

FLOOD CONSULT



Flood Consult International Ltd

18 Tirmynydd Road

Three Crosses

Swansea

SA43PD

www.floodconsult.co.uk

3 Neath Abbey Road – Proposed
Redevelopment

Flood Consequence Assessment

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Preface

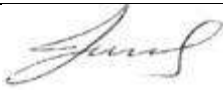
Creator: Flood Consult International Limited
18 Tirmynydd Road
Three Crosses
Swansea
SA4 3PD

Client(s): Atrium Planning Consultants

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Contents

1.0	Introduction.....	5
2.0	Site Information	5
2.1	OS Location Map	5
2.2	Aerial Image	6
3.0	Site Information	6
3.1	Geology.....	6
3.2	Hydrology	6
3.3	Existing Property	7
3.4	Proposed Development.....	7
3.5	Planning Information	7
3.6	Report Scope	7
4.0	Flood Risk Assessment	8
4.1	Planning Information	8
4.2	Modelling Introduction	8
4.3	Fluvial Flooding	8
4.3.1	Flood Zone	8
4.3.2	Fluvial Flood Levels	9
4.3.3	Climate Change	9
4.3.4	Fluvial Flood Defences	10
4.4	Coastal/Tidal Flooding	10
4.5	Surface Water Flooding	11
4.6	Groundwater Flooding.....	11
4.7	Artificial Sources of Flooding.....	11
5.0	Development Flood Risk	12
5.1	Fluvial Flood Risk.....	12
5.2	Surface Water Flood Risk	12
5.3	Impact on Local Flood Risk.....	12
5.3.1	Loss of Floodplain Volume	12
5.3.2	Increased Run-off.....	12
6.0	Flood History	12
7.0	Development Suitability	13
8.0	Recommendations	18
8.1	Flood Resilience Measures	18
8.2	Property Services.....	19
8.3	Flood Evacuation Plan	19
8.4	NRW flood Warnings.....	19

9.0	Conclusion.....	19
10.0	Glossary.....	20

APPENDICES

A	NRW Fluvial Flood Zone Map
B	NRW Fluvial Flood Modelling Information
C	Development Advice Map
D	NRW Tidal Flood Zone Map
E	NRW Tidal Flood Modelling Information
F	NRW Surface Water Flood Zone Map
G	NRW Reservoir Flood map
H	NRW Flood History Map
I	Site LiDAR Topography
J	Existing Site Plans
K	Proposed Site Plans
L	Flood Evacuation Plan

Executive Summary

The proposed redevelopment of an existing four bedroom house into a two bedroom property consisting of two self-contained flats requires a flood consequence assessment in line with TAN15 guidance to assess the vulnerability and impacts of the development from flooding. The development location has been reviewed based on commercially available information with the exposure summarise in the below table:

Source of Flooding	Exposure	Likelihood
Fluvial	High	20% (1 in 5)
Tidal	Very Low	Less than 0.1% (1 in 1000)
Surface Water	Low	Between 1% (1 in 100) and 0.1% (1 in 1000)
Artificial	Very Low	N/A
Groundwater	Low	N/A

The flood exposure of the site is detailed below:

- The site is shown to lie within the high risk flood zone from fluvial flooding equating to greater than 3.3% (1 in 30) chance.
- The Development Advice Map (DAM) shows the property to lie within flood zone C2 which is described as areas of the floodplain not benefitting from significant flood defence infrastructure.
- Flood risk from tidal flooding is deemed to be very low, equating to less than 0.1% (1 in 1000) chance. Site is circa 1.6m above the predicted tidal flood level during the 0.1% (1 in 1000) chance including additions for sea level rise up to the year 2116.
- Surface water flooding is deemed low, between 1% (1 in 100) and 0.1% (1 in 1000) chance. Flood depths of up to 0.25m expected within the site boundary.
- Flooding from artificial sources (reservoirs and canals) has been deemed very low.
- Flooding from groundwater has been deemed low.
- Fluvial flooding is applicable from the 20% (1 in 5) chance based on NRW flood modelling up to 0.07m above the property floor level. Internal flooding rises up to 0.79m during an extreme 0.1% (1 in 1000) flood scenario.
- Climate change guidance states that an addition to the 1% (1 in 100) peak flow of 30% is required for a development with a lifespan of 100 years. In the absence of specific modelling for this addition, the present day 0.2% (1 in 500) flood level of 10.00mAOD has been used as a proxy. Flood depths onsite are expected to be up to 0.65m externally and 0.55m internally based on this flood level.
- The most practical method of flood protection is considered to be the use of resilient materials on the ground floor as raising floor levels is not viable and local fluvial protection is also not viable given the scale of the development.
- A flood evacuation plan has also been created to minimise the risk to life and property damage.

Flood Risk Report

1.0 Introduction

Following instruction given to FCI by Atrium Planning Consultants on behalf of their client, a flood consequence assessment has been completed to form part of the planning application for the redevelopment of a terraced property in Neath. This report will discuss any flood risk that has been identified and give recommendations to mitigate if required.

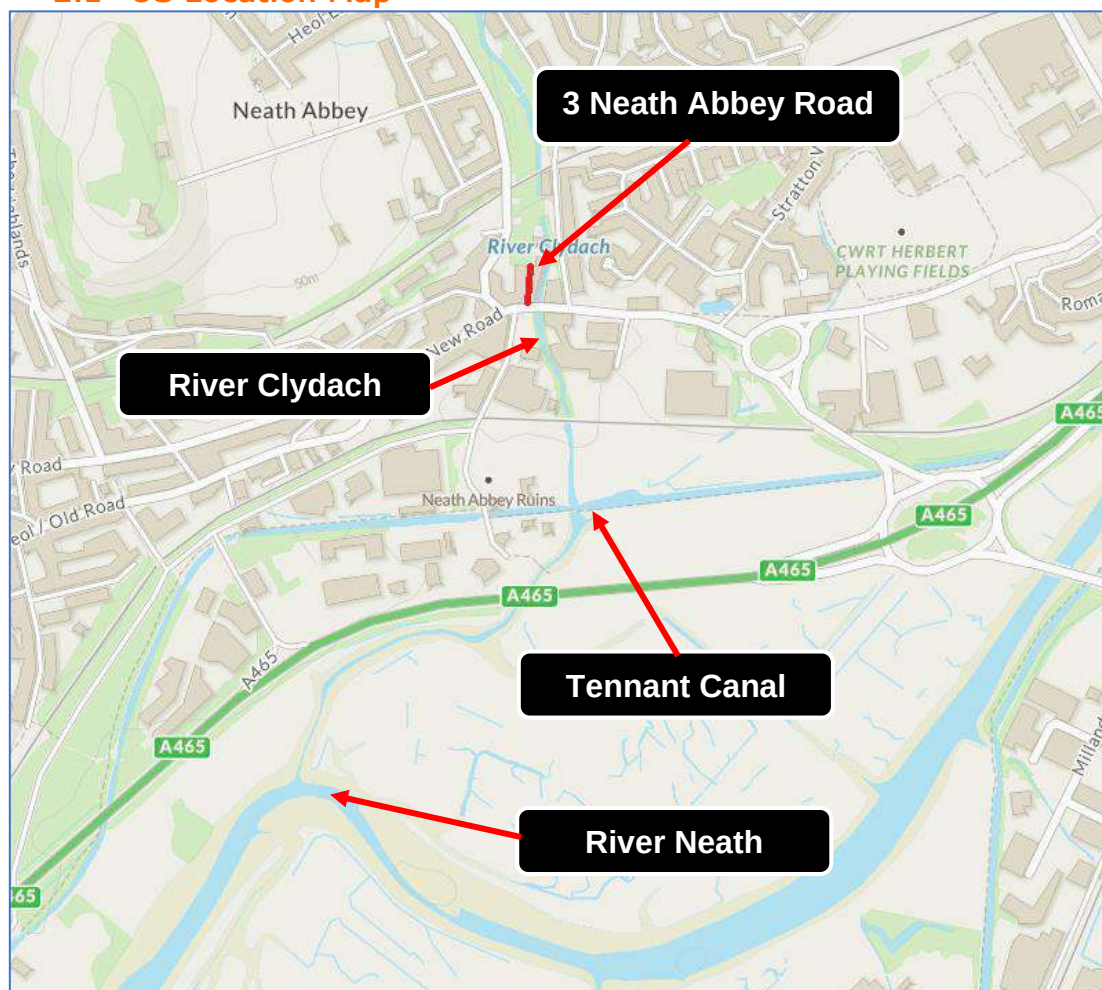
2.0 Site Information

3 Neath Abbey Road is located at grid reference SS 73792 97640 in Neath Abbey to the north west of the town of Neath. Access into the grounds is gained from Neath Abbey Road.

The nearest watercourse to the site is the River Clydach which lies 30m east of the site with the River Neath approximately 820m to the south west at the closest point. The Tennant Canal is also situated 340m south of the property. This can be seen on the following OS and aerial image.

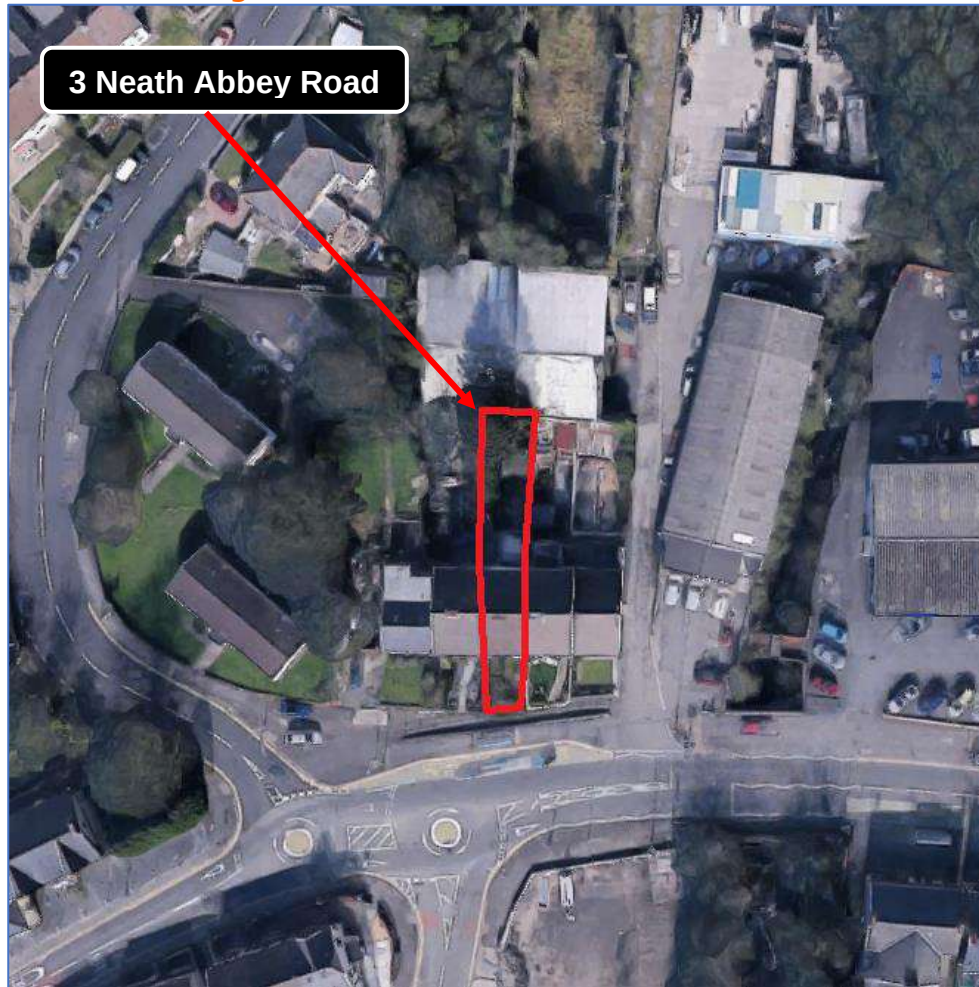
The property is a four bedroom terraced house constructed in the early 1900's from brick with solid concrete floors throughout.

2.1 OS Location Map



(OS Copyright)

2.2 Aerial Image



(Google Copyright)

3.0 Site Information

3.1 Geology

Analysis of the British Geological Survey (BGS) indicates that the superficial site geology is Tidal Flat Deposits - Clay, silt and sand. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

The bedrock geology is defined as Swansea Member - Sandstone. Sedimentary bedrock formed between 309.5 and 308 million years ago during the Carboniferous period.

No formal geotechnical survey has been undertaken at the proposed site at the time of this report.

3.2 Hydrology

The nearest major watercourse to the site is the River Clydach which lies approximately 30m east of the property with the River Neath approximately 820m to the south and the Tennant Canal 340m to the south. The site lies within the Western Wales Drainage Basin within the Tawe to Cadoxton management area.

3.3 Existing Property

The overall site covers approximately 185m² and consists of one terrace house with front and rear garden constructed in the early 1900's. The property is constructed from brick with solid concrete floors throughout and is currently a four-bedroom house.

Based on available LiDAR information obtained from the LLE Geo-Portal for Wales the site topography is generally between 9.35mAOD and 10.50mAOD with ground rising from south to north through the boundary.

A topographical survey is unavailable at the time of this report and therefore the floor level of the property is assumed to 9.45mAOD which is the closest ground level to the main entrance of the property on the southern perimeter.

3.4 Proposed Development

The proposed development of the property is a redevelopment from a four-bedroom house into two self-contained one-bedroom flats.

The redevelopment will not increase the footprint of the existing house or create any new impermeable areas externally.

The proposed new flats will be situated on the first and second floor of the property with the ground floor comprising a kitchen, living room, hallway and stairwell. Existing and proposed plans of the property can be seen in APPENDICES J & K.

3.5 Planning Information

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 (2016) 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 (2016).

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

3.6 Report Scope

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.

A thorough review of a commercially available flood risk report and NRW supplied data indicating potential sources of flood risk to the property from rivers, the sea, 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 Consequences Assessment Stage 1 & 2 (Clarkebond, 2014) 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 (2016).

NRW have provided detailed fluvial and tidal modelling outputs from their Neath Phase 2 Modelling Study completed by JBA Consulting in March 2017 which covers the property boundary. Using available data, the existing and future flood risks to and from the property from all flood sources will be assessed in line with current best practice.

Limitations

It should be noted that the findings presented in this report will be a desktop study using information supplied by third parties. It is assumed 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.

4.0 Flood Risk Assessment

4.1 Planning Information

The following flood risk assessment has been undertaken in line with the TAN15 Technical Guidance on flood risk. Information has been gathered from relevant parties and include the following:

- Flood Zone Map (Natural Resources Wales)
- Flood Zone Classification (Natural Resources Wales)
- Modelled Flood Levels (Natural Resources Wales)
- Historical Flooding Information (Natural Resources Wales)
- LiDAR Topographic Data in metres above Ordnance Datum (mAOD)
- Development proposals provided by the client.

4.2 Modelling Introduction

FCI set out to use the most accurate flood risk modelling information that is available which will cover flood risk from Fluvial (River), Pluvial (Surface Water) and Tidal (Coastal Flooding), Groundwater and Artificial sources (Reservoir, Canal). Below, each potential flood risk will be discussed.

4.3 Fluvial Flooding

4.3.1 Flood Zone

Based on the Natural Resources Wales (NRW) flood zone map, the site is shown to fully within the high risk flood zone which equates to a greater than 3.3% (1 in 30) probability of flooding from fluvial flooding in any given year. The NRW flood zone map can be seen in APPENDIX A.

According to the NRW Development Advice Map (DAM) the property is located within zone C2 which is defined as areas of the floodplain without significant flood defence infrastructure. The NRW DAM can be seen in APPENDIX C.

The DAM zone definitions can be seen in the below table:

Zone Description	Zone
Considered to be a little or no risk of fluvial/tidal flooding	A
Areas known to have 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

4.3.2 Fluvial Flood Levels

Following the searches conducted, the most up to date fluvial modelling information for the site was obtained from NRW. The River Clydach lies 30m east of the site with the River Neath situated approximately 820m to the south for which NRW have supplied modelled flood levels taken from their 1D-2D linked ESTRY-TuFLOW model completed in 2017 by JBA Consulting. The fluvial flood risk to the locality is dominated by the River Clydach and not the River Neath but the influence of the River Neath has been included within the modelling of River Clydach. The table below shows the maximum predicted flood levels within the property boundary.

Return Period	3 Neath Abbey Road Modelled Level (mAOD)
20% (1 in 5)	9.52
5% (1 in 20)	9.64
2% (1 in 50)	9.71
1.3% (1 in 75)	9.81
1% (1 in 100)	9.83
1%CC (1 in 100CC)	9.89
0.5% (1 in 200)	9.89
0.2% (1 in 500)	10.00
0.1% (1 in 1000)	10.24

The above table shows the modelled fluvial flood levels from the 20% (1 in 5) return period up to the 0.1% (1 in 1000) return period.

The topography within the property boundary based on LiDAR data is between 9.35mAOD and 10.50mAOD with the lowest topography on the southern perimeter. The floor level of the property was estimated to be 9.45mAOD which when compared to the predicted flood levels in the above table shows inundation is possible from the 20% (1 in 5) return period up to 0.07m. When considering the 0.1% (1 in 1000) return period the likely depth above the property floor level rises to 0.79m.

Internal flooding up to 0.79m during the 0.1% (1 in 1000) flood scenario is above the maximum tolerable level within TAN15 of 0.6m, however, measures will be put in place to reduce the risk of damage and to life within this report.

4.3.3 Climate Change

In order to account for climate change with regard to development proposal and vulnerability into the future. The table below sets out current guidance with regard to climate change uplifts for rivers located in the Western Wales Catchment.

Catchment	Allowance Category	Total potential	Total potential	Total potential
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		chance anticipated for the '2020's' (2015 to 2039)	chance anticipated for the '2050's' (2040 to 2069)	chance anticipated for the '2080's' (2070 to 2115)
Western Wales	Upper End	25%	40%	75%
	Higher Central	15%	25%	30%
	Central	5%	10%	15%

Government guidance in Wales with regard to climate change uplift states:

'The projected peak river flow change is a range, with the highest estimate equally likely to occur as the lowest estimate. For this reason, it is recommended that the central estimate, or change factor, for the 2080s for the relevant river basin district is used to assess the potential impact of climate change as part of a flood consequence assessment (FCA) and to inform design levels.'

It is assumed that the design life of the development will be 100 years so '2080's' uplift of 30% will be considered.

The modelled flood data for the River Clydach provided by the EA includes a 20% addition for climate change for the 1% (1 in 100) return period which is lower than the 30% increase as set out above. Taking this into account further flood levels have been provided for the 0.5% (1 in 200) chance and 0.2% (1 in 500) chance for the River Clydach for which the 0.5% (1 in 200) flood level is shown to be equal to the 1%CC20% (1 in 100CC20%) flood level of 9.89mAOD. Given that a 20% increase to the peak 1% (1 in 100) flow results in a flood level equal to the 0.5% (1 in 200) flood level at present, in the absence of modelling for a 30% increase to the peak flow, the 0.2% (1 in 500) flood level is considered the most likely representation of a 30% increase to the peak 1% (1 in 100) flow and hence this flood level will be used as a proxy for the 1%CC30% (1 in 100CC30%) scenario. It should be noted that the 0.2% (1 in 500) chance is likely to exceed a 30% increase to the 1% (1 in 100) flow and therefore this is considered a conservative approach.

Consideration should also be given to the upper end estimate for the '2080's' scenario of 75%, however, modelling for this scenario is not currently available. The 0.1% (1 in 1000) flood level of 10.24mAOD is considered the most suitable proxy on which to base the potential future fluvial flood levels and therefore an evaluation of the risk to the property will be made based on this level also.

4.3.4 Fluvial Flood Defences

The NRW mapping does not indicate any significant flood defence infrastructure in the locality which benefits the site location which aligns with the property being placed in flood zone C2 on the DAM.

4.4 Coastal/Tidal Flooding

The River Clydach and River Neath are both tidally influenced in the locality for which NRW have supplied modelled tidal flood levels for the present day (2016) and the year 2116, these can be seen below:

	3 Neath Abbey Road
Return Period	Modelled Level (mAOD)
0.5% (1 in 200) 2016	7.09
0.1% (1 in 1000) 2016	7.09
0.5% (1 in 200) 2116	7.45
0.1% (1 in 1000) 2116	7.63

The extent of flooding during a tidal flood scenario is not shown to escape the banks of the River Clydach in the close vicinity of the property with the above flood levels representing the highest within the channel. The tidal modelled flood extents can be seen in APPENDIX E.

The right bank of the River Clydach (site side) has ground levels of 9.30mAOD as a minimum and hence the predicted tidal flood level during a 0.1% (1 in 1000) scenario for the year 2116 is 1.67m below the river bank. Therefore, flooding purely from tidal sources is not considered a risk to the property.

Whereas the River Clydach is tidally influenced at the site location, the dominant mechanism of flooding at present and into the future is considered to be fluvial and hence this report will base its findings on the fluvial flood risk identifies in section 4.3 of this report.

4.5 Surface Water Flooding

Based on the NRW indicative flood map for surface water, the site is deemed at low risk of flooding from this source equating to between 1% (1 in 100) and 0.1% (1 in 1000) chance. The EA surface water flood map can be seen in APPENDIX F.

The NRW mapping for surface water and small watercourses has been obtained and predicted flood depths extracted. During the low chance scenario the maximum predicted flood depth within the site boundary is 0.25m with the majority of the site shown to be free from flooding.

Flood depths of up to 0.25m could potentially result in inundation to the property to shallow depths, less than 0.15m.

Although there is a risk of surface water flooding, it should be noted that the predicted flood risk from this source is greatly outweighed by the fluvial flood risk identified above, therefore, no further investigation into the surface water flood risk was undertaken.

4.6 Groundwater Flooding

Based on information within the Neath Port Talbot Strategic Flood Consequence Assessment (SFCA) 2014, groundwater flooding is not considered to be a significant source of flooding in the area with no specific records of flooding from this source historically. Given the sites close proximity to the River Clydach, rising groundwater is likely to be hydraulically connected to fluvial flooding.

Although the risk of flooding from this cannot be completely discounted, the proposed development will not include any below ground structures and hence rising ground water is not expected to impact the property.

4.7 Artificial Sources of Flooding

Based on the NRW reservoir flood maps the extent of flooding from an uncontrolled release of water from reservoirs further upstream in the River Neath catchment does not affect the site boundary, therefore the flood risk associated with reservoir breach is considered negligible.

There is a canalised watercourse, the Tennant Canal, located 340m to the south of the property, however, this is located at a lower elevation than the property with ground levels falling further to the south (away from the property) and hence the risk of flooding from canal breach is considered to be negligible.

5.0 Development Flood Risk

Taking into account the information gathered within this report, the site is considered at greatest risk from fluvial flooding with a 1%CC30% (1 in 100CC30%) flood level taken to be 10.00mAOD (the present day 0.2% (1 in 500) flood level).

The below section will therefore discuss the potential flood risk in and around the proposed development location from fluvial flooding as well as surface water and also discuss how the development affects flood risk elsewhere.

5.1 Fluvial Flood Risk

The fluvial flood mechanism affecting the site boundary is as a result of overtopping of the River Clydach from the east with a maximum flood level of 10.00mAOD expected within the site boundary from the 1%+30%CC (1 in 100 + 30%CC) return period.

Based on the ground levels external to the property of circa 9.40mAOD, flood depths of up to 0.60m can be expected in this area.

The floor level of the property has been estimated to be 9.45mAOD which when compared to the predicted flood level of 10.00mAOD results in an internal flood depth of 0.55m.

When considering the upper end climate change allowance of a 75% increase to the peak flow during a 1% (1 in 100) flood scenario (taken as the present day 0.1% (1 in 1000) flood level), flood depths externally would increase up to 0.84m with depths of 0.79m above the property floor level.

5.2 Surface Water Flood Risk

Surface water flooding is deemed to be low at the property location with depths of up to 0.25m expected onsite. In the absence of site specific ground and threshold levels depths around the property and internally cannot be confirmed but internal flooding is likely to be shallow, below 0.15m.

5.3 Impact on Local Flood Risk

5.3.1 Loss of Floodplain Volume

The proposed development is the redevelopment of an existing property with no increase to the building footprint. Therefore, the flood risk locally will not be increased as a result of the development.

5.3.2 Increased Run-off

The proposed development will not create an additional impermeable areas from the existing and therefore surface water run-off will not be increased as a result of the development.

6.0 Flood History

Through the background research conducted as well as data received from NRW, no records were found to show that the site or immediate locality had suffered any degree of flooding from any source historically. Flood records however are not exhaustive and therefore this does not mean that flooding has not occurred in the area just that no instances have been recorded.

7.0 Development Suitability

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

Planning Policy

The aims of the national planning policies TAN15 (2004) and PPW (2012 and 2016) are achieved through application of the Justification Test and by assessing Flood Consequences. The key requirements of these are outlined below:

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 Highly Vulnerable, according to Table 9 (Summary of Policy Requirements) in TAN 15 (2004).

It should be noted that on the provision the mitigation measures detailed within the following section and planning application are implemented, flood resilience materials and a flood evacuation plan, the flood risk and overall risk to life will be minimal.

A Justification Test (Section 6 of TAN15) and Assessment of Flood Consequences (Section 7 and Appendix 1 TAN15) will be included with the report as set out in Table 9 of TAN15 which can be seen below:

Zone	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 and Appendix 1)
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	• 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 • 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 • 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.
	Highly vulnerable development		• Acceptable consequences for nature of use • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • No increase in flooding elsewhere	
	Less vulnerable development		• No increase in flooding elsewhere	
	Other	• Refer to surface water requirements	• Occupiers aware of flood risk • No increase in flooding elsewhere	
C1	Emergency services Highly vulnerable development Less vulnerable development	• Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) • 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 and applications for all development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.

			• Flood resistant design • No increase in flooding elsewhere	
	other	• Application of acceptability of consequences (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.
C2	Emergency services Highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable development are not considered to be acceptable. Plan allocations should not be made for such development and planning applications not proposed.		
	Less vulnerable development	• Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) • 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 and acceptability of consequences in accordance with section 7 and Appendix 1.
	Other	• Application of acceptability of consequences (section 7 and appendix 1) • 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

As per the guidance in TAN15, for highly vulnerable development in zone C2 the justification test is required to be passed of which the following applies (FCI comments in red):

Justification Test

1) Should be located only in an area of flood risk which is developed and served by significant infrastructure, including flood defences (Zone C1 of the DAM); **The proposed development is located within Zone C2, however the flood risk is considered to be manageable by means of flood resilience as all habitable accommodation is located on the first floor and above, above predicted flood levels. The resilience measures put forward in this report should be included within development plans**

AND

2) Its location is necessary to assist a local authority regeneration initiative or Strategy, or contribute to key employment objectives, necessary to sustain an existing settlement or region; **The property is an existing property located within a residential area and therefore contributes to local regeneration.**

AND

3) The site meets the definition of previously developed land (i.e. it is not a Greenfield site) and concurs with the aims of Planning Policy Wales (i.e. the presumption in favour of sustainable development). **The property is existing with no change of footprint planned and therefore is previously developed.**

AND

4) A Flood Consequence Assessment has been produced to demonstrate that the potential consequences of a flood event up to the extreme flood event (1 in 1000 chance of occurring in any year) have been considered and meet the criteria below in order to be considered acceptable. **This FCA has evaluated the flood risk to the property from a range of potential flood mechanisms with recommendation put forward to minimise the risk of damage in the event of flooding.**

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).

The site location does not benefit from flood defences with recommendations within this report based around resilience in the event of flooding.

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).

Further local flood defences are not proposed and therefore not relevant. Recommended flood resilience measures would be maintained as part of the building structure and ongoing by the owner.

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

The property owner has commissioned this FCA and therefore should make any third party aware of the flood risk.

Q. Effective flood warnings are provided at the site

One of the recommendations made within this report is for the client to sign up to the NRW flood alert service as warnings are not given.

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

Evacuation of the property in the event of flooding is covered within the flood evacuation plan (separate to this report). The property should be evacuated before the onset of flooding and the routes of egress should be maintained.

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

As part of this FCA, a site specific flood evacuation plan has been included as a separate document.

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.

Non-fixed vulnerable items (TV's, computers, routers etc.) should be located on stands or tables or have the facility to relocate to tables/worktops in the event of a flood alert. No sleeping accommodation is proposed on the ground floor and hence would not suffer damage.

Q. 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.

Flood resilience measures will be made within this report so that permanent damage is avoided where possible and property re-occupation can take place as efficiently as possible.

Q. No flooding elsewhere.

The existing property footprint is not changing during the redevelopment process and floor levels will remain the same. Therefore, flood risk will not be increased.

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.

The development is a redevelopment of an existing property where the floor level would be impractical to raise retrospectively and would also contribute to displacement of flood water locally. Local flood defence measures to protect the property are also deemed un-economically viable given the nature of the proposed development.

Therefore, the ground floor of the development, which will not contain any sleeping accommodation, is to be designed with flood resilience measures to reduce the risk of flood damage to the building fabric and vulnerable items within.

It is also noted that the existing property comprises a four-bedroom house whereas the proposed redevelopment changes this to a two-bedroom house (self-contained flats). Therefore, the number of occupants resident within the property will reduce as part of the proposed development.

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).

As mentioned, the floor levels of the property will not be raised retrospectively as this is impractical and would result in displacement of flood water locally. During the 0.1% (1 in 1000) chance flood depths above the floor level are expected to be up to 0.79m which is above the maximum tolerable level within TAN15.

However, this is the case with the existing property as well as the proposed redevelopment with the proposals set to reduce the occupancy of the property from four bedrooms to two bedrooms.

Sleeping accommodation is not planned on the ground floor of the property and hence refuge could be sought on the first and seconds floors which are above predicted flood levels.

The ground floor of the property is to be managed using flood resilience techniques to minimise the risk of permanent damage in the event of flooding and also speed up property re-occupation following a flood event.

The risk of flooding is therefore considered to be manageable in accordance with TAN15 guidance and will constitute an Improvement compared to the existing property.

8.0 Recommendations

Taking into account the information gathered within this report, the proposed development is deemed at greatest risk of flooding from the River Clydach with inundation to the ground floor applicable from the 20% (1 in 5) chance.

During the 1% (1 in 100) chance with a 30% uplift for climate change over the lifetime of the development, the predicted flood level (based on the present day 0.2% (1 in 500) flood level) is 10.00mAOD produces flood depths internally of up to 0.55m.

With inundation expected to the property, best practice in the event of flooding should be considered with regard to fabric and layout ground floor. Therefore, FCI will propose general recommendations for the ground floor:

Flood Resilience – A flood resilient building is designed and constructed to reduce the impact of flood water entering the building so that no permanent damage is caused, structural integrity is maintained and drying and cleaning is easier.

8.1 Flood Resilience Measures

Flood resilience measures are considered the most practical solution to minimise the risk of permanent damage to the property during a flood event. These measures will be listed below:

- Ground floors designed to be resistant to water and permit passage of flood water when subject to elevated depths. E.g tiled flooring, vinyl flooring, composite panel flooring.
- Resilient material usage for fixtures, fittings and furniture. Such as metal/plastic chairs, tables, kitchen cupboards, stair cases etc.
- Water resilient materials for walls and internal finishes. Avoid gypsum based plaster board and consider lime base plasterboard, plastic fittings and finishes, water resilient paint.
- Raising of electrical sockets above the extreme 0.1% (1 in 1000) flood level of 10.24mAOD.
- Retractable rugs to be used in place of carpet which can be relocated in the event of a flood alert.

Further information regarding flood resilience techniques can be found on the below link:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7730/flood_performance.pdf

8.2 Property Services

Given the predicted flood risk, services entering the property such as electric boxes and gas telemetry may be located below predicted flood depths. It is therefore advised that where possible any vulnerable services are relocated above predicted flood levels.

8.3 Flood Evacuation Plan

A flood evacuation plan will be included as separate document and added as an appendix to this report.

8.4 NRW Flood Alerts

The property is located within an area where flood alerts are provided by NRW and therefore it is recommended the client is signed up to receive these.

Further information regarding any of the above recommendations can be attained by contacting Flood Consult International.

9.0 Conclusion

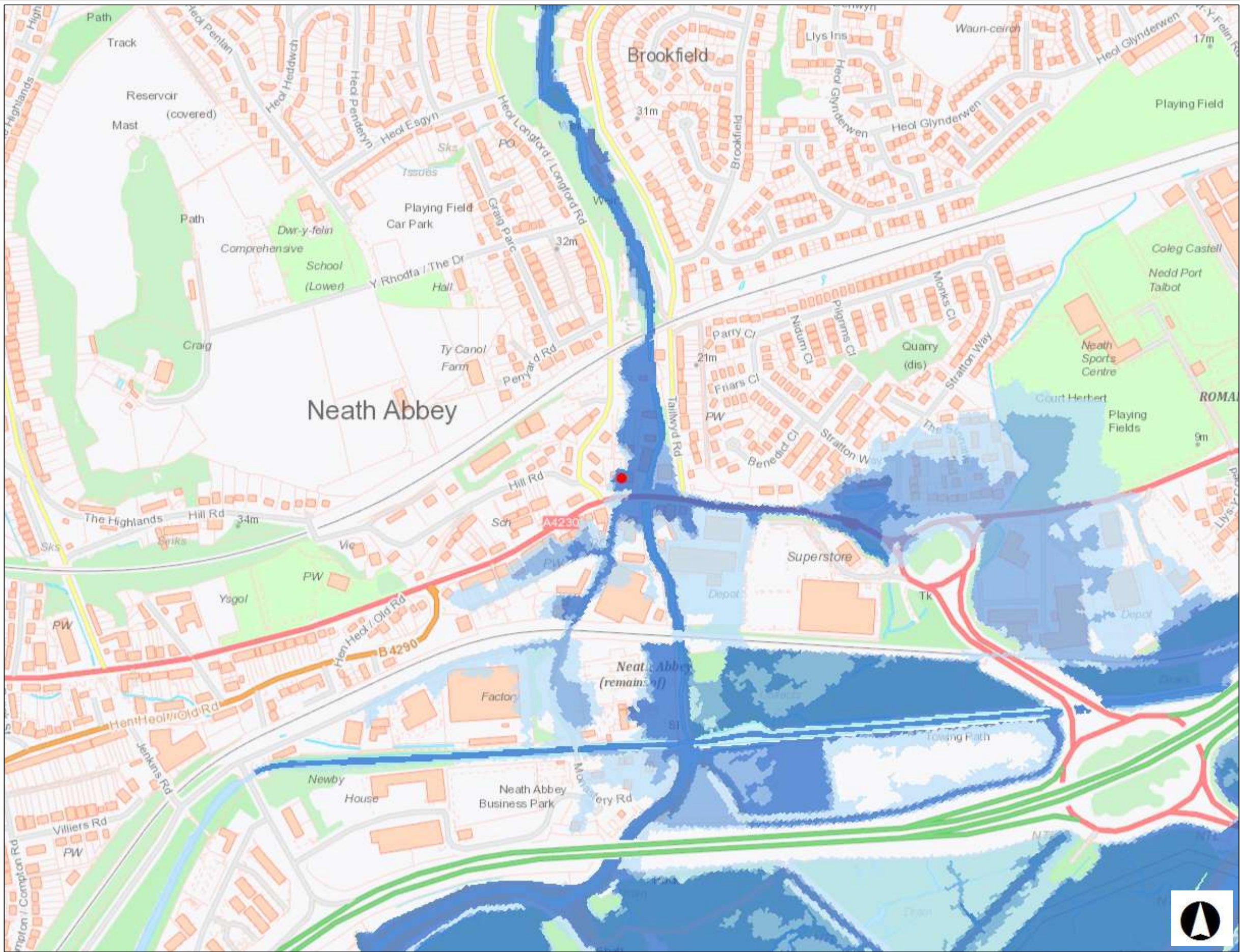
Following investigation into the flood risk exists at the Pukka Pies Ltd, the following conclusions are made:

- The site lies within the high risk flood zone on the Natural Resources Wales flood map which equates to a greater than 3.3% (1 in 30) probability of flooding from the nearby River Clydach.
- The site is located within flood zone C2 on the Development Advice Map (DAM) and is classed as 'highly vulnerable' in line with TAN15 guidance.
- Atrium Planning Consultants are proposing to redevelop an existing four bedroom property into a two bedroom property made up of two self-contained flats.
- Modelled flood level information obtained from NRW show that inundation to the ground floor is applicable from the 20% (1 in 5) chance up to 0.07m in depth.
- During the 1% (1 in 100) flood scenario the predicted flood depth increases to 0.38m. To account for climate change over the lifetime of the development, assumed 100 years, an addition of 30% was made to the peak 1% (1 in 100) flow (taken as the present day 0.2% (1 in 500) flood level) to produce a 1%CC30% (1 in 100CC30%) flood level of 10.00mAOD.
- When the predicted flood level of 10.00mAOD is compared to the site topography, flood depths externally of up to 0.65m are expected with internal depths of 0.55m likely.
- The risk of flooding from coastal/tidal sources has been deemed very low.
- The risk of surface water flooding has been deemed low.
- The site location is not known to have suffered flooding from any source historically.
- The proposed development is the redevelopment of an existing property from a four bedroom house into a two bedroom property consisting of two self-contained flats.
- The proposed redevelopment will not increase the building footprint or raised floors levels and therefore there will be no displacement of floodplain cause.
- There will be no increase to impermeable areas as a result of the development and hence no increase in surface water run-off will result.
- Recommendations have been made within the report pertaining to flood resilience measures for the ground floor of the property to minimise the risk of permanent damage and speed up the site re-occupation process following a flood event.
- It is advised that the client signs up for flood alerts from Natural Resources Wales.
- The redevelopment of the property will not increase flood risk elsewhere, can be managed in line with TAN15 guidance and will reduce the occupancy of the property which is considered an improvement on the existing scenario.

10.0 Glossary

Word	Definition
1D	Estimation of peak flow and elevation in the river channel only
2D	Estimation of flow routes and elevations across the floodplain
CC	Climate Change
BGS	British Geological Survey
DAM	Development Advice Map – flood maps used in Wales to derive development suitability
Fluvial	Rivers
LiDAR	Light Detection and Ranging – method of remote sensing using laser pulses to measure variable distances to earth.
mAOD	Meters Above Ordnance Datum - a vertical datum used by ordnance survey as the basis for deriving altitudes on maps.
Pluvial	Rainfall or surface water
Property Level Protection	Utilising the existing structure of an asset to implement flood protection measures.
Return Period	Estimated likelihood of an event
SFCA	Strategic Flood Consequence Assessment – a broadscale overview of flood risk for a town or borough
TAN15	Technical Advice Note 15 – Guidance in Wales with regard to development and flood risk
Topography	The arrangement of the natural and artificial physical features of an area

APPENDIX A
NRW Fluvial Flood Zone Map



Map Perygl Llifogydd / Flood Risk Map -

Allwedd / Map Key

- + Flood Defence Locations
- Areas Benefitting from Flood Defences
 - Rivers
 - Sea
 - Rivers and Sea
- Flood Risk from Rivers - Extent
 - High
 - Medium
 - Low

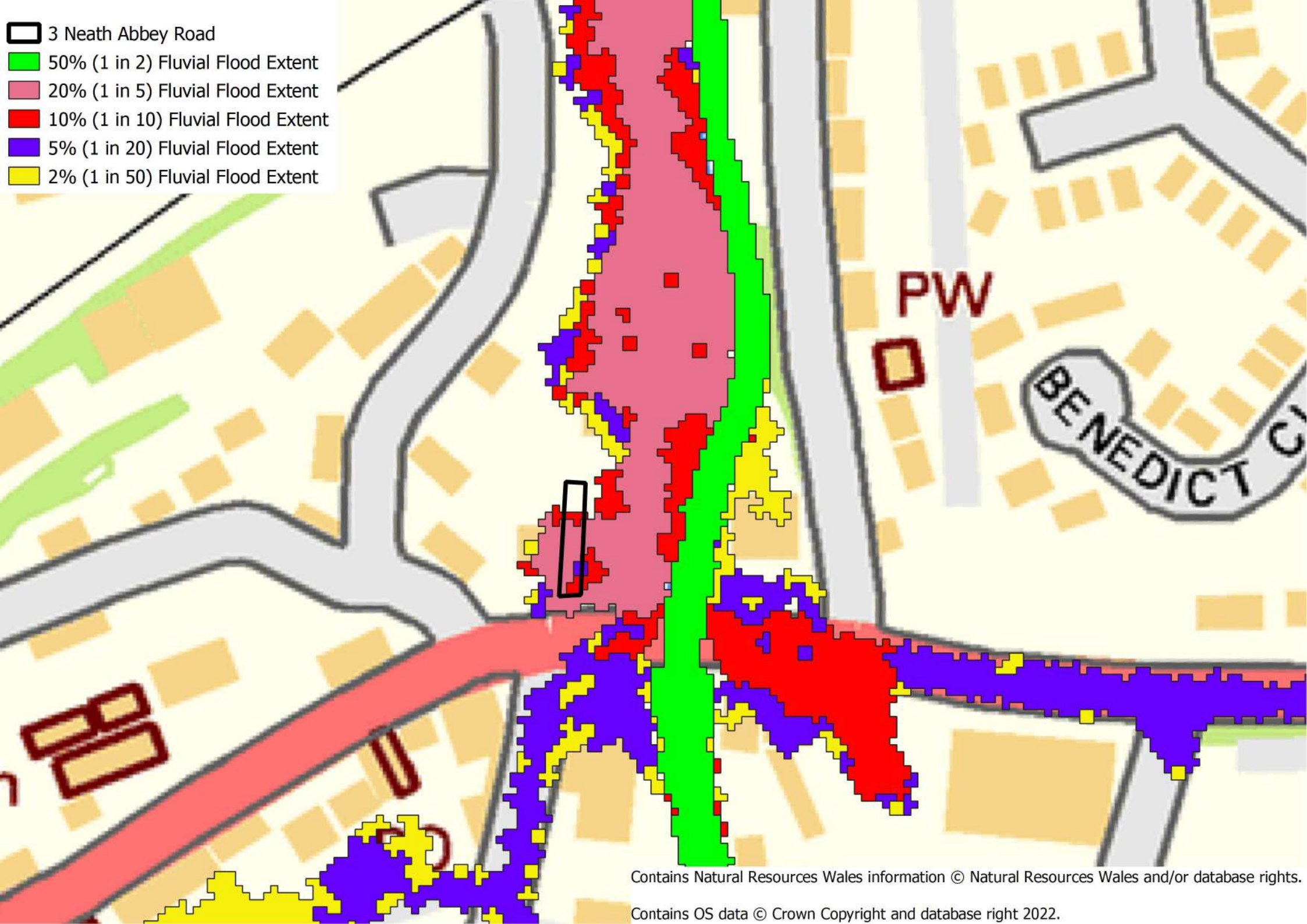
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Dyddiad / Date
22/07/2022

0.3 0 0.13 0.3
British_National_Grid Kilometers

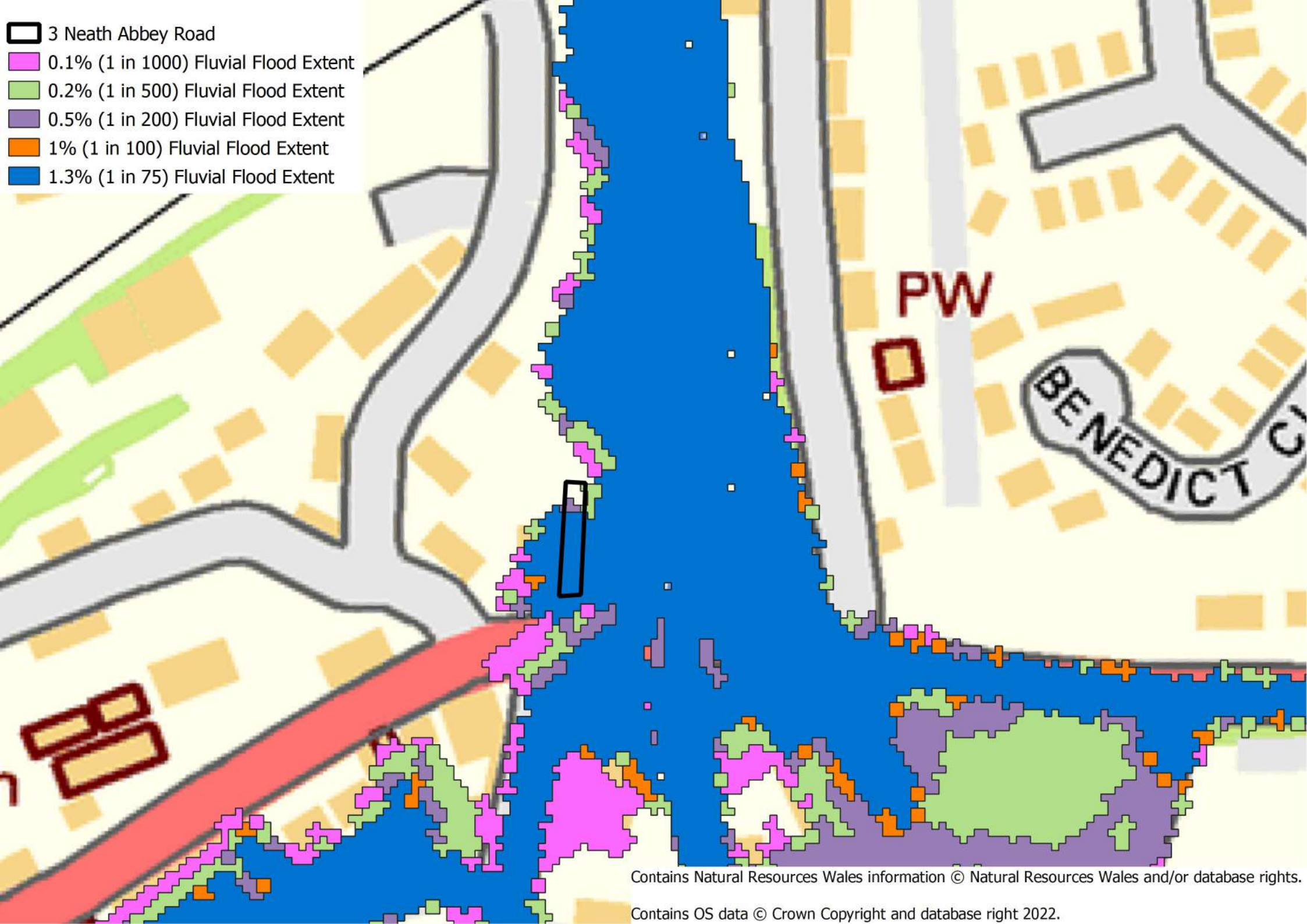
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APPENDIX B
NRW Fluvial Flood Modelling Information



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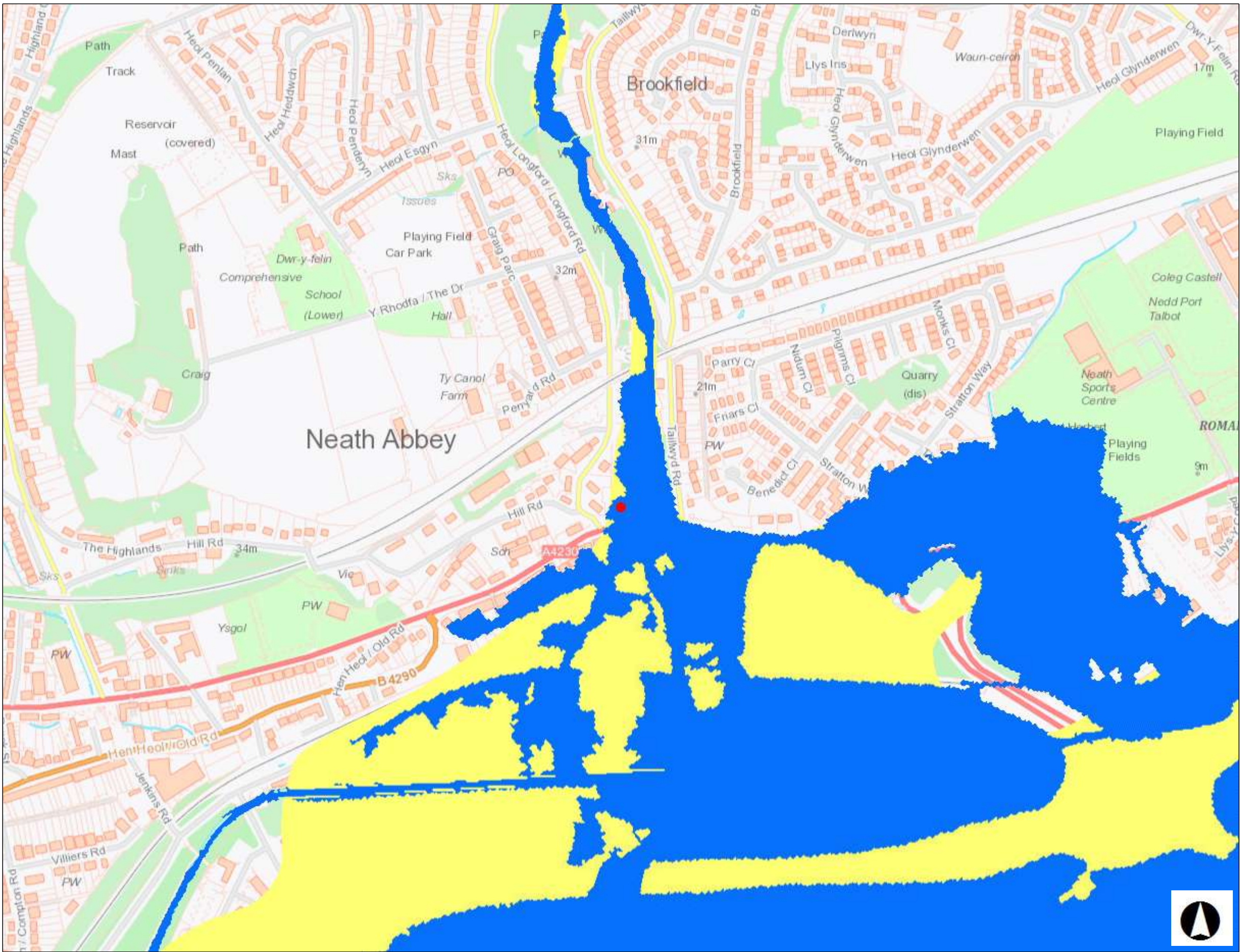
- 3 Neath Abbey Road
- 0.1% (1 in 1000) Fluvial Flood Extent
- 0.2% (1 in 500) Fluvial Flood Extent
- 0.5% (1 in 200) Fluvial Flood Extent
- 1% (1 in 100) Fluvial Flood Extent
- 1.3% (1 in 75) Fluvial Flood Extent

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3 Neath Abbey Road	River Clydach									
	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.3% (1 in 75)	1% (1 in 100)	1%CC20% (1 in 100CC20%)	0.5% (1 in 200)	0.2% (1 in 500)	0.1% (1 in 1000)
Max Level (mAOD)	9.52	9.64	9.71	9.77	9.81	9.83	9.89	9.89	10.00	10.24

APPENDIX C
Development Advice Map



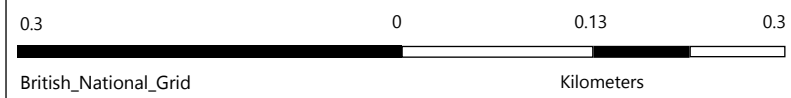
Map Perygl Llifogydd / Flood Risk Map -

Allwedd / Map Key

- Zone C1
- Zone C2
- Zone B
- Zone A

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Dyddiad / Date
22/07/2022



APPENDIX D
NRW Tidal Flood Zone Map



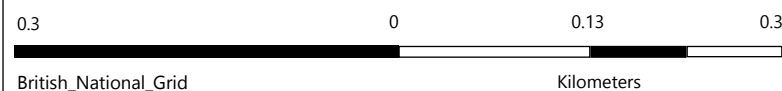
Map Perygl Llifogydd / Flood Risk Map -

Allwedd / Map Key

- + Flood Defence Locations
- Areas Benefitting from Flood Defences
 - Rivers
 - Sea
 - Rivers and Sea
- Flood Risk from the Sea
 - High
 - Medium
 - Low

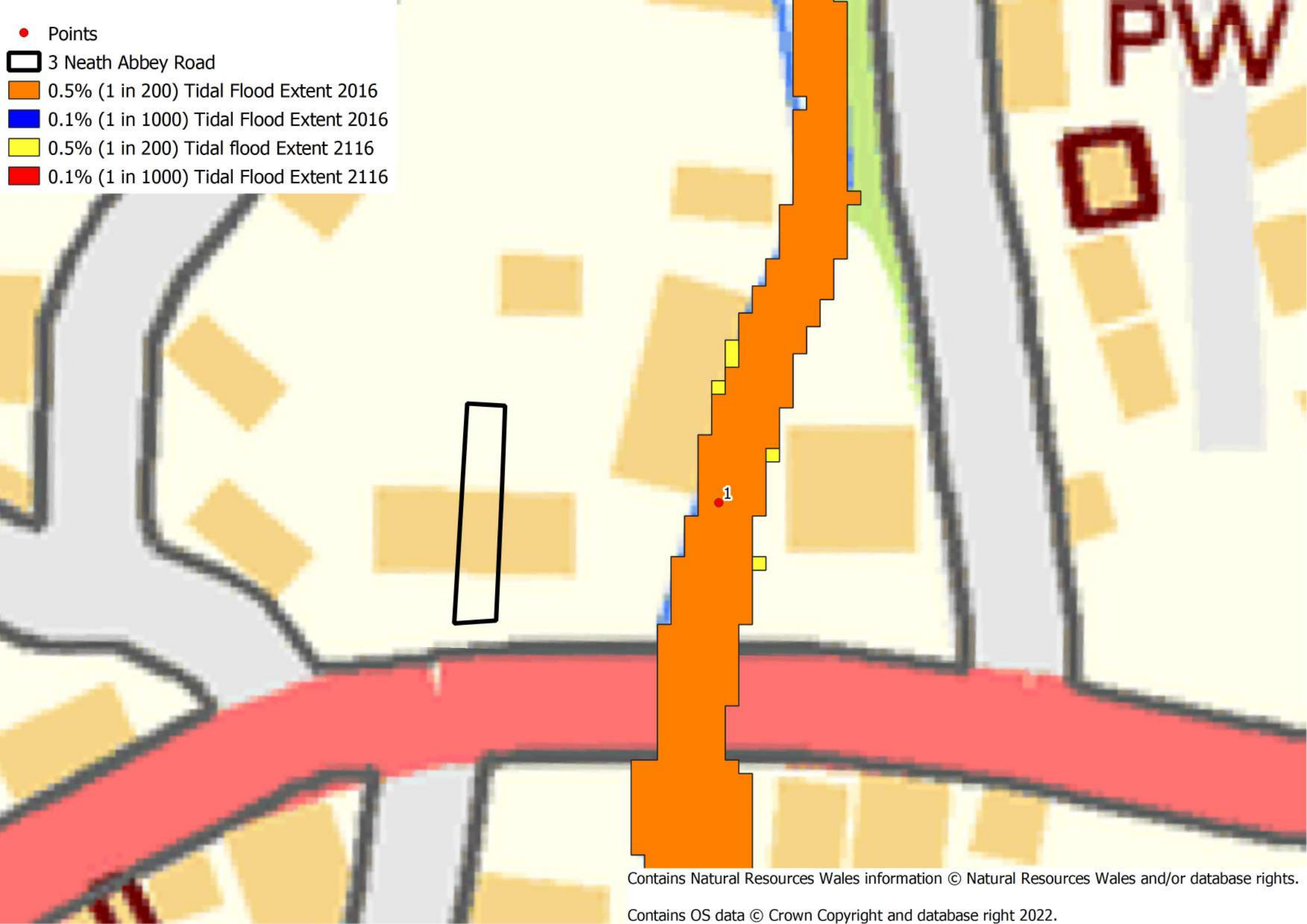
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Dyddiad / Date
22/07/2022



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APPENDIX E
NRW Tidal Flood Modelling Information



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3 Neath Abbey Road	River Clydach			
	0.5% (1 in 200)	0.5%CC2116 (1 in 200CC 2116)	0.1% (1 in 1000)	0.1%CC2116 (1 in 1000CC 2116)
Max Level (mAOD)	7.09	7.45	7.09	7.63

APPENDIX F
NRW Surface Water Flood Zone Map



Flood Defence Locations

Areas Benefitting from Flood Defences

- Rivers
- Sea
- Rivers and Sea

Flood Risk from Surface Water & Small Watercourses - Extent

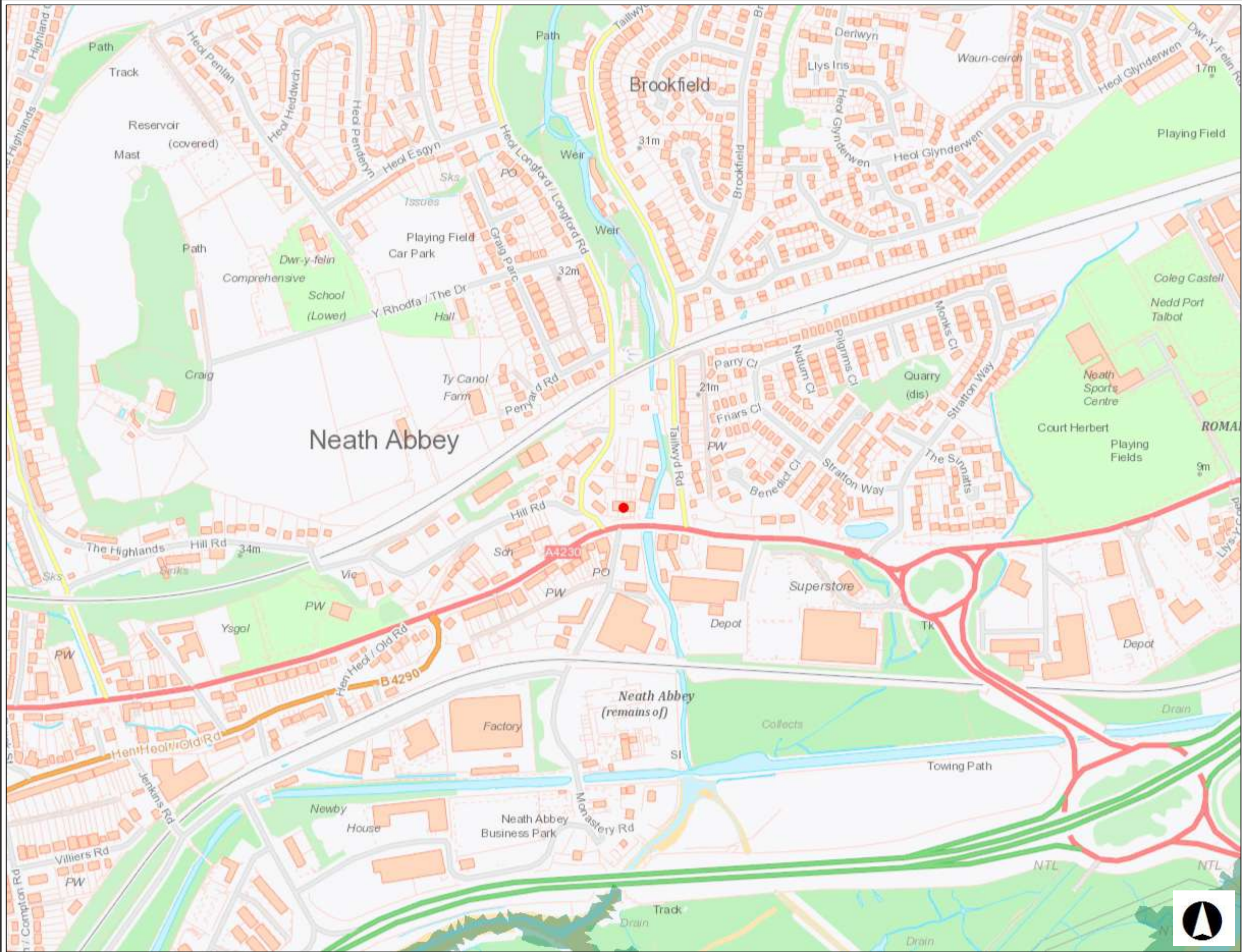
- High
- Medium
- Low

Dyddiad / Date
22/07/2022



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APPENDIX G
NRW Reservoir Flood Map



Map Perygl Llifogydd / Flood Risk Map -

Allwedd / Map Key

- + Flood Defence Locations
- Areas Benefitting from Flood Defences
 - Rivers
 - Sea
 - Rivers and Sea
- Flood Risk from Reservoirs

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
22/07/2022



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APPENDIX H
NRW Flood History Map



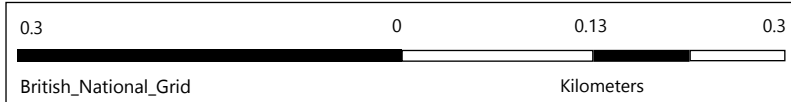
Map Perygl Llifogydd / Flood Risk Map -

Allwedd / Map Key

- + Flood Defence Locations
- Areas Benefitting from Flood Defences
 - Rivers
 - Sea
 - Rivers and Sea
- Recorded Flood Extents

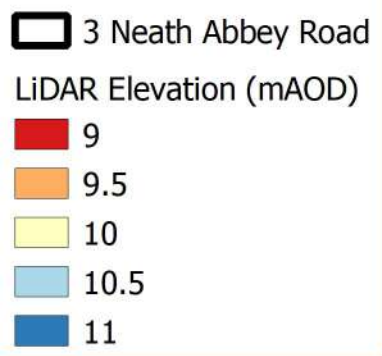
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Dyddiad / Date
22/07/2022



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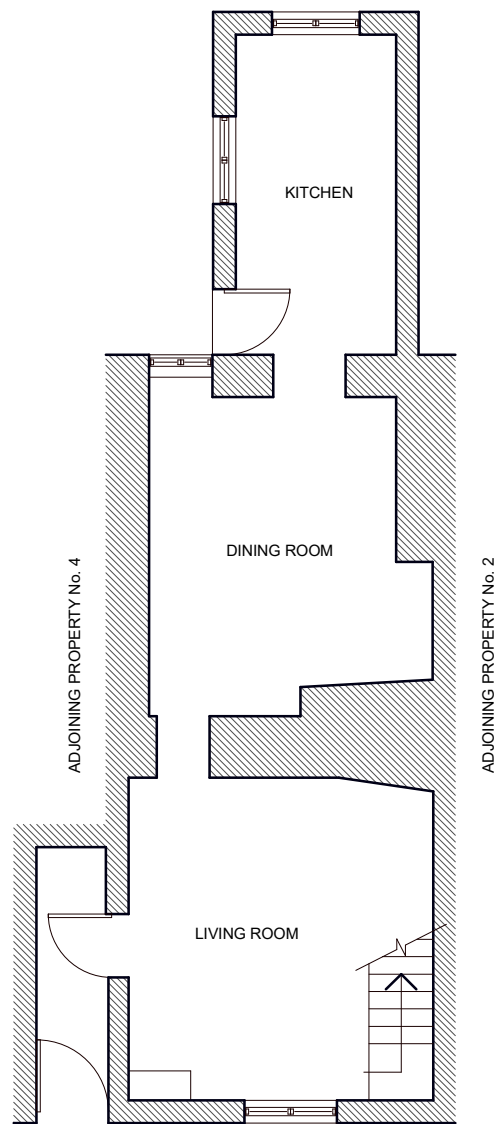
APPENDIX I
Site LiDAR Topography



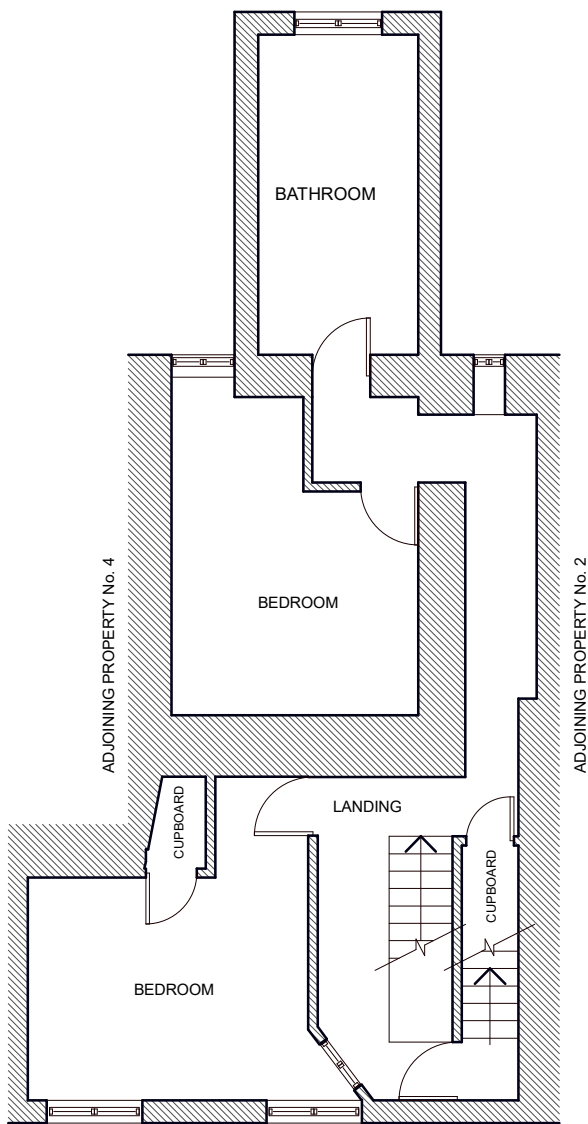
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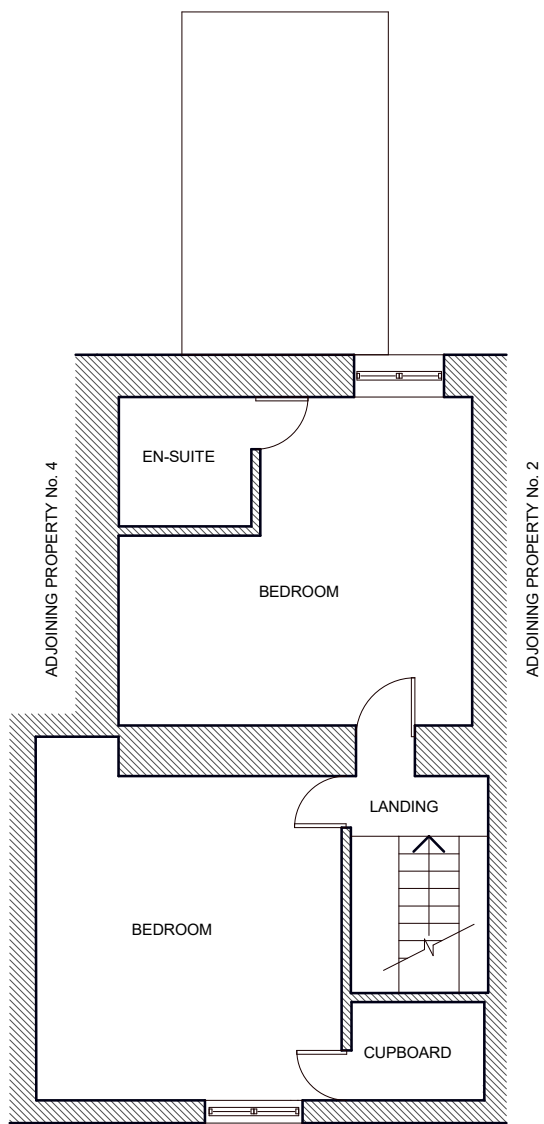
APPENDIX J
Existing Site Plans



GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN

Scale 1 / 100 @ A3



SHEET TITLE:
Existing Floor Plans

PROJECT DESCRIPTION:
2 Self Contained Flats



DATE:
June 2022

SCALE:
1 :100

SHEET:
A-3



LABC
Registered
Partner Auditing Scheme

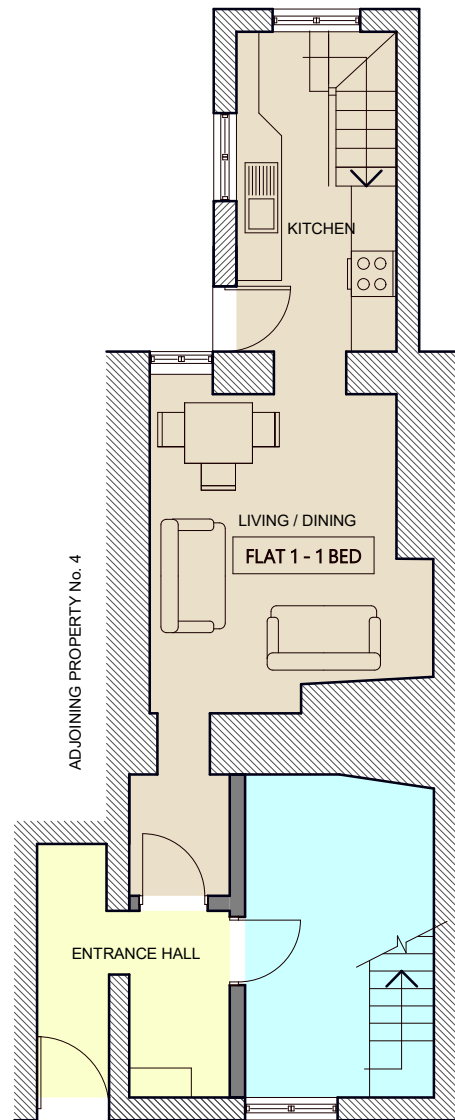
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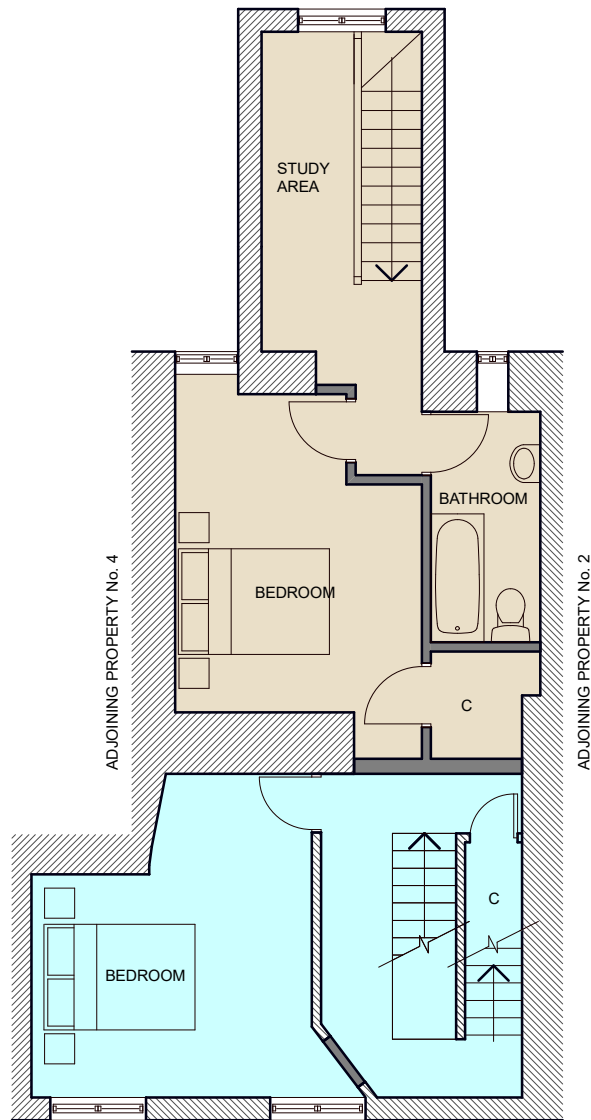
RTPI
Accredited Degrees

Matt John
MSc: Regeneration
BSc (Hons) City and Regional
Planning

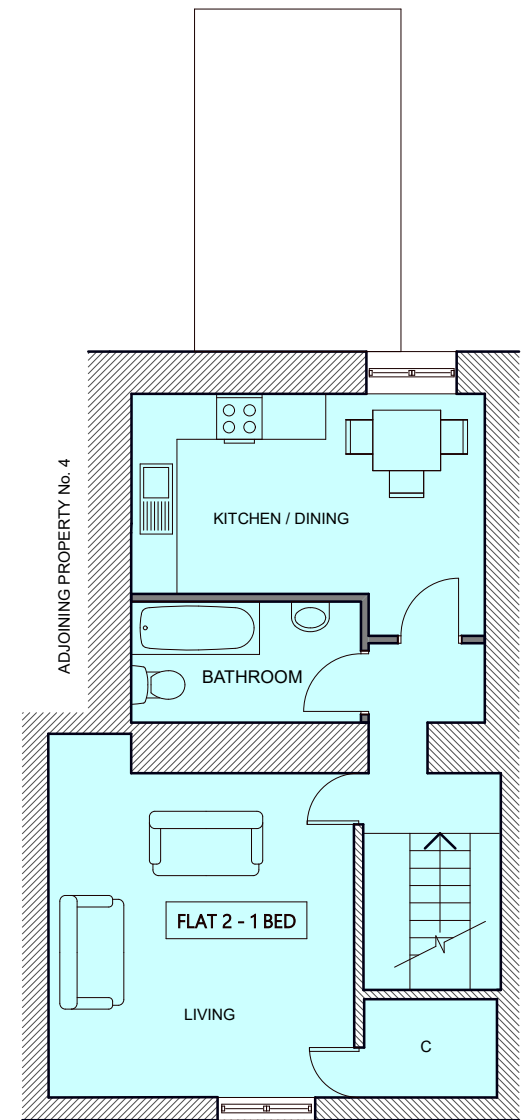
APPENDIX K
Proposed Site Plans



GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN

Scale 1 / 100 @ A3



APPENDIX L
Flood Evacuation Plan

Flood Plan

Site Address:

3 Neath Abbey Road,
Neath Abbey,
Neath Port Talbot,
SA10 7NN

Property Owner:**Introduction**

Given the flood risk that has been identified at the above address, this plan will detail the necessary actions required if the site is at risk from an impending flood event. The objective of the flood plan is to provide the responsible parties onsite with procedures to ensure a safe and efficient evacuation of the site as well as provide useful information on preventative measures and hazards associated with flood water. All tenants should be aware of this plan with adequate training organised by the property owner to safely evacuate if a flood alert is issued.

Situation

The site is a terraced property which is proposed to be redeveloped from a four bedroom house into a two bedroom house consisting of two self-contained flats. All sleeping accommodation will be located on the first and seconds floors of the property above predicted flood levels.

Flood Risk Assessment

FCI have undertaken a desktop FCA on the site which has led to the determination of the flood risk to the site. Flooding from the River Clydach is applicable from the 20% (1 in 5) chance and greater in magnitude. Flooding internally is possible up to 0.07m during this scenario rising to 0.79m during an extreme 0.1% (1 in 1000) flood scenario.

During the 0.1% (1 in 1000) flood scenario flood depths are considered to be severe and would result in the ground floor of the property suffering inundation and damage as well as a significant risk to life. Should a flood event of this magnitude occur the site would be inaccessible on foot with the only remaining access option via boat. It is therefore imperative that everyone is able to evacuate site and proceed to a flood free zone as safely and efficiently as possible.

Due to the construction of the property from brick with solid floors, it is considered that preventing flood water from entering the building isn't feasible as the structure is insufficient to resist implosion under loading of flood water up to 0.79m in depth.

Flood Warnings & Preparation

Natural Resources Wales operates a flood warning service called Floodline. The site is not located within an area that can receive these warnings but is covered by the flood alert service, all types of NRW flood warnings are described in the below table:

<i>Warning</i>	<i>Description</i>	<i>Timescale</i>	<i>Action(s)</i>
 FLOOD ALERT	Flooding is possible – Be prepared	2-48 hours in advance of flooding	• Be prepared for flooding
 FLOOD WARNING	Flooding is expected – Immediate Action is required	Half an hour to 24 hours in advance of flooding	• Act now to protect/defend your property • Install any flood resilience measures • Move any critical equipment to raised levels
 SEVERE FLOOD WARNING	Severe Flooding – Danger to life	When the threat of flooding is to cause significant threat to life and different actions are required	• Be ready should you need to evacuate from the property • Co-operate with the emergency services and call 999 if you are in immediate danger.
Warning Removed	No further flooding is expected in your area	Issued when a flood warning is no longer in force	• Accumulated flood water may still exist and may be contaminated • If your property has flooded, contact your insurance company

In times of high rainfall and flooding is predicted through local media, contact Floodline on 0345 988 1188, quoting the property address. Upon receiving a flood warning, the responsible parties' should prepare to move all vulnerable items to a higher level above the predicted flood level such as tables, kitchen counters or upstairs. Given that the flood alert may only be issued two hours before flooding begins, adequate labour will need to be sought in order to complete the move prior to inundation of the Property.

As the property is not covered by flood warnings from NRW at present, in the event of a flood alert being given the situation should be closely monitored by the tenants by listening to local media and following the advice of emergency services were necessary.

Considerate Measures

When preparing for evacuating site, the following information should be taken into consideration:

- Always consider your own safety, loss preventive measures and procedures should always be undertaken in pairs and should only be completed if safe to do so
- Avoid contact where possible with flood water as it maybe contaminated. Ensure any staff who are contacted by flood water wash their skin thoroughly
- Be aware that access/egress routes to the site may be compromised
- Be vigilant if required to walk along main roads
- Do not walk/drive through flood water unless unavoidable
- 6 inches of fast flowing water can knock you off your feet
- 2 feet is sufficient to float your car
- Manhole covers can be lifted with other debris hidden beneath the surface
- Flood water may be contaminated
- Follow advice from the emergency services

Protective Measures

In line with predicted flood depths of up to 0.79m above the property floor level, the following measures can be taken with a view to reducing the risk of damage to vulnerable items.

Item	Possible Action	Safe Location (if applicable)
Computers, Printers & Office Electrical Equipment	Raise Up	Desks/Upper Floor Level
Paper Files	Raise Up	Desks/Upper Floor Level
Routers	Back-up Files	N/A
Chairs	Raise Up	Desks/Upper Floor Level
Vehicles	Move Off Site	Car Parks, Yards or Closed Roads
Utilities (Electric, Gas, Water)	Turn Off	N/A

The above protective measures are aimed at reducing the damage to vulnerable on the ground floor of the property. With regard to the utility service points within the property, it is recommended that the shut-off points for each service are shown on a layout plan so this can be actioned as efficiently as possible.

Site Evacuation Route

1. Once a flood alert has been given and evacuation has been advised, the following route should be observed to vacate the property and reach a flood free zone.
2. Exit the property at the main entrance on the southern perimeter and proceed onto Neath Abbey Road

3. Turn Right and proceed along Neath Abbey Road for 30m until the junction you reach junction with Longford Road.
4. This flood free zone and the evacuation route are shown on the aerial image below and the projected flood extents on the map underneath, follow the advice of the emergency services.



Site Reoccupation

Following the subsidence of flood water and subsequent removal of the flood warning, the following hazards should be considered during the reoccupation of the site:

- The local area is likely to be severely disrupted with access/egress routes compromised.
- Do not re-renter your property unless instructed to do so. The building may have been subject to structural damage or electrical cables may be exposed to water (if not able to be turned off).
- Ensure photographic/video evidence of all damage to goods and property as evidence to present to your insurance company.
- Instruct a local contractor who specialises in restoration following flooding to pump out your premises (if required), dispose of damaged/contaminated goods and commence the 'drying-out' process.
- Do not turn on utility services unless authorised to do so by the local service provided following a site inspection by a qualified engineer.
- Do not use any electrical apparatus contacted by flood water unless declared safe to use by a qualified engineer.
- Flood water could contain harmful chemicals and sewage, therefore handling any objects that have been contacted by flood water should be done using suitable PPE (gloves, overalls, wellies) and take extra care to identify sharp objects (i.e. nails, broken glass).
- Open all windows and doors to allow the building to ventilate, be aware not to expose valuables to theft.
- Identify vulnerable equipment/assets likely to require replacement/refurbishment.
- Do not re-open your premises to the public until thoroughly cleaned and disinfected, contact the environmental health department of the local authority for further assistance.

It would be advantageous to select a local flood restoration contractor prior to a flood event as post flood extended waiting periods are likely due to increased demand. In terms of drying out of the premises following a flood, it is suggested that purchasing dehumidifiers in anticipation of a flood event would speed up the drying out process as these are likely to be in short supply after a flood event.

Useful Contacts

Below is a list of contacts which may be useful when preparing for flooding or reinstatement works following a flood event.

Description	Company Name	Contact Number
Floodline	Environment Agency	0345 988 1188
Electricity Supplier	Western Power Distribution	
Gas Supplier	Wales & West Utilities	
Water Supplier	Welsh Water	
Telephone Provider	British Telecommunications	
Local Authority Emergency Services	Neath Port Talbot Council	01639 686868
Insurance Company Claims Service		
Insurance Agent		
Flood Restoration	Belfor UK Ltd	01827 307600
Flood Restoration	DriTech Ltd	01322 586522
Flood Restoration	Rainbow International	01322 662277