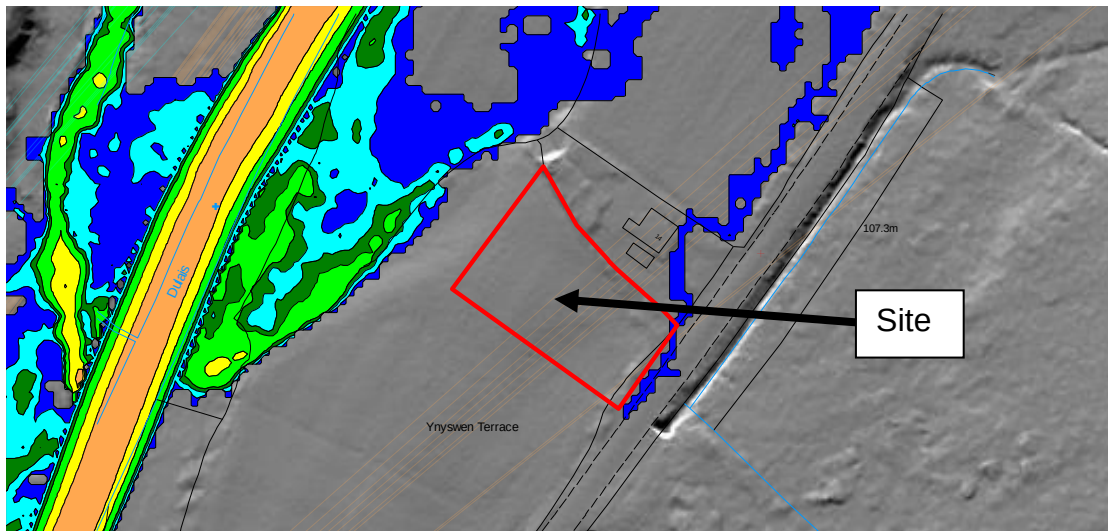


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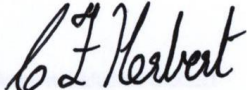
Proposed Caravan Pitches and Supporting Infrastructure Adjacent to Ynyswen Terrace, Crynant Flood Consequence Assessment Report



**October 2020
Final
Revision B**

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This document has been produced in accordance with Francis Sant Limited Quality Management System

Signed 

Date October 2020

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1 INTRODUCTION

It is proposed to develop a greenfield plot adjacent to Ynyswen Terrace, Pen-y-Bont Crynant, to include two static caravan pitches along with a utility and dayroom building. The client has been advised, however, that the plot partially lies within a Zone C2 flood area as defined by the development advice maps (see Figure 1.1) referred to in Technical Advice Note 15, Development and Flood Risk (TAN 15). This means that the area is considered to be at risk of flooding during at least the 1 in 1000 year event and is not protected by significant and recognised flood defence infrastructure.

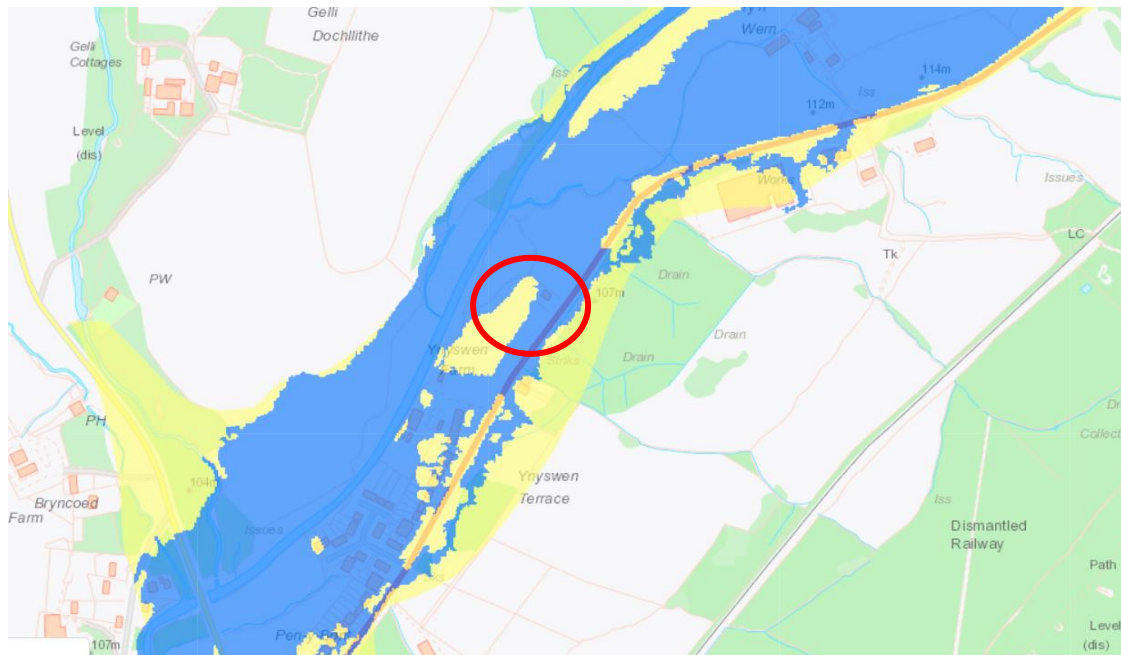


Figure 1.1 - Development Advice Flood Map

The development advice maps are based on Natural Resources Wales Flood Risk Maps (see Figure 1.2) supplemented by sediment data, held by the British Geological Survey (BGS), of historical flooding. 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.

Considering the proximity of the site to Afon Dulais it is possible that the property could be at risk from fluvial flooding. As such the client recognises the need for a Flood Consequence Assessment to be prepared to evaluate the risk of flooding. The assessment should be in accordance with the requirements of Section 7 and Appendix 1 of TAN 15. Francis Sant have been employed to undertake this task.

This document summarises the work undertaken as part of the study. Section 2 of the report gives a description of the surrounding area while the risk of flooding from various sources is considered in Section 3. Possible flood proofing measures are discussed in Section 4 and the conclusions and recommendations of the study are provided in Section 5.



Figure 1.3 – NRW Flood Risk Map

2 DEVELOPMENT

The site (coordinates 279600 206520) is situated off Ynyswen Terrace highway (A4109) north of Pen-y-Bont, Creynant and some 9.5km north of Neath (see Figure 2.1 to 2.3 and Plate 2.1). It is a greenfield plot with an open field to both the west and south but with a house to the north. The road forms the site's eastern boundary with again an open field beyond. Afon Dulais is some 60m to the east.

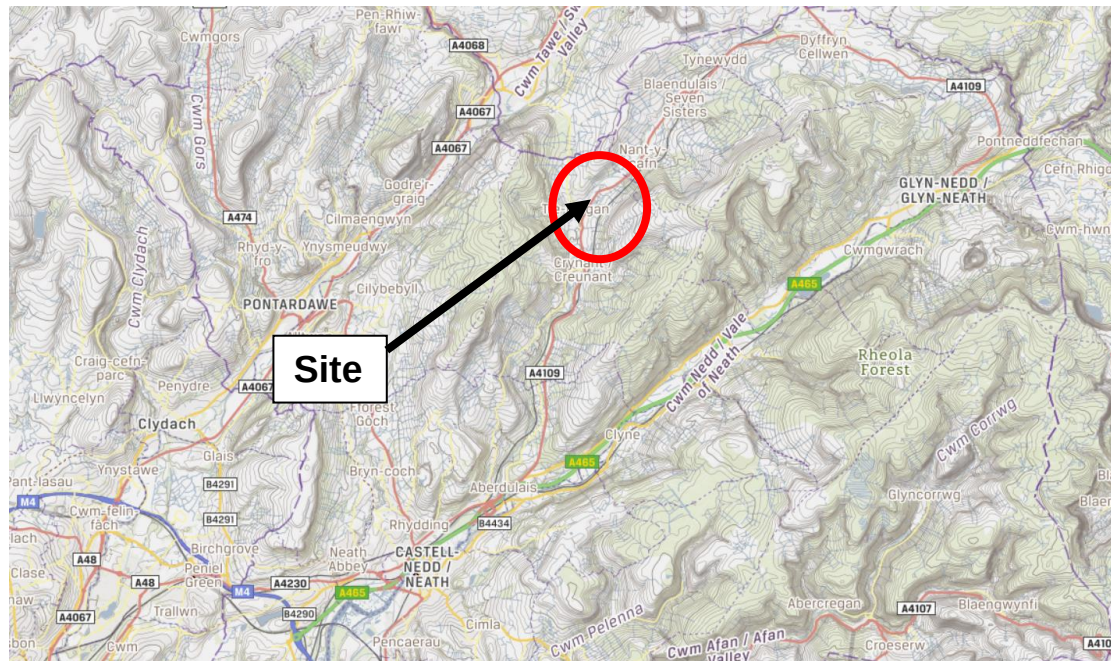


Figure 2.1 – Location Plan

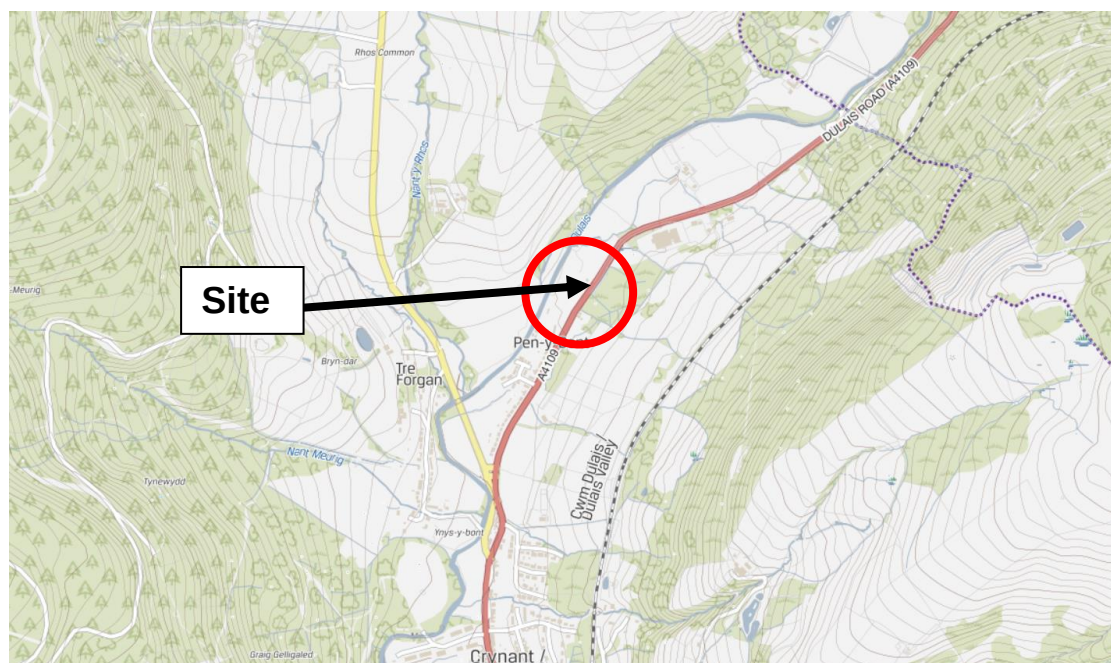


Figure 2.2 – Plan of Area



Figure 2.3 – Plan of Site

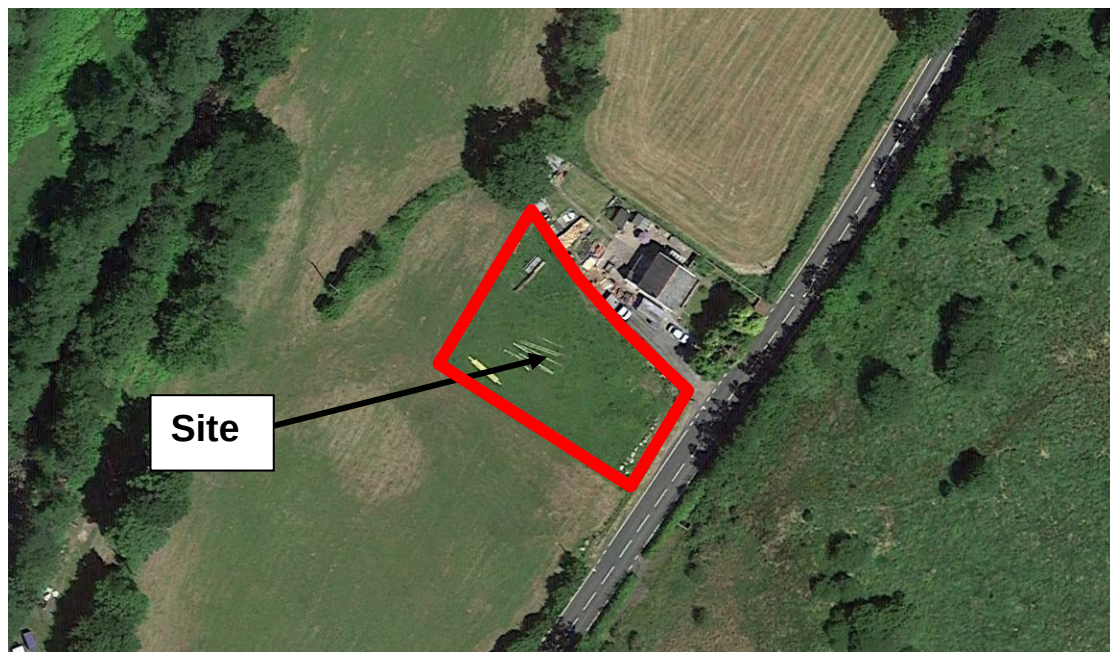


Plate 2.1 – Aerial View of Site

Proposed Development

It is proposed to construct two static caravan pitches along with an associated utility and day room building, and driveway (see Figure 2.4 to 2.6).

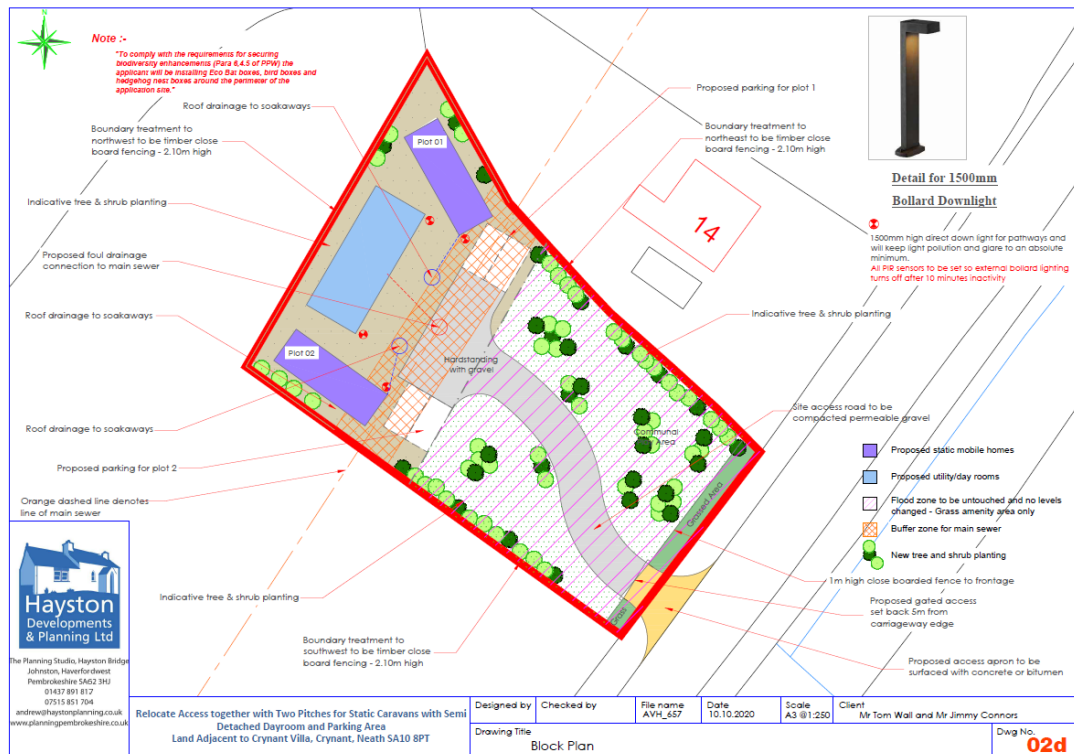


Figure 2.4 – Proposed Development

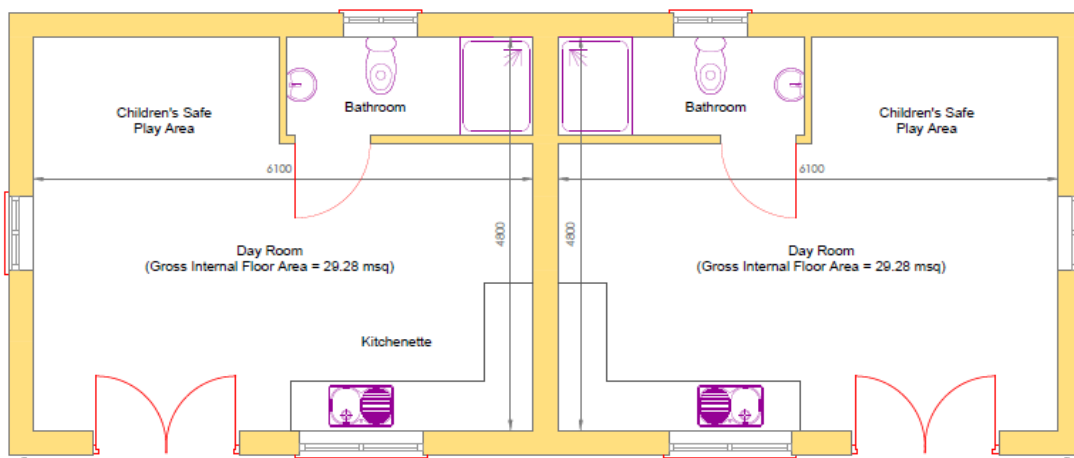


Figure 2.5 – Plan of Proposed Utility / Day Room Building

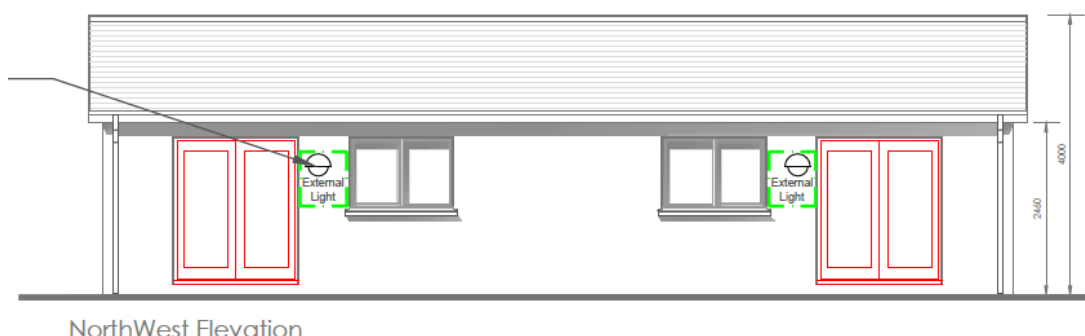


Figure 2.6 – Front Elevation of Proposed Utility / Day Room Building

Topography

Lidar data for the area (see Figure 2.7) indicated that the site levels ranged between 106.4m AOD and 107.2m AOD with the levels generally rising from the south east to the north west before falling down to the Dulais beyond the site.

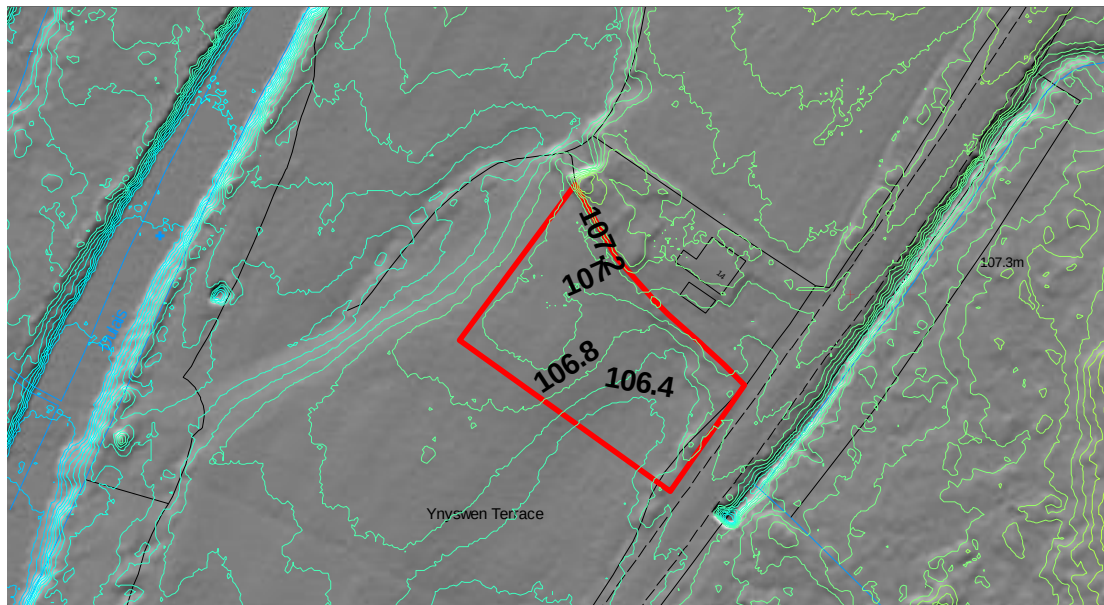


Figure 2.7 – Lidar Data for the Site

3 FLOOD RISK

Flooding can occur from several sources, some of which are considered in this section. A flood map (see Figure 3.1), obtained from Natural Resources Wales, indicates that part of the site is expected to remain flood free during the Q100 event but that the eastern part is expected to be at risk during the Q1000 year event.

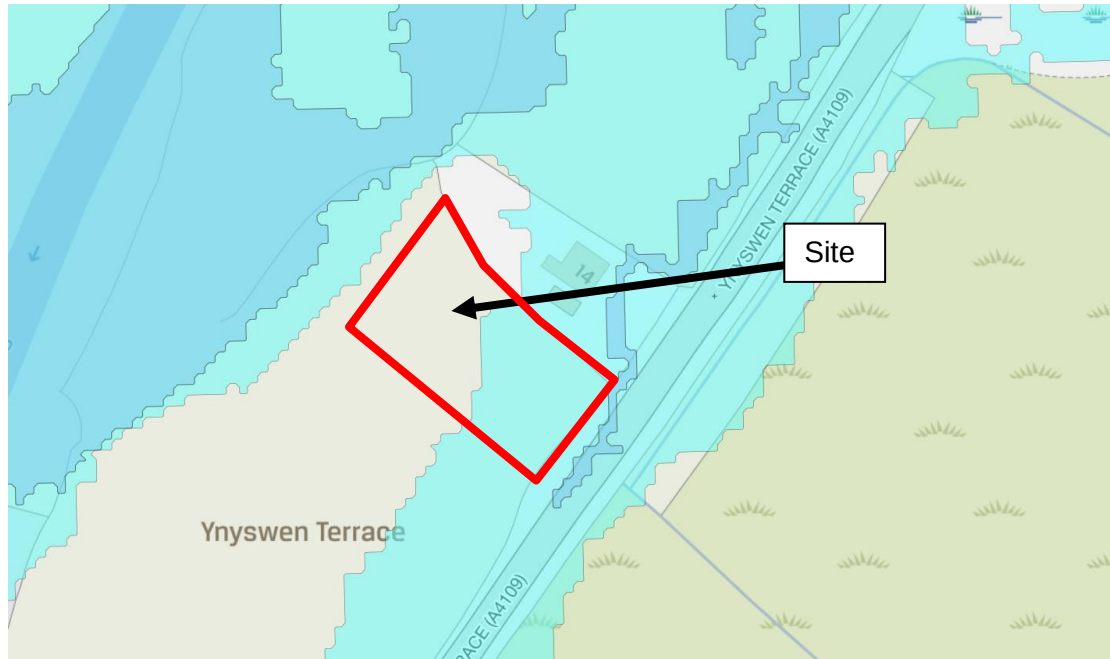


Figure 3.1- NRW Flood Map of the Area

3.1 Fluvial

The results from the latest NRW 2D TUFLOW model suggests that the site will be flood free during the Q100 event (see Figure 3.2 and Table 3.1). However, when taking climate change into consideration some water flowed onto the eastern part of the site although the depth is generally expected to be less than 100mm (see Figure 3.3). The flood extent during a Q1000 event was similar although the depth was slightly greater in areas but the velocity could reach 0.6m/s (see Figure 3.4 and 3.6).

These results assume that the flood defences, protecting the modelled area, are in place. The impact of the undefended scenario was also considered. This showed that during the studied events there was no marked difference in the either the flood depths or velocity (see Figure 3.7 to 3.11).

Should it become necessary to evacuate the site during an event then the escape route is onto the highway, where the flood depth is generally expected to be less than 0.2m but the velocity could be greater than 1m/s in areas.

Table 3.1 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

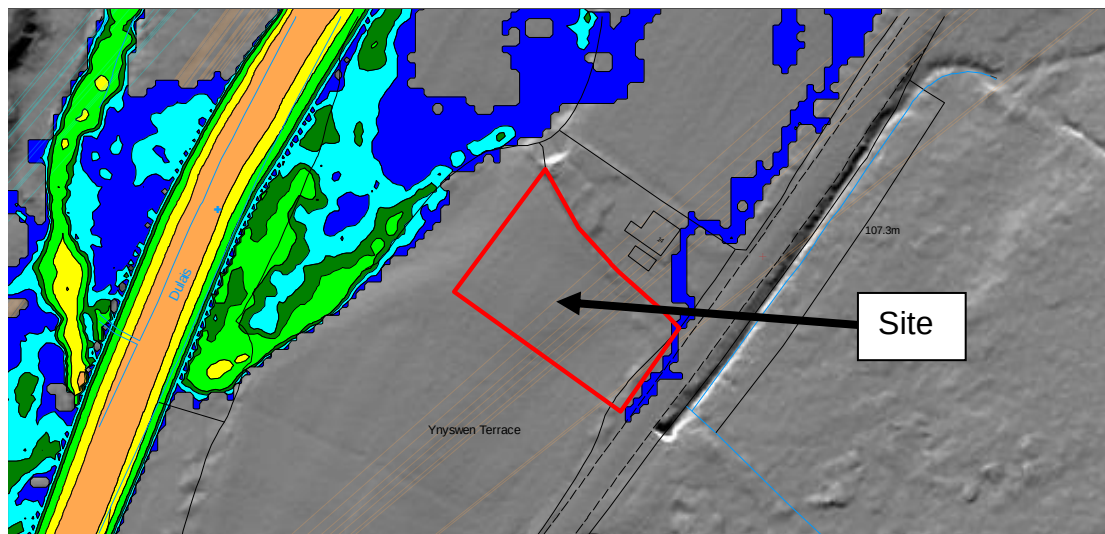


Figure 3.2 - Q100 Depth (Key on Table 3.1)

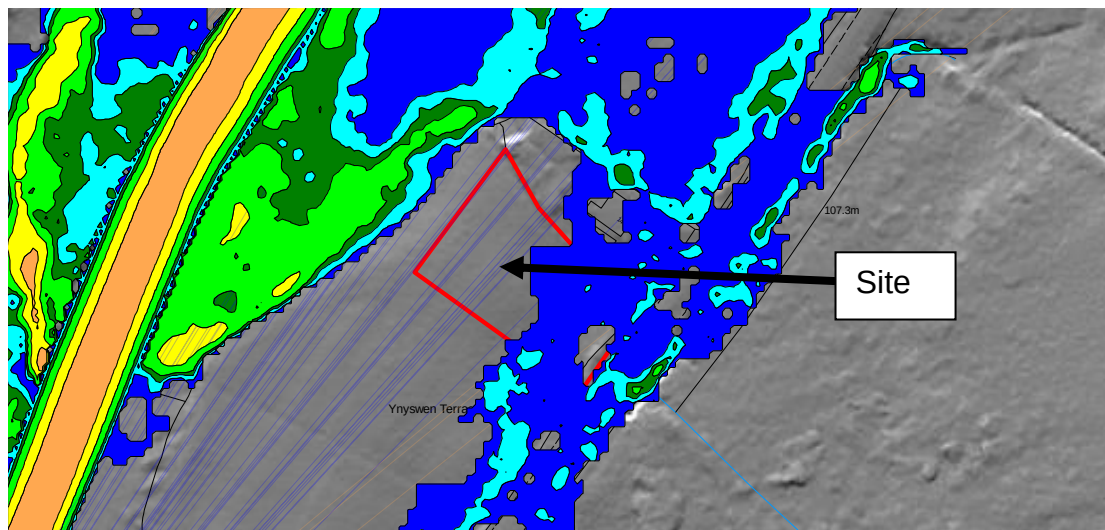


Figure 3.3 - Q100 With Climate Change - Depth (Key on Table 3.1)

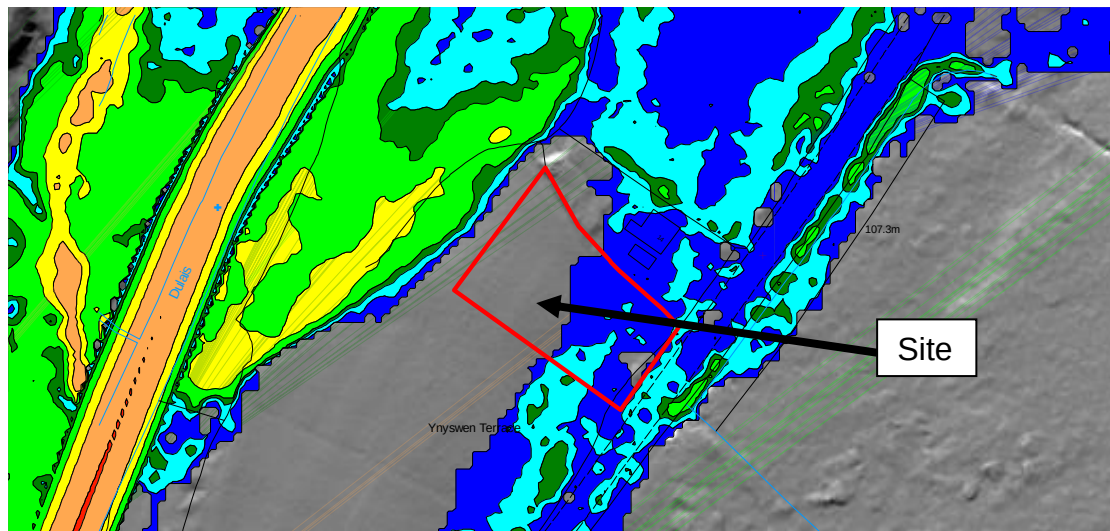


Figure 3.4 - Q1000 Depth (Key on Table 3.1)

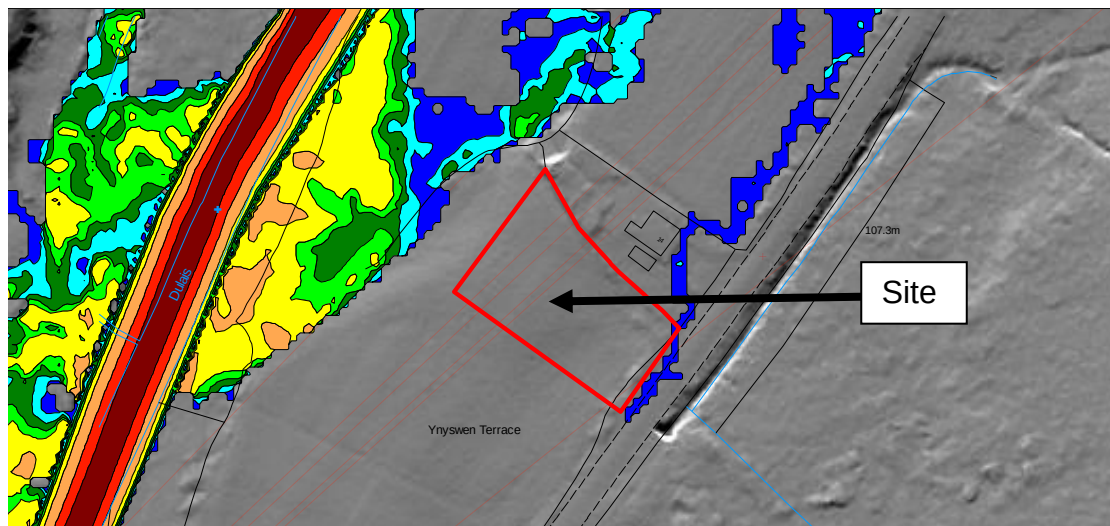


Figure 3.5 - Q100 Velocity (Key on Table 3.1)

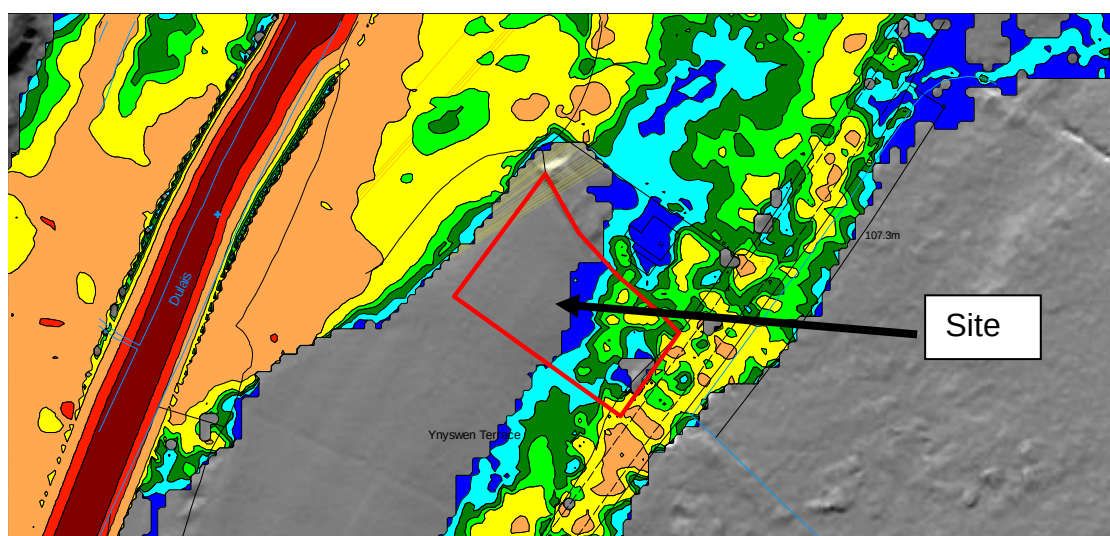


Figure 3.6 - Q1000 Velocity (Key on Table 3.1)

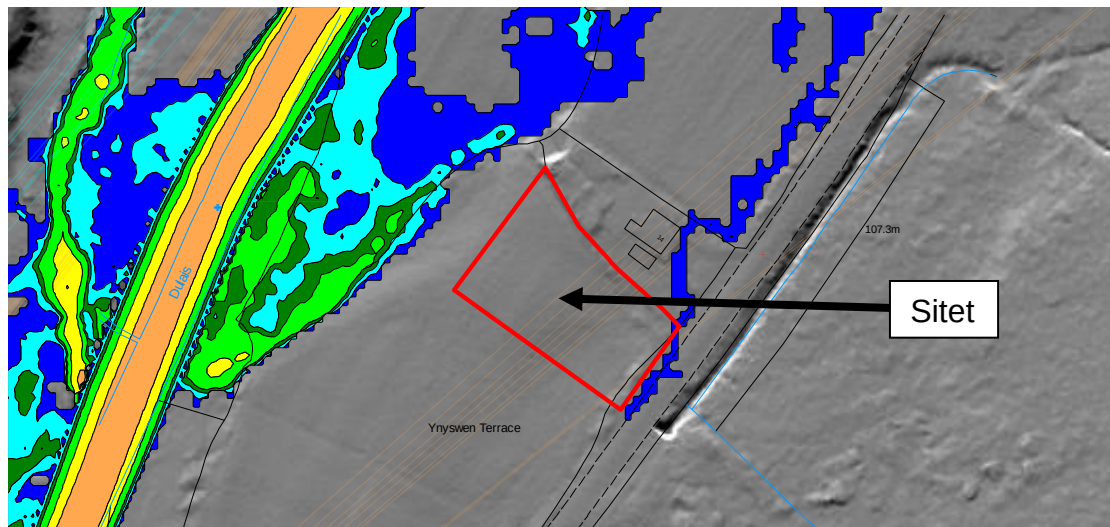


Figure 3.7 - Undefended Q100 Depth (Key on Table 3.1)

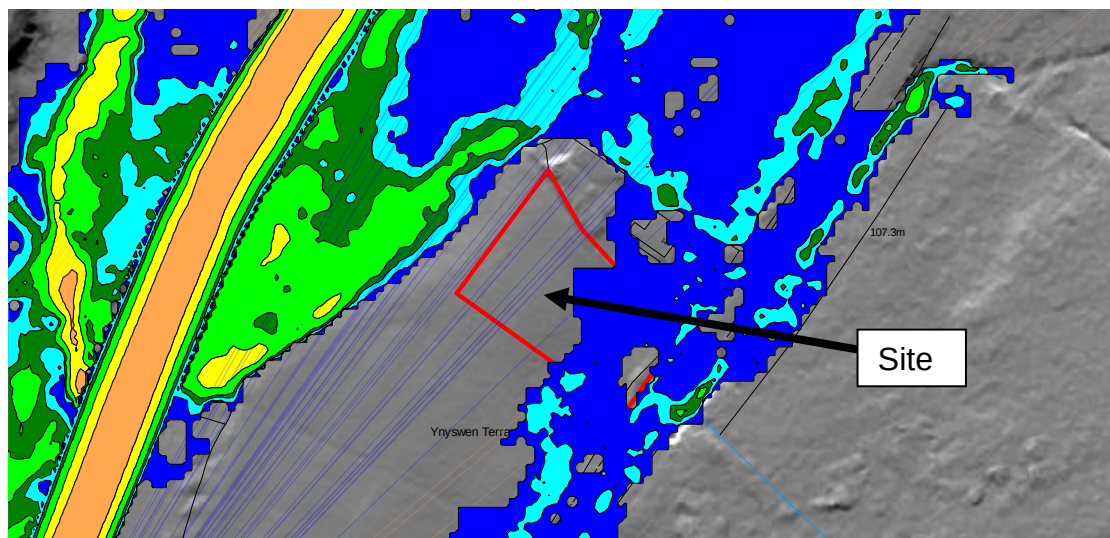


Figure 3.8 - Undefended Q100 + CC Depth (Key on Table 3.1)

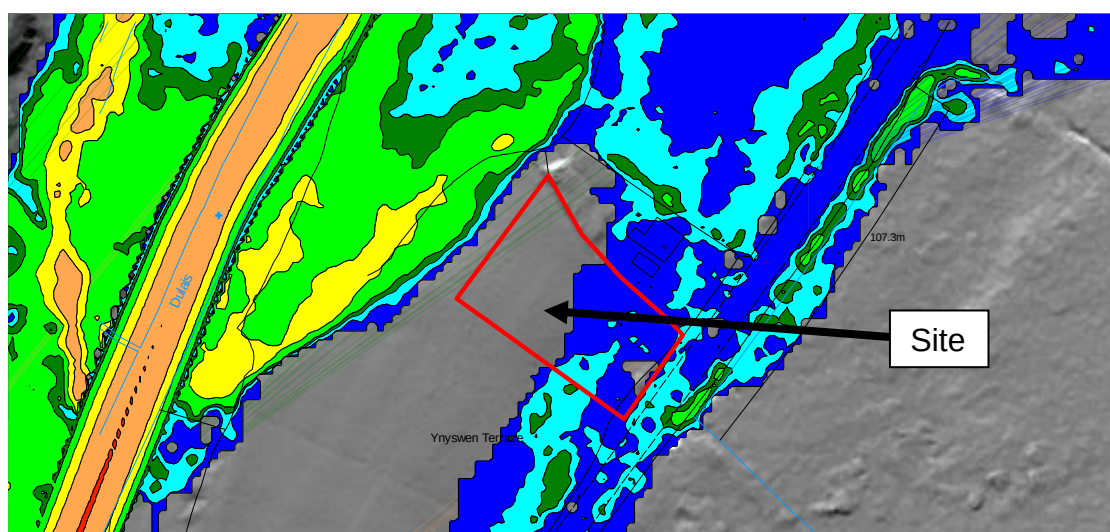


Figure 3.9 - Undefended Q1000 Depth (Key on Table 3.1)

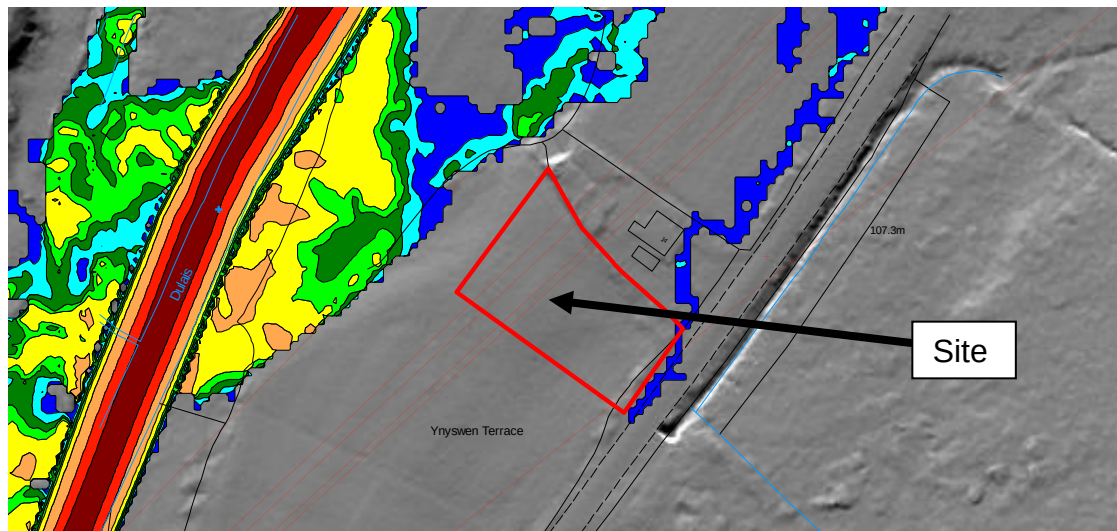


Figure 3.10 - Undefended Q100 Velocity (Key on Table 3.1)

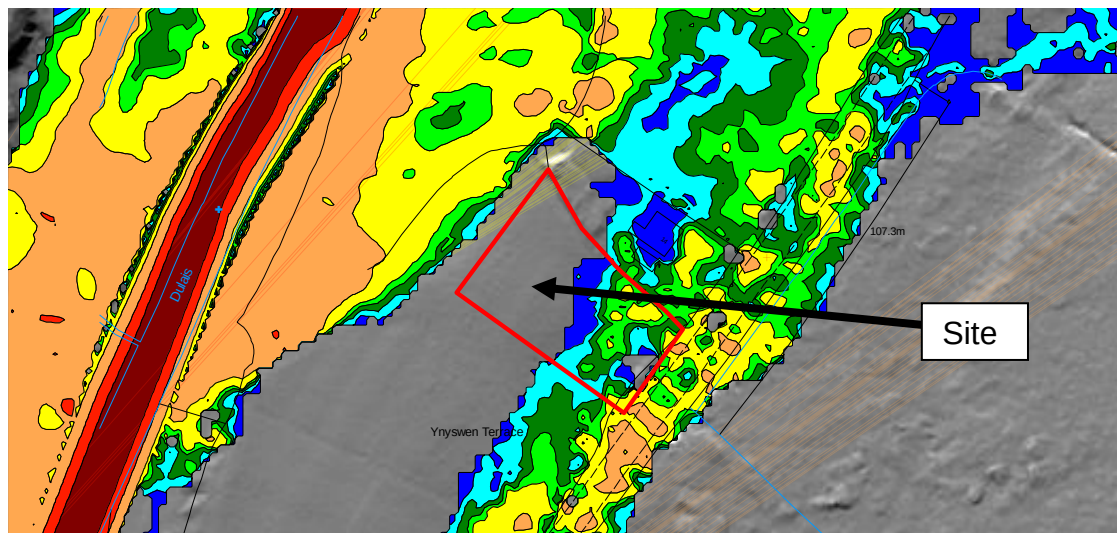


Figure 3.11 - Undefended Q1000 Velocity (Key on Table 3.1)

3.2 Tidal

The site is not considered to be at risk from tidal inundation.

3.3 Surface Water

NRW surface water map suggests that the site is not expected to be at risk of surface water flooding (see Figure 3.12).

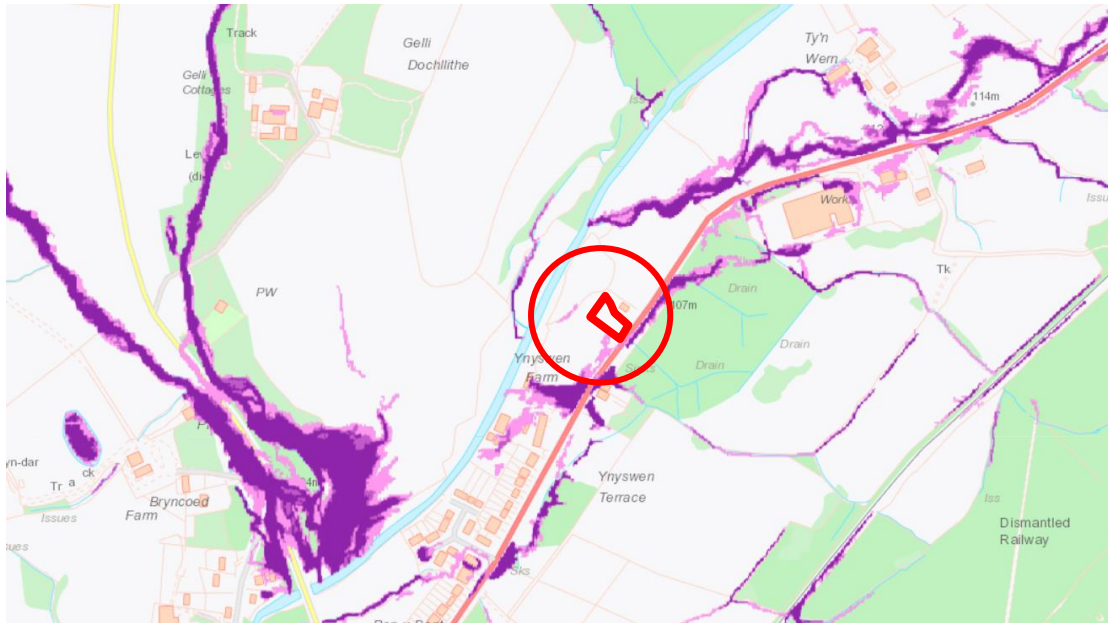


Figure 3.12 – Surface Water Flooding

3.4 Sewage Backflow.

Care should be taken to ensure that water from the foul sewer system is unable to back up into the development and consideration should be given to installing a none return valve.

3.5 Sustainable Drainage

As the development will be constructed on a greenfield plot the proposal will increase the rainfall runoff rate if a sustainable drainage system is not included in the design. The system should be designed in accordance with the Welsh Government Standards and the SUDS manual.

3.6 Reservoir Failure

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

3.7 Ground Water

The superficial geology for the area consist of Clay, Silt, Sand and Gravel, from Alluvium, overlying a bedrock geology of Mudstone, Siltstone and Sandstone of the Llynfi Member or the South Wales Upper Coal Measures Formation (see Figure 3.13 and 3.14). When also taking the terrain into account the risk of groundwater flooding is considered to be low to moderate.

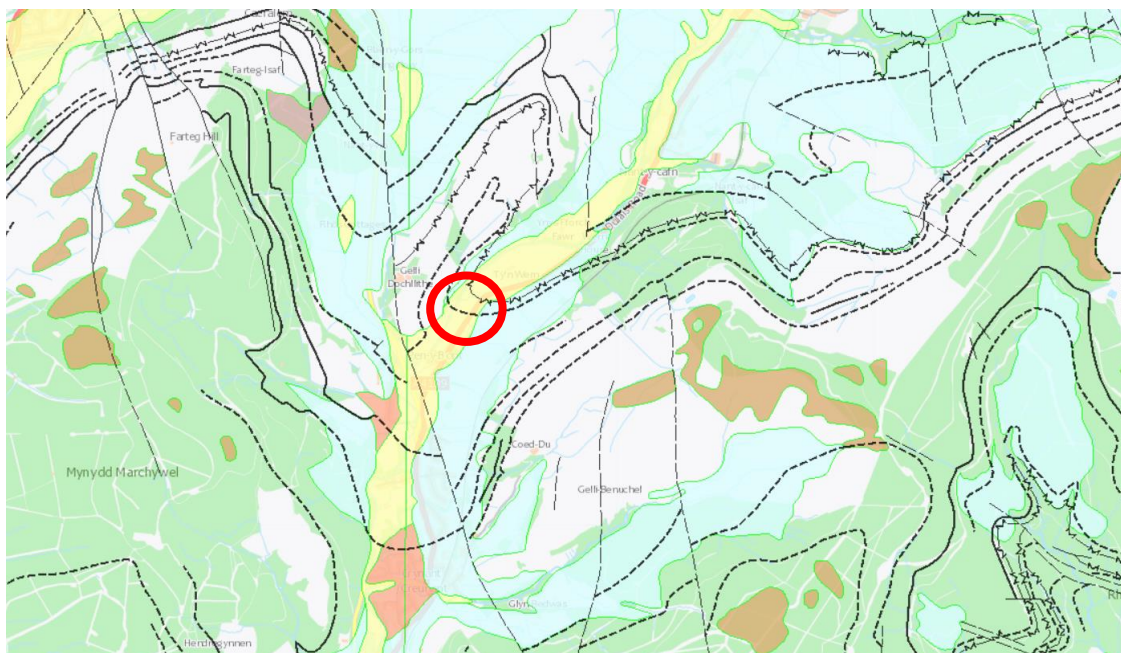


Figure 3.16 – Superficial Geology

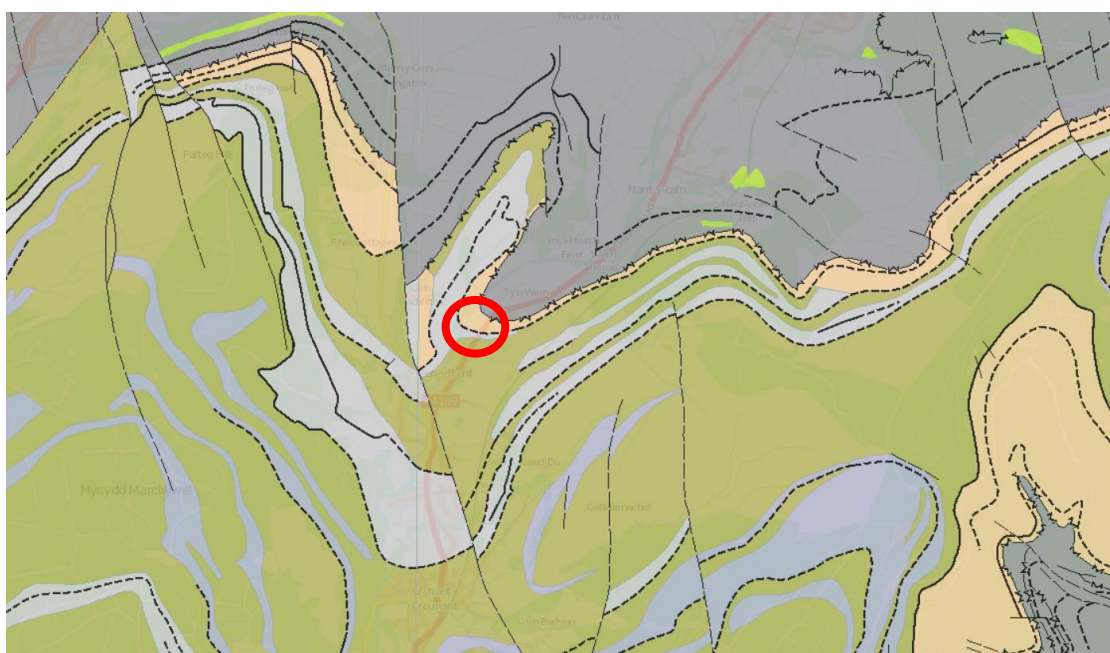


Figure 3.17 – Bedrock Geology

4 FLOOD PROOF MEASURES

Although the residential development will be limited to the areas expected to remain flood free in a Q1000 year event, the risk of flooding can not be removed completely. Flooding can result in the need for expensive repairs. As well as the direct damage caused to a building, flooding can impact in many other, and possibly more stressful, ways. The inconvenience of cleaning up a home and the loss of sentimental valuables can be immeasurable. There are methods, however, to limit and mitigate against the consequence of flood damage in the proposed utility / day room building. Some of these are discussed in this section and should be considered during the refurbishment. The caravans are elevated which would further reduce their risk of flooding.

Water can enter a building:

- Around the edges of closed doors;
- Through airbricks;
- Backflow through overloaded sewers;
- Seepage through walls especially cracks;
- Seepage through the ground;
- Around cable / services entrance into the building.

Dryproofing - Preventing the water from entering the building.

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

- There are several propriety barriers available, however, these can be expensive. If desirable, it might be more appropriate to ensure that the walls of the utility / day room building are able to act as barrier themselves. Care should be taken to ensure that the pointing and any external plastering are kept in good order and that all cracks and gaps around cables and ducts entering the building are sealed;
- Providing temporary covers to any low air vents. These covers should be removed once the risk of flooding is over. Alternatively, the air vents can be installed at a high level;
- Erecting a temporary barrier in front of any external doors or installing flood protection doors to the utility / day room;
- Installing a valve allowing the sewer system to be shut preventing any back flow.

By limiting the development to the land above the Q1000 year event flood line the risk of flooding will be low and installing additional dryproofing measures may be excessive. However, it is possible to limit the damage that the water can cause once in the dayroom building (wetproof). Where appropriate the following could be considered:

- Move valuable items to a higher level;
- Have solid concrete floors. Suspended floors are more difficult to clean and dry underneath;
- Use water resistant render for walls;
- Use non water absorbing insulation;
- Use corrosion resistant fittings such as galvanised or stainless steel;
- Ensure that the ground floor electrics is on a separate circuit to the rest of the building and that the electric cables are fed from above with the sockets kept high;
- Use an appropriate damp proof course;

- Consider freestanding movable equipment;
- Install equipment with motors high up from the floor;
- Install solid internal and external doors effectively sealed;
- Avoid storage heaters;
- Ensure boilers are off the ground.

A flood response plan should be prepared for the site and regularly maintained. All future occupiers should be made aware of the flood risk and what actions are to be undertaken during an event. It is important to also have as much warning as possible to allow the flood response plan to be followed safely. This can be achieved by registering on the flood warning scheme provided by NRW (see Figure 4.1).



Figure 4.1 – NRW Flood Alert Area

5 CONCLUSION AND RECOMMENDATIONS

It is proposed construct two static caravan pitches along with associated infrastructure, including an utility / day room building. However, the client has been advised that the plot partially lies within a C2 flood zone, in accordance with TAN 15, and hence an FCA is required to consider the consequences of flooding.

NRW's 2D hydraulic model suggest that the site is expected to remain flood free during the Q100 event although, with climate change, some water flooded across part of the site (generally less than 100mm). During the Q1000 year event the extent of flooding remained similar but the depth could reach 300mm and the velocity could reach 0.6m/s in areas. The development part of the site will need to be limited to the area expected to remain flood free during the Q1000 event (see Figure 5.1).

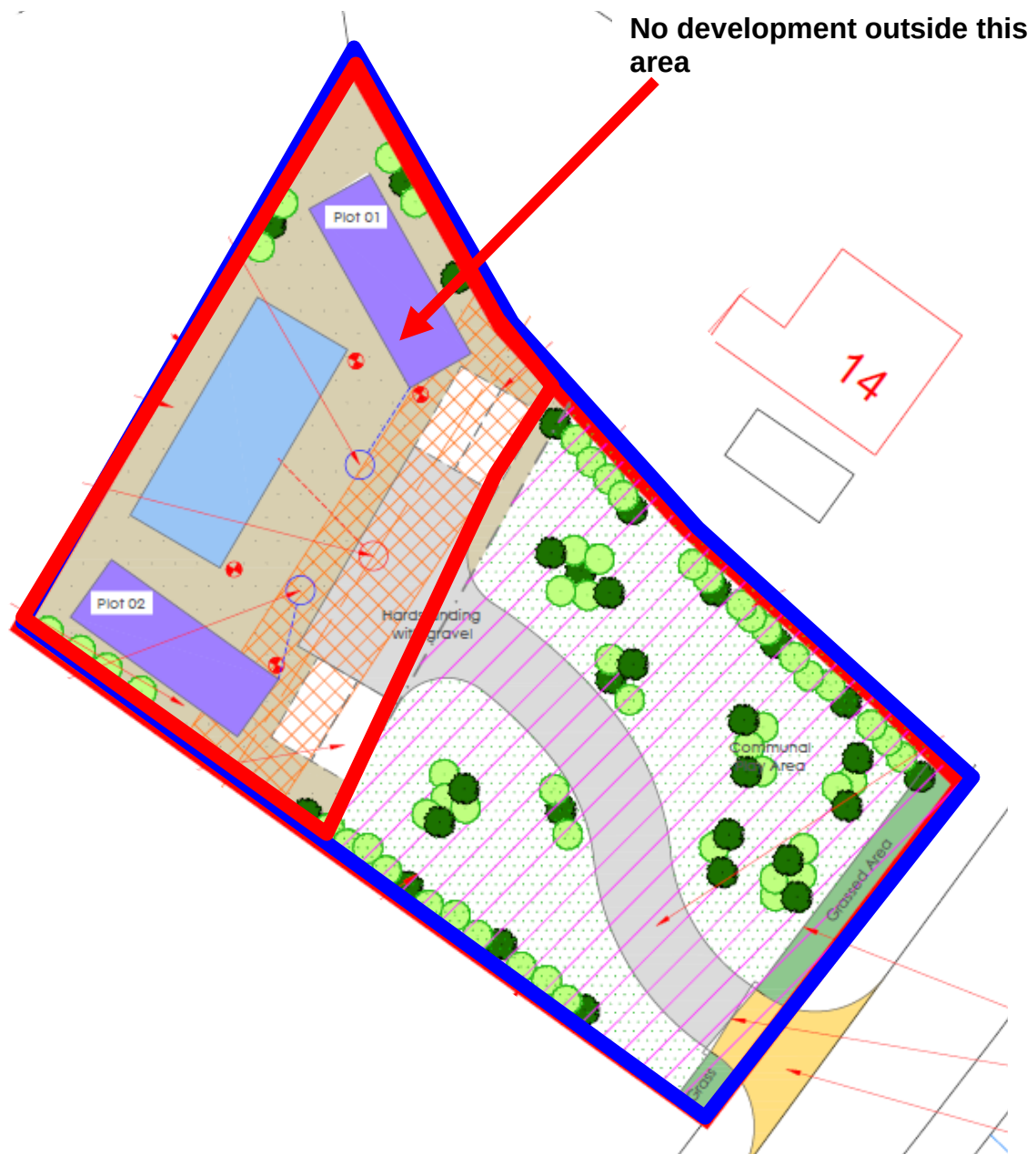


Figure 5.1 – Proposed Development

The site is not expected to be at risk from tidal flooding, surface water flooding, or reservoir failure. The risk from ground water flooding is also considered to be low to medium and there will be no loss of flood storage capacity.

A summary of the adherence of the development with the requirements of Section 7 and Appendix A1 of TAN 15 is summarised in Table 5.1.

As it is a greenfield development, a sustainable drainage system will be required in accordance with the requirements of the Welsh Government Standards and the SUDS Manual.

Table 5.1 - Adherence With Section 7 and Appendix A1 of TAN 15		
	Requirement	Comment
1	Is the property flood free during a Q100 event	Yes.
2	Is the flood depths at the property less than 600mm during a Q1000 event	Yes.
3	Is the flood velocity at the property less than 0.15m/s during a Q1000 event	Yes
4	Is the flood depths on the access route less than 600mm during a Q1000 event	In general
5	Is the flood velocity on the access route less than 0.3m/s during a Q1000 event	No
6	Will the development have an impact on third parties	No
7	Will there be a loss of flood storage capacity	No (Development to be limited to the area above the Q1000 flood line)

Recommendations

In developing the site, it is recommended that:

- the development is limited to areas above the Q1000 flood level;
- wet proofing measures, as identified in Section 4, are included in the utility / day room where possible;
- an emergency evacuation plan is prepared, maintained and effectively disseminated to all future occupiers;
- the property is registered on the flood warning scheme provided by NRW.