

Ingen Consulting
Alstonville NSW 2477
0417 264 987
michiel@ingenconsulting.com.au
www.ingenconsulting.com.au



Our Reference: J1143_lett 180724

Steve Connelly
Planners North
6 Porter Street, Habitat
Byron Bay NSW 2481

22nd July 2024

Re: PMF flooding response to Gateway Determination Report PP-2021-7471

Dear Steve,

This report is provided in response to the NSW Government's Gateway Determination Report PP-2021-7471 and in particular Direction 4.1 – Flooding, and specifically to the following paragraph regarding the Probable Maximum Flood (PMF) event:

The planning proposal does not include information regarding the level of the Probable Maximum Flood (PMF) event (relevant as a residential component is included as part of the proposal), the level of hazard, time of isolation or shelter in place. It is recommended that this information be included in the planning proposal prior to agency and community consultation.

The precincts plan in Figure 1 shows the BILS precincts B and C referenced in this report.

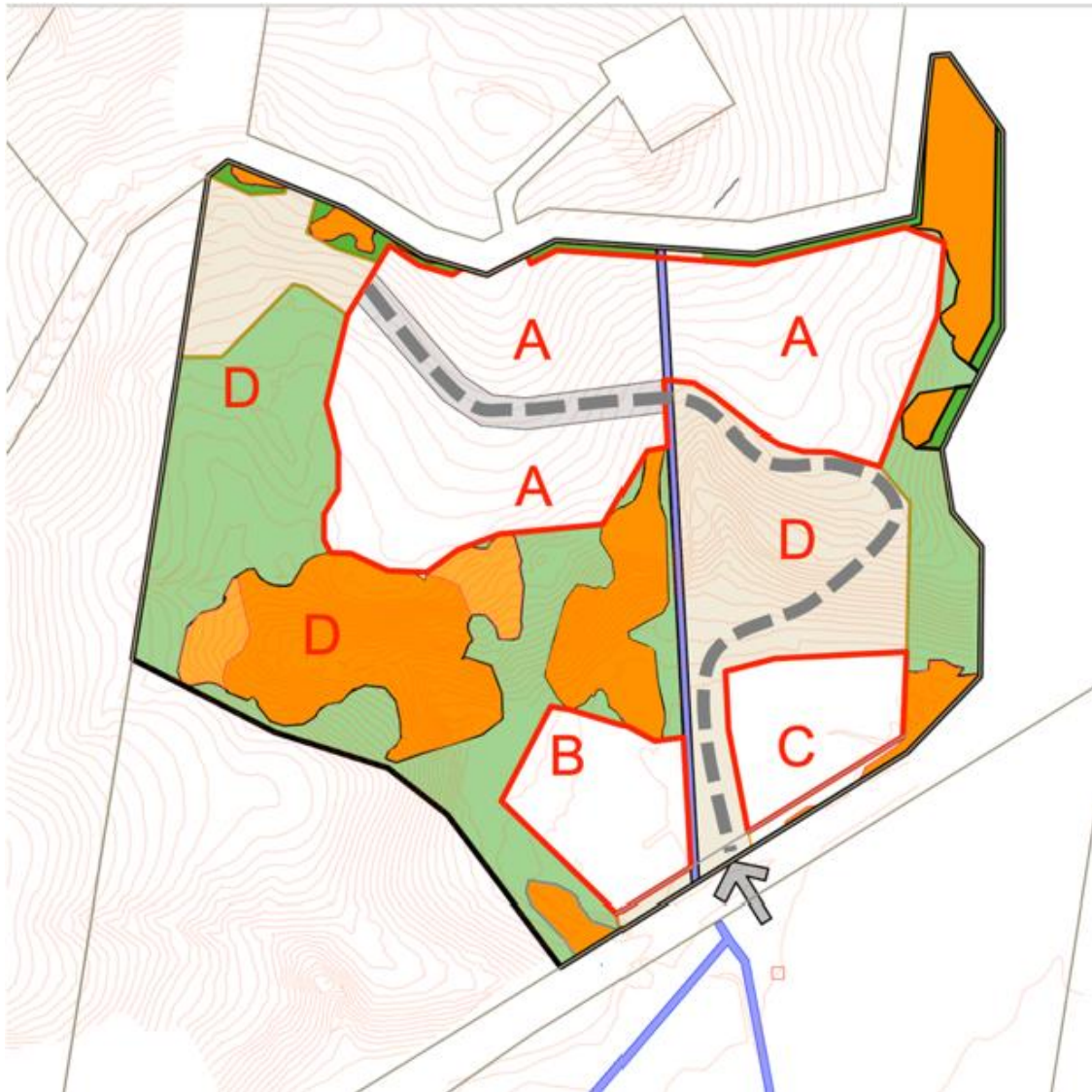


Figure 1 | BILS precinct plan

Context

The proposal contains three developable precincts. Precinct A is at high elevation, well above flood waters, and contains work-live accommodation. Precinct B is in the lower lying area, partially within the PMF flood extents, above the 1% AEP flood and does not contain a residential component. Precinct C is the lowest lying area, it is proposed to fill this to the FPL2100 (4.63m AHD) and does not contain a residential component either, it is light industrial only. Precinct C is already flood free for the 1% AEP event, but the existing ground levels are lower than the FPL2100, which is why filling is proposed.

All of the proposed precincts are be flood free in the 1% AEP flood event.

PMF Modelling results

We have since carried out post-development (with 1% AEP flood proofing filling to RL4.63 in place and collector road constructed) PMF modelling for the site, and provide the following results. Both a 12-hour PMF and a 24-hour PMF event are included in the model (as per Table 5 of the 2020 North Byron Floodplain Risk Management Study and Draft Plan) and results for both scenarios are provided in this report. The PMF flood hazard map for the lower BILS areas (precincts B and C) is shown below in Figure 2 and Figure 3. The hazard colour scheme reflects the hazard definitions in Figure 4. This shows that the flood hazards within the BILS precincts B and C during the PMF flood peak vary between H1 and H3.

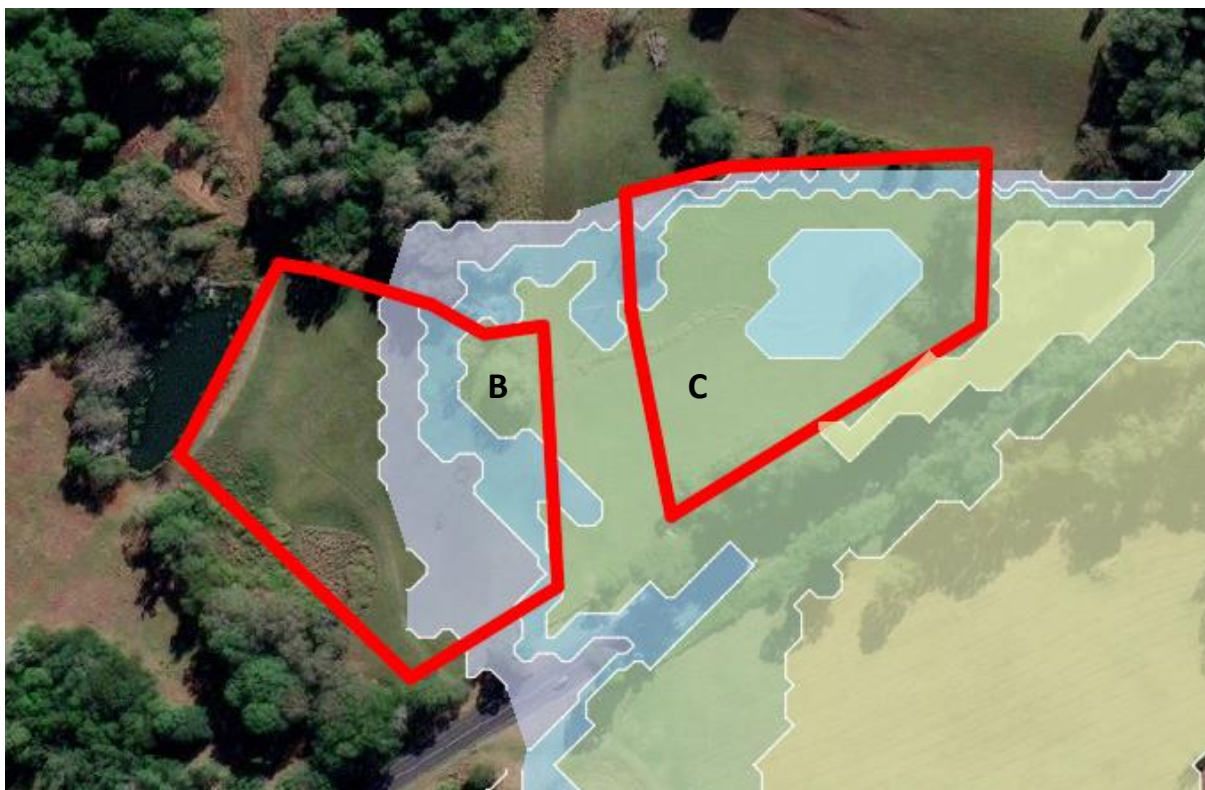


Figure 2 | PMF Flood Hazard Map (post development) – 12hr event



Figure 3 | PMF Flood Hazard Map (post development) – 24hr event

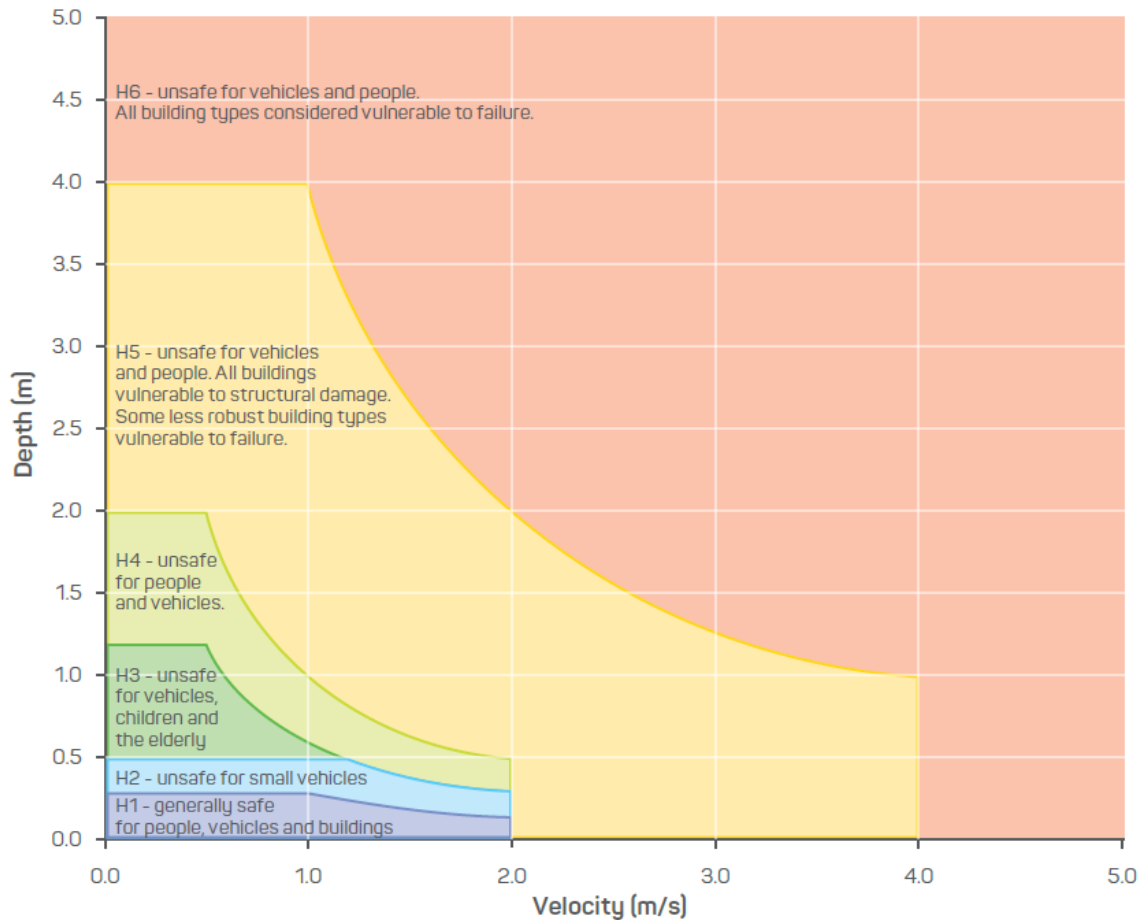


Figure 4 | Flood hazard definitions, Source: ADR Guideline 7-3

We have generated hydrographs for the three locations shown in Figure 5. In this figure, location 1 represents the approximate centre of the future roundabout, at the current pavement level. Location 2 represents the FPL2100 pad above RL 4.63m for the BILS C precinct, and location 3 is a point on the BILS B precincts, which is not subject to filling. The flood level results for these three points are plotted in Figure 6 and the flood depths (including hazard category ceilings) in Figure 8. The flood velocity at the three sample locations was found to be less than 0.1 m/s, therefore the 'limiting still water depths' from Table 2 from the Australian Disaster Resilience (ADR) Handbook collection, Flood Hazard Guideline 7.3 are applied to plot these hazard category ceiling levels.



Figure 5 | Flood hydrograph locations, Source of aerial image: Google Earth Pro

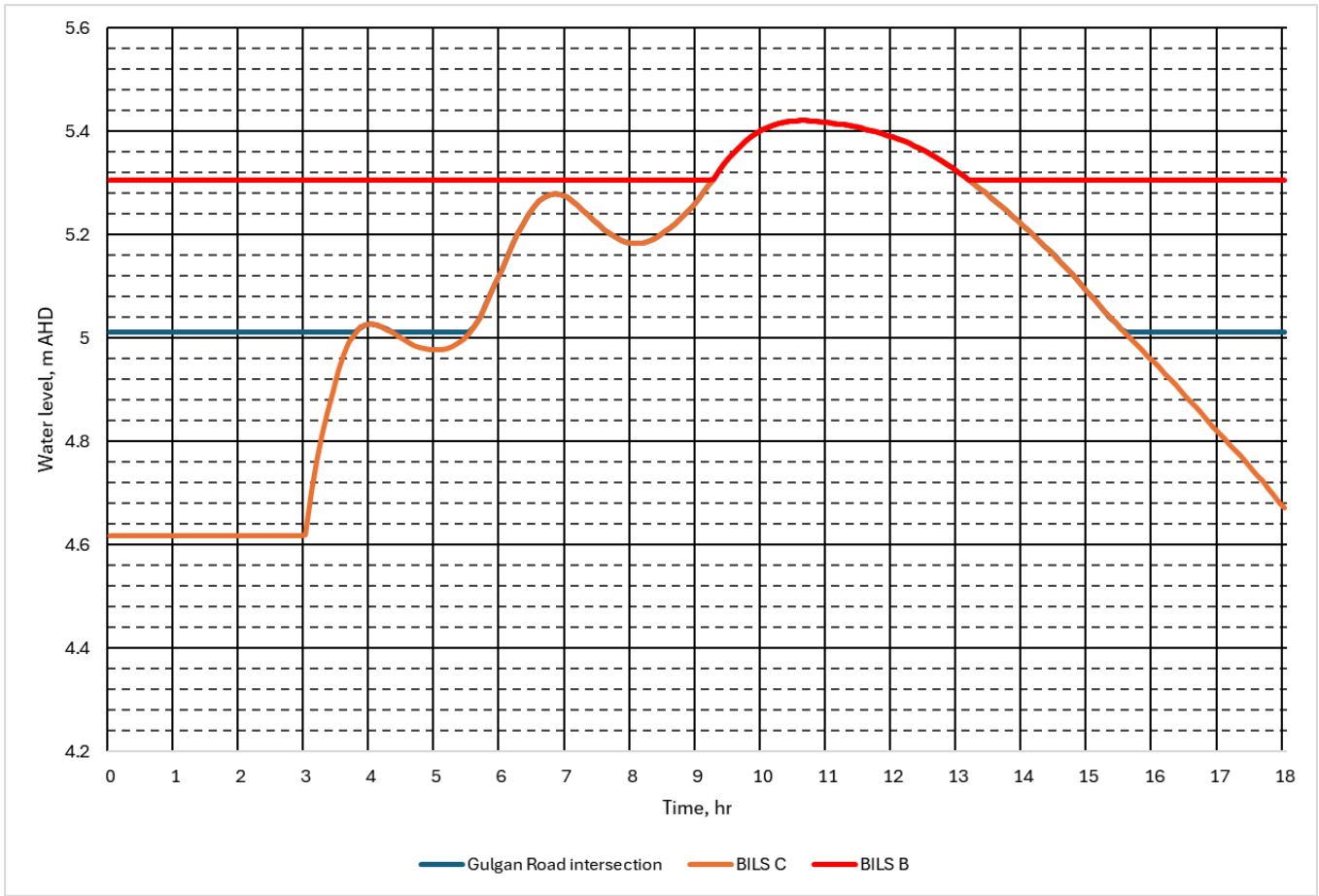


Figure 6 | PMF level hydrograph (12-hour event)

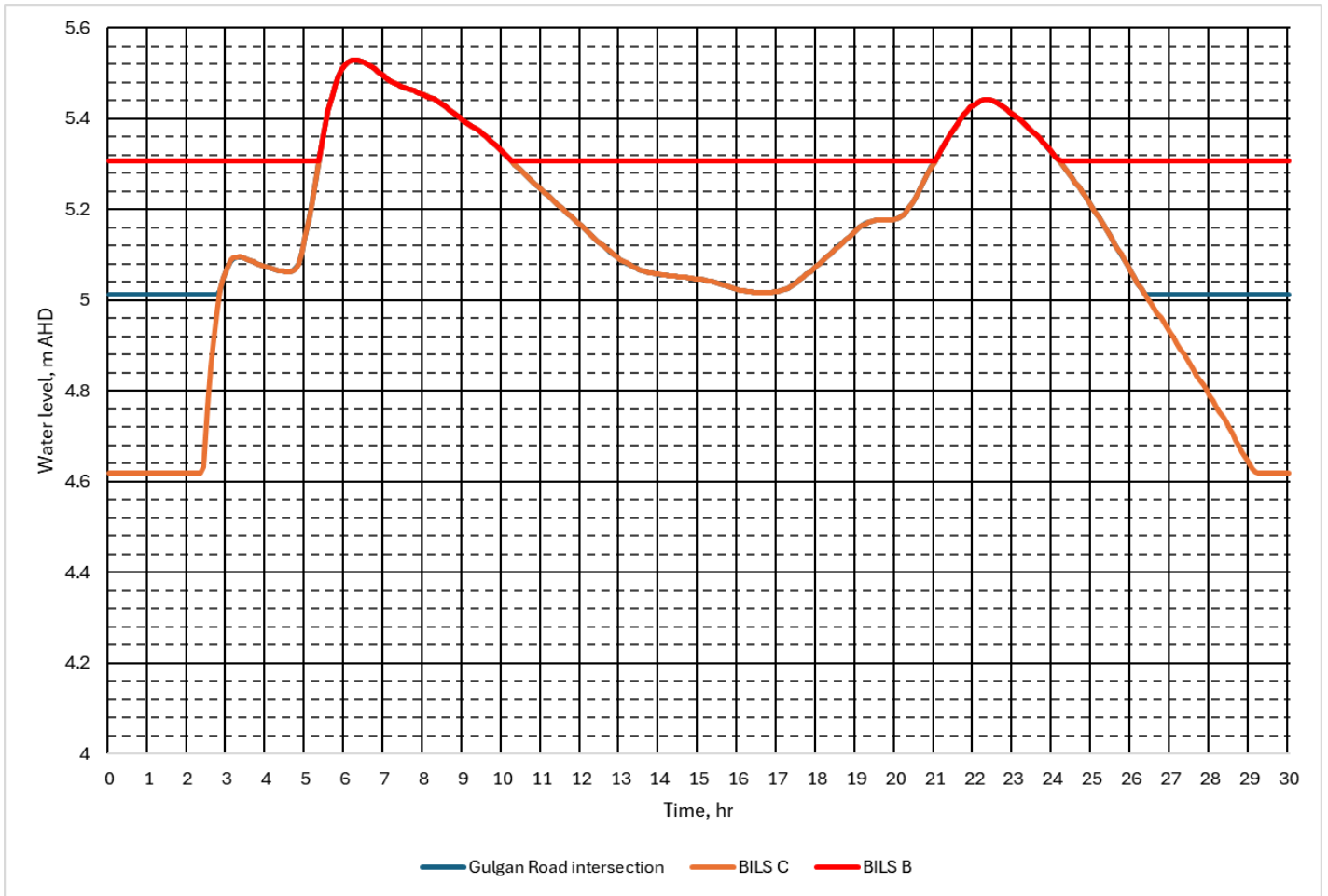


Figure 7 | PMF level hydrograph (24-hour event)

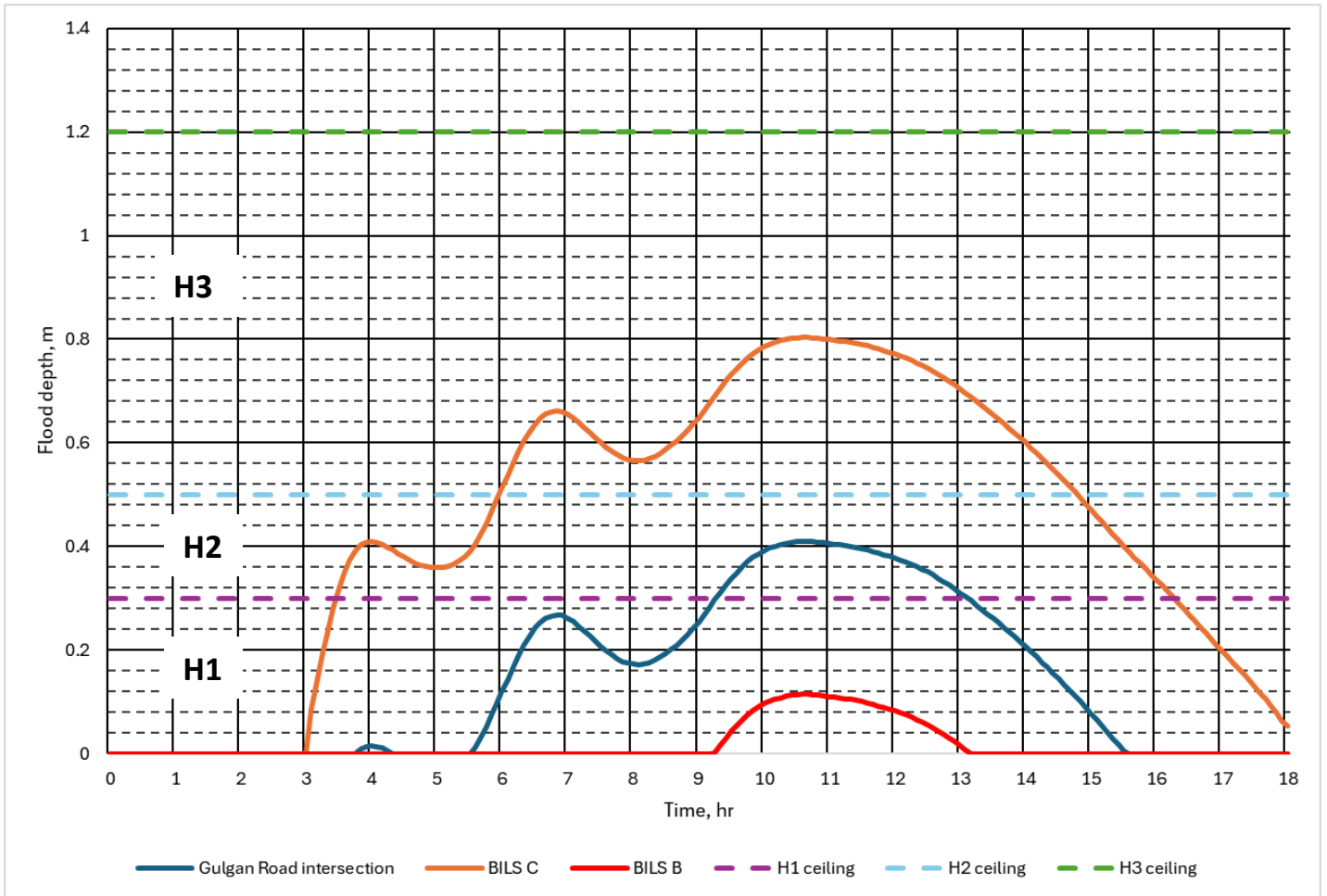


Figure 8 | PMF depth hydrograph (12-hour event)

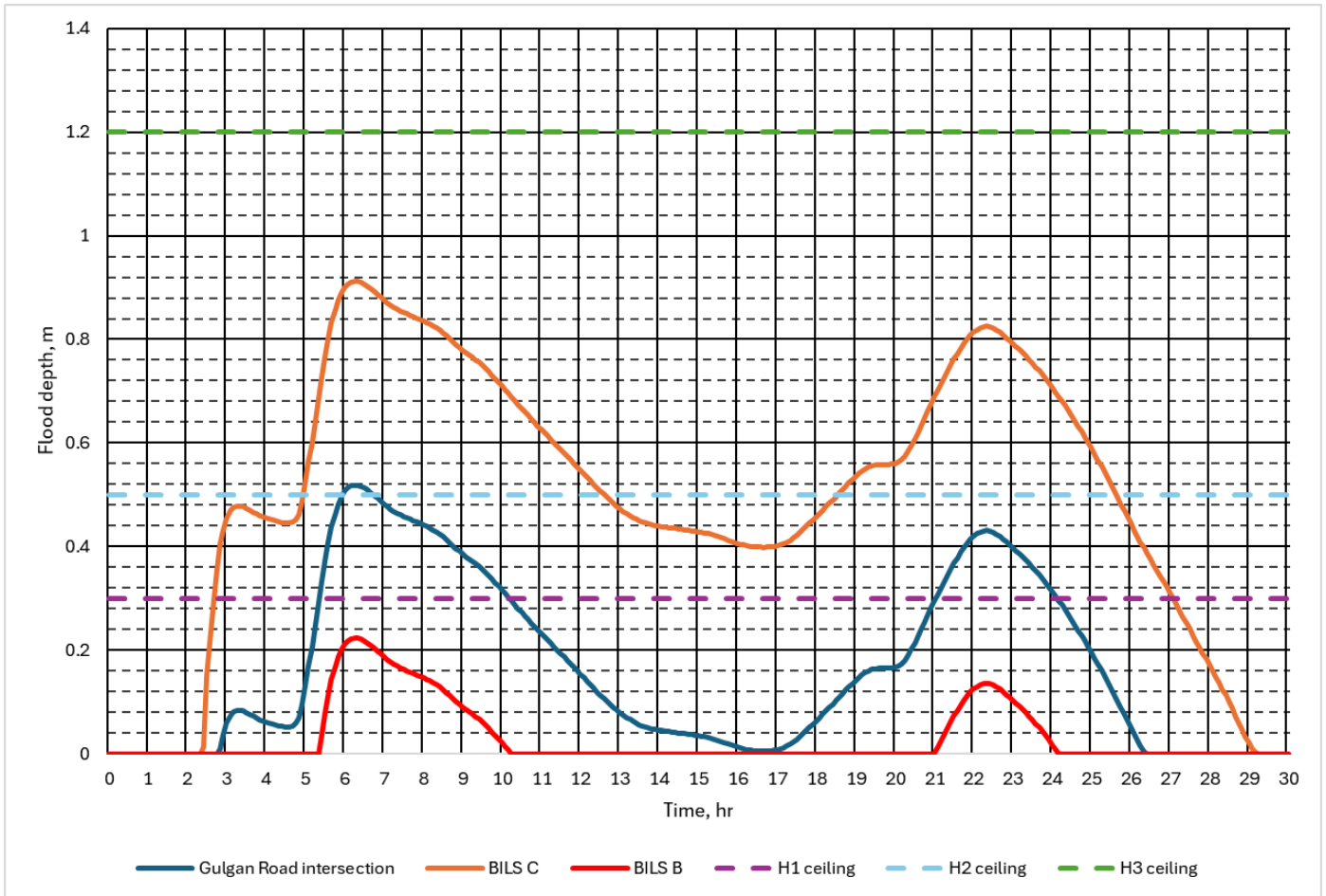


Figure 9 | PMF depth hydrograph (24-hour event)

Modelling results interpretation

The modelling results show the following:

- The PMF flood peak on site is RL5.42m AHD for the 12-hour event and RL5.52m AHD for the 24-hour event.
- The 24-hour event has two distinct flood peaks
- The BILS B precinct maximum PMF flood depths are 0.11m (12-hr) and 0.21m (24-hr), which classified as H1 and is 'generally safe for people, vehicles and buildings'.
- The BILS C precinct maximum PMF flood depths are up to 0.79m (12-hr) and 0.89m (24-hr), which is classified as H3 and is 'unsafe for vehicles, children and the elderly'. It will be inundated for approximately:
 - 12hr event: 15 hours, of which 13 hours in H2 and 9 hours in H3.
 - 24hr event: 27 hours, of which 25 hours in H2 and 15 hours in H3

Flood risk management

Potential flood risk management approaches for BILS precincts B and C include 'Shelter in place' and evacuation.

PMF level flooding Shelter in place is feasible for BILS precinct B, which is partially flood free and partially H1. PMF level flooding Shelter in place may be feasible for precinct C, depending on building design floor levels.

PMF flood evacuation is also feasible for both precincts B and C given flood free land is available close by at BILS precinct A and all of The Saddle Road as shown in Figure 11. Figure 10 shows that parts of the M1 will be inundated during a PMF event, therefore evacuation to Ocean Shores via the M1 is not a guaranteed approach.

It should be noted that the site RL's are higher than much of Mullumbimby and Brunswick Heads. If there were any flooding that would trigger an evacuation response in the BILS area, an evacuation response for Mullumbimby and Brunswick Heads would have been triggered before that point in time. On this basis it is reasonable to assume that there will be ample of evacuation warning time for this site.

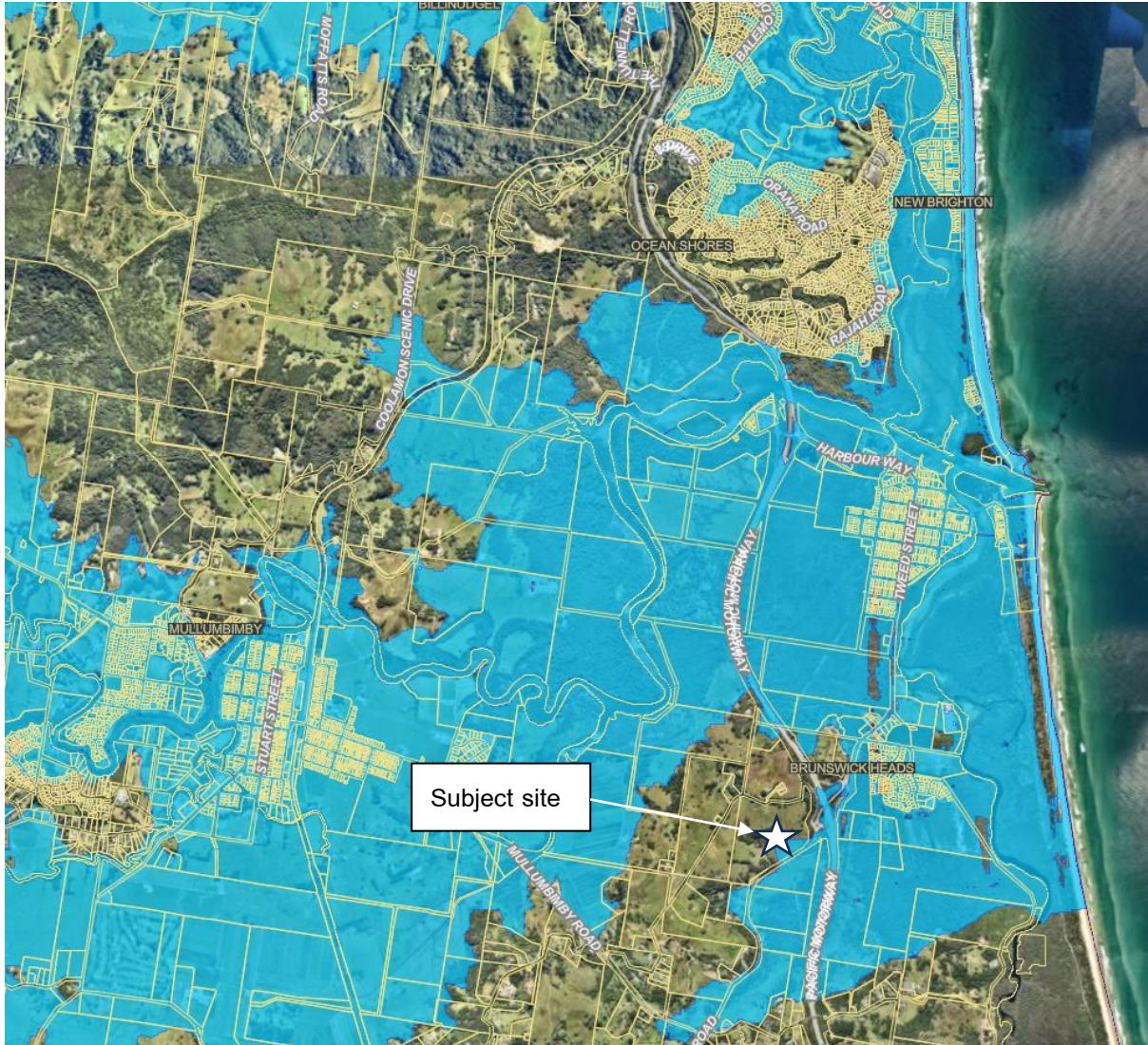


Figure 10 | PMF inundation map, Source: Byron Shire Council Web Map

