

FloodSmart Plus



Flood Consequence Assessment

Site Address

Felin-Fach
Rhys-y-Garth
Powys
LD3 0NR

Date

2023-08-24

Report Status

FINAL

Site Area

0.06 ha

Report Reference

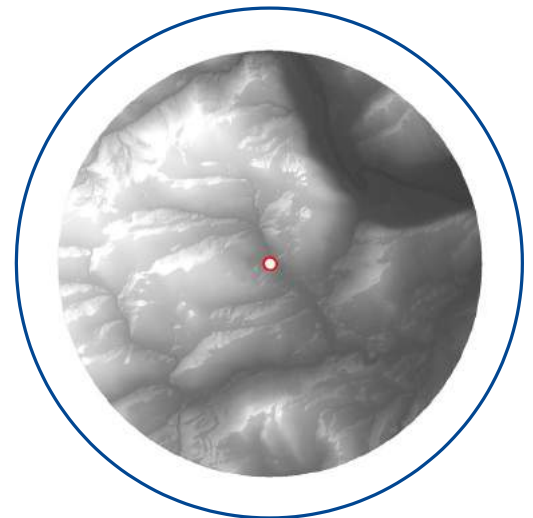
79957R1

Grid Reference

311076, 236383

Report Prepared for

Peter Weavers



RISK – Very Low to High

The Site is in Flood Zone 2 and Flood Zone 3, which equates to a Medium to High probability of flooding from rivers and the sea. However, flood modelling suggests that the risks from fluvial flooding are likely to be Very Low. Surface water (pluvial) flood risks are Low to High. Groundwater flood risks are Negligible and flooding risks from artificial sources (i.e., canals, reservoirs and sewers) are also Negligible. Mitigation measures are recommended in this report to reduce the risks to an acceptable level over the lifetime of the development.

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1. Executive summary



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

It should be noted that TAN15 (2004) is anticipated to be updated and a new Flood Map for Planning will be published at the same time to support this. The new Flood Map for Planning will supersede the NRW's Development Advice Map (DAM) and the conclusions of this report may change as a result. However, this is yet to be implemented and this report is based upon TAN15 (2004) and DAM.

Site analysis

Source of Flood Risk	Baseline ¹	After analysis ²	After Mitigation ³
River (fluvial) flooding*	Very Low	Very Low	N/A
Sea (coastal/tidal) flooding	Very Low	Very Low	N/A
Surface water and small watercourses flooding	Low to High	Low to High	Low
Groundwater flooding	Negligible	Negligible	N/A
Other flood risk factors present	No	No	N/A
Is any other further work recommended?	Yes	Yes	Yes (see below)

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of NRW flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys.

3 AFTER MITIGATION risks include risks to the proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

Summary of existing and proposed development

The wider Site area is in use as a dwelling with associated landscaping, car parking and a shepherd's hut to the north of the Site is used for holiday lettings. Site plans are included within Appendix A. The proposal is for the retention of the existing shepherd's hut, so no new building is proposed.

Summary of flood risks

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

River (fluvial) and Sea (Estuarine/Coastal) flooding

- According to EA's flood zone map, the Site is located between fluvial Flood Zone 2 and 3.
- The NRW's Development Advice Map (DAM) indicates that the Site is located within a DAM Zone A.
- The Site does not benefit from the presence of flood defences.
- According to the NRW's Flood Risk Assessment Wales (FRAW) map, which considers the type, condition and crest height of flood defences, the Site has a Very Low risk of flooding from the nearby watercourse, the River Triffwrdd. The risk of flooding from associated tributaries is included in the surface water section.
- Buildings and important features on the Site are outside the mapped flood extents.

Surface water (pluvial) flooding

- According to NRW's Flood Risk Assessment Wales (FRAW) mapping, the Site has a risk of flooding from surface water and small watercourses ranging from Low to High.
- Flooding depths from pluvial and small watercourses could be as high as 0.9m in comparison with ground levels, but this appears to be confined to the watercourse and/or the immediate floodplain. It is noted that the shepherd's hut is currently 1.4m uphill of the small watercourse and has raised floor levels 0.6m above ground level, mitigating the risk of pluvial flooding substantially.

Groundwater flooding

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

Artificial sources of flooding

- The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:
 - The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding.
 - Ordnance Survey (OS) data confirms there are no canals near to the Site.

The Strategic Flood Consequence Assessment (SFCA) (Powys County Council, 2012) confirms no recorded instances of sewer flooding at or within the vicinity of the Site. The risk of flooding from artificial sources is Negligible.

The risk to the development has been assessed over its expected 20-year lifetime, including appropriate allowances for the impacts of climate change which could increase the flood risk to the Site. Risks identified include increases in river flooding / and or increased potential for surface water / river flooding and appropriate mitigation measures are proposed.

Recommendations for flood mitigation are provided below, based upon the flood risk identified at the Site and TAN15 (2004) requirements for residential 'Highly Vulnerable' development:

- *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. In addition, for tidal breach flood events, an escape route should be practical in all conditions. Finish floor levels (FFL) of highly vulnerable developments should be set 0.30m above the maximum flood level.*
- **GeoSmart Comment:** Analysis of the Site demonstrates that the development would be flood free during a 1 in 100 year (fluvial) present day and future climate change events.
- *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).*

***GeoSmart Comment:** Analysis of the Site demonstrates that the access roads would be affected by flood depths of less than 0.6 m during a 1 in 1000-year fluvial event, thus satisfying the requirements of A1.15 of TAN15 (2004).*

Recommendations

Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site.

- As there is a risk of flooding from surface water and small watercourses, where flood depths could be up to 0.9 m in depth in the area proposed for development, Finished Floor Levels (FFL) of the proposed development should be set as high as possible. Standard flood resilient design measures should be incorporated. The current hut flooring is raised and uphill of the small watercourse.
- A Flood Warning and Evacuation Plan (FWEP) is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning.
- The ongoing management and maintenance of existing and any proposed drainage networks, under the riparian ownership of the developer, should be undertaken in perpetuity with the development.
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff over the lifetime of the proposed development.

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

2. Introduction



Background and purpose

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

This report has been prepared with reference to the Technical Advice Note (TAN) 15 (2004) which supplements the PPW (2021).

The general approach of PPW, supported by TAN15, 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 in high-risk areas (Zone C) only those developments which can be justified on the basis of the tests outlined in Section 6 and Section 7 are located within such areas.

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

Report scope

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

Information obtained from NRW and a review of the Powys Strategic Flood Consequence Assessment (SFCA) (Powys County Council, 2012) are 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 (2021).

The existing and future flood risk to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and mitigation measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the Site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site. A drainage strategy to control runoff can be commissioned separately if identified as a requirement within this report.

Report limitations

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

The basemap used is the OS Street View 1:10,000 scale; however, the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

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

Datasets

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

Table 1. Datasets consulted to inform sources of flooding and associated risks

Source of flooding	Commercial Flood Maps	Local Policy & Guidance Documents*	Natural Resources Wales + Climate Change Allowances (Appendix B)	OS Data
Historical	X	X	X	
River (fluvial) / Sea (tidal/coastal)	X	X	X	
Surface water (pluvial)	X	X	X	
Groundwater	X	X		

Source of flooding	Commercial Flood Maps	Local Policy & Guidance Documents*	Natural Resources Wales + Climate Change Allowances (Appendix B)	OS Data
Sewer		X		
Culvert/bridges		X		X
Reservoir		X	X	

*Local guidance and policy, referenced below, has been consulted to determine local flood conditions and requirements for flood mitigation measures.

Local policy and guidance

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

Powys Local Plan (Powys County Council, 2018)

Policies

Most settlements in Powys are in valleys close to rivers which are susceptible to flooding. New development must be directed away from areas at high risk from flooding and must not increase flood risk elsewhere, and where possible should aid the reduction or better management of existing flood risk for communities, infrastructure and businesses. Powys is also important as an upstream catchment for several major rivers including the Wye and Severn, providing for water storage and alleviating flooding downstream.

In areas identified at risk of flooding (fluvial, tidal, surface water and groundwater) or where a watercourse has insufficient channel capacity, opportunities to improve existing flood risk by using Sustainable Drainage Systems (SuDS), wetlands or other agreed and appropriate measures are investigated and implemented wherever possible.

Powys Strategic Flood Consequence Assessment (Powys CC, 2012):

Although TAN15 designates zone A as areas where there are likely to be little or no flood risk issues, some sites in zone A may have flood risk issues associated with them. Many sites in zone A may have a small drain flowing through them as well as potentially localised flood risk issues with no associated Flood Zone information. Some guidance for sites in zone A can be found below:

The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water runoff, with appropriate mitigating action, should be incorporated in the planning application. It may prove useful to include these in a Flood Consequences Assessment (FCA) for the site depending on the issues. This is required to demonstrate that runoff from the site is the same as in the predevelopment case thereby ensuring flood risk is not increased (though wherever possible, betterment should be achieved). This will involve the use of SuDS techniques which should take into account the local geological and groundwater conditions. Where possible these should be strategic SuDS. Space should also be set-aside for SuDS at the master planning stage.

Where a small watercourse or drain, with no Flood Zone information, either runs through the site or follows the boundary of the site, a development easement from the top of bank should be applied. The exact distance of the easement should be discussed with the Environment Agency Wales, but should typically be 8m, to allow appropriate access for routine maintenance and emergency clearance. Early engagement with the Lead Local Flood risk authority is advised.

Guidance

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



Site information

The Site is located in Llandefalle, Powys in a setting of agricultural and residential land use at National Grid Reference SO 11076 36383.

Figure 1. Aerial imagery of the Site (Bluesky, 2023)

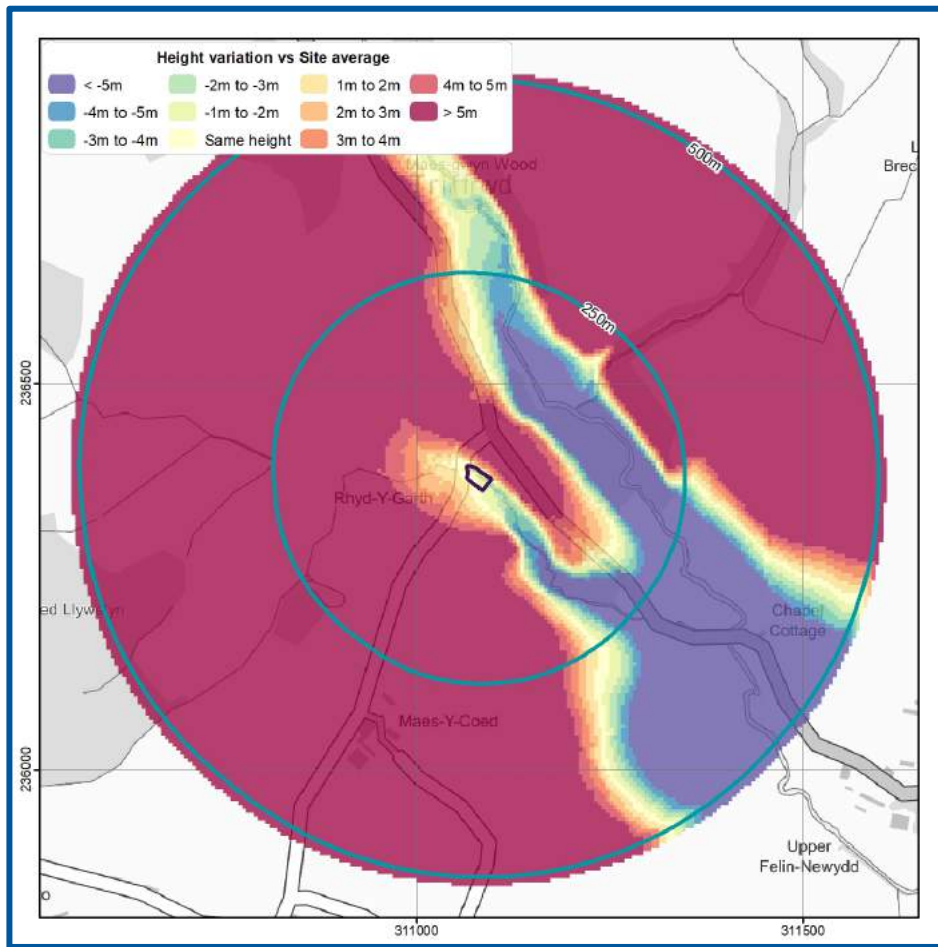


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Figure 2 indicates ground levels within 500m of the Site rise and fall, with significant undulations owing to the elevated nature of the nearby topography.

The general ground levels on-Site are between 178.1 mAOD and 180.1 mAOD, with the Site falling gradually in an easterly direction. This is based on NRW elevation data obtained for the Site to a 2 m resolution with a vertical accuracy of ± 0.15 m (Appendix A).

Figure 2. Site Location and Relative Elevations (GeoSmart, 2023)



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Development

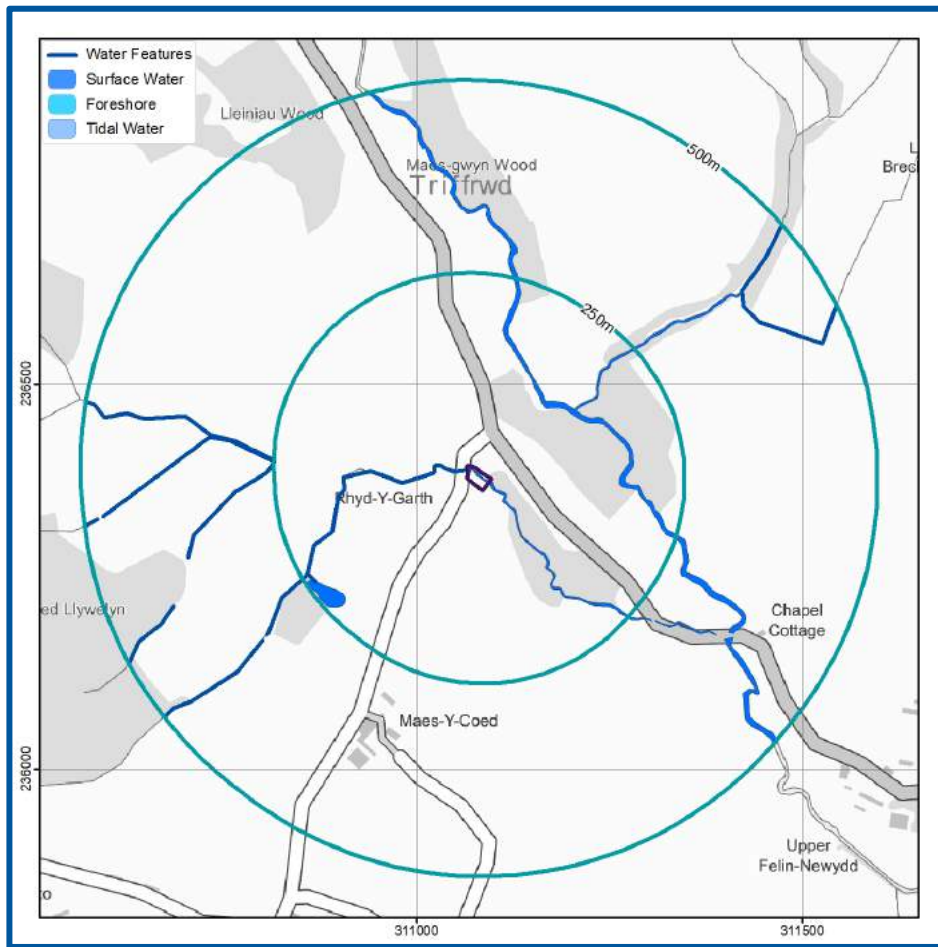
The wider Site area is in use as a dwelling with associated landscaping, car parking and a shepherd's hut to the north of the Site is used for holiday lettings. Site plans are included within Appendix A. The proposal is the retention of the existing shepherd's hut, so no new building is proposed.

The effect of the overall development will not result in an increase in number of occupants and/or users of the building and will not result in the change of use, nature or times of occupation. According to Table 2 of the NPPG (2014), the vulnerability classification of the existing development is Highly Vulnerable and proposed development is Highly Vulnerable. The estimated lifespan of the development is 20 years.

Hydrological features

According to Ordnance Survey (OS) mapping included in the following figure, there are numerous surface water features within 500 m of the Site.

Figure 3. Surface water features (OS, 2023)



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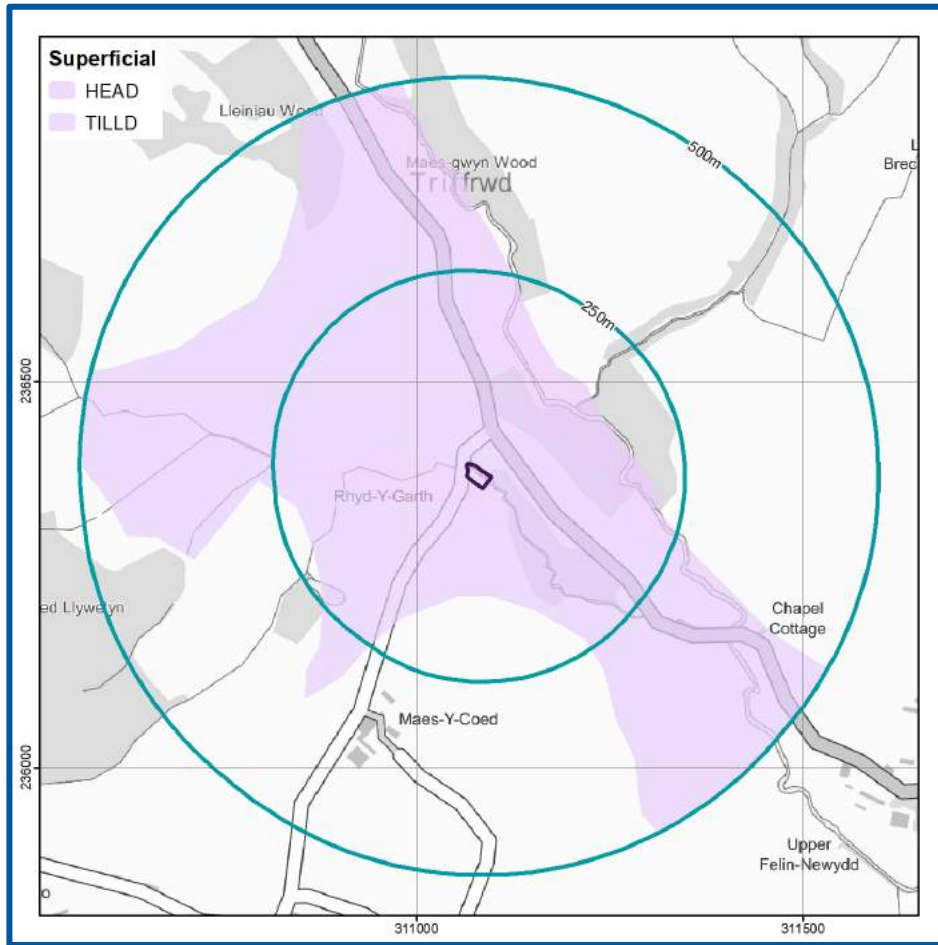
The River Triffrwd is located approximately 180 m to the north-east of the Site, at a lower elevation than the Site. An associated tributary, which joins the River Triffrwd c. 375 m to the southeast of the Site, passes directly through the Site.

A pond is situated approximately 250 m southwest from the Site.

Hydrogeological features

British Geological Survey (BGS) mapping indicates the underlying superficial geology (Figure 3) consists of Head (HEAD), which is classified as a Secondary (A) Aquifer (BGS, 2023).

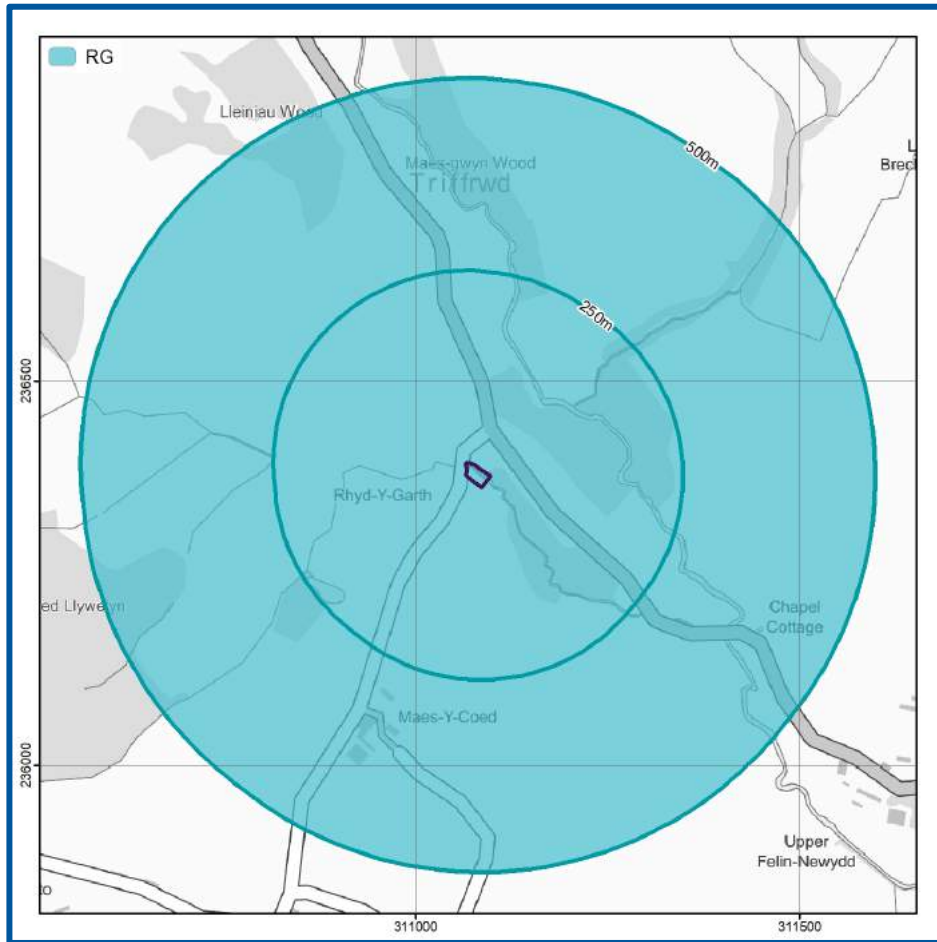
Figure 4. Superficial Geology (BGS, 2023)



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BGS mapping indicates the underlying bedrock geology (Figure 4) consists of the Raglan Mudstone Formation (RG), which is classified as a Secondary (A) Aquifer (BGS, 2023).

Figure 5. Bedrock Geology (BGS, 2023)



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Geological conditions

A review of the BGS borehole database (BGS, 2023) indicates there are no relevant boreholes within the vicinity of the Site from which the mapped geology can be confirmed.

4. Flood risk to the development

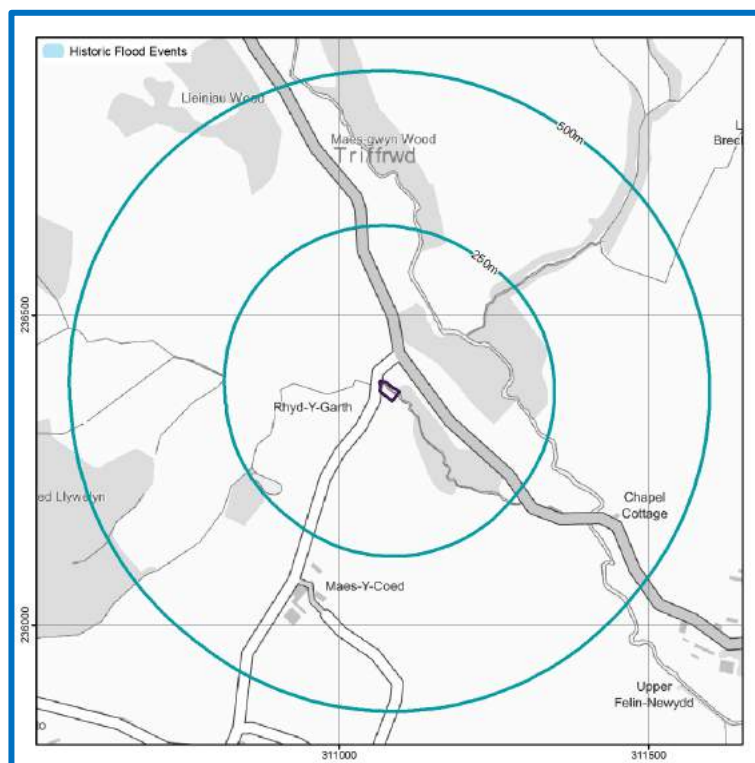


Historical flood events

According to the NRW's Recorded Flood Extents Map (Figure 6) and the Powys SFCA (2012), no historical flood events have been recorded at the Site (NRW, 2023).

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

Figure 6. Historical Flood Event Outline (NRW, 2023)



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

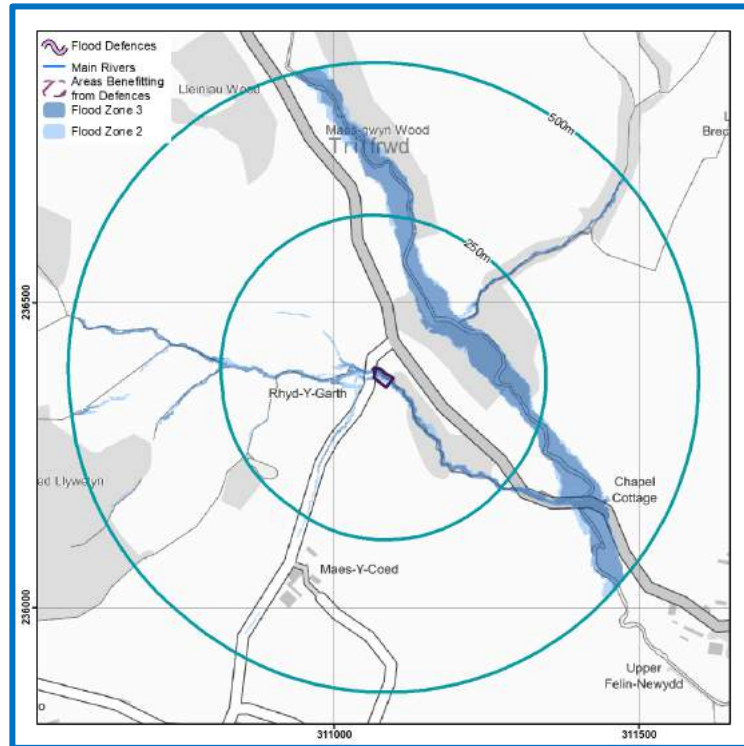
The predominant risk at the Site is from flooding from rivers, termed as fluvial flooding. The Site is located in an inland location and the risk of flooding from coastal and tidal processes are therefore considered to be Negligible.

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

Flood Zones Map

According to the NRW's Flood Map for Planning (Figure 7), the Site is located on the boundary of a Flood Zone 2 and 3 and is therefore classified as having a Medium to High probability of fluvial flooding from the River Triffrwd and associated small watercourses.

Figure 7. NRW Flood Zone mapping (NRW, 2023)



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Please note that Flood Zones 1 to 3 are not presently used for planning purposes, but instead provide an indicative extent for the 1 in 100 year / 1 in 200 year and 1 in 1000 year fluvial and tidal events, respectively.

The above Flood Zones will become live once the revised version of TAN15 is published later in 2023. The Development Advice Map (DAM) is currently the most up to date mapping for planning purposes in line with TAN15 (2004).

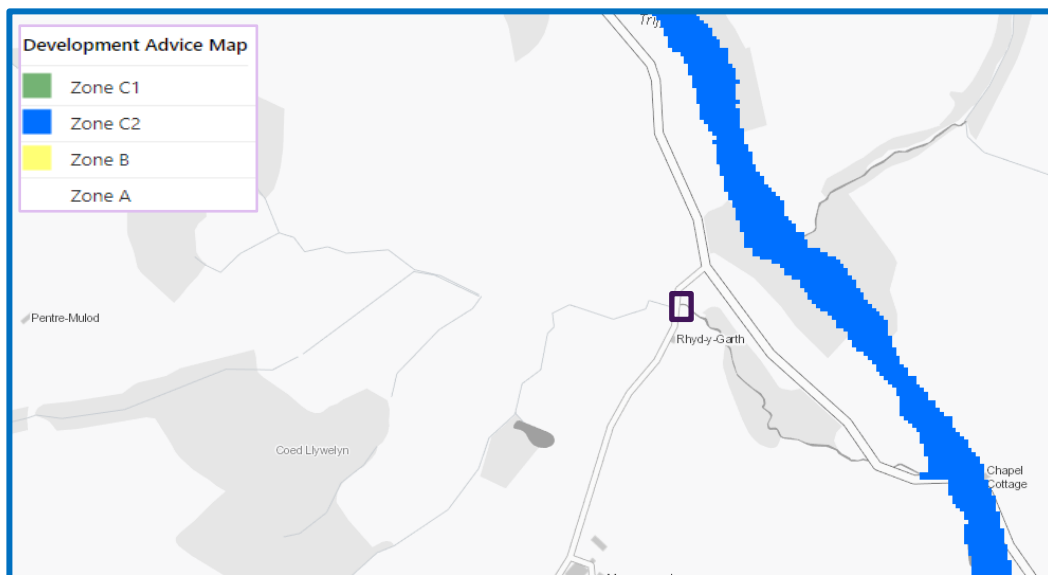
Development Advice Map

The NRW's Development Advice Map (DAM) indicates that the Site is located within DAM Zone A (TAN15, 2004).

Table 1. Development Advice Map Classification

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

Figure 8. Development Advice Map (NRW, 2023)



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Flood defences

Guidance

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

Existing flood defences

- According to NRW's Flood Map for Planning (Figure 7), the Site is not located within a TAN15 Defended Zone for fluvial flooding, which provides a 1 in 200-year standard of protection.
- There are no proposed flood defences within 500 m of the Site.
- The Site is not located in an area benefiting from flood defences.

Flood Risk including the benefit of defences

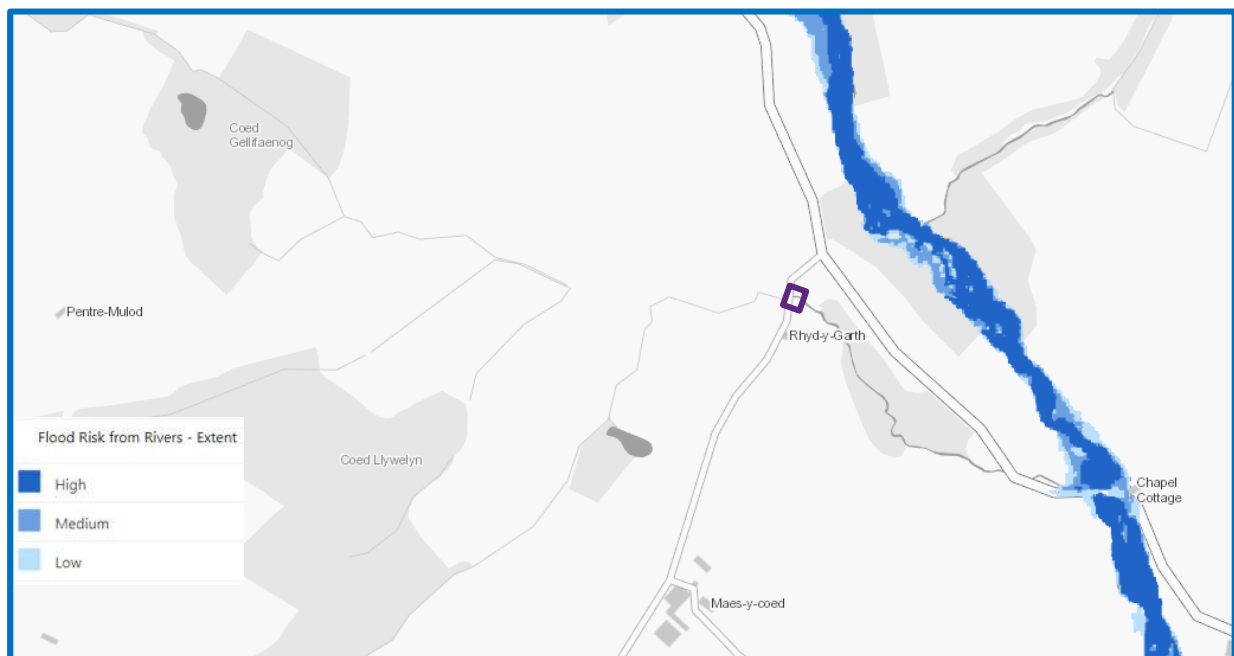
The Flood Risk Assessment Wales (FRAW) maps were published in the Summer of 2020.

The FRAW mapping includes consideration of flood defences that have been built to protect against flooding from rivers and the sea. The defences shown provide different levels of flood protection and this is recognised in the risk classification shown in the Flood Risk Assessment Wales (FRAW) map.

The FRAW maps indicate:

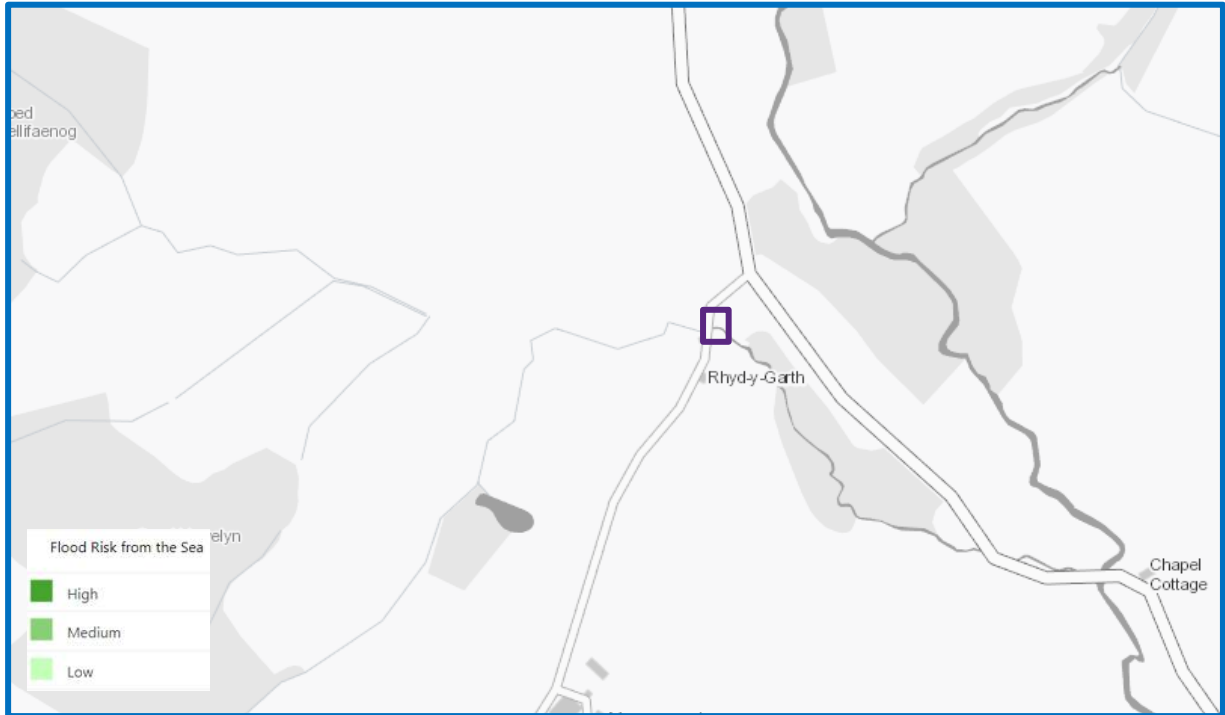
- The risk from Rivers is Very Low (see Figure 9).
- The risk from the Sea is Very Low (see Figure 10).
- The risk from Surface Water and Small Watercourses is High (see Figure 11).

Figure 9. Rivers – FRAW Risk Map (NRW 2023)



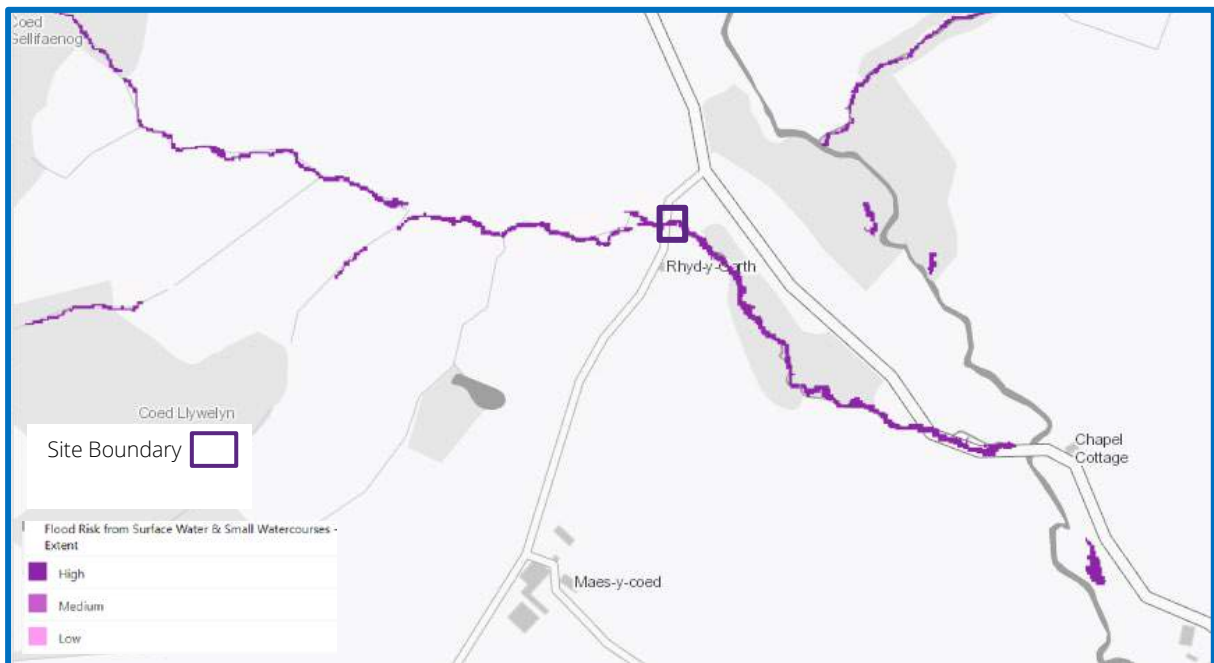
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Figure 10. Sea – FRAW Risk Map (NRW 2023)



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Figure 11. Surface Water and Small Watercourses – FRAW Risk Map (NRW 2023)



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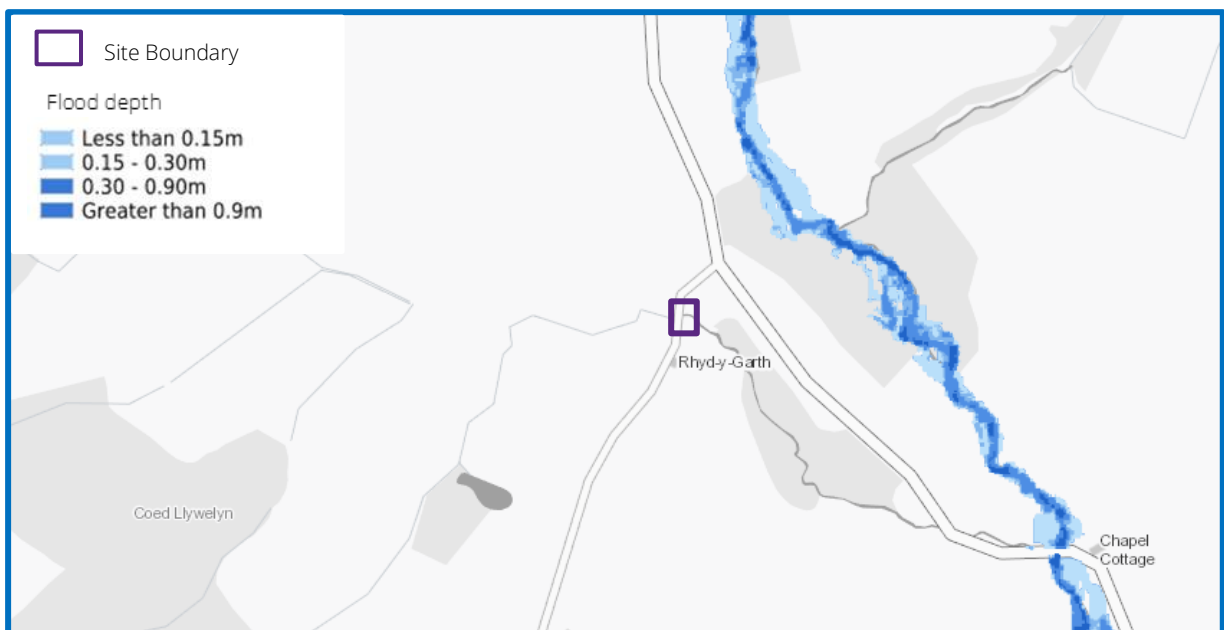
National Flood Hazard Maps

The National Flood Hazard (NFH) maps were published in the Summer of 2020, these show results for an undefended scenario which means the modelling and mapping process explicitly excluded any flood defences.

NFH maps have been included in order to understand the risk of flooding in a worst-case undefended scenario. As the Site does not benefit from defences, the risk shown by the NFH maps would be representative of the risks for the Site.

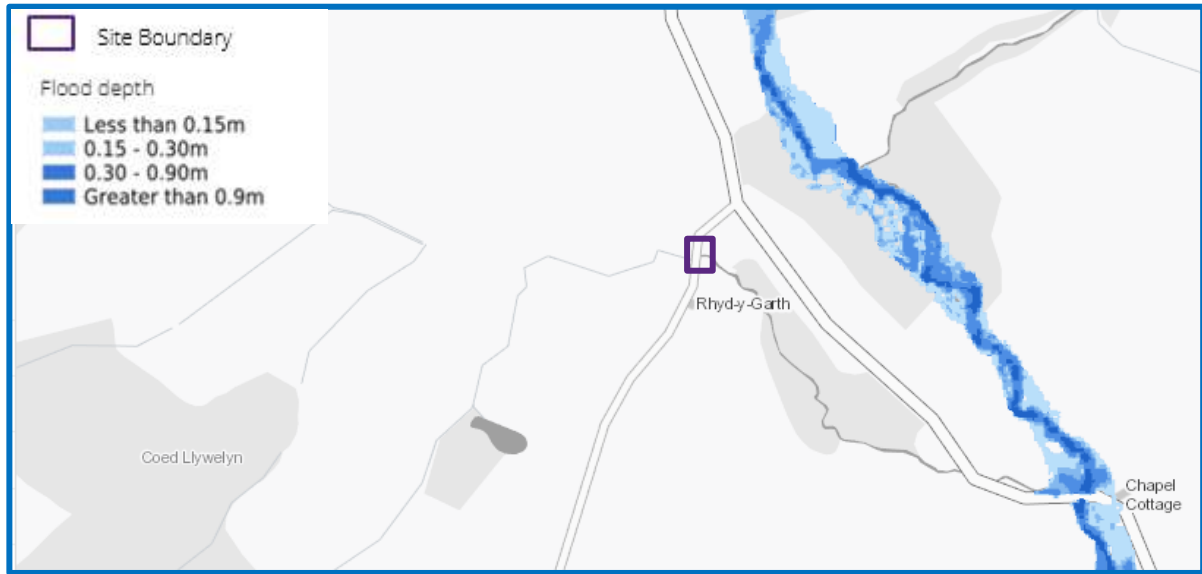
National Flood Hazard – Fluvial Flood Risk

Figure 12. 1 in 30-year (High risk) map for river flooding (NRW, 2023)



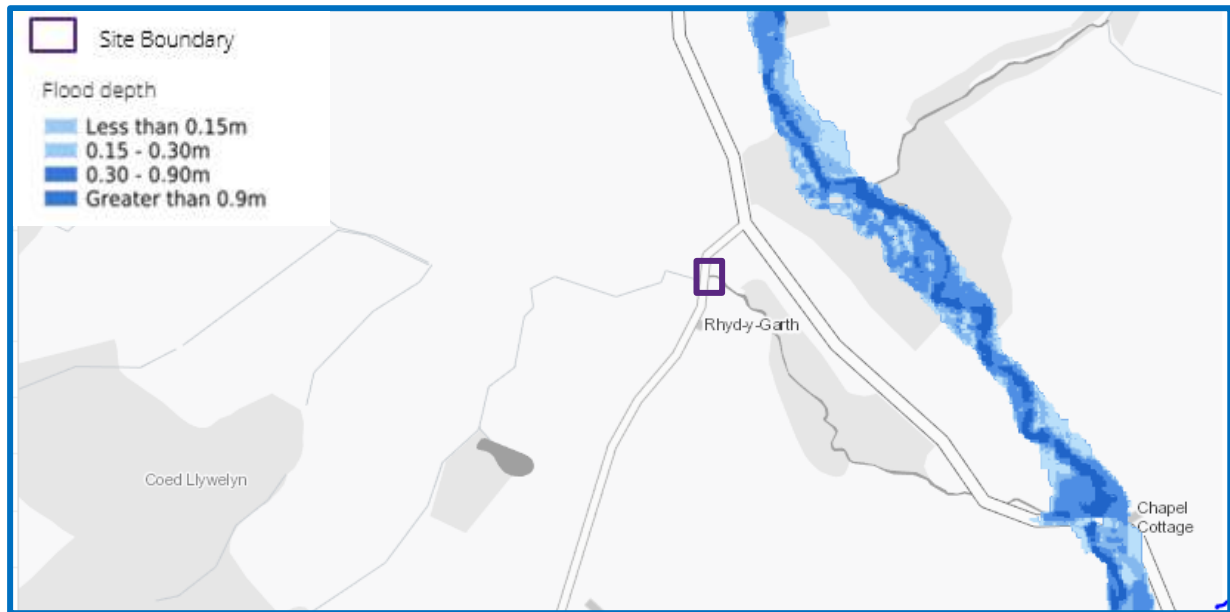
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Figure 13. 1 in 100-year (Medium risk) map for river flooding (NRW, 2023)



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Figure 14. 1 in 1000-year (Low risk) map for river flooding (NRW, 2023)

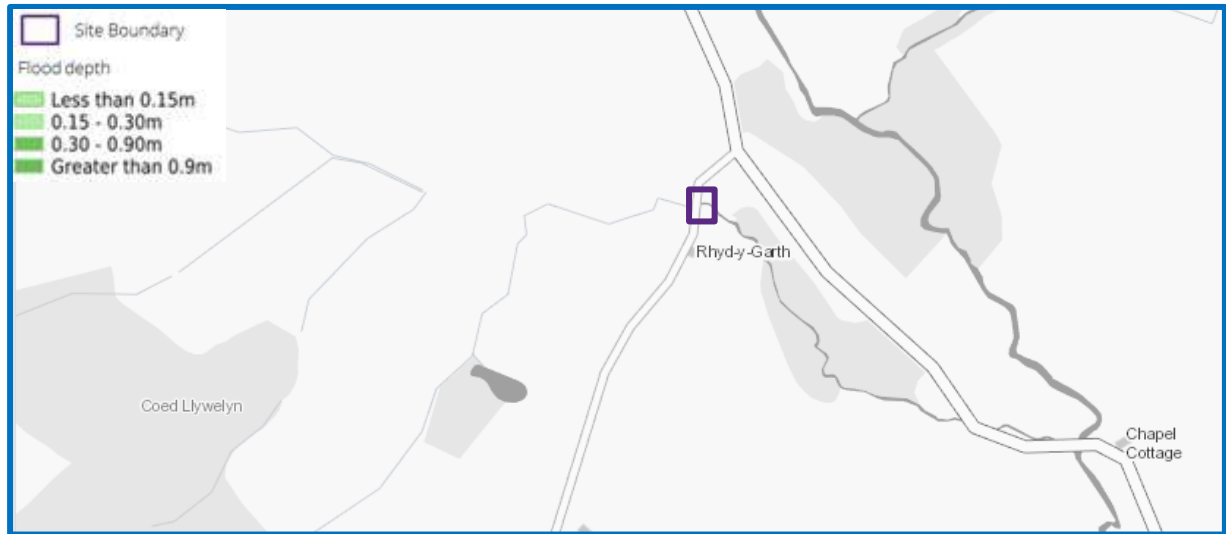


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The fluvial flood risk maps demonstrate that the Site would not be affected by flooding during a 1 in 1000-year event.

National Flood Hazard – Tidal Flood Risk

Figure 15. 1 in 1000 year (Low risk) map for tidal flooding (NRW, 2023)



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The tidal flood risk maps demonstrate that the Site would not be affected by flooding from the 1 in 1000 event.

Model data Fluvial

The NRW's modelled flood data was requested on the 19th of July 2023. The NRW responded on 11th of August 2023 stating the following:

“Further to your recent request, I’m afraid this site lies outside of our flood outlines and is not in the flood map therefore we have no data for this site. Apologies that we could be of no further assistance at this time”.

JFLOW modelling

The modelled fluvial flood depth data was created for the 1% and 0.1% annual chance of flooding situations and was produced as a by-product from the 2004 generalised modelling project in 2004, using JFLOW modelling. The purpose of the generalised modelling project was to fill the gaps where there was no detailed local modelled data in 2004, in order to define the extents of Flood Zones for spatial planning. A two-dimensional hydrodynamic model called JFLOW was used to produce this modelled fluvial flood depth data on a 5x5m grid.

Since 2004, local detailed modelling has been used to replace this generalised modelling in many areas to define the extents of Flood Zones. However, the JFLOW dataset in this location has not been updated.

JFLOW was used to produce flood maps for the whole of England and Wales for all catchments greater than 3 sq km in a consistent manner. The method is therefore very generalised and therefore cannot take account of information that may be very significant locally. This might include:

1. Effects of bridges and other structures including flood defences are not taken into account.
2. Errors in the DTM, caused by trees and buildings for example.
3. The effect of reservoirs and urban drainage and other man-made influences on the flow regime can only be taken into account in a very general sense in JFLOW.
4. The channel is assumed to be able to take the 2 year flow. This may not be true especially in those modified by man.
5. Hydraulic roughness is assumed to be the same everywhere in JFLOW, but of course it is not.

Considering the above, and given that there is no detailed modelling included within the SFCA, to estimate flood levels at the Site, the NRW's 2m LiDAR data has been compared with the NRW's Flood Zones.

The 2m LiDAR data has been classified and the highest elevation on the extent of the Flood Zone 3 and 2 has been used to form the basis for the 1 in 100 year and 1 in 1000-year flood events respectively¹. The following flood levels have been estimated for the Site, using the method described above:

Table 1. Estimated flood levels using LiDAR data

Ground levels on-Site (mAOD)	Estimated Modelled Flood Levels (mAOD)	
	1 in 100-year event	1 in 1000-year event
178.1 to 180.1	175.7	180.1
Estimated Flood depths (m)	No flooding	0.0 to 2.0

Climate change factors

In accordance with the Welsh Government's Climate Flood Consequences Assessments: Climate change allowances guidance (2021), allowances should be made for the impact of increased river and sea levels and flows to the proposed development.

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

¹ As the calculated flood elevation is based on LiDAR the accuracy of the calculated level is +/- 0.15m.

As the Site is located within the River Severn Basin and the proposed development is classed as Highly Vulnerable, where the proposed lifespan is 100 years, although the expected lifetime is significantly less (20 years) the Central (25%) allowances have been used to determine a suitable climate change factor to apply to river data.

Table 2. Flood levels plus climate change allowances*

Ground levels in area proposed for development (mAOD)	Modelled Flood Levels (mAOD)	
	1 in 100 years plus 20% 2050 central allowance for climate change flood level (mAOD)	1 in 100 year plus 25% 2080 central allowance for climate change flood level (mAOD)
178.1 to 180.1	177.7	178.1
Flood depths (m)	No flooding	0.0

* The Flood Zones of which flooding depths were estimated have an allowance for climate change applied to them, however it is unknown what allowance has been applied. Therefore, these figures are calculated using the appropriate climate change allowance with the additional unknown NRW climate change allowance. It is therefore likely that these flood depths are an overestimate.

Surface water (pluvial) flooding

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

The SFCA does not indicate reported incidents of historical surface water flooding within 100 m of the Site (Powys County Council, 2012). The SFRA indicates that historical flooding is recorded using the Environment Agency Historical Flood Map.

According to the National Flood Hazard Map's Flood Risk from Surface Water and Small Watercourses flood mapping (Figures 16 to 18), the Site is at a variable risk of pluvial flooding ranging from Low to High.

Figure 16. NRW Low surface water risk Hazard map (NRW, 2023)



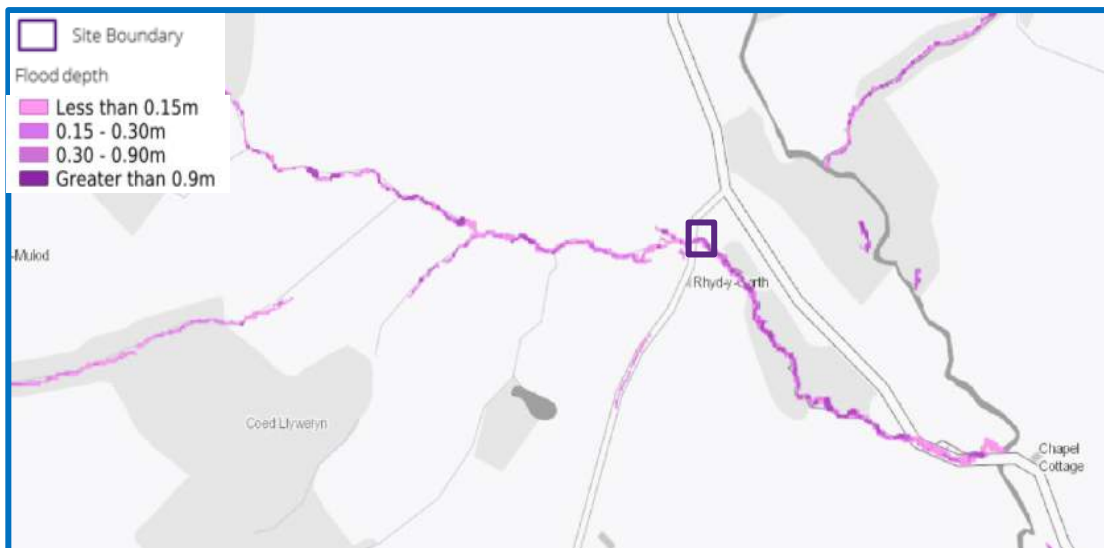
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Figure 17. NRW Medium surface water risk Hazard map (NRW, 2023)



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Figure 18. NRW High surface water risk Hazard map (NRW, 2023)



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Guidance

According to NRW's surface water flood risk map the Site is at:

- Low risk - chance of flooding of between a 1 in 1000 & 1 in 100 (0.1% and 1%).
- Medium risk - chance of flooding of between a 1 in 100 and 1 in 30 (1% and 3.3%).
- High risk - chance of flooding of greater than 1 in 30 (3.3%).

Figures 16 to 18 illustrate the extent and depth of flooding during various modelled flood scenarios. Flooding depths of greater than 0.9 m would impact the area proposed for development in the >3.3% (High) risk event, although this appears to be contained to the riparian zone and watercourse. The property also demonstrates high resilience to flood risk, as it placed uphill of the surface watercourse and has significantly raised floor levels.

Guidance

According to NRW's surface water flood risk mapping the following advisory guidance applies to the Site:

Flood Depths:

- 0.15 to 0.3 m – Flooding would: typically exceed kerb height, likely exceed the level of a damp-proof course, cause property flooding in some areas.
- 0.3 to 0.9 m – Flooding is likely to exceed average property threshold levels and cause internal flooding. Resilience measures are typically effective up to a water depth of 0.6 m above floor level.
- >0.9 m Very likely to exceed the maximum flood depth where property-level flood resilience measures are still effective.

Climate change may lead to an increase in rainfall intensity which affects river levels, land and urban drainage systems. Rainfall intensity for small and urban catchments may increase from 5% to 20% (central estimate) or 10% to 40% (upper estimate) over the period to 2115 (NRW, 2023).

The 1 in 1000-year event has been used as a proxy to account for the 40% Upper End Climate Change Allowance.

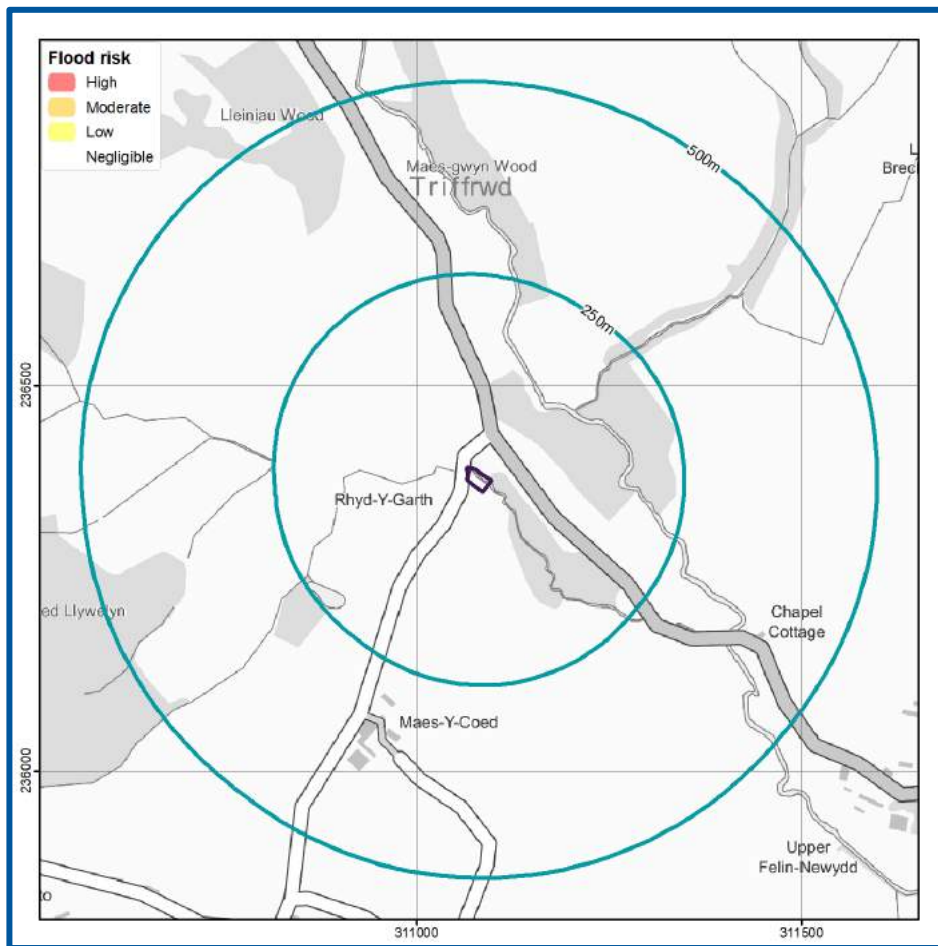
Any existing and proposed on-Site surface water drainage systems should be designed and maintained appropriately to manage the run-off over the lifetime of the proposed development.

Groundwater flooding

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

Groundwater Flood Risk screening data (Figure 19) indicates there is a Negligible risk of groundwater flooding at surface in the vicinity from permeable superficial deposits during a 1 in 100-year event.

Figure 19. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2023)



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

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

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

It is understood there are no existing basements, and a basement is not proposed as part of the development.

According to a review of the local hydrogeological setting, the Site is underlain by superficial and bedrock deposits of low to moderate permeability (both Secondary A Aquifers). There is therefore the potential for an aquifer(s) to be present beneath the Site which could potentially offer a mechanism for groundwater flooding at the Site.

Groundwater levels may rise in the superficial aquifer in response to high river events due to the potential hydraulic continuity with the on-Site water course.

Despite the presence of underlying aquifers, the Site would only be at risk of groundwater flooding if the water table reaches the base of the Site development or the ground surface when groundwater seepage could lead to overland flow and ponding.

There are no nearby BGS boreholes from which the underlying groundwater depth can be inferred.

Spring lines have not been identified in close proximity to the Site.

The baseline groundwater flood risk rating is Negligible, but on the basis of the site-specific assessment the groundwater flood risk is considered to remain as Negligible.

Guidance

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

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

significant distance inland and affect infrastructure previously constructed above average groundwater levels.

The impact of climate change on groundwater levels beneath the Site is linked to the variation in rainfall recharge which is uncertain, and the rise in peak river flows adjacent to site.

Flooding from artificial sources

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

Sewer flooding

The SFCA does not include any information regarding flooding events from sewers (Powys County Council, 2012) local to the Site.

Guidance

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

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

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

Culverts and bridges

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

other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

Culverts and bridges have not been identified within 50 m of the Site.

Reservoir flooding

According to the NRW's Flood Risk from Reservoirs mapping the Site is not at risk of flooding from reservoirs (Figure 20) (NRW, 2023).

Figure 20. NRW Flood Risk from Reservoirs Flooding (NRW, 2023)



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Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m³ of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (NRW, 2023).

5. Flood risk from the development



Floodplain storage

Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked.

The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.

The development is located within a fluvial Flood Zone 2 and 3 but does not involve an increase in building footprint as the shepherd's hut is already present. Therefore, there would be no displacement of flood water and compensatory flood storage is not required.

Drainage and run-off

The development proposals are for an existing site and will not involve the alteration of any external features (or any changes to existing impermeable and permeable areas), an estimation of surface water runoff is not considered necessary.

Any changes to the existing drainage system will be undertaken in accordance with best practice and care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site.

The PPW (2021) recommends the effects of climate change are incorporated into FRA's and the recently updated climate change guidance (published in 2016 and updated in 2021) confirms the requirements for inclusion within FRA's.

As the proposed development is residential, the lifespan of the development and requirements for climate change should allow up to the 2115 scenario.

Table 3. Climate change rainfall allowances

Severn river basin district	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end	25%	40%	70%
Central	10%	20%	25%

A separate assessment of surface water runoff may be required, as the Statutory requirements in Wales are to include a SuDS strategy, where development proposals are greater than 100 m² in size. This is to ensure surface water runoff is managed in accordance with the Welsh Statutory requirements over the lifetime of the proposed development. The shepherd's hut is less than 100m² in size.

Sustainable Drainage System (SuDS)

It is recommended that attenuation of run-off is undertaken on-Site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision of storage within a Sustainable Drainage System (SuDS). SuDS can deliver benefits from improving the management of water quantity, water quality, biodiversity and amenity. Potential SuDS options are presented in the table below, subject to further investigation:

Table 4. SuDS features which may be feasible for the Site

Option	Description
Rainwater harvesting	Rainwater harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.
Permeable paving	Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.
Swales	Shallow, wide and vegetated channels that can store excess run-off whilst removing any pollutants.

Option	Description
Soakaways	An excavation filled with gravel within the Site. Surface water run-off is piped to the soakaway.

6. Suitability of the proposed development



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

National policy and guidance

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

Guidance

Justification Test: New developments should be directed away from Zone C and towards suitable land in Zone A, or 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.

The proposed Site use is residential and is classified as “Highly Vulnerable” development. The Site is located with the Development Advice Map (DAM) Zone A.

Table 5. Flood risk vulnerability and flood zone compatibility (taken from TAN15, 2004)

DAM Zone	Development Type	Planning Requirements	Acceptability Criteria	Development Advice
A	Emergency Services, highly vulnerable development, less vulnerable development, other	<ul style="list-style-type: none"> Justification test not applicable Refer to surface water requirements 	No increase in flooding elsewhere	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere
B	Emergency services & Highly vulnerable development	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Acceptable consequences for nature of use Occupiers aware of flood risk Escape/Evacuation routes present Effective flood warning provided Flood emergency plans and procedures Flood resistant design No increase in flooding elsewhere 	Generally suitable for most forms of development. Assessments where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.
	Less vulnerable development	Refer to surface water requirements	<ul style="list-style-type: none"> Occupiers aware of flood risk No increase in flooding elsewhere 	
	Other	Refer to surface water requirements	No increase in flooding elsewhere	
C1	Emergency services, highly vulnerable development, less vulnerable development	<ul style="list-style-type: none"> Application of justification test including acceptability of consequences Refer to surface water requirements 	<ul style="list-style-type: none"> Acceptable consequences for nature of use Flood defences adequate Agreement for construction and maintenance costs secured Occupiers aware of flood risk 	Plan allocations and applications for all development can only proceed subject to justification in accordance to section 6 of TAN 15 and acceptability of

			<ul style="list-style-type: none"> • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • Flood resistant design • No increase in flooding elsewhere 	consequences in accordance to section 7 and Appendix 1 of TAN 15
	Other	<ul style="list-style-type: none"> • Application of acceptability of consequences (TAN 15 section 7 and Appendix 1) • Refer to surface water requirements 	<ul style="list-style-type: none"> • Acceptable consequences for nature of use • Occupiers aware of flood risk • Desirable if effective flood warning and evacuation routes/procedure provided depending on nature of proposal • No increase in flooding elsewhere 	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1 of TAN 15
C2	Emergency services, highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable developments are not considered to be acceptable. Plan allocations should not be made for such developments and planning applications not proposed		
	Less vulnerable development	<ul style="list-style-type: none"> • Application of justification test (section 6 of TAN 15), including acceptability of consequences (section 7 and Appendix 1 of TAN 15) • Refer to surface water requirements 	<ul style="list-style-type: none"> • Acceptable consequences for nature of use • Flood defences adequate • Agreement for construction and maintenance costs secured • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures 	Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 of TAN 15 and acceptability of consequences in accordance with section 7 and Appendix 1 of TAN 15
	Other	<ul style="list-style-type: none"> • Application of acceptability of consequences (section 7 and 	<ul style="list-style-type: none"> • Flood resistant design • No increase in flooding elsewhere 	Plan allocations and applications for development should only be

		Appendix 1 of TAN 15) <ul style="list-style-type: none"> Refer to surface water requirements 	<ul style="list-style-type: none"> Acceptable consequences for nature of use Occupiers aware of flood risk Effective flood warning provided No increase in flooding elsewhere 	made if considered acceptable in accordance with section 7 and Appendix 1 of TAN 15.
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Justification Criteria:

- 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).
- 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.
- 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).
- 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.

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).

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).

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

Q. Effective flood warnings are provided at the site

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

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

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.

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.

Q. No flooding elsewhere.

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.

GeoSmart Comment. Analysis of the Site demonstrates that the development would be flood free during a 1 in 100-year plus climate change (fluvial) event.

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).

GeoSmart Comment. Analysis of the Site does demonstrate that the access roads would be flood free during a 1 in 1000-year fluvial event.

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

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

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

Surface water management

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

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

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

Planning permission is required to use a material that can't absorb water (e.g., impermeable concrete) in a front garden larger than 5 m².

Access and evacuation

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

Plans should show:

- Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g., higher ground nearby;

- Basement rooms have clear internal access to an upper level, e.g., a staircase; and
- Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

Floor levels

The following should be provided:

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

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

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

7. Resilience and mitigation



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

Sea (coastal/tidal) flood mitigation measures

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

Rivers (fluvial) flood mitigation measures

The Site is located within an area which is potentially affected by flooding from rivers, the following table confirms the flood depths associated with the area proposed for development.

Table 6. Flood levels compared to ground levels in the area proposed for development.

Ground levels on-Site (mAOD)	Estimated Modelled Flood Levels (mAOD)	
	1 in 100 years plus 25% CC	1 in 1000 year
178.1 to 180.1	178.1	180.1
Estimated Flood depths (m)	N/A	0 to 2.0

Raising minimum floor levels

The vulnerability classification of the Site and the Flood Zone dictates that proposals for the Site fall under the EA’s Flood Risk Standing Advice (FRSA) for more vulnerable developments.

As such, the recommended minimum finished floor level should be set at least 0.6 m above the 1 in 100-year flood event, in line with the advice given in Table A1.15 of TAN15. The hut is currently 1.4m uphill of the small watercourse and has floor levels raised 0.6m above surrounding ground levels.

Table 7. Recommended Minimum Finished Floor Level Required

Ground Level (mAOD)	1 in 100 Year Flood Level plus 25% CC	Freeboard above Flood Level (m)	Recommended FFL (mAOD)
178.1 to 180.1	178.1	0.6	180.7

If finished floor levels can be raised this could reduce the flood risk to the development. It is appreciated that the shepherd’s hut has already been erected and raising floor levels therefore may not be feasible, so alternative mitigation strategies are suggested overleaf. It is also noted that the shepherd’s hut is currently 0.6 m above the current ground level and so mitigation already in place.

Surface water (pluvial) and small watercourses flood mitigation measures

As the development is at High risk from surface water and small watercourses to depths of above 0.9m, the finished floor levels should be raised as high as possible, and mitigation measures in the fluvial section will reduce flood risk to the property. The flooding appears to be confined to the small watercourse and surrounding banks, and as such the risk is reduced as the hut is uphill of the watercourse.

Groundwater flood mitigation measures

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

Reservoir flood mitigation measures

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

Other flood risk mitigation measures

As the Site is not identified as at risk from other sources, mitigation measures are not required.

Residual flood risk mitigation measures

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

Further flood mitigation information

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

www.knowyourfloodrisk.co.uk

Emergency evacuation - safe access / egress and safe refuge

Emergency evacuation to land outside of the floodplain should be provided if feasible. An area of safe refuge should be sufficient in size for all potential users and be reasonably accessible to the emergency services.

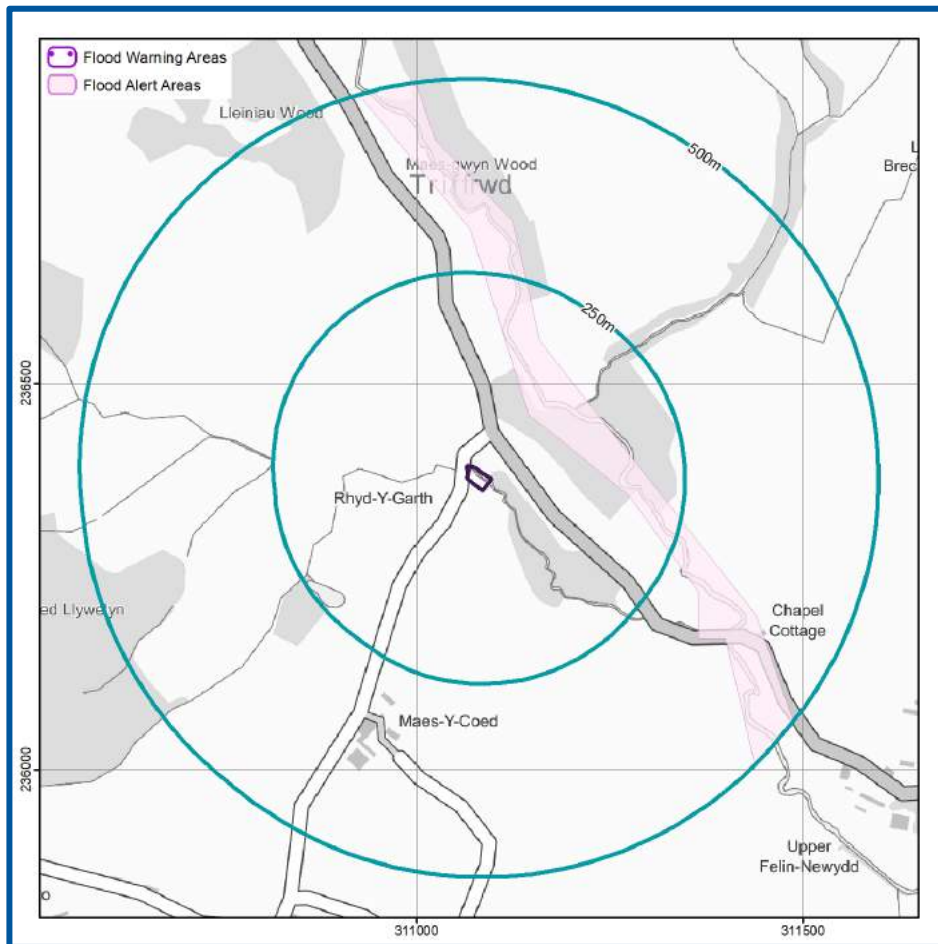
Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The NRW operates a flood warning service in all areas at risk of flooding; this is available on their website: <https://www.gov.uk/check-flood-risk>. All warnings are also available through the NRW's 24-hour Floodline Service 0345 988 1188.

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

Figure 21. NRW Flood Warning Coverage for the local area (NRW, 2023).



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Emergency evacuation

Where possible, a safe access and egress route with a 'very low' hazard rating from areas within the floodplain to an area wholly outside the 1 in 100-year flood event including an allowance for climate change should be demonstrated. The Planning Officer in this case has requested a safe evacuation route from the shepherd's hut.

Based on the EA's Flood Zone Map the closest dry evacuation area within Flood Zone 1 is along the main road, 50 m north of the site. It is advised that evacuation from the premises would be the preferred option in a flood event if safe to do so. It is recommended that residents prepare to evacuate as soon as possible.

Other relevant information

A Flood Warning and Evacuation Plan (FWEP) is recommended by the planning committee.

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

8. Conclusions and recommendations



Table 8. Risk ratings following Site analysis

Source of Flood Risk	Baseline ¹	After analysis ²	After Mitigation ³
River (fluvial) flooding*	Very Low	Very Low	N/A
Sea (coastal/tidal) flooding	Very Low	Very Low	N/A
Surface water and small watercourses flooding	Low to High	Low to High	Low
Groundwater flooding	Negligible	Negligible	N/A
Other flood risk factors present	No	No	N/A
Is any other further work recommended?	Yes	Yes	Yes (see below)

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of NRW flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys.

3 AFTER MITIGATION risks include risks to the proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

The table below provides a summary of where the responses to key questions are discussed in this report.

Highly vulnerable developments in a DAM Zone A are acceptable according to TAN15 (2004) and providing the recommended mitigation measures are put in place (see previous sections) it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 9. Summary of responses to key questions in the report

Key sources of flood risks identified	Surface Water and Small Watercourses (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is any further work recommended?	Yes (see executive summary and Section 7).

9. References and glossary



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Glossary

General terms

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

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

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

Data Sources

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Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023

<p>Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water Features/Reservoir/ Flood Alert & Warning)</p>	<p>Natural Resource Wales copyright and database rights 2023 Ordnance Survey data © Crown copyright and database right 2023</p>
<p>Flood Risk (Groundwater)</p>	<p>GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2023) Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023</p>
<p>Location Plan</p>	<p>Contains Ordnance Survey data © Crown copyright and database right 2023</p>
<p>Topographic Data</p>	<p>OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2023 Natural Resource Wales copyright and database rights 2023</p>

10. Appendices

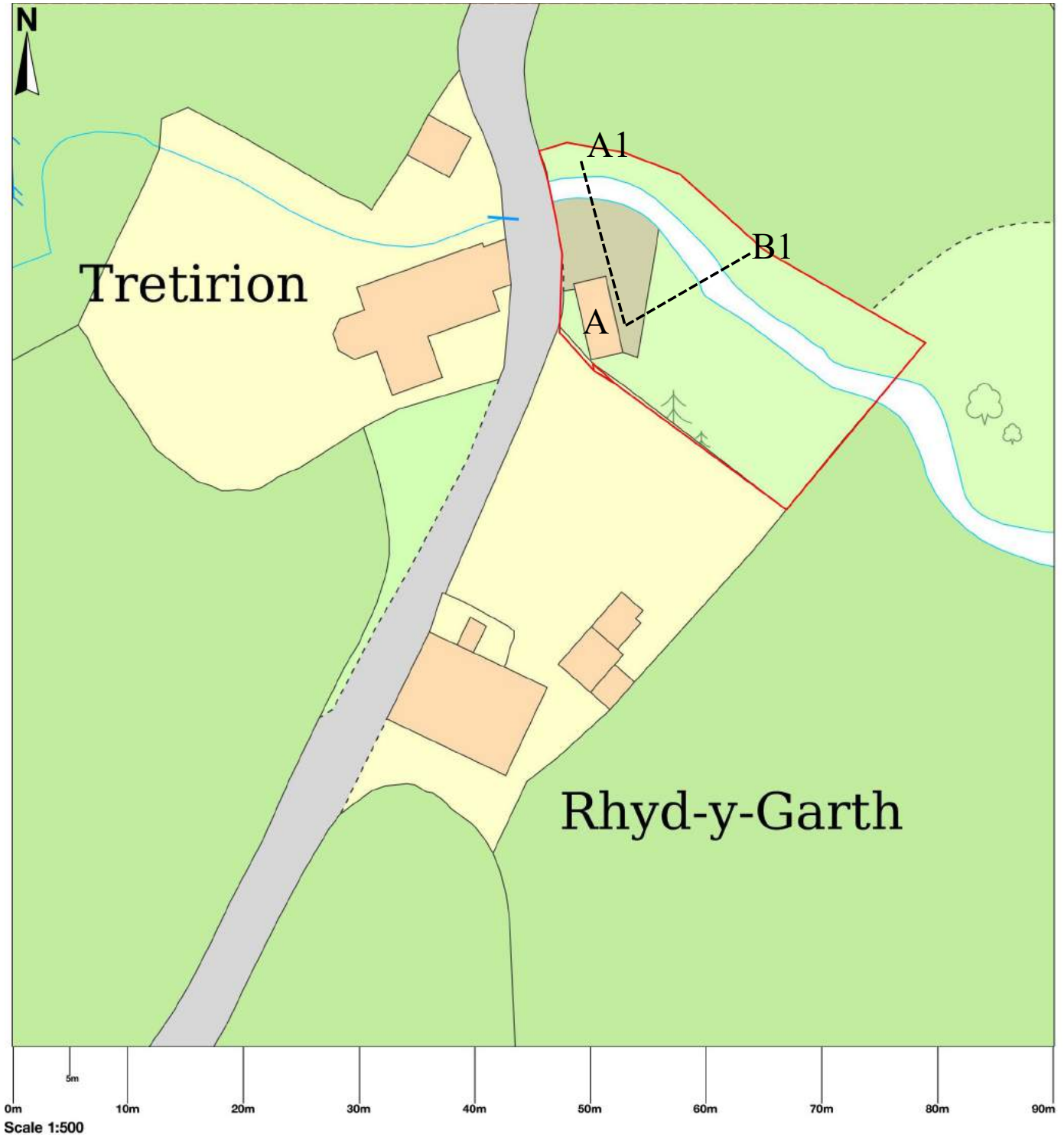


Appendix A



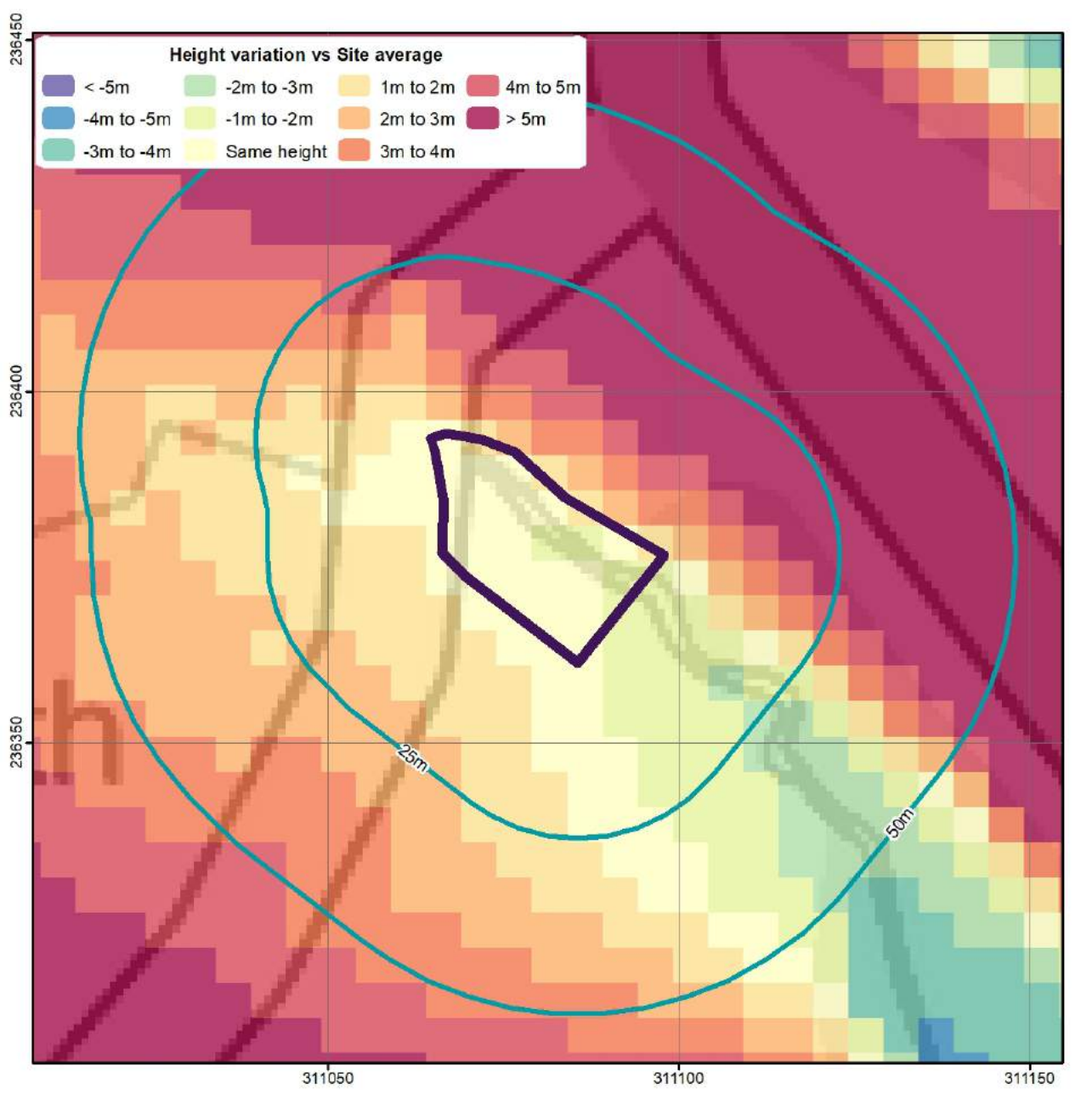
Site plans

Rhydygarth, Llandefalle, Brecon, LD3 0NR





Natural Resource Wales LiDAR ground elevation data



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Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

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- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

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We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

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