

REFERENCE: **P/15/60/FUL**

APPLICANT: **COASTAL HOUSING GROUP & BCBC  
3RD FLOOR 220 HIGH STREET SWANSEA**

LOCATION: **LAND AT THE RHIW MULTI STOREY CAR PARK WALKWAY  
BRIDGE & ENTRANCE, BRIDGEND**

PROPOSAL: **DEMOLISH & REBUILD CAR PARK: ERECT 5 STOREYS  
RESIDENTIAL/COMMERCIAL BLOCK (CLASS A1/A2/A3 &  
28 DWELLINGS WITH PARKING)**

## REPORT

This application was considered by the Development Control Committee at the meeting on 30 April 2015. Members may recall that Natural Resources Wales (NRW) submitted a late objection to the development, indicating that the submitted Flood Consequence Assessment (FCA) that accompanied the planning application had failed to demonstrate that the consequences of flooding could be acceptably managed in accordance with national guidance over the lifetime of the development. Officers were advised at that time that the principal issue related to the flood modelling, which had been undertaken in support of the FCA but, it was understood, did not fully comply with the NRW requirements. The applicant's agent indicated that revised modelling would be undertaken and a revised FCA would be prepared. Accordingly it was recommended to Committee that the Corporate Director - Communities be given plenary powers to issue a decision of conditional consent provided no adverse representations were received from Natural Resources Wales to the revised Flood Consequence Assessment.

On 10 June 2015, a revised Flood Consequence Assessment and river modelling report was submitted to Natural Resources Wales. On 22 June 2015, NRW provided the following response:

*'We believe the latest work that has been undertaken to understand the flood risk related to the proposed development is reasonable and can be used to inform your decision making.*

*The proposal as submitted raises significant issues in terms of flood risk, safety and conformance with National Planning Policy which are material considerations for your Authority. We have provided our advice on these matters below.*

*Notwithstanding the broader considerations of flood risk management by your Authority, we object to the proposed development as submitted due to evidence that it will increase flood risk to a significant number of third party properties. Please note that changes to building design and footprint would have effects on flood flow, it is not possible to advise you on the sensitivities of this dependency and resulting consequences without alternative proposals and modelling being submitted by the applicant in advance of the principal of development being established. Any decision to undertake further work would be a matter for the applicant and the results of such work cannot be predicted.*

*The application site lies partly within zone C1, as defined by the development advice map referred to under TAN 15 Development and Flood Risk (July 2004). Our Flood Map information, which is updated on a quarterly basis, confirms the site to be within the extreme flood outline.*

*The application proposes to replace an existing less vulnerable development in favour of a highly vulnerable development all within the floodplain of the River Ogmore, as referred to in Technical Advice Note 15 (TAN 15).*

*In addition it is our view in practical terms the change of use from the pre-existing commercial carpark to residential car parking will also increase the vulnerability of the receptor.*

*We have reviewed the Flood Consequences assessment ref C14173 Prepared by Jubb/Coastal housing Group and the Hydraulic Model prepared by Edenvale Young. We consider the FCA and Hydraulic Model provide a satisfactory analysis of the existing flood risk and post development flood risk at the development site.*

*The FCA has examined the effect of a number of flood risk scenarios at the site for both the existing and proposed conditions. The scenarios considered include a range of flows up to and including the 1 in 1000 annual probability flood event (ape) including an allowance for climate change for the 1 in 100 ape. Consideration of blockage of the arched access bridge immediately upstream of the site has also been analysed as required by TAN15.*

*Results from the hydraulic modelling scenarios, for existing conditions, show the site defended by Bridgend Flood Alleviation Scheme and flood free for the 1 in 100 plus allowance for climate change (CC) ape and at risk of flooding for the 1 in 1000 ape.*

*The hydraulic modelling also shows that for bridge blockage conditions, the site experiences flooding in the 1 in 100 ape.*

*The maximum flood depths at the site reported for existing conditions for the scenarios considered are circa 2.7 m. Post development, the hydraulic modelling shows that for blockage and the 1 in 1000 ape the site and in particular the undercroft parking associated with the development floods to circa 2.9m depth with flood water velocities at circa 1.5m/s. The depths of velocities of flooding are predicted to exceed the guide levels provided in table A1.15 of TAN15 and would significantly exceed the levels defined as hazard rating "Danger for all including the emergency services".*

*The assessment of whether safe access and egress can be achieved at all times, whether other emergency management measures are appropriate or indeed whether the proposed use of areas of the development site vulnerable to flooding should be constrained are matters for your Authority to consider.*

*The proposed layout of the scheme as submitted has changed the movement of the flood waters, and as a result there will be an increase in flood waters on third parties. A larger area of the commercial and residential centre of Bridgend is shown to experience an increase in flood risk with floods depths increased by up to circa 100mm. We estimate some 230 third party properties maybe impacted, 190*

*commercial and 40 residential. The FCA does not evidence whether these properties are currently at pre-existing risk of flooding'.*

On reviewing the above objection with the Council's Land Drainage Engineer, the applicants and their engineering consultants and hydrologists, it is apparent that NRW's principle concern is how the proposed development will change the movement of flood waters in a major flood event and the resulting impact of flood waters on third parties. NRW suggests that a larger area of the commercial and residential centre of Bridgend will experience an increase in flood risk with flood depths increased by up to 100mm. NRW maintain that the FCA does not evidence whether the 'affected' properties are currently at pre-existing risk of flooding.

Edenvale Young, on behalf of the applicants consulting engineers, has produced a response to the NRW consultation response which addresses the above concerns by providing additional information on the nature of flooding in Bridgend, which the consultant indicates will allow an informed decision to be made about the risks and changes in risk associated with flooding. A copy of the report and maps is attached as APPENDIX A. A representative of Edenvale Young will also present the findings of the report to Committee to assist Members in the understanding of flood risk associated with the granting of planning permission for the proposed development.

Whilst it is not normal for an applicant's agent to directly address the Development Control Committee, it is considered that, in this case due to the highly technical nature of the information concerned, it is appropriate for, Members to be provided with the briefing in order for a determination to be made.

In brief, the Edenvale Young report details how Bridgend currently floods, how frequently flooding will occur, what are the flood depths and their danger, how the existing risk of flooding is managed and, critically, what will be the change in depth of flooding and hazard as a result of the development and how this could be managed.

Bridgend is protected from flooding by flood defences which run through the town centre. Hydraulic modelling undertaken for the FCA that accompanied the planning application indicates that in the 1 in 1000 year event and a blockage up-stream, flood water will overtop the flood defence walls upstream of the application site and flow overland towards the Rhiw Car Park, flooding the triangular area including Market Place, Dunraven Place and Adare Street. The progression of flood waters continues flooding property adjacent to Dunraven Place and eventually this entire area including the Rhiw is inundated. In such an event, the depth of flooding in properties adjacent to Dunraven Place varies from 1.98m to 2.38, with an average flood depth across the area being approximately 1.5m. Members should be clear that this is a description of an extreme flood event and its consequences based on the existing site circumstances. In such an event it would be necessary for residents and employees of the town to be evacuated from the area. Such a risk is currently managed with the NRW providing a flood warning service to business and residents of the town. Furthermore, the Council maintains water level gauges and is responsible for the closure of floodgates and a civil contingency plan.

The changes to the depth of flooding that will result from the proposed development occurs principally due to the design and the need to include fire walls for the proposed residential element of the scheme. Being a less porous development than the existing multi-storey car park, flood water flowing towards the proposed

development from the north will be held up, resulting in a slight increase in water levels in the surrounding area. Edenvale Young's response has quantified the post-construction increase in flood levels and examples have been given for specific properties in Dunraven Place where existing water depths will range from 1.552m and 2.330m and will increase by 0.059m and 0.045m respectively. The Edenvale Young report confirms that because of the (a) large depths of flooding in the existing condition and the comparatively small increase in depth in the post construction scenario and (b) the small changes in flood hazard from pre to post construction the changes to flooding as a result of the development can justifiably be classified as being minor adverse. The report also reaffirms that all the proposed residential development will be situated above the 1 in 1000 year water level and the residents will benefit from a safe access and egress to areas of higher ground. The flood risk management strategy and the response of the general public, the local authority and the emergency services to flooding will remain the same and no additional properties will be inundated as a result of the development.

Notwithstanding the maintained objection from NRW, the Edenvale Young report concludes that the risks to residents and businesses in the town centre can be adequately managed and the minor adverse changes to flood risk to the north of the site are acceptable.

Members should be aware that this regeneration project has been the subject of extensive examination and consultation both during and prior to the submission of the planning application and it is all the more disappointing that NRW maintain their objection to the scheme having had the opportunity not only to comment on the proposal following pre-application meetings but also as consultees to the Bridgend Local Development Plan which allocates the site as a key development site for retailing and commercial development under Policy REG9. Planning Policy Wales confirms that, in line with the presumption in favour of sustainable development, all applications for planning permission should be determined in accordance with the adopted development plan for the area, unless material considerations indicate otherwise and the recommendation to approve the scheme accords with the adopted policies of this Council. It is acknowledged however that flood risk, whether inland or from the sea, is a material consideration in land use planning and this Council, through the planning process has an important role in avoiding or minimising the adverse effects of any environmental risks on present or future land use.

Technical Advice Note 15: Development and Flood Risk does however recognise that much of urban development in Wales has taken place alongside rivers and in the coastal plain. It is therefore inevitable, despite the overall aim to avoid flood risk areas, that some existing development will be vulnerable to flooding and fall within Zone C (the application site falls within Zone C1). Some flexibility is therefore necessary to enable the risks of flooding to be addressed, whilst recognising the negative economic and social consequences if policy and planning decisions were to preclude investment in existing urban areas and the benefits of reusing previously developed land. TAN 15 confirms that further development in such areas, whilst possibly benefitting from some protection, will not be free from risk and could, in some cases, exacerbate the consequences of a flood event for existing development. It calls for local authorities to use balanced judgement in their decision making. TAN 15 does however indicate that development should only be permitted within Zones C1 and C2 if it can be demonstrated that:-

(i) 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,

(ii) its location in Zone C is necessary to contribute to key employment objectives supported by the local authority and other key partners, to sustain an existing settlement or region, and

(iii) it concurs with the aims of PPW and meets the definition of previously developed land and

(iv) the potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable.

In reference to the above, the proposed development does form part of a wider regeneration strategy that is being delivered in the Primary Key Settlement and Sub-Regional Centre of Bridgend through the adopted Local Plan on a brownfield site. Criteria (i) – (iii) are therefore addressed. Furthermore, due weight has been given to the observations of NRW and a decision to approve the scheme against their advice is done so on the basis that the development will not cause additional properties to be affected by an extreme flood event, there being only a comparatively small increase in flood water over the affected area and the changes to flooding as a result of the development being classified as being minor adverse.

It is considered that the proposal is justified and that the consequences of flooding are acceptable.

The recommendation to Members is that permission be granted for the development subject to the conditions set out in the report to the Development Control Committee report on 30 April 2015 with the addition of a planning condition requiring the submission and agreement of a flood management and evacuation plan for the proposed development.

**RECOMMENDATION:** That planning permission be **GRANTED** subject to conditions set out in the report to the Development Control Committee report on 30 April 2015 with the addition of the following condition:-

22. No development shall take place until the applicant has submitted to and had agreed in writing by the Local Planning Authority a Flood Warning and Evacuation Plan (FEP). This Plan shall address the matters required pursuant to Appendix 5 of Technical Advice Note 15 Development and Flood Risk and include the following information:

During Demolition/Construction Process:

- command & control (decision making process and communications to ensure activation of FEP);
- training and exercising of personnel on site (H& S records as to whom and when);

- flood warning procedures (in terms of receipt and transmission of information and to whom);
- site evacuation procedures and routes and provision for identified safe refuges (who goes there and resources to sustain them).

During Occupation of Development:

- occupant awareness of the likely frequency and duration of flood events;
- safe access to and from the development;
- subscription details to Natural Resources Wales flood warning system,

The FEP shall be reviewed at intervals not exceeding 3 years and will form part of the Health & Safety at Work Register maintained by the applicant.

Reason: To limit the effect of flooding by ensuring the provision of a satisfactory means of flood management on the site.

**MARK SHEPHARD**  
**CORPORATE DIRECTOR COMMUNITIES**

**Background Papers**

See relevant planning application number.

# The Rhiw Car Park & Residential Development Bridgend

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## Introduction

A Planning Application has been submitted by Coastal Housing for the redevelopment of the Rhiw Car Park in the centre of Bridgend. The development will include a new multi storey Car Park and residential housing in the form of apartments at the front of the building. Because the site is situated in Flood Zone C1 a Flood Consequence Assessment (FCA) has been prepared to accompany the Planning Application. The NRW has reviewed the FCA and has made a formal objection to the Planning Application. In its letter to the Planning Authority the NRW states:-

*The proposed layout of the scheme as submitted has changed the movement of the flood waters, and as a result there will be an increase in flood waters on third parties. A larger area of the commercial and residential centre of Bridgend is shown to experience an increase in flood risk with floods depths increased by up to circa 100mm. We estimate some 230 third party properties maybe impacted, 190 commercial and 40 residential. The FCA does not evidence whether these properties are currently at pre-existing risk of flooding.*

The objective of this response is to address these concerns by providing additional information on the nature of flooding in Bndgend to allow an informed decision to be made about the risks and change in risks associated with flooding.

## How Does Bridgend Flood?

Bridgend is protected from flooding by flood defences which run through the town centre. The flood defences comprise high walls which give a high standard of protection in to the town. However, the flood defences can be overtopped when very high flows occur on the Afon Ogmore.

Hydraulic modelling undertaken for the FCA indicates that flood water will overtop the walls upstream of the site and flow overland towards the Rhiw Car Park flooding the triangular area including Market Place, Dunraven Place, Adare Street (see Figure 1). The progression of flooding continues flooding property adjacent to Dunraven Place (see Figure 2) and eventually this entire area including the Rhiw is inundated (see Figure 3).

Water levels gradually rise until it reaches a peak. Unfortunately water is unable to flow back into the river because the flood defences form a barrier to water re-entering the channel and water in the area ponds between the defence and the high ground. The extend of flooding is shown in Figure 5.

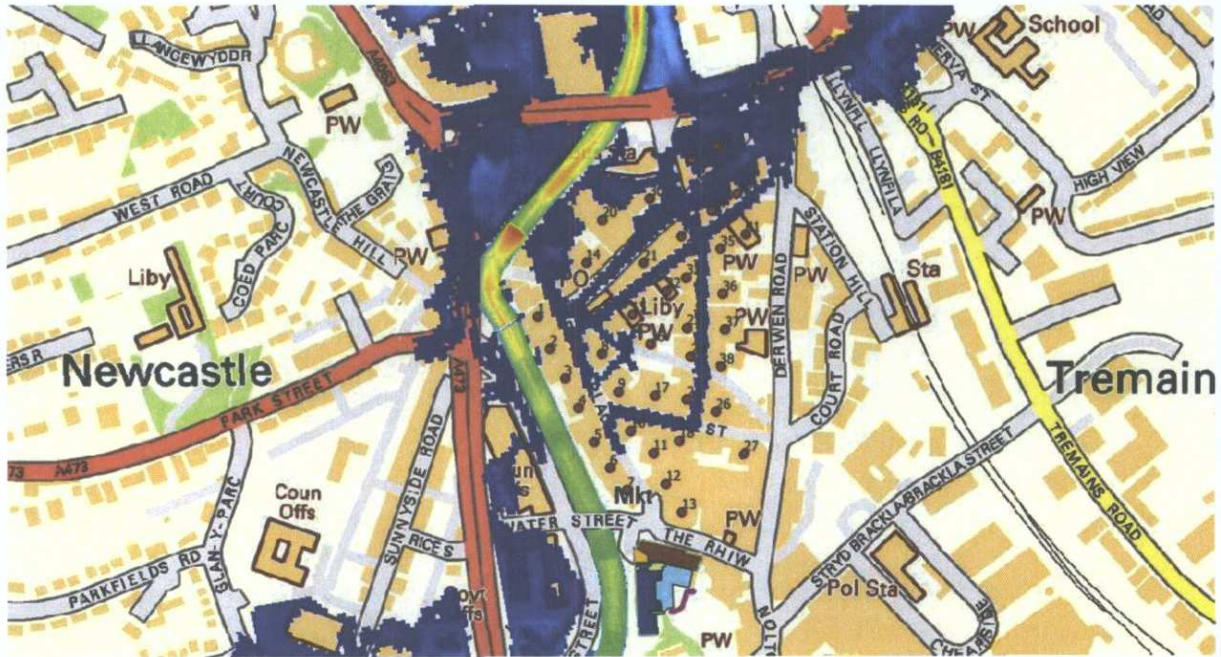


Figure 1 | Initial Flood to Roads: 1 in 1000 year return period pre construction

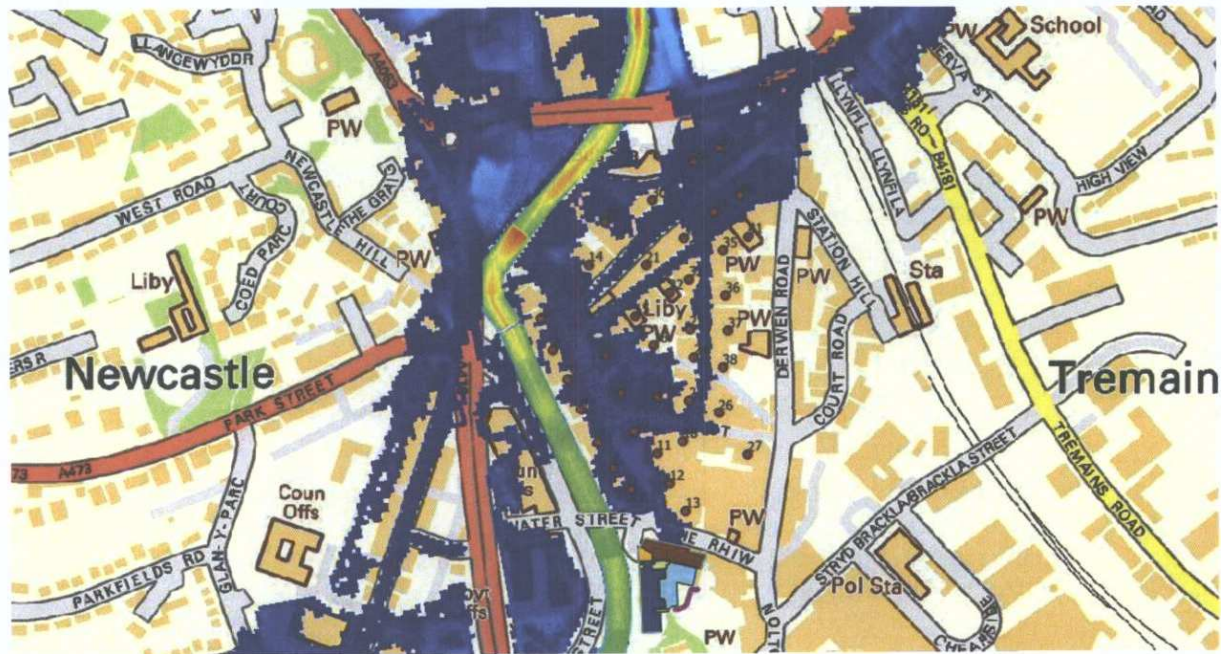


Figure 2 | Progression of Flooding: 1 in 1000 year return period pre construction





Figure 3 | Maximum water depths: 1 in 1000 year return period pre construction

## How frequently will this occur?

Edenvale Young has undertaken a hydrological analysis for Bridgend and the analysis has been reviewed and approved by NRW. The hydrological analysis in conjunction with the hydraulic modelling indicates that the flood defences do not overtop in the:-

- 1 in 100 year return period event
- 1 in 100 year return with peak flows in the river increased by 20% to allow for climate change but with no blockage to bridges.

It should be noted that flood defences are normally constructed to give a standard of protection of 1 in 100 years with a 20% allowance for climate change. Accordingly this result is not unexpected. However, overtopping of the flood defences and flooding to Bridgend is predicted for the

- 1 in 1000 year event and
- 1 in 100 climate change event at the same time that the Old Arch Footbridge between Angle Street and Dunraven Place is blocked by 60% of its cross sectional area.

This latter scenario is equivalent to a very large tree being stuck under the structure during the event reducing the flow area in the river. It should also be noted that the Rhiw Development is at the downstream limit and will not change the frequency of occurrence.

## What are the flood depths and is it dangerous?

The hydraulic modelling has been reviewed and approved as being fit for purpose by NRW and has been used to predict the depth of flooding for a 1 in 1000 year event before the construction of the development. Thirty eight representative properties have been identified to the south of the A4061 and these are shown in Figure 4. Figure 5 and Table 1 show the results of the hydraulic modelling analysis. The depth of flooding in properties adjacent to Dunraven Place varies from 1.98m to 2.38m. This latter figure is roughly equivalent to the height of a standard door frame. The average flood depth across the area is approximately 1.5m.

Self-evidently flood depths of this magnitude are clearly dangerous presenting a real risk of drowning. NRW assesses danger through the use of the concept of hazard. Hazard combines flow velocity and depth. This approach recognises the fact that both deep still and shallow fast flowing flood water can be dangerous. Figure 6 shows the results of the hazard analysis for the existing situation. For the area adjacent to Dunraven Place and along the roads the hazard is classified as extreme. Further to the east the hazard reduces to significant.

In summary the existing Rhiw car park and the area to the north are located on an area where the danger of flooding is classified as dangerous to all (extreme hazard) and "dangerous to Most" (significant hazard).

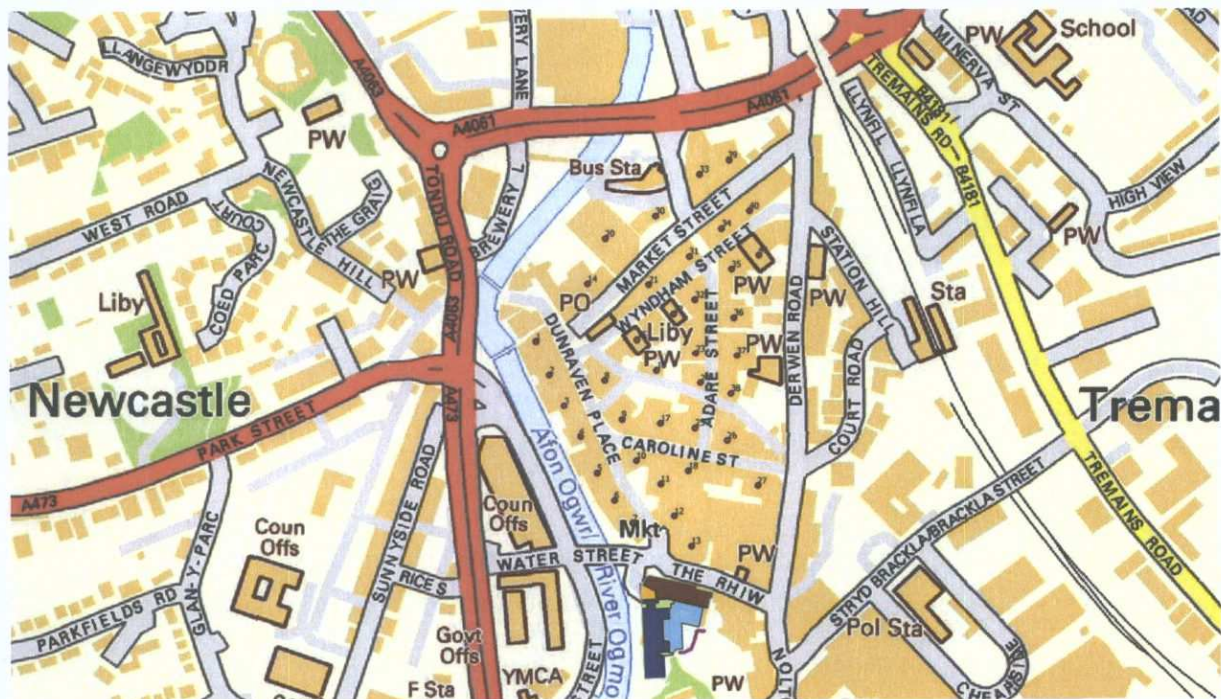


Figure 4 | Reference Properties



Figure 5 | Maximum water depths: 1 in 1000 year return period pre construction

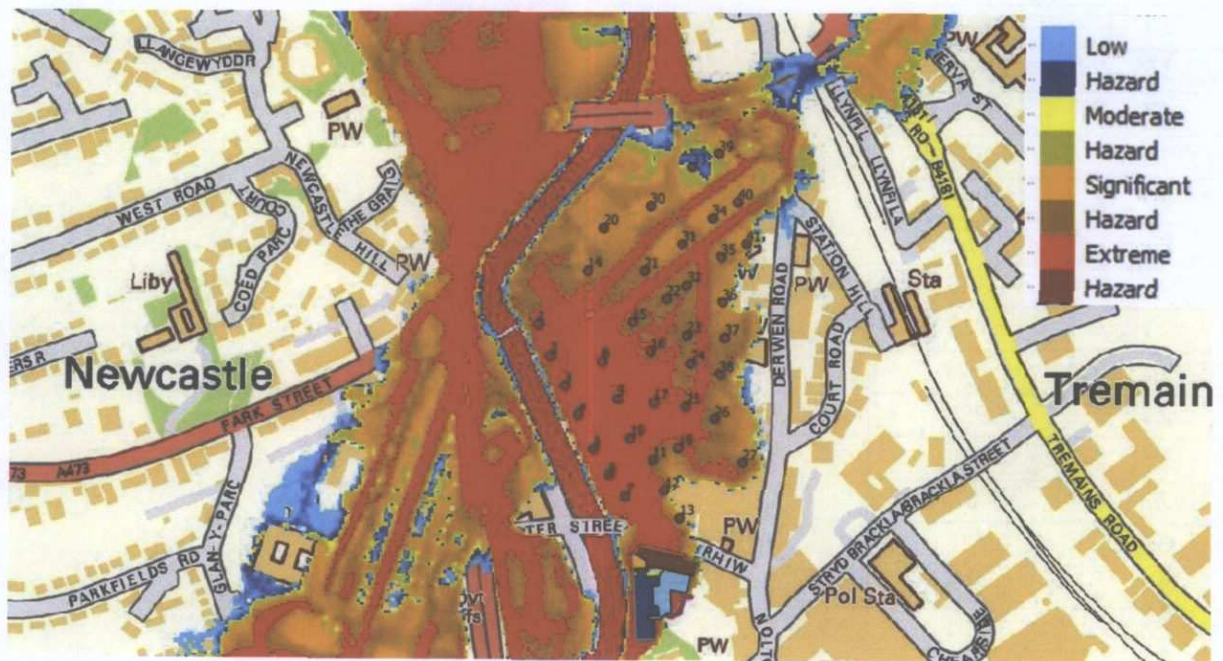


Figure 6 | Flood Hazard: 1 in 1000 year return period pre construction

Table 1 | Flood Depth in Reference Properties Pre Construction

Property Ref	Pre-Development (m AOD)
1	2.330
2	1.981
3	2.323
4	2.103
5	2.172
6	2.381
7	2.090
8	2.240
9	2.096
10	2.035
11	1.803
12	1.552
13	0.574
14	1.037
15	1.613
16	1.629
17	2.233
18	1.687
20	0.808
21	1.386
22	1.526
23	1.715
24	1.609
25	1.952
26	2.007
27	1.67
30	0.618
31	0.928
32	1.401
33	0.229
34	0.794
35	1.156
36	0.702
37	1.423
38	1.785
39	0.431
40	0.682

## **How is the existing risk of flooding managed?**

NRW provides a flood warning service to Bridgend. This service gives automated warnings to all residents registered for the service of flooding. This is a critical service for Bridgend where floodgates must be closed in advance of a serious flooding event. It is also clearly very important for residents and businesses to the south of the A4061 where flood depths in the 1 in 1000 year condition mean that the majority of the area is classified as being at significant or extreme hazard.

The Local Authority maintains water level gauge on the Afon Ogmore and is responsible for

- closure of floodgates
- civil contingency planning.

In this context the danger associated with flooding to this area clearly means that residents and employees must be evacuated from the area to reduce the risk of loss of life if a severe flood warning is received from the NRW.

## **What will be the changes in depth of flooding and hazard as a result of the development?**

*The development occupies approximately the same footprint as the existing building. However, the structure will be slightly less porous than the existing car park. This is because of the need to include fire walls within the building to make it suitable for residential use. As a result water flowing towards the development from the north will be held up in front of the building resulting in a slight increase in water levels to the north of the building.*

The affected area is shown in Figure 7 and Figure 8 which shows the difference in water levels before and after construction of the Rhiw. The areas shaded in grey will experience no change in water levels as a result of the development. However, water levels immediately upstream of the car park and to the south at the A4061 will rise by 0.040m to 0.060m.

Figure 9 shows the extent of flooding following construction of the car park. The steepness of the high ground to the east and the flood wall to the west means that the slight increase in flood level does not flood any further properties. Moreover, there is no measurable change to the extent of flooding across the model domain. Figure 10 shows the hazard in the post construction situation.

Table 2 shows the change in flood depth at each of the thirty eight representative properties. For example at Property 1 on Dunraven the water depth changes from 2.330m to 2.375m which is an increase of 0.045m. Similarly, the depth of water at Property 12 changes from 1.552m to 1.611m which is an increase of 0.059m. Figure 10 shows the flood hazard in the post development scenario. In comparing the post construction hazard to the pre-construction hazards results (see Figure 6) it is difficult to see any change in extent or categorisation of hazard. The change in hazard has been quantified and is shown in Figure 11.

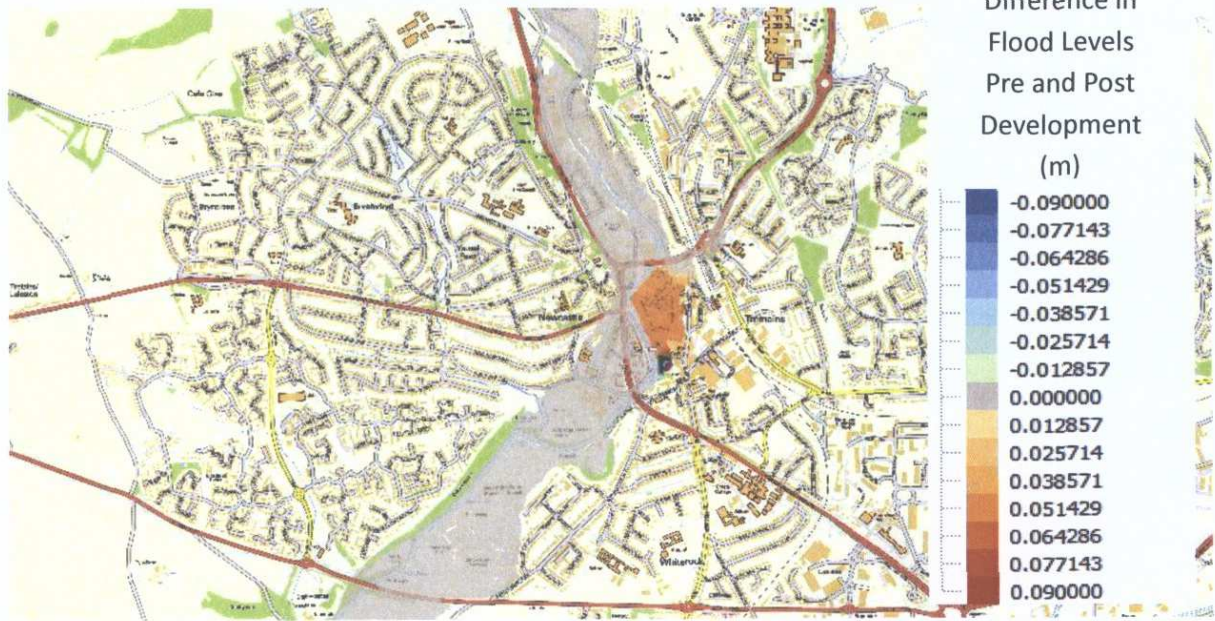


Figure 7 | Post-Construction Flood Depth Minus Pre-Construction Flood Depth 1 in 1000 year return period

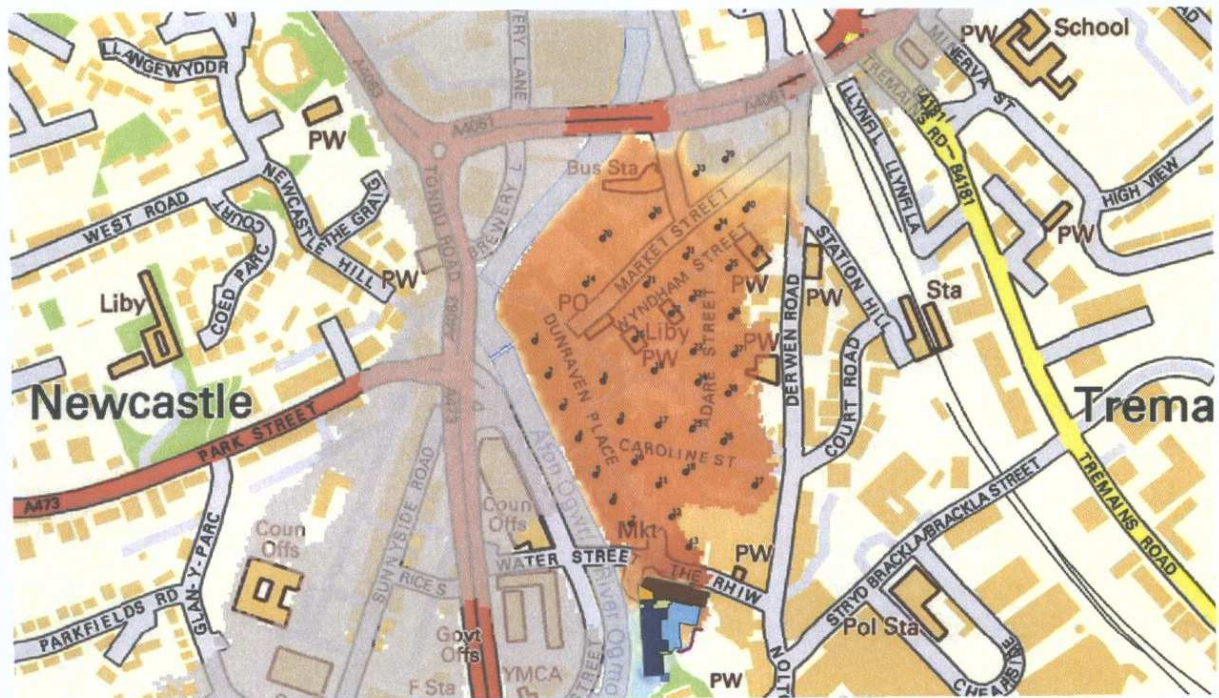


Figure 8 | Post-Construction Flood Depth Minus Pre-Construction Flood Depth 1 in 1000 year return period



Figure 9 | Maximum water depths: 1 in 1000 year return period pre construction



Figure 10 | Flood Hazard: 1 in 1000 year return period pre construction

Table 2 | Flood Depth in Reference Properties Pre and Post Construction

Property Ref	Pre-Development (m AOD)	Post Development (m AOD)	Difference (m)
1	2.330	2.375	0.045
2	1.981	2.039	0.058
3	2.323	2.39	0.067
4	2.103	2.161	0.058
5	2.172	2.232	0.060
6	2.381	2.445	0.064
7	2.090	2.15	0.060
8	2.240	2.301	0.061
9	2.096	2.156	0.060
10	2.035	2.093	0.058
11	1.803	1.864	0.061
12	1.552	1.611	0.059
13	0.574	0.633	0.059
14	1.037	1.093	0.056
15	1.613	1.67	0.057
16	1.629	1.684	0.055
17	2.233	2.291	0.058
18	1.687	1.735	0.048
20	0.808	0.864	0.056
21	1.386	1.442	0.056
22	1.526	1.583	0.057
23	1.715	1.779	0.064
24	1.609	1.669	0.060
25	1.952	2.011	0.059
26	2.007	2.052	0.045
27	1.67	1.742	0.062
30	0.618	0.665	0.047
31	0.928	0.983	0.055
32	1.401	1.457	0.056
33	0.229	0.248	0.019
34	0.794	0.842	0.048
35	1.156	1.21	0.054
36	0.702	0.759	0.057
37	1.423	1.481	0.058
38	1.785	1.843	0.058
39	0.431	0.435	0.004
40	0.682	0.721	0.039



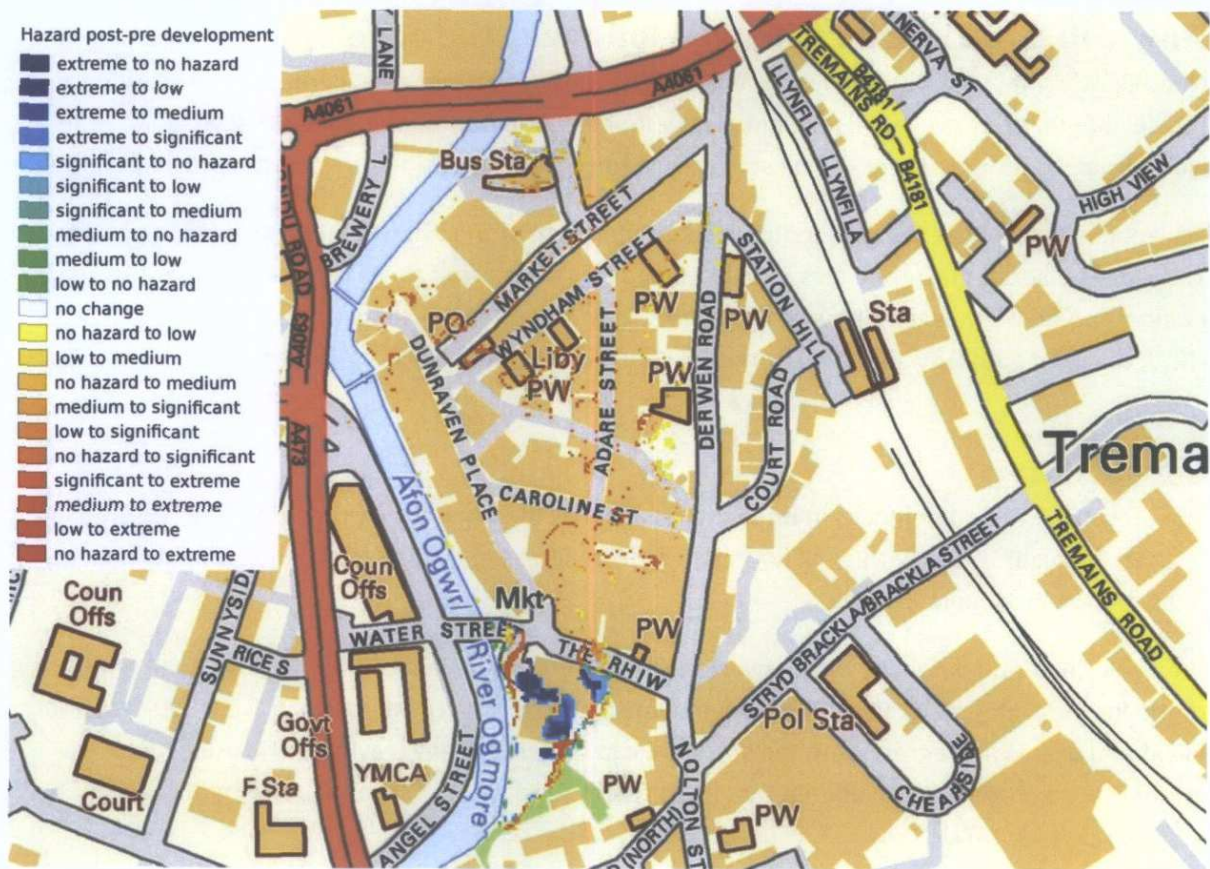


Figure 11 | Change in Hazard Classification

As noted above, this confirms that there are very small changes in the classification of hazard throughout the area to the north of the development. Accordingly, because of the

- large depths of flooding in the existing condition and the comparatively small increase in depth in the post construction scenario and
- the small changes in flood hazard from pre to post construction

the changes to flooding as a result of the development can justifiably be classified as being **minor adverse**. It should also be noted that the risk of the general public and the emergency services entering this area are so high that they should be classified as unacceptable in both the pre- and post-development condition.

## How will flood risk be managed following the development?

Flooding will affect the Rhiw development and the most important consideration is the residents of the development. However all residential development will be situated above the 1 in 1000 year water level. In addition there will be safe access and egress for residents to areas of high ground.

As explained above the changes to flood risk to the north of the Rhiw Car Park are minor adverse. There are no additional properties inundated and this means that there is no requirement to adapt or alter flood risk management within the area. Accordingly, the response of: the general public; NRW, the local authority and the emergency services to flooding will remain the same.

## Conclusions

The presence of flood defences in Bridgend means that the Rhiw Development will not be inundated in a 1 in 100 year return with peak flows in the river increased by 20% to allow for climate change but with no blockage to bridges.

However, the flood defences will be overtopped by a 1 in 1000 year event which will lead to flooding of the Rhiw development. Residential development will be above the level of a 1 in 1000 year flood event and access and egress from the structure can be achieved by leaving the building onto dry ground. Accordingly it is considered that flood risk to residents can be adequately managed in accordance with TAN15.

The development will cause a slight rise in water levels upstream of the site estimated to be between 0.04m and 0.06m. However the depth of flooding to the triangular area to the north is very deep in both the pre- and post-development situations. As noted in the text the depth of water in properties adjacent to Dunraven Place varies from 1.98m to 2.38m for a 1 in 1000 year event before the construction of the development. The average flood depth across the area is approximately 1.5m. Accordingly, because of the

- large depths of flooding in the existing condition and the comparatively small increase in depth in the post construction scenario and
- the small changes in flood hazard from pre to post construction

the changes to flooding as a result of the development can justifiably be classified as being minor adverse. It should also be noted that the risk of the general public and the emergency services entering this area are so high that they should be classified as unacceptable in both the pre- and post-development condition.

In conclusion it is considered that the risks to residents can be adequately managed and the minor adverse changes to flood risk to the north of the site are acceptable.

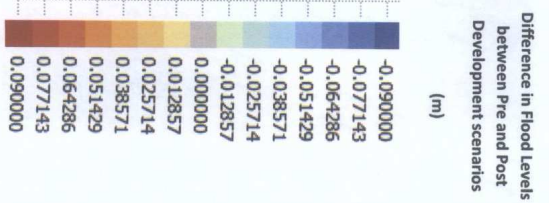
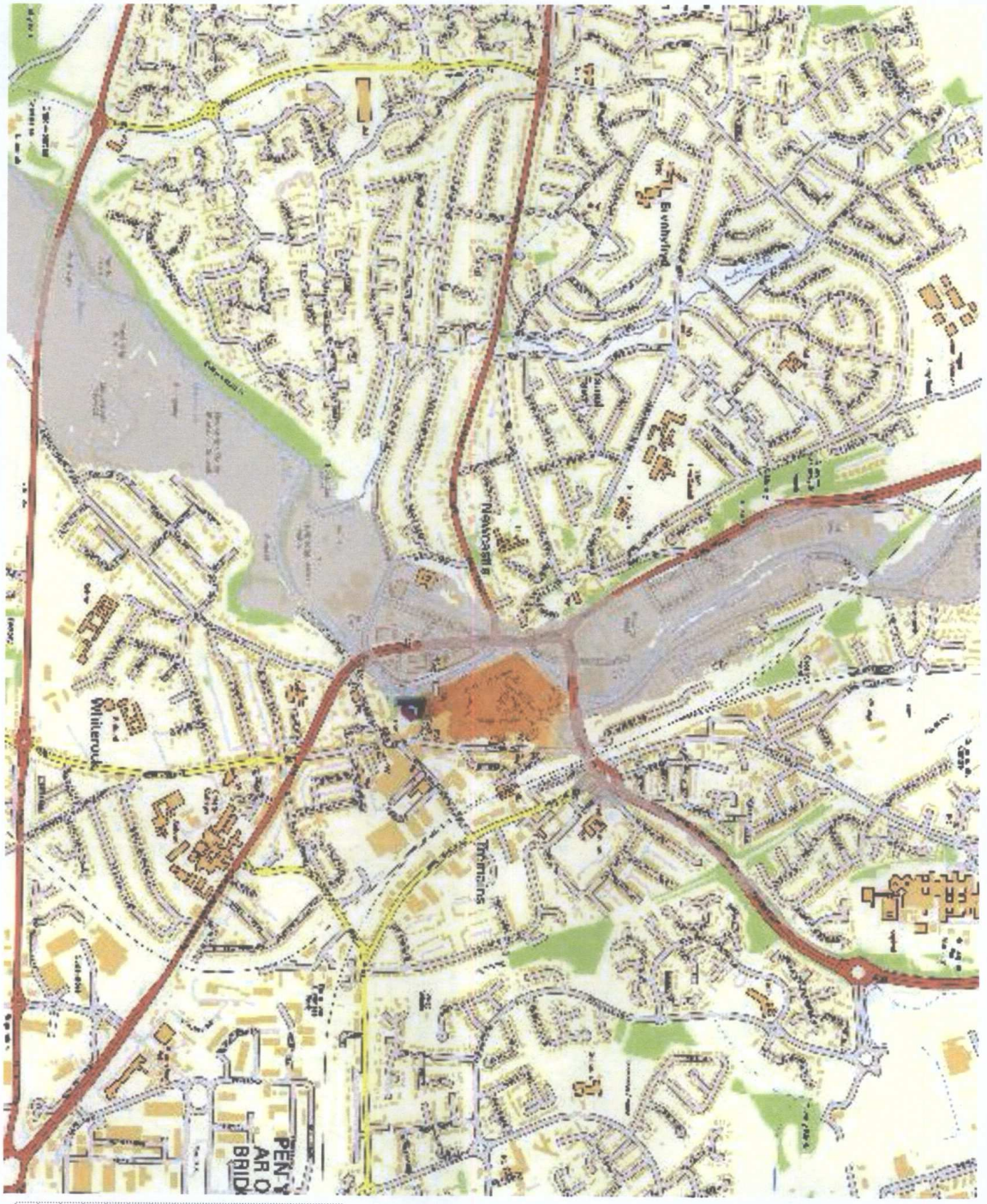


Figure 1 - Flood Difference Map Bridgend

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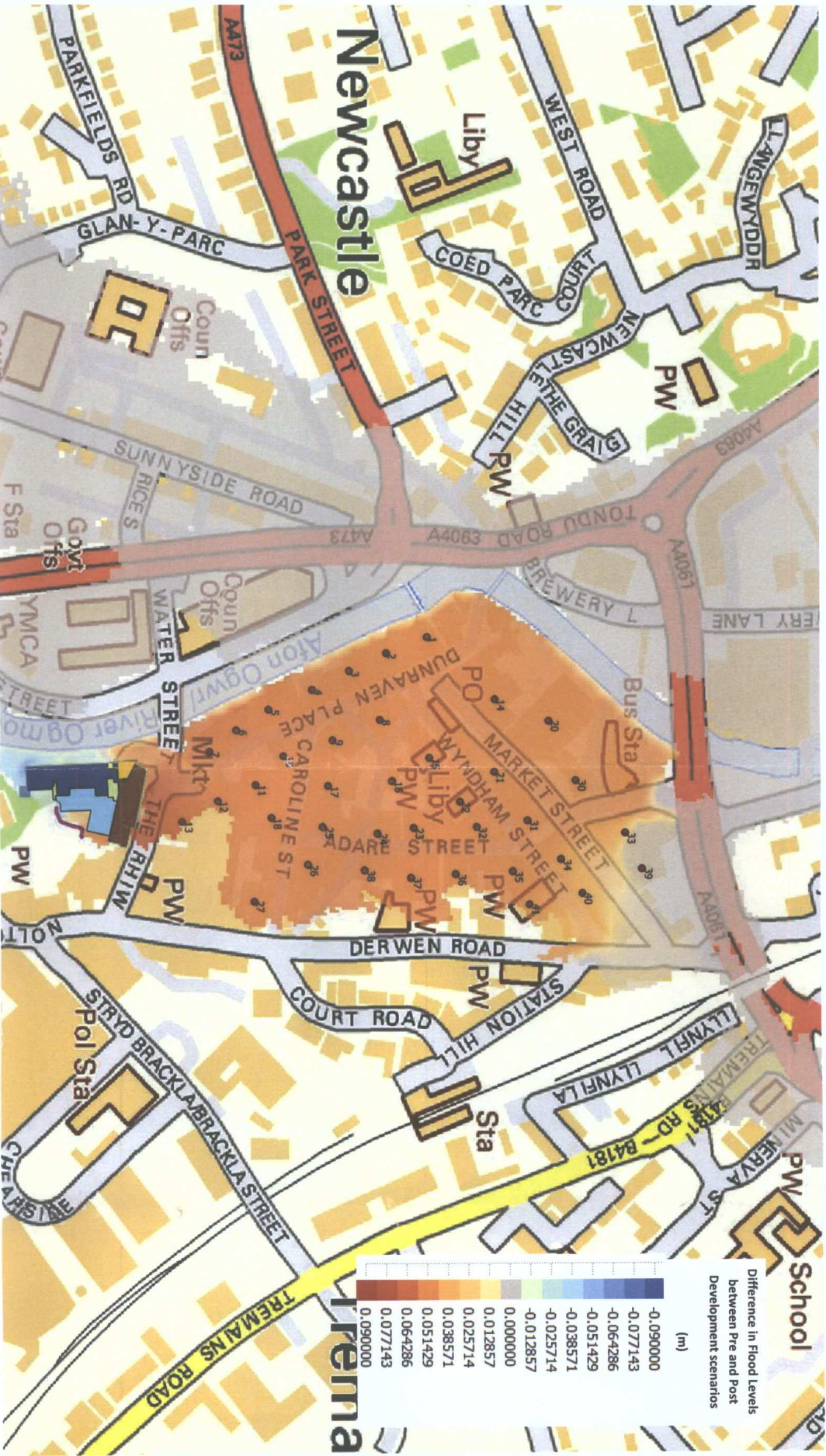


Figure 2 | Flood Difference Map The Rhiw

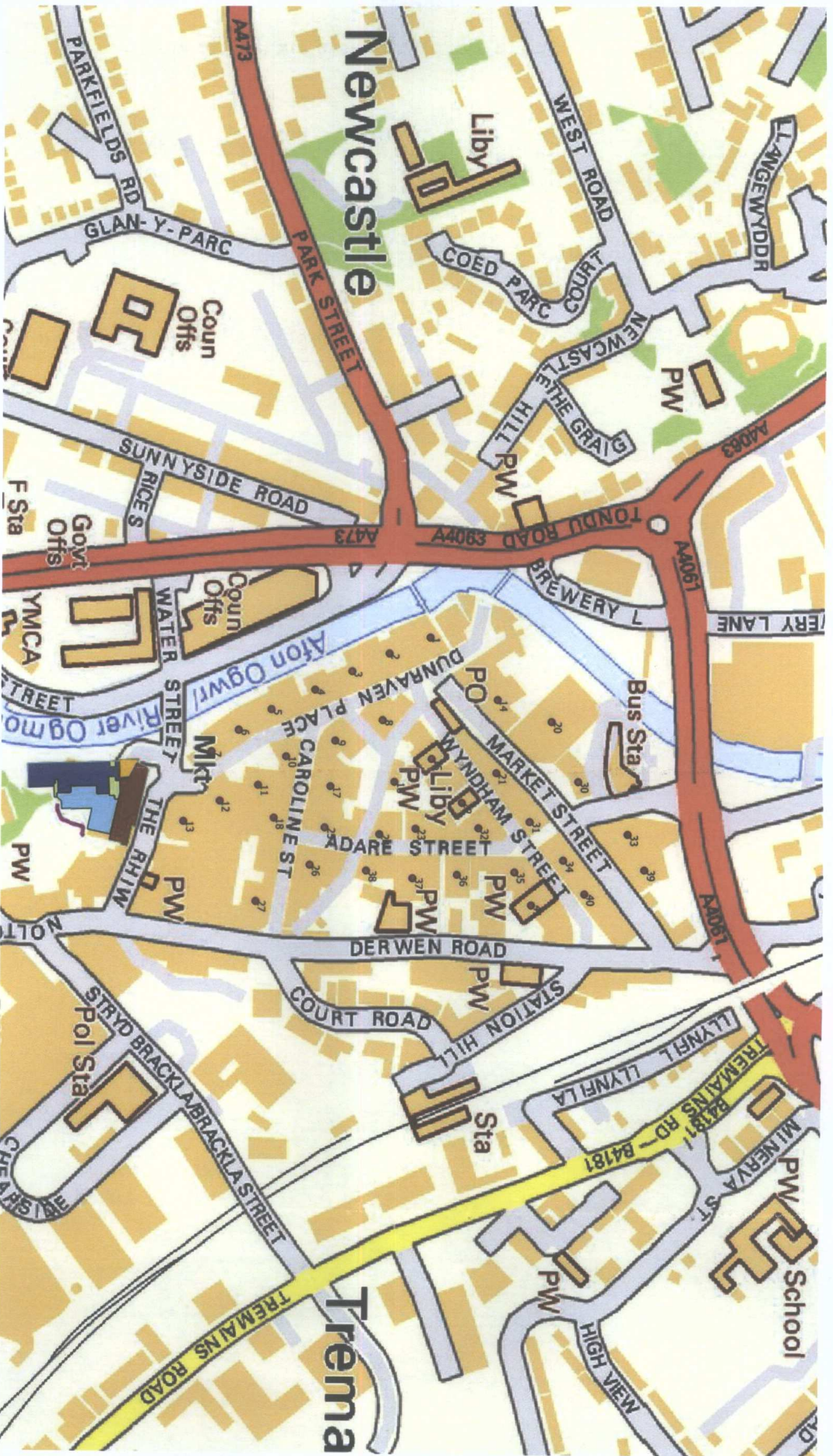


Figure 3 | Reference Properties

Table 1 \_ Flood Depth in Reference Properties Pre and Post Construction

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9	2.096	2.156	0.060
10	2.035	2.093	0.058
11	1.803	1.864	0.061
12	1.552	1.611	0.059
13	0.574	0.633	0.059
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22	1.526	1.583	0.057
23	1.715	1.779	0.064
24	1.609	1.669	0.060
25	1.952	2.011	0.059
26	2.007	2.052	0.045
27	1.67	1.742	0.072
30	0.618	0.665	0.047
31	0.928	0.983	0.055
32	1.401	1.457	0.056
33	0.229	0.248	0.019
34	0.794	0.842	0.048
35	1.156	1.21	0.054
36	0.702	0.759	0.057
37	1.423	1.481	0.058
38	1.785	1.843	0.058
39	0.431	0.435	0.004
40	0.682	0.721	0.039
41	0.524	0.57	0.046



Figure 4 | Preconstruction Flood Depth Map The Rhiw

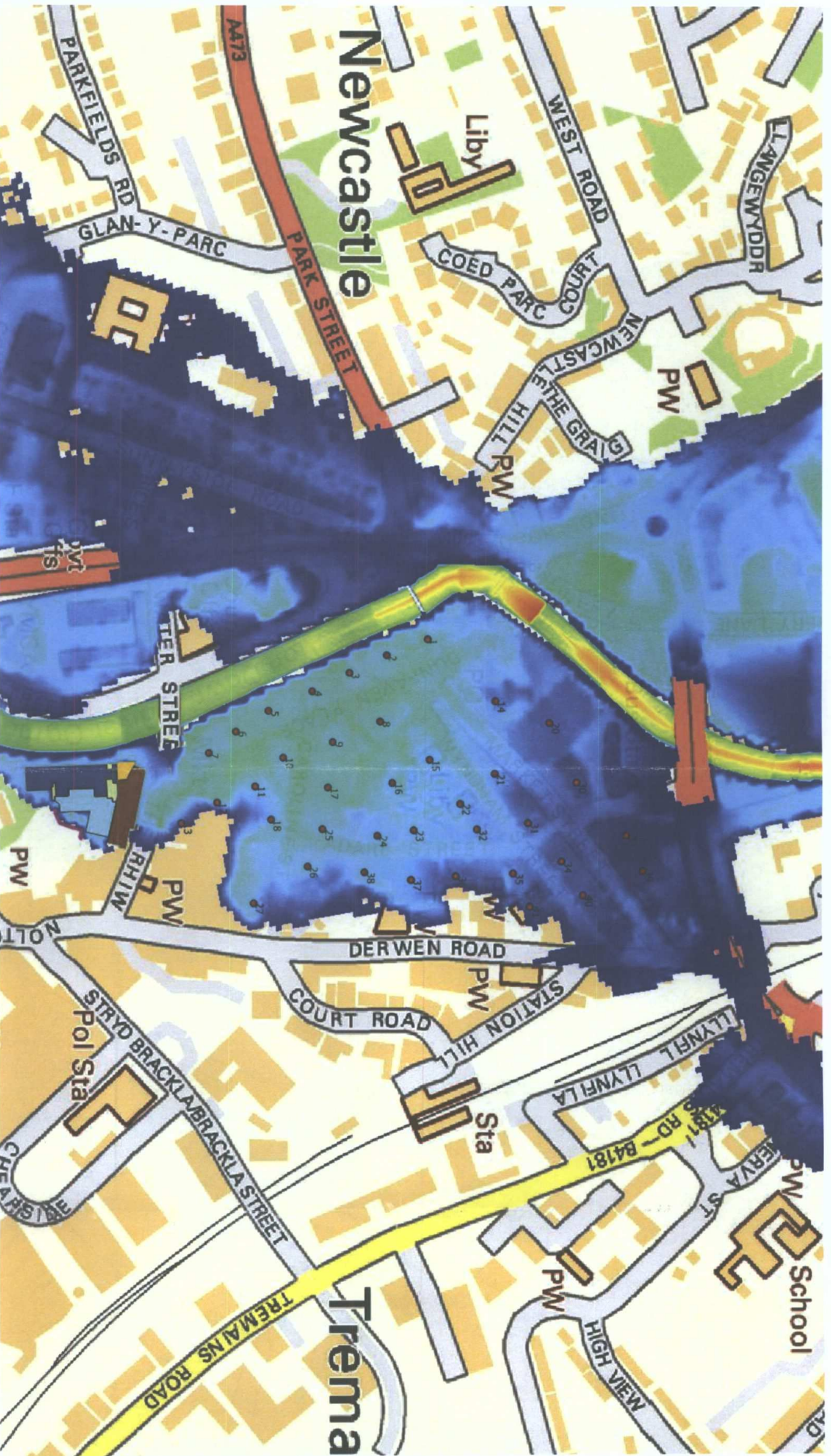


Figure S1 Post Construction Flood Depth Map The Rhiw



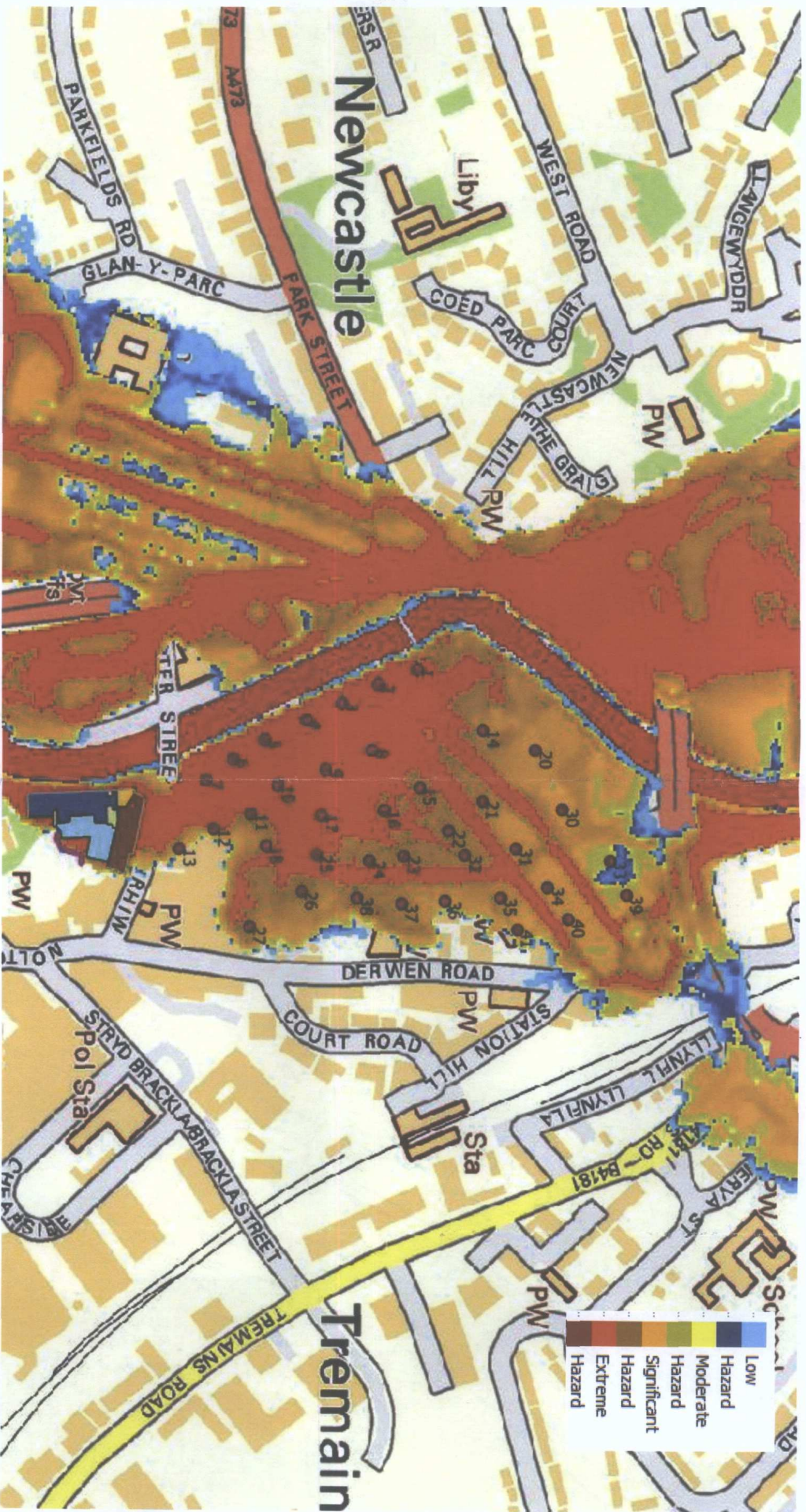


Figure 6 | Pre Construction Flood Hazard Map The Rhw

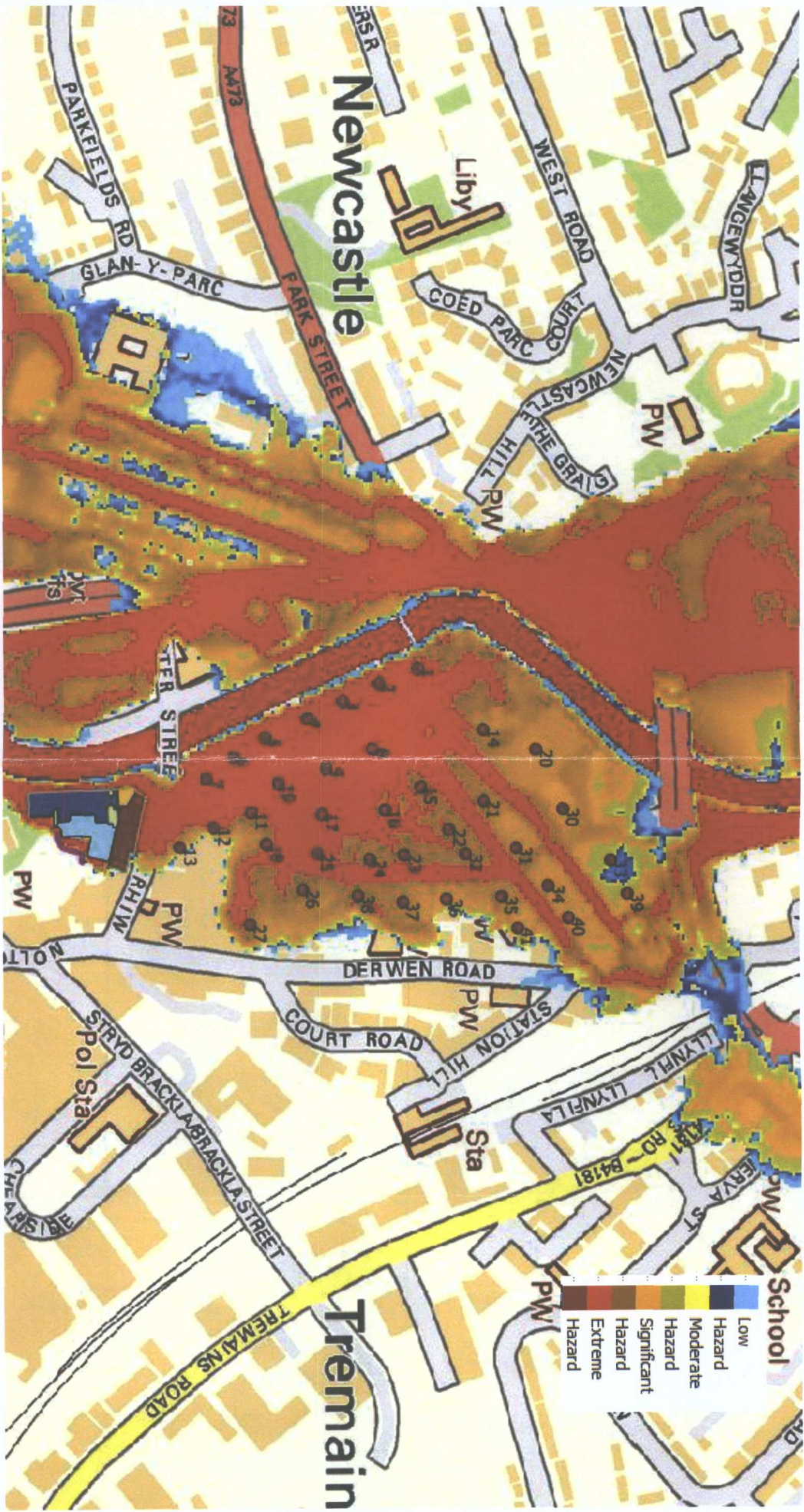


Figure 7 | Post-Construction Flood Hazard Map The Rhiw