

Switch FCA, Port Talbot

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Prepared by	George Williams BSc (Hons) MSc Analyst
Reviewed by	George Baker BEng AIEMA CEnv IEng MCIWEM C.WEM Associate Director
Authorised by	George Baker BEng AIEMA CEnv IEng MCIWEM C.WEM Associate Director

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Contract

JBA Project Manager	Hannah Booth
Address	Kings Chambers, 8 High St, Newport NP20 1FQ
JBA Project Code	2023s0818

This report describes work commissioned by Morgan Sindall Construction by an instruction dated March 2024. The Client's representative for the contract was John Charles of Morgan Sindall Construction Ltd. George Williams of JBA Consulting carried out this work.

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Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
AEP	Annual Exceedance Probability
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Survey
C1	Benchmarking system using GPS
FCA	Flood Consequence Assessment
FMfP	Flood Map For Planning
LDP	Local Development Plan
LiDAR	Light Detection And Ranging
NGR	National Grid Reference
NRW	Natural Resources for Wales
OS	Ordnance Survey
OS NGR	Ordnance Survey National Grid Reference
PM	Project Manager
PPW	Planning Policy Wales

1 Introduction

1.1 Terms of Reference

JBA Consulting (JBA) was commissioned by Morgan Sindall Construction and Infrastructure Ltd to undertake a Flood Consequence Assessment (FCA) to support a planning application for the redevelopment of a brownfield site into a Research, Development, and Innovation (RD&I) facility for the decarbonisation of the Steel & other foundation industries. The South Wales Industrial Transition from Carbon Hub (SWITCH) is a collaborative innovation centre working with academia and industry partners to develop and deploy new technologies, products, and processes to move towards a net zero carbon future.

1.2 FCA Requirements

This FCA follows Welsh Government guidance on development and flood risk set out in Technical Advice Note 15: Development and Flood Risk (TAN15). Where appropriate, the following aspects of flood risk should be addressed in all planning applications over their expected lifetime:

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

2 Site Description

2.1 Site Summary

The proposed development site is located in the Harbourside regeneration area of Port Talbot, South Wales. The development site comprises an unused brownfield site and is approximately 1.88ha in size. The site can be accessed via Oakwood Road or Harbourside Road.

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 Port Talbot Parkway station car park to the north. The location of the site is described in Table 2-1.

Table 2-1 Site Summary

Site Name	SWITCH Harbourside, Port Talbot
Site Area	1.88ha
Existing Land use	Brownfield site
Purpose of development	Strategic Employment use
OS NGR	SS 76594 89483
Local Planning Authorities	Neath Port Talbot Council
Lead Local Flood Authority	Neath Port Talbot Council

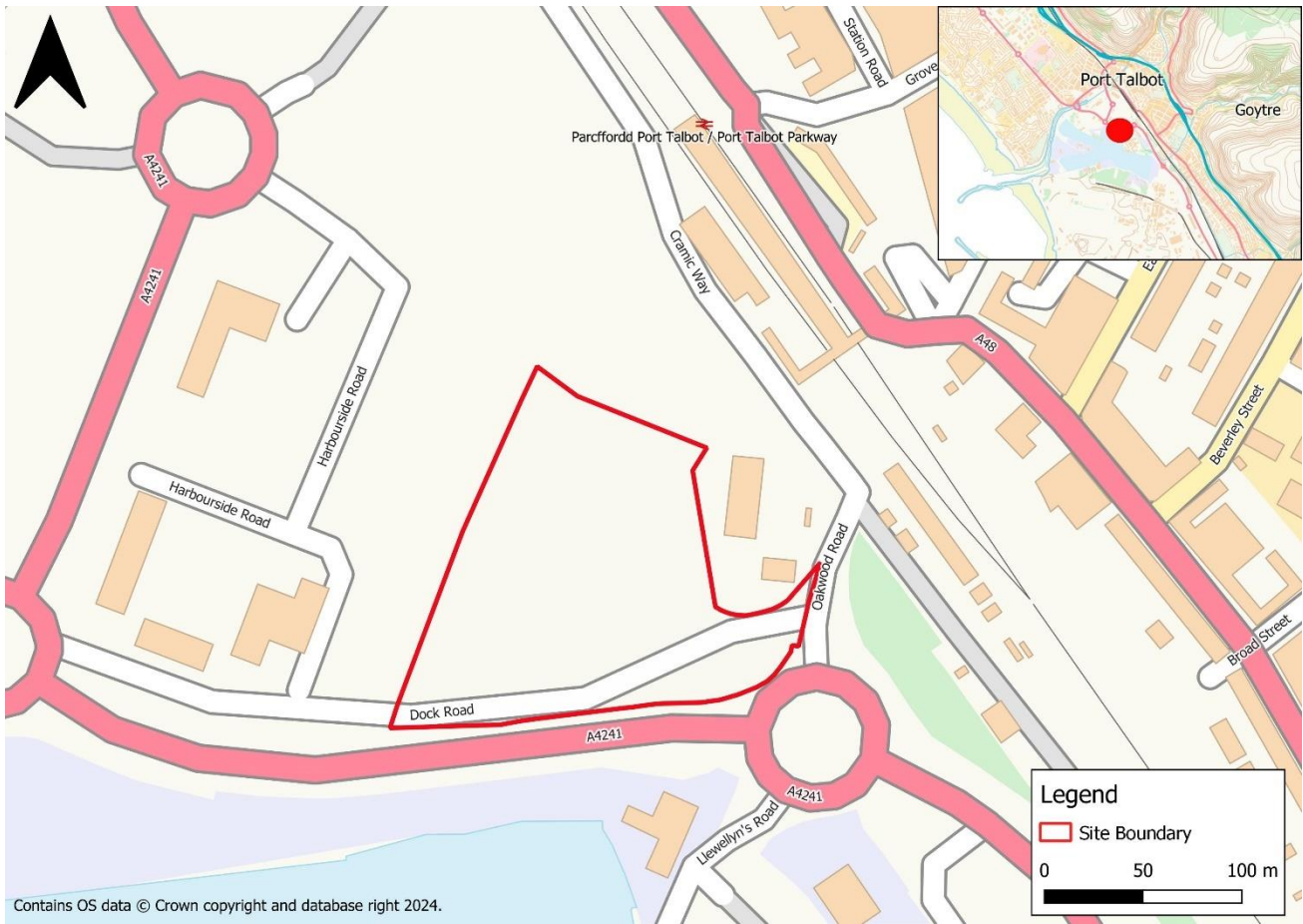


Figure 2-1 Site Overview

2.2 Planning History

In May 2018 JBA produced a Flood Consequence Assessment (FCA) in support of a hybrid planning application for the site (Ref. P2022/0823). The successful planning application was for the strategic redevelopment of the site for commercial development. The detailed aspects were for the supporting site preparation works, access road and flood mitigation works. The outline component was for 6no. buildings for strategic employment use.

The FCA proposed ground levelling of much of the site to 7.50mAOD and the further raising of buildings to a minimum level of 7.70mAOD. To manage the risk of flooding and the predicted effects of development on flood risk elsewhere, 3no. flood relief culverts were included under Harbourside Way to facilitate the conveyance of floodwater to the dock. These works were implemented in 2022 by the approved plans. Approved culvert plans can be found in Appendix A - Implemented Culvert Design Drawings.

Since the initial works have been carried out, proposals for the site's redevelopment have changed. Furthermore, changes to flood modelling methods and data have changed, including a significant increase in the predicted flood flows on the River Afan. Consequently, the findings and conclusions of the previous JBA FCA are no longer representative of the best available data.

2.3 Site Topography

Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data has been used to analyse existing ground levels across the site and within the surrounding area, as shown in Figure 2-2. NRW LiDAR data demonstrates that the site has been levelled to a height of 7.5mAOD as was proposed during a previous planning application (P2020/0294). The access road splitting the site in two and connecting Harbourside Road to Oakwood Road is raised slightly higher with a typical level of 8.4mAOD.

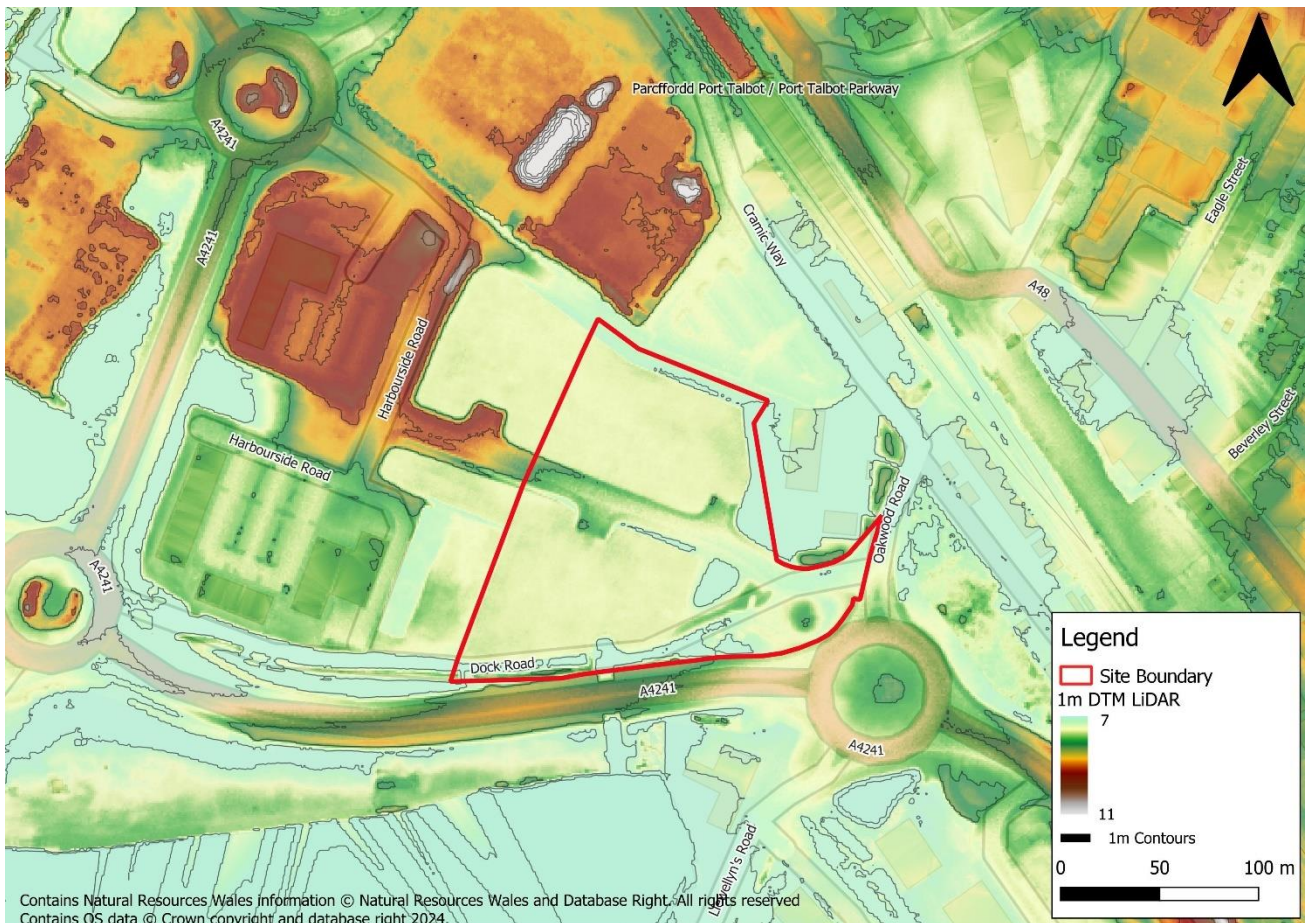


Figure 2-2 NRW 1m LiDAR Generated DTM

2.4 Soils and Geology

The geology of the site has been assessed using the British Geological Survey (BGS) Geology of Britain Viewer¹. The bedrock is shown to be the South Wales Middle Coal Measures Formation comprised of mudstone, siltstone, and sandstone. The superficial geology is formed of Tidal Flat Deposits that comprise silt, clay and sand.

The soils on site have been assessed on the Cranfield University Soilscape viewer and are shown to be Loamy and clayey soils of coastal flats with naturally high groundwater.

¹ https://mapapps.bgs.ac.uk/geologyofbritain/home.html?&_ga=2.235342593.1646683261.1643098406-854211532.1643098406

2.5 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 as seen in Figure 2-3. 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 Wyllt 850m to the east. Both watercourses flow in a south-westerly direction, ultimately, into Swansea Bay. NRW flood defences are present along the banks of the river Afan located to the northwest and west of the site. Despite being located behind the River Afan defences the site does not fall within an area benefiting from river flood defences.

The Ffrwd Wyllt discharges into the Port Talbot Docks via a culvert under the A4241 (Harbour Way), before flowing into the Swansea Bay. The site is approximately 2km north of the Swansea Bay coastline.

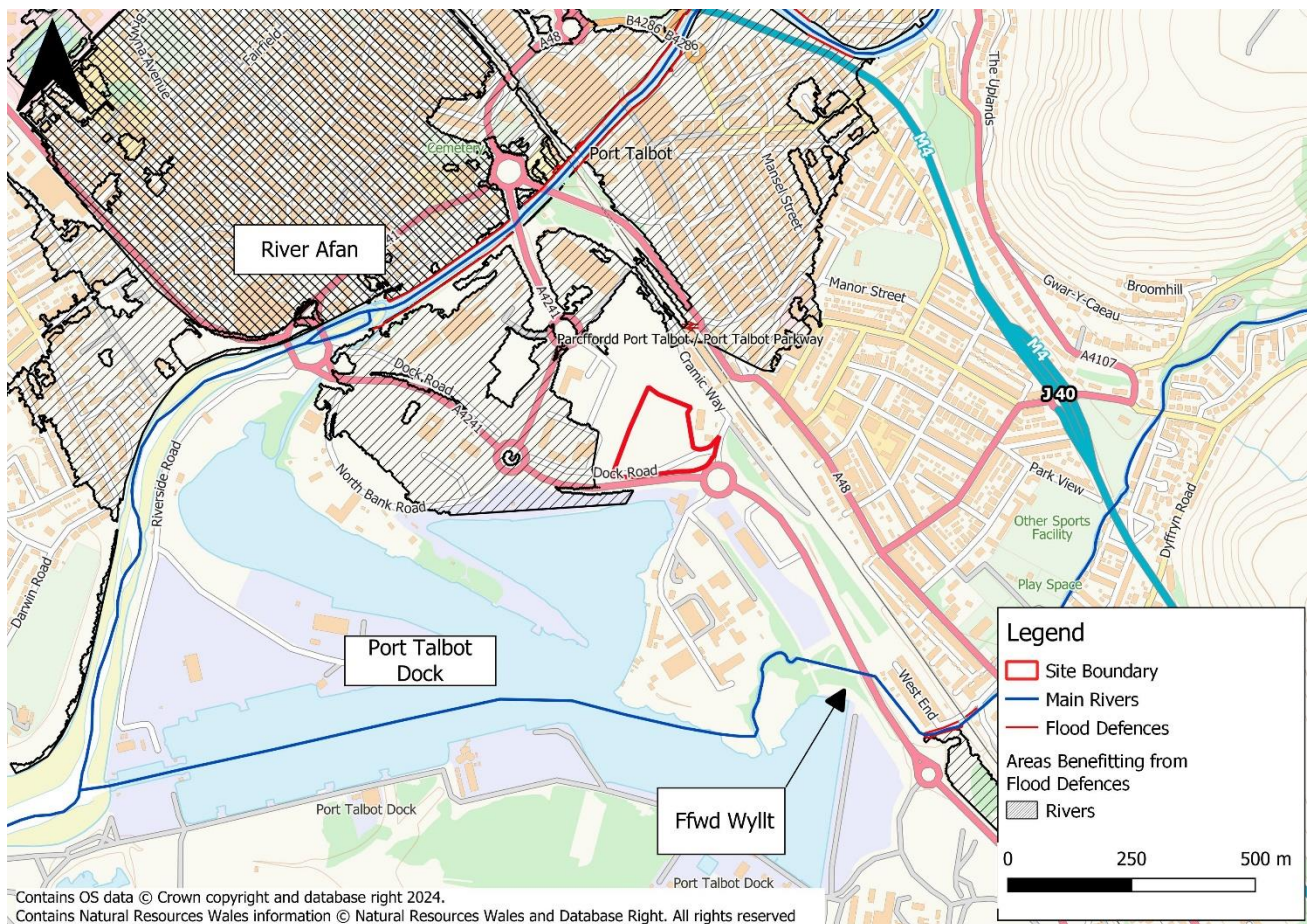


Figure 2-3 Watercourses and Defences

2.6 Development Proposals

The proposed site is for a Research, Development, and Innovation (RD&I) facility for the decarbonisation of the Steel & other foundation industries. The South Wales Industrial Transition from Carbon Hub (SWITCH) is a collaborative innovation centre working with

academia and industry partners to develop and deploy new technologies, products, and processes to move towards a net zero carbon future.

The Hub will be run by Swansea University to deliver academic and industrial research seeking to reduce carbon footprint through transforming raw materials supply, process and product development and energy consumption within the steel and metals industries and their supply chains across the UK.

The construction will consist of a mix of office space, laboratories, research and production area, storage areas and external works. An extract of the development proposals is included in Figure 2-4 below and in Appendix B - Proposed Site Layout.

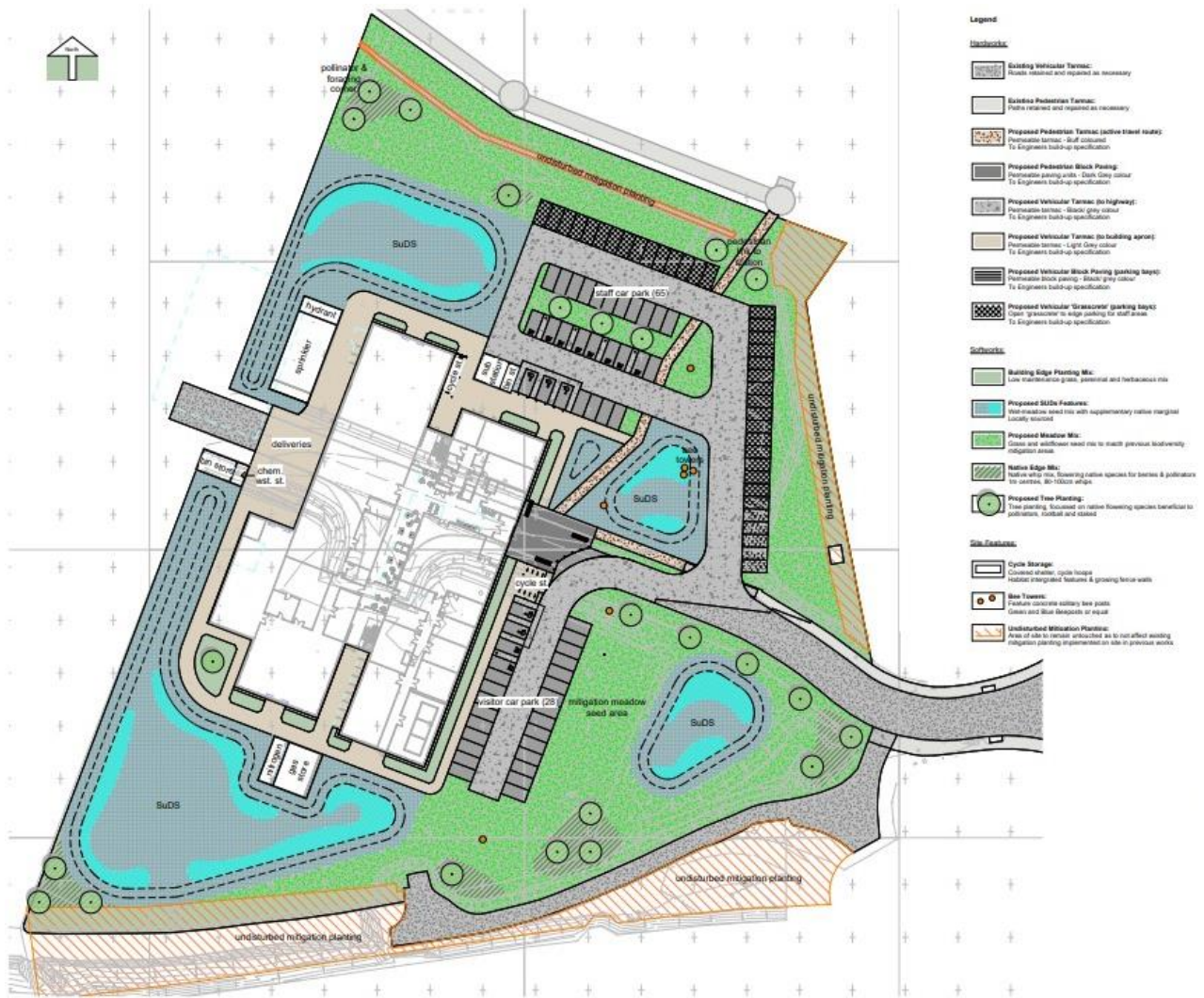


Figure 2-4 Proposed Development Plan (extract)

3 Planning Policy

3.1 Planning Context

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

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

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

As a result of the above, both the DAM and the FMfP are considered as part of this FCA.

3.2 Vulnerability Classification

TAN-15 assigns one of three flood risk vulnerability classifications to development, as shown in Table 3-1. The proposed development is classed as an Employment development. Consequently, the development is classified as Less Vulnerable.

Table 3-1 TAN-15 Vulnerability Classifications

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

Development category	Types
	mineral extraction sites and associated processing facilities, excluding waste disposal sites.

3.3 Lifetime of Development

The Welsh Government's latest technical guidance for Climate Change States:

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

As the proposals are not for residential use, a 75-year lifetime of development has been considered in this assessment based on less vulnerable development use.

3.4 Development Advice Map Classification

The DAM zone classification of a site is used to trigger different planning actions based on a precautionary assessment of flood risk. Figure 3-1 shows that the site is located entirely in Zone C1. Zone C1 is described as areas of the floodplain which are developed and served by significant infrastructure, including flood defences.

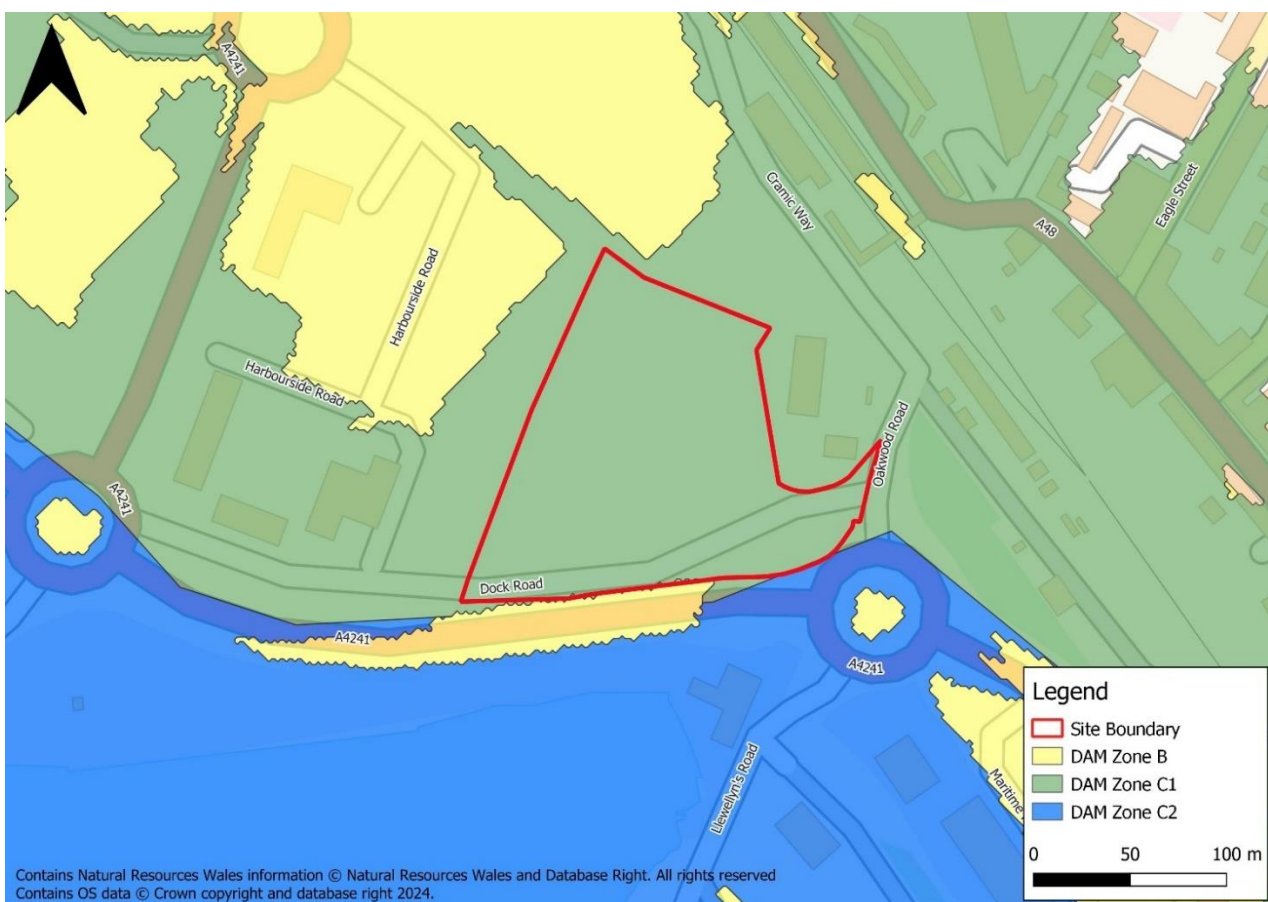


Figure 3-1 NRW DAM Map

3.5 Flood Map for Planning Classification

3.5.1 Flood Map for Planning - Flood Risk from Rivers

As shown in Figure 3-2, the entirety of the site is located within Flood Zone 3. Flood Zone 3 represents areas with a greater than 1 in 100 (1%) chance of flooding in a given year, including climate change from fluvial sources. Flood Zone mapping does not account for the presence of flood defences, of which there are major defences along the River Afan.

The proposed development site is not located within a TAN-15 Defended Zone for Rivers. Although there are Defended Zones in the area, they stop short of the site. It is believed that this is because of the flood risk from the Ffrwd Wyllt, which does not benefit from defences in the same way as the River Afan.

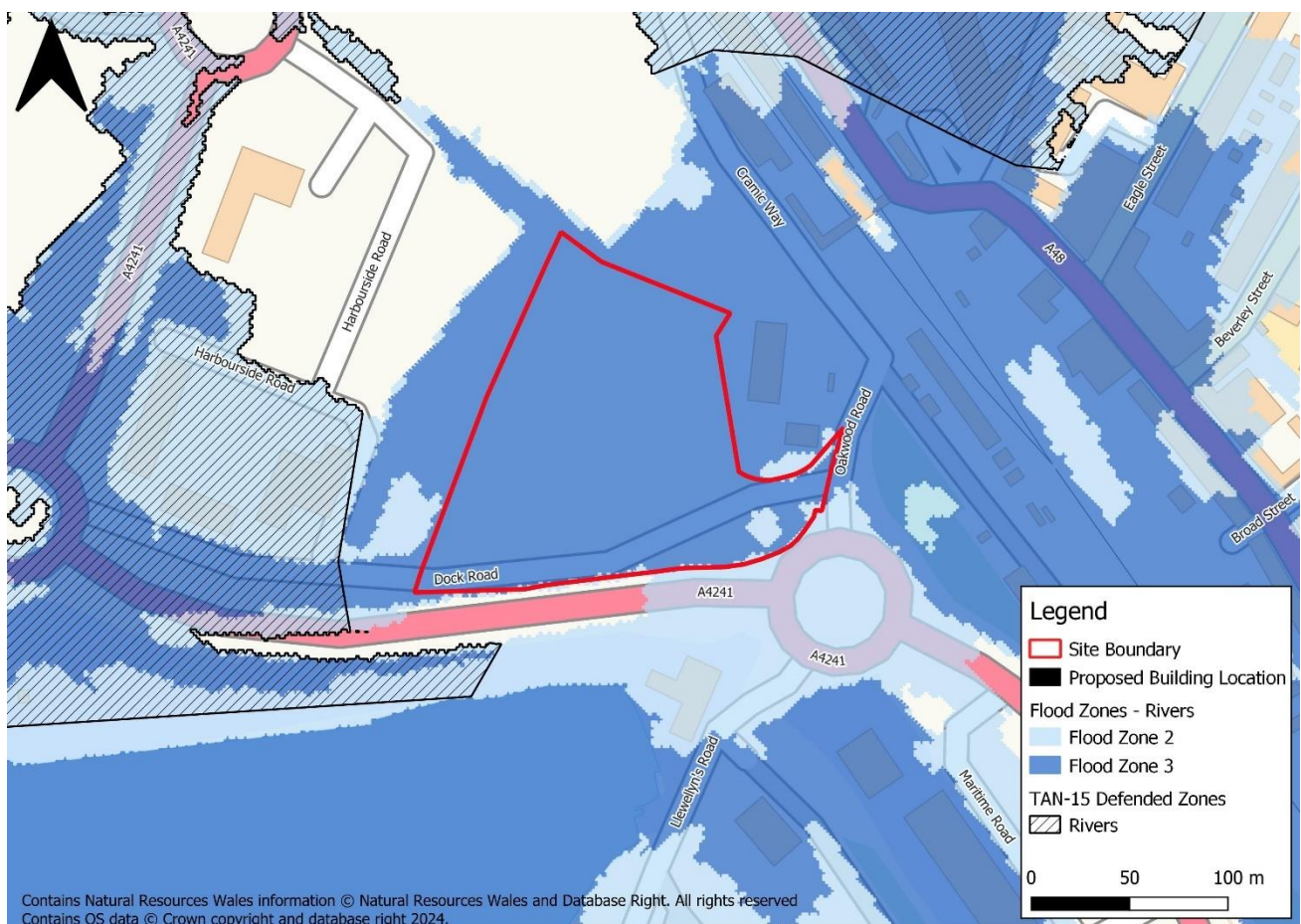


Figure 3-2 NRW FMfP- Flood Risk from Rivers

3.5.2 Flood Map for Planning - Flood Risk from the Sea

There is minor encroachment of Flood Zone 2 into the Southeastern boundary of the site, skirting around to the northeast and only flooding a minor portion of the northeast areas of the site as seen Figure 3-3. Flood Zone 2 are area with a 0.1% to 0.5% (1 in 1000 to 1 in 200) chance of flooding from the sea in a given year, including the effects of climate change (assuming a 100-year lifetime of development).

The proposed development site is not located within the TAN-15 Defended Zone for the Sea.

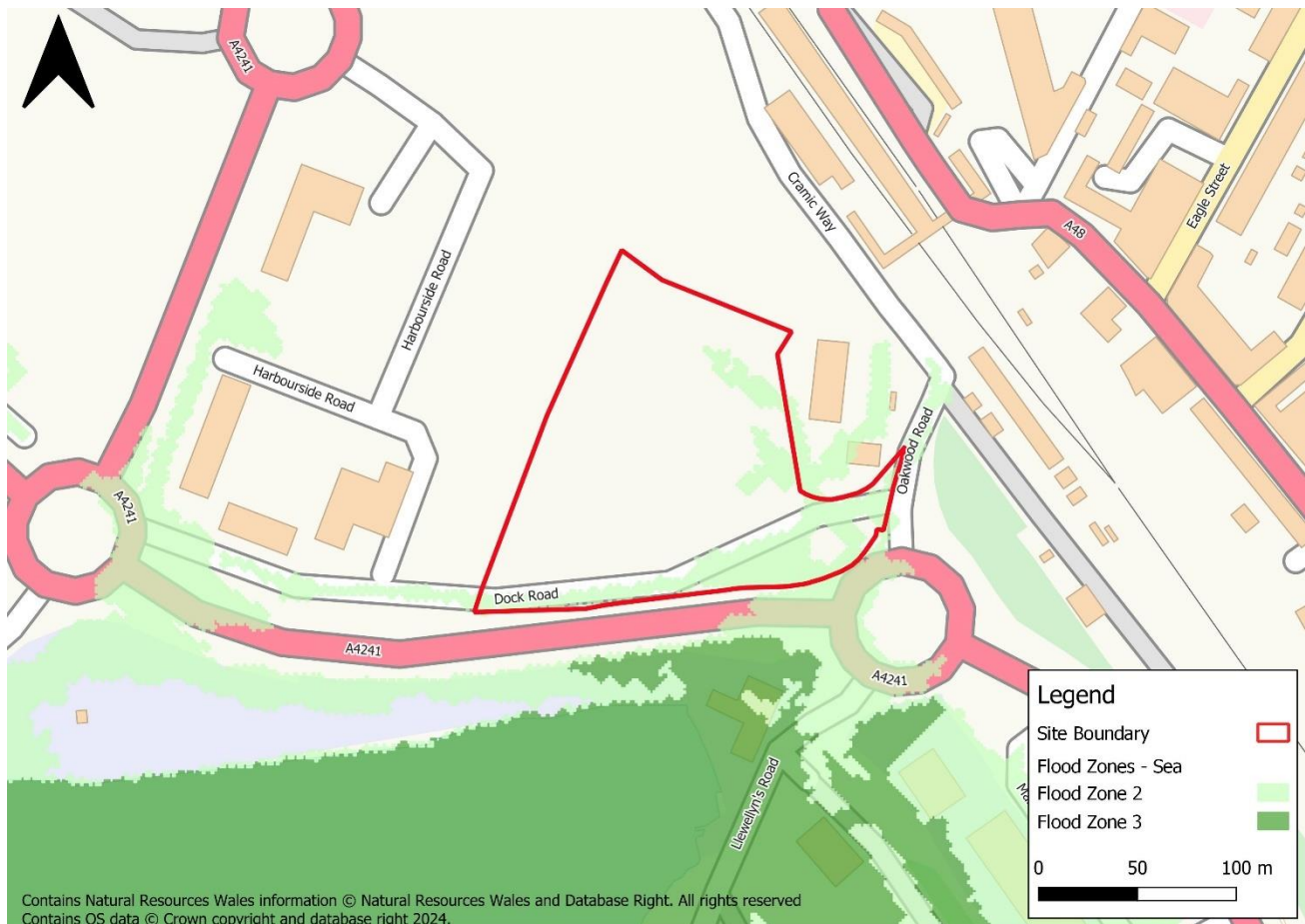


Figure 3-3 FMfP Flood Risk from the Sea

3.5.3 Flood Map for Planning - Flood Risk from Surface Water and Small Watercourses

The site is shown to be located within Flood Zone 3 for surface water and small watercourses flooding as seen in Figure 3-4. Areas in Flood Zone 3 are predominantly located in the north areas of the site north of the access road that currently splits the site into two. The vast majority of the rest of the site is within Flood Zone 2 with only a small area in the southeast of the site located outside of an area at risk of Surface Water or Small Watercourse flooding.

Flood Zone 2 are areas which have less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change of flooding from surface water or small watercourses. Flood Zone 3 represents areas with a greater than 1 in 100 (1%) chance of flooding in a given year, including climate change from fluvial sources.

The flood map for surface water and small watercourses flooding does not reflect the current topography of the site, nor the significant drainage infrastructure that allows water to flow under the A4241 and into the dock.

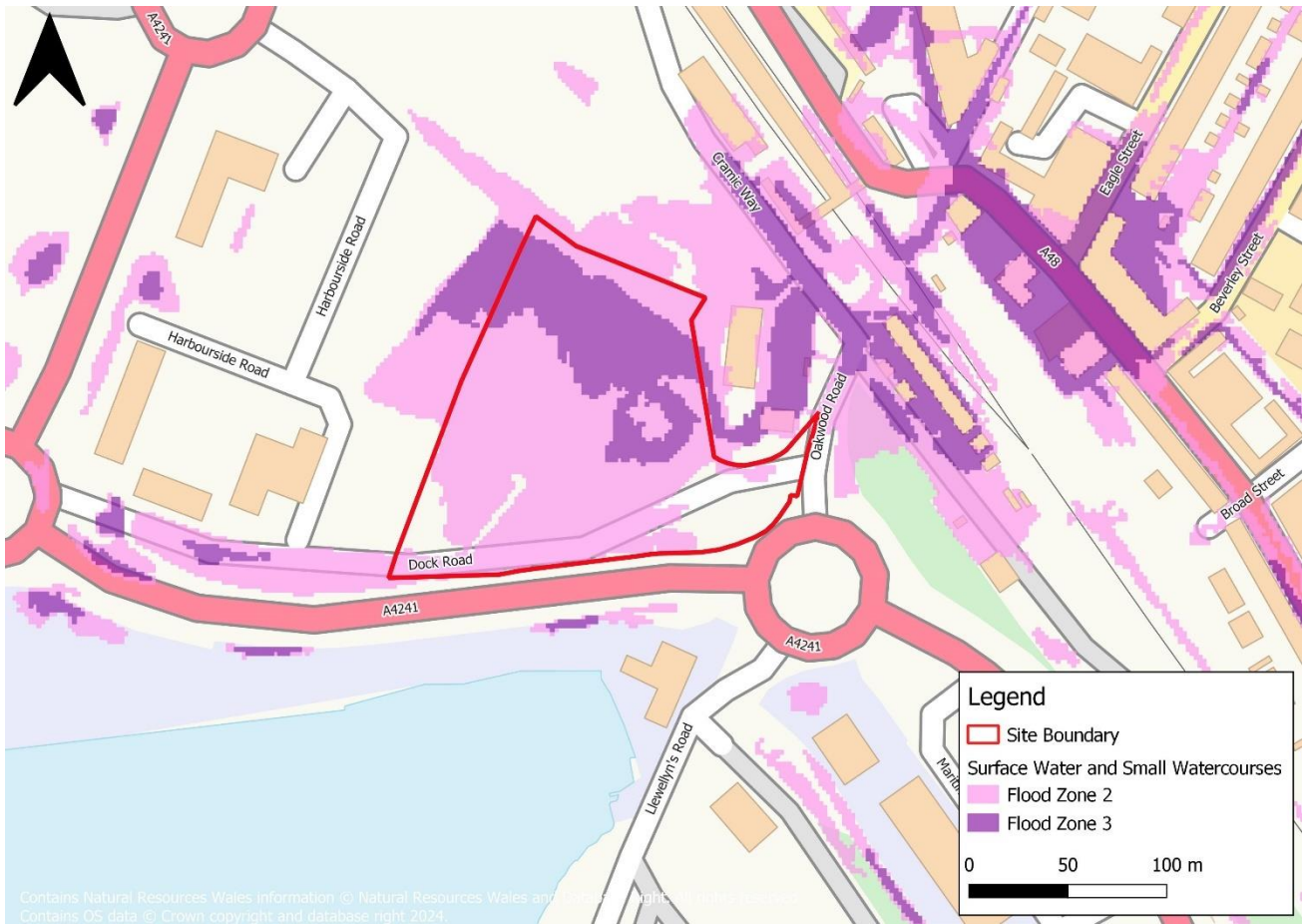


Figure 3-4 FMfP Flood Risk from Surface Water and Small Watercourses.

3.6 Local Development Plan

The Local Development Plan (LDP) is a land use document in which the NPTC sets out its land use development aspirations over 15 years. The current LDP, entitled ‘Neath Port Talbot County Borough Council Local Development Plan (2011-2026)’ was adopted by NPTC in January 2016. Work has begun on the replacement LDP including a call for sites. However, the replacement LDP is not expected to be adopted before 2027 therefore for this assessment, the current LDP will be consulted.

The site location in Harbourside, Port Talbot, has been identified as an area which will “provide major regenerative effects to Port Talbot”. NPTC 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 the resilience of the areas and [the ability] to compete 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 the 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.

3.7 Justification Test

Development in Zone C1 is subject to the Justification Test. TAN-15 states that 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.

The proposed development has been assessed against the requirements of the Justification Test with the results summarised in Table 3-2.

Table 3-2 TAN-15 Justification Test Summary for Site

TAN 15 Justification Criteria	Comments	Achieved
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.	The proposed development will assist with Harbourside Strategic Regeneration Areas (SRA2) as outlined in the Local Development Plan (LDP)	✓
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)	The proposed development site meets the criteria of previously developed land.	✓
The potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable.	The flood consequences have been assessed and are detailed further in Sections 5 and 6	✓

4 Flood Risk Assessment

This section assesses the risk to the proposed development from all sources of flooding, the risk of increased flooding to others, and how flood risks can be managed.

4.1 Review of Existing Flood Risk Data

The latest available information on flood risk at the site, published by Natural Resources Wales (NRW) is summarised Table 4-1, below.

Table 4-1 Overview of Flood Risk from different sources

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	✓	Mostly at 'Medium' risk with some areas at 'Low' risk.
Flood Risk from the Sea	✗	Located in an area at Very Low Risk from Tidal/Coastal Flooding
Flood Risk from Surface Water and Small Watercourses	✓	Mostly at Low risk although there is an area to the north of the site that is indicated to be at medium risk.
Flood Risk from Groundwater	✗	Low- No recorded groundwater flood incidents documented with favourable underlying geology.
Flood Risk from Reservoirs	✓	The Site is at risk in the event of a reservoir failure, however, the likelihood of a failure occurring is low.
Flood Risk from Sewers	✗	Flood No recorded sewer flood incidents at the site by Dwr Cymru Welsh Water.

4.2 Historical Flood Risk

NRW's map of recorded flood extents does not show any evidence of historic flooding on the site. Furthermore, Neath Port Talbot Preliminary Flood Risk Assessment² and Flood Risk Management Strategy³ were also referred to with no recorded flood incidents occurring within close proximity to this site.

² Neath Port Talbot Preliminary Flood Risk Assessment (2011). Retrieved from https://www.npt.gov.uk/media/4629/pfra_report_2011.pdf?v=20171123145433

³ Neath Port Talbot Flood Risk Management Strategy (2013). Retrieved from https://www.npt.gov.uk/media/4930/lfrms_npt_local_flood_risk_management_strategy.pdf?v=20170627002244

4.3 Flood Risk from Rivers

NRW's Flood Risk Assessment Wales (FRAW) flood mapping indicates that a large portion of the northern areas of the proposed site is located in an area at medium risk of flooding from rivers, with a between 1 in 100 (1%) and 1 in 30 (3.3%) each year, as seen in Figure 4-1. However, the majority of the site is located within a low-risk area of flooding from rivers, with between a 1 in 1000 and 1 in 100 (0.1% - 1% AEP) chance of flooding in any given year.

The proposed development site is located within an Area Benefiting from Flood Defences for Rivers.

To better understand the risk of flooding posed by fluvial flooding sources and the implications of climate change on the flood risk to the proposed development, further assessment using detailed flood modelling data was undertaken and is discussed in Section 5.

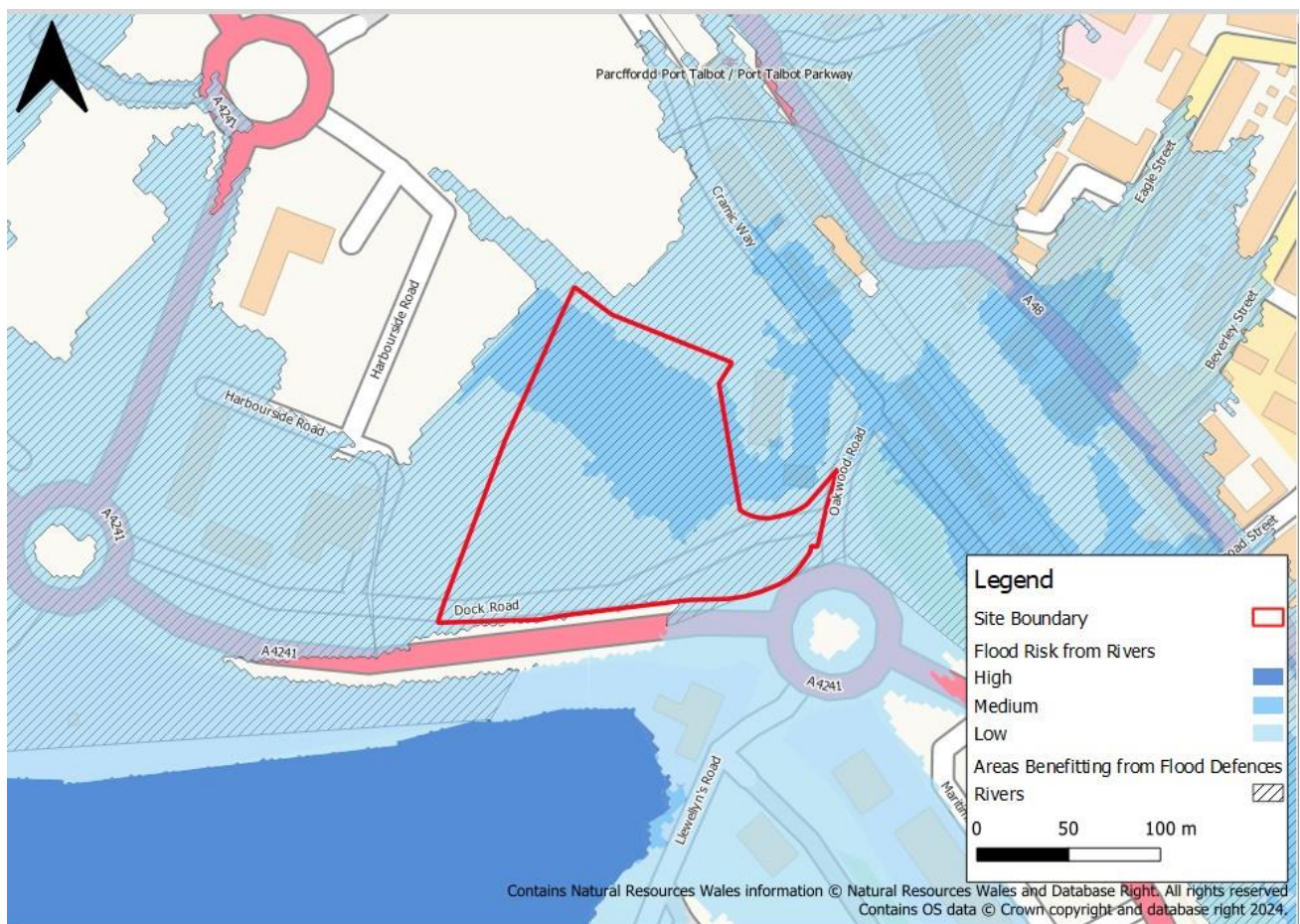


Figure 4-1 FRAW Flood Risk from Rivers

4.4 Flood Risk from the Sea

NRW's Flood Risk Assessment Wales (FRAW) flood mapping indicates that the entirety of the proposed site is located in an area at Very Low risk of Tidal/Coastal flooding. No figure

has been provided as areas at very low risk are shown as transparent on the NRW FRAW map.

4.5 Flood Risk from Surface Water and Small Watercourses

NRW's Flood Risk Assessment Wales (FRAW) flood mapping indicates that most of the site is located in an area at Low risk of flooding from surface water or small watercourses as seen in Figure 4-2. This area of the site has a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%) in any given year from surface water or small watercourses.

An area located to the north of the site that stretches horizontally across the site is in an area of Medium Risk of flooding from surface water and small watercourses. This area has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%) of flooding each year from surface water or small watercourses.

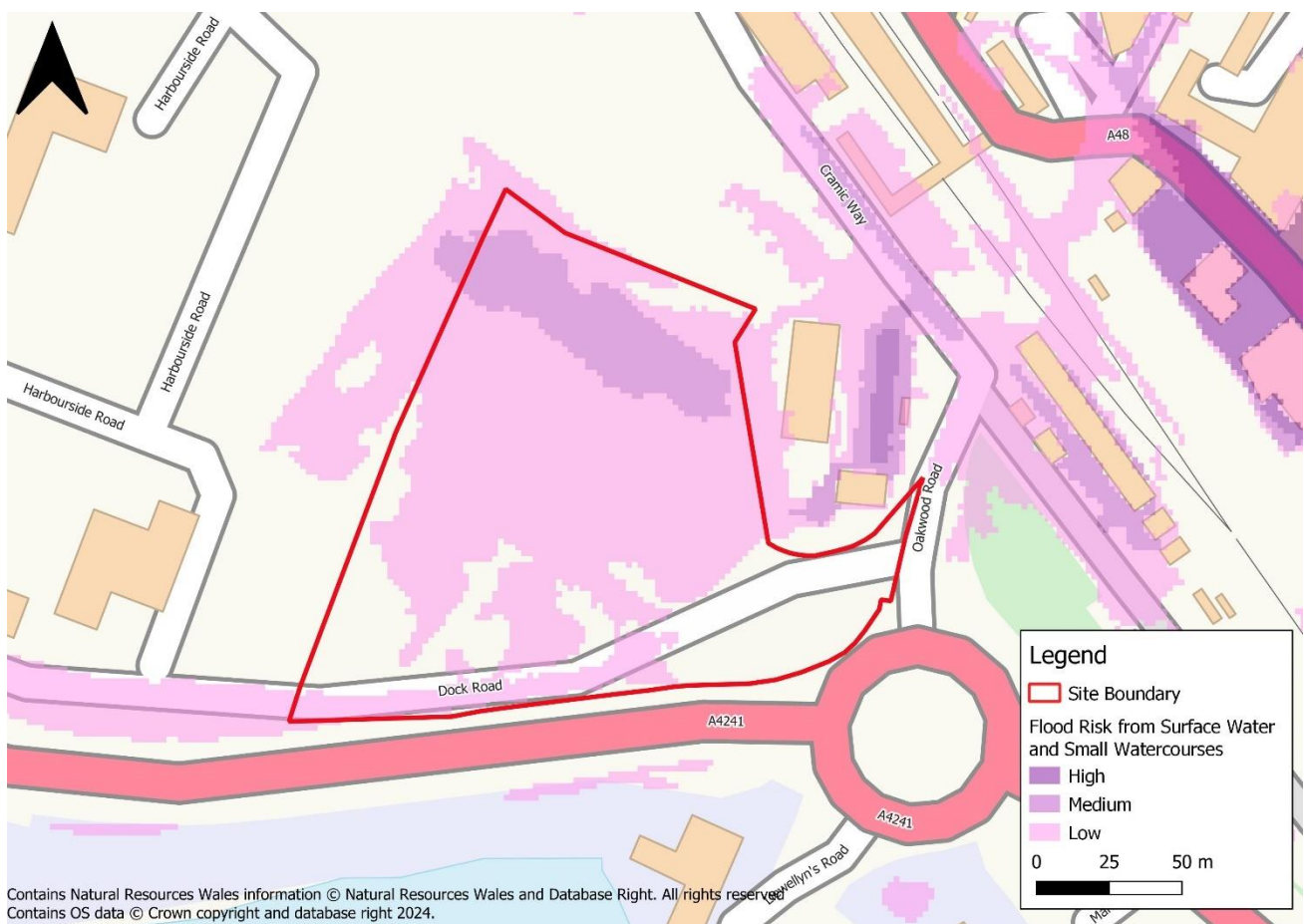


Figure 4-2 FRAW- Risk from Surface Water and Small Watercourses

The flood map for surface water and small watercourses flooding does not reflect the current topography of the site, nor the significant drainage infrastructure that allows water to flow under the A4241 and into the dock. Consequently, with knowledge of these factors and the proposed drainage strategy, the development is concluded to be a low risk of Surface Water and Small Watercourses flooding.

4.6 Flood Risk from Groundwater

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerges at the ground surface or within manmade 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 Council (NPTC) Local Flood Risk Management Strategy (2013) states that “Historically, there are no specific areas of groundwater flooding recorded in the Neath Port Talbot area.”

The underlying superficial geology comprising Tidal Flat Deposits tends to be impermeable and therefore would not provide a pathway for groundwater to rise and impact this development. Furthermore, the site is extensively built upon ground raising it above the natural groundwater table established by the dock level.

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

4.7 Flood Risk from Sewers

Flood risk from sewers is a result of excess surface water within the sewer drainage network. The NPTC 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 with the Harbourside area. Therefore, it's been assessed the risk of sewer flooding for this site is 'Low'.

4.8 Flood Risk from Reservoirs

NRW flood maps indicate that the proposed development site is in an area that is at risk of flooding from a reservoir failure as seen in Figure 4-3. Even though the site is shown to be at risk if a failure were to occur the map is not indicative of the likelihood of such an occurrence.

Reservoirs in Wales are strictly regulated for safety by NRW under the Reservoirs Act 1975. Therefore, the probability of failure and consequently the risk is judged to be extremely low.

5 Detailed Fluvial Flood Risk Assessment

5.1 Hydraulic Modelling Availability

As identified in the section 0, the site is considered to be at risk of fluvial flooding. To better understand the risk of flooding posed to the site and the potential implications of climate change, further assessment using detailed hydraulic modelling is provided in this section.

NRW's detailed fluvial and tidal flood model for Port Talbot consists of a 1D-2D linked ESTRY-TUFLOW Model developed by JBA Consulting in August 2017.

The 2017 NRW model was recently updated for another study conducted by JBA in October 2023. In summary, the key model updates were as follows:

- Updates to the Tuflow software version.
- Updates to the flood hydrology to comply with current methods, technical guidance, and data sources.
- Updates to the tidal boundary to apply the latest coastal extreme estimates and climate change allowances.
- Updates to the model representation of Green Park and Newbridge weirs.

The model incorporates the flood relief culverts under the A4241, and updated site topography taken from NRW's 2022 LiDAR release (only applied locally to the site).

5.2 Baseline Flood Modelling

5.2.1 Baseline 1% AEP plus climate change event

During the 1% AEP plus Climate Change event, the site is shown to be inundated with varying levels of flood depths across the site as shown in Figure 5-1. Most of the site is modelled to have flood depths of less than 600mm, with areas along the northern boundary and isolated areas towards the southeast of the site having modelled flood depths of >1200mm.

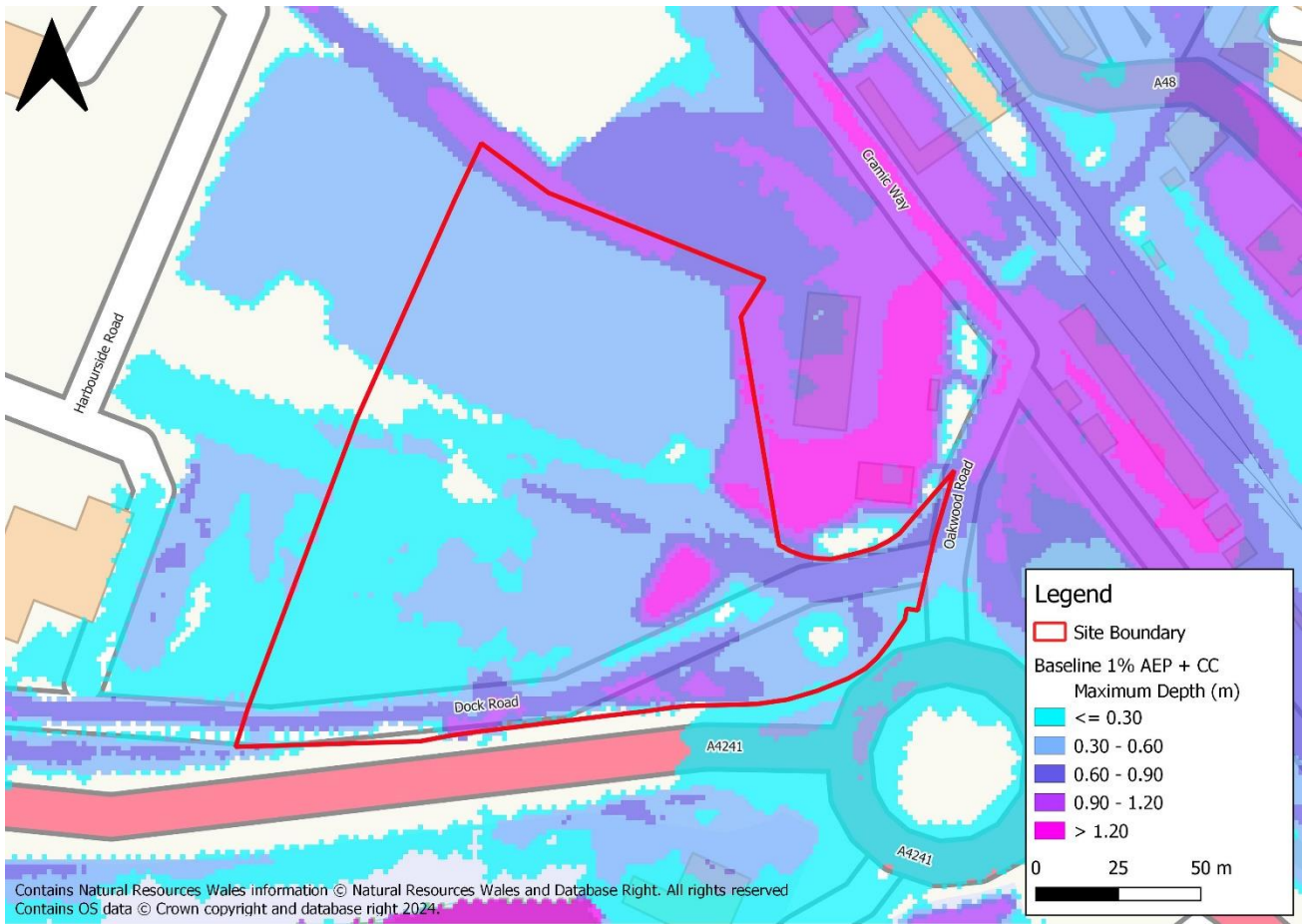


Figure 5-1 1% AEP plus Climate Change

5.2.2 Baseline 0.1% AEP event

During the 0.1% AEP event, the site is shown to be inundated with varying levels of flood depths across the site as shown in Figure 5-2. As expected, flood depths are greater than those experienced during the 1% plus climate change AEP event, typically increasing by 200mm.

Modelled flood depths are predominantly between 300-900mm in this design event with greater areas in the north modelled to have maximum flood depths of greater than 1200mm. Furthermore, an area just to the south of the road that currently splits the site into two is modelled to have flood depths of between 900-1200mm.

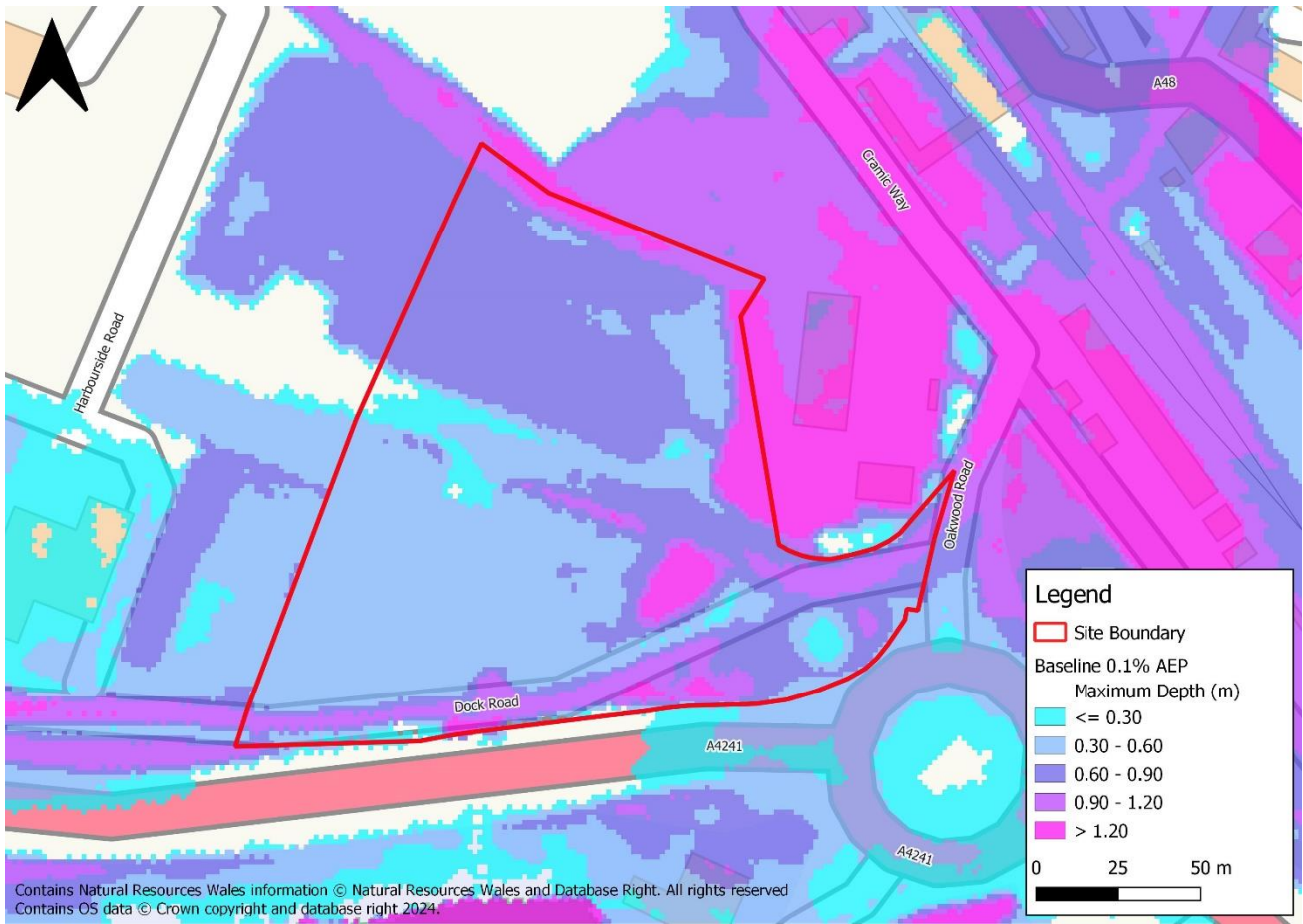


Figure 5-2 0.1% AEP Scenario

5.3 Post-Development Modelling

5.3.1 Policy Requirements

Where development is justified, suitable mitigation measures can be incorporated within the design to ensure that development is as safe as possible, and there is (TAN15, Para 7.3):

- minimal risk to life;
- minimal disruption to people living and working in the area,
- minimal potential damage to property;
- minimal impact of the proposed development on flood risk generally; and,
- minimal disruption to natural heritage.

Further guidance on assessing the above requirements is provided in Appendix 1 of TAN-15. Three requirements are particularly important concerning the proposed development and the flood mitigation required. These are:

1. **[A1.12]** No flooding elsewhere. The proposed development should have minimal impact of the proposed development on flood risk generally.
2. **[A1.14]** Commercial/ Industrial development should be flood-free in the 1% AEP plus climate change event. This is “indicative guidance”.

3. **[A1.15]** Beyond the threshold set by A1.14 flooding should be safe for site users and recommended values of maximum flood depths and velocity are provided. The maximum recommended flood depth for commercial development is 600mm and 1000mm for industrial. The figures provided are “indicative”; “Each site must therefore be considered individually, and a judgement taken in the context of the particular circumstances which could prevail at that site”.

NRW provide further guidance with respect to Ancillary Development within Operational Guidance Note 105a - Flooding to Ancillary Areas. This guidance notes that "*for some new development proposals, allowing selective flooding to certain parts of the site may offer a means of mitigating risk, including to third parties off-site. Therefore, in certain circumstances, some limited flooding may be considered acceptable as part of wider flood risk management proposals if it can be demonstrated by a developer that the risks and consequences of flooding can be managed down to a tolerable level*". The guidance goes on to explain:

In the first instance, all new development proposals should be designed to meet the appropriate design threshold frequency of flooding, including an allowance for climate change², set out in table A1.14. However, there may be specific local situations where a developer is able to demonstrate that flooding to certain parts of a site within the red line boundary could be tolerable, for example ‘ancillary areas’.

In these cases, a developer will need to provide full reasoning in the FCA, along with appropriate avoidance and/or mitigation measures for consideration. As part of their planning submission, the developer must demonstrate that all options to design the development to be entirely flood free have been explored and exhausted.

Flooding within the red line development site boundary will only be considered where:

- All properties and /buildings and adjacent garden areas are designed to be flood free³.
- Flood depths to ‘ancillary areas’ do not exceed **+300mm** for the minimum design threshold frequency in table A1.14 (plus an allowance for climate change over the lifetime of the development).
- With the exception of clearly designated ‘flood storage/conveyance areas’, the flood hazard rating is no greater than ‘very low’ in accordance with the established Defra FD2320 hazard guidance (supplementary note)⁴ using depth and velocity (see Table 1). Flood hazard greater than this may result in an unacceptable risk (dependant on the type/location of the development proposal).
- There is no risk of increased flooding elsewhere.

General use car parking areas (non-residential) and estate roads are considered to qualify as ‘ancillary development’. As such, where necessary and unavoidable, it is permissible for areas of car parking and internal site roads to flood up to 300mm in the A1.14 design event. Furthermore, it is recognised that flooding of areas designated for flood storage and conveyance is likely to be tolerable even where the flood hazard rating is greater than ‘very low’.

5.3.2 Post-development model updates

The post-development model includes mitigation measures to help reduce the flood risk at the site as depicted in Figure 5-3 . These include;

- Raising of the Switch building a Finished Floor Level (FFL) of 7.9mAOD
- Raising ground levels around the building, including ancillary car parking areas, raised to 7.7mAOD
- The lowering of land around the southeastern and southern boundaries to a minimum of 6.8mAOD to facilitate flood flows around the site and to towards the flood relief culverts under the A424. Areas already lower than 6.8mAOD will remain unchanged
- Increased the number of flood relief culverts under the A4241 from the existing 3 to 5.

The post-development scenario have been assessed for the 1% plus climate change and the 0.1% AEP events.

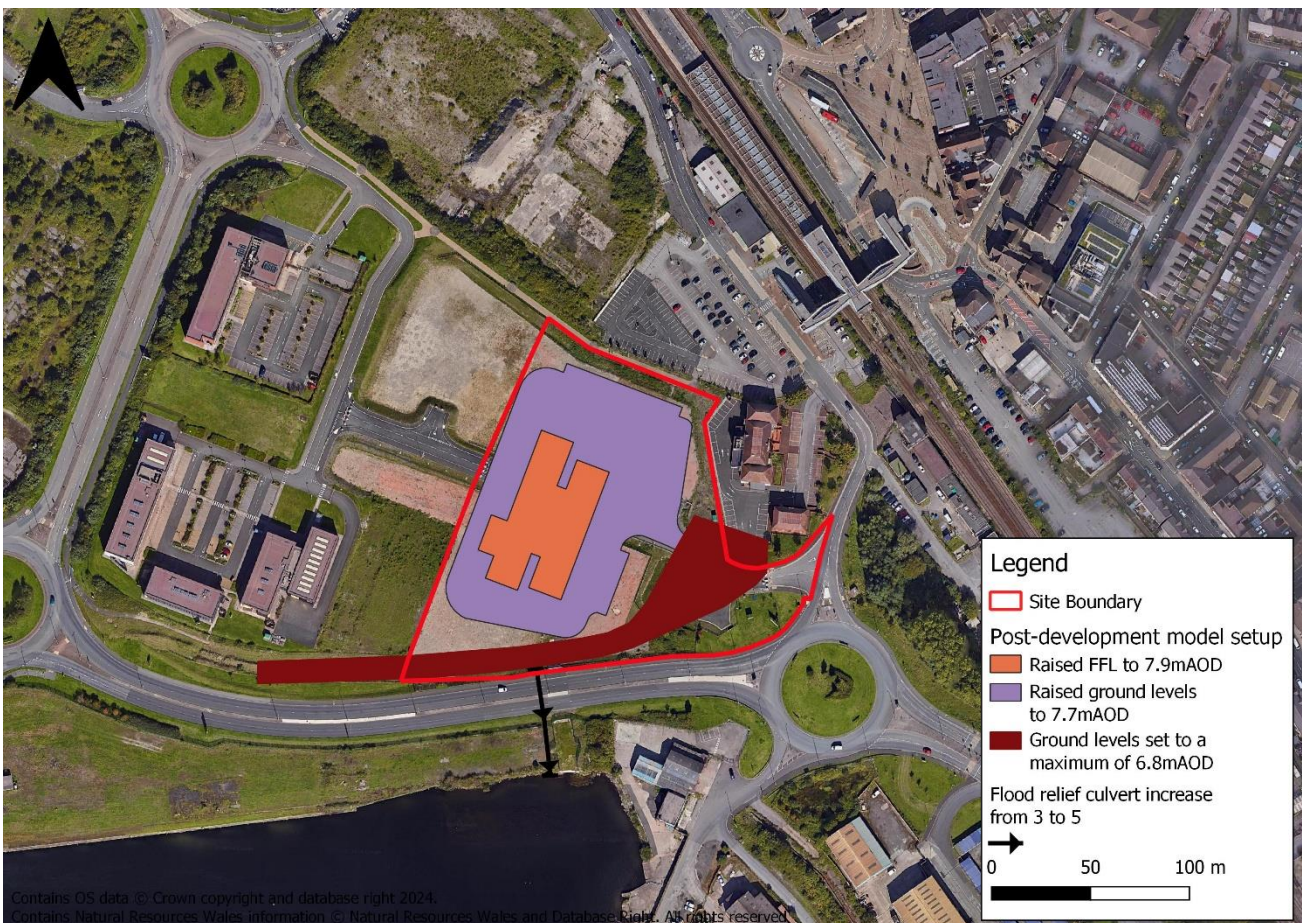


Figure 5-3 Post-development model setup

5.3.3 Post-development 1% AEP plus climate change event

The predicted depths of flooding across the site are shown in Figure 5-4. As a result of the flood mitigation measures, flooding across most of the site is reduced in comparison with the baseline scenario.

The maximum flood level around the perimeter of the proposed building is 7.81mAOD. The proposed FFL of the building is 7.90mAOD. Consequently, the building is not predicted to flood and any signs of flooding within the building are an artifact of the modelling approach and not a true indication of internal flooding. The proposed building therefore complies with the requirements of A1.14 of TAN15.

Furthermore, the ancillary areas of car parking and internal estate roads surrounding the building are predicted to experience flooding less than 300mm, complying with NRW's guidance on flooding of ancillary areas.

Flood depth remain significant along the eastern and southern boundaries of the site. This is an intended consequence of the flood mitigation strategy to channel water around the site. These areas are designated flood storage/conveyance areas.

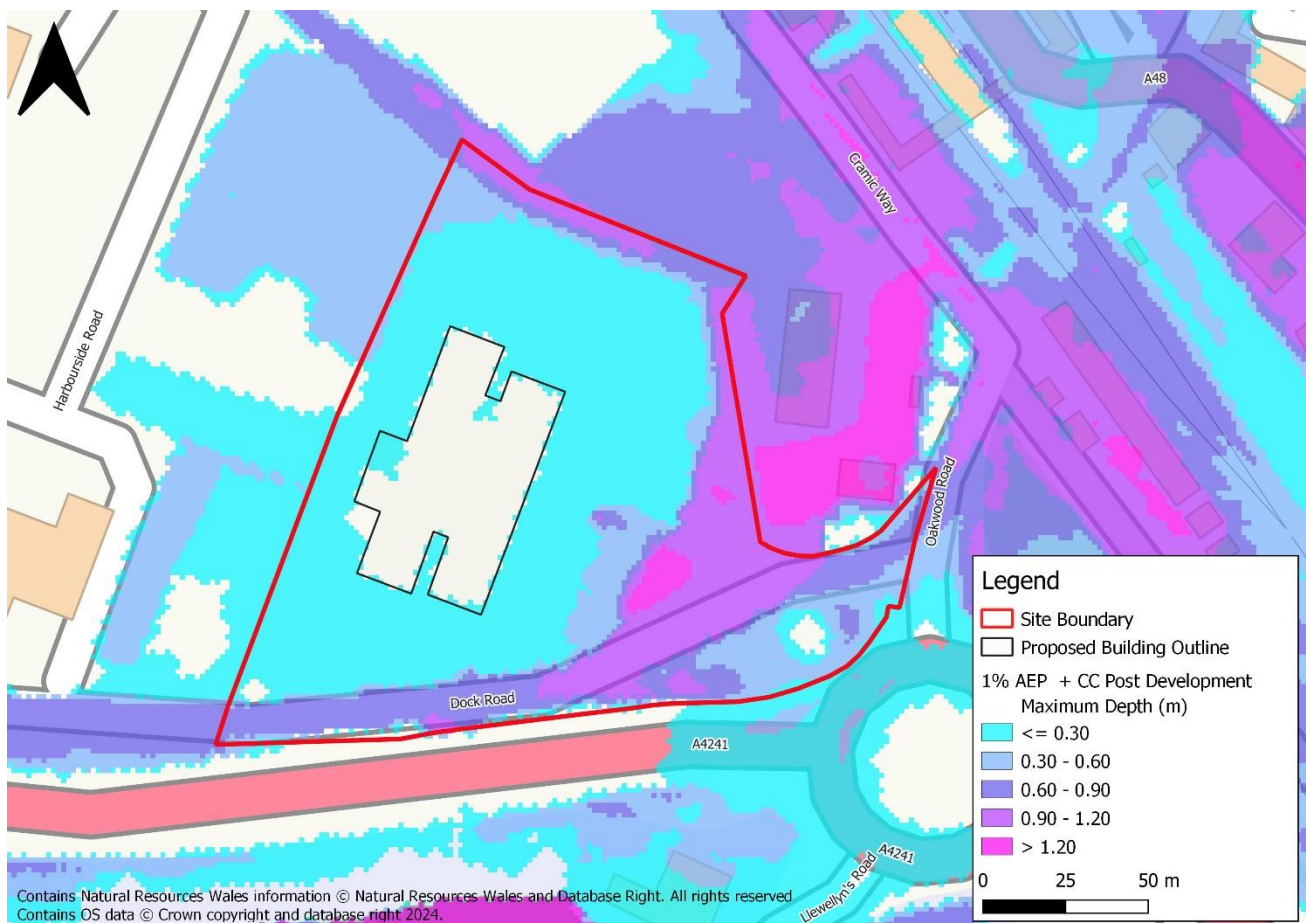


Figure 5-4 Flood depths in the post Development 1% AEP plus climate change event

5.3.4 Post-development 0.1% AEP event

The flood depths predicted during the post-development 0.1% AEP event are shown in Figure 5-5. During this event, flood depths are typically increased by 200-300mm over the 1% AEP plus climate change event.

The maximum flood level predicted within the building footprint is 8.11mAOD, resulting in a maximum internal flood depth of 210mm.

Ancillary areas of car parking and internal estate roads surrounding the building are predicted to experience flooding not greater than 550mm and typically within a range of 300mm to 470mm.

All predicted flood depths are within the recommended tolerable conditions of A1.15.

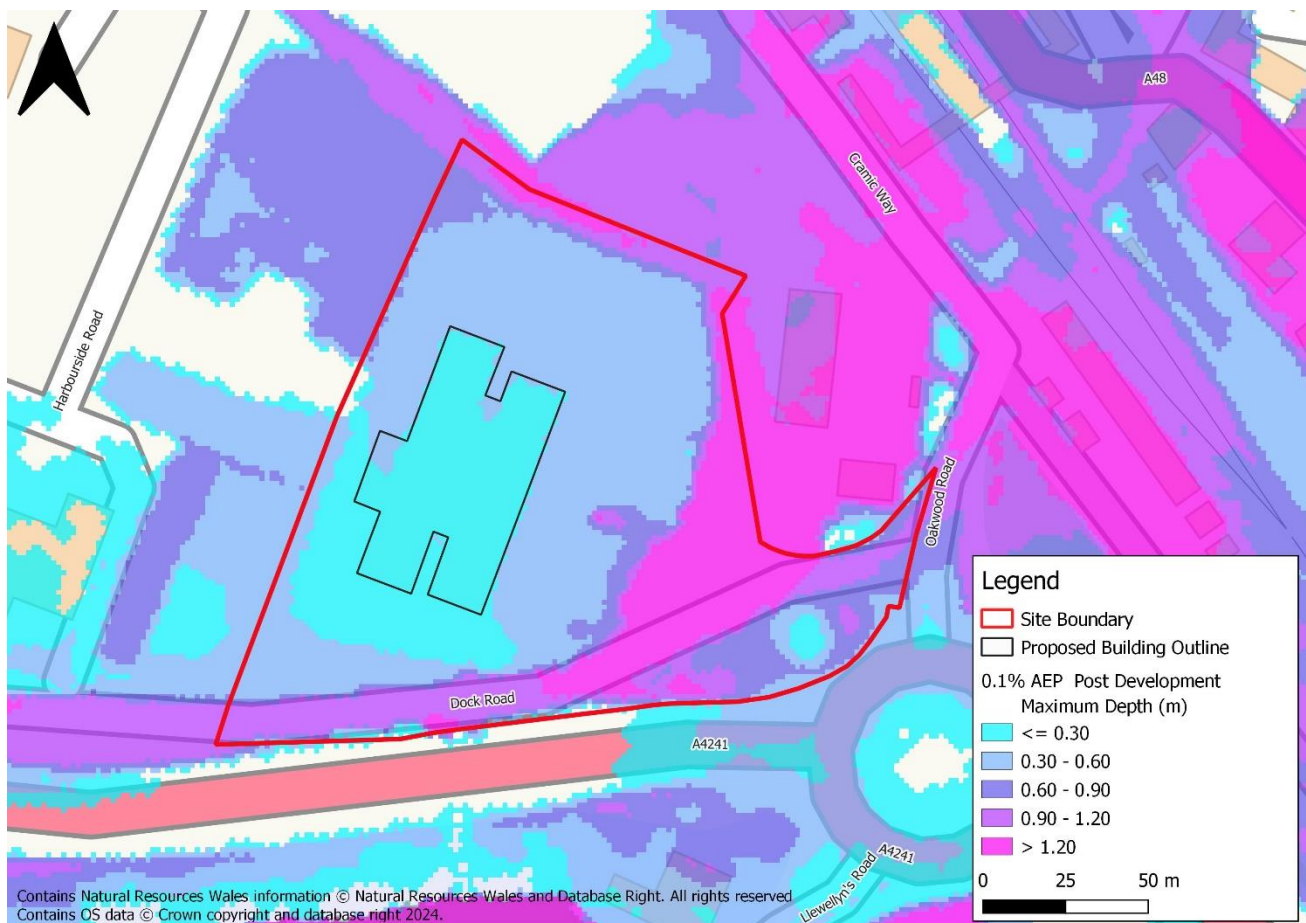


Figure 5-5 Flood depths in the post Development 0.1% AEP event

5.3.5 Third-Party Impacts

Almost any new development in the floodplain has the potential to change the flood risk to others. This can be caused by changes in the availability of flood storage or changes in how flood water can flow across a site (conveyance).

Paragraph 7.3 of TAN15 states that development must have “minimal impact of the proposed development on flood risk generally”. Furthermore, the guidance in Section A1.5 of TAN15 requires that an FCA should assess “the impact of the development in terms of

flood risk on neighbouring properties and elsewhere on the flood plain". Therefore, this matter is discussed in the following section.

The proposed flood mitigation strategy has been carefully developed to manage flood conveyance around the site and direct a significant portion of the flood volumes to the dock where water levels can be suitably managed.

To understand the potential change to the flood risk to others as a result of the development the pre- and post-development scenarios have been compared using GIS software. The 'detriment analysis' identifies areas where the flood depth has increased or decreased as a result of changes to the hydraulic model to represent the pre- and post-development scenarios.

5.3.5.1 1% AEP plus climate change event

The detriment analysis for the 1% AEP event plus climate change is shown in Figure 5-6.

As a result of the flood mitigation strategy, there is widespread betterment across the site and wider area. Reductions in flood depths across the site vary considerably but are typically reduced by 200-300mm. Reductions offsite, generally northeast of the site, are generally less than 50mm, diminishing further away from the site.

Increases in water levels are generally limited to the designated flood storage/conveyance areas, where ground levels have been deliberately lowered. The model also reports slight changes in water levels within the dock, typically less than 10mm. This is associated with increased flows into the dock (although in practice all flood water would find its way to the dock eventually) and also instabilities in the model that struggle to resolve comparatively small flows in a large and deep waterbody. In reality, water levels in Port Talbot dock are carefully monitored and controlled by Associated British Ports (ABP). ABP have multiple water levels sensors around the dock and on the Afon dock feeder channel and multiple control structures for water level management, including penstocks at Green Park Weir and lock gates. These systems allow ABP to manage and maintain water levels in the dock under all conditions, although these structures and systems are not represented in the hydraulic model.

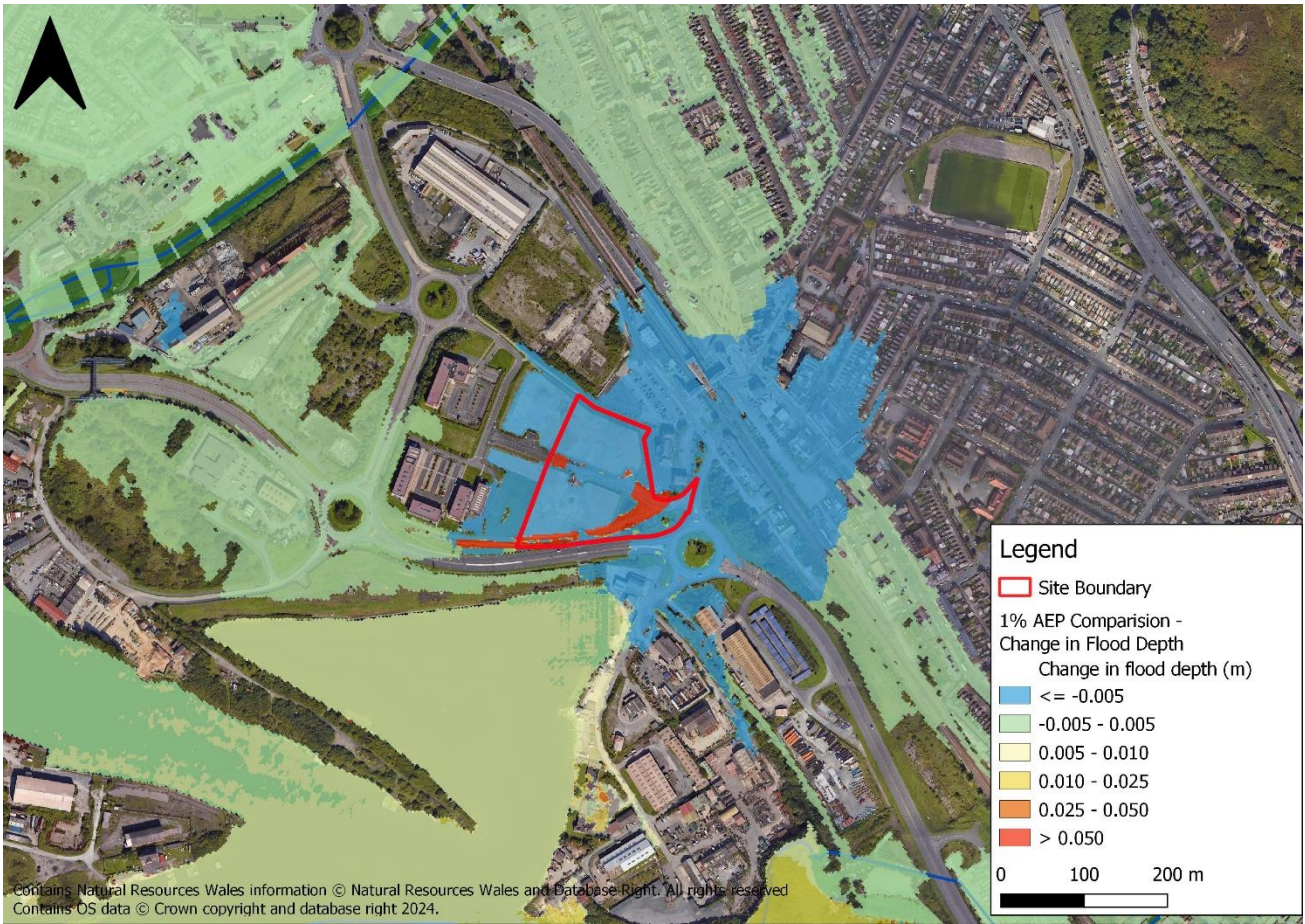


Figure 5-6 Flood depth comparison 1% AEP plus climate change event

5.3.5.2 0.1% AEP event

The detriment analysis for the 0.1% AEP event is shown in Figure 5-7. The results of the analysis are similar to that of the 1% AEP plus climate change event. Although the area of betterment in this event extends to a large area west of the site, where flood depths are reduced by 27mm.

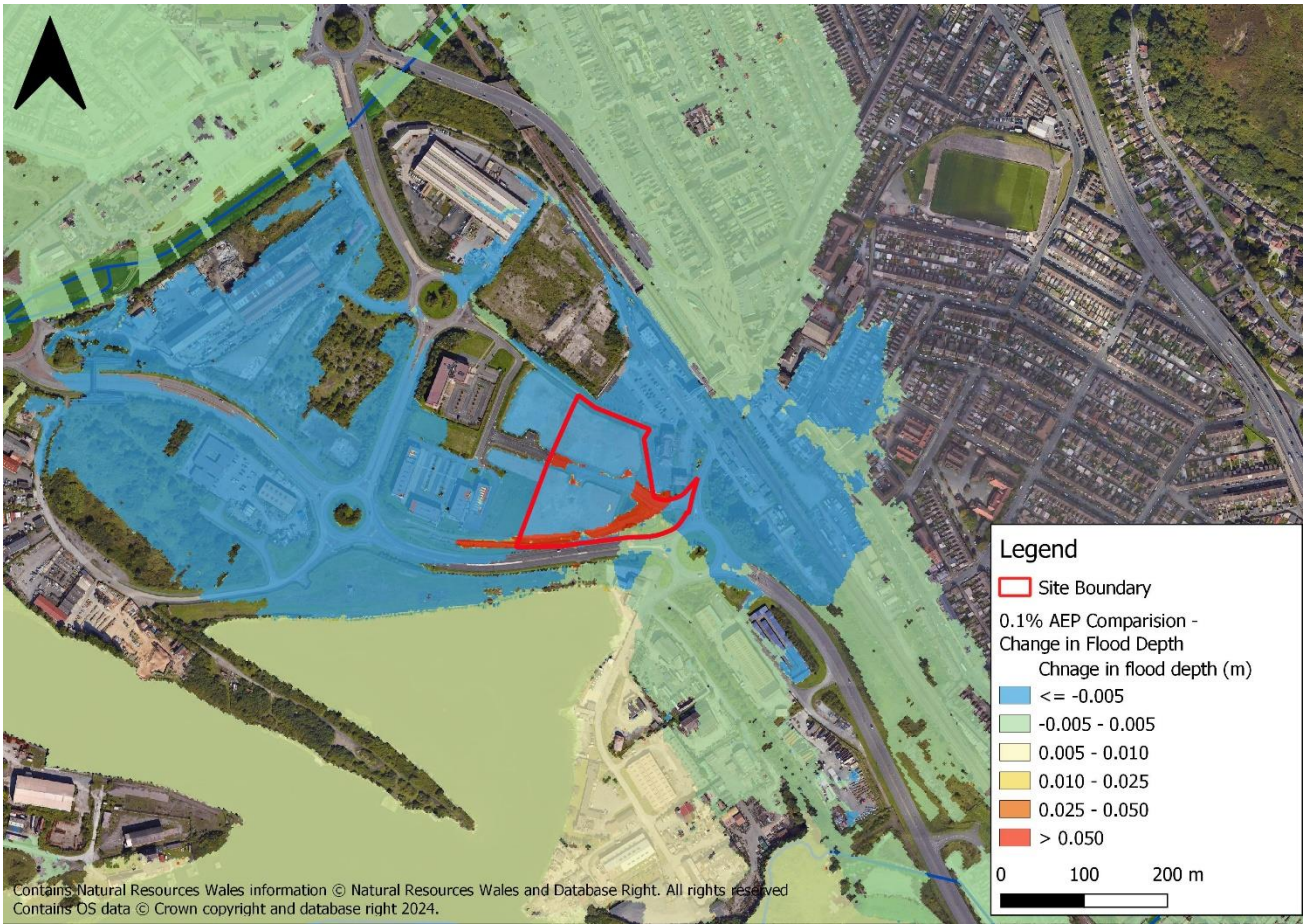


Figure 5-7 Flood depth comparison 0.1% AEP event

5.4 Access and Egress

During the TAN15 design events, access to dry land will be restricted across much of Port Talbot due to the scale of flooding. However, specifically for the site the main site access off Oakwood Road will be inaccessible during a flood event as the access is bisected by the flood mitigation strategy with significant flood depths across this access. Consequently, the site has been designed to provide an alternative access to the west via Harbourside Road and arterial roads north to the M4. This route is predicted to remain flood free in all design events as shown in Figure 5-8. Any flooding shown along the route is related to flooding under the raised flyovers.

It is recommended that the building managers sign up for flood warnings and prepare and implement an appropriate emergency plan to ensure that staff and visitors know how to react in the event of flooding.

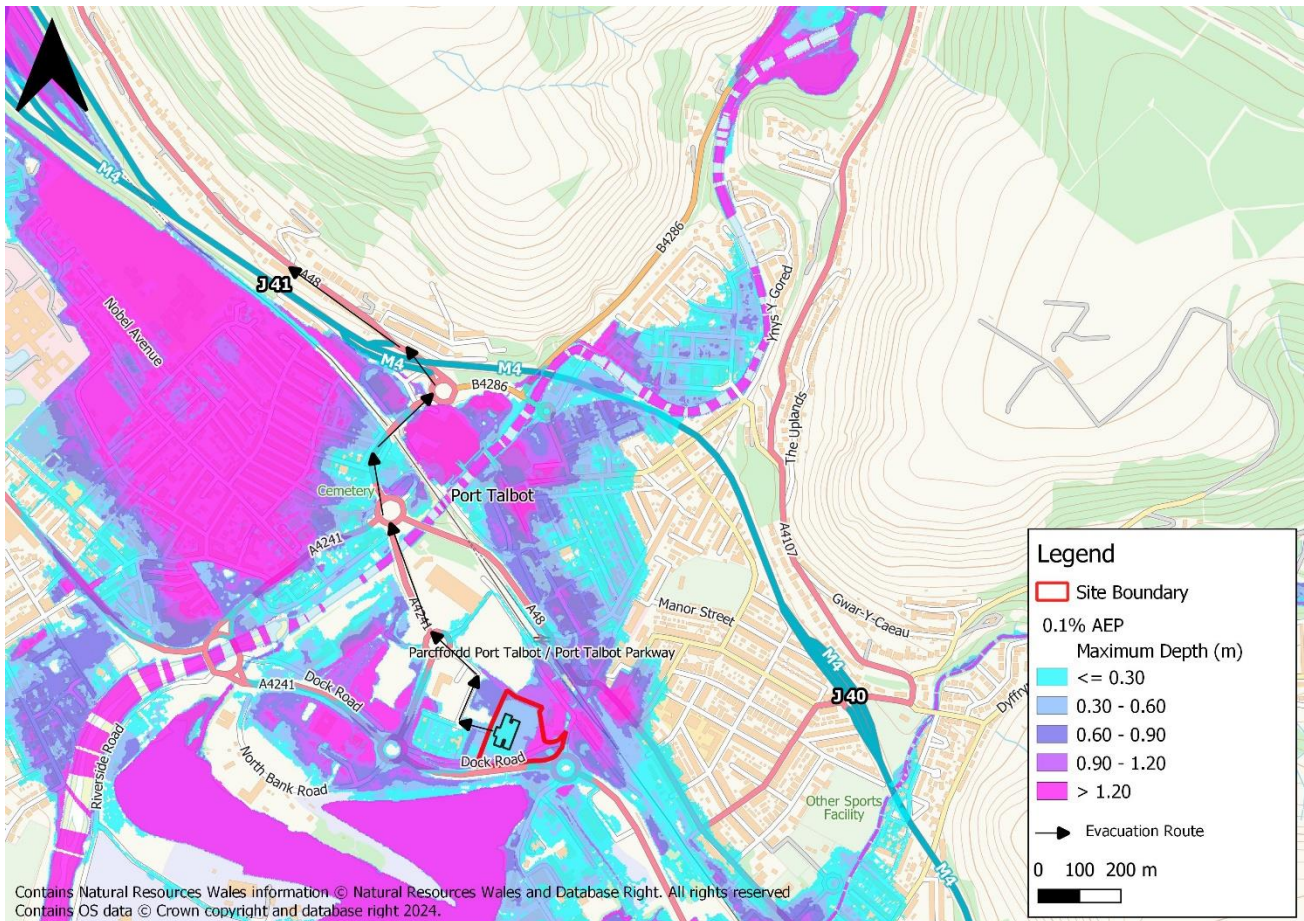


Figure 5-8 Proposed Evacuation Route

5.5 Flood Mitigation Measures

The following mitigation measures are recommended to ensure the safety of the site's occupiers and users, in the event of an extreme flood.

The measures that have been included within the post-development modelling should be implemented so that the modelled results can be achieved. These are;

- Raising of the Switch building to 7.9mAOD
- Raising of land that includes ancillary car parking areas raised to 7.7mAOD
- The lowering of land around the southeastern and southern boundaries to maximum level of 6.8mAOD to direct floodwater towards the flood relief culverts
- Expand the provision of flood relief culverts under Harbourside Way from 3no. to 5no.

Additionally, the following measures are advised to enhance the site's resilience to flooding;

- Site management should sign up for the NRW flood warning service. The proposed development site is located entirely within the 'River Afan at Port Talbot' flood warning area and the 'Swansea Bay and Gower Coast' and the 'Rivers Afan and Kenfig' flood alert area.

- A Flood Response Plan should be developed and adopted so that occupiers and users are aware of the flood risk and know what action to take in the event of receiving a flood warning. At a minimum, the flood emergency plan should cover adequate flood warning, evacuation, and access/egress routes in the event of flooding for the lifetime of the development. NRW guide the production of flood emergency plans⁴. This guidance should be used to inform flood response procedures at the site.
- Where practical the building should be made flood-resilient by design. Such measures might include hard floors, raised electrics and placing key/high-value equipment above the predicted extreme flood level (i.e. ~300mm off the floor).

⁴ Natural Resources Wales, How to prepare your home business or farm for a flood, retrieved from:
<https://naturalresources.wales/flooding/preparing-your-home-business-or-farm-for-a-flood/?lang=en>

6 Assessment of Acceptability Criteria

TAN-15 states that for Less vulnerable development to be considered within Zone C1, the site must meet both the Justification Test and the Acceptability Criteria. The Section 3.7 details the assessment of the proposed development site against each criterion of the Justification Test. Our assessment of the Acceptability Criteria, as set out in TAN-15, is summarised Table 6-1 below. These criteria must be satisfied for the proposed development to comply with all aspects of TAN-15.

Table 6-1 Assessment of Acceptability Criteria

TAN 15 Acceptability Criteria	Comments	Achieved
The developer is required to demonstrate that the site is designed to be flood-free for the lifetime [Ref: TAN-15 A1.5] of development for a 1 in 100 (1%) chance (fluvial) and 1 in 200 (0.5%) chance (tidal) flood event including an allowance for climate change in accordance with TAN-15 table A1.14.	The proposed SWITCH building is predicted to be flood-free in the post-development 1% AEP plus climate change flood event. Further, ancillary areas, including car parking and estate roads, are predicted to flood but remain below the 300mm recommended threshold for such areas. Flooding above 300mm is confined to areas designated for flood storage/conveyance.	Yes, in line with NRW ancillary areas guidance.
The development should be designed so that in an extreme (1 in 1000 chance) event there would be less than 600mm of water on access roads and within the building.	During the 0.1% AEP event, flooding is predicted not to exceed 600mm within the building or ancillary areas. Flooding above 600mm is confined to areas designated for flood storage/conveyance.	Yes
No flooding elsewhere.	Detailed hydraulic modelling has shown that the proposed development will not increase flood risk elsewhere, as detailed in Section 5	Yes
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	The flood defences in Port Talbot are owned and maintained by NRW and are regularly inspected.	Yes

TAN 15 Acceptability Criteria	Comments	Achieved
in any given year).		
The developer must ensure that future occupiers of development are aware of the flooding risks and consequences	Site management should sign up to the NRW Flood Warning Service to provide adequate warning of flooding. A Flood Response Plan should be developed and adopted so that occupiers and users are aware of the flood risk and know what action to take in the event of receiving a flood warning. At a minimum, the flood emergency plan should cover adequate flood warning, evacuation, and access/egress routes in the event of flooding for the lifetime of the development	Yes
Effective flood warnings are provided at the site	The site is located within NRW's 'River Afan at Port Talbot' flood warning area as well as the 'Swansea Bay and Gower Coast' and the 'Rivers Afan and Kenfig' flood alert area.	Yes
Escape/evacuation routes are shown by the developer to be operational under all conditions.	Secondary site access shall be available via Harbourside Road, providing a flood free route to the M4.	Yes
The development is designed by the developer to allow the rapid movement of goods/possessions to areas away from flood waters.	It has been recommended that resilience measures including the production of a flood management plan should be undertaken. An effective plan and dry access route will facilitate rapid movement of goods/possessions away from the site or to higher levels within the building.	Yes
Development is designed to minimise structural damage during a flooding event and is floodproofed to enable it to be returned to its prime use quickly after the flood.	The proposed development would be unlikely to experience any structural damage during a flood event due to the shallow (<300mm) depths of flooding within the building.	Yes

7 Conclusion and Recommendations

- JBA Consulting (JBA) was commissioned by Morgan Sindall Construction and Infrastructure Ltd to undertake a Flood Consequence Assessment (FCA) to support a planning application for the redevelopment of a brownfield site into a Research, Development, and Innovation (RD&I) facility for the decarbonisation of the Steel & other foundation industries. The South Wales Industrial Transition from Carbon Hub (SWITCH) is a collaborative innovation centre working with academia and industry partners to develop and deploy new technologies, products, and processes to move towards a net zero carbon future.
- The 1.88 hectares brownfield site is currently vacant. Preparatory works for the site, including flood mitigation measures, were completed in 2022 under a previous planning consent (P2022/0823).
- The site is located in proximity to two NRW main rivers. The River Afan is located 380m to the northwest of the site and Ffrwd Wylt is 850m to the east
- The proposal is classed as a Less Vulnerable Development by TAN-15.
- The site is located within Zone C1, as categorised by NRW's Development Advice Maps. Zone C1 is described as areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
- The site is located within Flood Zone 3 of the FMfP for flood risk from River.
- The site was shown to be at risk of flooding during the extremely unlikely event of reservoir failure.
- The site is at little or no risk of flooding from the sea, groundwater, or sewer flooding.
- The proposals have been developed with care to including measures to manage and mitigate the risks of flooding. These measures including, raising Finished Floor Levels (FFL) to 7.9mAOD, rising site levels to 7.7mAOD, lowering areas along the southern and southeastern boundary to a maximum level of 6.8mAOD, and increasing the number of flood relief culverts under Harbourside Way from 3no. to 5no.
- Detailed hydraulic modelling has been used to assess the risk of fluvial flooding to the site. This demonstrates that the proposed building will be flood-free in the post-development 1% AEP plus climate change fluvial event. Ancillary car parking areas and internal roads are predicted to flood to depths of less than 0.3m. Such flooding is unavoidable without causing an increase in flood risk elsewhere. As such, in line with NRW guidance for ancillary areas, the proposals satisfy the requirements of A1.14 of TAN15.

- During the post-development 0.1% AEP event the building is predicted to flood to a maximum flood depth of 210mm. Ancillary areas flood risk depths no greater than 600mm. Flooding greater than this is only predicted in areas of designated flood storage and conveyance. As such, the proposals comply with the requirements of A.15 of TAN15.
- It is recommended that the building management sign up NRW's Flood Warning Service and that a Flood Response Plan is prepared to ensure that future occupiers of the site are aware of the flood risk and recommended flood risk management actions.
- In conclusion, we find that with appropriate design and flood mitigation measures the site satisfies all the requirements of the Justification Test and Acceptability Criteria in compliance with the aims and objectives of Planning Policy Wales and TAN-15.

Appendix A - Implemented Culvert Design Drawings

Dwg. No. C2014B / RM / 1702

FLOOD RELIEF CULVERT

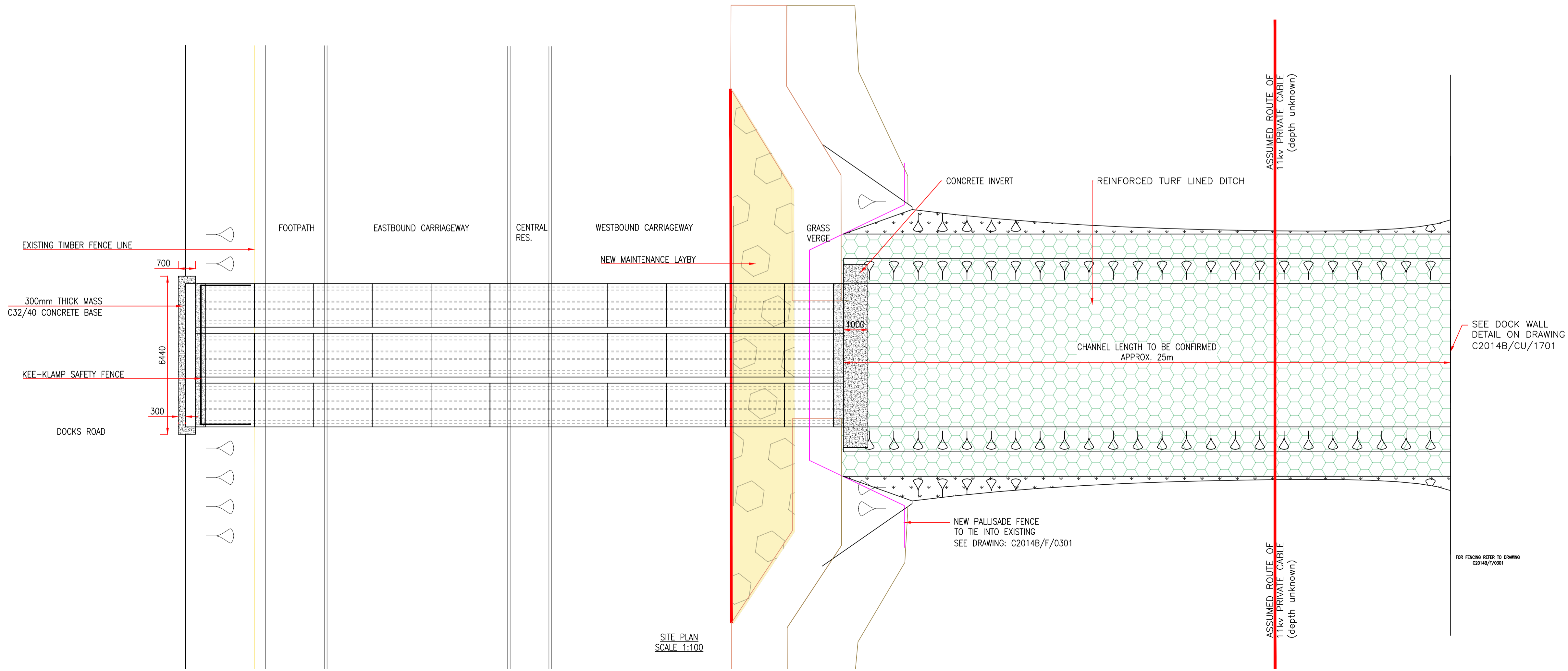
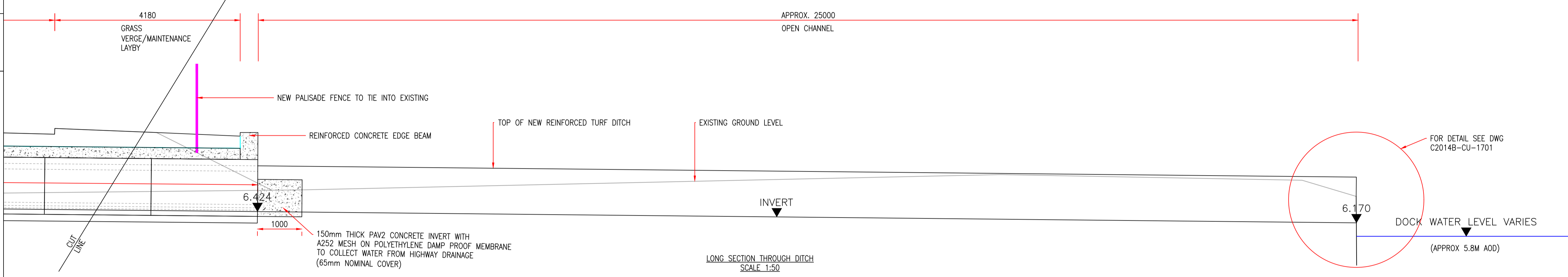
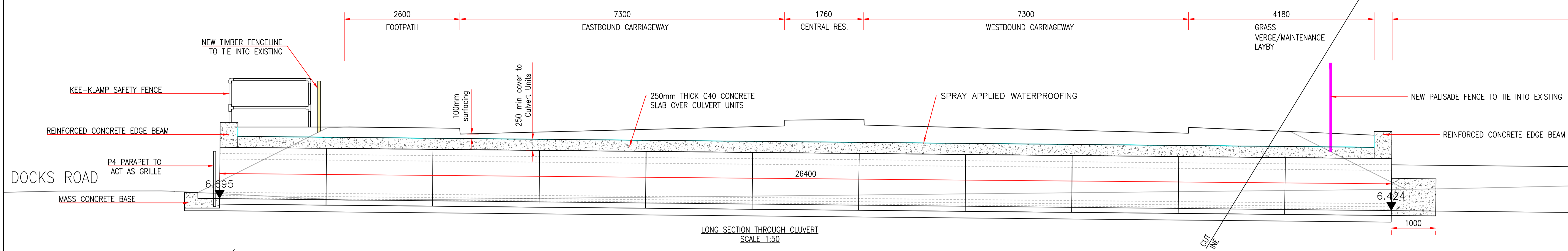
C2014B HARBOURSIDE STRATEGIC EMPLOYMENT SITE

Job Title

THIS IS A C.A.D. PRODUCED DRAWING AND SHOULD NOT BE AMENDED BY HAND.

NOTES A1

1. All dimensions are in millimetres unless otherwise stated.
2. This drawing should be read in conjunction with:
C2014B/F/0301
C2014B/RP/0701
C2014B/K/1101



A	11KV CABLE SHOWN, DOCK WALL DETAIL ADDED	NE	PR	HH	22/04/18
Rev	Details	Dr	Ch	Ap	Date

Client

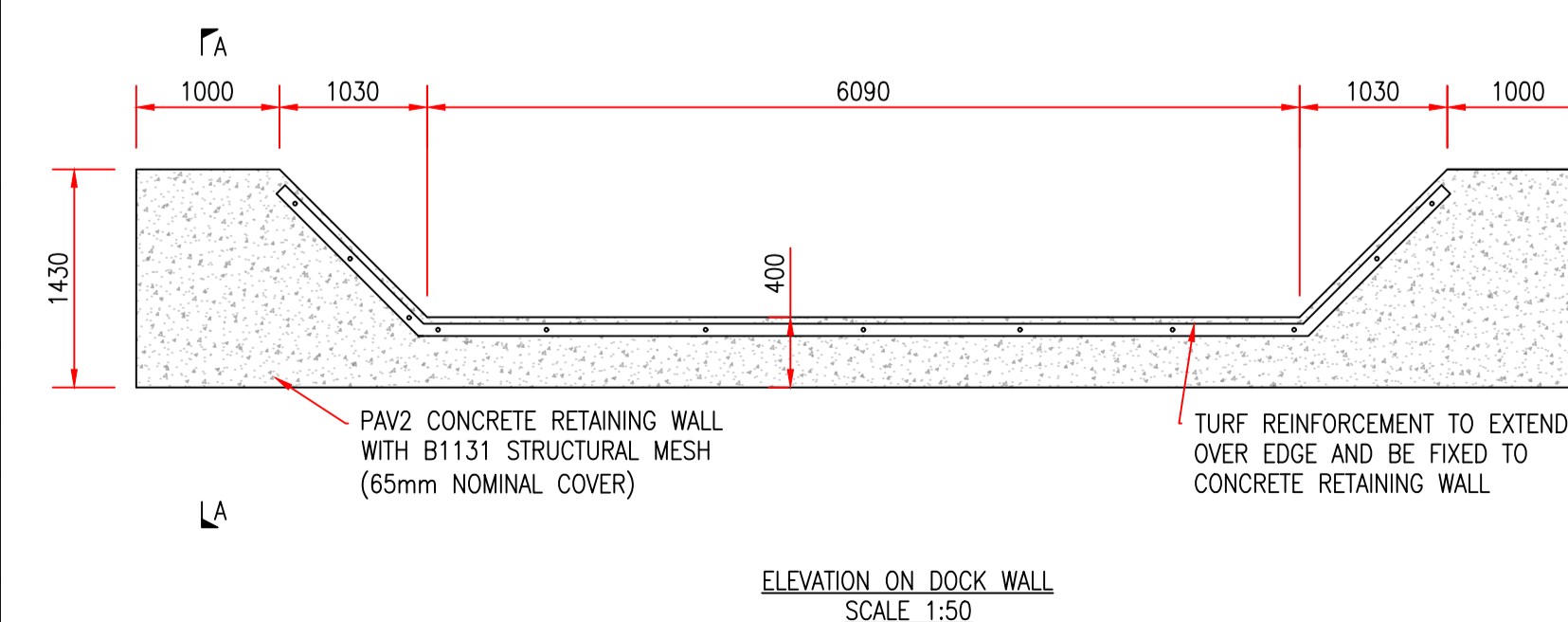
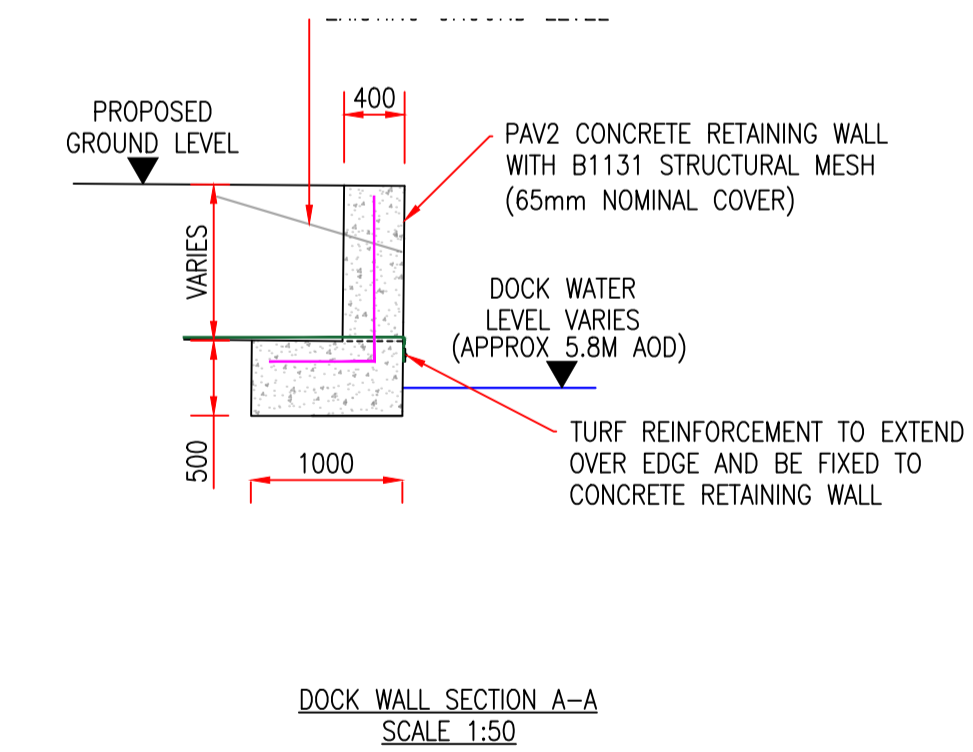
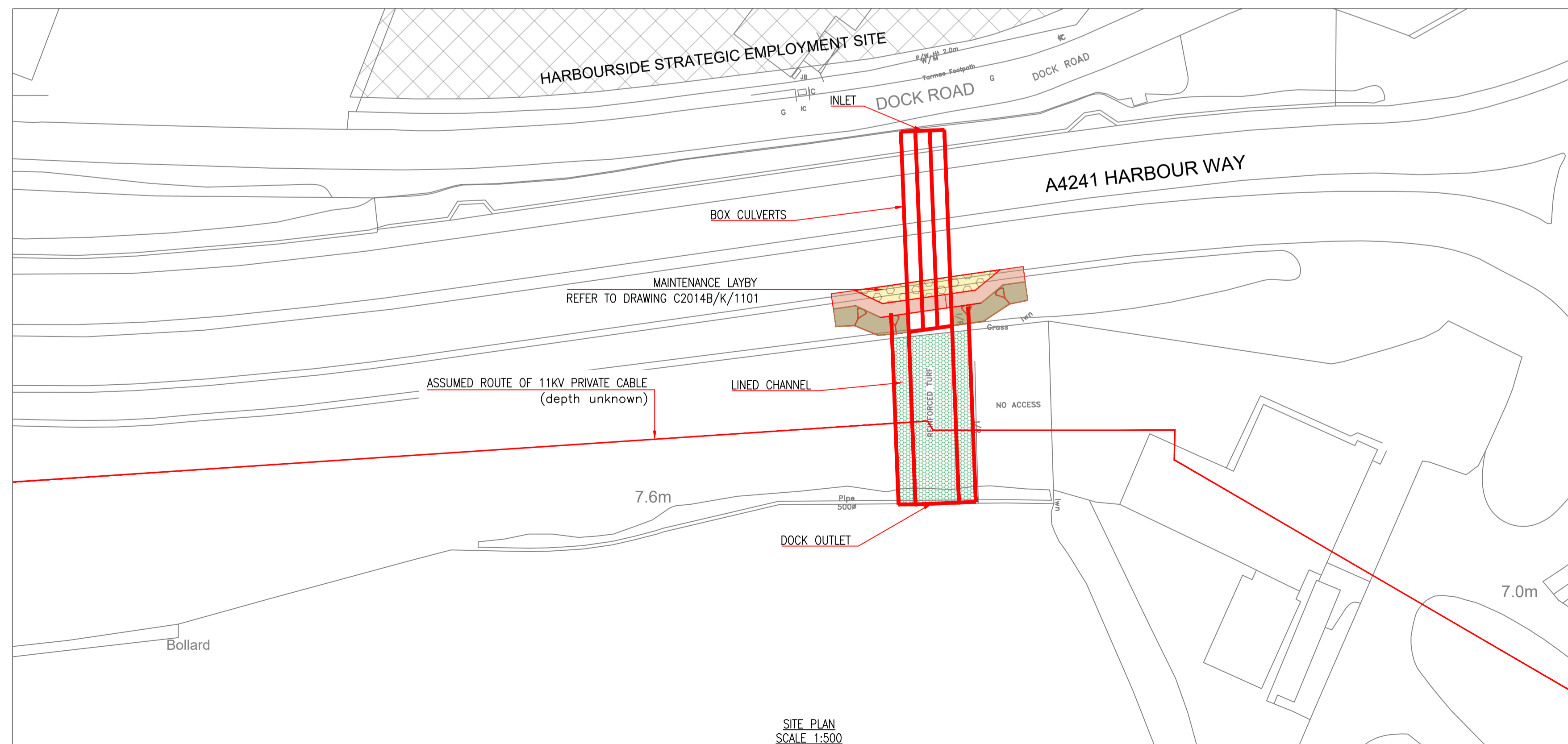
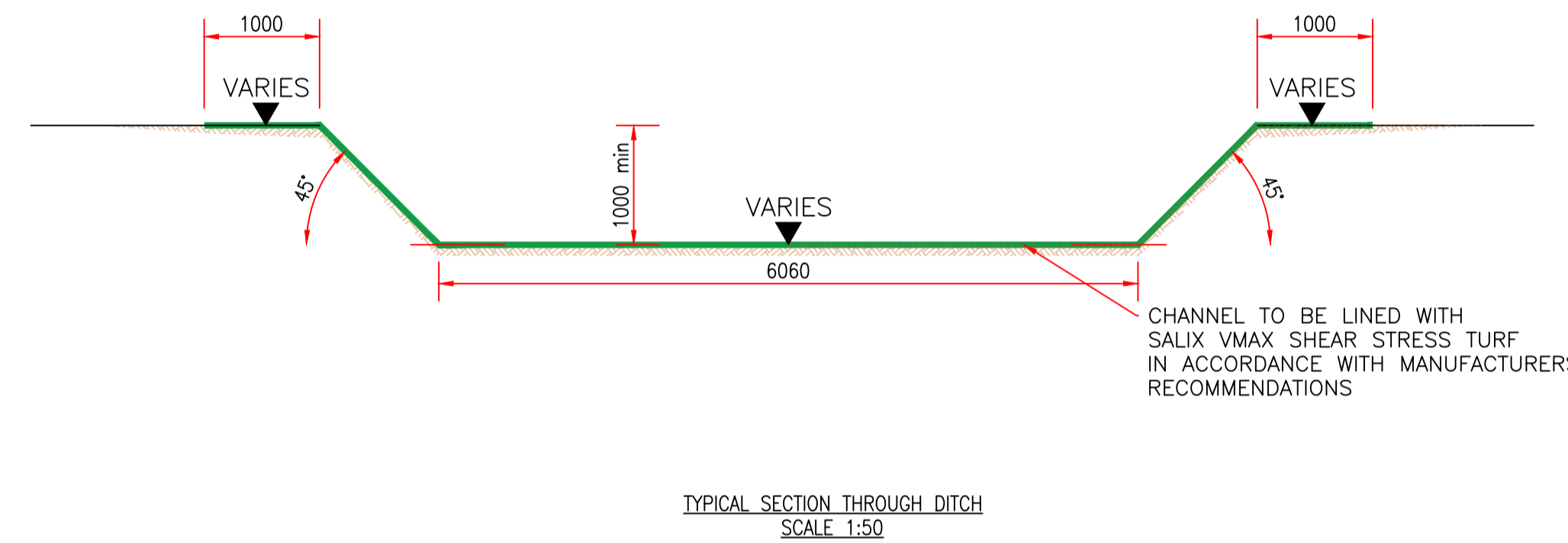
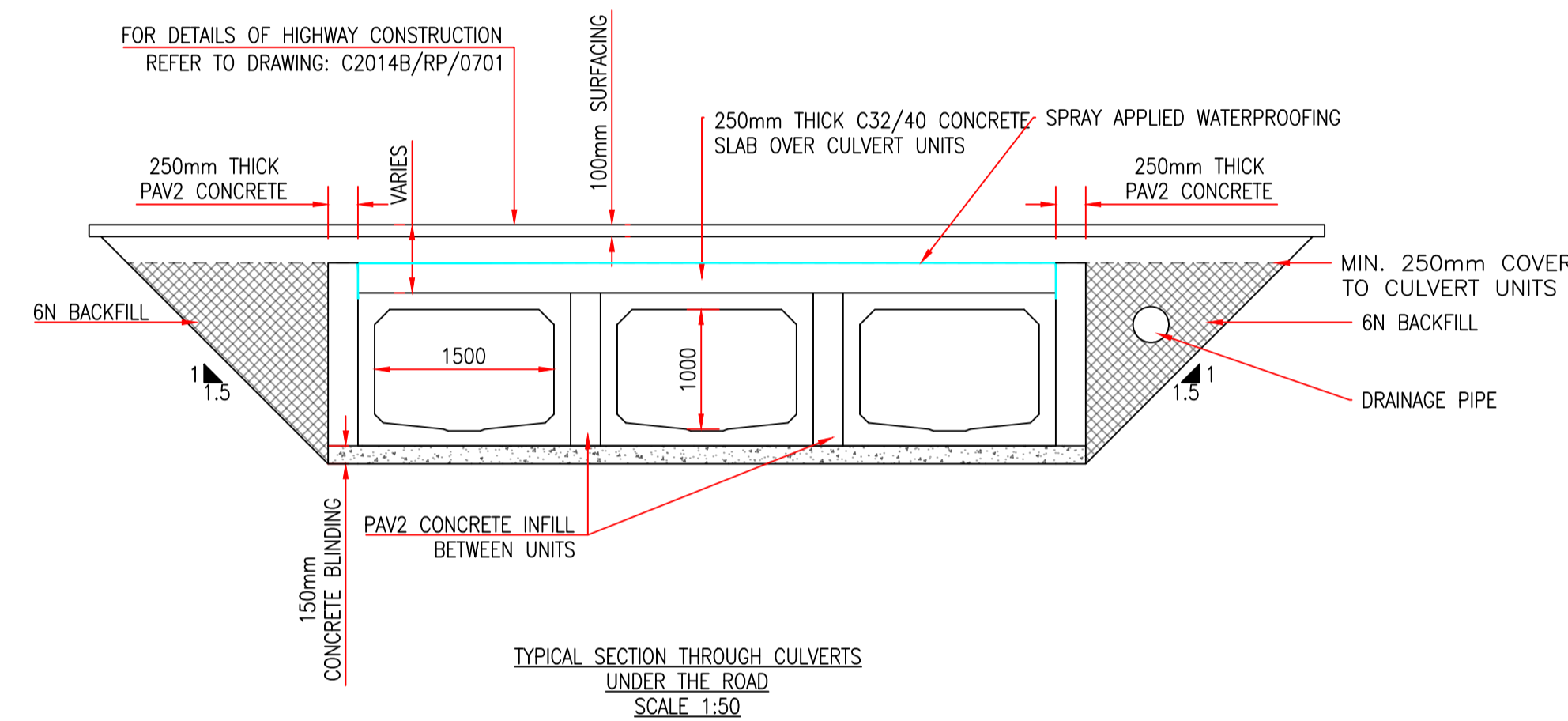
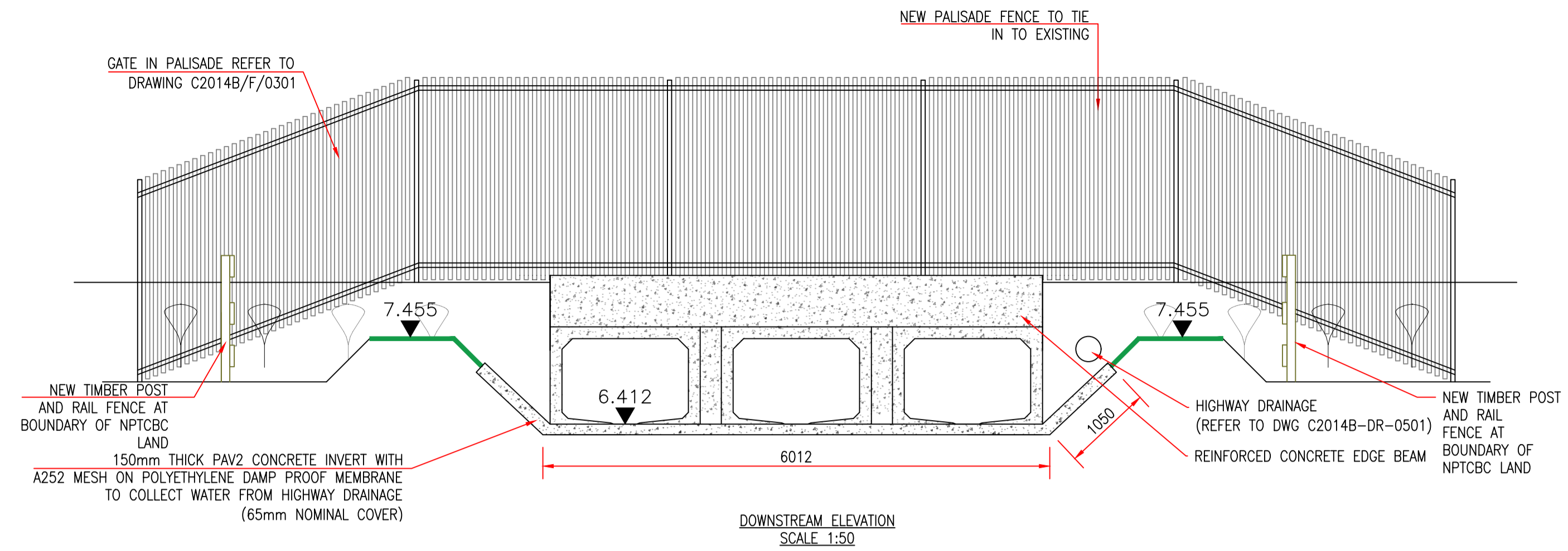
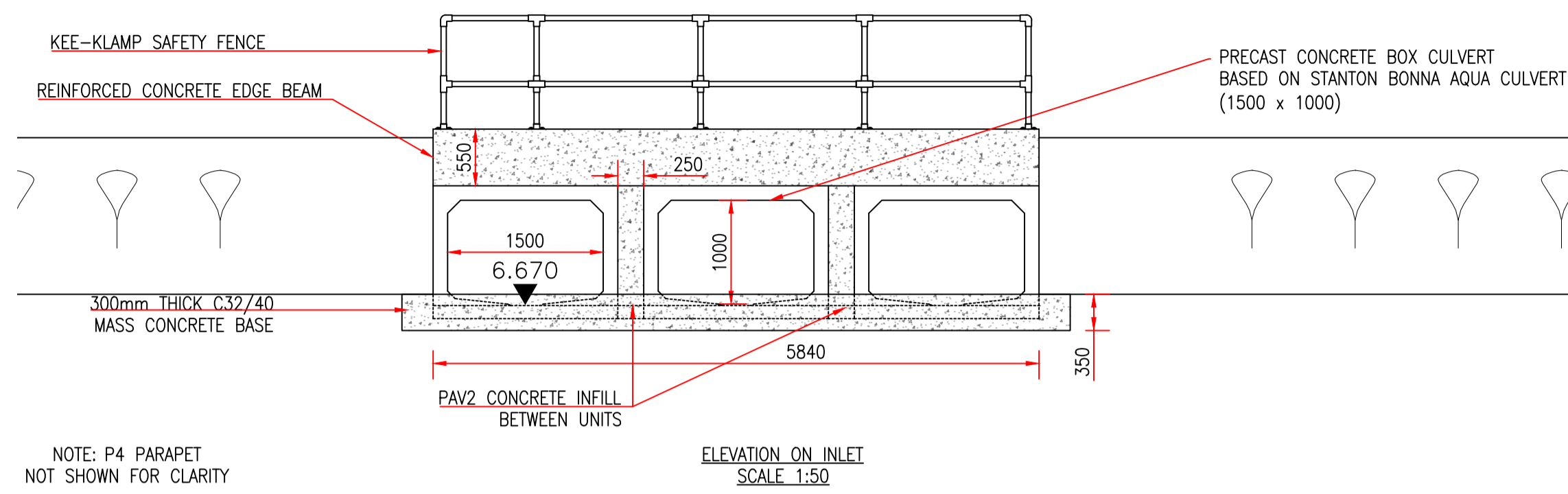


ENGINEERING AND TRANSPORT
GARETH NUTT
DIRECTOR OF ENVIRONMENT
THE QUAYS, BRUNEL WAY
BAGLAN ENERGY PARK
NEATH SA11 2GG

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

File No.	Financial Code No. 26.007500.B054.300916				
Drawn	NE	Checked	PER	Approved	HIH
Date	APRIL '18	Date	APRIL '18	Date	APRIL '18
Scales	1:500	Status	PLANNING		
Drawing No.	C2014B / CU / 1702				

1. All dimensions are in millimetres unless otherwise stated.
2. This drawing should be read in conjunction with:
C2014B/F/0301
C2014B/RP/0701
C2014B/K/1101



Rev	11KV CABLE SHOWN, DOCK WALL DETAIL ADDED	NE	FR	HH	22/04/18
Dr	Ch	Ap	Date		

Client

Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council / Cyngor Bwrdeistref Sirol
ENGINEERING AND TRANSPORT

GARETH NUTT
DIRECTOR OF ENVIRONMENT
THE QUAYS, BRUNEL WAY
BAGLAN ENERGY PARK
NEATH SA11 2GG

Job Title
C2014B HARBOURSIDE STRATEGIC EMPLOYMENT SITE
FLOOD MITIGATION CULVERT GENERAL ARRANGEMENT 1 OF 2

File No.	Financial Code No.	26.007500.B054.300916			
Drawn	NE	Checked	PER	Approved	HHH
Date	APRIL '18	Date	APRIL '18	Date	APRIL '18
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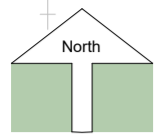
Drawing No. **C2014B / CU / 1701**

Dwg. No. C2014B / RM / 1701

C2014B HARBOURSIDE STRATEGIC EMPLOYMENT SITE FLOOD RELIEF CULVERT

Job Title

Appendix B - Proposed Site Layout



0m 10m 20m 30m 40m

VISUAL SCALE 1:500 @ A2

Notes

- Drawing is copyright of fenton+reece
- Only labelled dimensions are to be taken from this drawing. Do not scale from this drawing.
- Contractor is responsible for taking and checking all dimensions, below ground services and setting out.
- All elements of design should be checked on site and conflicts reported to responsible designer.. **If in doubt ask**

Legend

Hardworks:

- Existing Vehicular Tarmac:**
Roads retained and repaired as necessary
- Existing Pedestrian Tarmac:**
Paths retained and repaired as necessary
- Proposed Pedestrian Tarmac (active travel route):**
Permeable tarmac - Buff coloured
To Engineers build-up specification
- Proposed Pedestrian Block Paving:**
Permeable paving units - Dark Grey colour
To Engineers build-up specification
- Proposed Vehicular Tarmac (to highway):**
Permeable tarmac - Black/ grey colour
To Engineers build-up specification
- Proposed Vehicular Tarmac (to building apron):**
Permeable tarmac - Light Grey colour
To Engineers build-up specification
- Proposed Vehicular Block Paving (parking bays):**
Permeable block paving - Black/ grey colour
To Engineers build-up specification
- Proposed Vehicular 'Grasscrete' (parking bays):**
Open 'grasscrete' to edge parking for staff areas
To Engineers build-up specification

Softworks:

- Building Edge Planting Mix:**
Low maintenance grass, perennial and herbaceous mix
- Proposed SuDS Features:**
Wet-meadow seed mix with supplementary native marginal
Locally sourced
- Proposed Meadow Mix:**
Grass and wildflower seed mix to match previous biodiversity
mitigation areas
- Native Edge Mix:**
Native whip mix, flowering native species for berries & pollinators
1m centres, 80-100cm whips
- Proposed Tree Planting:**
Tree planting, focussed on native flowering species beneficial to
pollinators, rootball and staked

Site Features:

- Cycle Storage:**
Covered shelter, cycle hoops
Habitat intergrated features & growing fence walls
- Bee Towers:**
Feature concrete solitary bee posts
Green and Blue Beeposts or equal
- Undisturbed Mitigation Planting:**
Area of site to remain untouched as to not affect existing
mitigation planting implemented on site in previous works



P02	Issued for PAC Approval	MR	RF	240301
P01	Issued for Comment	MR	RF	240222
Rev.	Revision description	Drawn	Checked	Date



Project	SWITCH HARBOURSIDE for MORGAN SINDALL
Title	Landscape Masterplan
Project Status	S1 - For Co-Ordination
Drawing Number	26CB02 -FRL -01 -XX -D -L -1001
Rev.	P02

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