

FloodSmart Plus



Flood Consequence Assessment

Site Address

Former Remploy Site
Neath Abbey Road Industrial Estate
Neath
SA10 7DN

Date

2022-10-18

Update

2023-02-17

Grid Reference

274370, 197494

Report Status

FINAL

Report Prepared for

Joseph Lyons-Mound
Lyons Holiday Parks
LL18 3UU

Site Area

0.62 ha

Report Reference

77670R3



Risk – Very Low to Medium

The Site is located in DAM Zone C2, tidal Flood Zone 3 and fluvial Flood Zones 1 and 2, and therefore has a High probability of flooding from the Sea and Low to Medium probability of flooding from rivers.

According to Natural Resources Wales (NRW), the Site is at a Low to Medium risk of tidal and fluvial flooding. The Site is at a Very Low to Low risk of surface water flooding and a Negligible risk of groundwater flooding.

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1. Executive summary



The Planning Policy Wales (PPW) 11th edition (2021) and Technical Advice Note 15 (TAN 15) (2004) requires Flood Consequence Assessments (FCA) to review flooding from all potential sources. A review has been undertaken of national environmental data sets to assess the potential flood risk to the Site. The review is provided within this concise interpretative report written by an experienced GeoSmart consultant.

Site analysis

Source of Flood Risk	Baseline	After Mitigation
River (fluvial) flooding	Low to Medium	Low
Sea (coastal/tidal) flooding	Low to Medium	Low
Surface water (pluvial) flooding	Very Low to Low	Very Low
Groundwater flooding	Negligible	N/A
Other flood risk factors present	Yes (Canal)	Yes
Is any other further work recommended?	Yes	Yes

N/A = mitigation not required

Summary of existing and proposed development

The Site is currently used within a commercial capacity as a former Remploy factory. Currently there is an existing derelict building in the south of the Site and buildings have been demolished in the centre of the Site. According to a topographical survey provided by the Client, the FFLs of the existing building are 6.69 mAOD.

Development proposals comprise the extension and refurbishment of the existing derelict building to create a large industrial unit to the rear and with six smaller starter/incubation units in the central area, along with a retail development in the north of the Site facing the adjacent road, with associated access and parking. The FFLs of the industrial unit will remain 6.69 mAOD, however FFLs for the proposed retail development have not been provided.

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

According to the NRW's Development Advice Map (DAM) the Site is located within Zone C2, which are areas of the floodplain without significant flood defence infrastructure. (TAN15, 2004).

- Further information on each source of flooding is provided below:

Tidal flooding

- According to Natural Resources Wales' (NRW) Flood Zone Map, the Site is located within tidal Flood Zone 3.
- According to the Flood Risk Assessment (Wales) (FRAW) map, which considers the presence of defences, the Site is at Low to Medium risk of flooding from the Sea.
- The Site does not benefit from formal/significant defences.
- Modelled defended flood data obtained from NRW has been used to confirm tidal flood levels at the Site. Analysis of this data, including the most up to date guidance on climate change, confirms the maximum flood level at the Site during the 1 in 200 year (2116) event would be 7.35 mAOD. During this event, flood depths at the Site could be up to 1.01 m, and up to 0.66 m where proposed FFLs are 6.69 mAOD.

Fluvial flooding

- According to the NRW's Flood Zone Map, a small area in the east of the Site is located within fluvial Flood Zone 2 and the rest of the Site is located within fluvial Flood Zone 3.
- However, according to the FRAW map, which considers the presence of defences, the Site is at variable risk of flooding from rivers, ranging from Low to Medium.
- The NFH maps indicate that the Site is at a Low risk of flooding from rivers when the undefended scenario is considered.
- Modelled defended flood data obtained from NRW has been used to confirm fluvial flood levels at the Site. Analysis of this data, including the most up to date guidance on climate change, confirms the maximum flood level at the Site during the 1 in 100 year + 25% climate change allowance event would be 7.19 mAOD. During this event, flood depths at the Site could be up to 0.85 m, and up to 0.50 m where proposed FFLs are 6.69 mAOD.

Surface water flooding

- According to Natural Resources Wales' (NRW) Flood Zone Map, the Site is located within Flood Zone 1 due to risk originating from surface water and small watercourses.
- Both the FRAW and NFH maps indicate that the Site is at Very Low to Low risk of flooding from surface water and small watercourses in both the defended and undefended scenario.

Groundwater flooding

- Groundwater Flood Risk screening data indicates there is a Negligible risk of groundwater flooding at the surface in the vicinity of the Site during a 1 in 100 year event.

- The presence of an underlying Secondary (A) Aquifer bedrock could indicate that there is good drainage at the Site and therefore a low groundwater table may be possible.
- Borehole data suggests there is unlikely to be a shallow groundwater table beneath the Site, however there are a lack of relevant boreholes within 250 m of the Site therefore it is not possible to accurately determine this.
- It is noted that groundwater levels may potentially rise in the bedrock aquifer in response to high river and tidal events, and this could cause shallow flooding of the groundwater table at the Site.

Flooding from artificial (man-made) sources

- The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding.
- Ordnance Survey (OS) data confirms the Tennant Canal is approximately 90 m to the south of the Site. The Canal is located along a flow route and acts as a flood pathway, conveying water from the River to the Site. If surface water enters the canal, the level of water would reach a point where it could exceed control structures and overtopping may result.
 - Although, in terms of the canal as a potential source of flooding, the likelihood of the canal overtopping or breaching (where the river is not flooding) is considered minimal due to the rigorous management and maintenance regimes normally applied to the UK Canal Network.
- A sewer flooding history search was undertaken using the Strategic Flood Consequence Assessment (NPT County Borough Council, 2014). This indicates there are no records of historic sewer flooding in the area of the Site.

Recommendations and next steps

Recommendations for mitigation are provided below, based upon the proposed development and the flood risk to the Site:

- As there is a risk of flooding from tidal and fluvial sources, where flood depths could be up to 1.01 m in depth, Finished Floor Levels (FFL) of the proposed development should be set to 7.65 mAOD¹;

Paragraphs A1.14 and A1.15 of the acceptability criteria for flooding consequences outlined within TAN15 (2004) state the following:

- A1.14: the threshold frequency of flooding for commercial and industrial developments is the fluvial 1% AEP (1 in 100 year) and the tidal 0.5% AEP (1 in 200 year) scenarios; and

¹ 600 mm above the 1 in 100 year plus climate change fluvial flood level of 5.66 mAOD. Note that greater depths would be experienced during a tidal flood event due to flood waters entering the Site from the north (whereas fluvial flood water would enter from the south); however, the flood level in this scenario is lower than the fluvial flood level.

- A1.15: the maximum depth of flooding considered tolerable conditions for commercial developments is 600 mm and for industrial developments is 1000 mm.
- Ground levels along the access road to/from the Site should be raised to ensure there is less than 600 mm of flood water along the access roads in a 1 in 1000 year (2116) tidal flood event in order to accommodate Paragraph A1.15 of TAN15 (2004);
- Alternative mitigation measures have also been recommended within this report;
- as the proposed development is in Flood Zone C2 there is no requirement to provide additional floodplain storage or compensatory flood storage;
- Occupants of the Site should be signed up to NRW's flood warning service to receive Flood Alerts and Flood Warnings; and
- A Flood Warning and Evacuation Plan is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction



Background and purpose

This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the PPW (2021) and the source(s) of any flood risk present. Finally, a preliminary assessment of the steps that can be taken to manage any flood risk to the development was undertaken.

This report has been prepared with reference to the TAN 15 (2004) which supplements the PPW (2021). It is noted that an update to TAN 15 (2021) comes into effect from 1 December 2021, and any changes to planning policy identified within TAN 15 (2021) have also been included in the report.

The general approach of PPW, supported by the TAN, is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is, in order of preference, to:

- Direct new development away from those areas which are at high risk of flooding; and
- Where development is considered to be in high-risk areas (Zone C) only those developments which can be justified on the basis of the tests outlined in section 6 and section 7 are located within such areas.

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

A thorough review of a commercially available flood risk report and NRW supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from NRW and a review of the Neath Port Talbot County Borough Council Strategic Flood Consequence Assessment (SFCA) (NPT County Borough Council, 2014) and the Neath Port Talbot County Borough Council Local Flood Risk Management Strategy (LFRMS) (NPT County Borough Council, 2013) have been used to ascertain local flooding issues and, where appropriate, identify information to support a Justification test and Assessment of Flood Consequences required as part of the PPW 11th Edition (2021).

Using available data, the existing and future flood risks to and from the Site from all flood sources will be assessed in line with current best practice.

An indication of potential flood risk from the Site to downstream receptors is provided where the proposed development increases run-off from the Site.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted			
	Commercial Flood Maps	FRMS*	Natural Resources Wales	OS Data
Historical	X	X	X	
River (Fluvial) / Sea (tidal)	X	X	X	
Surface water (pluvial)	X	X	X	
Groundwater	X	X		
Sewer		X		
Culvert/bridges		X		X
Reservoir		X	X	

* Neath Port Talbot County Borough Council Strategic Flood Consequence Assessment (SFCA) (NPT County Borough Council, 2014) and Neath Port Talbot County Borough Council Local Flood Risk Management Strategy (LFRMS) (NPT County Borough Council, 2013)

3. Site analysis



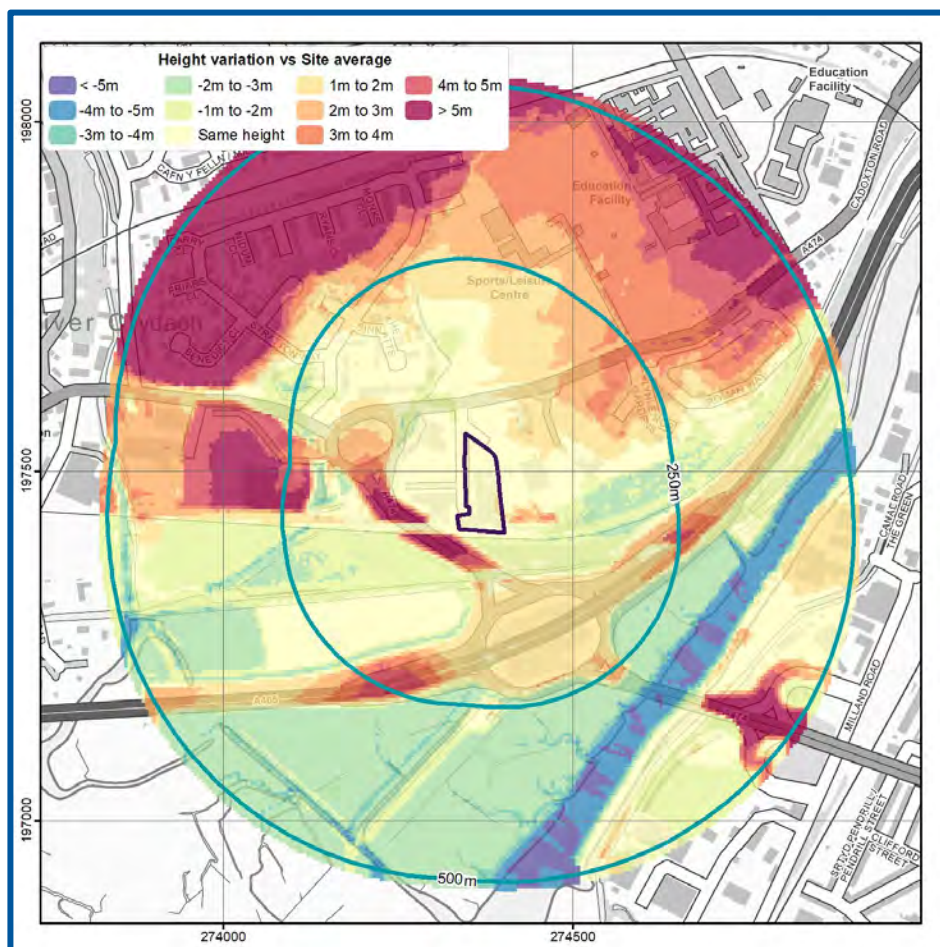
Site information

The Site is located in the Neath Abbey Road Industrial Estate, Neath, SA10 7DN in a setting of commercial land use at National Grid Reference SS 74370 97494. Site plans and drawings are provided in Appendix A.

Using a 500 m around the Site, the Site is on a gentle slope (Figure 1), but gently undulates. It is noted that to the north land rises to c. 20.28 m Above Ordnance Datum (AOD). To the west land rises to c. 11.55 mAOD, and to the south land falls to c. 4.28 mAOD, and to the east land remains relatively level at c. 6.92 mAOD.

According to OS data, the general level of the Site is between 6.34 and 6.98 mAOD with the Site falling gradually in a northerly direction. This is based on NRW elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ± 150 mm.

Figure 1. Site Location and Relative Elevations (GeoSmart, 2022).



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Development

The Site is currently used within a commercial capacity as a former Remploy factory. Currently there is an existing derelict building in the south of the Site and buildings have been demolished in the centre of the Site. According to a topographical survey provided by the Client, the FFLs of the existing building are 6.69 mAOD.

Development proposals comprise the extension and refurbishment of the existing derelict building to create a large industrial unit to the rear and with six smaller starter/incubation units in the central area, along with a retail development in the north of the Site facing the adjacent road, with associated access and parking. The FFLs of the industrial unit will remain 6.69 mAOD, however FFLs for the retail development have not been provided.

The effect of the overall development will result in an increase in number of occupants and/or users of the building and will result in the change of use, nature or times of occupation. The estimated lifespan of the development is 60 years.

The proposed development is classed as Less Vulnerable according to Table 9 (Summary of Policy Requirements) in TAN 15 (2004).

Hydrological features

The Tennant Canal is approximately 90 m to the south of the Site.

There are numerous culverted watercourses between 250 m and 500 m to the south of the Site.

There is an unnamed culverted watercourse approximately 295 m to the east of the Site.

There is a watercourse approximately 70 m to the north west of the Site.

There is a culverted watercourse approximately 215 m to the west of the Site.

There is a pond located approximately 235 m to the north west of the Site.

The River Neath is approximately 400 m to the east of the Site.

The River Clydach is approximately 500 m to the west of the Site.

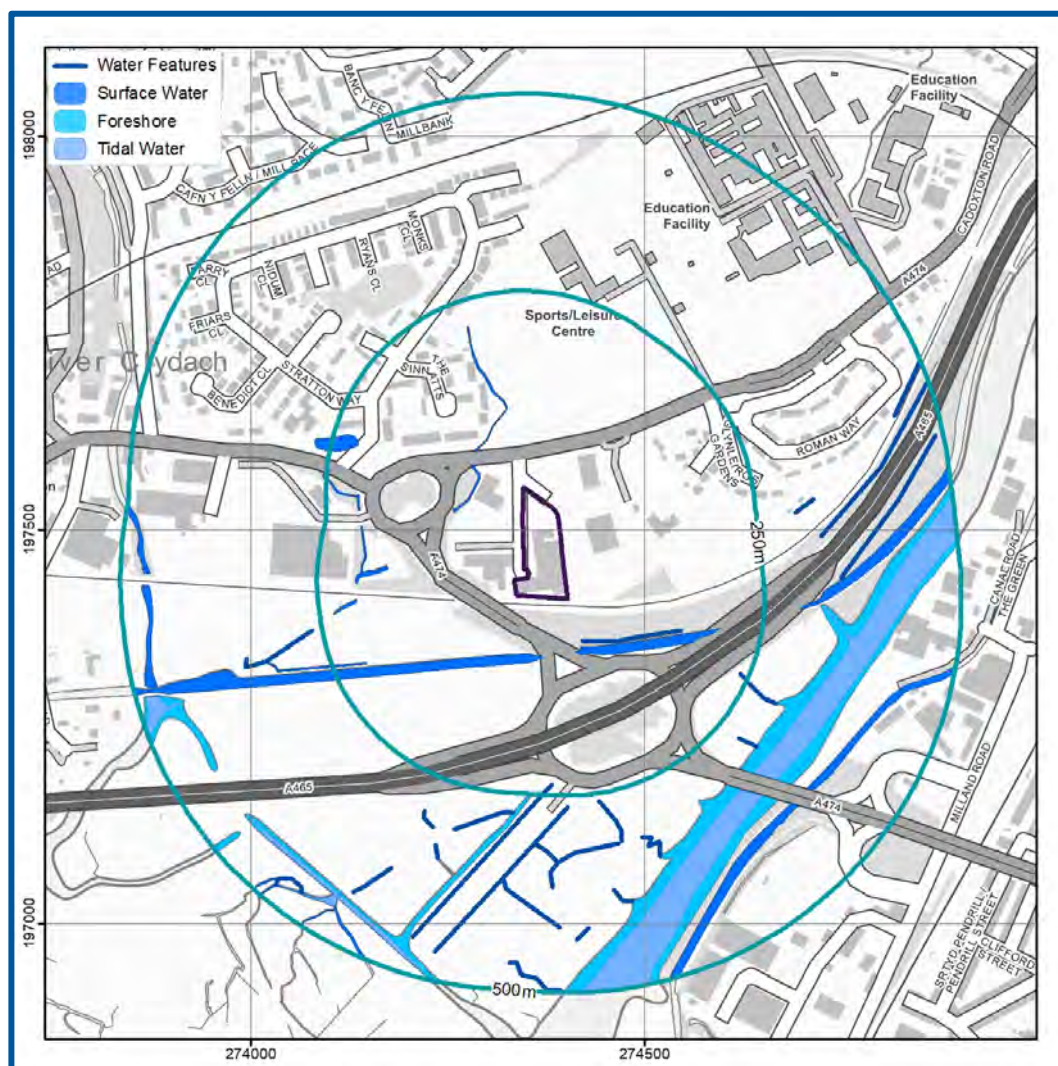
Proximity to relevant infrastructure

The Tennant Canal Towpath is located approximately 120 m to the south of the Site.

There are also two bridges located approximately 120 m and 125 m to the south of the Site, adjacent to the Towpath.

There is a bridge on the A465 located approximately 270 m to the south east of the Site.

Figure 2. Surface water features (NRW, 2022)



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BGS mapping indicates the underlying bedrock geology consists of the Swansea Member – Sandstone (SW) (Figure 4) and is classified as a Secondary (A) Aquifer (BGS, 2022).

Figure 4. Bedrock Geology (BGS, 2022)



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The Site does not lie within a groundwater Source Protection Zone (SPZ) (EA, 2022).

A review of the BGS borehole database (BGS, 2022) indicates the nearest and most relevant borehole (ref: SS79NW80) is located approximately 50 m to the west of the Site at an elevation of approximately 7.15 mAOD, and records 0.4 m thickness of topsoil overlying 1.80 m thickness of gravel and clay overlying 9.87 m thickness of gravel. Groundwater levels are recorded at 2.31 m below ground level (bgl) on date, subject to seasonal variations.

There are no other relevant boreholes mapped within the same superficial deposits and bedrock as the Site. The hydrogeological characteristics suggest there is potential for a shallow groundwater table beneath the Site.

It is noted that groundwater levels may rise in the bedrock aquifer in response to high river and tidal events subject to hydraulic continuity between the driving water level, the groundwater system and the Site.

4. Flood risk to the development



Historical flood events

According to the NRW's Recorded Flood Extents Map, no historical flood events have been recorded at the Site (NRW, 2022).

According to the Neath Phase 2 Modelling Report (JBA Consulting, 2017), the Tennant Canal has overflowed several times in the past:

- 27th December 1979 – overflowed, resulting in the flooding of adjacent properties.
- 23rd October 1998 – the canal's aqueduct surcharged leading to flooding on both banks of the river upstream and downstream of the structure.
- 4th October 2004 – the aqueduct surcharged, and the water level reached the parapet level of the structure.

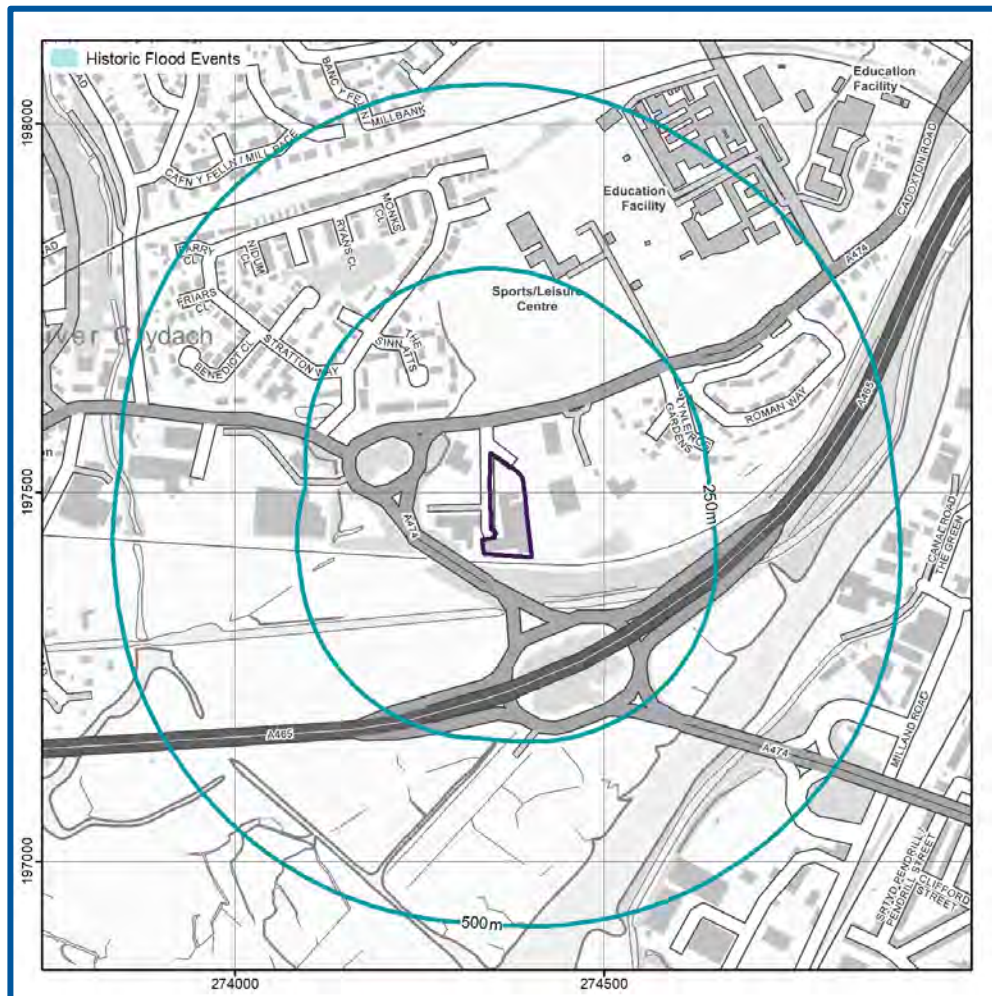
Specific flood locations are not provided; therefore, it cannot be determined if the Site was impacted in this flood event.

Table A8.1 of the Neath Port Talbot (NPT) Local Flood Risk Management Strategy (LFRMS) (NPT County Borough Council, 2013) identifies past flooding in close proximity to the Site. Day's Garage on Neath Abbey Road (A474) experienced short term flooding due to the inability of culverts to carry flows effectively due to obstructions downstream and above discharge points. The date of this flooding occurrence is unknown.

Figure 4-2 of the LFRMS (Appendix B) highlights historic flood events between April and December 2010 in close proximity to the Site (NPT County Borough Council, 2013), however due to the resolution of the mapping it is not possible to determine whether the Site was impacted in these flood events.

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

Figure 5. Recorded Flood Extents Map (NRW, 2022)



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Rivers (fluvial) / Sea (coastal/tidal) flooding

The predominant risk at the Site is from fluvial and tidal flooding from the River Neath and its associated smaller watercourses.

River (fluvial) flooding occurs during times of heavy rainfall or snow melt when watercourses' capacity can be exceeded, over topping the banks and flood defences.

Tidal/coastal flooding is caused by extreme tidal conditions that occur because of three main mechanisms, either individually or in combination. These are:

- High tide levels – variations in tidal levels due to gravitational effects of the sun and moon can result in higher sea levels – there is an approximate twice daily variation between high and low tide, onto which is superimposed a spring-neap tide cycle when extra high and low tides occur.
- Surge – an increase in sea level above tidal level caused by low atmospheric pressure which may be exacerbated by the wind acting on the sea.

According to NRW's Flood Zone Map, the Site is located within tidal Flood Zone 3 and is therefore classified as having a High probability of flooding from the Sea (Figure 8).

The Site is located within fluvial Flood Zones 2 and 3 and is therefore classified as having a Medium to High probability of flooding from fluvial sources (Figure 7).

- A small area on the eastern boundary of the Site (approximately 5%) is located within Flood Zone 2.
- The majority of the Site (approximately 95%) is located within Flood Zone 3.

The Development Advice Map (DAM) is used for development planning matters; this confirms that the Site is currently located within Zone C2 (TAN15, 2004; Figure 6).

The Site is 195 m south west of the nearest area within DAM Zone A which is not a dry island and tidal Flood Zone 3.

Table 2: Development Advice Map Classification

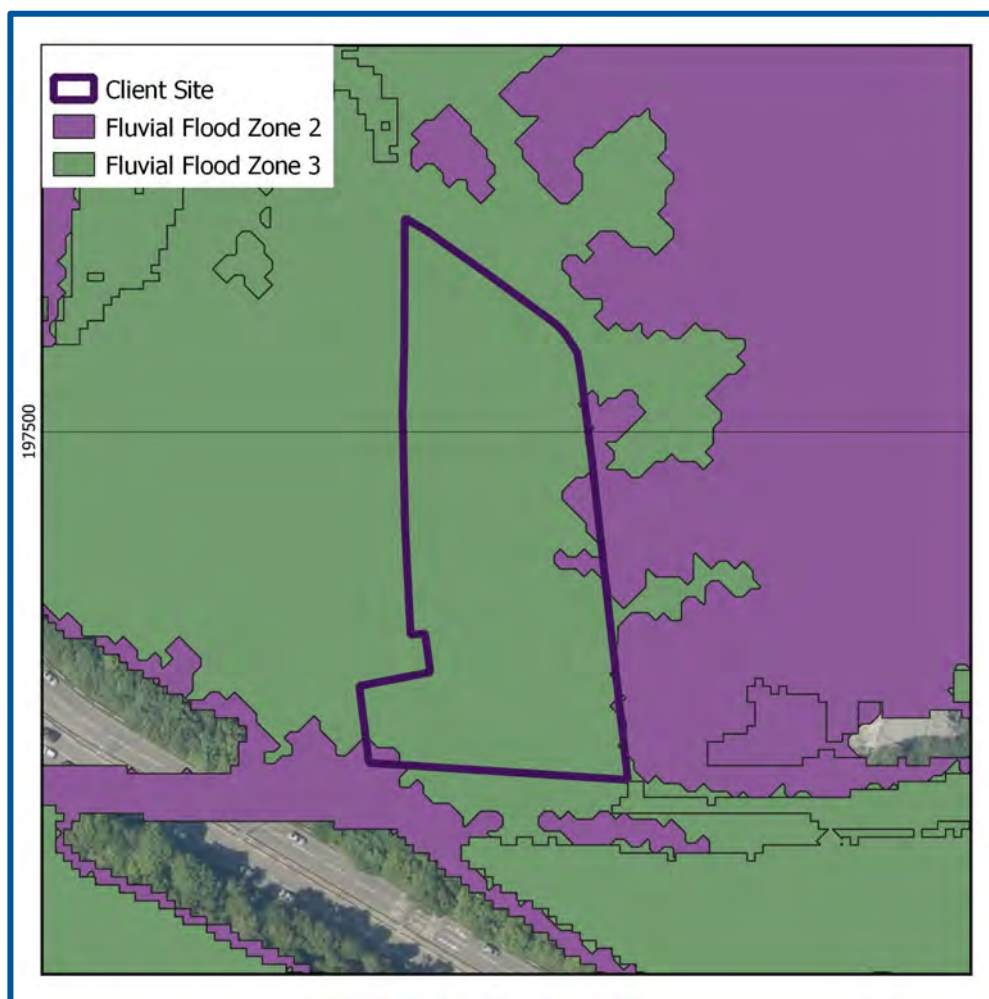
Description of Zone	Zone
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1
Areas of the floodplain without significant flood defence infrastructure.	C2

Figure 6. Development Advice Map (NRW, 2022)



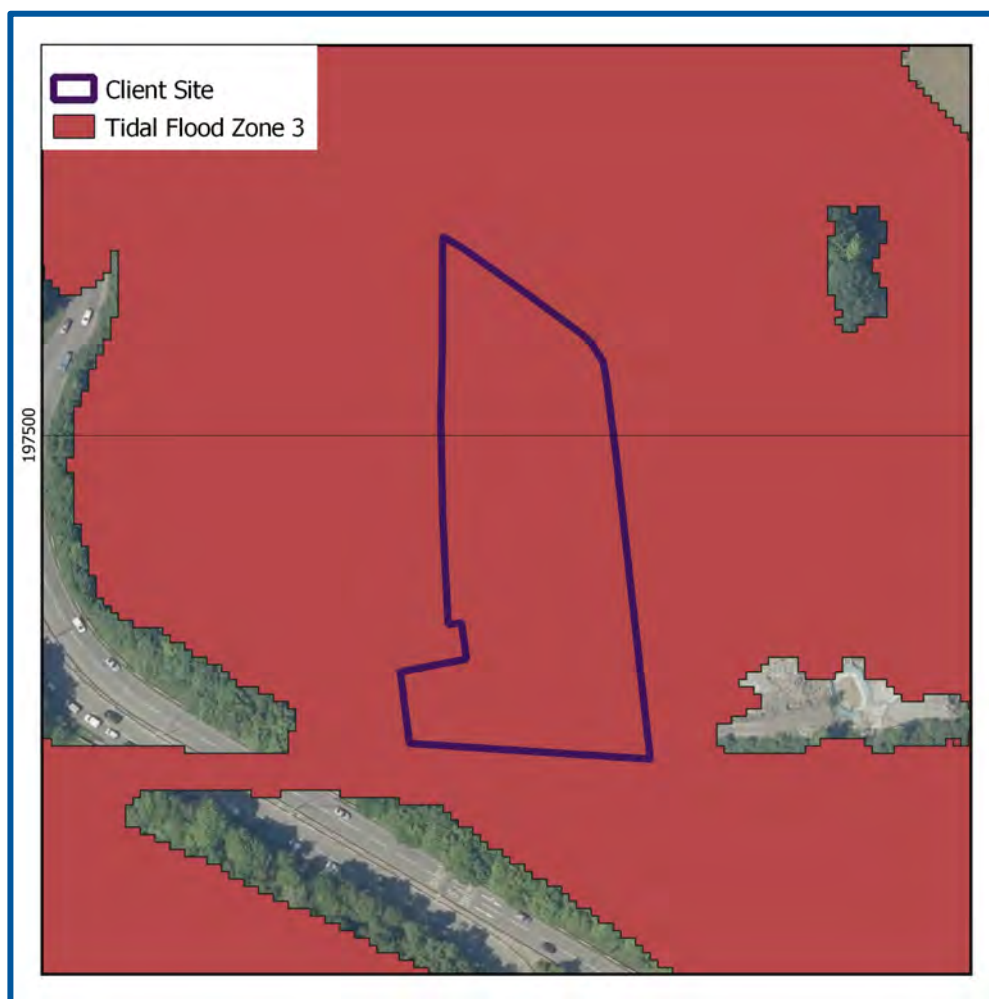
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Figure 7. Fluvial Flood Zone Map – Rivers (NRW, 2022)



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Figure 8. Tidal Flood Zone Map – Sea (NRW, 2022)



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Figure 9. Flood Zone Map – Surface Water and Small Watercourses (NRW, 2022)



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Flood defences

Guidance

Sites that are located close to flood defences are likely to be zones where rapid inundation will occur in the event of the flood defences being overtopped or breached. A Site located close to flood defences (within 250 m) may require a more detailed FRA subject to local topography.

- According to the Flood Map for Planning (NRW, 2022) the Site is located in an area that does not benefit from formal/significant flood defences.
- There are no formal flood defences on the River Clydach, which is located approximately 500 m to the west of the Site.
- However, there are flood defences along the River Neath (approximately 400 m east of the Site) and the Tennant Canal (approximately 90 m south of the Site).
 - The defences on the River Neath are comprised of embankments and concrete walls (JBA Consulting, 2017).
 - The defence on the Tennant Canal is a towpath (JBA Consulting, 2017).
- These defences do not defend up to a 1 in 100 year or a 1 in 1000 year flood as the modelled flood levels on Site in these scenarios are the same in both the defended and undefended scenarios.
- Although there is not adequate information on the flood defences in the area to confirm their standard of protection, it can be assumed that they defend at least up to the 1 in 50 year fluvial event as the Site is not impacted by flooding in this event, but it is impacted by flooding in the 1 in 75 year flood event. This can be inferred from the model data as the NRW only provided defended scenarios for the 1 in 50 and 1 in 75 year events.

National Flood Hazard Maps

The National Flood Hazard (NFH) and Flood Risk Assessment Wales (FRAW) maps were published in the Summer of 2020. The NFH map shows results for an undefended scenario which means the modelling and mapping process explicitly excluded any flood defences, providing a worst-case scenario for the Site. The FRAW map shows results for a defended present-day scenario.

The maps do not currently have an official status for setting planning policy, as set out in Tan 15 (2004).

Both NFH and FRAW maps have been included in order to understand the probability of the flood event that is most likely to affect the Site.

The Sea

The FRAW map indicates the Site is at Low to Medium risk of flooding from the Sea during the present day scenario.

According to Figure 10, only the south of the Site is at risk of tidal flooding. A small area along the southern boundary of the Site is at Medium risk while a larger area in the south of the Site is at Low risk of flooding.

The proposed industrial unit to the rear of the Site and the proposed starter units in the centre of the Site are potentially at risk of flooding in the Low to Medium scenarios.

Rivers

The FRAW map indicates the Site is at variable risk of flooding from rivers, ranging from Low to Medium, in the defended present day scenario.

The majority of the Site is at Medium risk of flooding from rivers, with a small area in the east of the Site at Low risk. Development proposals are located in the area at Medium risk of river flooding.

The NFH map indicates that the Site is at Low risk of flooding from rivers when the undefended scenario is considered. The entire Site is at risk of fluvial flooding in the Low risk scenario, with depths ranging from 0.15 m to 0.9 m and a hazard rating ranging from Low to Danger for Most.

Surface Water and Small Watercourses

Both the FRAW and NFH maps indicate that the Site is at Very Low to Low risk of flooding from surface water and small watercourses in both the defended and undefended scenario.

An access route adjacent to the west of the Site is at a Low risk of surface water flooding where depths could be up to 0.3 m. This flooding may impact the north western boundary of the Site, however flooding is likely to affect the proposed parking areas of the Site and may not impact the proposed commercial development. The majority of flooding in this scenario will likely be contained within the adjacent access route.

Figure 10. FRAW map for tidal/coastal flooding (NRW, 2022)



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Figure 11. FRAW map for river (fluvial) flooding (NRW, 2022)



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Model data

As the Site is located within NRW's fluvial floodplain, flood elevation data was obtained from NRW. This data has been used to assess flood risk and to provide recommendations for mitigation for the proposed development.

Modelled flood data and flood extents were provided by NRW in the form of raw output grid files and analysed using QGIS, to extract flood levels and flood depths in relation to the Site. Data has been obtained for both the fluvial and tidal scenarios and is presented below.

Neath – Phase 2 Modelling Report (JBA Consulting, 2017)

Modelled flood data has been taken from the Neath – Phase 2 Modelling Report (JBA Consulting, 2017) for the defended (including the presence of defences), undefended (excluding the presence of defences) and breach (including a breach in the defences) scenarios.

According to NRW, the modelled flood risk affecting Neath Abbey is attributed to the River Clydach (JBA Consulting, 2017). Flood levels for the undefended scenarios were used within this report as the Site is not in an area benefitting from significant flood defences.

Neath Fluvial Flooding Modelling

According to NRW data, the Site is impacted by the 1% AEP (1 in 100 year), 1% AEP plus Climate Change and 0.1% AEP (1 in 1000 year) flood events.

Table 2. Undefended Modelled flood level data

Ground levels at the Site (mAOD)	Modelled Flood Levels (mAOD)			
	1 in 20 year	1 in 100 year	1 in 100 year plus 20% CC	1 in 1000 year
6.34 to 6.98	–	6.80	7.14	7.50
Flood depths (m)	No Flooding	Up to 0.46	Up to 0.80	Up to 1.16
FFL of 6.69*	No Flooding	Up to 0.11	Up to 0.45	Up to 0.81

*These FFLs are for the proposed industrial unit and do not account for the proposed retail development in the north of the Site, where ground elevations are slightly lower.

Neath Tidal Flooding Modelling

Table 4 illustrates the flood depths experienced on Site during undefended tidal flooding events.

Table 3. Undefended Modelled Flood Levels

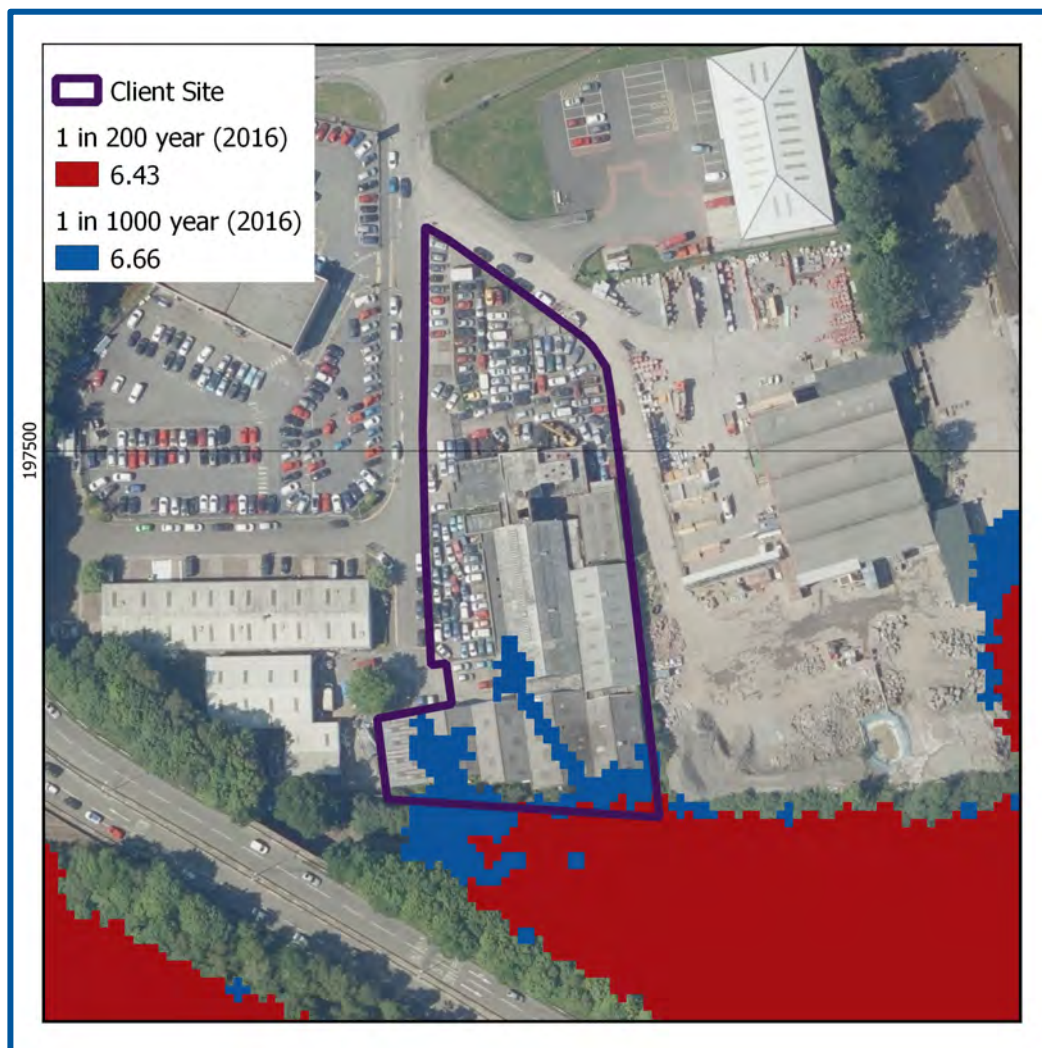
Ground levels at the Site (mAOD)	Modelled Flood Levels (mAOD)			
	0.5% AEP (1 in 200 year) scenario flood level (mAOD)		0.1% AEP (1 in 1000 year) scenario flood level (mAOD)	
	2016	2116	2016	2116
6.34 to 6.98	6.43	7.35	6.66	7.61
Flood depths (m)	Up to 0.09	Up to 1.01	Up to 0.32	Up to 1.27
FFL of 6.69*	No Flooding	Up to 0.66	No Flooding	Up to 0.92

*These FFLs are for the proposed industrial unit and do not account for the proposed retail development in the north of the Site, where ground elevations are slightly lower.

It should be noted that in the 0.5% AEP 2016 scenario only a very small area in the south east of the Site is affected by flooding, and in the 0.1% AEP 2016 scenario, small areas in the south of the Site are affected by flooding (Figure 15). In the 0.5% AEP 2116 and 0.1% AEP 2116 scenarios the entire Site is affected by flooding.

It should also be noted that although the proposed development is commercial and therefore the lifespan of the development is 75 years, modelled data for a 100 year period was used as this is what was provided by NRW. Therefore, the flood levels in Table 3 potentially slightly overestimate the predicted flood depths at the Site.

Figure 12. 1 in 200 year and 1 in 1000 year (2016) tidal flood extents



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Climate Change factors

In accordance with the Welsh Government's Guidance for flood and coastal erosion risk management authorities in Wales (2022), allowances should be made for the impact of increased river and sea levels and flows to the proposed development. The impact of climate change is considered separately for the fluvial and tidal cases:

Fluvial

Due to recent changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes, unless the guidance stipulates this is the correct allowance to use (depending on the river basin and development proposals).

As the Site is located within the West Wales River Basin and the proposed development is classed as Less Vulnerable, where the proposed lifespan is 60 years, the Central (25%) allowances have been used to determine a suitable climate change factor for fluvial flooding.

A stage / discharge relationship graph (Appendix C) has been produced using NRW's modelled flood level data. The climate change allowances have been derived as a proportion of the 100 year peak flow to the 1 in 1000 year event, using the Flood Studies Report. For Wales, the 1 in 1000 year event flow is approximately 46% greater than the 1 in 100 year flow.

Table 4. Fluvial modelled flood level data, including the impacts of climate change

Ground levels at the Site (mAOD)	Modelled Flood Levels (mAOD)	
	1 in 100 year plus 20% CC	1 in 100 year plus 25% CC
6.34 to 6.98	7.14	7.19
Flood depths (m)	Up to 0.80	Up to 0.85
FFL of 6.69*	Up to 0.45	Up to 0.50

*These FFLs are for the proposed industrial unit and do not account for the proposed retail development in the north of the Site, where ground elevations are slightly lower.

Tidal

The 2D model data provided by the NRW within the Neath – Phase 2 Modelling Report (JBA Consulting, 2017) has already taken climate change into account in the 1 in 200 (2116) year and 1 in 1000 year (2116) scenarios and has been used to assess the impacts of climate change on tidal flooding at the Site.

Surface water (pluvial) flooding

Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the National Flood Hazards Map's Flood Risk from Surface Water and Small Watercourses map, there is a Very Low to Low risk of pluvial flooding at the Site.

Guidance

According to NRW's surface water flood risk map, a site at Very Low risk has a chance of flooding of less than 1 in 1000 (0.1%)

According to NRW's surface water flood risk map, a site at Low risk has a chance of flooding of between a 1 in 1000 and 1 in 100 (0.1% and 1%).

Figure 13. NFH Flood Risk from Surface Water and Small Watercourses medium flood risk map (NRW, 2022)



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Figure 14. NFH Flood Risk from Surface Water and Small Watercourses low flood risk map (NRW, 2022)



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Figure 15 shows the National Flood Hazards Map's Flood Risk from Surface Water and Small Watercourses map for a Medium (1 in 100 year) risk scenario and indicates that the Site is not expected to flood in this scenario. An area immediately adjacent to the northern boundary of the Site is affected by flooding in this scenario, however flooding is likely to be contained within the adjacent highway.

Figure 16 shows the NFH Map's Flood Risk from Surface Water and Small Watercourses map for a Low (1 in 1000 year) risk scenario and indicates the western and north-western boundary of the Site may be affected by flooding from surface water and small watercourses. Flooding in this scenario is most likely to impact the proposed parking area and the adjacent access route.

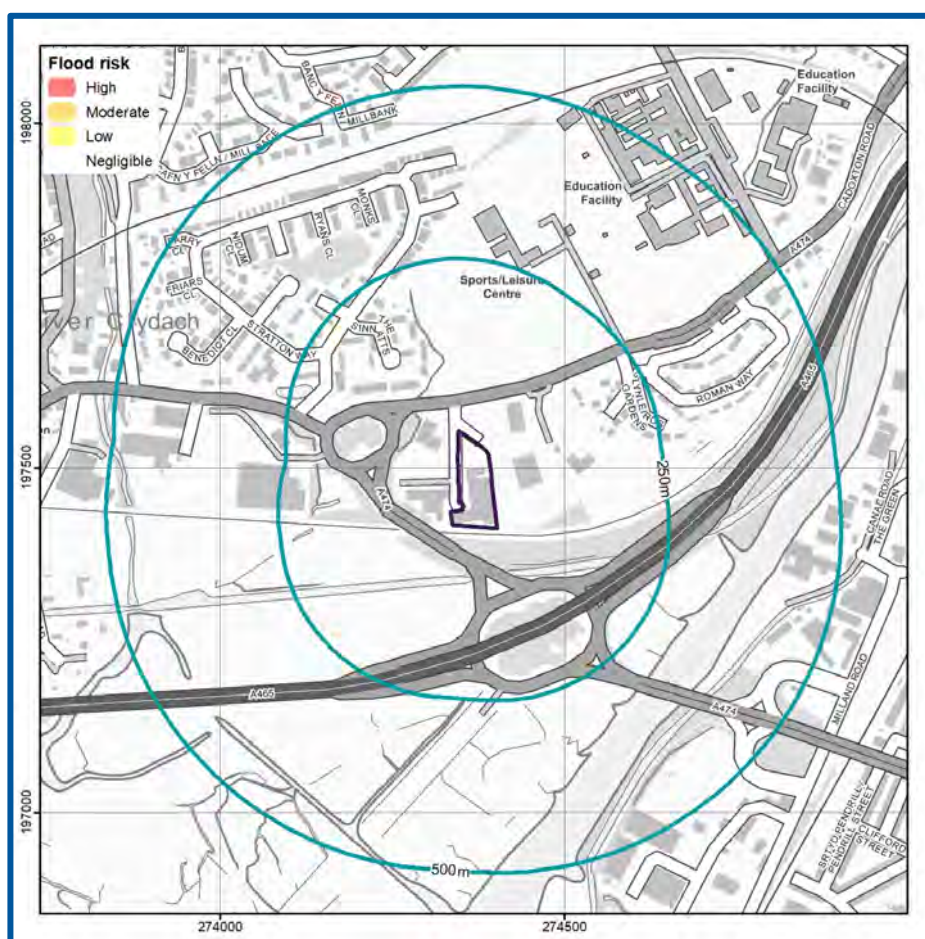
Climate change may lead to an increase in rainfall intensity which affects river levels, land and urban drainage systems. Rainfall intensity for small and urban catchments may increase from 5 to 20 % (central estimate) or 10 % to 40 % (Upper estimate) over the period to 2116 (NRW, 2021). The impact of climate change on surface water flooding can be represented by the 1 in 1000 year pluvial extent.

Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 16) indicates there is a Negligible risk of groundwater flooding at surface in the vicinity from permeable superficial during a 1 in 100 year event.

Figure 15. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2022)



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Mapped classes combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater

flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including the NRW's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

Groundwater levels may rise in the bedrock aquifer in response to high river and tidal events, and this could cause shallow flooding of the groundwater table at the Site. It is noted that groundwater flooding may occur in response to prolonged high river or tidal levels even if overtopping of flood defences does not occur.

The presence of an underlying Secondary (A) Aquifer bedrock could indicate that there is good drainage at the Site and therefore a low groundwater table may be possible.

There is one relevant borehole (ref: SS79NW80) in the vicinity of the Site, approximately 50 m to the west which recorded groundwater levels at 2.31 m below ground level. The borehole is at an elevation of 7.15 mAOD compared to general ground elevations of 6.34 and 6.98 mAOD, therefore there may be potential for relatively shallow groundwater levels beneath the Site. However, as this is the only relevant borehole, it does not give an accurate indication of potential groundwater levels at the Site.

According to the SFCA, groundwater flooding is not well documented in the area and there is very little information available (NPT County Borough Council, 2014).

On the basis of the site-specific assessment the groundwater flood risk is considered to be Negligible.

Guidance

Negligible Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels. A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment. Sea level rises of between 0.4m and 1m are predicted by 2100, leading to a rise in average groundwater levels in the adjacent coastal aquifer systems, and potential increases in water levels in the associated drainage systems. The 'backing up' of groundwater levels from both coast and tidal estuary locations may extend a significant distance inland and affect infrastructure previously constructed above average groundwater levels.

The impact of climate change on groundwater levels beneath the Site is linked to the predicted risk in both peak river levels and sea levels.

Based on the available evidence the resulting increase to groundwater flood risk is not considered significant.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Sewer flooding

The SFCA does not state that the area surrounding the Site is at risk from sewer flooding and does not hold records of past sewer flooding incidences in the area (NPT County Borough Council, 2014).

Guidance

Properties classified as “at risk” are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

Culverts are normally covered channels or pipes that are used to continue a watercourse or drainage path under an artificial obstruction. Culverts range in size and capacity and require appropriate maintenance to function. Screens may be installed across openings to prevent entry and reduce the risk of blockage inside the culvert. However, they can cause flooding when they are poorly maintained or trap large amounts of debris in times of high flow.

Culverts have been identified within 500 m of the Site, as follows:

- 295 m south;
- 215 m west;

These culverts are a significant distance from the Site and are unlikely to present a flood risk to the Site in the event of a blockage.

The SFCA has not identified any historic drainage issues within the Site area (NPT County Borough Council, 2014).

Reservoir flooding

According to the NRW's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (Figure 17) (NRW, 2021).

Figure 16. NRW Risk of Reservoir Flooding (NRW, 2022)



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Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m³ of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (EA, 2022).

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water

supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier (Dwr Cymru Welsh Water).

Canal failure

According to Ordnance Survey (OS) mapping, the Tennant Canal is approximately 90 m to the south of the Site. The Canal is located along a flow route and acts as a flood pathway, conveying water from the River to the Site. If surface water enters the canal, the level of water would reach a point where it could exceed control structures and overtopping may result.

However, in terms of the canal as a potential source of flooding, where the river is not flooding, the likelihood of the canal overtopping or breaching is considered minimal, due to the rigorous management and maintenance regimes normally applied to the UK Canal network. Furthermore, according to the SFRA (2014), historic flooding is not reported to have occurred historically from the canal.

5. Flood risk from the development



Floodplain storage

The proposed development on the Site is likely to increase the built footprint and also raise ground levels on the Site. However, as the development is located within Flood Zone C2 the raising of ground levels is unlikely to impact on maximum levels, so there is no requirement to provide additional floodplain storage or compensatory flood storage, as the floodplain is undefended (CIRIA C624, 2004).

Drainage and run-off

The proposed development involves an increase in impermeable surfaces at the Site. An estimation of run-off is therefore required to permit effective site water management and prevent any increase in flood risk to off-site receptors from the Site.

Using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016), the potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated. As a minimum, proposals should be assessed against the central allowance to inform design levels. The Welsh Government's Flood Consequences Assessments: Climate change allowances guidance (September 2021) and Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales (August 2022) recommends the impacts of climate change are incorporated into the proposed development and associated Flood Consequences Assessment for the Site. As the proposed development is for commercial purposes, the lifespan of the development and requirements for climate change should allow up to the 2080s scenario.

Table 5: Peak rainfall allowances for all of Wales

Applies across all of Wales	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper End Estimate	10%	20%	40%
Change factor/Central Estimate	5%	10%	20%

A method of investigating the run-off due to the proposed development can be calculated by multiplying the run-off per square metre by the impermeable area within the proposed development plan.

It is recommended that attenuation of run-off is undertaken on site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision

of storage within a sustainable drainage system (SuDS). Recommendations of potential SuDS options are presented in the table below, subject to further investigation:

Table 5. SuDS features which may be feasible for the Site

Option	Description
Rainwater harvesting	Rain water harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.
Green roof	Having part/all of the roof as a green roof covered in vegetation can intercept and store a proportion of the rainfall to result in an overall reduction in the amount of surface water run-off generated from a building structure. They comprise a substrate (growth medium) layer which can be seeded with specially selected plants suitable for the local climatic conditions. Beneath the growth medium is a geotextile filter layer which filters out the substrate from entering the aggregate/geo-composite drainage layer below. At the very bottom of the green roofing, a waterproof membrane protects the roof structure below.
Permeable paving	Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.

It is assumed that any changes to the existing drainage system will be undertaken in accordance with best practice and that care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site. Based on the Very Low surface water flood risk in the vicinity interference with overland flow paths is considered unlikely.

6. Suitability of the proposed development



The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies TAN15 (2004) and PPW (2021) are achieved through application of the Justification Test and by assessing Flood Consequences. The key requirements of these are outlined below:

Guidance

Justification Test: New developments should be directed away from Zone C and towards suitable land in Zone A, otherwise Zone B, where river or coastal flooding will be less of an issue. In Zone C the tests outlined in sections 6 and 7 of TAN15 will be applied, recognizing, however, that highly vulnerable development and Emergency Services in Zone C2 should not be permitted. All other new development should only be permitted within Zones C1 and C2 if determined by the planning authority to be justified in that location.

Assessing Flood Consequences: If a development proposal in Zone C1, or in C2 and if it is defined as being of low vulnerability, it would meet the test outlines in section 6, however it should be noted that those developments would be more likely to flood and appropriate mitigation would need to be planned accordingly. This section applies to Zone C, and those parts of Zone B where flooding has been identified as a material consideration to allow for localised problems.

Assessing whether a development should proceed or not will depend upon whether the consequences of flooding of that development can be managed and reduced to a level which is acceptable for the nature/type of proposed development, including its effects on existing development.

Suitability of the proposed development, and whether a Justification Test is required, is based on the Development Advice Map Zone the Site is located in and the flood risk vulnerability classification of the development proposals.

As the area of the Site proposed for development is located within DAM Zone C2, and the proposed development is defined as Less Vulnerable, according to Table 9 (Summary of Policy Requirements) in TAN 15 (2004) and included in Table 7 below; "Applications for less vulnerable development can only proceed subject to justification in accordance with section 6 of TAN 15 and acceptability of consequences in accordance with section 7 and Appendix 1 of TAN 15."

Therefore, it is recommended that a Justification Test (Section 6 of TAN15) and Assessment of Flood Consequences (Section 7 and Appendix 1 TAN15) should be undertaken at the Site

to establish whether the Site will pass the acceptability criteria for that of 'Less Vulnerable' development in Zone C2.

Table 4: Flood risk vulnerability and flood zone compatibility (taken from TAN15, 2004)

DAM Zone	Development Type	Planning Requirements	Acceptability Criteria	Development Advice
A	Emergency Services, highly vulnerable development, less vulnerable development, other	- Justification test not applicable - Refer to surface water requirements	No increase in flooding elsewhere	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere
B	Emergency services & Highly vulnerable development	- If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further - Refer to surface water requirements	- Acceptable consequences for nature of use - Occupiers aware of flood risk - Escape/Evacuation routes present - Effective flood warning provided - Flood emergency plans and procedures - Flood resistant design - No increase in flooding elsewhere	Generally suitable for most forms of development. Assessments where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.
	Less vulnerable development		- Occupiers aware of flood risk - No increase in flooding elsewhere	
	Other	Refer to surface water requirements	No increase in flooding elsewhere	
C1	Emergency services, highly vulnerable development, less vulnerable development	- Application of justification test including acceptability of consequences - Refer to surface water requirements	- Acceptable consequences for nature of use - Flood defences adequate - Agreement for construction and maintenance costs secured - Occupiers aware of flood risk	Plan allocations and applications for all development can only proceed subject to justification in accordance to section 6 of TAN 15 and acceptability of

			• Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • Flood resistant design • No increase in flooding elsewhere	consequences in accordance to section 7 and Appendix 1 of TAN 15
	Other	• Application of acceptability of consequences (TAN 15 section 7 and Appendix 1) • Refer to surface water requirements	• Acceptable consequences for nature of use • Occupiers aware of flood risk • Desirable if effective flood warning and evacuation routes/procedure provided depending on nature of proposal • No increase in flooding elsewhere	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1 of TAN 15
C2	Emergency services, highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable developments are not considered to be acceptable. Plan allocations should not be made for such developments and planning applications not proposed		
	Less vulnerable development	• Application of justification test (section 6 of TAN 15), including acceptability of consequences (section 7 and Appendix 1 of TAN 15) • Refer to surface water requirements	• Acceptable consequences for nature of use • Flood defences adequate • Agreement for construction and maintenance costs secured • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures	Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 of TAN 15 and acceptability of consequences in accordance with section 7 and Appendix 1 of TAN 15

	Other	• Application of acceptability of consequences (section 7 and Appendix 1 of TAN 15) • Refer to surface water requirements	• Flood resistant design • No increase in flooding elsewhere • Acceptable consequences for nature of use • Occupiers aware of flood risk • Effective flood warning provided • No increase in flooding elsewhere	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1 of TAN 15.
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According to the Summary of what TAN15 requires for less vulnerable development to be considered acceptable, the following applies (including GeoSmart comments below):

Justification Criteria:

1) Should only be permitted within zones C1 and C2 if determined by the planning authority to be justified in that location. Development, including transport infrastructure, will only be justified if it can be demonstrated that 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 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; **The proposed development is located within Zone C2. According to the Pre-App for the Site, there are a number of retail policies within the development plan that both identify and protect existing retail centres, from our town centres to district and local centres. A3 uses are supporting ancillary uses to our centres, and emerging guidance from Welsh Government, indicates that town centres are evolving, and must evolve to include a wider range of use to attract footfall and retain expenditure for longer periods. As such restaurants, cafes, but also leisure and community uses are encouraged.**

AND

2) It concurs with the aims of PPW and meets the definition of previously developed land (PPW fig 2.1); **The Site is developed land in a commercial and industrial setting and development plans are to revive and expand the operational capacity of the Site.**

AND

3) The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable. **This FCA confirms the potential consequences of a flood event can be reduced through flood mitigation measures up to a flood event which has a 1 in 1000 chance of occurring.**

Acceptability Criteria (has to meet all):

Q. Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a 1 in 1000 chance of occurring in any year).

A. As the Site is located in Flood Zone C2, it is not in an area benefitting from significant defences. However, there are flood defences on the River Neath and Tennant Canal (JBA Consulting, 2017), which are understood to be in Fair Condition and the resultant flooding risks at the Site are low to medium.

Q. The cost of future maintenance for all new/approved flood mitigation measures, including defences must be accepted by the developer and agreed with the Environment Agency (now Natural Resources Wales).

A. The cost of flood defences is not relevant in this instance, as flood defences are not proposed. Recommended FFL's and flood resilience measures would be maintained as part of the building structure and would be ongoing by the owner as part of the development.

Q. The developer must ensure that future occupiers of the development are aware of the flooding risks and consequences.

A. It is assumed that the developer will make the future users of the Site aware of flood risks and consequences.

Q. Effective flood warnings are provided at the site.

A. Recommendations within this report are for all future occupiers to sign up to the NRW's flood warning service.

Q. Escape/evacuation routes are shown by the developer to be operational under all conditions.

A. Escape and evacuation routes are discussed within section 7 of this report. Evacuation should be undertaken prior to flooding at the Site and routes of safe access and egress would be available at all times.

Q. Flood emergency plans and procedures produced by the developer must be in place.

A. Flood emergency plans are recommended as part of this report and can be conditioned as part of the approval.

Q. The development is designed by the developer to allow the occupier the facility for rapid movement of goods/possessions to areas away from floodwaters.

A. The FFL's of the development are recommended to be raised 0.6 m above the maximum of either the 1 in 200 year (2116) tidal level and 1 in 100 year + 25% CC fluvial level (whichever is greatest). Therefore goods/possessions would already be raised.

Q. The development is designed to minimise structural damage during a flooding event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of the flood.

A. Flood resilience measures are recommended as part of this report, to ensure the building(s) are flood-proofed for the maximum flood event.

Q. No flooding elsewhere.

A. The proposed development would increase the built footprint at the Site and potentially raise ground levels (subject to development proposals). However, the provision of

floodplain compensatory storage (as suggested within section 5 of this report) is not required within an undefended C2 floodplain as this would not affect maximum flood levels.

Q. Developer is required to demonstrate that the site is designed to be flood free for the lifetime (A1.5) of development for either a 1 in 100 chance (fluvial) flood event, or a 1 in 200 chance (tidal) flood event including an allowance for climate change (depending on the type of flood risk present) in accordance with table A1.14.

A. This is only possible through ground level raising, the existing development would be located within the 1 in 200 year (2116) tidal extent, but it is recommended that the proposed built development has minimum FFLs at least 0.6 m above the 1 in 200 year (2116) tidal level.

Q. In respect of the residual risk to the development it should be designed so that over its lifetime (A1.5) in an extreme (1 in 1000 chance) event there would be less than 600mm of water on access roads and within properties, the velocity of any water flowing across the development would be less than 0.3 m/second on access roads and 0.15m/second in properties, and the maximum rate of rise of floodwater would not exceed 0.1m/hour (see table A1.15).

A. During a 1 in 1000 year (2016) tidal event small areas in the south of the Site would flood but the majority of the Site would not, and during a 1 in 100 year + 25% CC fluvial event up to 0.81 m of flooding could be experienced on-Site. However, during the 1 in 1000 year (2116) tidal event maximum flood depths at the Site are in excess of 1 m when not accounting for proposed FFLs. In this case, safe refuge and evacuation can be provided. In order to meet this criteria though, it would require raising of ground levels to 7.01 mAOD.

Natural Resources Wales Flood Risk Standing Advice for Sites located in Flood Zones 2 or 3

For all relevant vulnerable developments (i.e. more vulnerable, less vulnerable and water compatible), advice on the points should be followed:

- Surface water management;
- Access and evacuation; and
- Floor levels.

Surface water management

Plans for the management of surface water need to meet the requirements set out in either the local authority's:

- Surface water management plan where available; OR
- Strategic flood consequence assessment.

They also need to meet the requirements of the approved building regulations Part H: drainage and water disposal. Read section H3 rainwater drainage.

Planning permission is required to use a material that can't absorb water (e.g. impermeable concrete) in a front garden larger than 5 square metres.

Access and evacuation

Details of emergency escape plans should be provided for any parts of a building that are below the estimated flood level:

Plans should show:

- Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- Basement rooms have clear internal access to an upper level, e.g. a staircase; and
- Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

Floor levels

The following should be provided:

- Average ground level of the building; and
- Finished floor level of the lowest habitable room in the building.

Ground floor levels should be a minimum of whichever is higher of:

- 300 millimetres (mm) above the general ground level of the site; OR
- At least 600 mm above the estimated river or sea flood level.

Local policy and guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Neath Port Talbot County Borough Council Strategic Flood Consequence Assessment (NPT County Borough Council, 2014):

- According to the SFCA, Port Talbot has the potential to be affected by fluvial and tidal flooding. However, the SFCA does not provide any information on historic flooding incidences.

Neath Port Talbot Local Flood Risk Management Strategy (Neath Port Talbot County Borough Council, 2013):

- According to the Local FRMS, there are five main sources of flooding in the Neath Port Talbot area, from surface water; groundwater; sewers; canals and ordinary watercourses, and the interaction with main rivers and the sea.
- Under the Flood Risk Regulations 2009, Neath Port Talbot CBC are required: to identify and assess the risk of flooding in the County Borough; to prepare flood hazard and flood risk maps; to prepare flood risk management plans for each flood risk area, and to ensure these are all regularly updated to take into account climate change. The following table sets out the required timetable for the respective deliveries. The first two elements of work, highlighted in red, are covered by the Preliminary Flood Risk Report already prepared by Neath Port Talbot CBC.

- The Flood and Water Management Act (2010) was approved in April 2010 and provides legislation for the management act of risks associated with flooding and coastal erosion. The Act reinforces the need to manage flooding holistically and in a sustainable manner. It places a number of new roles and responsibilities on Neath Port Talbot County Borough Council which is designated a 'LLFA'. The preparation of the Local Flood Risk Management Strategy is just one of the duties placed upon the County Borough Council.

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPPF, 2021).

7. Resilience and mitigation



Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) and River (fluvial) flood mitigation measures

The Site is located within an area which is affected by tidal and fluvial flooding. Modelled data for tidal flooding was used to determine the mitigation measures for the development as they produced deeper flood depths than fluvial flooding. The following table confirms the flood depths associated with the area proposed for development.

Table 6. Undefended tidal flood levels compared to on-Site ground levels

Ground levels at the Site (mAOD)	Modelled Flood Levels (mAOD)			
	0.5% AEP (1 in 200 year) scenario flood level (mAOD)		0.1% AEP (1 in 1000 year) scenario flood level (mAOD)	
	2016	2116	2016	2116
6.34 to 6.98	6.43	7.35	6.66	7.61
Flood depths (m)	Up to 0.09	Up to 1.01	Up to 0.32	Up to 1.27
FFL of 6.69*	No Flooding	Up to 0.66	No Flooding	Up to 0.92

*These FFLs are for the proposed industrial unit and do not account for the proposed retail development in the north of the Site, where ground elevations are slightly lower.

Raising minimum floor levels

Paragraphs A1.14 and A1.15 of the acceptability criteria for flooding consequences outlined within TAN15 (2004) (Appendix B) state that:

- A1.14 – the threshold frequency of flooding for commercial and industrial developments is the fluvial 1% AEP (1 in 100 year) and the tidal 0.5% AEP (1 in 200 year) scenarios;
- A1.15 – the maximum depth of flooding considered tolerable conditions for commercial developments is 600 mm and for industrial developments is 1000 mm.

Table 7. Recommended Minimum Finished Floor Level Required

Ground Level (mAOD)	Flood Level (mAOD)	Freeboard above Flood Level (m)	Recommended FFL (mAOD)
6.34 to 6.98	7.35*	0.3	7.65

*Tidal 1 in 200 year (2116) modelled flood level.

According to the Site plans, the proposed FFLs of the main industrial unit are 6.69 mAOD. These would not provide adequate protection in the event of flooding. The recommended FFLs for the development are 7.65 mAOD.

As it is likely not feasible to raise the FFLs to the recommended level, alternative mitigation measures have been recommended below.

Raising ground levels

In order to satisfy the requirements of TAN15 A1.15 the maximum depths of flooding that are acceptable in a 1 in 1000 year plus climate change event are 600 mm (for commercial/retail). The maximum flood level is 7.61 mAOD and therefore ground levels in access and parking areas should be set to at least 7.01 mAOD.

The A1.15 requirements are slightly at odds with the A1.14 because this requires FFL's of the buildings to be raised to 7.65 mAOD, which may affect access to the buildings / require ramped access.

Alternative Mitigation (where finished floor levels cannot be raised)

Where it is not possible to raise the minimum finished floor levels to the recommended elevation, it may be appropriate to adopt a water exclusion strategy for flood depths up to 0.3 m, as the proposals are for commercial uses. A water exclusion strategy, using avoidance and resistance measures, is appropriate where floods are expected to last for short durations. Potential water exclusion strategies include:

- Passive flood door systems;
- Temporary flood barriers;
- Air brick covers (manual or automatic closing);
- Non-return flap valves on sewer outfalls.
- Construction of local bunds;
- Landscaping to divert water away from the property;
- Sustainable Drainage Systems (SuDS) to store/intercept flood water;
- Boundary walls/fencing;

Avoidance and resistance measures are unlikely to completely prevent floodwater entering a property, particularly during longer duration flood events. Therefore, it is recommended that the following flood resilience measures are also considered.

- Flood resilient materials and designs:
 - Use of low permeability building materials up to 0.3 m such as engineering bricks (Classes A and B) or facing bricks;
 - Hard flooring and flood resilient metal staircases;
 - The use of internal lime plaster/render or where plasterboards are used these should be fitted horizontally instead of vertically and/or using moisture resistant plasterboard at lower levels;
 - Water, electricity and gas meters and electrical sockets should be located above the predicted flood level;
 - Communications wiring: wiring for telephone, TV, Internet and other services should be protected by suitable insulation in the distribution ducts to prevent damage.

Where flood depths are expected to exceed 0.6 m within buildings, a water entry strategy should be adopted to preserve building integrity and to promote flood resilience rather than resistance (which is more difficult to achieve for significant flood depths). A structural engineer should be consulted to confirm this would be a suitable strategy for the proposed development, to ensure flood flows would not impact the structural integrity of the building. Potential strategies include:

- Ground floors designed to permit water passage at high flood depths;
- Hard flooring and flood resilient metal staircases;
- Heating systems, electrical sockets and utility meters should be raised above the predicted flood level where possible; and
- Sump and pump.

Where flood depths are expected to be between 0.3-0.6 m both water exclusion and water entry strategies should be adopted depending on a structural assessment of the building.

If these mitigation measures are implemented this could reduce the flood risk to the development from Low to Medium to Low.

Surface water (pluvial) flood mitigation measures

A Very Low to Low risk of surface water flooding has been identified at the Site.

The mitigation measures recommended for tidal and fluvial flooding are likely to be sufficient to reduce the risk of surface water flooding to the Site.

Groundwater flood mitigation measures

As the Site is not identified as being at risk of groundwater flooding, mitigation measures are not required.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

At its closest point, the Tennant Canal is located approximately 90 m to the south of the Site. The Canal is located along a flow route and acts as a flood pathway, conveying water from the River to the Site. If surface water enters the canal, the level of water would reach a point where it could exceed control structures and overtopping may result.

In the event of overtopping, the mitigation measures outlined for fluvial and tidal flooding should be sufficient to reduce the risk from the Tennant Canal.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

The exception to this is the flood defences for the Sea north and east of the Site, which will be maintained by NRW. Residual risk should be managed at the Site, such as by using a Flood Warning and Evacuation Plan (FWEP).

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

Emergency evacuation - safe access / egress and safe refuge

Emergency evacuation to land outside of the floodplain should be provided if feasible. Where this is not possible, 'Highly Vulnerable' developments should have internal stair access to an area of safe refuge within the building to a level higher than the maximum likely water level. An area of safe refuge should be sufficient in size for all potential users and be reasonably accessible to the emergency services.

Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The NRW operates a flood warning service in all areas at risk of flooding; this is available on their website: <https://www.gov.uk/check-flood-risk>. The Site is located within an NRW Flood Alerts (ref: Swansea Bay and the Gower Coast; quick dial code: 503015) coverage area so is able to receive alerts (Figure 18). All warnings are also available through the NRW's 24 hour Floodline Service 0345 988 1188.

The NRW aims to issue Flood Warnings 2 hours in advance of a flood event. Flood Warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

Figure 17. NRW Flood Warning Coverage for the local area (NRW, 2022).



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Emergency evacuation

Where possible, a safe access and egress route with a 'Very Low' hazard rating from areas within the floodplain to an area wholly outside the 1 in 100 year flood event including an allowance for climate change should be demonstrated.

Based on the NRW's Flood Zone Map the closest accessible dry evacuation area within tidal Flood Zone 1 is along Llys-y-Coed (c. 195 m north east – direct measurement). It is advised that evacuation from the premises would be the preferred option in a flood event if safe to do so. It is recommended that users of the Site prepare to evacuate as soon as an NRW Flood Warning is issued in order to completely avoid flood waters.

Other relevant information

A Flood Warning and Evacuation Plan (FWEP) is recommended, and Site Management teams and occupants will be signed up to receive NRW's Flood Alerts and Warnings.

Registration to the Natural Resource Wales flood warning scheme can be done by following this link: <https://www.gov.uk/sign-up-for-flood-warnings>.

It is recommended that main communication lines required for contacting the emergency services, electricity sockets/meters, water supply and first aid stations and supplies are not compromised by flood waters. Where possible these should all be raised above the extreme flood level.

8. Summary



Site analysis

Source of Flood Risk	Baseline	After Mitigation
River (fluvial) flooding	Low to Medium	Low
Sea (coastal/tidal) flooding	Low to Medium	Low
Surface water (pluvial) flooding	Very Low to Low	Very Low
Groundwater flooding	Negligible	N/A
Other flood risk factors present	Yes (Canal)	Yes
Is any other further work recommended?	Yes	Yes

N/A = mitigation not required

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 8. Summary of responses to key questions in the report

Key sources of flood risks identified	Rivers, the Sea, Pluvial (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is any further work recommended?	Yes (See Section 7 and executive summary for full details)

9. References and glossary



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Glossary

General terms

BGS	British Geological Survey
NRW	National Resource Wales
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 100 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is $\pm 0.25\text{m}$ for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFCA	Strategic Flood Consequence Assessment. This is a brief flood risk assessment provided by the local council

SuDS

A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

Principal aquifer

These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

Secondary A aquifer

Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Secondary B aquifer

Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Secondary undifferentiated

Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.

Unproductive Strata

These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2022 BlueSky copyright and database rights 2022
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water Features/Reservoir/ Flood Alert & Warning)	Natural Resource Wales copyright and database rights 2022 Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2022) Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2022
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2022 Natural Resource Wale copyright and database rights 2022

10. Appendices

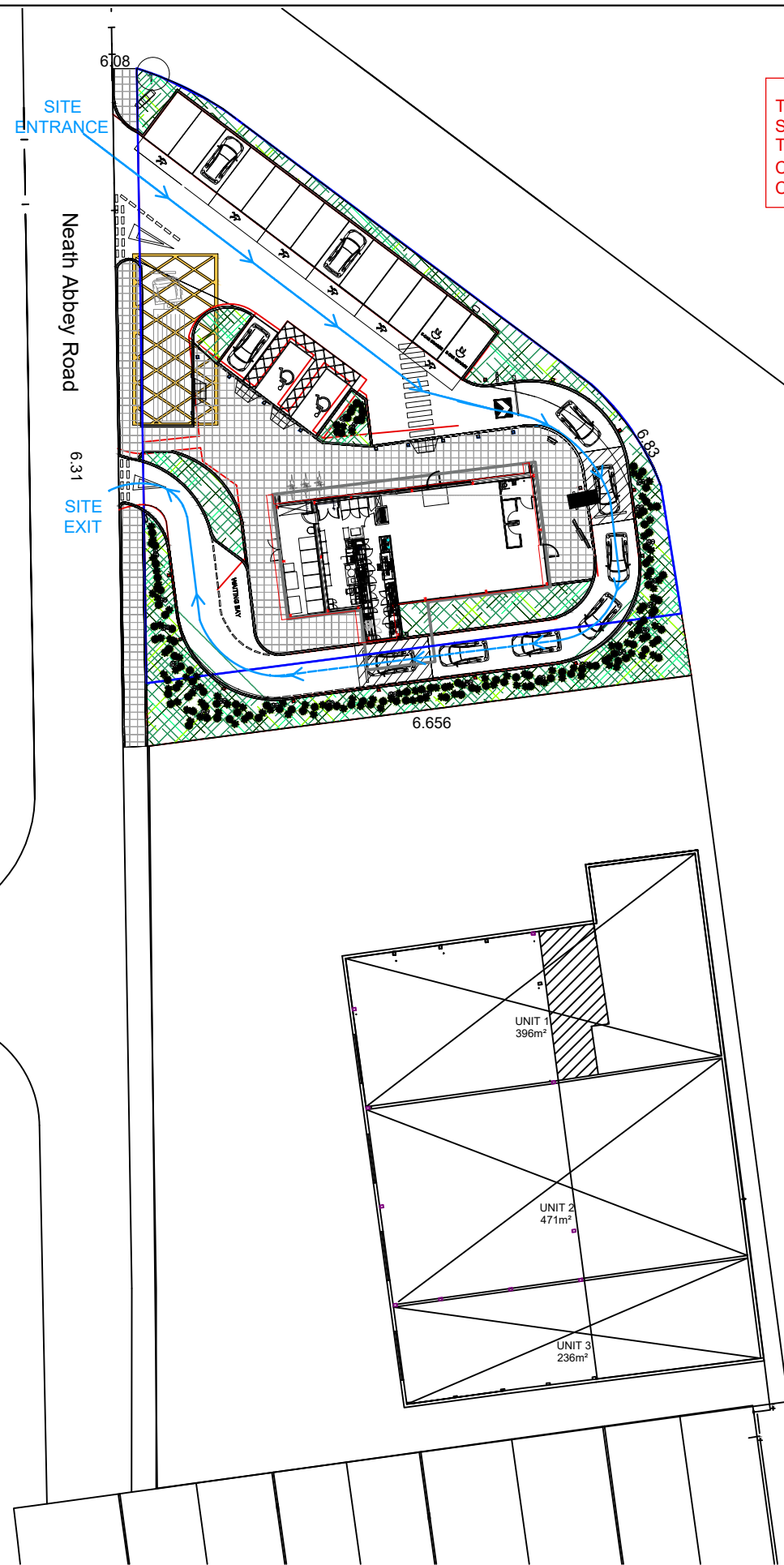


Appendix A



Site plans





THESE PLANS ARE FOR INITIAL FEASIBILITY PURPOSES ONLY AND THEREFORE SUBJECT TO CHANGE BY STARBUCKS UPON RECEIPT OF A FULL DESIGN BRIEF. NO AGREEMENTS OR RIGHTS CAN BE OBTAINED FROM THESE PLANS. BEFORE PROGRESSING, THIS SITE MUST BE APPROVED BY STARBUCKS REAL ESTATE COMMITTEE VIA THE SITE SUBMITTAL APPROVAL PROCESS. FINAL LAYOUT WILL BE DETERMINED ON COMPLETION OF THE SCHEMATIC REVIEW PROCESS.

SITE ENTRANCE MARKING

Speed limit sign at point of entry into the site, to be installed by developer.



Site Demise

DT lane Route

1 PYLON DISK

LICENSEE: MAGIC BEAN

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Note: All dimensions to be checked on site and not to be scaled from drawing.

AMENDMENTS:

Revision Date

PRELIMINARY SCHEMATIC ONLY – NOT INTENDED FOR CONSTRUCTION

BUCKMASTERBATCUP
Architects Ltd.

CLIENT:

Huw Jenkins

PROJECT TITLE:

Site adjoining Neath Abbey Road, Neath

DRAWING TITLE:

Test Fit I

SCALE: 1:500 @ A3

DATE: November 2022

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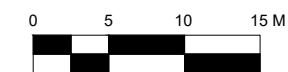
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Paddington Central

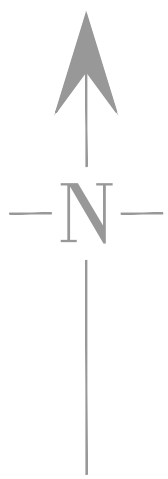
London, W2 6BD

BBA 909.F.12

1 PROPOSED SITE PLAN OVERVIEW
Scale: 1:500



1:500



BUCKMASTERBATCUP
Architects Ltd.

CLIENT:

Huw Jenkins

PROJECT TITLE:

Site adjoining Neath Abbey Road, Neath

DRAWING TITLE:

Topographic Survey

SCALE: 1:250 @ A1

DATE: September 2022

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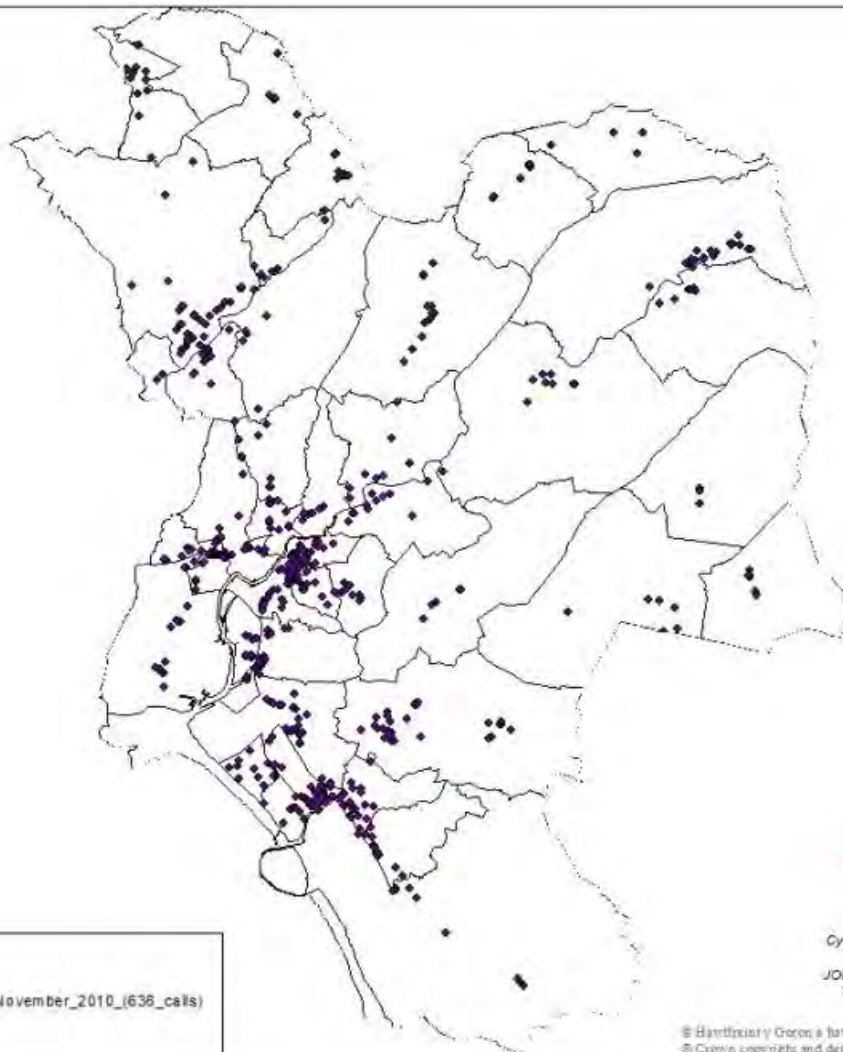
Revision

Date

Appendix B



Local document mapping



Legend

◆ Drainage_calls_between_April_and_November_2010_(636_calls)

NET.NPTCBC_Boundary

Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council / Cynghor Bwrdddeistref Sirol

Drainage and Network Services

Neath Port Talbot County Borough Council
 Cynghor Bwrdddeistref Sirol Castell-nedd Port Talbot
 Environment Directorate

JOHN S FLOWER BSc, CEng, CEnv, FICE, MCIHT
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A1.14 In addition to the above general conditions there are particular flooding consequences which may not be considered acceptable for particular types of development. For instance in view of the traumatic impact of flooding on people's personal lives it is not sensible to allow residential development in areas which flood frequently. Environment Agency advice to planning authorities suggests that development should be designed to be flood free during the 1% fluvial flood (i.e that fluvial flood with a 100 to 1 chance of occurring in any year) and the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event). There is therefore a frequency threshold of flooding below which flooding of development should not be allowed. The following table, which should not be regarded as prescriptive, provides indicative guidance as to what that frequency threshold could be for different types of development described in terms of annual probability of occurrence.

Type of Development	Threshold Frequency (Years)	
	Fluvial	Tidal
Residential	1%	0.5%
Commercial/Retail	1%	0.5%
Industrial	1%	0.5%
Emergency Services	0.1%	0.1%
General Infrastructure	1%	0.5%

A1.15 Beyond the threshold frequency proposed development would be expected to flood under extreme conditions. However even with adequate mitigation measures in place it may still not be sensible to allow particular development to take place. For instance it would not be sensible for developments to be built in areas where the velocity and depth of floodwaters was such that structural damage was possible or that people could be swept away by the flood. Similarly it would not be sensible for single storey residential development to be sited where the depth of flooding would exceed heights of 0.6metres (ie the height of a bed or a cot). The following table, which should not be regarded as prescriptive provides indicative guidance on what is considered tolerable conditions for different types of developments.

Type of development	Maximum depth of flooding (mm)	Maximum rate of rise of floodwaters (m/hr)	Maximum speed of inundation of flood risk area (hrs)	Maximum velocity of floodwaters (metres/sec)
	Property Access			Property Access
Residential (habitable rooms)	600 600	0.1	4	0.15 0.3
Commercial & Retail	600 600	0.3	2	0.15 0.3
Industrial	1000 1000	0.3	2	0.3 0.45
Emergency Services	450 600	0.1	4	0.15 0.3
General Infrastructure	600 600	0.3	2	0.3 0.3

NOTE. The above figures are indicative and reflect conditions in which, given the presence of adequate warnings and preparation, appropriately equipped personnel could undertake emergency activities. However they are not definitive. Each site must therefore be considered individually and a judgement taken in the context of the particular circumstances which could prevail at that site.

Appendix C



Stage discharge graph

Flood level analysis - 25% climate change allowance



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