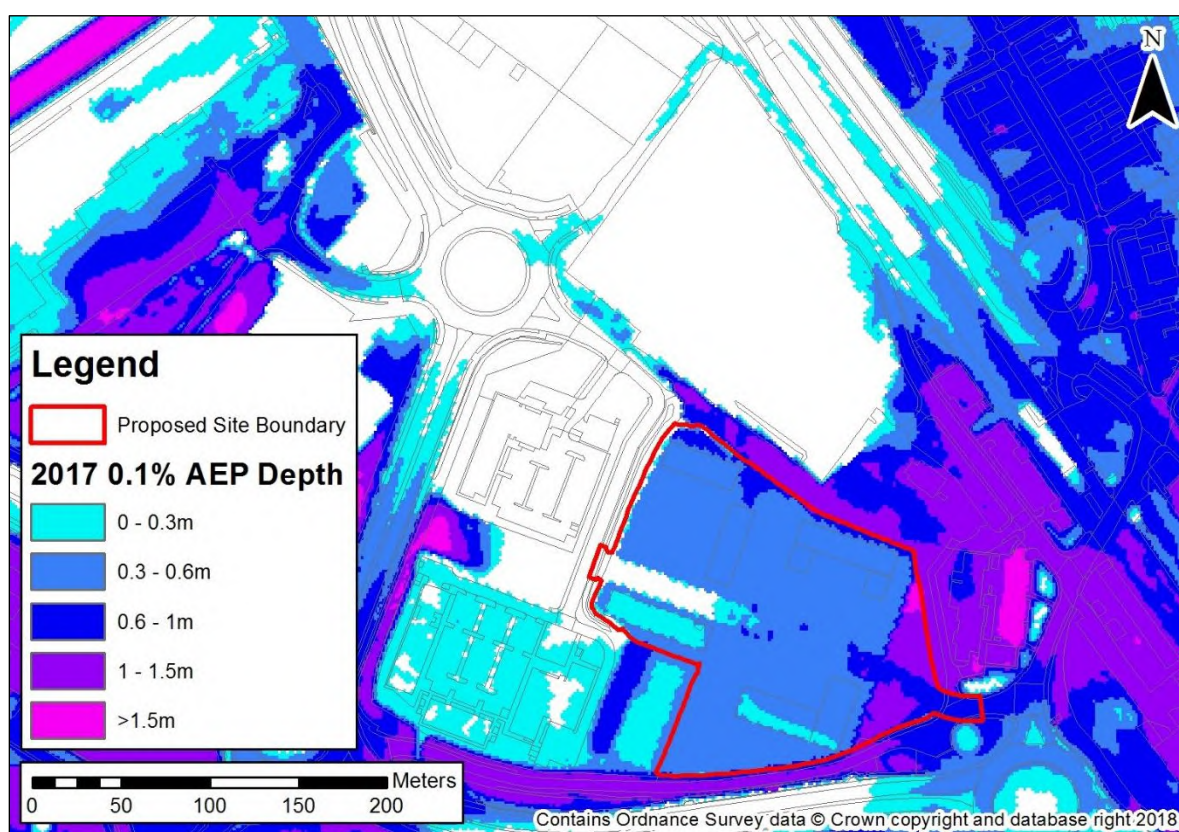


Figure 4-13 Maximum flood depths for the 0.1% AEP fluvial event at the Harbourside site post-development, with blockage to the High Street bridge

4.4.2 Proposed development culvert failure

A 100% blockage to the three proposed culvert pipes at the south of the site, under the A4241 (Harbour Way) was tested for this scenario. This is a very worst-case scenario and was selected for simplicity. The total blockage of the culverts results in increased volumes of water onsite as the capacity of the site to drainage flood water away from the site is compromised.

As presented in Figure 4-14 and Figure 4-15, much of the Harbourside site is at risk of flooding with the blockage of the culverts. During the 1% AEP plus climate change event, an area in the south of the site has gone from being flood free to at flood risk. Nonetheless, the proposed buildings will remain flood free during this event, with flood depths to the whole area proposed to be subject to ground levelling not exceeding 300mm. The 0.1% AEP event shows this area to experience flood depths less than 600mm over the ground levelled area. Although undesirable, the effects of the proposed culverts blocking lead to flooding very similar to the current level of flood risk and the development will remain within safe limits of flooding.

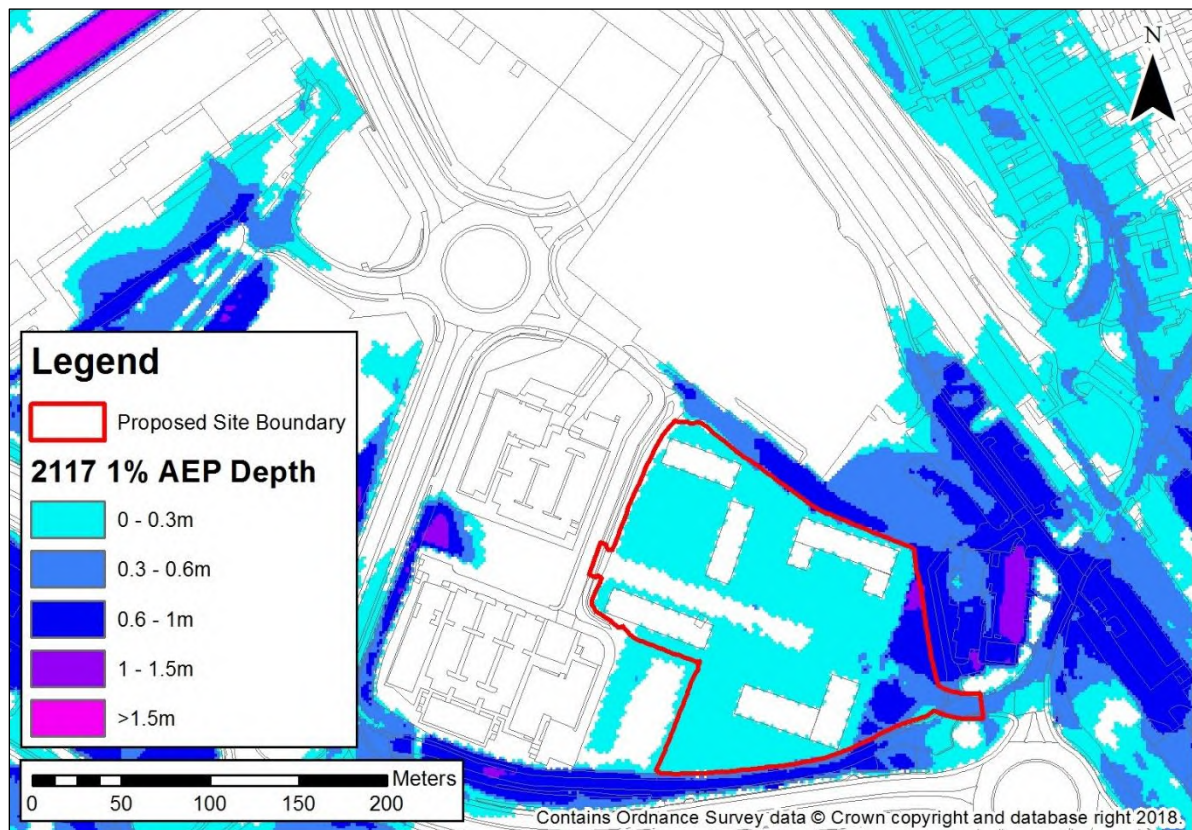


Figure 4-14 Maximum flood depths for the 1% AEP plus climate change fluvial event at the Harbourside site post-development, with blockage to the proposed culverts

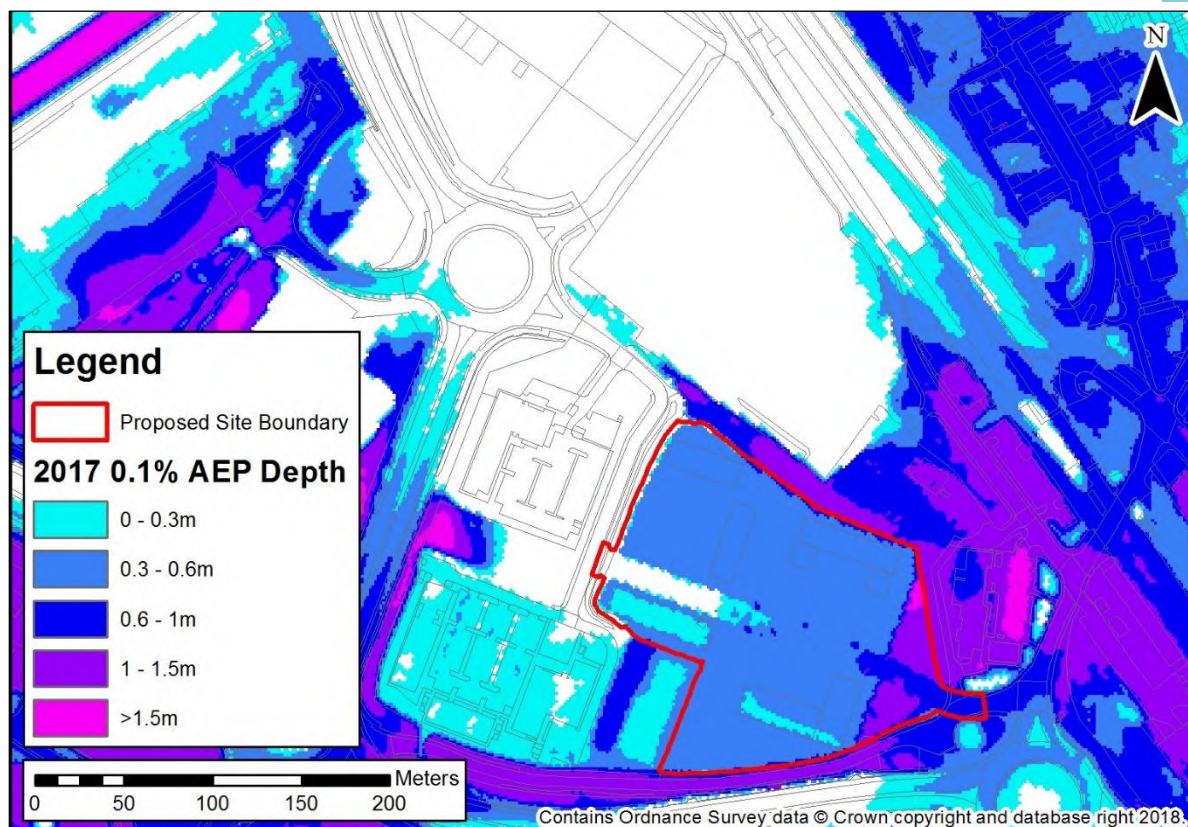


Figure 4-15 Maximum flood depths for the 0.1% AEP fluvial event at the Harbourside site post-development, with blockage to the proposed culverts

5 Assessment of Acceptability Criteria

The proposed Harbourside development is located with Welsh Government DAM Zones B and C1. Due to partially being within Zone C1, TAN-15 states that the development proposal must be subject to the Justification Test, including the Acceptability of Consequences. Section 3.3 details the assessment of the site against each criteria of the Justification Criteria.

The Acceptability Criteria, as set out in TAN-15, is summarised in Table 5-1. All of the Criteria must be met in order for the Harbourside site to be passed and deemed in compliance with TAN-15.

Table 5-1 Acceptability Criteria assessment for the Harbourside strategic development site

TAN-15 Acceptability Criteria	Comments	Achievable?
<i>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 year)</i>	NRW have confirmed that they are confident in the adequacy and maintenance of their flood defences in Port Talbot, and have not requested any breach scenarios to be considered.	✓
<i>The cost of future maintenance for all new/approved flood mitigation measures, including defences must be accepted by the developer and agreed with the Environment Agency (now Natural Resources Wales)</i>	The development of the Harbourside site would be subject to new flood mitigation measures, including three parallel culverts directing flood water into the docks.	✓
<i>The developer must ensure that future occupiers of the development are aware of the flooding risks and consequences</i>	Site occupiers to be made aware of the risk of flooding through the sharing of this FCA.	✓
<i>Effective flood warnings are provided at the site</i>	The site is currently within the 'Port Talbot' flood warning area and the 'Swansea Bay and the Gower Coast' flood alert area. This provision will enable effective flood warnings for the site.	✓
<i>Escape/evacuation routes are shown by the developer to be operational under all conditions</i>	The proposed access through road provides two vehicle and pedestrian access points, to the east and the west of the site. Due to the topographic elevations, it is likely that the western route will be operational under all flood conditions, travelling north along the A4241 once offsite and continue to the A48.	✓
<i>Flood emergency plans and procedures produced by the developer must be in place</i>	The developer will advise occupants to sign up to flood warning alerts and put in place procedures to evacuate their premises when a flood alert occurs.	✓

<i>The development is designed by the developer to allow the occupier the facility for rapid movement of goods/possessions to areas away from floodwaters</i>	The proposed access through road provides two vehicle and pedestrian access points, to the east and the west. Due to the topographic elevations, it is most likely that the western route will be operational under all flood conditions, travelling north along the A4241 once offsite and continue to the A48.	✓
<i>Development is designed to minimise structural damage during a flooding event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of the flood</i>	The development of the Harbourside site results in shallow flood depths, and thus structure damage is not anticipated. Maximum flood depths of 600mm occur during the extreme events including when considering residual risk.	✓
<i>No flooding elsewhere</i>	No additional land subject to flood risk offsite. Where flooding is already predicted, the development results in a maximum 15mm third-party detriment in the extreme 0.1% AEP event. The proposed flood mitigation strategy will result in a widespread reduction in flood risk.	✓
<i>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 either a 1 in 100 chance (fluvial) flood event, or a 1 in 200 chance (tidal) flood event including an allowance for climate change (depending on the type of flood risk present) in accordance with TAN-15 table A1.14</i>	The proposed buildings within the site are flood free during the fluvial 1% AEP plus climate change event.	✓
<i>In respect of the residual risk to the development it should be designed so that over its lifetime (Ref: TAN-15 A1.5) in an extreme (1 in 1000 chance) event there would be less than 600mm of water on access roads and within properties, the velocity of any water flowing across the development would be less than 0.3 m/second on access roads and 0.15m/second in properties, and the maximum rate of rise of floodwater would not exceed 0.1m/hour [TAN-15 table A1.15]</i>	The proposed buildings within the site are predicted to experience flood depths of less than 600mm. Additional residual risk of asset failures has also been assessed.	✓

6 Conclusions and Recommendations

- JBA Consulting was commissioned by Neath Port Talbot County Borough Council to produce a Flood Consequence Assessment (FCA) for a development site at Harbourside, to the south of Port Talbot town centre.
- The 2.5ha site is currently an undeveloped brownfield site.
- The proposed development is for six buildings and an access through road. The site will also incorporate ground levelling to 7.5mAOD and a new drainage path allowing flood water to directly flow into the docks. Therefore, flood mitigation measures have been incorporated into the site development plan.
- The site is situated within Welsh Government Development Advice Map (DAM) Zones B and C1. Zone C1 describes areas which are "*served by significant infrastructure*", whilst Zone B requires caution when assessing the 0.1% AEP event flood depths.
- As a strategic employment site, the site is deemed to be a 'less vulnerable development'.
- A 100-year lifetime of development has been considered in accordance with the latest climate change guidance from Welsh Government.
- A detailed 1D-2D ESTRY-TUFLOW hydraulic model has been development to better assess the flood risk from various nearby watercourses.
- The proposed development will not be at flood risk in the 1% AEP plus climate change event.
- During the 0.1% AEP event, the development is predicted to experience flood depths of up to 400mm in the extreme 0.1% AEP event.
- The residual risk of a blockage to the High Street bridge along the River Afan been assessed by applying a 25% blockage. This results in shallow (approximately 200mm) flooding of the site in the 1% AEP plus climate change event. In the extreme 0.1% AEP event, flood depths remain below 500mm across the site.
- The residual risk of the complete blockage of the three proposed culverts has been assessed. During the 1% AEP plus climate change event the development within the site remains flood free. However, residual flood risk is present during the extreme 0.1% AEP event, with flood depths of approximately 500mm across the site (a 100mm increase).
- The Harbourside site is generally subject to very low to medium risk of surface water flooding. However, localised areas of greater risk are present that will be address through the planned levelling of the site.
- The Harbourside site is at risk of shallow flooding from an exceptionally unlikely failure of the Cwmwernderi reservoir.
- The Harbourside site is not at tidal flood risk, nor risk of flooding from groundwater, canals or sewers.
- The Harbourside site complies with the Justification Test as set out in TAN-15, including the Acceptability Criteria.
- We conclude that on the grounds of flood risk, the Harbourside site development proposal is in compliance with Planning Policy Wales and TAN-15, meeting all of the requirements set out therein.

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Appendix A – Harbourside Site Proposed Masterplan

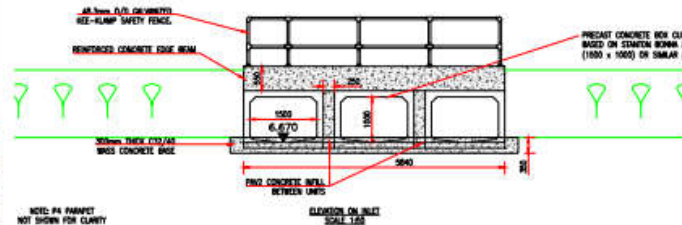
Appendix B – Harbourside Site Proposed Flood Culvert Design Drawings

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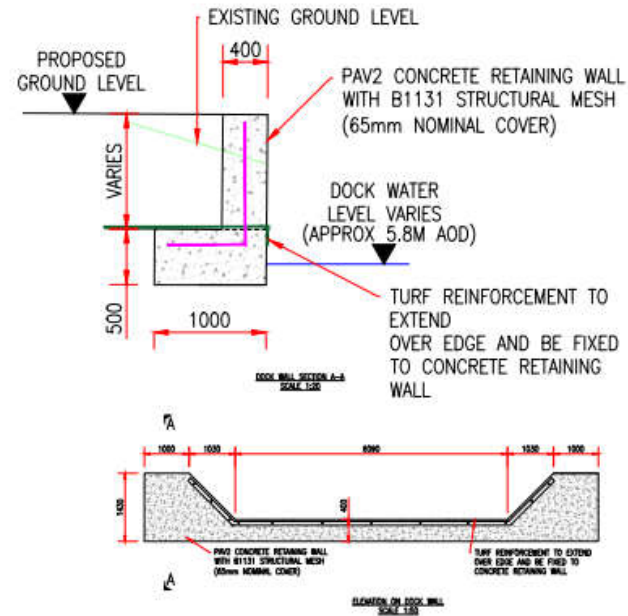
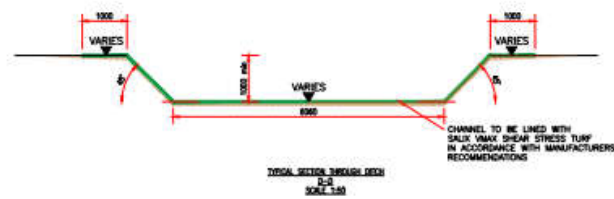
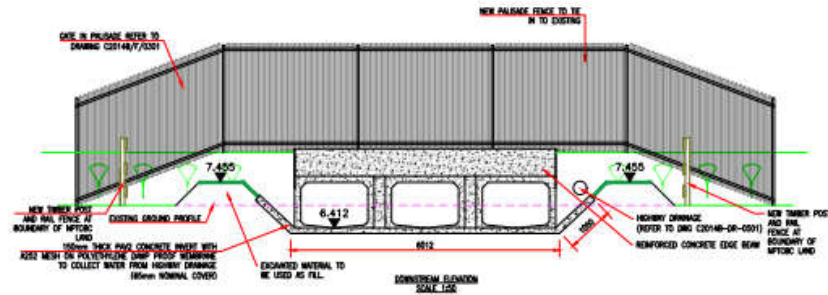
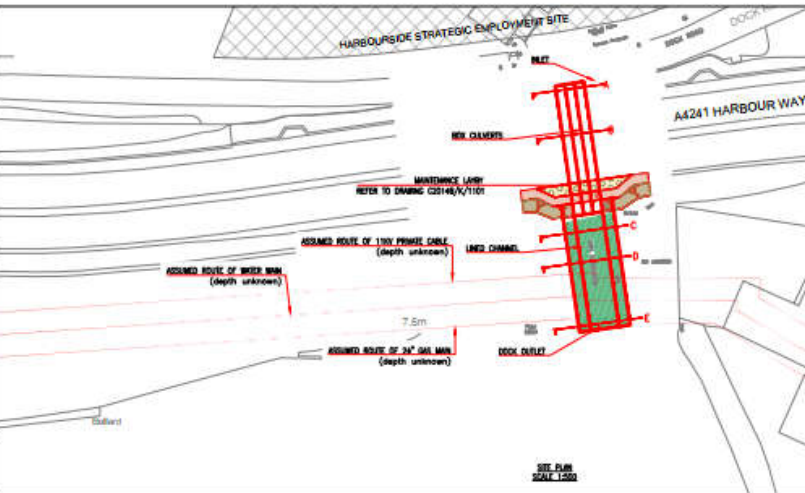
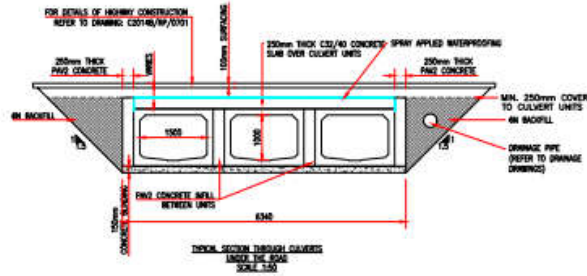
FLUVED RELIEF CULVERT

CONTIGUOUS HARBOURSIDE STRATEGIC EMPLOYMENT SITE

17/01



NOTE: PA PARAPET NOT SHOWN FOR CLARITY



NOTES

1. All dimensions are in millimetres unless otherwise stated.
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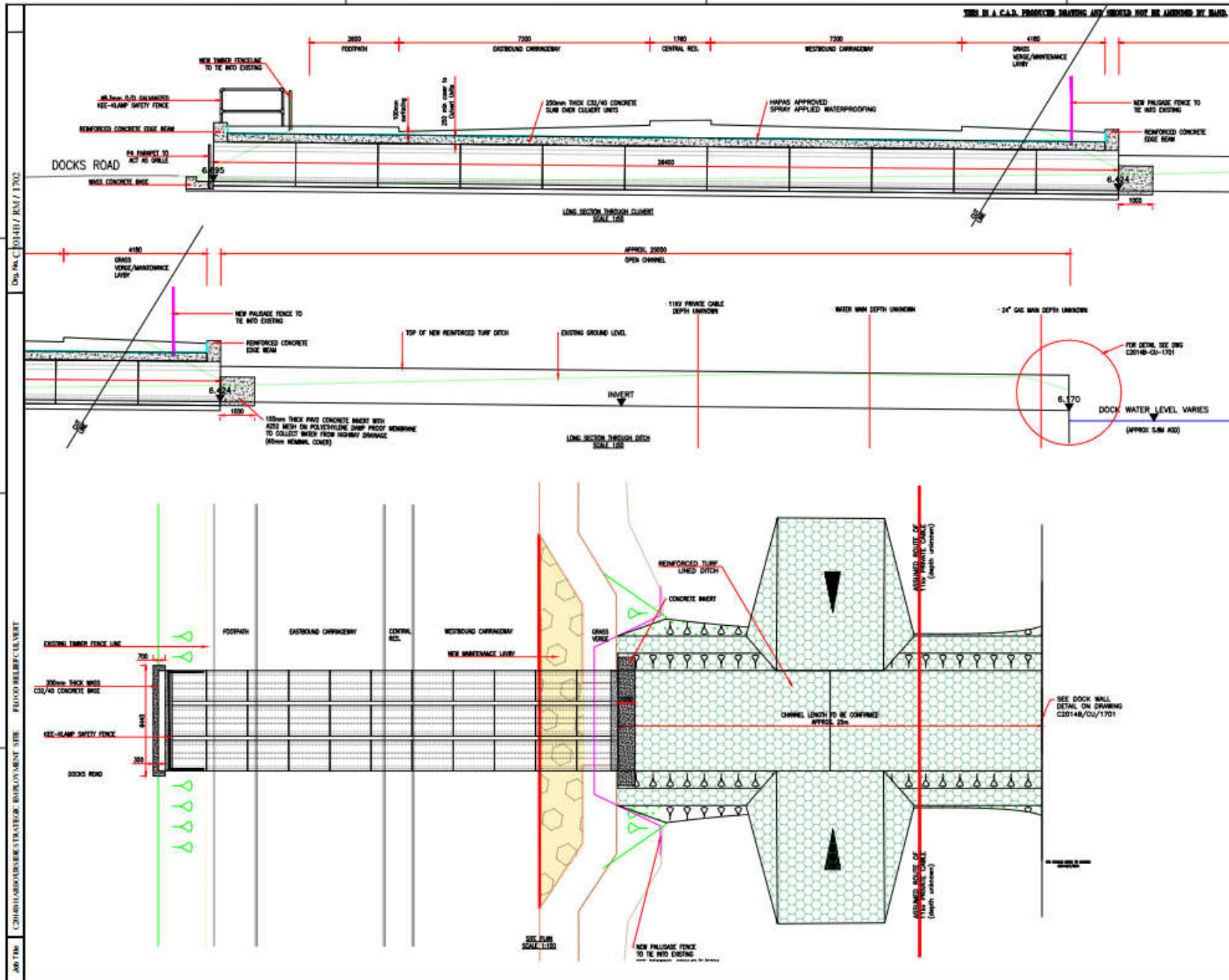


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1 OF 2

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ENGINEERING AND TRANSPORT

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C2014B HARBOURSIDE STRATEGIC EMPLOYMENT SITE
FLOOD MITIGATION CULVERT GENERAL ARRANGEMENT
2 OF 2

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