

Paddock Cabin Development Proposal: Flood Risk Assessment

Poole Farm,
Leigham,
Plymouth,
PL6 8NF

This FRA has been produced for the ‘Paddock Cabin’ development proposed at Poole Farm as per Planning Application 23/01094/FUL. Site plan below.



Fig.1

Description,

The Paddock Cabin is a sustainable timber building designed to host visitors to Poole Farm for activities such as outdoor learning, wildlife watching and eco-therapy. The location has been carefully chosen due to its close proximity to important fluvial, grassland and wooded habitats enabling unique wildlife watching and education opportunities within the city.

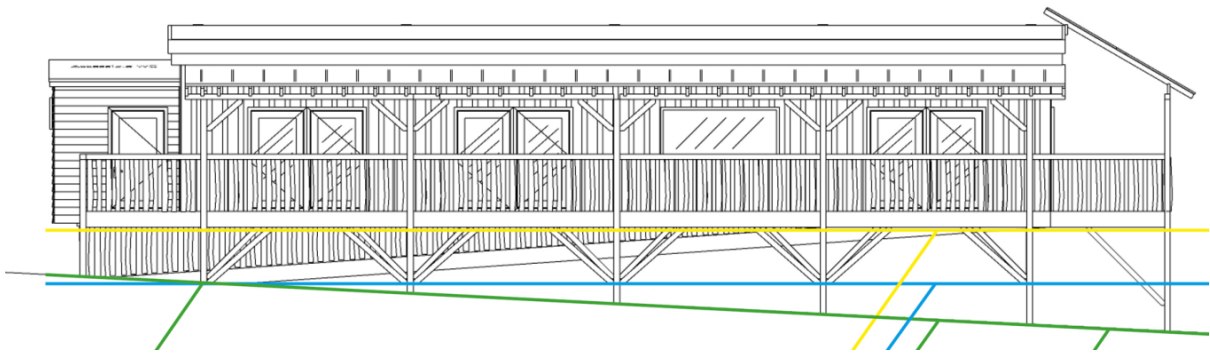


Fig.2

Current Land use,

The proposed development is to be situated in a grassy field currently used for agricultural grazing.

Development Size,

Internal footprint: 104 m²

Internal volume: 312 m³

External useable space (sheltered raised deck): 64 m²

Existing site levels/topography,

See topography PDF attached for full drawings.

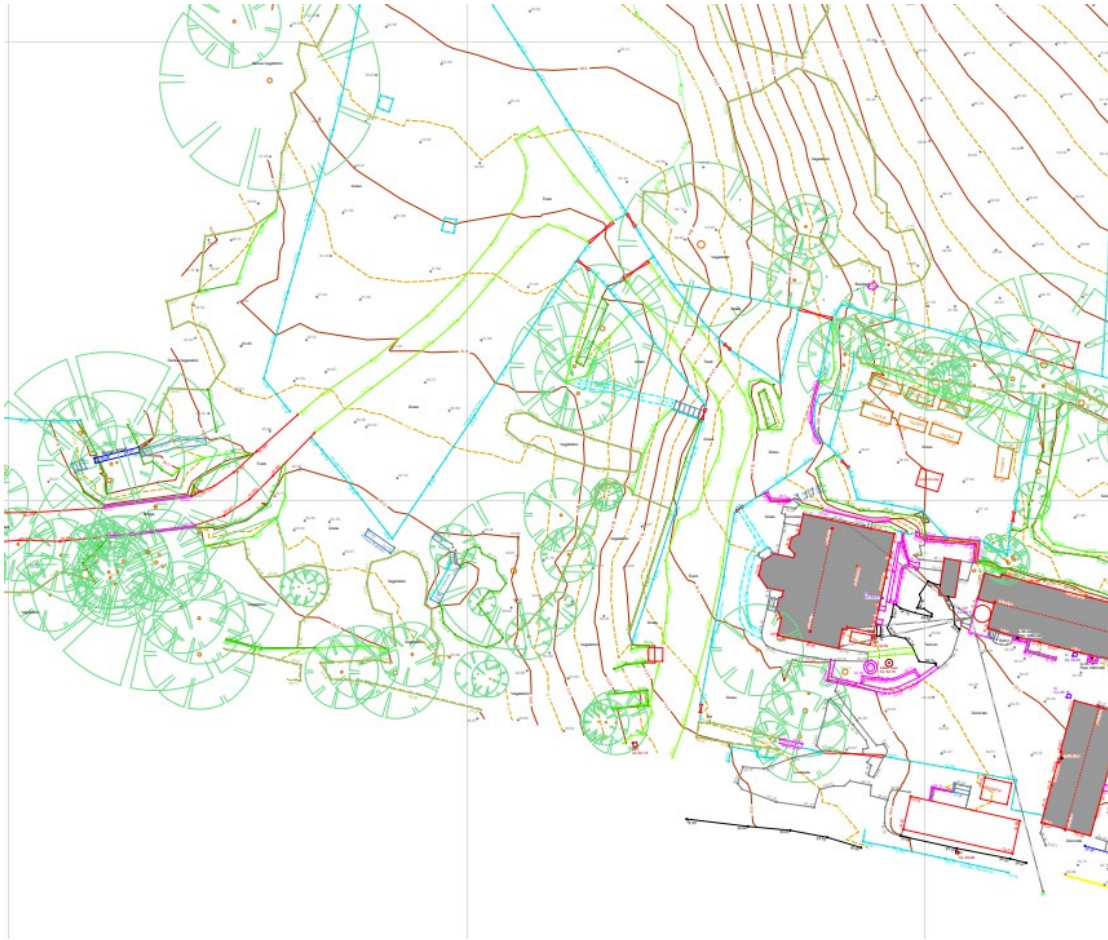


Fig.3

Assessment of flood risk,

Flood Zone:

Environment Agency Flood Map:

Macauley Potter (Planning Officer) has requested the following is highlighted in the FRA: *“I also note that the EA flood risk map indicates that the structure’s footprint may fall just outside of FZ3, if this is the case it will be important to highlight this in the FRA”*



Flood map for planning

Your reference: FR map paddoc
Location (easting/northing): 250343/58564
Created: 23 Aug 2023 17:21

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

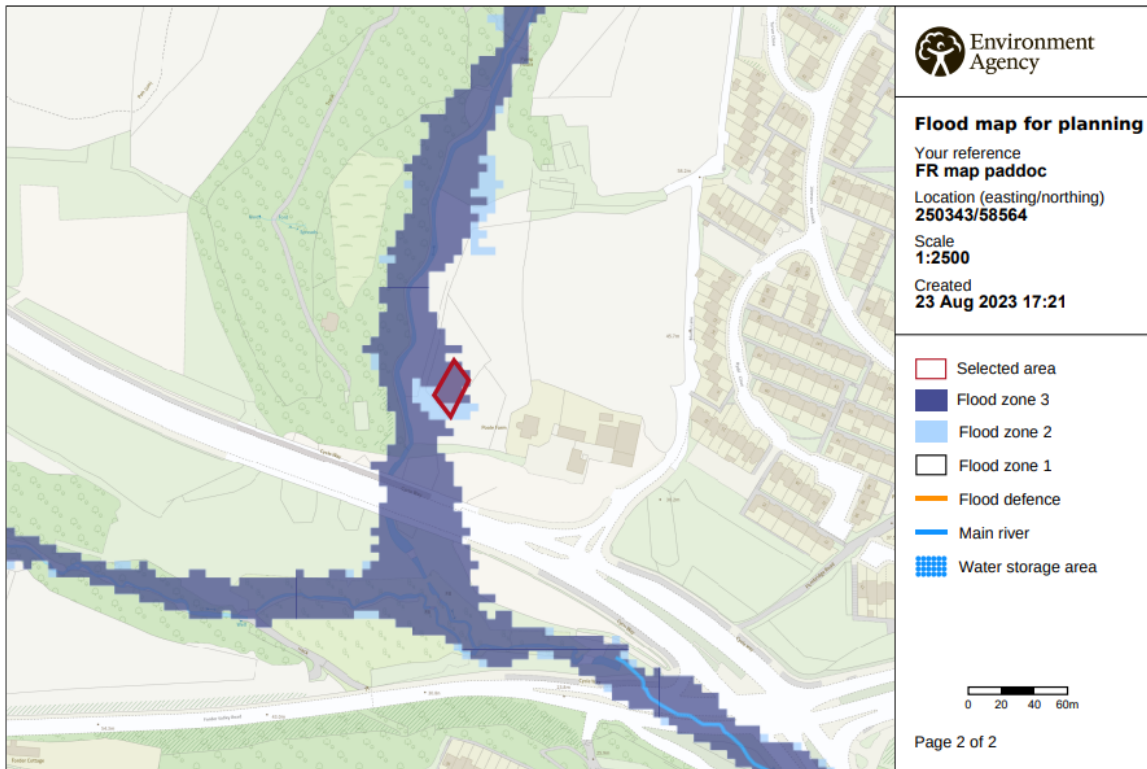
The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

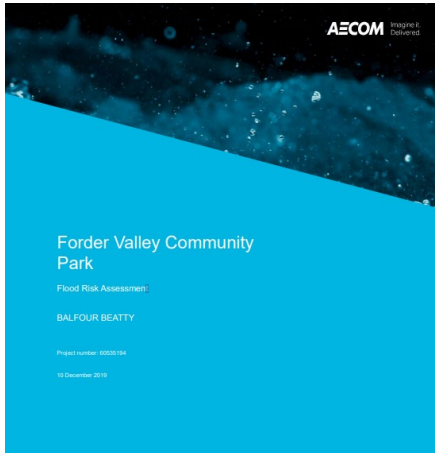
Fig. 4



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Fig. 5

The FRA uses information provided in the FRA (FVCP FRA, 2019) produced by Aecom in 2019. This document is appended.



There is a medium risk of fluvial flooding (FVCP FRA, 2019) and this FRA will focus on this source of flooding. The other sources of flooding are deemed low risk (FVCP FRA, 2019) and for this cabin development, the surface water flooding and runoff from surrounding developed land is deemed to be at low risk due to the location of the cabin being surrounded by fields and no significant hardstanding areas.

Type of Flooding	Sources of Flooding	Flood Risk
Fluvial	Bircham Stream Forder Stream	Medium
Groundwater	Underlying geology and groundwater levels	Low
Sewers	Foul Water Sewers	Very Low
Surface water	Runoff from surrounding developed land	Medium
Reservoir	None	Very Low

Fig. 6

Topography:

See topography PDF attached for full drawings.

The principal watercourse within the vicinity of the Site is the Bircham Stream (north to south). Bircham Stream originates 1km to the north west of the proposed development and has a relatively steep catchment, with an area of approximately 2.7km².

There is an permanent bridge built in 2021 over the Bircham stream (20/00056/FUL - Bridge at Poole Farm over Bircham Stream) close to the location of the proposed paddock cabin (see topo maps for exact location) this 'request to discharge planning consent 5' was approved and Aecom's Flood Risk Assessment was referenced at the time.

The topography falls generally from west/northwest to east/southeast, forming a system of valleys with channels and flood plain for the Forder Valley and Bircham Streams. The site falls from

approximately 110m AOD at the head of the Bircham Stream for 1.6km, to approximately 25m AOD at the confluence – giving longitudinal gradients of 1:20, respectively.

Site geology and hydrogeology The British Geological Survey (BGS) data5 has identified the bedrock beneath the site as varying; Upper Devonian Slate under the east of the site, with Saltash Formation Slate and Siltstone and bands of Torpoint Formation Mudstone and Siltstone under the west of the site. Superficial deposits consist of gravel, clay, silt and sand and are present adjacent to stream locations. The area is designated a Secondary A Aquifer. Groundwater used for drinking water is protected by the Environment Agency. The Environment Agency classifies zones known as Source Protection Zones (SPZ) around potable groundwater abstraction points, designed to limit potentially polluting activities. The Environment Agency website shows that the site does not overlie a SPZ.

Relevant data, information and drawings from Aecom’s FRA (FVCP FRA, 2019):

For the purposes of this FRA, I have drawn on information from Aecom’s FRA (FVCP FRA, 2019), which uses WSP flood modelling data and is included in the appendix.

There are 2 sites described in the report which are of relevance to this FRA. From these sites I have inferred flood levels for the proposed paddock cabin development.

1. Bir245

Grid Reference:
 X: 250319.11
 Y: 58541.98
 BIR 245
 Recorded AOD: 28.37

Peak Modelled Water Level (mAOD)																
Location	Node	Bed lvl (mAOD)	1 in 5		1 in 25		1 in 50		1 in 100		1 in 200		1 in 100 +40%		1 in 100 +85%	
			BASE	PROP	BASE	PROP	BASE	PROP	BASE	PROP	BASE	PROP	BASE	PROP	BASE	PROP
Bircham Stream Reach																
Upstream end of Reach	Bir119	32.93	33.31	33.31	33.40	33.40	33.44	33.44	33.48	33.49	33.52	33.52	33.58	33.58	33.66	33.66
	Bir137	32.12	32.58	32.58	32.67	32.67	32.71	32.71	32.78	32.78	32.80	32.80	32.85	32.85	32.95	32.94
	Bir245	27.33	27.99	27.99	28.11	28.11	28.17	28.17	28.23	28.23	28.30	28.30	28.37	28.37	28.49	28.50
Upstream of Poole Farm Causeway	Bir343U	23.55	24.73	24.73	24.82	24.82	24.87	24.88	24.91	24.91	24.97	24.97	25.02	25.02	25.12	25.12
Downstream of Poole Farm Causeway	Bir343D	23.55	24.16	24.16	24.27	24.27	24.32	24.32	24.36	24.36	24.41	24.41	24.45	24.45	24.60	24.60
Connection point for spill from the Forder Stream	Bir351	23.07	23.91	23.91	24.05	24.05	24.12	24.12	24.19	24.19	24.26	24.26	24.33	24.33	24.44	24.44
Downstream extent of Reach (connection point to Forder)	Bir357	22.99	23.80	23.80	23.93	23.93	23.98	23.98	24.04	24.04	24.10	24.10	24.15	24.15	24.26	24.26
Forder Stream Reach																
Upstream end of Forder Stream reach	For113	29.32	29.73	29.73	29.81	29.81	29.86	29.86	29.90	29.90	29.95	29.95	29.99	29.99	30.08	30.08
Upstream of existing Forder Stream Culvert	For210	26.81	28.06	28.06	28.21	28.21	28.25	28.25	28.28	28.28	28.32	28.32	28.36	28.36	28.43	28.43
Downstream of existing Forder Stream Culvert	For217	26.07	26.74	26.74	26.86	26.86	26.92	26.92	26.97	26.97	27.03	27.03	27.09	27.09	27.18	27.18
Connection point for spill from Bircham stream	For351	23.33	23.92	23.92	23.99	23.99	24.04	24.04	24.09	24.09	24.15	24.15	24.20	24.20	24.31	24.31
Upstream of model Reach Junction	For357U	23.3	23.82	23.82	23.94	23.94	23.99	23.99	24.05	24.05	24.11	24.11	24.16	24.16	24.27	24.27
Downstream of model Reach Junction	For357D	23.3	23.80	23.80	23.93	23.93	23.98	23.98	24.04	24.04	24.10	24.10	24.15	24.15	24.26	24.26
Upstream of concrete footbridge	For361U	22.98	23.69	23.69	23.81	23.81	23.87	23.87	23.92	23.92	23.99	23.99	24.05	24.05	24.15	24.15
Downstream of concrete footbridge	For361D	22.98	23.65	23.65	23.76	23.76	23.81	23.81	23.86	23.86	23.92	23.92	23.98	23.98	24.08	24.08
Upstream of stream actual confluence and third inflow point	For420U	21.12	22.06	22.00	22.24	22.17	22.32	22.26	22.41	22.34	22.50	22.44	22.59	22.53	22.76	22.69
Downstream of stream actual confluence and third inflow point	For420D	21.12	22.06	22.00	22.24	22.17	22.32	22.26	22.41	22.34	22.50	22.44	22.59	22.53	22.76	22.69
Upstream end of Blunts Lane Culvert	For454	19.91	21.86	21.21	22.01	21.63	22.09	21.79	22.18	21.86	22.27	21.90	22.38	21.97	22.51	22.15
Downstream end of Blunts Lane Culvert	For476	19.9	20.87	20.57	21.10	20.80	21.22	20.92	21.34	21.05	21.47	21.20	21.62	21.36	21.88	21.68
River section downstream of Last structure in both models	For804	13.89	14.62	14.66	14.74	14.80	14.79	14.86	14.86	14.94	14.93	15.02	15.00	15.10	15.13	15.25
	For824	11.48	12.62	12.63	12.80	12.81	12.88	12.90	13.00	13.00	13.11	13.11	13.22	13.23	13.46	13.46
	For963	10.82	12.15	12.15	12.40	12.41	12.51	12.53	12.65	12.65	12.77	12.77	12.91	12.91	13.15	13.15
	For1065	9.9	11.07	11.07	11.28	11.28	11.36	11.37	11.45	11.45	11.55	11.55	11.65	11.65	11.83	11.83
Downstream extent of model	For1156	8.98	9.98	9.98	10.13	10.13	10.18	10.18	10.24	10.24	10.31	10.31	10.38	10.38	10.53	10.53

Fig. 7 (page 23 of Aecom’s FRA (FVCP FRA, 2019),

Bir245 has a flood level of 28.37m AOD for a 1in 100yr+40%



Fig. 8 (Location on map of Bir245) note the proximity to the Paddock Cabin

2. Bridge 1D

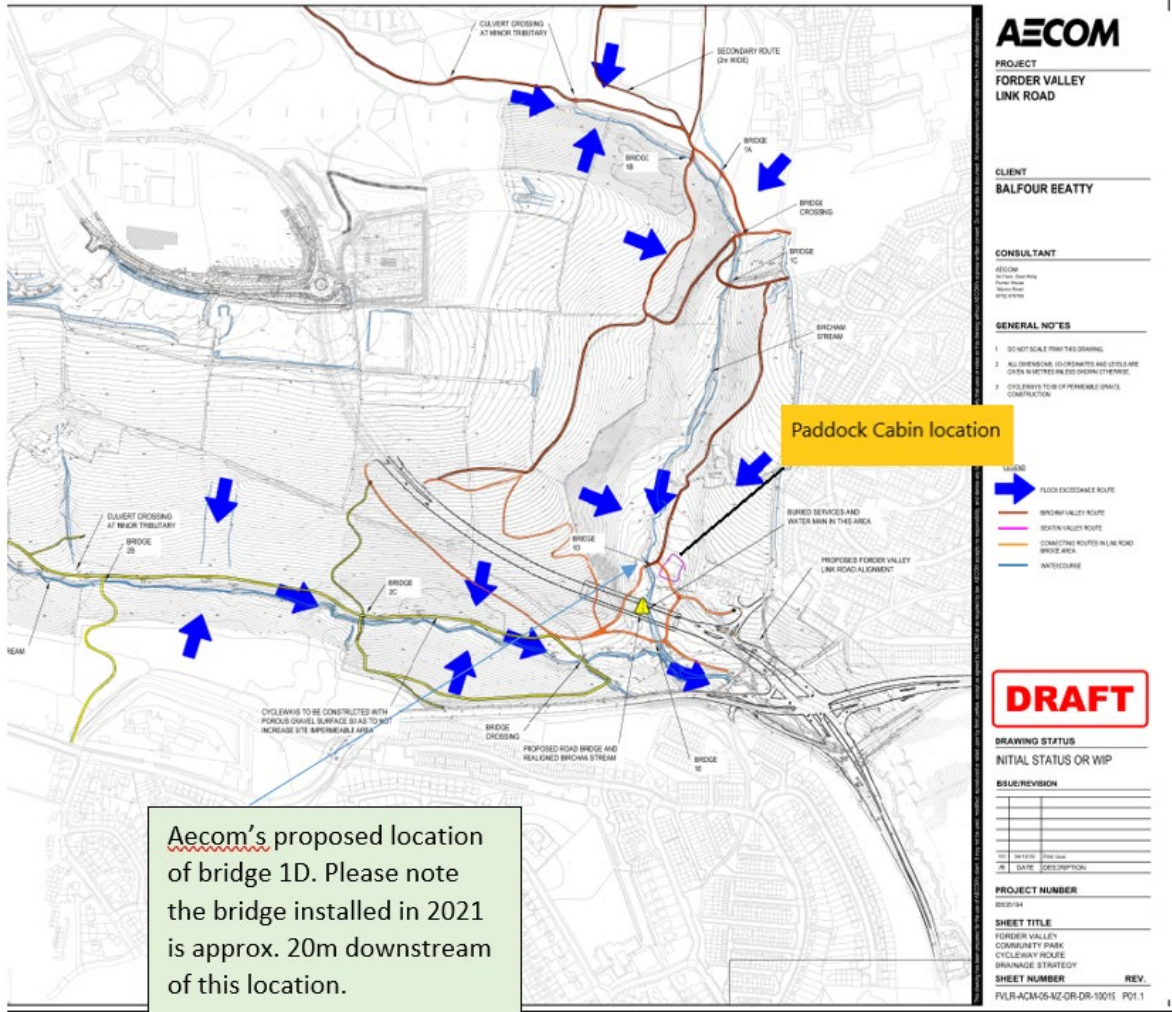


Fig. 9 Location of (previously) proposed bridge 1D (which is approx. 20-30m upstream of Bir245)

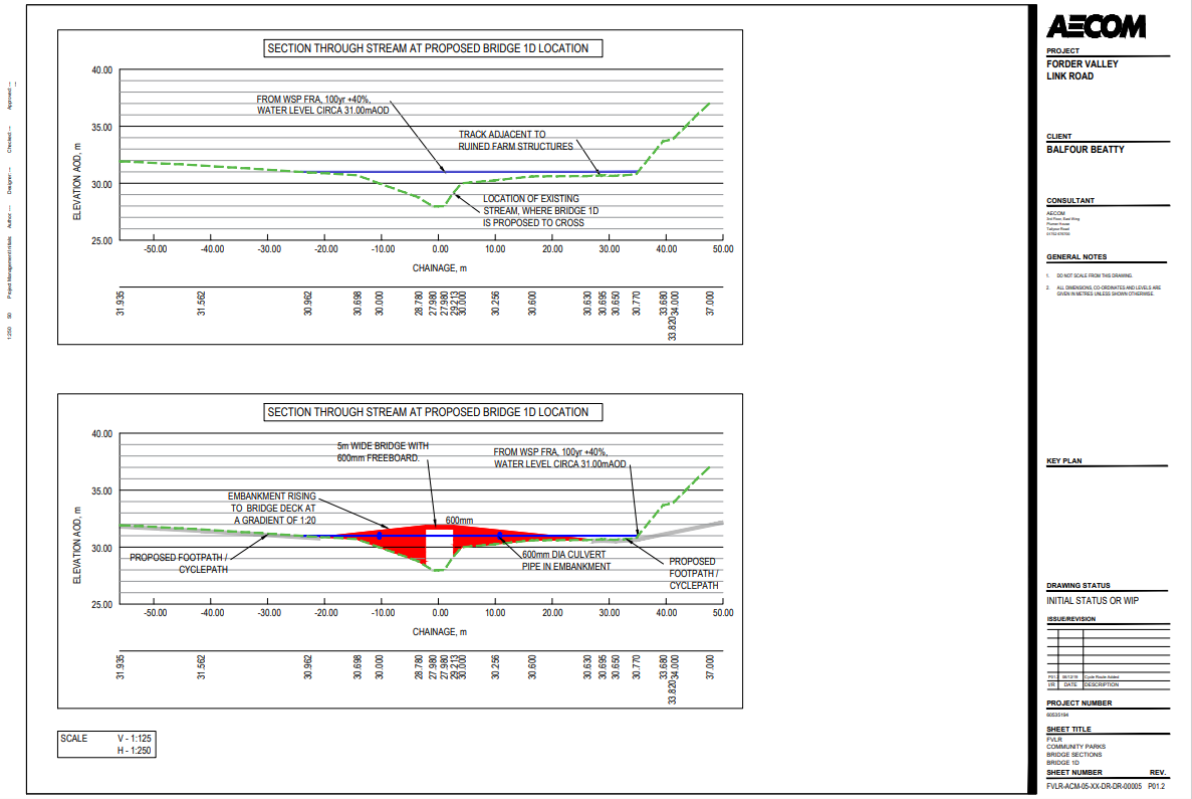


Fig. 10.

The flood water level (blue line) at site 'Bridge 1D' is 31.00m AOD (see Fig. 9 and 10) is 100yr flood event + 40% which takes into account future predictions of climate change.

See Appendix D (**FVCP FRA, 2019**) for full Flood Data and Hydraulic Modelling

Estimated Flood extent and Levels for Paddock Cabin,



Fig. 11 Bir245 and Bridge 1D (approx. 20 – 30m upstream of Bir245) provide 2 flood levels 28.37m AOD and 31.0m AOD respectively. These are transposed onto the topo drawings for the Paddock Cabin (see fig. 11).

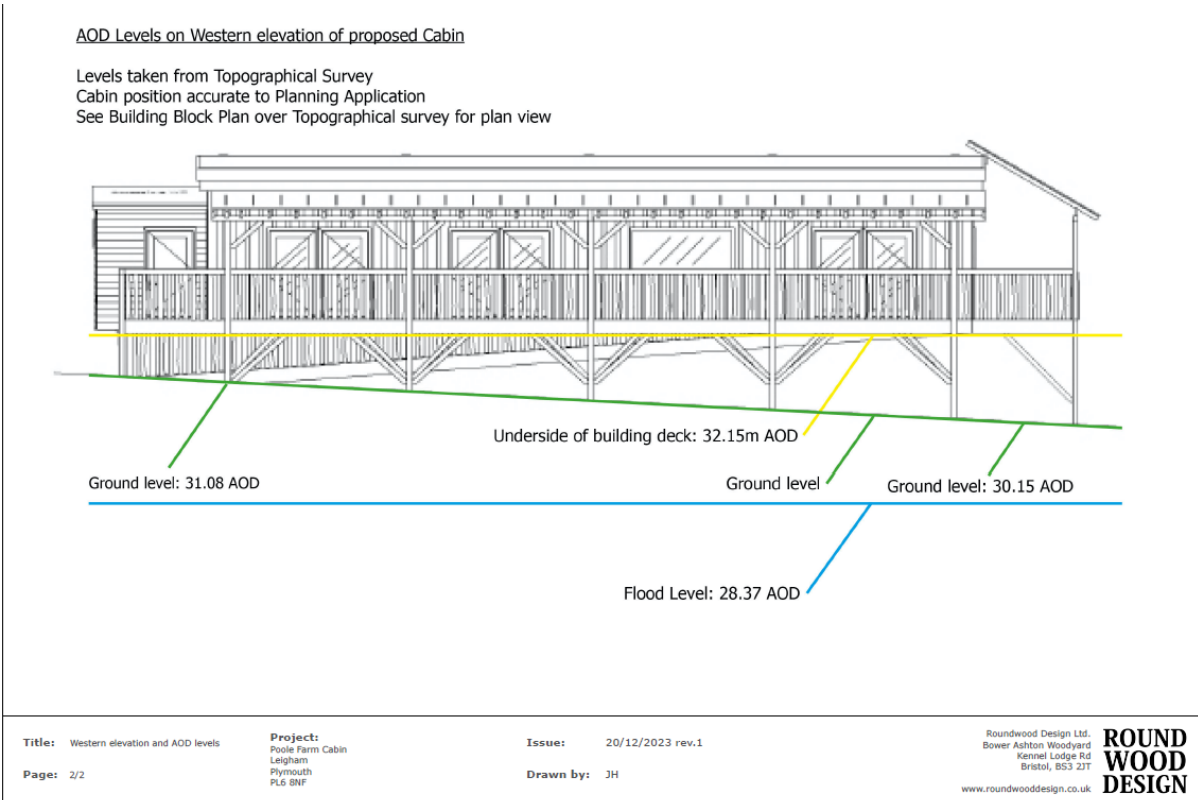


Fig. 12. The flood level (28.37m AOD) at Bir245 transposed onto design drawings.

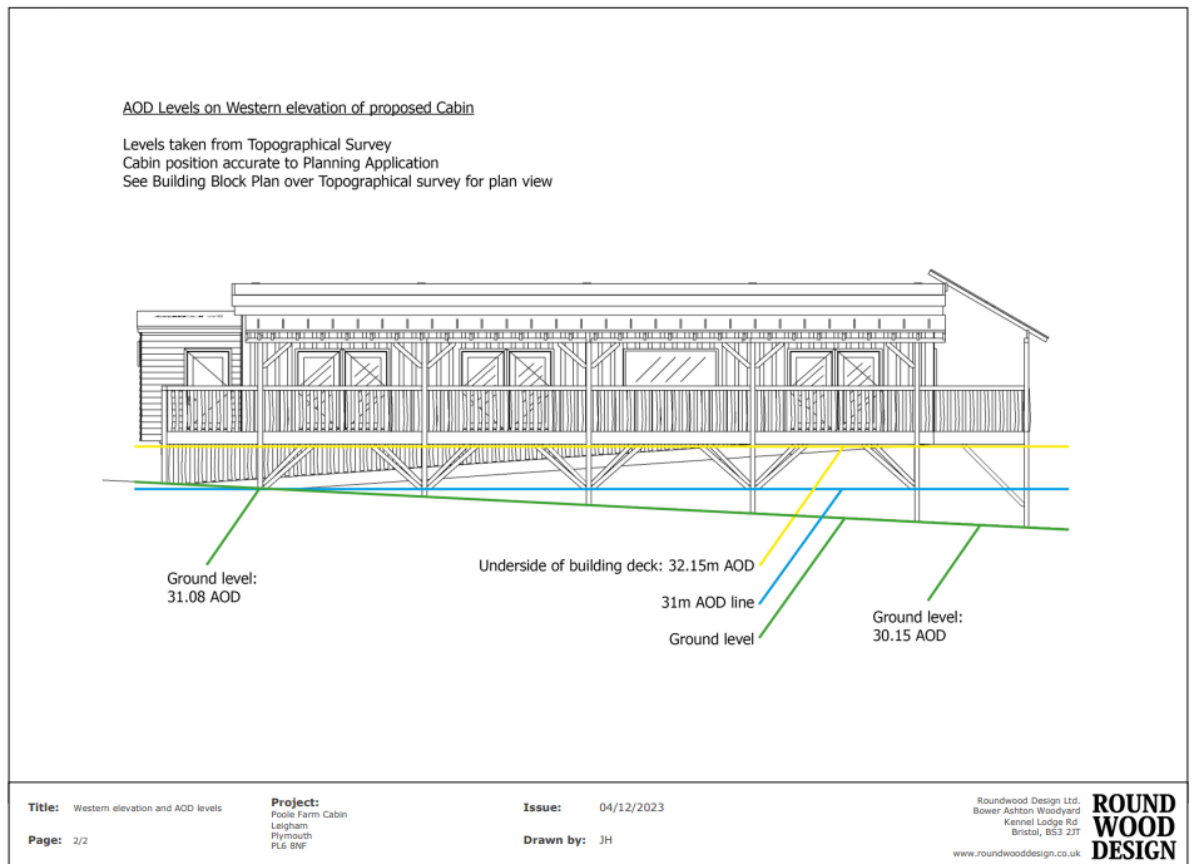


Fig. 13. The flood level (31m AOD) at Bridge 1D transposed onto design drawings.

The flood levels of Bir245 (27.37m AOD) and Bridge 1D (31.00m AOD) represent a 100yr flood event + 40%. Both levels are well below the underside of the building deck which sits at 32.15 AOD. Under both these flood scenarios, the finished floor and the entry point onto the access ramp are dry. Finished Floor Level is 1.15m above the 100yr flood event + 40% meaning the building has a 1.15m freeboard.

The lifespan for the development is 20 years. Both Bir245 (27.37m AOD) and Bridge 1D (31.00m AOD) represent a 100yr flood event + 40%. This takes into account the impacts of climate change over the 20 year lifespan of the building.

Using the data in Fig. 7 for Bir245 (the site closet to the proposed development) – the existing design/defence standard of the site (ground level: 30.15 AOD) is well above the 1in 100yr flood event +40% return period.

The minimum and maximum flood level of data relating to Bridge 1D for 31m AOD 100yr flood event + 40%, LHS and RHS of diagram respectively are; Minimum (LHS) = -0.8 and Maximum (RHS) = 0.85 (see fig. 13). Please note that the maximum and minimum levels will still only result in only some of the stilts being partially underwater - The finished floor level, and access point remains above flood water even during a 100yr event +40% due to the 1.15m freeboard in the worst-case scenario.

Flood Risk after development,

The Paddock cabin is designed to be a low impact build in a number of ways; low carbon, minimal impact to biodiversity and habitats AND low impact to the water infiltration of the flood plain. The unique design; having stilts, minimal foundations (earth screens or small concrete pads) and very little change to surface water discharges due to multiple discharge points from the intensive green roof, mean that the flood plain is only minimally impacted. For these reasons it can be said that after development the flood risk remains the same.

Dry access

See drawing above – the wheelchair access ramp and access/egress paths are outside of the flood zone for a 100yr flood event + 40%.

The Paddock Cabin at Poole Farm: Use and Flood Risk Mitigation

Appropriate use:

(see Paddock Cabin proposal drawings for detail)

The use of the building is appropriate for flood zone 3 and the following demonstrates how we plan to minimise the risk to people from flooding:

- Non-residential building – various daytime uses by groups when the Poole Farm site is open and manned by staff to help with any evacuation required.
- Building is fully accessible with wheelchair ramps exiting directly onto a permeable path. the level of the path is above the flood zone and the 100yr flood event + 40% level (see diagram above)

- In the event of an advance EA flood warning the building will not be used to eliminate and risk to people.
- Staff carry mobile phones to call for help if required. Staff are signed up to the EA flood warning system.
- In the event of extreme rainfall the building will not be used.
- The development is situated approx. 30m from the farmhouse at Poole Farm which is on high ground and staffed during the day

Why this location for the development?

- Wildlife watching – the site location has been chosen for its proximity to the river/pond/beaver enclosure which will enable opportunity to observe the wildlife of multiple habitats from one structure. The building is on stilts, in part to enhance the wildlife watching opportunity.
- This location is close to the beaver enclosure and examples of out NFM woody debris dam installations. This is the perfect location for visitors to learn about natural flood management and fluvial processes.
- Provide a 'farm experience' - the chosen location is within our only grazing field with close proximity to the farmhouse. This site has been chosen to enable users to observe and learn about food production, livestock, animal husbandry and conservation grazing
- Outdoor/indoor classroom – the building will be used by supervised groups of young people engaging in Poole farm activities including eco-therapy, green skills training and outdoor, nature-centric education.

Flood risk mitigation features:

- Building is raised off the ground and on stilts. Finished floor level is above the level of a 100yr flood event + 40%, including access ramp (see design drawing proposals above for detail including Topographical info and levels).
 - Built to withstand flooding:
 - o Minimal ground works and foundations are concrete pads with galvanised steel footings which are resistant to water (compared with wood) and minimal impact to the flood plain infiltration.
 - o Wooden stilts mean the finished floor level is 1.15m above of 100yr flood event + 40% = freeboard of 1.15m above of 100yr flood event + 40%.
 - o The design includes adequate bracing in the subframe to avoid any floatation of the structure.
 - No storage underneath structure has been designed or is planned – the area is for livestock grazing and shelter.
-