

SA1 Engineering Works-Flood Consequences Assessment

September 2024

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This report describes work commissioned by POBL Group on behalf of by an instruction dated 30th of November 2023. The Client's representative for the contract was Amy Prince of POBL Group. George Williams of JBA Consulting carried out this work.

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Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
ABP	Associated British Ports
AEP	Annual Exceedance Probability
BGS	British Geological Survey
FCA	Flood Consequence Assessment
FMfP	Flood Map For Planning
GL	General Logistic Distribution
LiDAR	Light Detection And Ranging
NGR	National Grid Reference
NRW	Natural Resources for Wales
OS	Ordnance Survey
OS NGR	Ordnance Survey National Grid Reference
PFRA	Preliminary Flood Risk Assessment
PPW	Planning Policy Wales
TAN-15	Technical Advice Note 15: Development and Flood Risk
TUFLOW	Two-dimensional Unsteady FLOW (a hydraulic model)

1 Introduction

1.1 Terms and References

JBA Consulting were commissioned by POBL Group to prepare a Flood Consequences Assessment (FCA) to support proposed engineering works at Plot E6, SA1, Swansea. This FCA demonstrates the suitability of the proposed works in terms of flood risk.

1.2 FCA Requirements

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

- The likely mechanism of flooding
- The likely source of flooding
- The depths of flooding through the site
- The speed of inundation at the site
- The rate of rise of flood water through the site
- Velocities of floodwater 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 site is accessed via Langdon Road, Swansea, as shown in Figure 2-1. The site is approximately 0.57ha in size and is brownfield in nature. The site is bound to the north by Langdon Road, and to the south, east and west by unnamed roads which are currently under private ownership.

To the north of the site is largely residential development and the A483 which crosses from east to west. Land to the east is mostly commercial development, and to the south and west are King's Dock and Prince of Wales Dock, which are connected to Swansea Bay to the south. Table 2-1 contains a summary of the site details

Table 2-1 Site Summary

Site name	SA1 Plot E6
Site area	0.57 ha
Existing land use	Disused Brownfield land
Purpose of development	Engineering works
OS NGR	SS 67449 92916
Local Planning Authorities	Swansea Council
Lead Local Flood Authority	Swansea Council

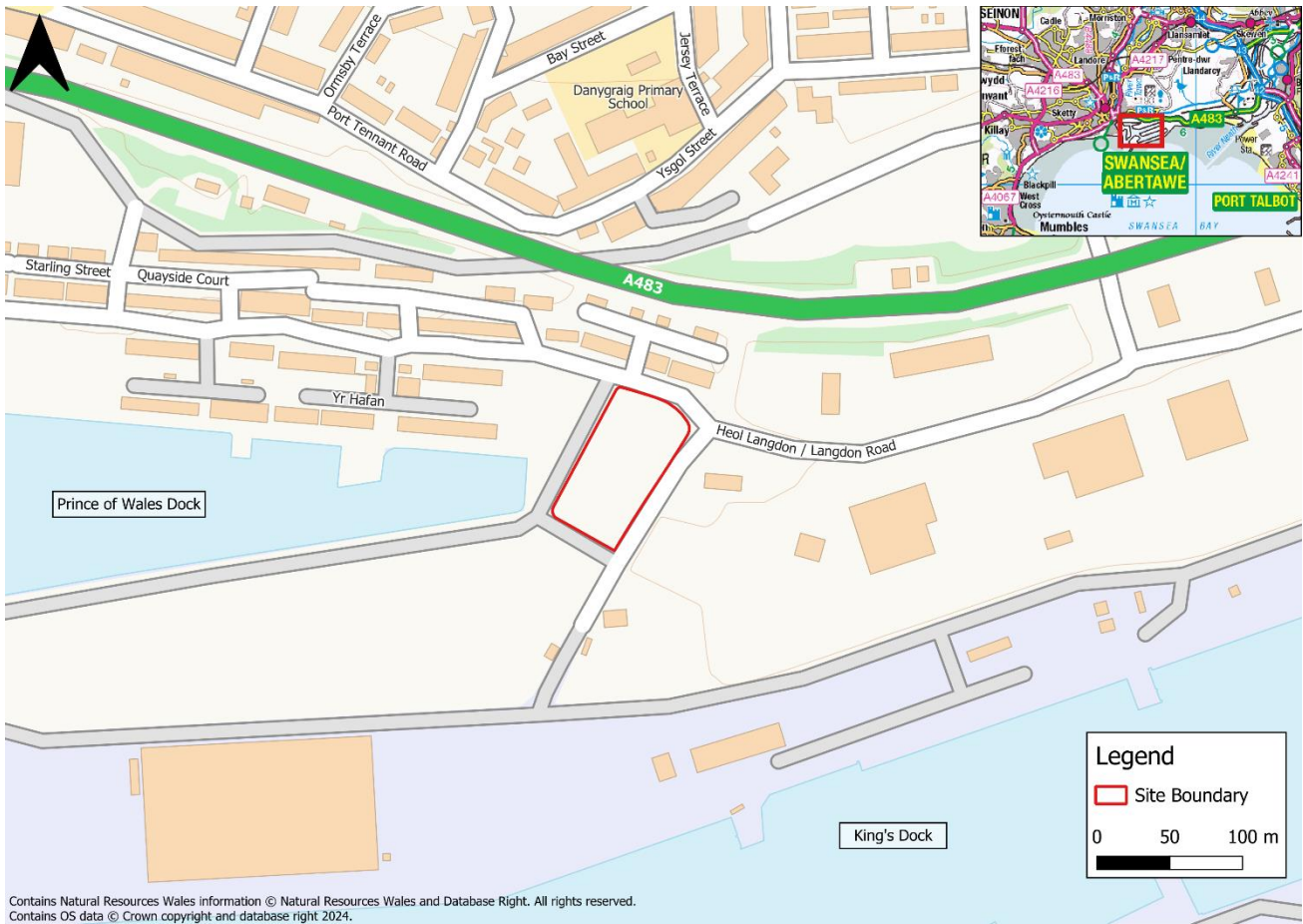


Figure 2-1 Site Location

2.2 Site Topography

A topographic survey was undertaken by John Vincent Surveys Ltd in March 2023 and is provided in Appendix A. The Natural Resources Wales (NRW) Open Source 1m Light Detection and Ranging (LiDAR) data has been used as an alternative illustration of the site topography, as shown in Figure 2-2.

The topographic survey shows that the site generally slopes towards the south-western corner. The highest topography is in the south-east of the site at approximately 8.48mAOD. There is a small area of raised ground in the north-west of the site, which at maximum is 8.21mAOD. Ground levels in the northwest corner of the site are 7.90mAOD, and 7.53mAOD in the north-eastern corner. The lowest ground levels are located in the south-west of the site, at approximately 7.09mAOD.

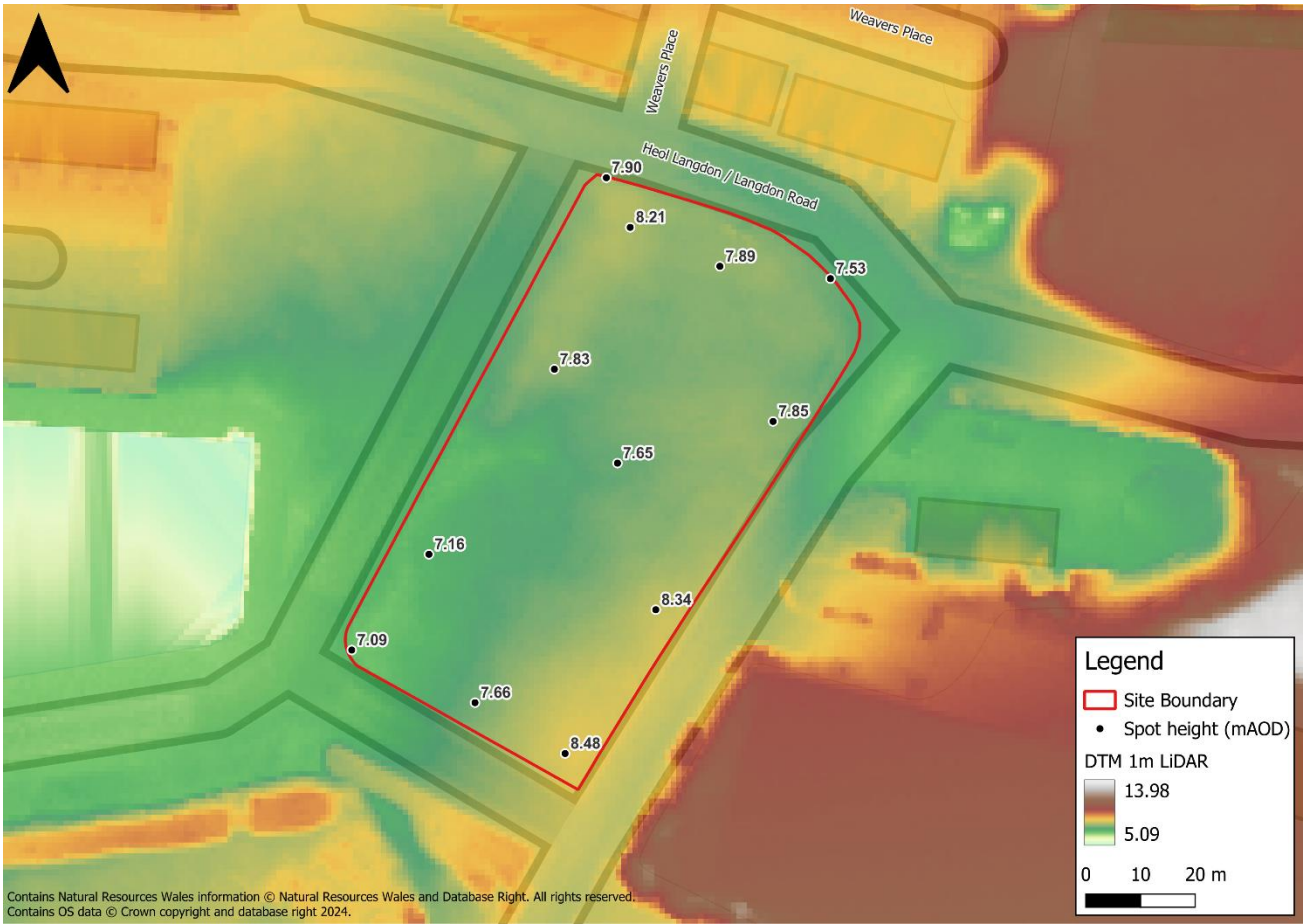


Figure 2-2 Site Topography Generated from NRW LiDAR Data

2.3 Watercourses and Flood Defences

There are no Main Rivers that pass through the site. The nearest Main River is the River Tawe, located approximately 1.1km to the west of the proposed development site, as shown in Figure 2-3.

To the west of the site is the Prince of Wales Dock, with King's Dock located to the south. These form part of the Swansea Docks. The Swansea Docks are managed and controlled by the Associated British Ports (ABP).

Swansea Bay is located approximately 1.2km to the south of the site.

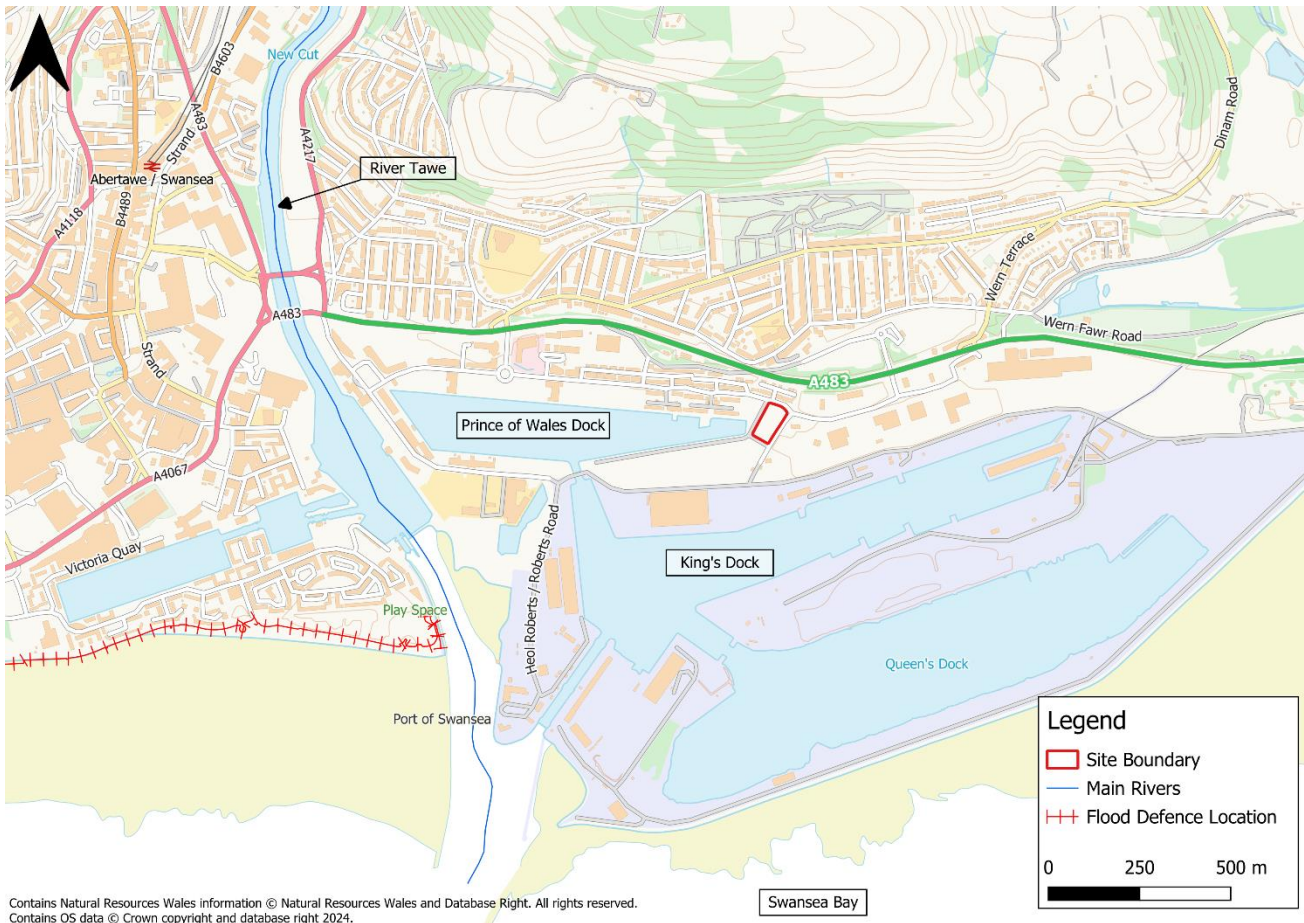


Figure 2-3 Watercourses

2.4 Soils and Geology

The geology of the site has been assessed using the BGS GeoIndex¹. The bedrock geology is shown to be South Wales Middle Coal Measures Formation, comprised of mudstone, siltstone and sandstone.

The soils on site have been assessed on the Cranfield University Soilscales Viewer². The underlying soils are shown to be loamy, and clayey floodplain soils have naturally high groundwater. Surface soils are most likely to be made ground, reflecting the site's industrial past.

2.5 Proposed Development

Proposed development at the site comprises engineering works in the form of ground raising. Ground raising at the site is proposed to facilitate future development. This FCA covers the proposed ground raising at the site only. It is proposed to raise ground levels across the site to 7.75mAOD.

1 <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

2 Soilscales soil types viewer - Cranfield Environment Centre. Cranfield University (landis.org.uk)

3 Planning Policy and Flood Risk

3.1 Planning Context

Planning Policy Wales (PPW) sets out the land use planning policy 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 wellbeing 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 Test.

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 subsequently suspended the implementation of the new TAN-15, and it is now unknown as to when this shall be implemented. 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, although only the policies of the current TAN-15 have been applied to this assessment.

3.2 Vulnerability Classification

TAN-15 assigns one of three flood risk vulnerability classifications to development, as shown in Table 3-1. TAN-15 is more commonly applied towards proposed property developments, whereas the focus of this FCA is on the proposed engineering works. The proposed engineering works do not fall into any of the three stated vulnerability classifications.

Table 3-1 Development Vulnerability Categories Defined by TAN-15

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.

Development category	Types
Highly vulnerable development	All residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development and waste disposal sites.
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

Section 5.3 of TAN-15 states that exceptions to these categories such as ‘water compatible development’ (in this instance the proposed ground raising) will not be subject to the Justification Test but will be subject to the required demonstration of the Acceptability of Consequences as outlined in Section 7 of TAN-15. The application of Section 7 requires that “the consequences of flooding can be managed down to a level which is acceptable for the nature/type of development being proposed, including its effects on existing development.” The Acceptability of Consequences with regard to third-party flood risk impact is discussed further in Section 5.

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 that it is necessary to take into account of 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.

Ground raising at the site is proposed to facilitate future development. Consequently, a lifetime of development of 100 years has been considered within this FCA to maximise the potential for development opportunities.

3.4 Development Advice Map Classification

The Development Advice Map (DAM) is used to trigger different planning actions based on a precautionary assessment of fluvial and tidal flood risk. Figure 3-1 shows that the site is located within Zone A. DAM Zone A is defined as an area 'considered to be little or no risk of fluvial or tidal/coastal flooding'.

Ordinarily, an FCA would not be required for development in Zone A. However, consideration has been given to the Flood Map for Planning, below.

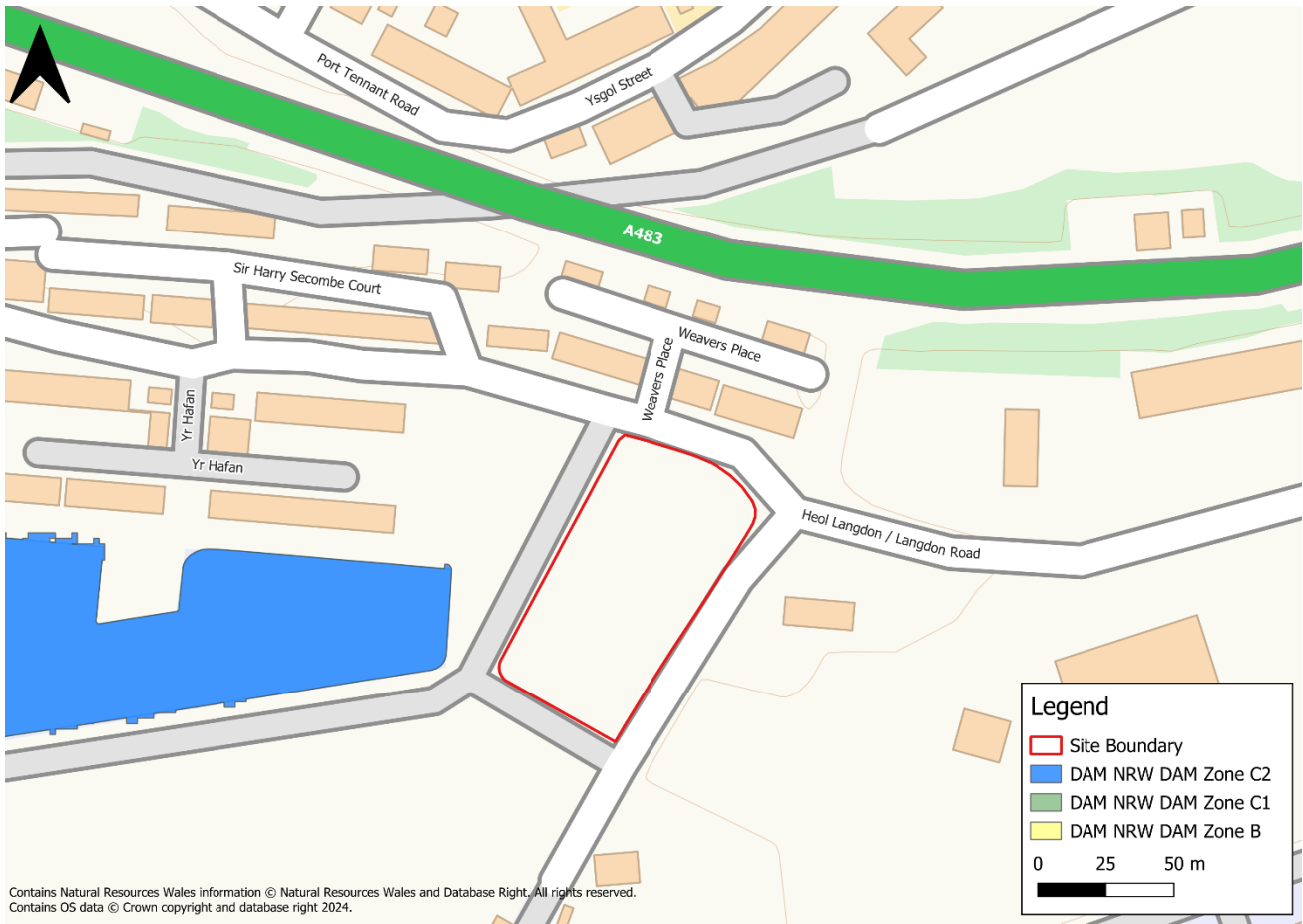


Figure 3-1 NRW DAM Map

3.5 Flood Map for Planning Classification

3.5.1 Flood Map for Planning - Flood Risk from Rivers

The proposed development site is located in Flood Zone 1 of the Flood Map for Planning for Rivers (shown as transparent on the map) as shown in Figure 3-2. Flood Zone 1 indicates that there is a less than 0.1% AEP (1 in 1000) chance of flooding from fluvial sources in any given year, including climate change.

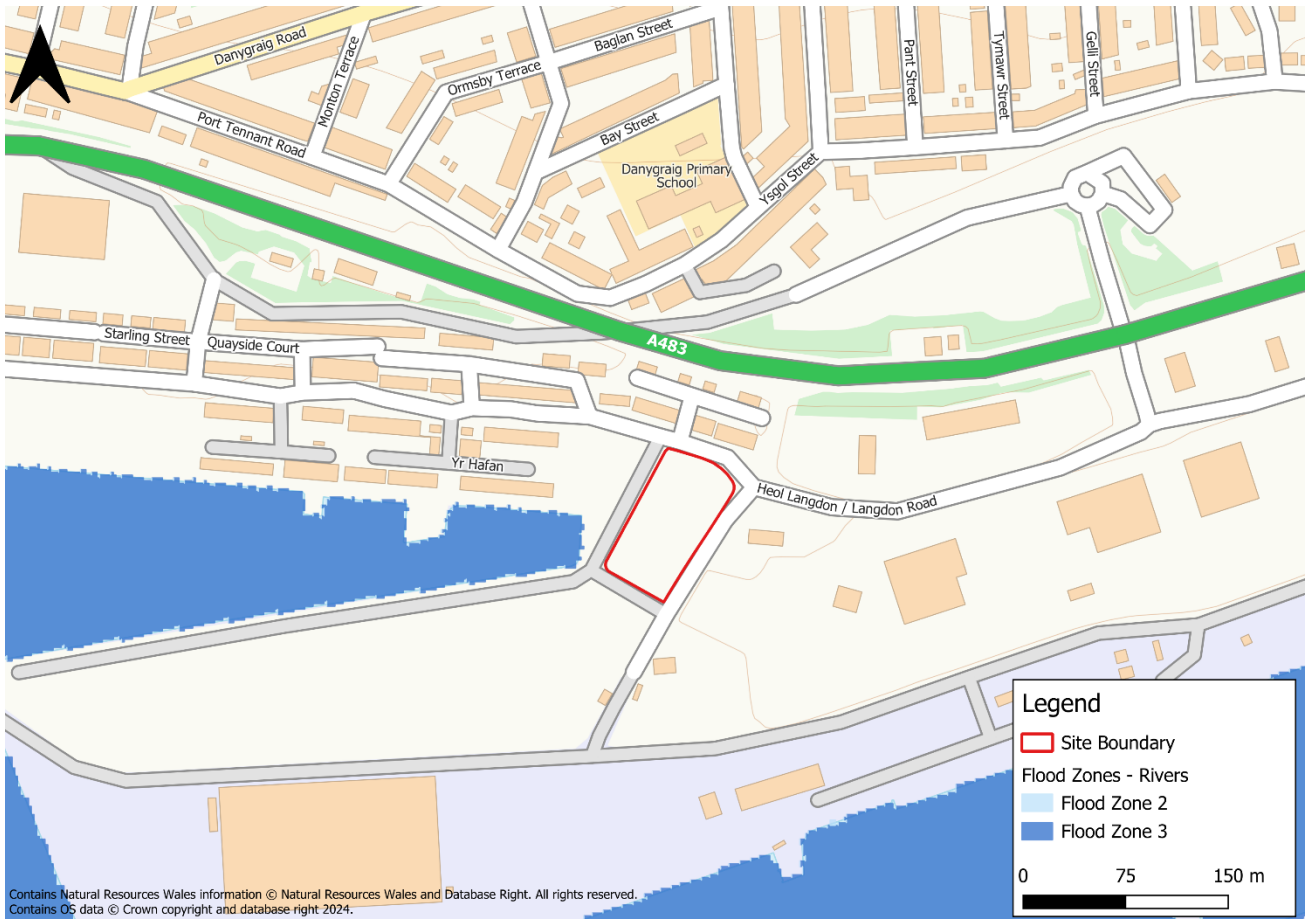


Figure 3-2 NRW FMfP- Flood Risk from Rivers

3.5.2 Flood Map for Planning - Flood Risk from the Sea

As shown in Figure 3-3, the proposed development site is partially located in Flood Zone 3 of the Flood Map for Planning for the Sea. This means that the site has a greater than 0.5% AEP (1 in 200) chance of tidal flooding in any given year, including climate change.

An area in the southeast of the site is located within Flood Zone 1, meaning that there is a less than 0.1% AEP (< 1 in 1000) chance of flooding from the sea in any given year, including climate change.

As the site is located within Flood Zone 3 of the FMfP Risk from the Sea an FCA is required to assess the potential consequences of flooding from all sources. However, no justification test is required as the proposed engineering works are located within DAM Zone A.

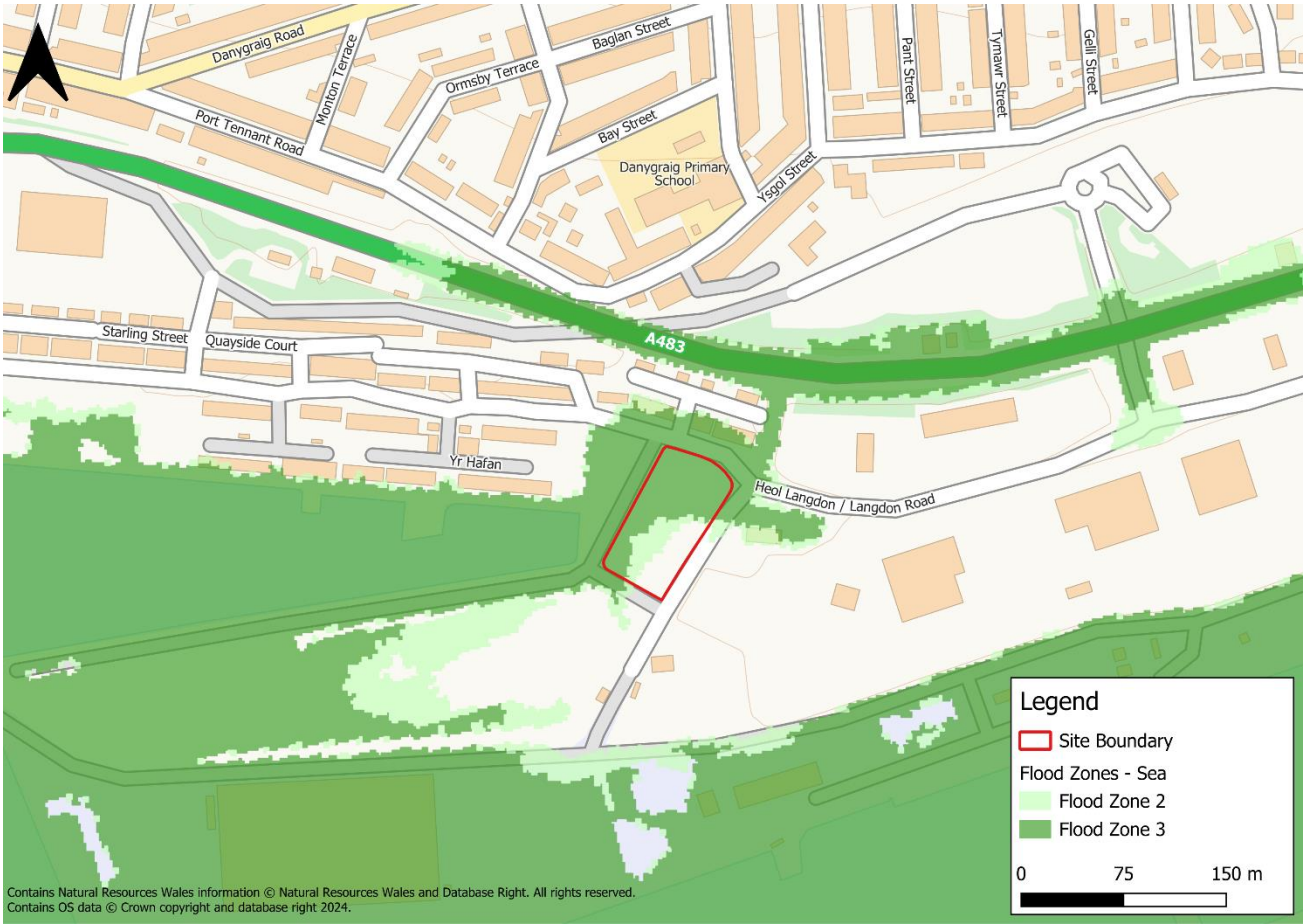


Figure 3-3 NRW FMfP- Flood Risk from the Sea

4 Flood Risk Assessment

This section assesses the risk to the site from all sources of flooding, the risk of increased flooding to others, and how flood risk can be managed. Information is taken from publicly available data sources.

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 in Table 4-1 below.

Table 4-1 Summary of Flood Risk

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	✘	The site is at very low risk of flooding from rivers.
Flood Risk from the Sea	✘	The site is at very low risk of tidal flooding.
Flood Risk from Surface Water and Small Watercourses	✓	The site is mostly at very low risk of surface water flooding. A small area in the north of the site is at low risk of flooding.
Flood Risk from Groundwater	✘	The site is at very low risk of groundwater flooding.
Flood Risk from Reservoirs	✘	The site is not at risk of flooding from reservoirs.
Flood Risk from Sewers	✘	There is no evidence to suggest that the site is at risk of flooding from sewers.

4.2 Historical Flood Risk

NRW's map of recorded flood extents does not show any evidence of historic flooding on the site. Furthermore, the Swansea Local Flood Risk Management Strategy³ mentions no cases of flooding in this area despite it being 'susceptible' to flooding. However, it is worth noting that this document was produced in 2013 and is now outdated, meaning the NRW data offers a more up-to-date record of previous flood events.

4.3 Flood Risk from Rivers

The site is at low risk of flooding from rivers, according to NRW's Flood Risk Assessment Wales (FRAW) Flood Risk from Rivers map as shown in Figure 4-1. This means that there is less than a 0.1% AEP chance of fluvial flooding in any given year. The area is shown as transparent on the map and has therefore not been shown graphically.

³ [Local flood risk management strategy - Swansea](#)

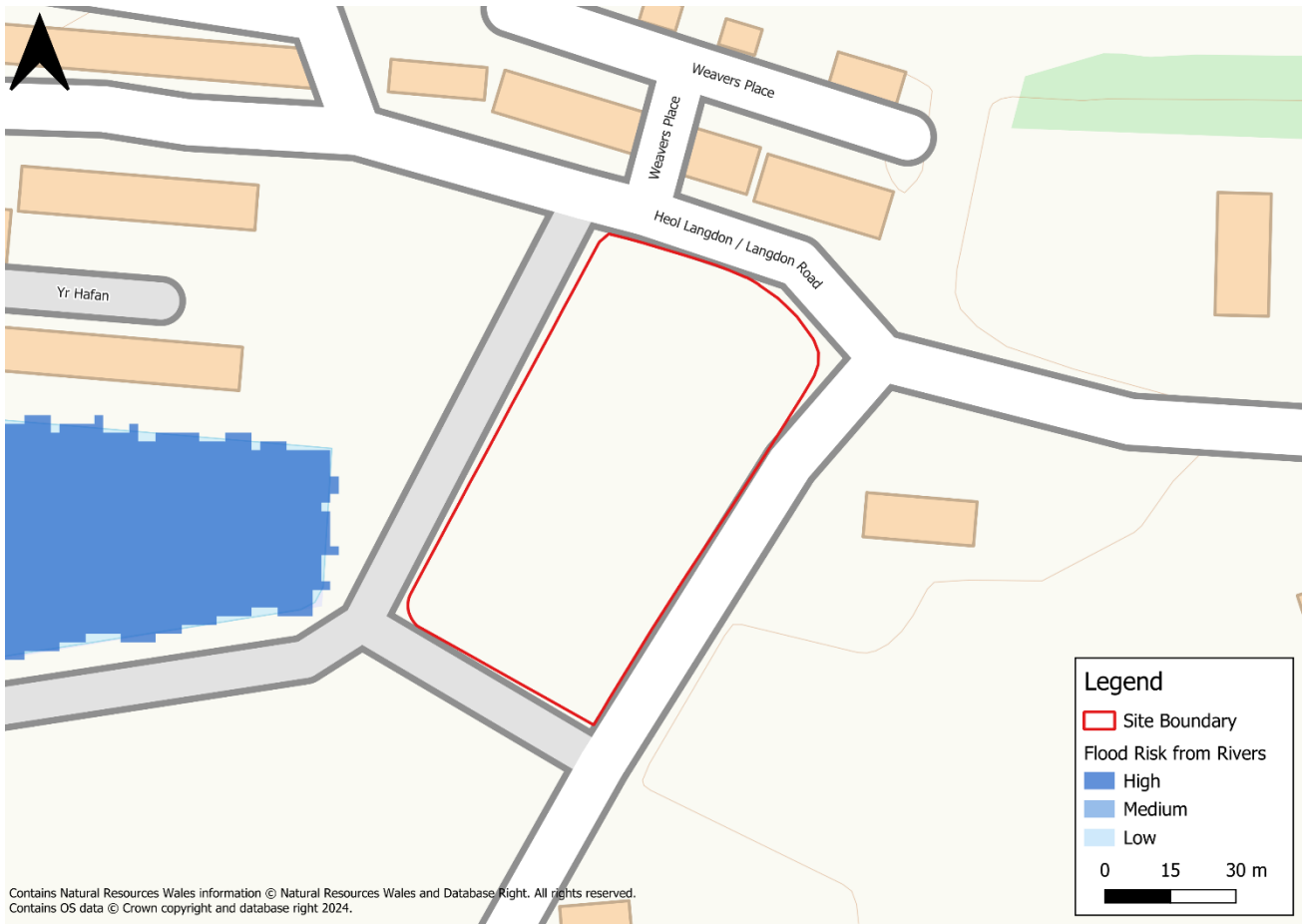


Figure 4-1 FRAW - Flood Risk from Rivers

4.4 Flood Risk from the Sea

The site is shown to be at very low risk of flooding from the sea according to NRW's FRAW Flood Risk from the Sea map, shown in Figure 4-2. This means that there is a less than 0.1% AEP chance of flooding from this source in any given year. However, this analysis does not include an uplift for climate change-induced sea level rise.

To better understand the risk of flooding posed by tidal flooding 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 below.



Figure 4-2 FRAW- Flood Risk from the Sea

4.4.1 Detailed Hydraulic Modelling

As the Flood Map for Planning identifies tidal flooding as the main flood risk to the site, a more detailed assessment of tidal flooding has been carried out to understand predicted flood depths at the site.

The 1D-2D ESTRY-TUFLOW Lower Tawe hydraulic model for Swansea was initially developed by Arup in 2011. JBA significantly updated this model, on behalf of NRW, in 2021. Subsequently, the model has been updated further, for the proposed development site, to apply the latest extreme tidal predictions and climate change uplifts, complying with the Welsh Government's latest technical guidance. A hydraulic modelling technical note is contained in Appendix B which details the model updates.

The updated model was used to simulate results for a 100-year lifetime of development, to the year 2124. Extreme sea level estimates have been calculated and mapped for the 0.5% and 0.1% AEP events, for the present day (2024) and with 100 years (2124) lifetime of development.

The tidal uplifts applied are contained in Table 4-2.

Table 4-2 Tidal Uplift for 75yr and 100yr Lifetime of Development

Year	Tidal Uplift (m)
2024	0.13
2124	1.07

4.4.2 Baseline Model

2024 0.1% AEP event

As seen in Figure 4-3 below, during the present day 0.1% AEP event the site remains flood-free with tidal levels confined to the existing docks.

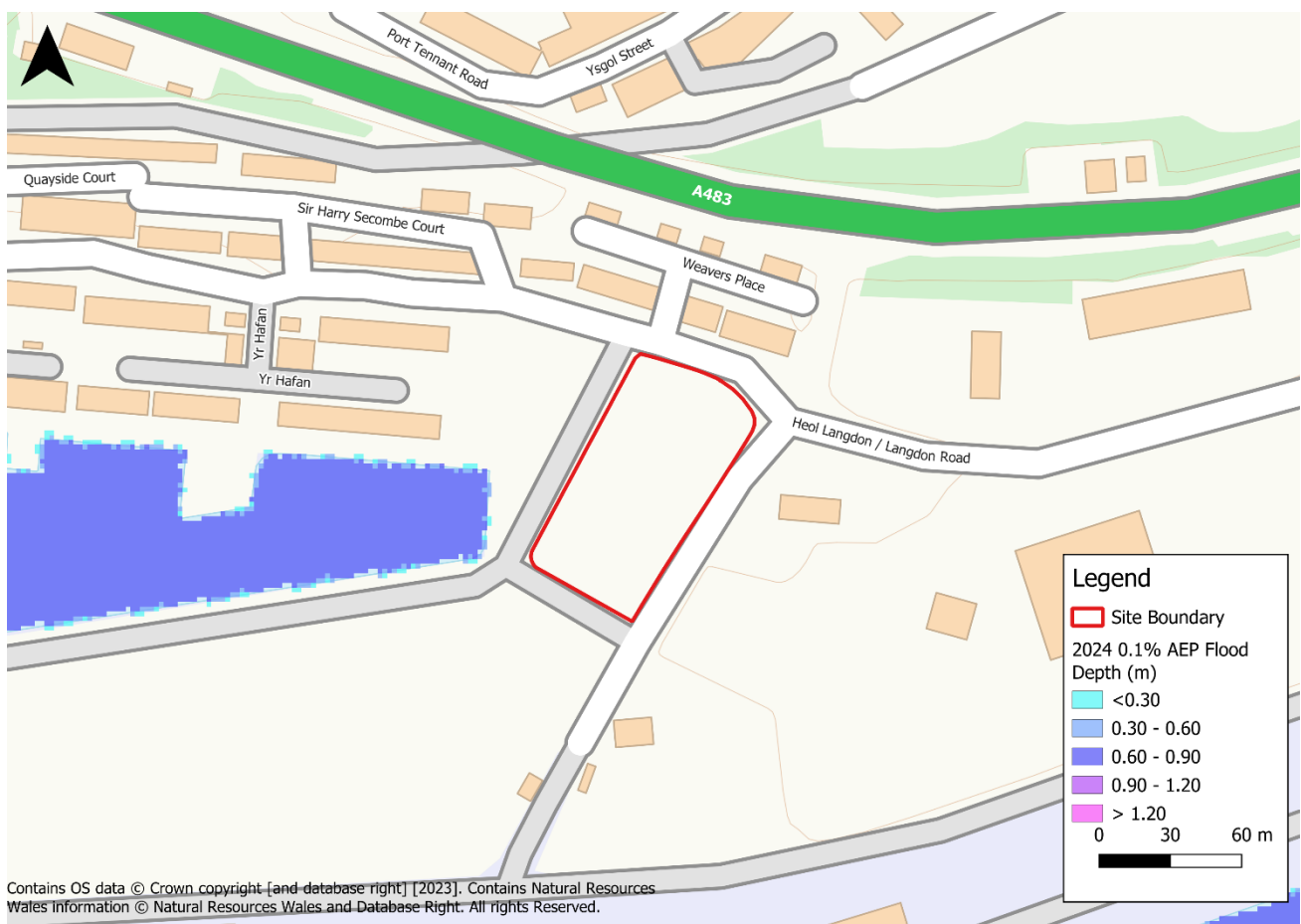


Figure 4-3 2024 0.1% AEP Event

2124 0.5% AEP event

During the 2124 0.5% AEP Event the site is predicted to flood with flood waters confined to the southeast of the site, as shown in Figure 4-4. Flood depths generally range from 60-300mm. The greatest flood depth is observed in the south-eastern corner at 460mm.

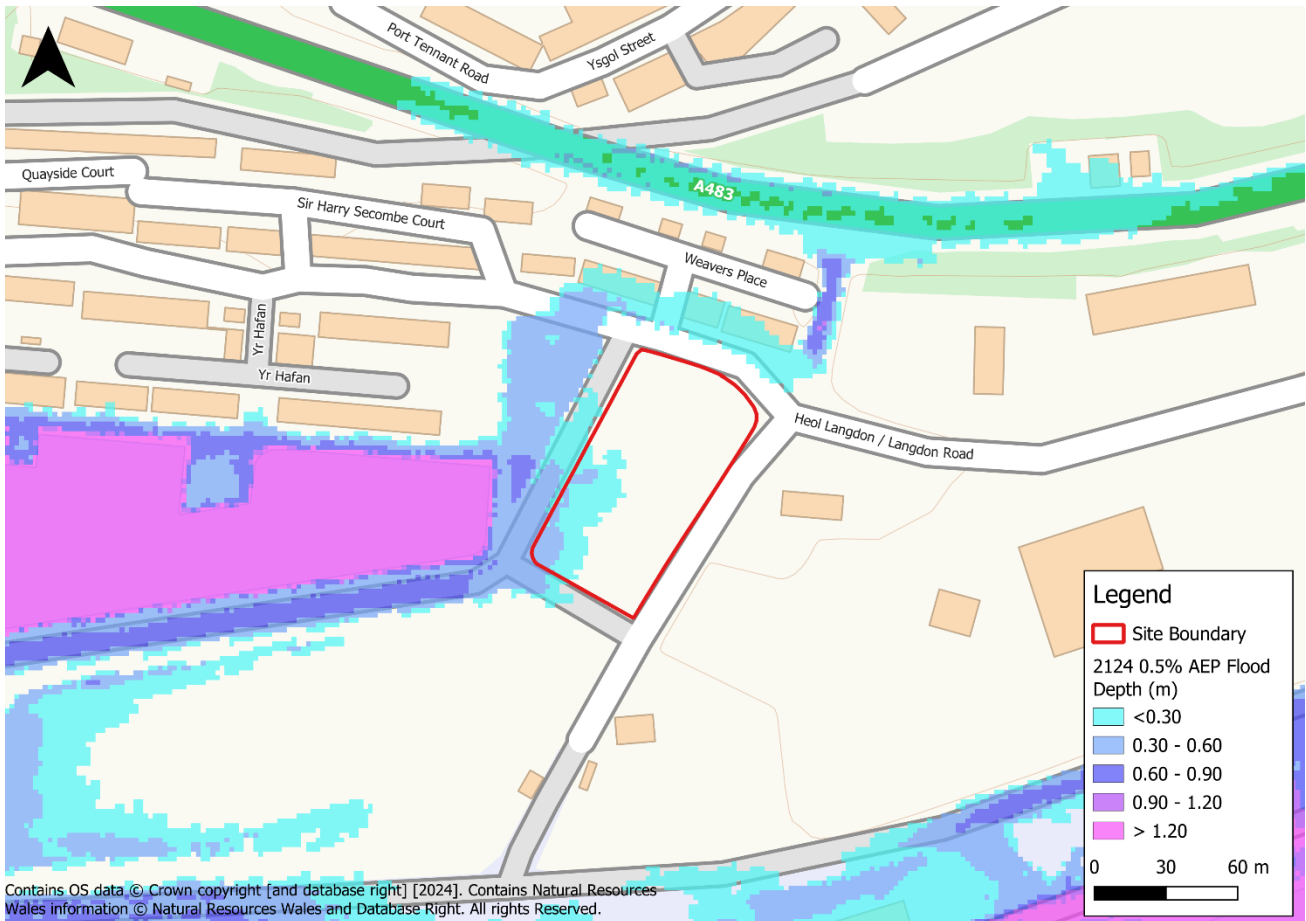


Figure 4-4 2124 0.5% AEP Event

2124 0.1% AEP event

During the 2124 0.1% AEP event the site is predicted to flood with flood waters being focused on the southeast of the site but extending further northwards than in the 2124 0.5% AEP, as shown in Figure 4-5.

Flood depths generally range from 80mm to 400mm. Greatest flood depths are observed in the south-eastern corner at 720mm.

Access and egress to the site is maintained during this extreme event via Langdon Road, Bevans Row and Fabian Way.

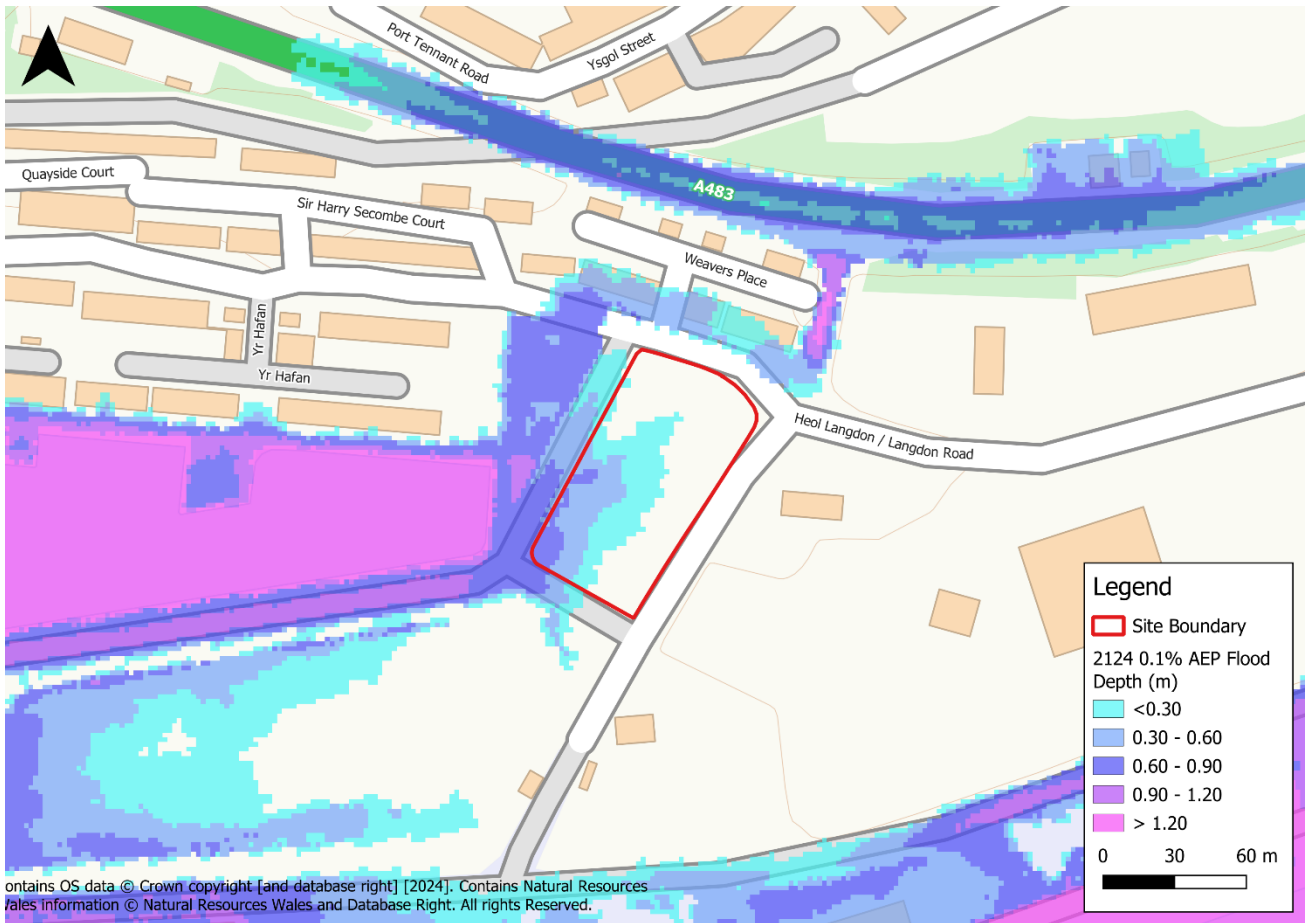


Figure 4-5 2124 0.1% AEP Event

4.4.3 Post Development Modelling

In order to address flood risk to the site, and create a flood free development plateau, proposed engineering works result in ground raising of the site to a ground level of 7.75mAOD. Post-development modelling has been undertaken to demonstrate the impact of flood risk on the development site and to assess the development impact on third parties.

The site is predicted to be flood free during the 2124 0.5% AEP event, and the 2124 0.1% AEP event, as shown in Figures 4-6 and 4-7, respectively.

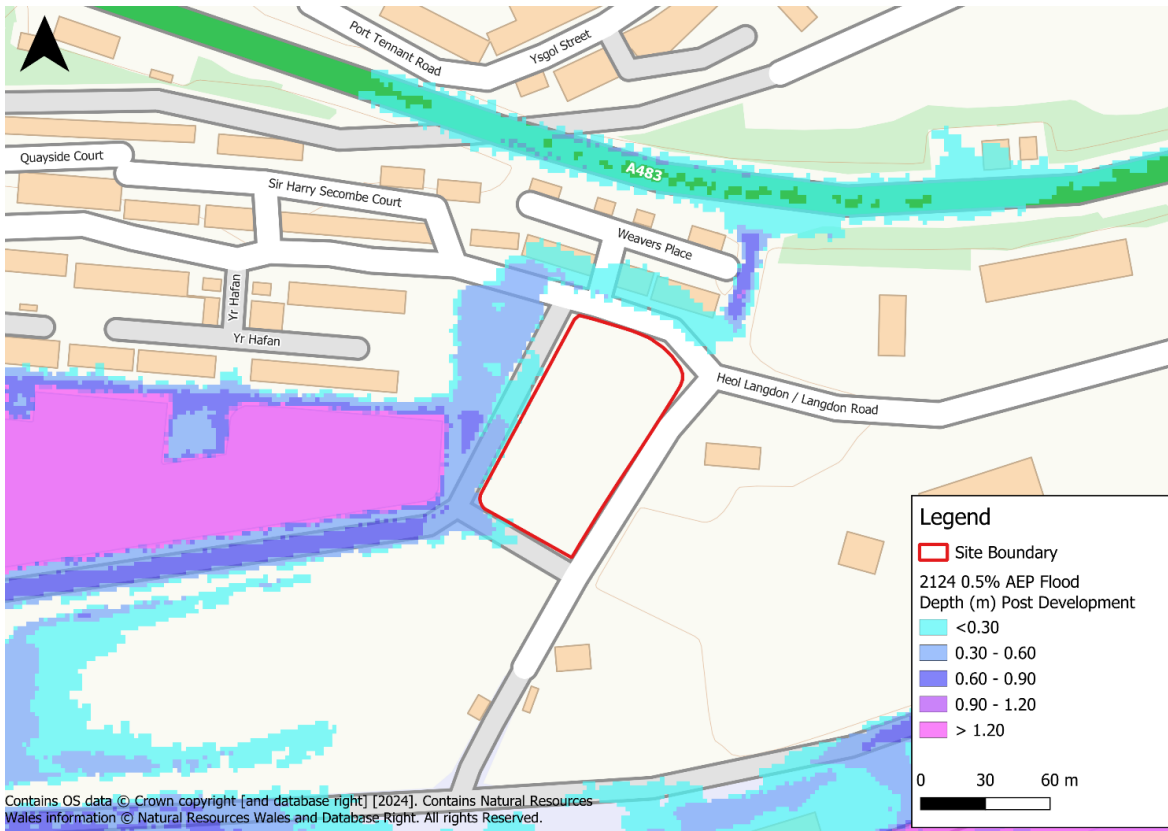


Figure 4-6 Post Development 2124 0.5% AEP event

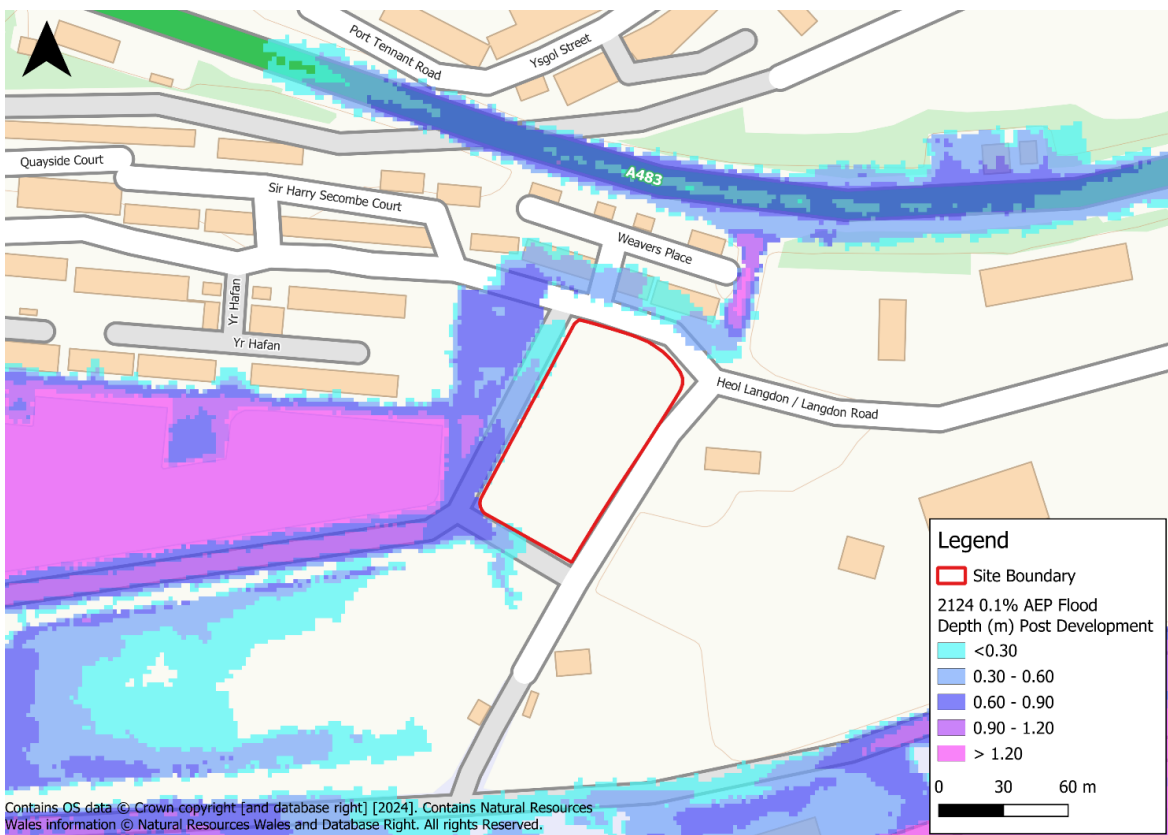


Figure 4-7 Post Development 2124 0.1% AEP event.

Impact of development on third parties

A depth comparison between the pre-development and the post-development modelling shows the site to have a reduced flood risk of more than 0.5mm on the 2124 0.5% AEP Event as shown in Figure 4-8. Furthermore, the surrounding areas are shown to have no change in the levels of flooding experienced, indicating that the ground raising at the site has no on flood risk elsewhere.



Figure 4-8 2124 0.5% AEP Depth Comparison Post Development

Much like the 2124 0.5% AEP event A depth comparison between the pre-development and the post-development modelling shows the site to have a reduced flood risk of more than 0.5mm during the 2124 0.1% AEP Event as shown in Figure 4-9. The surrounding areas are shown to have no change in the levels of flooding experienced, indicating that the ground raising at the site does not lead to increased flooding elsewhere.

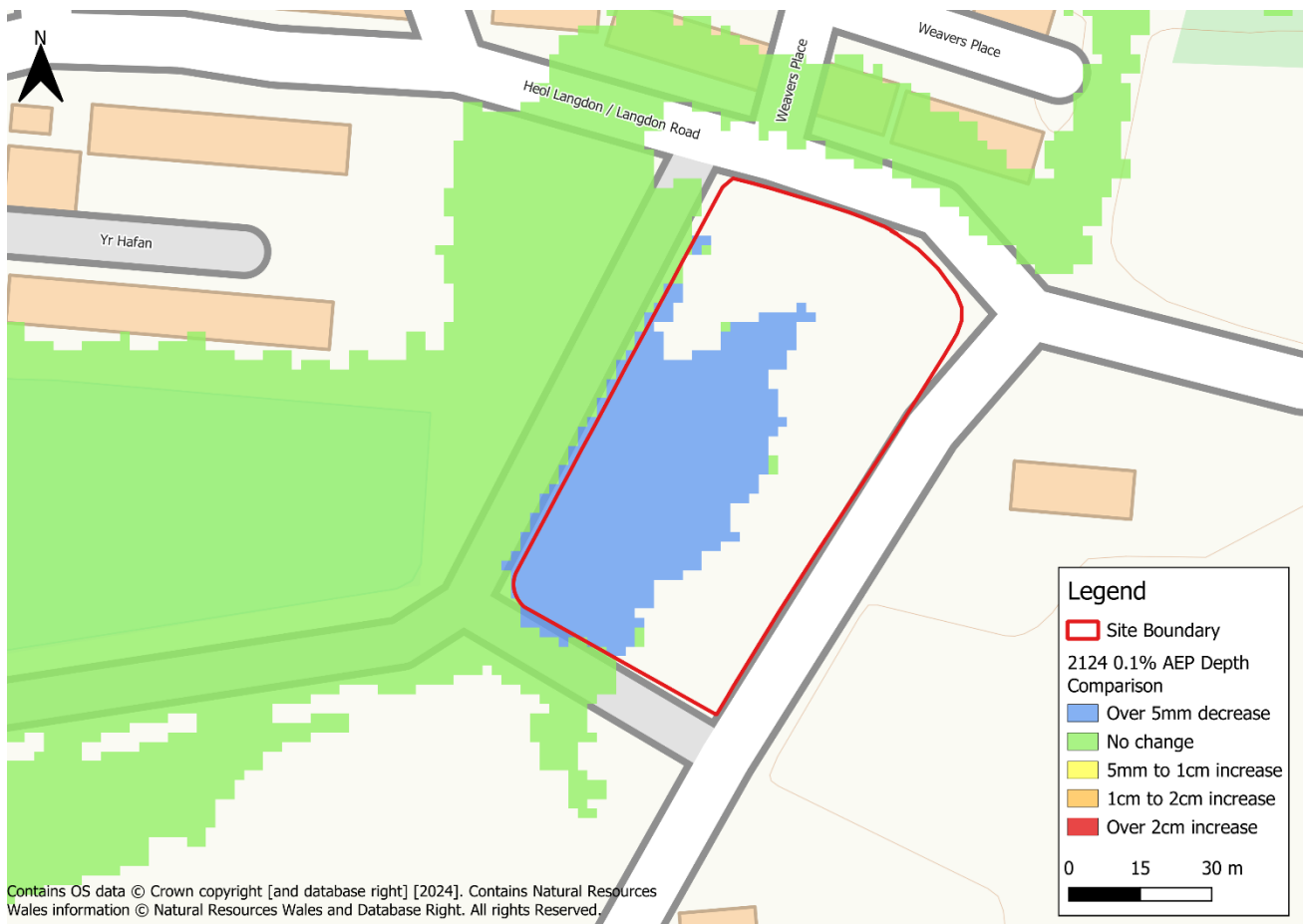


Figure 4-9 2124 0.1% AEP Depth Comparison Post Development

4.5 Flood Risk from Surface Water and Small Watercourses

The NRW FRAW flood risk from Surface Water and Small Watercourses mapping shows that the site is mostly at very low risk of flooding from these sources, as shown in Figure 4-10. This means that there is a less than 1 in 1000 (<0.1% AEP) chance of flooding in any given year.

An area in the north of the site is shown to be at low risk of Surface Water and Small Watercourse flooding. Low risk indicates areas with a chance of flooding between 0.1% AEP and 1% AEP (1 in 1000 to 1 in 100).

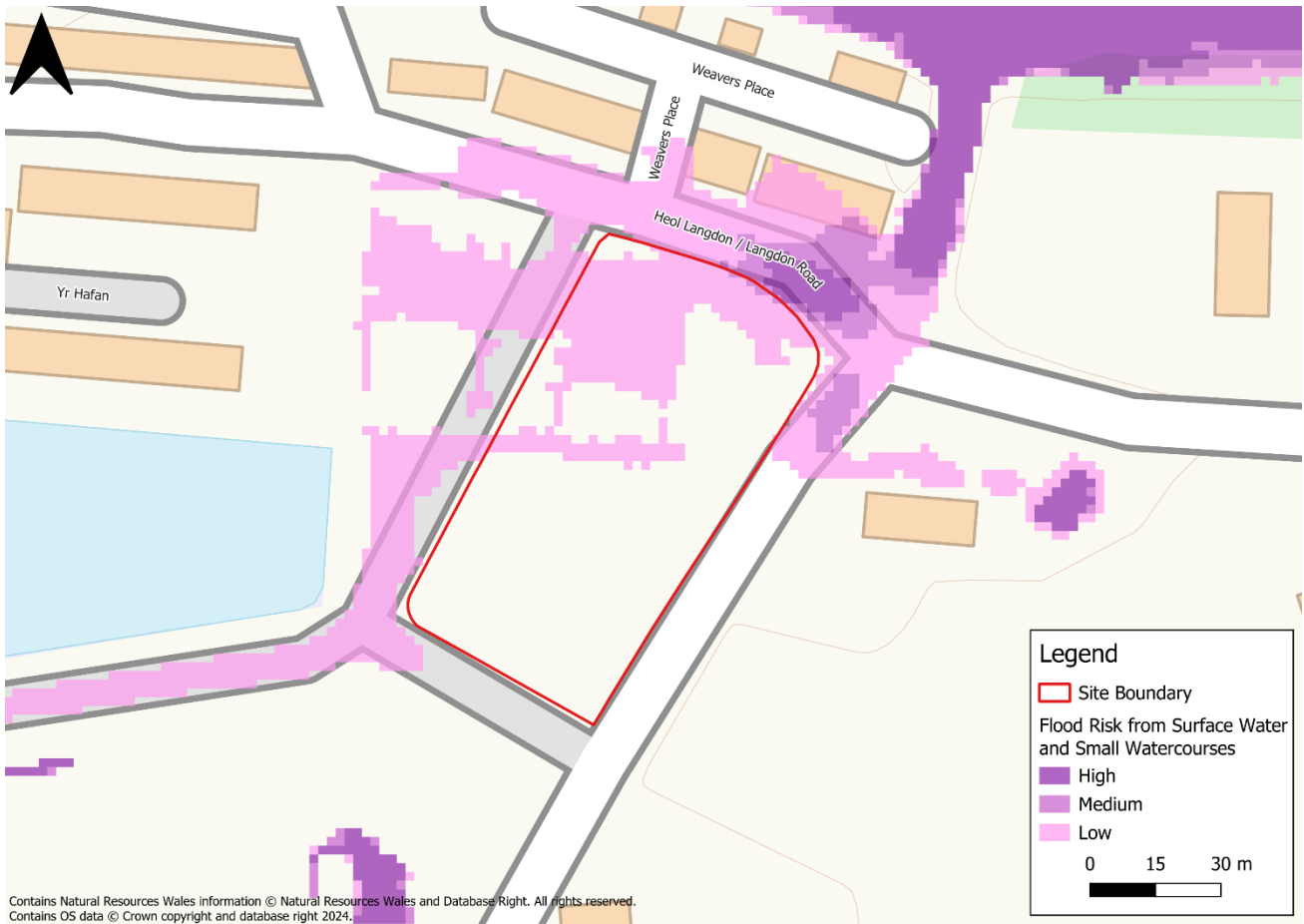


Figure 4-10 FRAW- Flood Risk from Surface Water and Small Watercourses

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 structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in damage to property. This risk of groundwater flooding depends on the nature of the underlying geology.

The South West Wales Strategic Flood Consequences Assessment (SFCA) states that *'Along the coastline in the southern region of the county, and particularly between Swansea and Mumbles, groundwater levels are also at or very near to (within 0.025m) the ground surface; this indicates that there is a greater risk of groundwater flooding in these areas'*.

However, it should also be considered that the proposed engineering works are not groundwater sensitive i.e. including excavations or construction of basements. Therefore, the Groundwater Flood Risk to the site has been assessed to be **low**.

4.7 Flood Risk from Reservoirs

The NRW FRAW Flood Risk from Reservoirs map illustrates that the proposed development site is at very low risk of reservoir flooding, shown as a transparent later the FRAW mapping and therefore not presented graphically below.

4.8 Flood Risk from Sewers

No records of existing sewers close to the site have been provided at this stage. However, after reviewing the Swansea Council Preliminary Flood Risk Assessment⁴ no record of any sewer flood incidents has been noted. However, the PFRA was produced in 2011 and therefore, will not provide the most accurate data for the site. The flood risk from sewers has been assessed to be **Low**.

⁴ [Preliminary Flood Risk Assessment - Swansea](#)

5 Assessment of Acceptability Criteria

Whilst the Justification Test is not required for this site, it is appropriate to consider the site against the acceptability of the consequences of flooding. Table 5-1 details the acceptability criteria required by TAN-15 and the site's compliance against these criteria.

Table 5-1 Acceptability Criteria Assessment

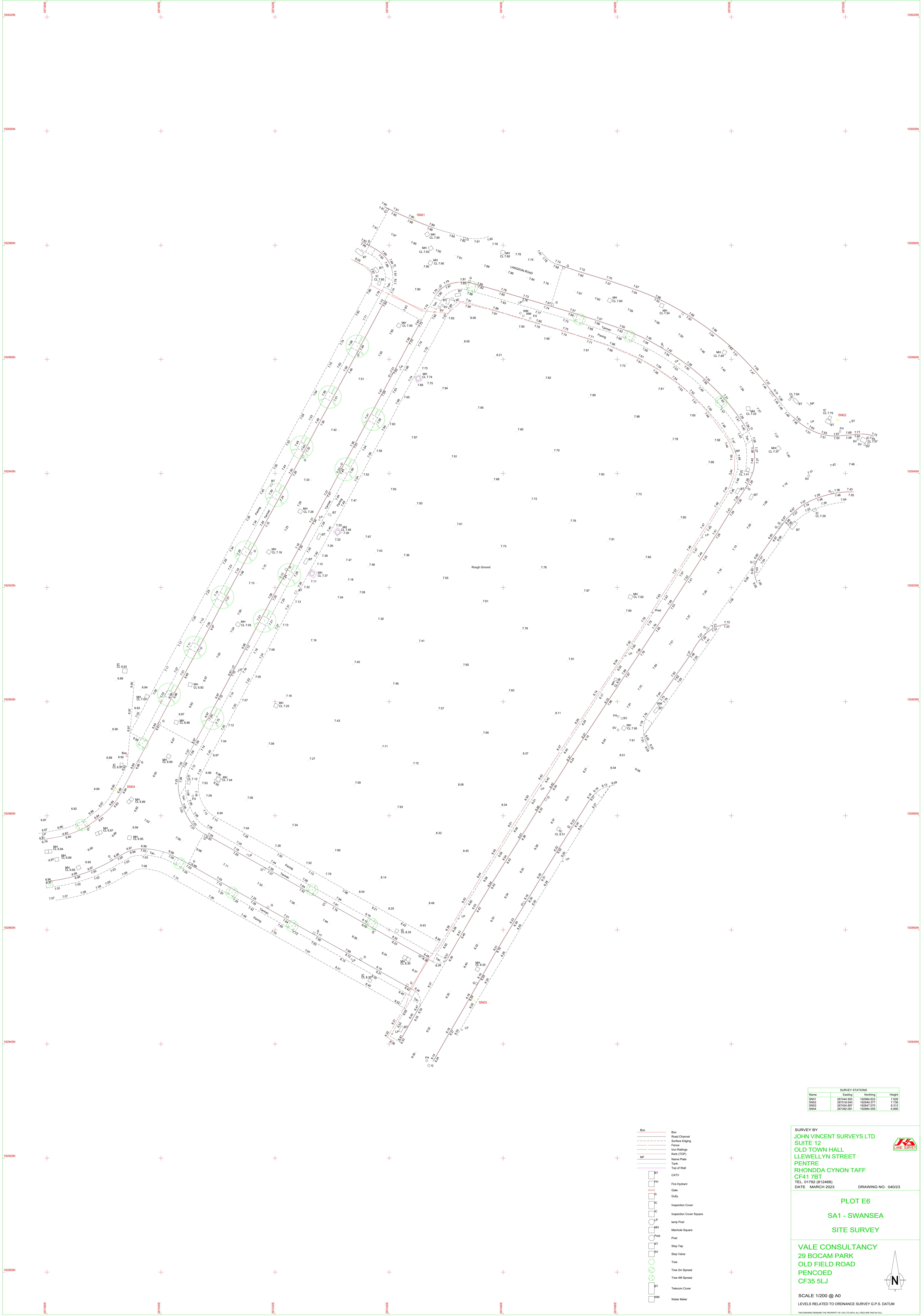
TAN-15 Justification Criteria	Comments	Achieved?
The developer is required to demonstrate that the site is designed to be flood free for the lifetime [Ref: TAN-15 A1.5] of development for a 1 in 100 (1%) chance (fluvial) or a 1 in 200 (0.5%) chance (tidal) flood event including an allowance for climate change in accordance with TAN-15 table A1.14.	The site is flood free in the post-development scenario	Yes
The development should be designed so that in an extreme (1 in 1000) event there would be less than 600mm of water on access roads and within the property.	The site is flood free in the post-development scenario	Yes
No flooding elsewhere.	The proposed engineering works will not result in an impact to third parties	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 in any given year).	The proposals are for ground raising and not typical 'defences' such as flood walls. Therefore, there are no structures associated with these engineering works and this criterion is not relevant to the proposals included with this FCA	N/A
The developer must ensure that future occupiers of development are aware of the flooding risks and consequences.	The future developers of the site will be aware in the form of this report.	Yes

TAN-15 Justification Criteria	Comments	Achieved?
Effective flood warnings are provided at the site.	N/A - The site is flood free in the post-development scenario.	N/A
Escape / evacuation routes are shown by the developer to be operational under all conditions.	Access and egress to the site is maintained during all events via Langdon Road, Bevans Row and Fabian Way.	Yes
The development is designed by the developer to allow the occupier of the facility for rapid movement of goods/possessions to areas away from flood waters.	N/A - The site is flood free in the post-development scenario.	N/A
Development is designed to minimise structural damage during a flood event and is floodproofed to enable it to be returned to its prime use quickly in the aftermath of a flood.	N/A - The site is flood free in the post-development scenario.	N/A

6 Conclusion and Recommendations

- JBA Consulting were commissioned by POBL Group to prepare a Flood Consequences Assessment (FCA) in support of proposed engineering works at Plot E6, SA1, Swansea.
- This FCA follows Welsh Government guidance on the development and flood risk set out in the Technical Advice Note 15: Development and Flood Risk (TAN-15)
- The engineering works will include raising Ground Levels (GL) to 7.75mAOD. Ground raising at the site is proposed to facilitate future development
- The site is approximately 0.57ha in size and is comprised of disused brownfield land
- The topographic survey shows that currently the site generally slopes in a south-westerly direction. The highest elevation is 8.48mAOD and the lowest elevation is 7.09mAOD.
- The site is located within Zone A. DAM Zone A is defined as an area 'considered to be little or no risk of fluvial or tidal/coastal flooding'.
- The site is partially located in Flood Zone 3 of the Flood Map for Planning for the Sea. This means the site has a greater than 0.5% AEP (1 in 200) chance of tidal flooding in any given year, including climate change.
- To further assess the impacts of tidal flooding at the site JBAs detailed 1D-2D ESTRY-TUFLOW Lower Tawe hydraulic model for Swansea created on behalf of Natural Resources Wales in 2021 was used and updated for a site-specific assessment.
- Post-development modelling demonstrates that ground raising results in a flood free development plateau. There is no impact to third parties as a result of the proposals.
- Flood risk from groundwater, surface water, sewers and as a result of reservoir failure are considered to be low.
- It is therefore concluded that on the grounds of flood risk this development is likely to be deemed acceptable against the requirements of Planning Policy Wales and TAN-15.

Appendix A



SURVEY STATIONS			
Name	Easting	Northing	Height
SN01	207444.565	102684.623	7.928
SN02	207515.645	102683.372	7.726
SN03	207464.897	102687.576	8.333
SN04	207702.011	102684.038	6.899

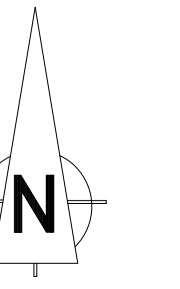
- Box
- Road Channel
- Surface Edging
- Fence
- Iron Railings
- Metal COP
- Name Plate
- Tank
- Top of Wall
- CATV
- Fire Hydrant
- Gate
- Culity
- Inspection Cover
- Inspection Cover Square
- Lamp Post
- Manhole Square
- Post
- Step Tap
- Stop Valve
- Tree
- Tree 2m Spread
- Tree 4M Spread
- Telecom Cover
- Water Meter

SURVEY BY
JOHN VINCENT SURVEYS LTD
 SUITE 12
 OLD TOWN HALL
 LLEWELLYN STREET
 PENTRE
 RHONDDA CYNON TAFF
 CF41 7BT
 TEL: 01792 (812468)
 DATE: MARCH 2023 DRAWING NO. 040/23

PLOT E6
SA1 - SWANSEA
SITE SURVEY

VALE CONSULTANCY
 29 BOCAM PARK
 OLD FIELD ROAD
 PENCOED
 CF35 5LJ

SCALE 1/200 @ A0
 LEVELS RELATED TO ORDNANCE SURVEY G.P.S. DATUM
THIS DRAWING REMAINS THE PROPERTY OF J.V.S. LTD. ALL FEES ARE PAID IN FULL.
 CAD REFERENCE: PLOT E6



Appendix B

TECHNICAL NOTE

JBA Project Code 2023s1617
 Contract SA1 Plot E6
 Client POBL Group
 Day, Date and Time December 2023
 Author Erica Godsland
 Reviewer / Sign-off
 Subject SA1 Plot E6

1 Introduction

JBA Consulting were commissioned by POBL Group to assess the flood risk to Plot E6 of the SA1 Development in Swansea, South Wales.

The proposed development site is approximately 0.57ha and is located adjacent to the east of the Prince of Wales Dock and 280m north of the King's Dock, as shown in Figure 1-1. The site is also located approximately 1km from Swansea Bay and the River Tawe.

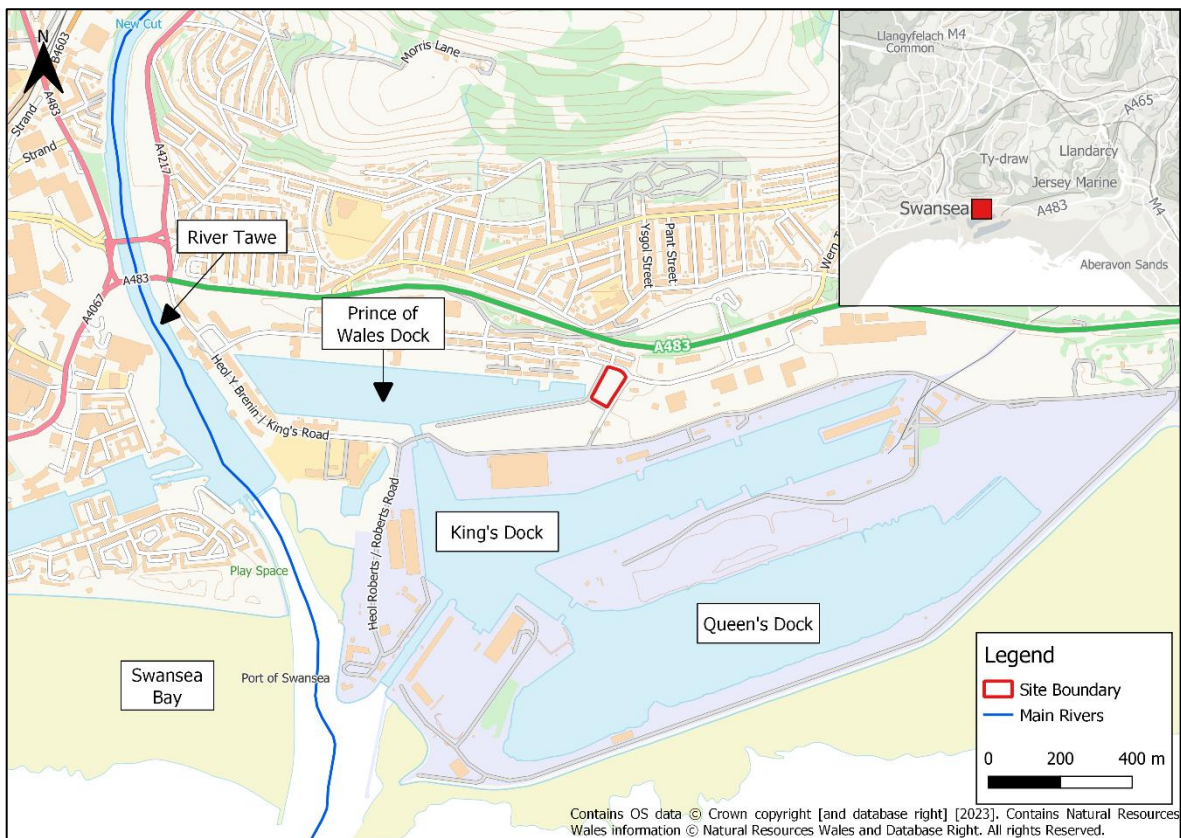


Figure 1-1 Site Location

TECHNICAL NOTE

JBA Project Code	2023s1617
Contract	SA1 Plot E6
Client	POBL Group
Day, Date and Time	December 2023
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Reviewer / Sign-off	
Subject	SA1 Plot E6

2 Hydraulic Modelling Availability

2.1 Existing Modelling

The 2021 1D-2D linked ESTRY-TUFLOW Lower Tawe Hydraulic Model for Swansea was used for this project. The model was developed by JBA Consulting in 2021 for NRW, based on a 2011 model developed by Atkins.

2.2 Model Updates

2.2.1 Baseline Updates

Within the baseline run the TUFLOW Version was updated to 2023-03-AA, and the roughness was adapted for buildings from a flow constriction approach to a high Mannings n value of 1. Manning’s n values of around 1 have been discussed with NRW for previous studies and deemed to be an appropriate representation of the impact of buildings on conveyance. This approach was therefore considered acceptable for the present study.

The sites topographical survey undertaken by John Vincent Surveys Ltd in March 2023 was incorporated into the model. The survey was added into GIS and converted into a TIN (Triangular Irregular Network) file and then converted into an Ascii which was read into the models TGC file. The topographical survey is shown in full in Appendix A.

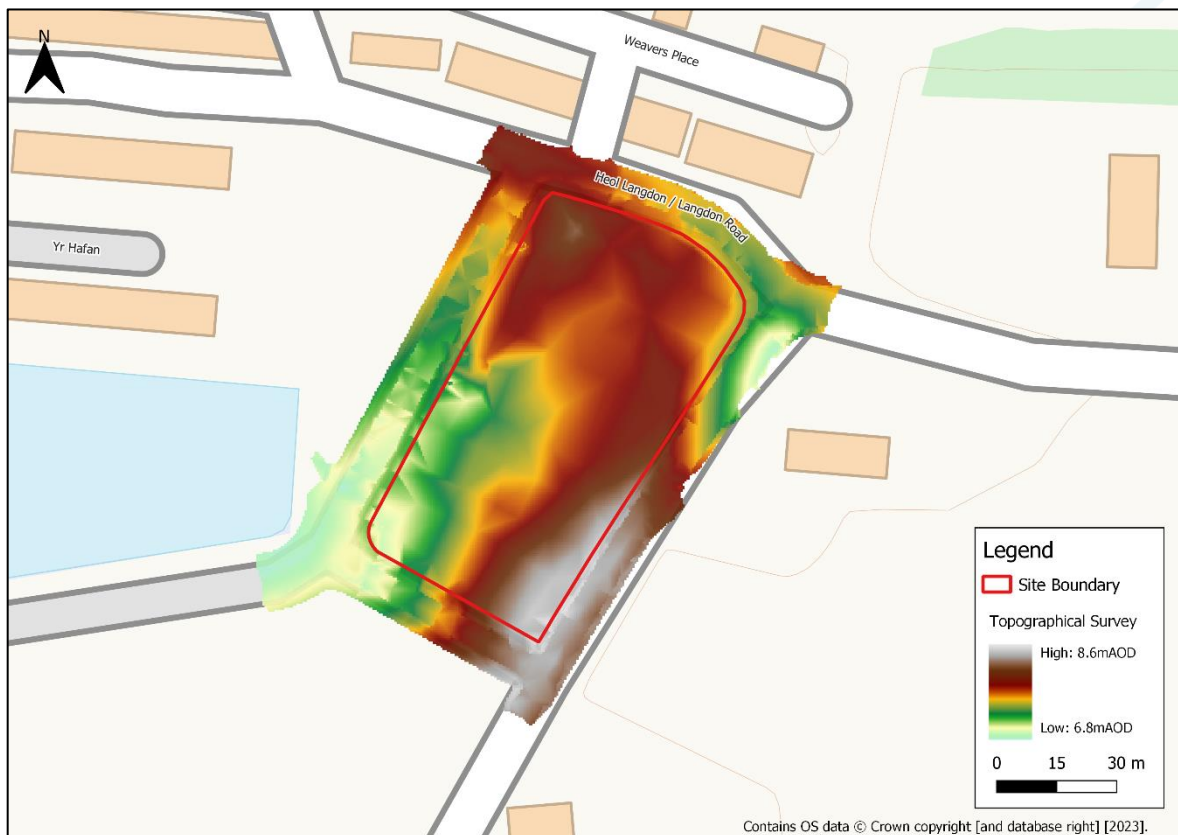


Figure 2-1 Topographical Survey DTM

TECHNICAL NOTE

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The model's tidal boundary was also updated to account for climate change with the base year 2024, and climate change allowances for the lifetime of the development (75 years and 100 years), as shown in Table 2-1.

Table 2-1 Tidal Boundary Uplifts

Year	Uplift (m)
2024	0.13
2099	0.84
2124	1.07

2.2.2 Post-Development Updates

Within the post-development run a ZSH Shapefile was created with the building area (the Red Line Boundary shown in Figure 1-1) set well above the flood level to identify the worst-case flooding extent and detriment at the site.

TECHNICAL NOTE

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Contract	SA1 Plot E6
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Subject	SA1 Plot E6

3 Results

3.1 Baseline

3.1.1 Present Day (2024)

0.1% AEP

The 0.1% AEP present day event, as shown in Figure 3-1, does not flood the site, and therefore will not be discussed further.

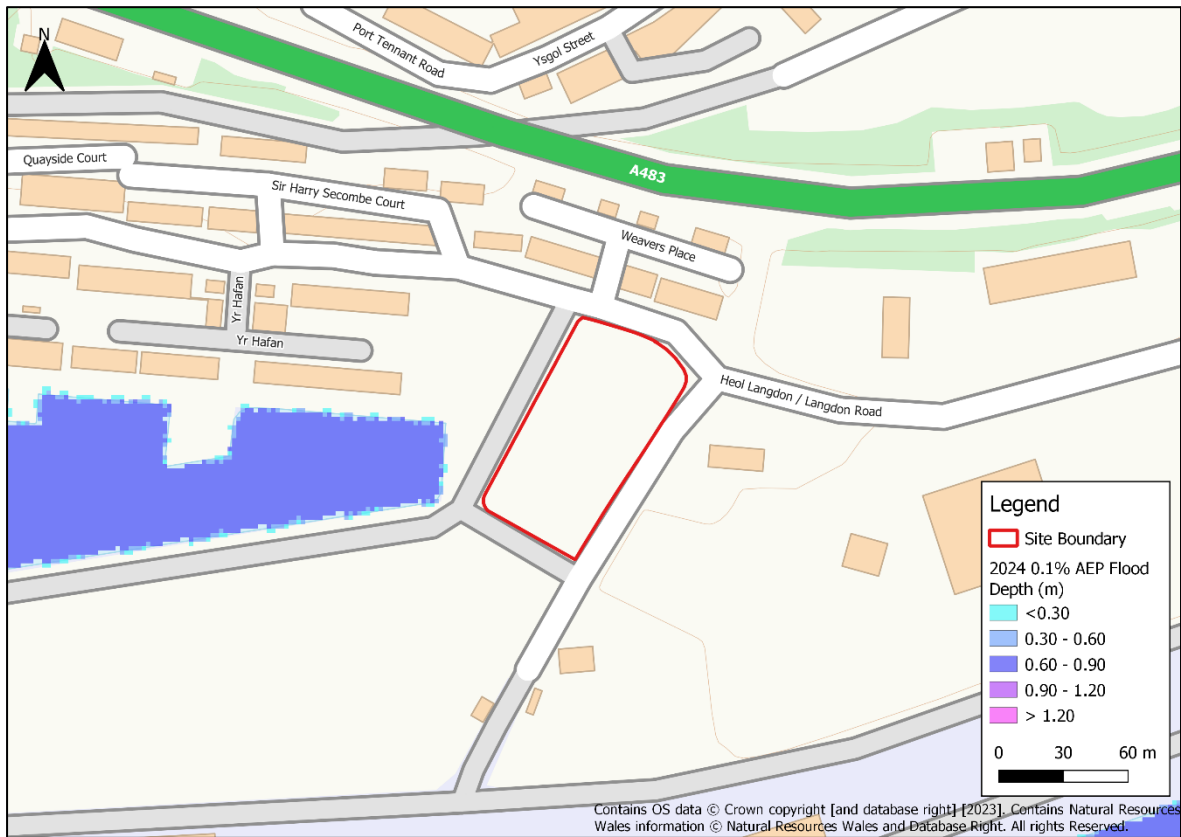


Figure 3-1 2024 0.1% AEP Baseline Event

TECHNICAL NOTE

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3.1.2 75 Years (2099)

0.5% AEP

As shown in Figure 3-2 and Figure 3-3, a small section of the southwestern corner floods up to depths of 17mm. The remainder of the site remains flood free.

The maximum water level on site is 7.01mAOD.

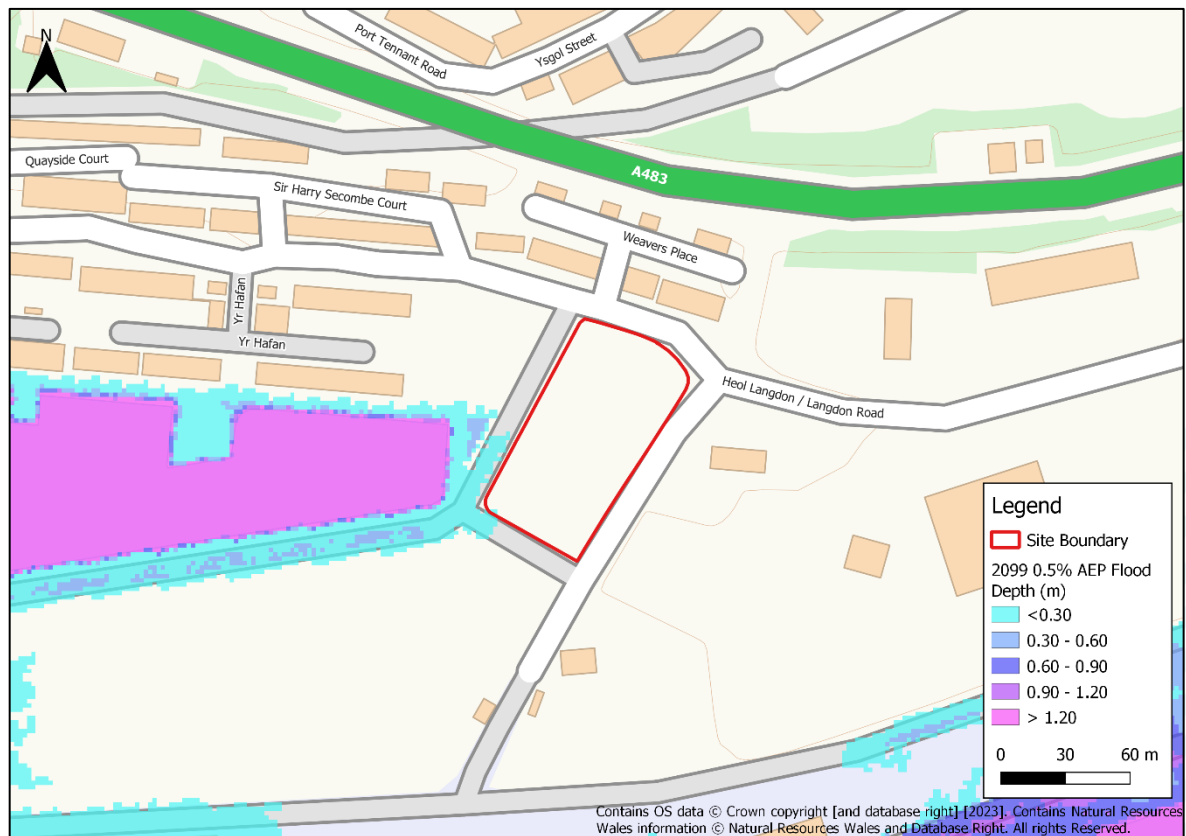


Figure 3-2 2099 0.5% AEP Baseline Event

TECHNICAL NOTE

JBA Project Code: 2023s1617
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 Client: POBL Group
 Day, Date and Time: December 2023
 Author: Erica Godsland
 Reviewer / Sign-off:
 Subject: SA1 Plot E6

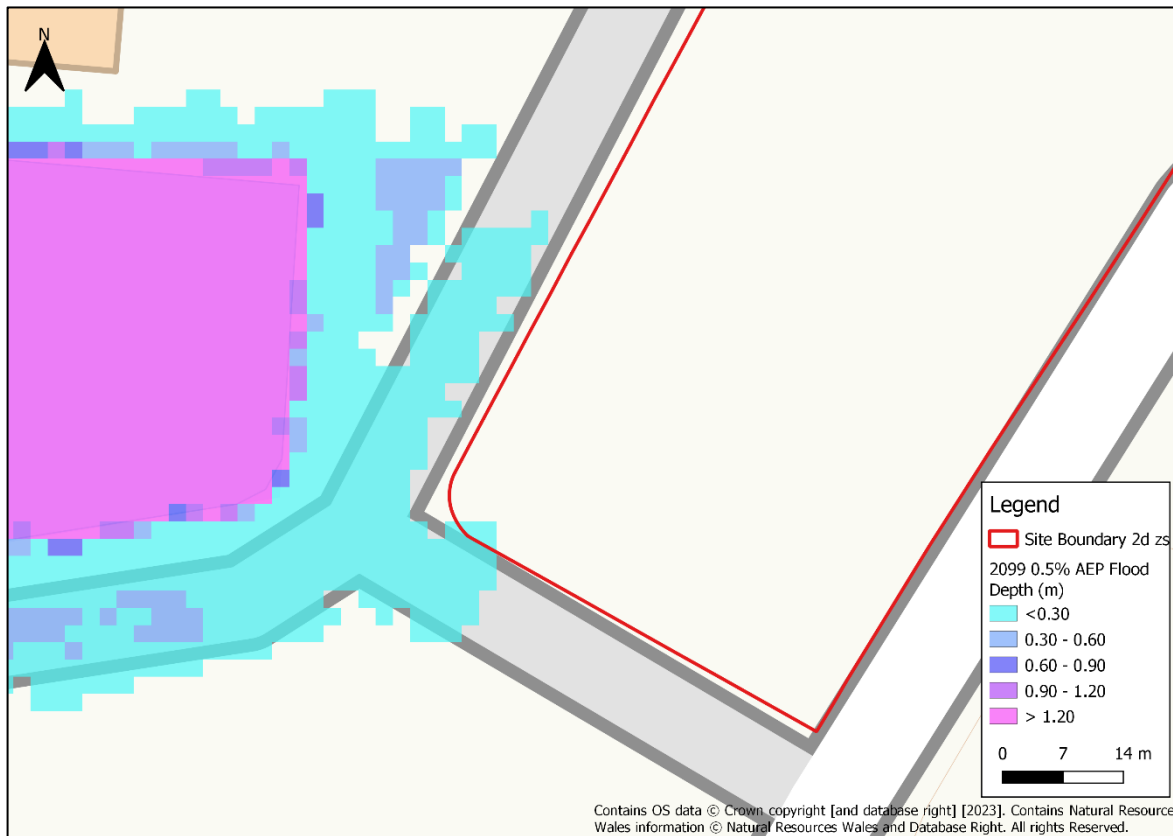


Figure 3-3 2099 0.5% AEP Baseline Event southwestern corner

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0.1% AEP

During the 0.1% AEP event the site is shown to flood to depths of 450mm in the southwest, as shown in Figure 3-4.

The remainder of the site is flood free.

The maximum water level on site is 7.42mAOD.

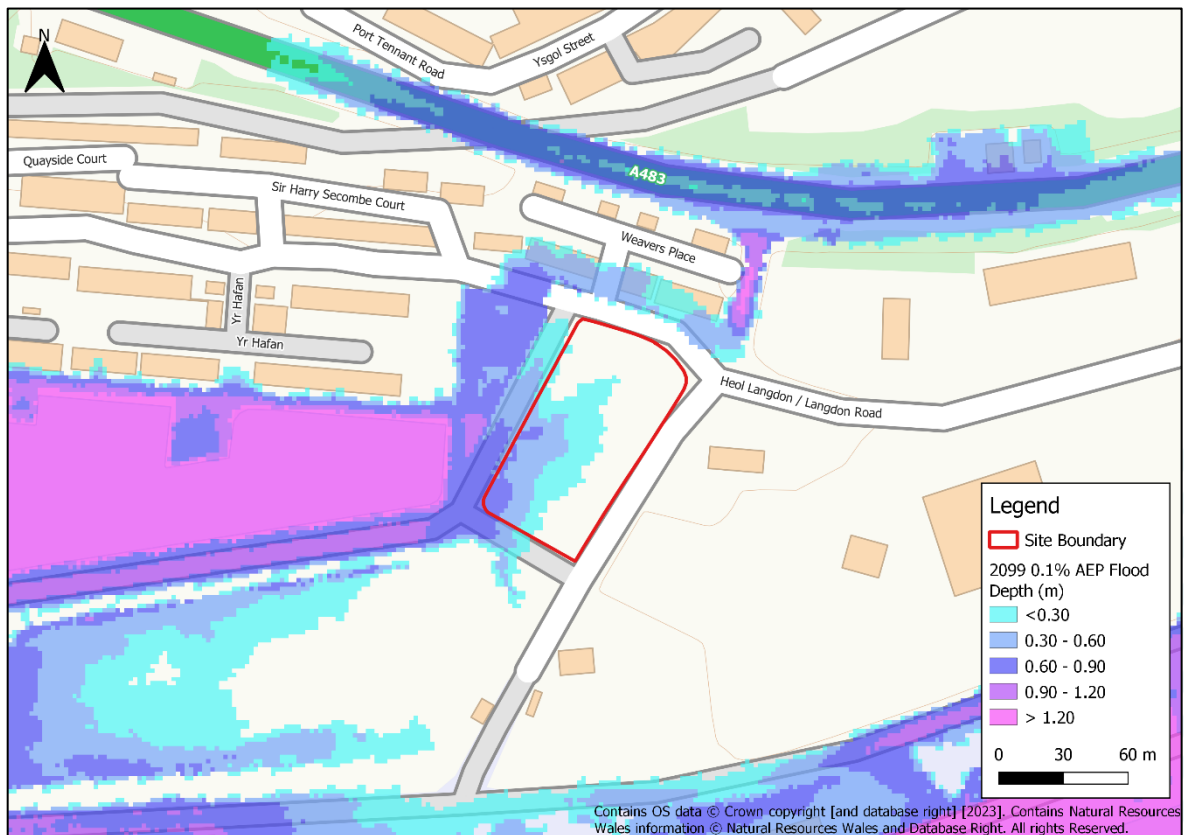


Figure 3-4 2099 0.1% AEP Baseline Event

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 Contract SA1 Plot E6
 Client POBL Group
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 Author Erica Godsland
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3.1.13 100 Years (2124)

0.5% AEP

Flood depths of up to 468mm are shown to flood the southwest of the site during the 0.5% AEP event (Figure 3-5) with 100 years climate change.

The maximum water level on site is 7.44mAOD.

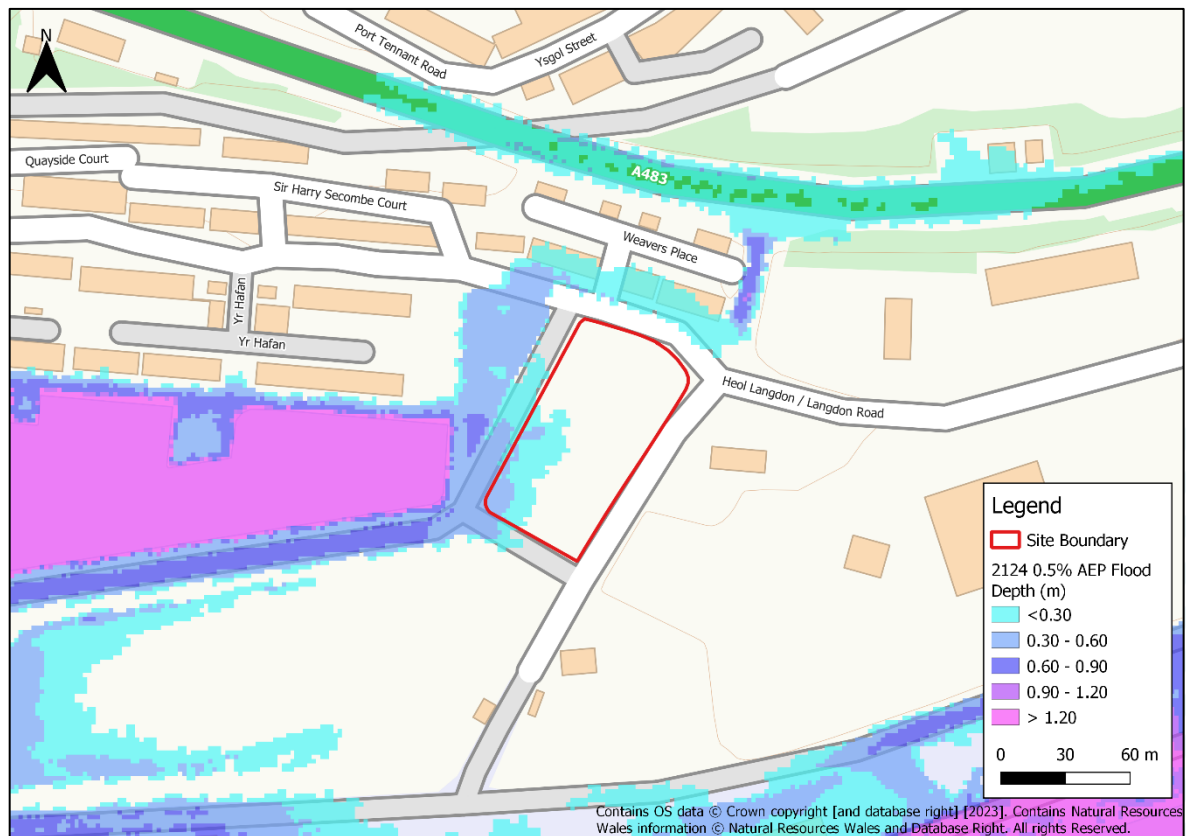


Figure 3-5 2124 0.5% AEP Baseline Event

TECHNICAL NOTE

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 Contract SA1 Plot E6
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 Author Erica Godsland
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0.1% AEP

During the 0.1% AEP, shown in Figure 3-6, the southwest of the site is predicted to flood quite significantly to depths of 762mm.

The maximum water level on site is 7.74mAOD.

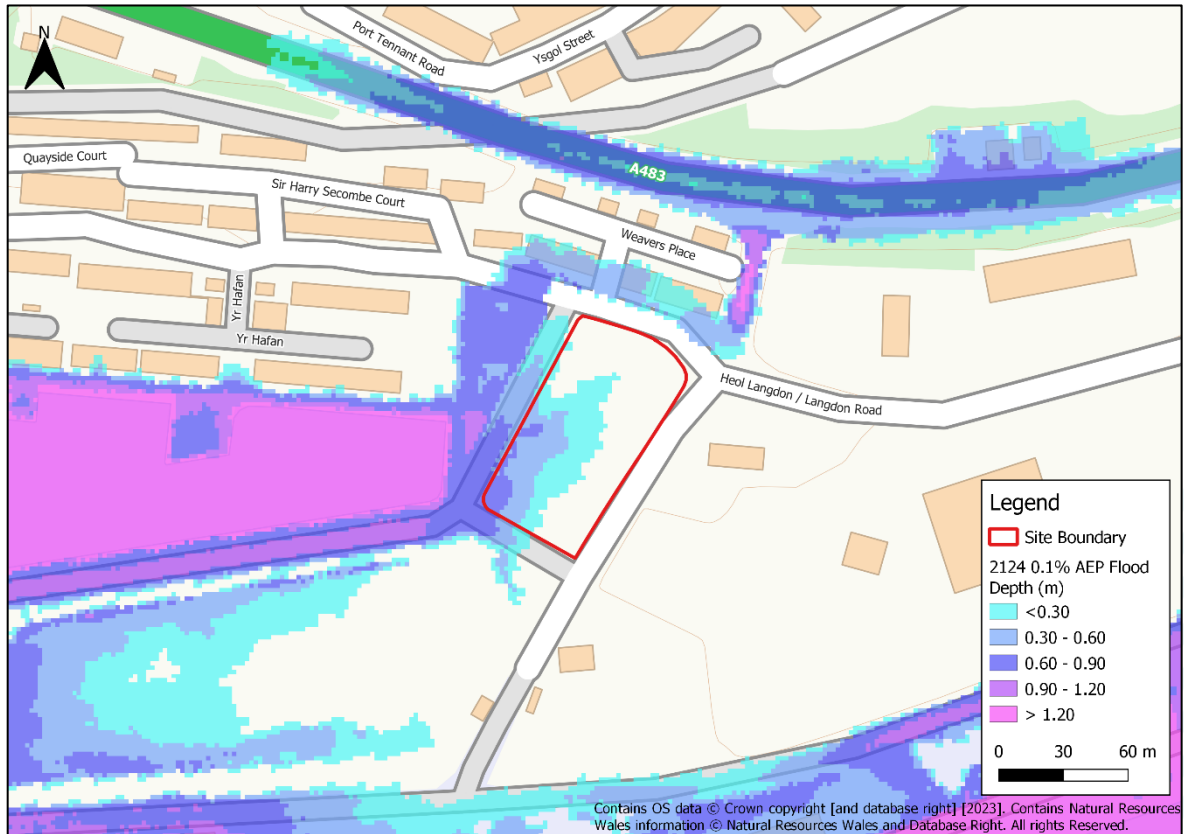


Figure 3-6 2124 0.1% AEP Baseline Event

TECHNICAL NOTE

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 Contract SA1 Plot E6
 Client POBL Group
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 Author Erica Godsland
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3.2 Post-Development

3.2.1 75 Years (2099)

0.5% AEP

As a result of the site being raised well above the flood level in the post-development scenario, the site is predicted to be flood free during the 0.5% AEP event, as shown in Figure 3-7.

Maximum flood levels adjacent to the west of the site are 7.06mAOD.

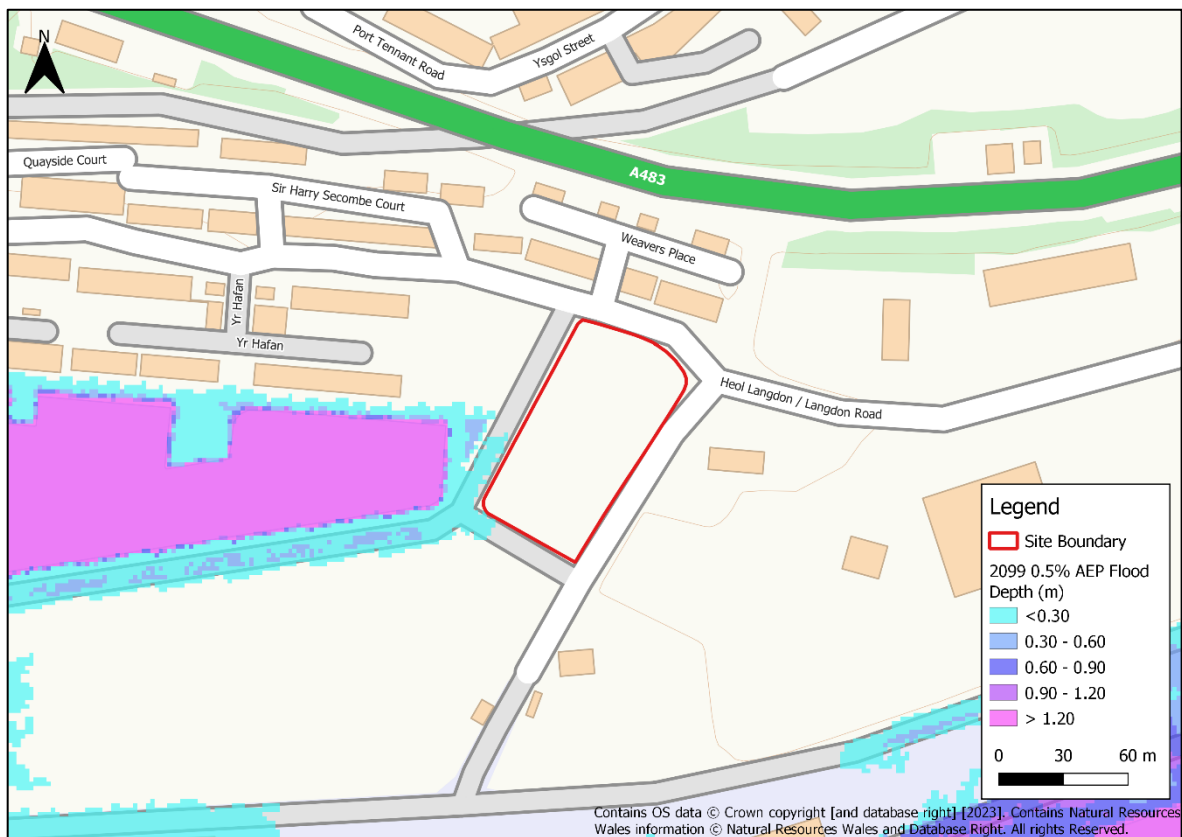


Figure 3-7 2099 0.5% AEP Post-Development Event

TECHNICAL NOTE

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Client	POBL Group
Day, Date and Time	December 2023
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Subject	SA1 Plot E6

0.1% AEP

The site is predicted to be flood free during the 0.1% AEP event with 75 years climate change, as shown in Figure 3-8. The majority of flood depths remain within the Prince of Wales Dock, however isolated areas to the west are predicted to receive 450mm.

The maximum flood level adjacent to the site is 7.42mAOD.

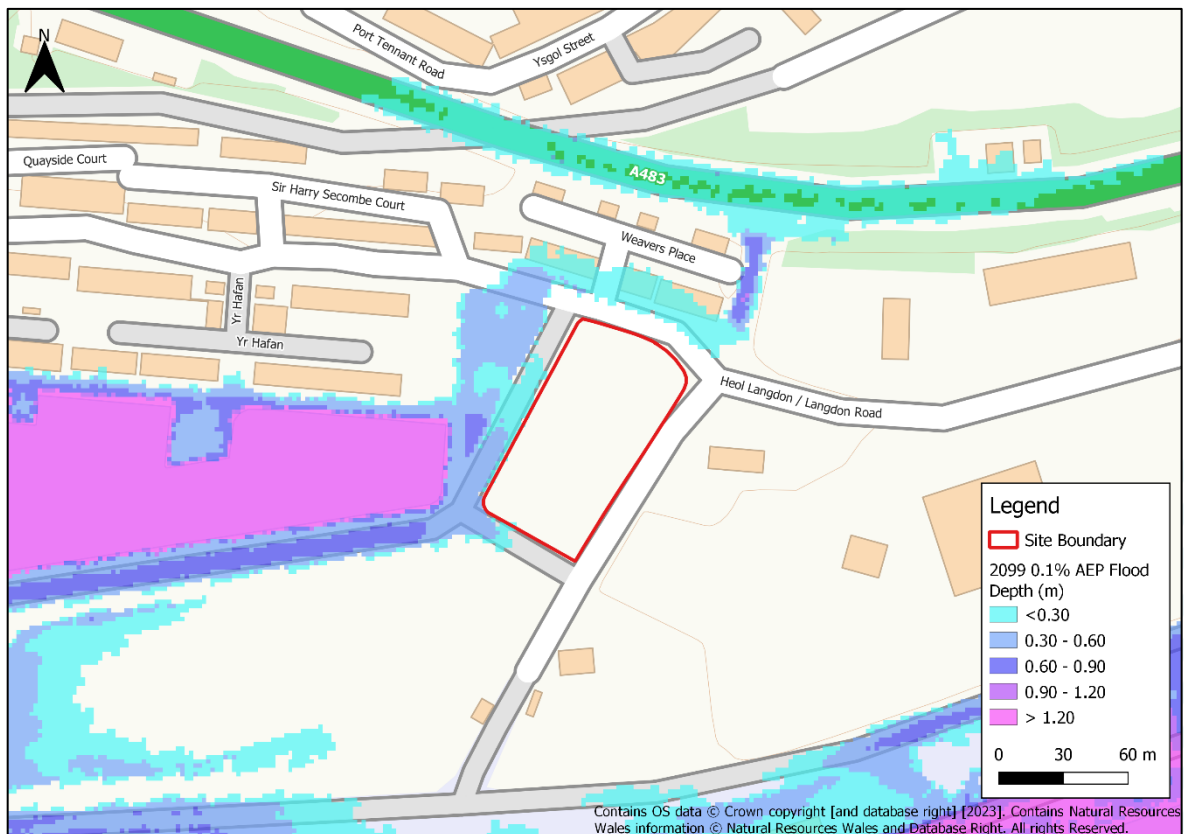


Figure 3-8 2099 0.1% AEP Post-Development Event

TECHNICAL NOTE

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Reviewer / Sign-off	
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3.2.2 100 Years (2124)

0.5% AEP

During the 2124 0.5% AEP event, flood depths alongside the western boundary of the site increase to 500mm, with a maximum flood level of 7.44mAOD.

Once again, as shown in Figure 3-9, the site itself remains flood free.

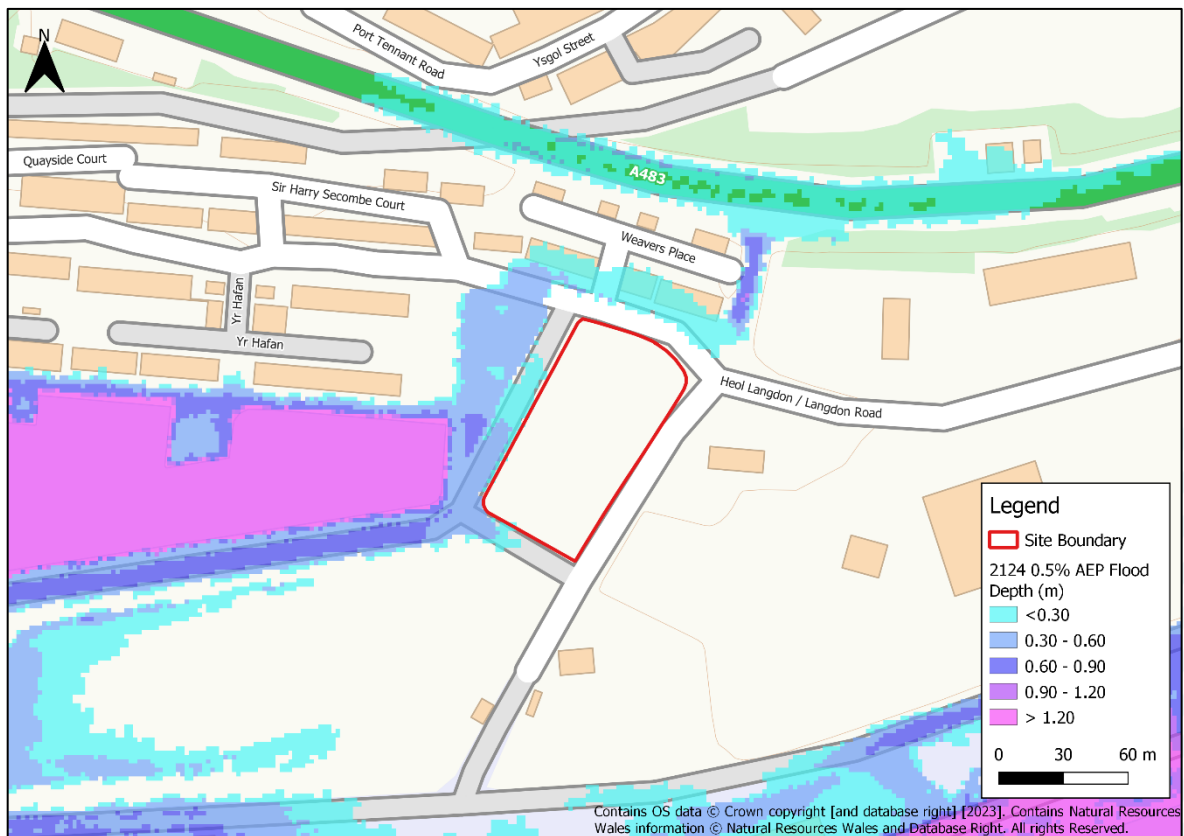


Figure 3-9 2124 0.5% AEP Post-Development Event

TECHNICAL NOTE

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0.1% AEP

Within the 0.1% AEP event, shown in Figure 3-10, the site remains flood free, but depths alongside the western boundary increase to 800mm.

Maximum flood levels west of the site are predicted to be 7.73m AOD.

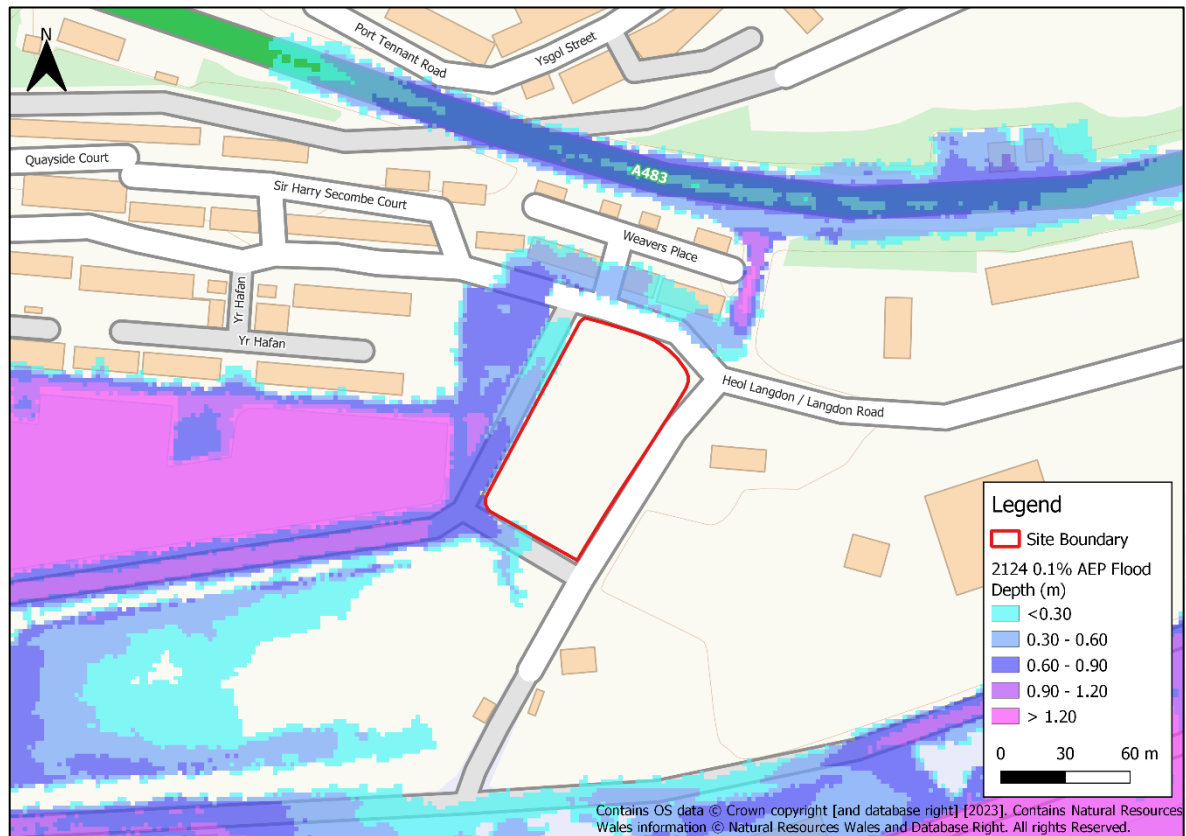


Figure 3-10 2124 0.1% AEP Post-Development Event

TECHNICAL NOTE

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 Author Erica Godsland
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3.3 Depth Comparisons

The depth comparisons for the 2099 and 2124 0.5% and 0.1% AEP events are shown below in Figures 10-13.

As shown in Figure 3-11 a very small area to the south receives an increase in flood depths up to 12mm. It is therefore considered to be a negligible increase and will not result in any third-party detrimental impacts.

Figures 11-13 highlight that there is over a 5mm decrease within the building footprint, with no change around the site location.



Figure 3-11 2099 0.5% AEP Depth Comparison

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Figure 3-12 2099 0.1% AEP Depth Comparison

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Figure 3-13 2124 0.5% AEP Depth Comparison

TECHNICAL NOTE

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 Client POBL Group
 Day, Date and Time December 2023
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 Reviewer / Sign-off
 Subject SA1 Plot E6



Figure 3-14 2124 0.1% AEP Depth Comparison

4 Model Performance

The model recorded a Mass Error of -0.31% at 0.08hrs, and noted no 1d/2d negative depths. There were 9 warnings and 58 checks messages recorded during the events, however these messages are contained within the original 2021 model report (FTJ-JBAU-XX-XX-RP-HM-S3-P01-0001-Lower_Tawe_MUR).

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