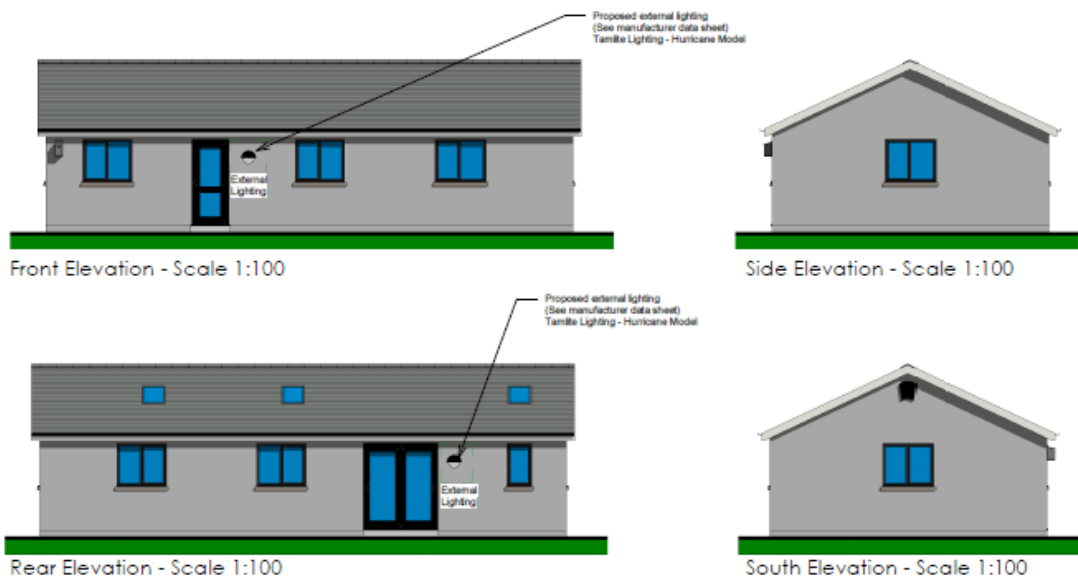


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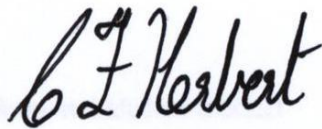
Land Adjacent to Dulais Rock Inn, Aberdulais Flood Consequence Assessment Report



November 2025
Final

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Signed	
Date	November 2025.....

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1 INTRODUCTION

It is proposed to construct a residential compound on a plot adjacent to the Dulais Rock Inn, Aberdulais. The site is partially located within a Fluvial Flood Zone 2 with the north western boundary possibly within Flood Zone 3 and at risk of fluvial, tidal and surface water flooding, as shown on the Flood Map For Planning (see Figure 1.1). This indicates that the area potentially could be at risk during a 1 in 1000 year fluvial event while part of the site could be affected during a 1 in 100 year fluvial and surface water event and a 1 in 200 tidal event, taking 100 years of climate change into consideration. The applicant appreciates, therefore, the need to assess the consequence of flooding.

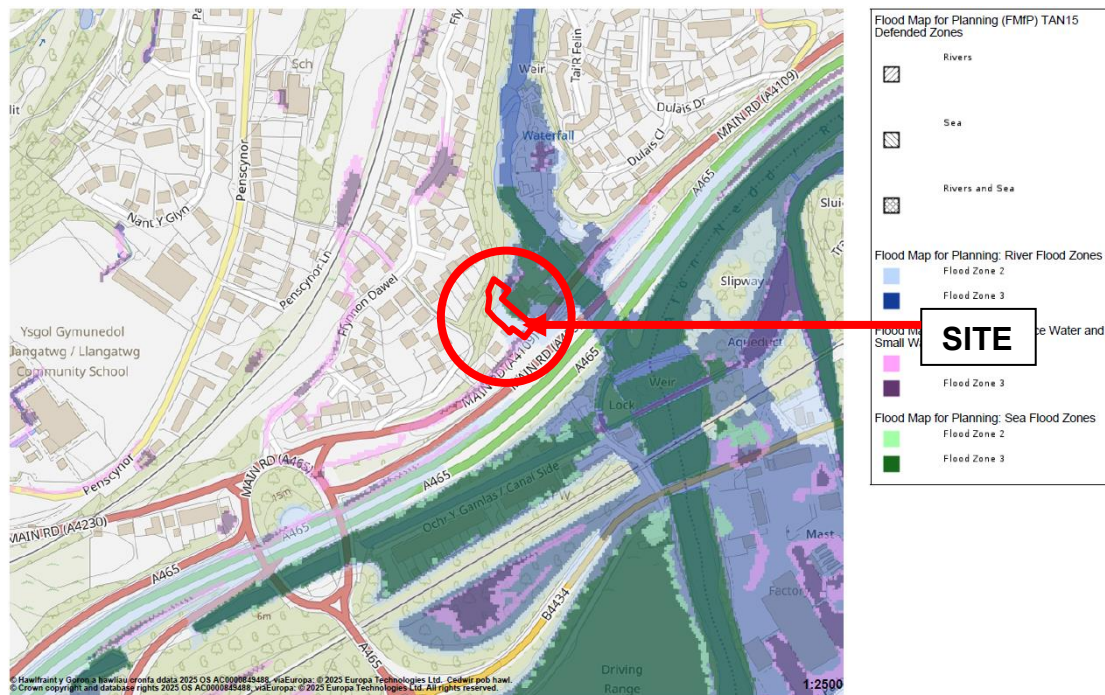


Figure 1.1 – Sea Flood Map For Planning

The prime objective of the Flood Consequences Assessment is to develop an appreciation of:

- The risk and consequences of flooding on the development; and
- The risk and consequences (i.e. the overall impacts) of the development on flood risk elsewhere.

It is noted that no new highly vulnerable development should be permitted, **on greenfield land**, in Zone 3 flood area, regardless of the conclusion of any Flood Consequences Assessments. In addition, Welsh Ministers must be notified of any such proposal a planning authority intends to approve. **In this instance, however, the proposals should be limited to a Zone 2 flood area.**

The assessment should consider a range of potential flooding scenarios including a 1 in 1000 year event with an allowance for climate change in line with current Welsh Government guidance. It is noted that the Flood Map for Planning allows for 100 years of climate change. Where a new development has a shorter lifetime, it is reasonable that the flood consequences assessment focusses on potential risks during the development's expected lifetime.

This assessment will help the planning authority determine whether the risk and consequences of flooding are acceptable and can be managed over the lifetime of development. The assessment will also establish whether appropriate measures can be incorporated into the design to ensure that the risk to life, damage to property and disruption to people, over its lifetime, are minimised.

The National Strategy recognises that many communities are located in areas at higher risk from flooding. TAN 15, however, recognises that these communities must be allowed to adapt, change, and regenerate in the knowledge of what the science is showing. Nevertheless, development and redevelopment should be avoided where there is a risk of being impacted by coastal erosion over the lifetime of the development.

The Flood Map For Planning are based on the Flood Risk Assessment Maps (see Figure 1.2) plus 100 years of climate change. The maps adopt the precautionary principle and are based on the best known information available at the time. However, a detailed examination of a site can refine an area's risk of flooding.

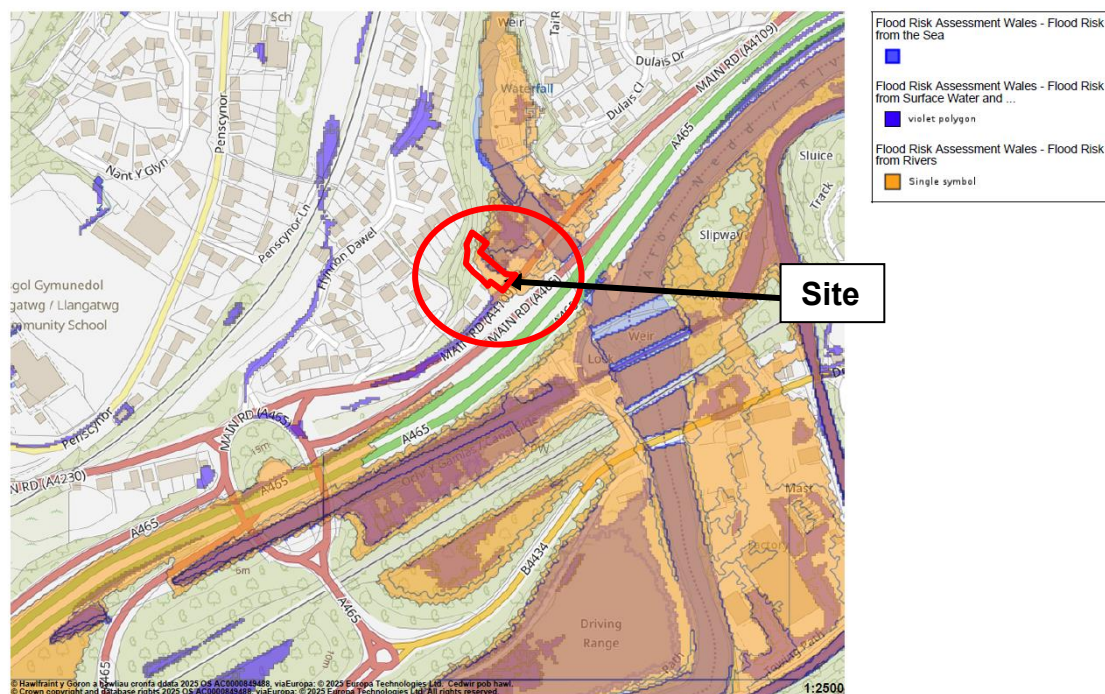


Figure 1.2 – Sea Flood Risk Assessment Map

Considering the site's proximity to the Afon Dulais, it is possible that the development could be at risk from both fluvial flooding, particularly when taking climate change into consideration. With this in mind, the client recognises the need to undertake a Flood Consequence Assessment to evaluate the risk and the implication of any flooding on the site. The assessment should be in accordance with the requirements of Section 11 of TAN 15. Francis Sant have been employed to undertake this task based on information currently available (ie. no additional modelling).

Section 2 of this report describes the location of the development while the method and risk of flooding, from various sources, are considered in Section 3. Section 4 considers sustainable drainage and potential resilient measures are discussed in Section 5. The conclusions of the study, along with the main recommendations, are provided in Section 6.

2 THE DEVELOPMENT

The development site (coordinates 277140 199365) is located on an infill plot, adjacent to Dulais Rock Inn and close to the Aberdulais Falls. The plot can be considered as a greenfield land in accordance with Welsh Government Circular 002/2025. Afon Dulais is some 50m to the north east with the confluence of the river with the Afon Nedd some 100m to the east (see Figure 2.1 to 2.3 and Plate 2.1). The open coast is some 8.5km south west of the site.



Figure 2.1 – Location Plan

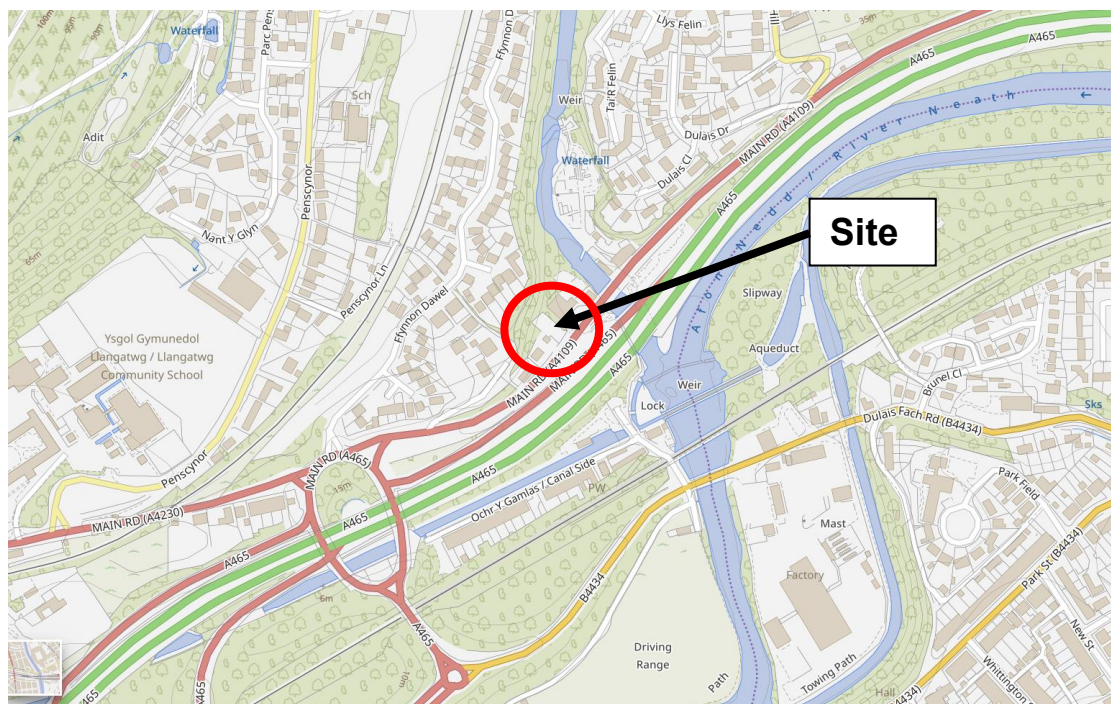


Figure 2.2 – Plan of Area



Figure 2.3 – Plan of Site



Plate 2.1 – Aerial View of Site



Plate 2.2 – Street View of the Site

Proposed Development

It is proposed to build a traveller family compound consisting of a static caravan, a day room and a pitch for a touring caravan (see Figure 2.4 to 2.6).

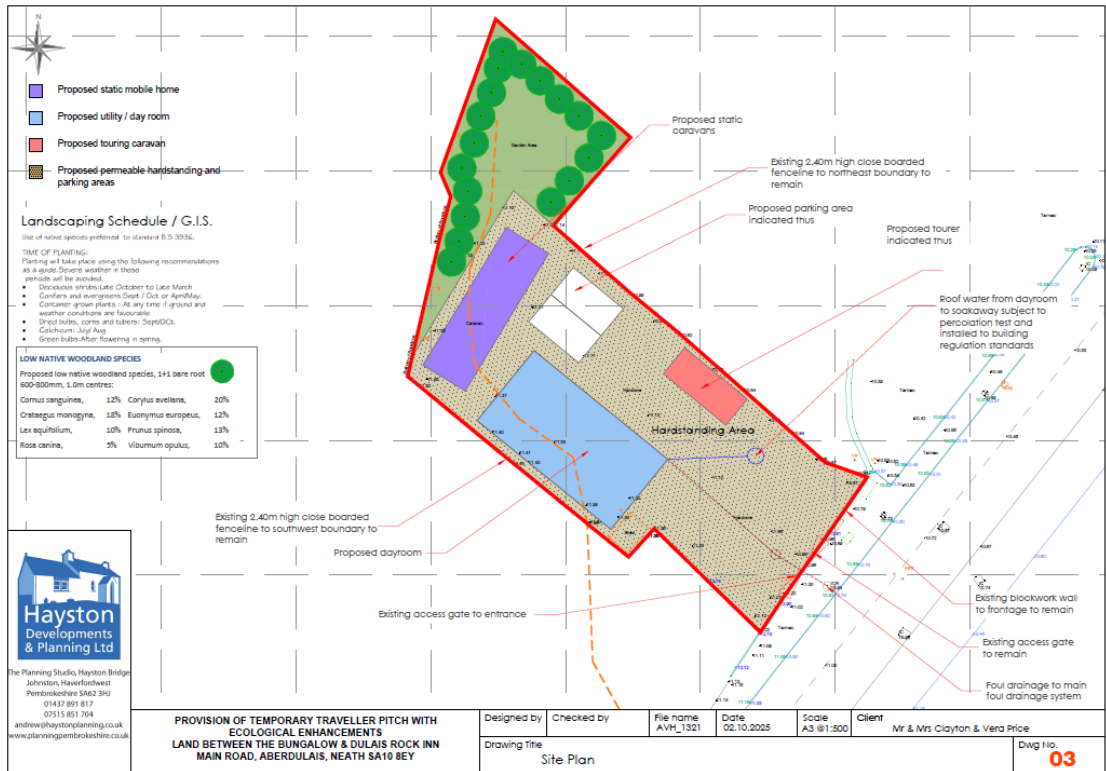


Figure 2.4 – Plan of Proposed Scheme

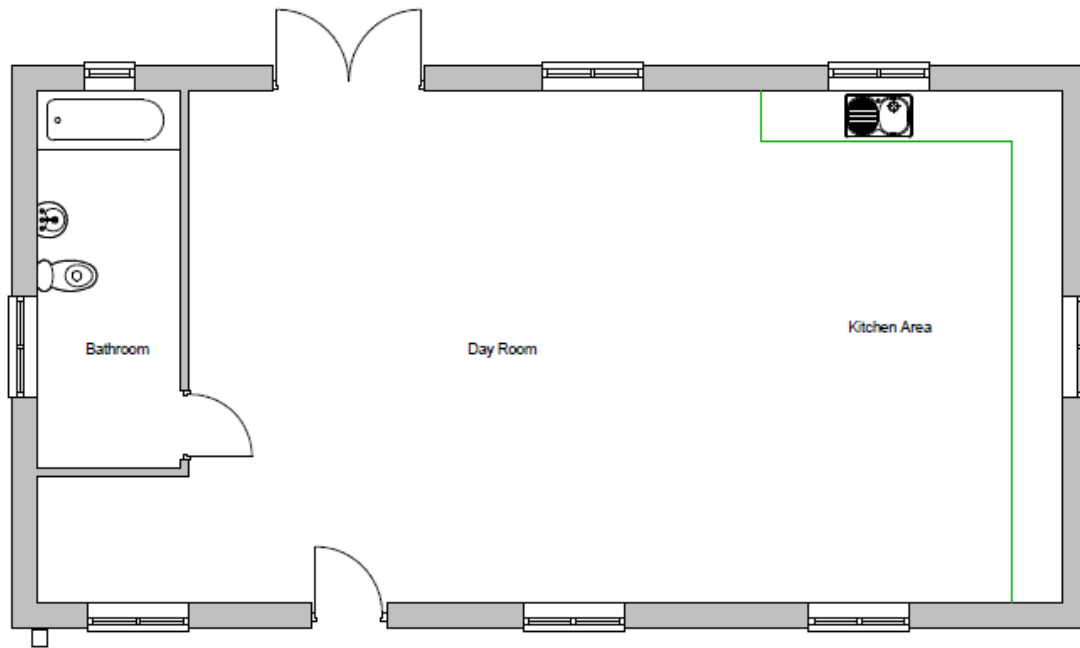


Figure 2.5 – Plan of Proposed Day Room



Figure 2.6 – Elevation of Proposed Day Room

Topography

Lidar data (see Figure 2.7) shows that the site ground levels generally ranges between 8.8m AOD and 11.4m AOD with the land generally falling from south west to north east adjacent to the Dulais Rock Inn. At the rear of the site the land is seen to rise to over 20m AOD. A topographic survey, however, shows that the land is flatter than the lidar data indicates with the ground level ranging between 10.82m AOD and 11.50m AOD (see Figure 2.8). This is likely due to an error in the Lidar data due to the steep fall on the sites north east boundary.

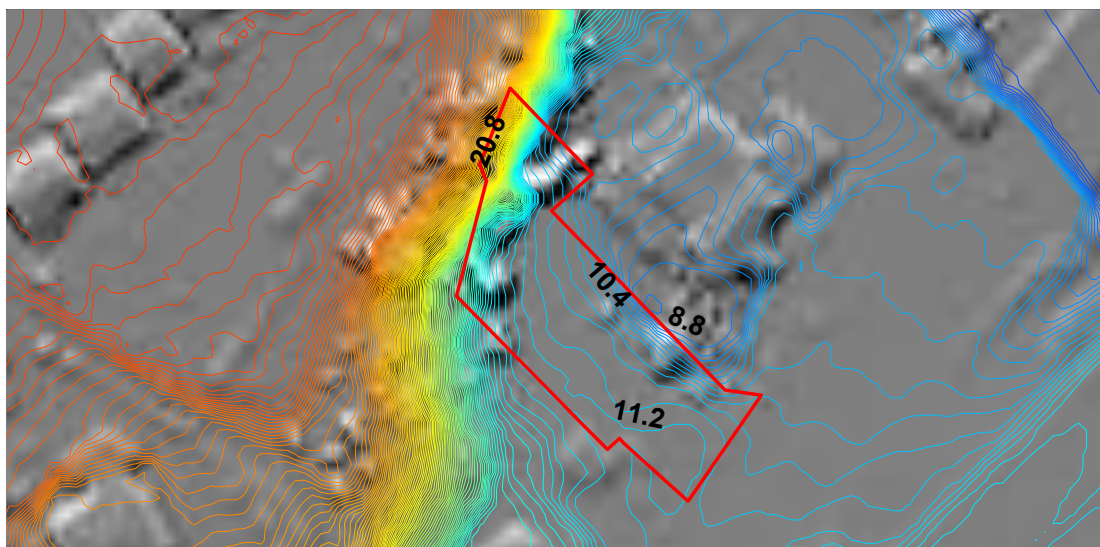


Figure 2.7 – Lidar Data for the Site

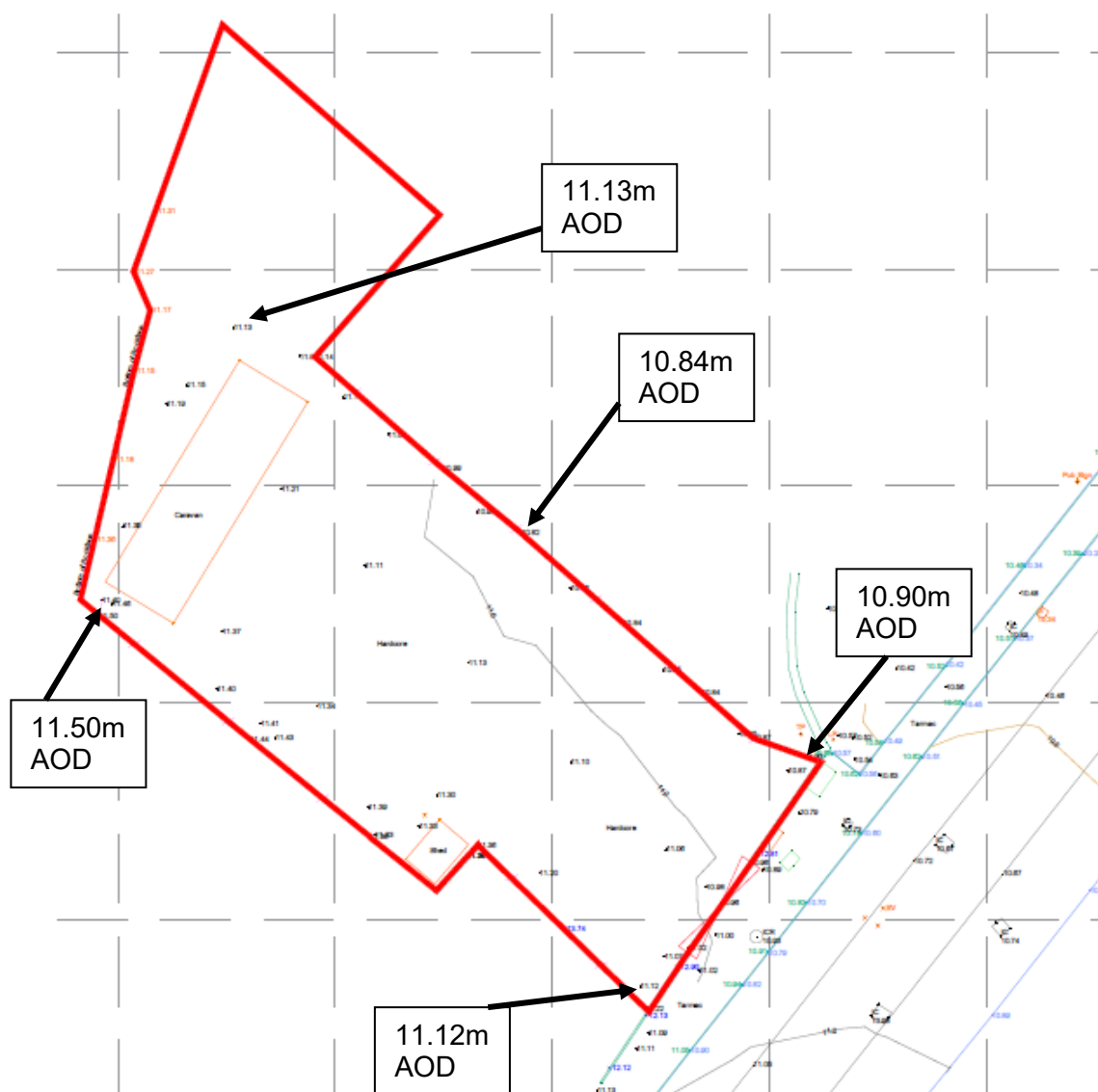


Figure 2.8 – Topographic Survey of The Site

3 FLOOD RISK

Flooding can occur from several sources, some of which are considered in this section. The Flood Risk Assessment Wales maps (see Figure 3.1) shows that the site is currently at risk of flooding from a river but also lies close to a surface water and tidal flood area. The maps, however, do not take climate change into consideration.

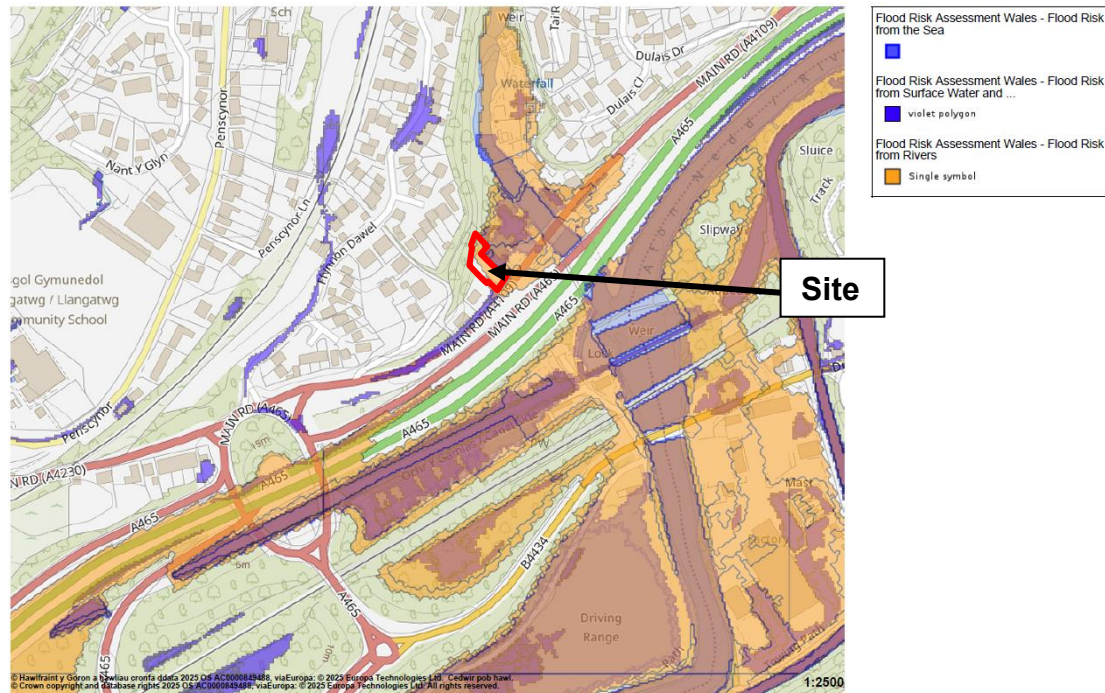


Figure 3.1 – Flood Risk Assessment Map

Fluvial

The Flood Map For Planning, which takes climate change into consideration (100 years), shows that the site is at risk of flooding from a river during a Q1000 event (flood Zone 2 - see Figure 3.2). Potentially the site's north eastern boundary could also be at risk during a Q100 event (flood Zone 3). This warrants a closer investigation.

The results from the latest NRW 2D TUFLOW model suggests that the site's eastern boundary could be at risk of flooding during a Q100 + CC event with a flood depth of up to 600mm (see Figure 3.3) but with a flow velocity of less than 0.15m/s (see Figure 3.5). During a Q1000 event flooding is expected to ingress further into the site with a maximum flow depth of over 1m and a corresponding flow velocity of 0.45m/s. However, the topographic survey has indicated that the Lidar data is not accurate on the site's north eastern boundary, possibly due to the sudden change in levels due to a bank. Considering the anticipated water levels (see Figure 3.11 and 3.12) we can take the Q100 + CC level as 10.5m AOD to 10.6m AOD and the Q1000 as 11.1m AOD to 11.2m AOD. Based on the Topographic Survey the site is expected to remain flood free during the Q100 + CC event and the flood depth during the Q1000 event is expected to range up to 360mm with the western side of the site expected to remain flood free. The day room and the static caravan is located on land over 11.2m AOD and, therefore, is expected to remain flood free during the Q1000 with no loss of flood storage capacity.

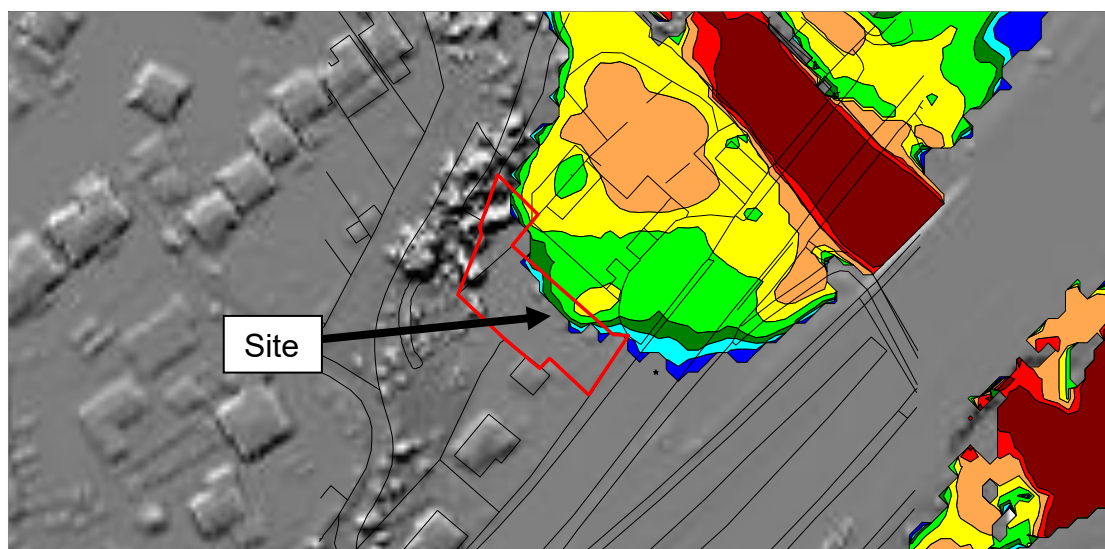


Figure 3.3 – Defended Q100+CC - Depth

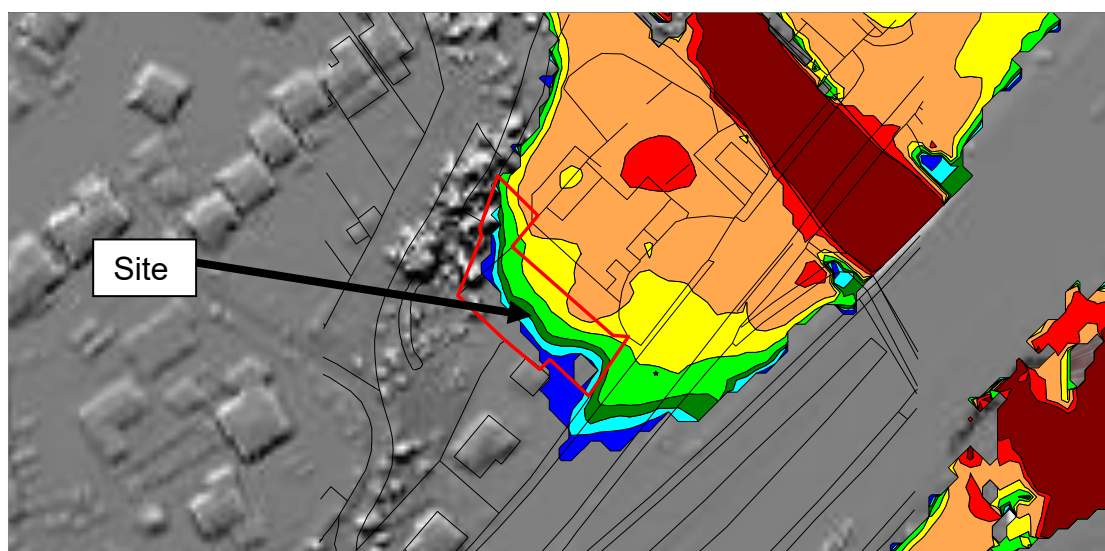


Figure 3.4 – Defended Q1000 - Depth

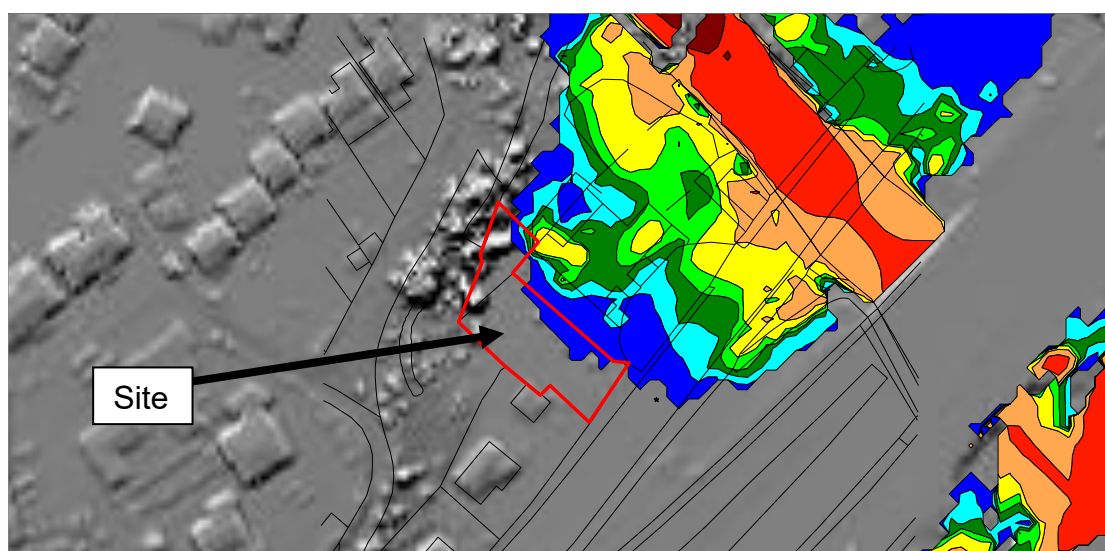


Figure 3.5 – Defended Q100+CC – Velocity

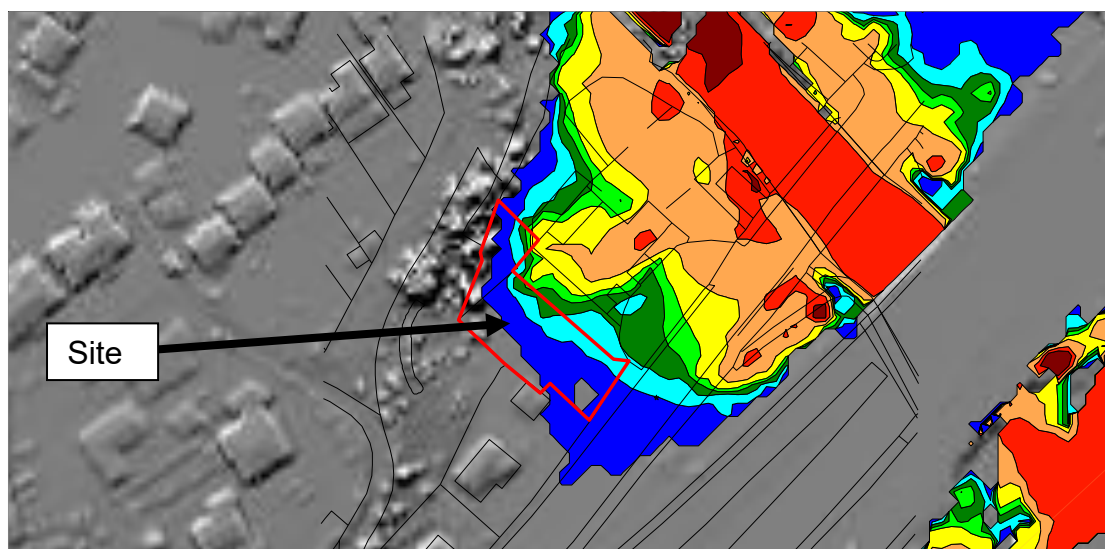


Figure 3.6 – Defended Q1000 – Velocity

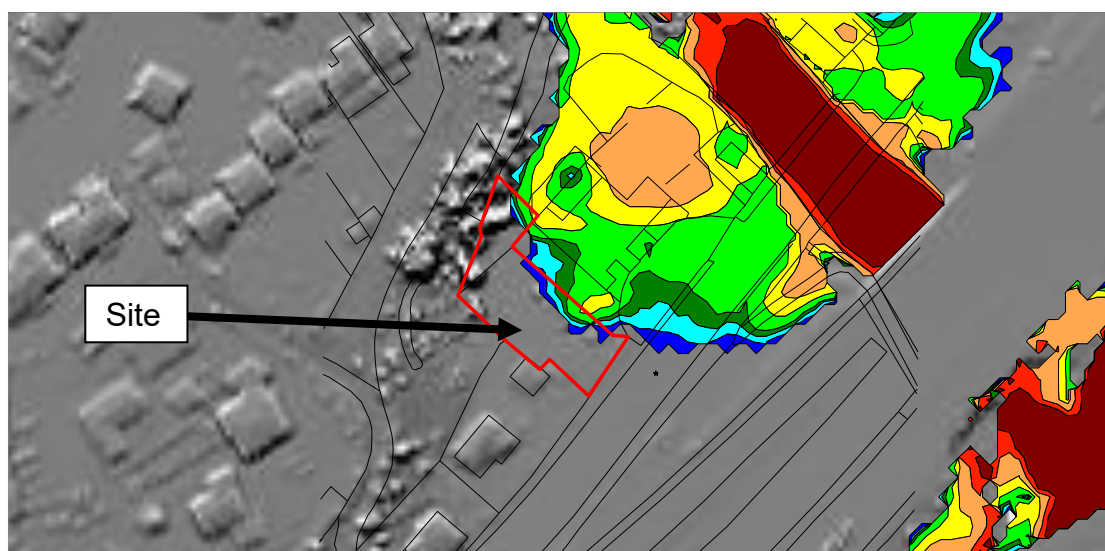


Figure 3.7 – Undefended Q100+CC – Depth

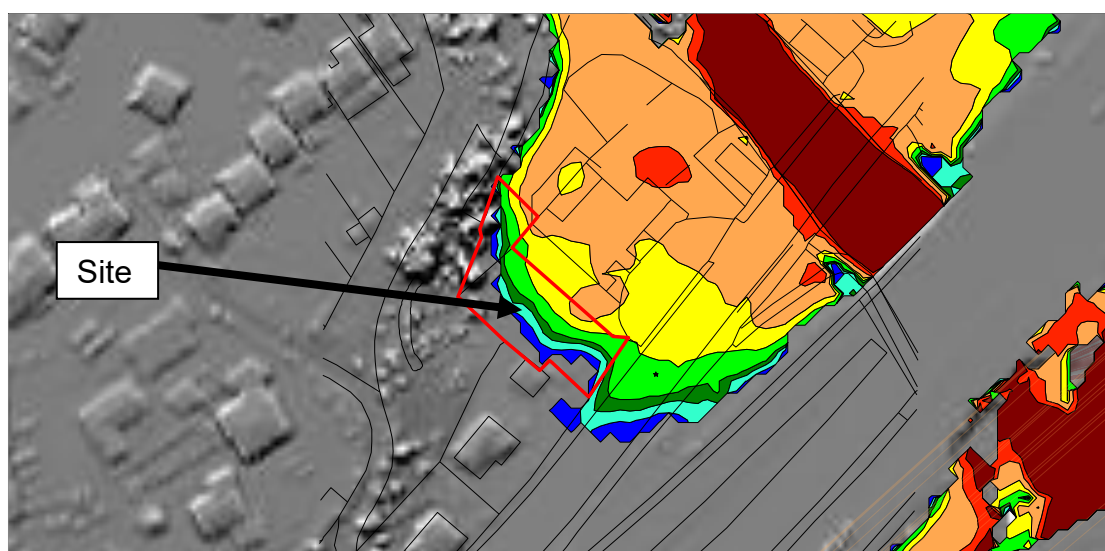


Figure 3.8 – Undefended Q1000 – Depth

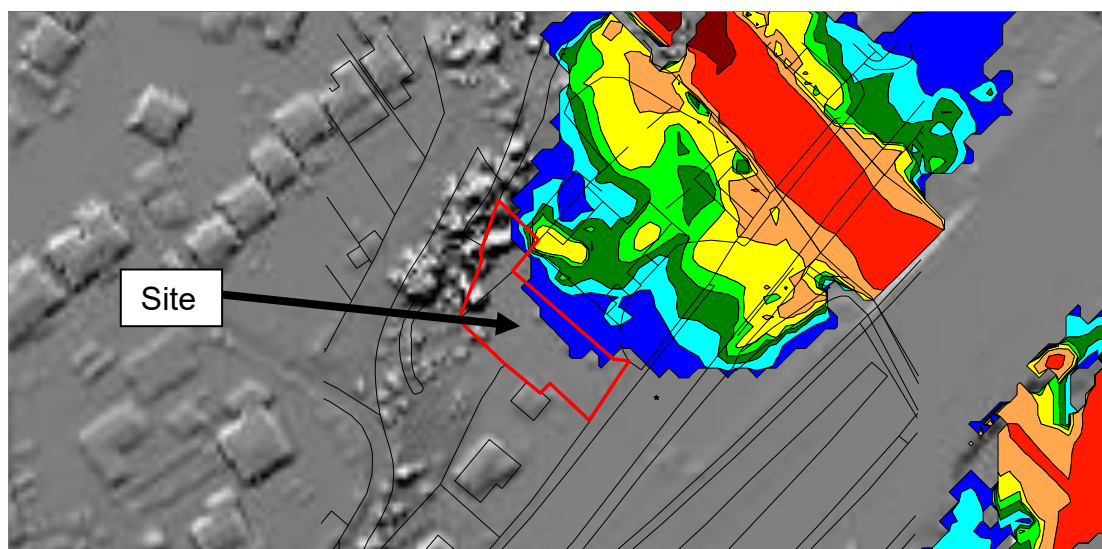


Figure 3.9 – Undefended Q100+CC - Velocity

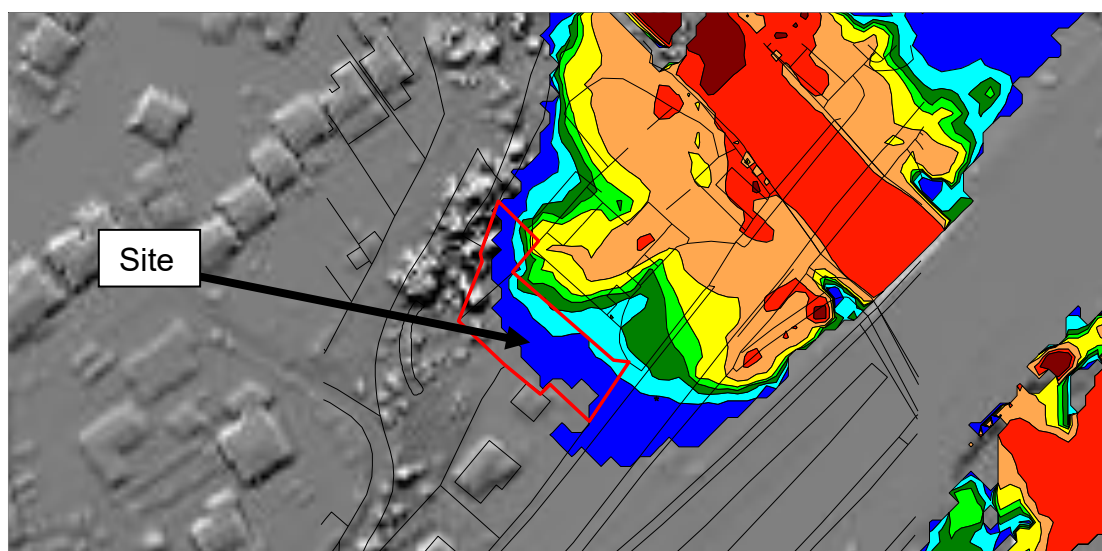


Figure 3.10 – Undefended Q1000 - Velocity

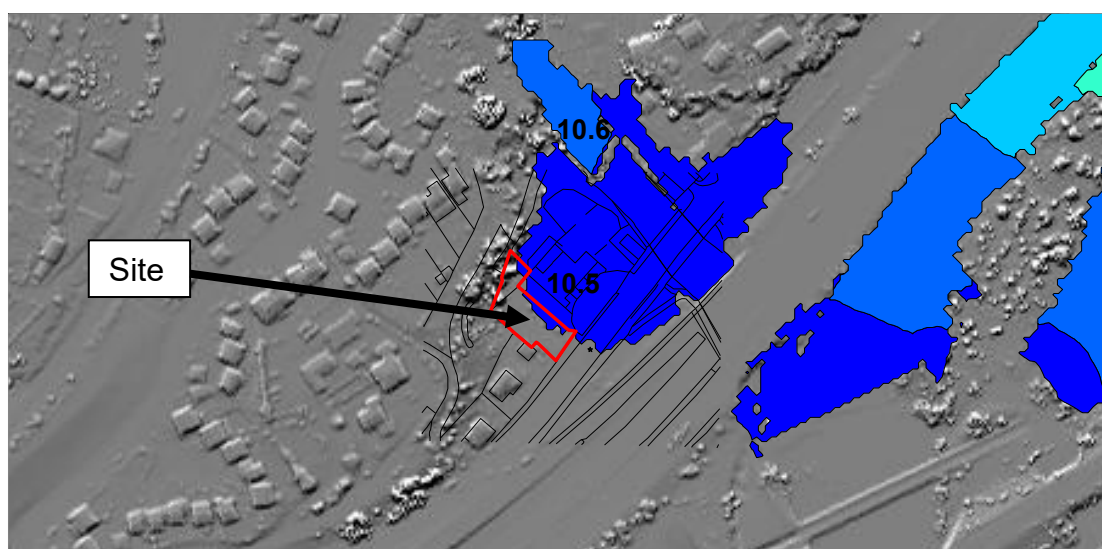


Figure 3.11 – Defended Q100+CC - Height

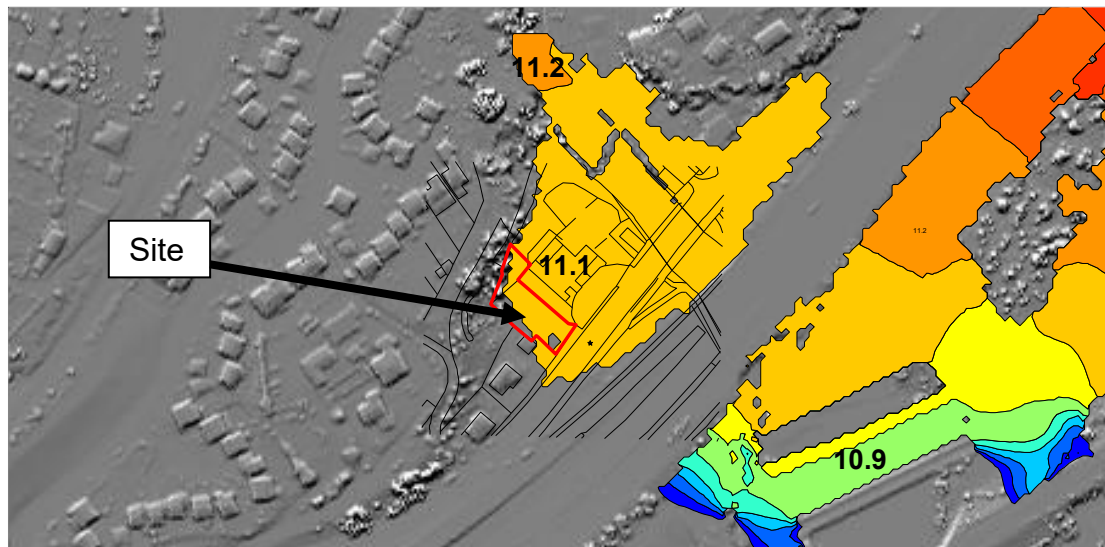


Figure 3.12 – Defended Q1000 - Height

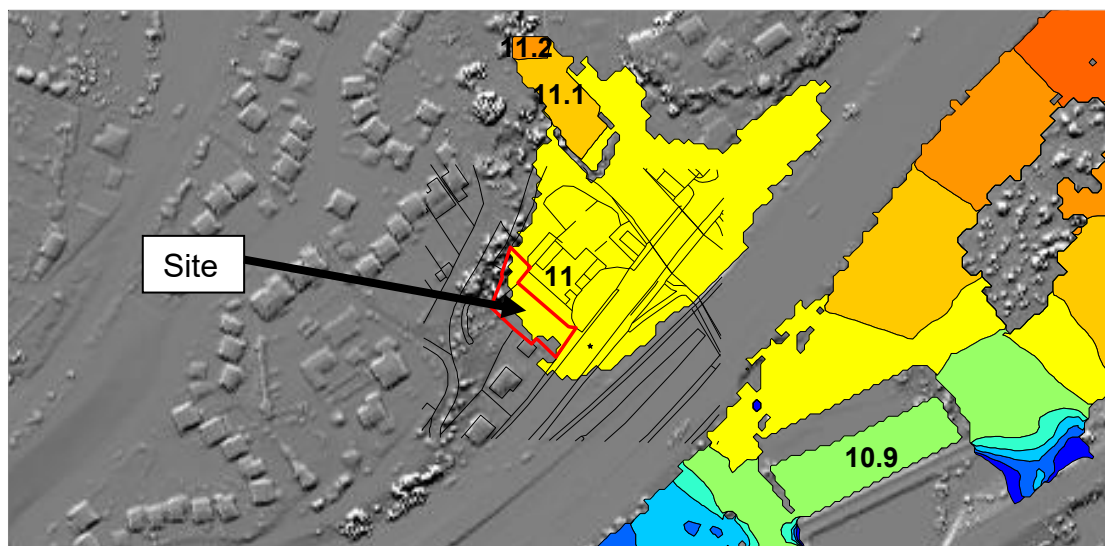


Figure 3.13 – Undefended Q1000 - Height

Tidal

The Tidal Flood Maps For Planning would suggest that most of the site lies in tidal flood Zone 1 and is expected to remain flood free even during the Q1000 event. Part of the north eastern boundary, however, is shown to be in flood Zone 3 and potentially at risk during a T200 event with sea level rise (see Figure 3.14). Possibly this might be due to an error in the Lidar data.

In examining this further, the method promoted in the coastal flood boundary conditions (for UK mainland) research project, as amended (2018), is used to determine the T200 and T1000 high tide levels. This accounts for the joint probability of meteorological (surges etc) and astrological effects (the impact of the sun and the moon on the tide). The levels for the Nedd, taken about 1km downstream, was obtained for the T200 and T1000 events (see Table 3.2 - base year 2017). The levels have a 95% confidence level although the precautionary levels, with a 97.5% confidence of non-exceedance, are also considered.

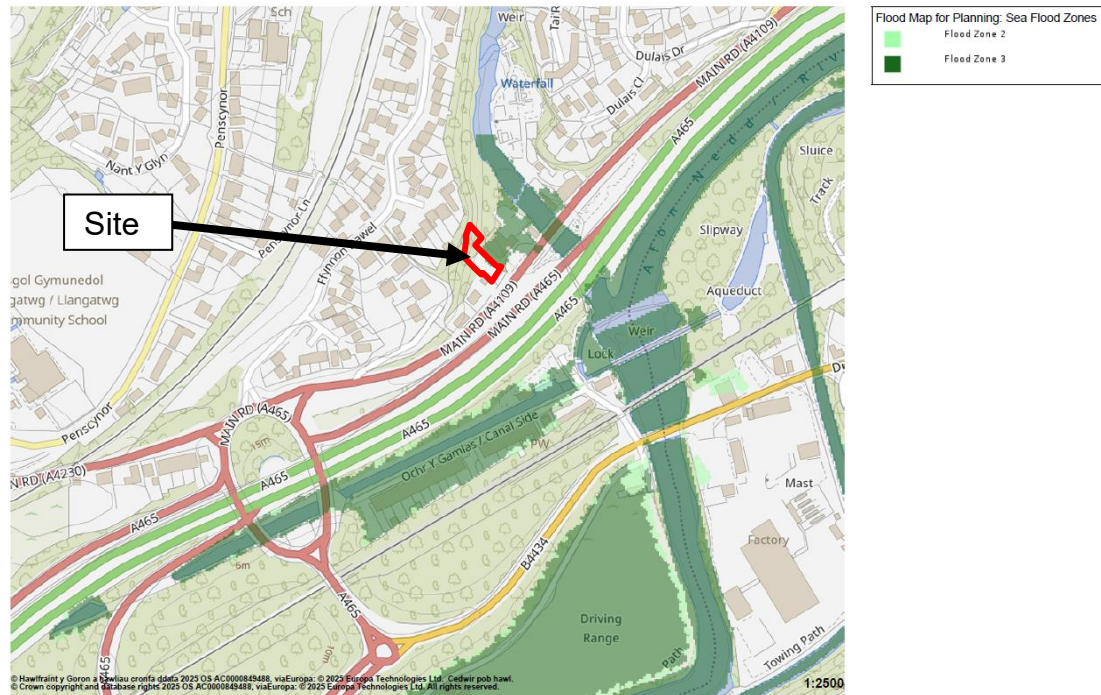


Figure 3.14 – Tidal Flood Map For Planning

Table 3.2 - Water Surface Extreme Tide Elevation (m AOD)			
T200 (0.5%)		T1000 (0.1%)	
Level	97.5% Confidence	Level	97.5% Confidence
6.71	6.90	6.94	7.33

In addition, recommendations from NRW suggest that the current tide levels should be increased by 100 years of sea level rise for a new highly vulnerable development (eg residential developments) and by 75 years of sea level rise for a new less vulnerable development. The derived T200 year and T1000 year levels, using the above approach, are provided in Table 3.2.

Table 3.3 Tide Levels With Sea Level Rise					
	20017	Current	50 years of sea level rise	75 years of sea level rise	100 years of sea level rise
T200	6.71	6.738	7.212	7.544	7.907
T200 Precautionary	6.9	6.928	7.402	7.734	8.097
T1000	6.94	6.968	7.442	7.774	8.137
T1000 Precautionary	7.33	7.358	7.832	8.164	8.527

As the lowest point on the site is measured to be 10.84m AOD (topographic survey) the development is expected to remain flood free even during a precautionary T1000 event with sea level rise. A 2d TUFLOW does however indicate that the adjacent Dulais Rock site could be affected (see Figure 3.15 to 3.18)

Table 3.4 Velocity and Depth Key			
Region	Depth	Region	Velocity
	0-0.1m		0 - 0.15m/s
	0.1m-0.2m		0.15m/s - 0.3m/s
	0.2m-0.3m		0.3m/s - 0.45m/s
	0.3m-0.6m		0.45m/s - 0.6m/s
	0.6m-1m		0.6m/s - 1m/s
	1m-2m		1m/s - 2m/s
	2m-3m		2m/s - 3m/s
	>3m		> 3m/s

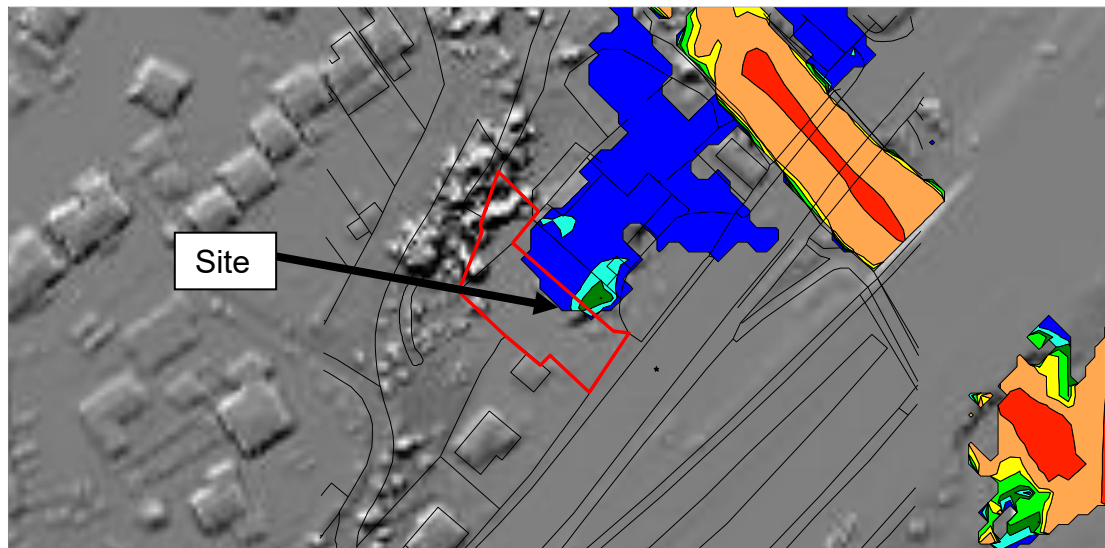


Figure 3.15 – Undefended T200 +CC– Depth

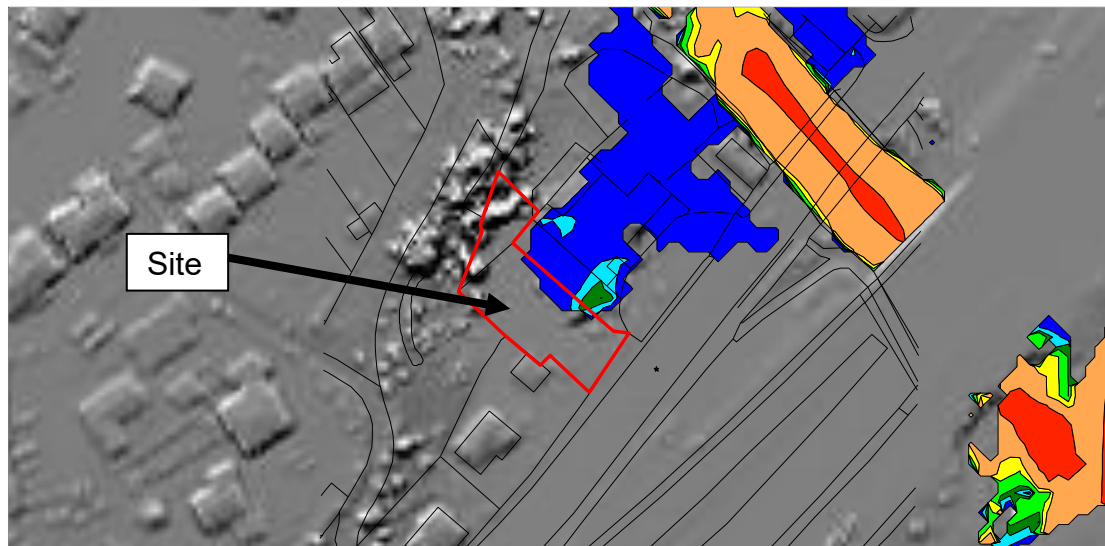


Figure 3.16 – Undefended T1000 +CC – Depth

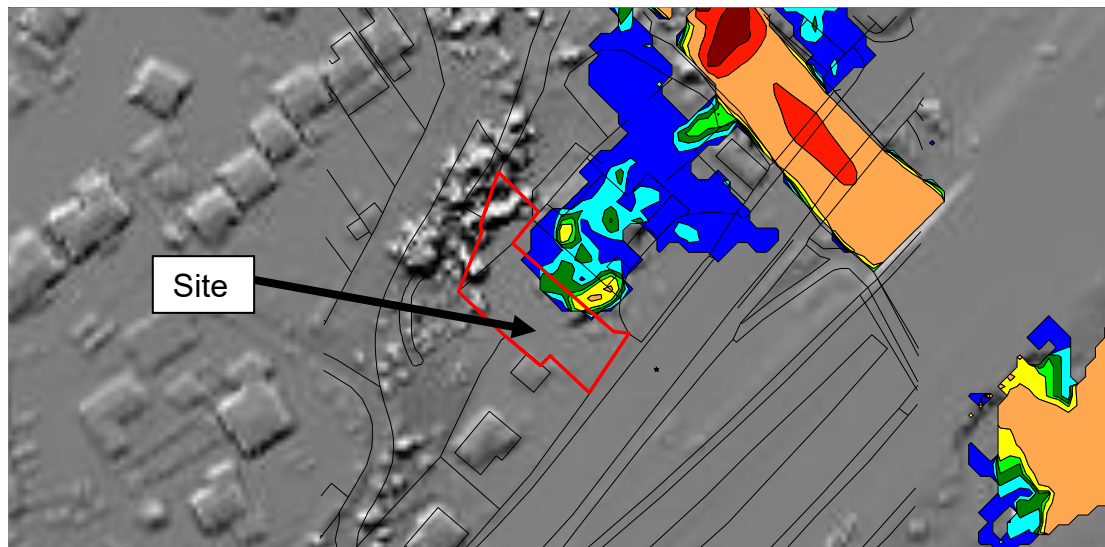


Figure 3.17 – Undefended T200 +CC – Velocity

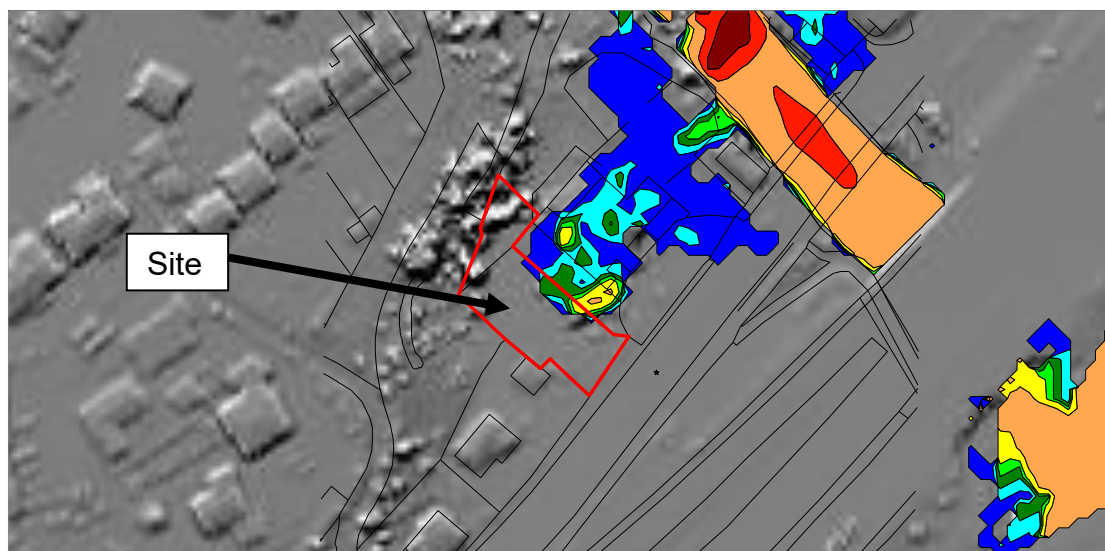


Figure 3.18 – Undefended T1000 +CC – Velocity

3.3 Surface Water

The surface water and minor watercourse Flood Map For Planning (see Figure 3.19) suggests that the site is not at risk of flooding from surface water flooding although the land between the Dulais Rock Inn could be at risk. Standard precautionary measures are expected to be sufficient to prevent flooding from this source. Surface water is also expected to flow along the adjacent road during an event.

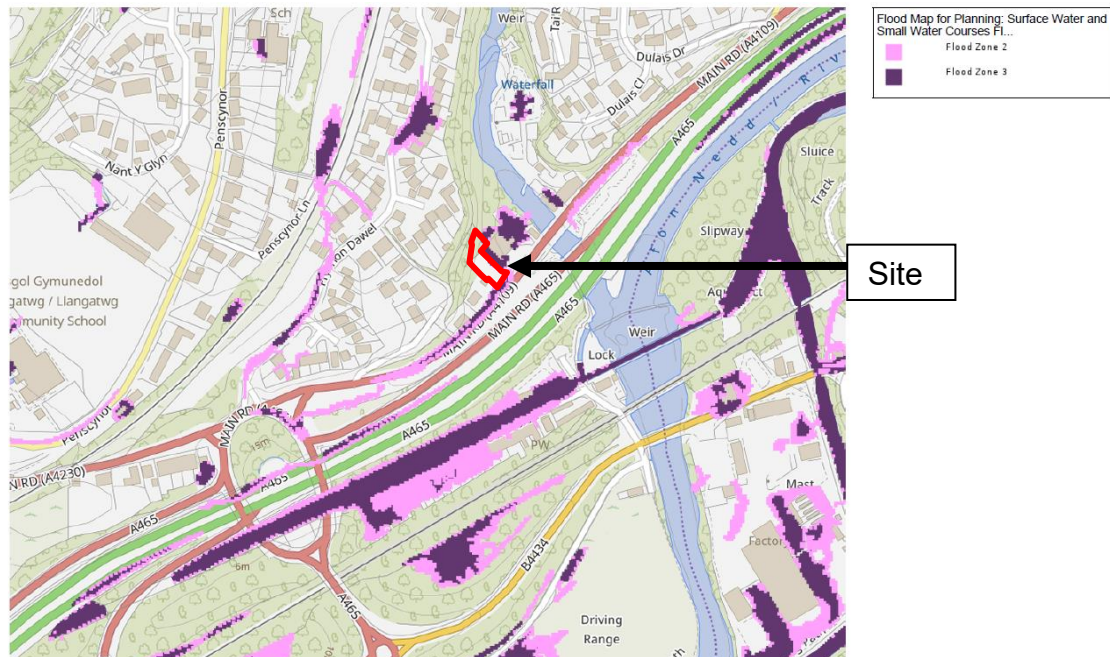


Figure 3.19 – Surface Water Flood Map For Planning

3.4 Sewage Backflow.

Care should be taken to ensure that surface and flood water is not able to flow into the foul sewer system. Consideration should also be given to installing a non return valve to prevent the backflow from the system.

3.5 Reservoir Failure

The development is not considered to be at risk from reservoir failure.

3.6 Ground Water

The superficial geology for the area consists of Sand and Gravel from Devensian Glaciofluvial sheet deposit overlaying a bedrock geology of Sandstone of the Brithdir Member (see Figure 3.20 and 3.21). When also taking the terrain into account the risk of groundwater flooding is considered to be low to Medium.

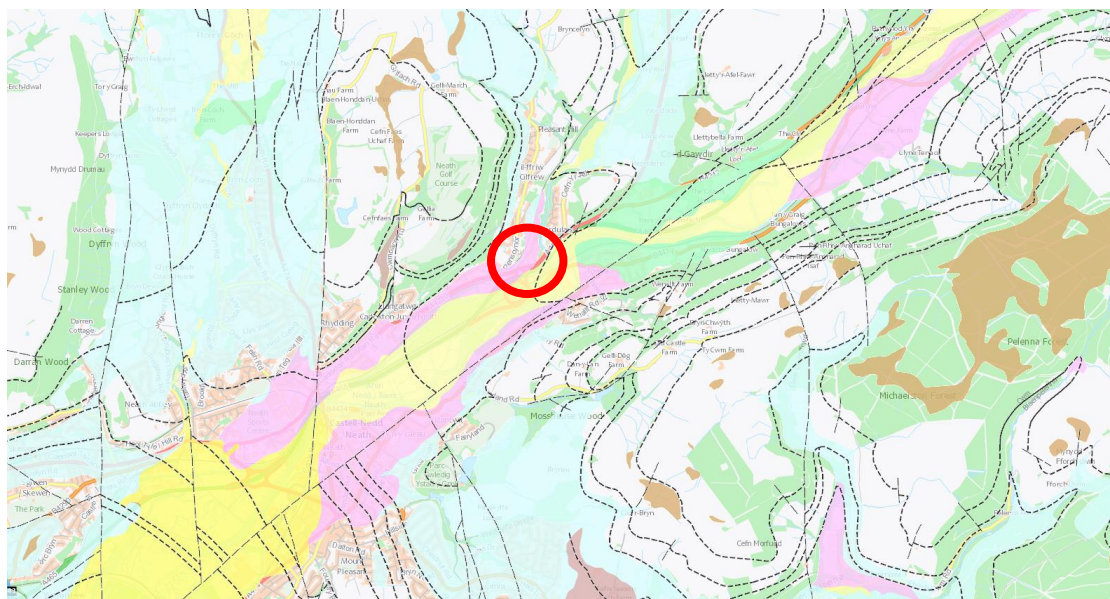


Figure 3.20 – Superficial Geology

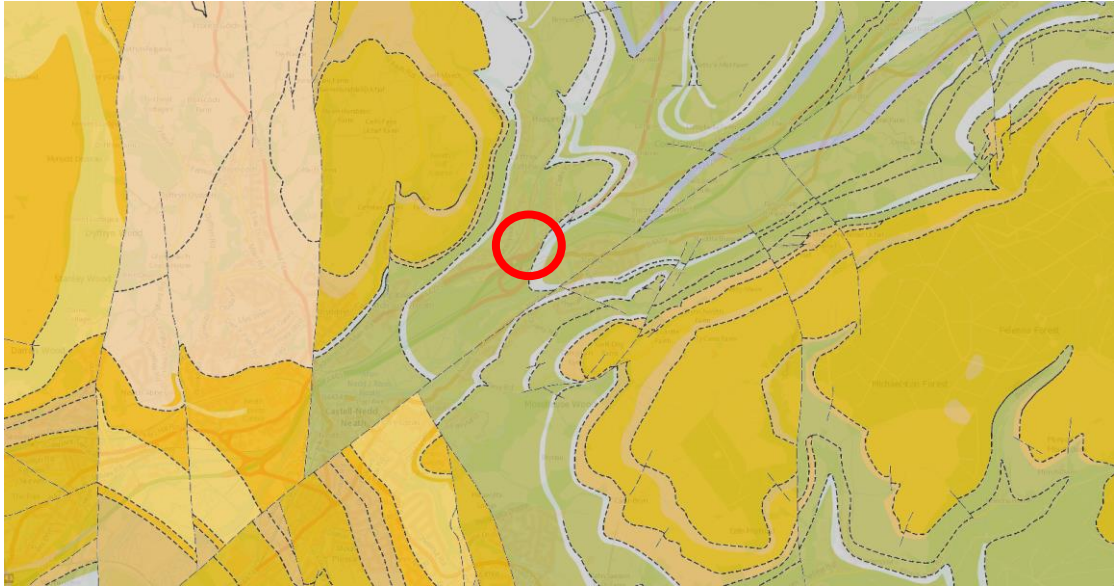


Figure 3.21 – Bedrock Geology

4 SUSTAINABLE DRAINAGE

A sustainable drainage solution, in accordance with the Welsh Government Standards and the SUDS Manual, should be incorporated into the design. SAB approval is also likely to be required which should be confirmed with the local authority.

The rain water falling on the roof of the day room will be stored for use, by means of a water butt, meeting the requirement of level 1 of Welsh Government sustainable drainage standard 1. It is expected that the overflow from the water butts, along with the remaining surfaces, will be dissipated using infiltration solution designed to accommodate the 1 in 100 year event plus climate change. This can be achieved in a number of ways, such as using a permeable surface (eg reinforced gravel) with an appropriate thickness of Type 3 subbase. However, if infiltration is not possible the rainwater will be drained into the surface water drain located in the highway at a greenfield runoff rate with the water being attenuated on site. Sediment will be removed from the catch pit of the flow control chamber as necessary.

Plants can be placed around the compound to help absorb the water, enhance biodiversity and provide an amenity.

The proposed solution, which will need to be designed in detail, can be cost effective to construct and maintain. Appropriate measures will be undertaken during the construction phase, in accordance with the recommendations given in the appropriate Guidance for Pollution Prevention (eg GPP 6 Working at construction and demolition sites) to minimise the risk of polluting the nearby watercourse.

It is important that construction material, such as cement, or even silt, do not impair or damage the integrity of the proposed drainage system. As such the SUDS system quite often will not come online until most of the construction work is completed. This could result in a temporary increase in the rainfall runoff rate, although being temporary it will not have an accumulative effect or be affected by climate change. Considering the size and the location of the development the likely impact will be low. Nevertheless, measures can be taken to reduce the rainfall runoff rate.

It is important also that the rainfall runoff does not wash contaminants from the site to any sensitive receptor. The contaminants could include:

- Silt, from when the ground becomes striped;
- Cement and grout;
- Oils and chemicals from construction materials and from plant;
- Fuel from plant (eg an excavator);
- Non Native Species that currently might be growing on the site;
- Construction waste.

Measures can be taken to minimize the risk as identified in Table 4.1 below:

Table 4.1 - Pollution Prevention Tasks	
Ref	Action
1	Where necessary place sandbags along the boundary of the site to help prevent silt from washing from the site into the road.
2	Ground is not to be stripped during periods of heavy rainfall.
3	All soil heaps to be covered.
4	The adjacent road will be monitored and, if necessary, periodically swept clean.

5	Grout/cement/concrete to be mixed in a designated location where the ground is protected.
6	Any waste to be disposed of in an appropriate receptor (eg skip) and taken off site to a licenced tip.
7	Used water, from washing tools used in working with cement (eg trowels) to be disposed of off site.
8	Where possible all chemicals will be stored off site. Any chemicals stored on site will be securely kept in a waterproof area and bunded where appropriate (eg using a hazardous substance storage cabinets).
9	Any cement kept on site will be stored in a secure waterproof area.
10	Ground protection will be present where chemicals are to be used and any spills are to be cleaned immediately using spill kits stored on site.
11	Site staff to be trained to use the spill kits.
12	Where possible plant will be fuelled off site. If this is not possible plant should be refuelled in a designated area where the ground is protected.
13	Prior to starting on site all workers will receive an induction training and advised of the chemicals used on site, where they are stored, pollution prevention measures to adopt, where the spill kits are stored and how to use them.
14	A waste minimisation audit will be undertaken prior to commencement on site. Where possible any residual waste will be recycled. All waste, however, will be cleaned immediately and placed in a covered collection receptor (eg a skip) and removed from site regularly.
15	Pollution incident response plan is prepared in accordance with current best practice (GGP21). An incident that could threaten the environment should be reported to NRW immediately on 0300 065 3000 (24hrs) .

5 FLOOD RESILIENCE

Section 3 indicates that part of the development could be at risk from fluvial flooding although the day room and static caravan is expected to remain flood free. However, the risk of flooding cannot be dismissed completely. Flooding could potentially result in the need for expensive repairs. As well as the direct damage caused to the structures flooding can impact in many other, and possibly more stressful, ways. The inconvenience of cleaning up a site, and the loss of sentimental belongings can be immeasurable. There are methods, however, to limit and mitigate against the consequence of flood damage. Some of these are discussed in this section and should be considered as part of the development where applicable.

Employment of Flood Proof Procedures

Water can enter buildings:

- Around the edges of closed doors;
- Through vents;
- Seeping through cracks in the walls or floors;
- Around cables and entrance of services into the building.

Dryproofing - Preventing the water from entering a building.

In the first instance it is possible to take measures to prevent the ingress of water (dryproof) which include the following.

- There are several expensive proprietary barriers available, however, it would be more appropriate to ensure that the walls of the buildings are capable of acting as barriers themselves. Care should be taken to ensure that the walls and floors are kept in good order and that all holes and gaps around cables and ducts, entering the buildings are sealed.
- Temporary covers could be provided to any air vents. These covers should be removed once the risk of flooding is over. Alternatively, the vents should be located at a higher level.
- Seals can be installed around the external doors.
- Temporary barriers can be placed in front of external doors or flood doors could be used.

In this instance, the development is expected to remain flood free during even the Q1000 event although some flood water is expected to flow across the site's north eastern side. Additional dry proofing measures is not considered necessary although raising the finished floor level of the day room would provide additional protection.

Wetproofing - Reducing damage once the water has entered.

It may not be feasible to completely eliminate the risk of flooding, however, it is possible to limit the damage that the water can cause once in the building (wetproof).

Where appropriate the following could be considered:

- Move valuable items to a higher level;
- Have solid concrete floors for the day room. Suspended floors are more difficult to clean and dry underneath.
- Ensure that the walls remain in good condition;
- Avoiding timber frame internal partitioning for the building. These are expensive to repair and dry;
- Where required, use non water absorbing insulation;
- Use corrosion resistant fittings such as galvanised or stainless steel in place of mild steel;

- Ensure that electric cables are fed from above. Also keep sockets away from the floor level;
- Where possible, Install machinery (eg fridges) with motors high up from the floor;
- Install solid internal and external doors, effectively sealed;
- Avoid storage heaters;
- Ensure boilers and space heaters are off the ground.

A flood response plan should be prepared for the development. All the family and visitors should be made aware of the flood risk and what actions to take during an event (eg using signs). It is important to also have as much warning as possible to allow the flood response plan to be followed safely. If available, this can be achieved by registering on the flood warning scheme provided by NRW (see Figure 5.1).

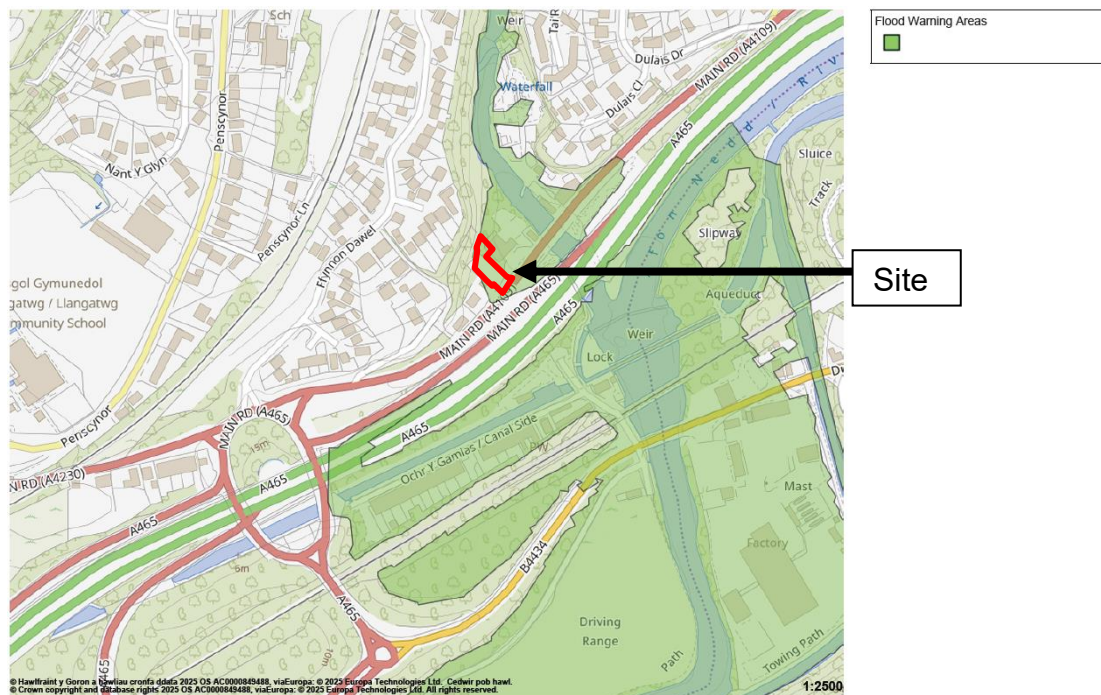


Figure 5.1 – NRW Flood Warning Plan

Flood Response

Although the site is expected to remain floor free during a Q1000 event, potentially the site could be at risk during an exceedance event.

The compound will subscribe to the Natural Resources Wales flood warning scheme, which uses the latest technology 24 hours a day to monitor rainfall, river levels and sea conditions. Combined with weather data and tidal reports from the Met Office, they can provide local area forecasts on the possibility of flooding and its likely severity.

Four different kinds of flood warning codes are issued. Three of the codes indicate the severity of the warning, and a fourth is an 'all clear', meaning the threat has passed. NRW ensure warnings are broadcasted on local radio and television, and information can also be obtained through their dedicated Floodline information service (0345 988 1188) or on their website, which is updated regularly when there is a flood risk.

The amount of warning that can be expected prior to an event depends on the source of the floodwater. A few days warning could be provided before a tidal event while only a few hours (or less) can be expected during a fluvial or surface water event. In some circumstances it may not be possible to provide a warning. In this instance a reasonable evacuation period is anticipated if necessary (an hour or two).

A member of the family will be designated as a Flood Warden (the name is not important but it will be the person in charge of making flood related decisions particularly during an event) and the remaining members and other residents will be made aware who this person is. All the family and visitors will be made aware of the risk of flooding and the procedures in place in the event of a warning being received.

On arriving on site visitors will be made aware, via a notice, of the risk of flooding at the site (simple signage). When necessary, they will also be made aware of the procedures that are in place, and should be followed, if a warning is issued.

On receipt of a flood warning from NRW, all present on site will be made aware that a warning has been issued and its severity. A decision will be made on whether to evacuate to higher land, or to remain on site. Prior to evacuating the compound all utilities will be switched off at the mains (electricity, water etc). No person will be allowed to return to the site until after the "all clear" has been given by NRW.

If, for whatever reason, water is seen to flow onto the lower sections of the site. retreat to the static caravan, which is expected to remain flood free, and stay until the flooding has dissipated. An emergency flood kit will be kept in the caravan and maintained on a regular basis. The kit will include a torch, radio, food, water, a first aid kit and family entertainment.

If it subsequently becomes necessary to leave the site during a fluvial event (eg medical emergency) then a flood free access route should be followed as displayed. The route will be onto the road and west up to the trunk road intersection.

A clear plan, showing the flood response procedure, is to be kept in a prominent position. The plan will be accessible to all to make them aware of the flood risk and what procedures are in place to safely evacuate the site.

This plan is to be reviewed as necessary, but at least annually, and is to be kept in good order

Evacuation Route

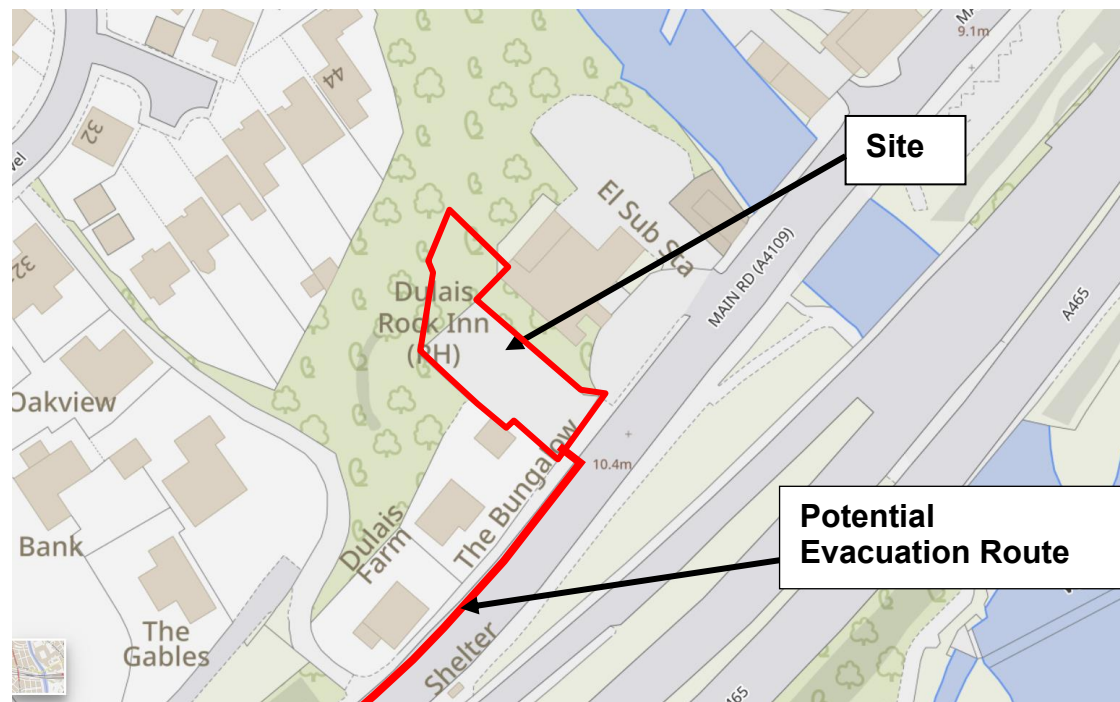


Figure 5.2 – Potential Emergency Evacuation Route

Flood response instructions

1 When a flood warning is issued to these premises, please advise the Flood Warden as named below:

Flood Warden _____

Work Hours Tel. _____

Out of Office Tel. _____

2 Ensure all present at the compound are aware that a flood warning has been issued, by Natural Resources Wales.

3 A decision is made by the Flood Warden whether it is prudent to evacuate the area.

4 Prior to evacuating the site, all utilities are to be switched off.

5 In the event of flood water being seen on the road refuge should be sought in the static caravan.

6 Once evacuated, do not re-enter the premises until instructed, by the recognised authority, that it is safe to do so.

6 CONCLUSIONS AND RECOMMENDATION

Conclusions

The client wishes to develop a residential family compound, which will include a day room and a static caravan, located on an infill plot adjacent to the Dulais Rock Inn, Aberdulais, however, a significant part of the site lies in a Zone 2 flood area, as shown on the Flood Map For Planning, and is considered at risk of flooding during a 1 in 1000 year event with 100 years of sea level rise. Francis Sant were, therefore, asked to undertake a Flood Consequence Assessment to evaluate the risk.

As shown on the Flood Risk Assessment Map, the site's north eastern boundary, is potentially at risk from tidal flooding and from surface water flooding.

It is noted, however, from inspection of the topographic survey, that the Lidar data for the site, particularly the north eastern boundary, is not correct and over lowers the site levels, significantly in areas. Considering the expected precautionary T1000 tide level, with sea level rise, (8.527m AOD) the site (from 10.84m AOD) is clearly not at risk from tidal flooding. The site is also not expected to be at risk from surface water flooding although some water could flow along the adjacent road.

TUFLOW 2d mathematical model estimates that the Q1000 flood level will be between 11.1m and 11.2m AOD. This would suggest that part of the site could be at risk of flooding during the Q1000 event, however, the depth is expected to be less than 0.6m and the day room and static caravan is expected to remain flood free.

The site is not expected to be at risk from reservoir failure and the risk of ground water flooding is considered to be low to medium. Considering the distance to the open coastline the development will not be affected by direct wave action.

A Flood Response Plan should be produced to allow as much time to prepare for an event as possible. If necessary, a flood free place of refuge is available in the static caravan, even during an extreme event. If it becomes necessary to evacuate the site during a fluvial Q1000 event (eg medical emergency) then a manageable access route is available from the site to the trunk road interchange. The route is expected to remain flood free during all considered fluvial events.

A sustainable drainage solution, in accordance with the Welsh Government Standards and the SUDS Manual, should be incorporated into the design. SAB approval will also be required which should be confirmed with the local authority.

A summary of the schemes compliance with TAN 15 is provided in Table 6.1.

Table 6.1 – Compliance With Tan15		
Ref	Criteria	
	What Zone does the development lie in?	Mainly zone Zone 1 and 2
	Vulnerability of the development?	Highly vulnerable
	Is the development located on greenfield or developed land?	Greenfield
	Is the development flood free during a 1 in 100 fluvial or 1 in 200 tidal events?	Yes
	Is the flood depth less than 600mm during a 1 in 1000 year event?	Yes
	Is the velocity expected to be less than 0.15 for a highly vulnerable development or less than 0.3 for a less vulnerable development during a 1 in 1000 year event?	Yes
	Is there a safe access route?	Yes
	Is the development at risk from costal erosion?	No
	Is the development in a defended zone?	No
	Is there a record of a previous flood event?	No
	What is the flood hazard for the development?	Very Low
	Does the development have a detrimental impact on third parties' risk of flooding?	No

Recommendations

In developing the site, it is recommended that:

- the finished floor level of the day room is set 150mm above the adjacent ground level;
- flood proofing measures, as identified in Section 4, should be considered for inclusion in the scheme;
- consideration should be given for the inclusion of a non return valve on the foul sewer system;
- A sustainable drainage system should be included in the design;
- SAB approval should be applied for;
- the site is registered on the flood warning scheme provided by NRW;
- a flood response plan is prepared, maintained and effectively disseminated to all future occupiers of the development.