

29 May 2022

President Private Hospital
C/- Imagescape Design Studios

By email

Dear Stephen,

RE: RESPONSE TO GRC HYDRO COMMENTS: ALTERATIONS AND ADDITIONS TO PRESIDENT PRIVATE HOSPITAL AT 369 – 381 PRESIDENT AVENUE, KIRRAWEE NSW.

Martens and Associates (MA) have prepared this letter in response to the comments in the February 2022 review letter received from GRC Hydro (dated 24 March 2022). This relates to the revised MA preliminary flood assessment for the site (P1907286JR02V03, February 2022).

Please refer to Table 1 below, which summaries our responses to the matters raised by GRC Hydro.

Table 1: MA response to GRC Hydro Comments.

GRC Hydro Comments	MA Response
Table 1 of the Letter	
3. In addition to the 5% AEP, 1% AEP and PMF events, analysis for an 'increase in rainfall intensity' associated with climate change is required as per the project SEARs. The 1% AEP event should be modelled with allowance for ARR2019 RCP8.5 rainfall increases for an appropriate planning horizon. Martens's February 2022 Response: Additional events consisting of the 5% and 1% AEP with climate change (ARR 2019 RCP 8.5 rainfall increases projected for the year 2090) events have been considered in the updated model GRC Hydro May 2022 comment: Discussion to be provided on the sensitivity of climate change on flood behaviour and if any impact to compliance is expected.	Refer to Table 2 at the end of this letter, which demonstrates the proposed ground levels remain compliant with the Flood Planning Levels associated with the 1% AEP climate change event.

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GRC Hydro Comments	MA Response
10. The 5% AEP, 1% AEP, 1% AEP + RCP8.5 increase in rainfall intensity, and PMF event should be modelled in TUFLOW for 'Existing' and 'Proposed' development conditions Martens's February 2022 Response: All four of these flood events have been modelled in TUFLOW for 'Existing' and 'Proposed' development conditions. GRC Hydro May 2022 comment: Discussion to be provided on the sensitivity of climate change on flood behaviour and if any impact to compliance is expected.	Refer to the above response to Point 3.
11. The design is required to meet the objectives of the SSLEP (2015) and SSDCP (2015). Comprehensive discussion of how the design meets these objectives is to be presented. Martens's February 2022 Response: A compliance table has been provided in Section 6 and has been updated following these modelling updates. GRC Hydro May 2022 comment: See Table 2 and Table 3 of this report.	Refer to responses to Table 2 and Table 3 of the letter.
12. Basements are to be afforded protection for events up to and including the PMF. Passive protection of basements is required up to the 1% AEP + 0.5 m freeboard Martens's February 2022 Response: The southern basement and open space carpark have been modelled to be protected against the PMF event by a flood wall running along the south-western edge of the carpark. Basement carparking level is 70 mAHD which is 0.6 m higher than the 1% AEP flood level (69.4 mAHD) at the entrance. So passive protection is not required. GRC Hydro May 2022 comment: Noted re southern basement entrance. However, PMF flood levels exceeding FFL of the Hydrotherapy Pool and Operation Theatres are noted (see Table 2). There is the potential that water could enter the basement from these areas. Habitable floor levels shall be no lower than the PMF level or the 1% AEP flood levels plus 500mm freeboard, whichever is higher, such that water ingress into the basement does not occur.	In the PMF event, flood levels at the northern boundary of the site are higher than the existing ground floor level. It should be noted that the flooded area at the north is not part of the mainstream overland flow and it is because of diverted flow from Bidurgal Ave in the PMF event. Buildings along Bidurgal Ave have not been included in the model, but in reality, they would block the overland flow to the site. Further, the stormwater network in Bidurgal Ave has not been included in the flood model, which would serve to reduce the flood levels on Bidurgal Ave. We therefore consider that the northern site boundary would be flood free in reality, and the model results are overly conservative. However, conservatively assuming the modelled flood levels are correct, to demonstrate compliance with the DCP, we propose the northern building should be flood proofed up to the PMF level of 73 mAHD, by use of flood proof doors and the like. Although the existing floor level would not be raised above the PMF level, this would protect the basement in all flood events up to and including the PMF, and hence compliance with this required is achieved. This could be required as a condition of consent.

GRC Hydro Comments	MA Response
13. Offsite flood impacts should be mitigated to ensure that surrounding properties are not adversely affected by increases in flood level that exceed 0.01 m. Flood impacts affecting the road would only be considered if they are localised/minor in nature, associated with an overall reduction in flood risk, and result in no increase in ARR2019 flood hazard category which could affect trafficability. Martens's February 2022 Response: As per the provided afflux map (Attachment C - Map 14) there is no impacts to neighbouring properties. Flood impacts affecting the road are localised and minor in nature, mostly along the footpath, and do not materially affect the ARR 2019 flood hazard category or change trafficability in any meaningful way. GRC Hydro May 2022 comment: Water level increases of 0.1 – 0.2 m are noted on President Avenue as well as an increase in H6 hazard areas. The impacts are due to concentration of flows in the proposed swale, and seemingly abrupt termination of the swale at the southern carpark entrance. Afflux of 0.1 – 0.2 m is not considered minor. Flood mitigation strategies to manage this impact are required. Distribution/spreading of discharge from the terminal swale may improve impact outcomes and should be investigated. The flood impact is also noted to impact the southern carpark entrance which increases flood risk. Flood impacts affecting the road should be reduced, and the southern parking entrance moved to an area of low hazard.	Post development afflux of 0.1- 0.2 m and increasing areas of H6 hazard does not affect any neighbouring properties and are limited to a relatively small area completely within the road, which is already affected by H5 flood hazards in existing condition. The H5 hazard category is unsafe for the vehicles and people, and the road is inaccessible during the flood in existing condition. So, post development condition does not materially affect road accessibility during flooding. There is therefore no actionable impact arising from these changes to flood characteristics, and changes are therefore considered acceptable. Following discussion with the project architect, due to architectural and traffic constraints, the southern car park entrance cannot be moved.
14. Assessment of the duration of isolation and site specific risks should be provided. A more detailed FERP is required to explain how the site can be safely developed to manage residual flood risk due to extreme flood events to confirm the emergency management approach. Martens's February 2022 Response: A more detailed FERP has been provided in Section 5 showing additional details as requested. GRC Hydro May 2022 comment: Management of the risk of the southern carpark entrance is required. The entrance is impacted by H5 hazard during the 1% AEP event, which is significant increase in flood risk relative to the existing site entrance near this location. The FERP provides some advice related to exiting the carpark, however, the risk to people trying to enter the carpark also needs to be managed during times of flood.	As mentioned in Section 5.4.2 of the report, the northern carpark would remain trafficable during flood events up to and including the PMF event. The southern carpark is inaccessible for traffic during flood events of 1% AEP or higher. We consider that a flood alert and automatic boom gate system could be proposed to prevent access to the southern carpark entrance, which would be activated upon reaching a certain flood level above the road surface. Details of the system can be required as a condition of consent. As the site is affected by short duration overland flooding, the cutoff period for the southern carpark is short, and vehicles can exit via the northern carpark instead. It should be noted that the southern carpark level is above the Flood Planning Level and is flood free in the PMF event.

GRC Hydro Comments	MA Response
15. Extending the swale further east should be investigated. This has the potential to replace lost flood storage, distribute discharge from the swale which may remove/reduce concentrated areas of H5 hazard, and improve access to the open carpark area. Widening of the swale may be feasible by cantilevering the carpark over a portion of the swale and should also be investigated. Martens's February 2022 Response: The swale has been extended further east for additional flood storage GRC Hydro May 2022 comment: Extending the swale has not improved the concentration of flow, or access to the southern carpark. It appears that the proposed entrance does not comply with SSDCP (2015) control 3. Of 'Car Parking and Driveway Access' (see Table 3). The carpark entrance should be relocated to the east of the currently proposed location in an area of lower hazard. Widening and increasing the length of the swale, combined with spreading discharge from the swale along its length, may benefit in reducing flood impacts and improving flood access for the southern carpark.	We note that the 1% AEP flood level at the driveway is 69.41 which is lowered than the driveway's deck level at 70 mAHd, demonstrating that flood water is conveyed under the suspended driveway level. The maximum depth along the southern carpark entrance is therefore less than 300 mm in 1% AEP flood which complies with SSDCP (2015) control 3.
Table 2 of the Letter	
1 Habitable floor levels shall be no lower than the PMF level or the 1% AEP flood levels plus 500mm freeboard, whichever is higher. Martens's February 2022 Response: The proposed floor levels comply with the DCP requirements. Refer to Table 6 in Section 4.6.2 for more details. GRC Hydro May 2022 comment: Significant flood depths are now noted along the north-western property boundary in the PMF. This was not noted for previous iterations of the report. Flood levels are ~73 mAHd which is higher than the building floor levels in this area presented in Figure 3 of the MA (Feb, 2022) report. Compliance with this control is not shown. Habitable floor levels shall be no lower than the PMF level or the 1% AEP flood levels plus 500mm freeboard, whichever is higher	Refer to response to Table 1 Point 12 of this letter.
2 All structures to have flood compatible building components below the PMF. Martens's February 2022 Response: All structures up to the peak PMF level, are to be constructed from flood compatible building components. Details will be provided at detailed design stage. GRC Hydro May 2022 comment: To be confirmed during detailed design	Will be confirmed during detailed design. This should be required as a condition of consent.

GRC Hydro Comments	MA Response
3 An engineer's report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF level Martens's February 2022 Response: All structures are to be constructed from flood compatible building components and buildings shall be designed considering the forces of the floodwater, debris, buoyancy and inundation up to the PMF level. Details will be provided at detailed design stage. GRC Hydro May 2022 comment: To be confirmed during detailed design.	Will be confirmed during detailed design. This should be required as a condition of consent.
4 An engineer's report is required to certify that the development will not increase flood effects elsewhere, having regard to: i. Loss of flood storage; ii. Changes in flood levels, flows and velocities caused by alterations to flood flows; Martens's February 2022 Response: The proposed swale offsets the loss in flood storage of the proposed south western carpark. The proposed development is not likely to materially affect flood levels, velocities or hazards as the swale does not increase the flows on site, it only redirects the flow. Therefore, we also do not expect there will be adverse environmental impacts such as erosion or siltation. GRC Hydro May 2022 comment: Water level increases of 0.1 – 0.2 m are noted on President Avenue. The impacts are due to concentration of flows in the proposed swale, and abrupt termination of the swale at the southern carpark entrance. Flood mitigation strategies to manage this impact are required. Distribution/spreading of discharge from the terminal swale may improve impact outcomes and should be investigated.	Refer to response to Table 1 Point 13 of this letter.
5 The minimum surface level of open car parking spaces shall be no lower than the 1% AEP flood level or the level of the crest of the road at the location where the site has access to the road Martens's February 2022 Response: The proposed open carpark has a flood protection wall along the south western edges which is more than 500mm above the 1% AEP peak levels within the swale. Proposed carpark level at 70.00 mAHD is higher than the 1% flood level of 69.41mAD and PMF level of 69.70 at the driveway crossing. GRC Hydro May 2022 comment: MA (Feb, 2022) response addresses DCP control.	-

GRC Hydro Comments	MA Response
6 <i>Restraints or vehicle barriers shall be provided to prevent floating vehicles leaving a site during a 1% AEP flood. A flood depth of more than 200 mm will cause serious water damage to a typical vehicle and a depth of 300 mm is sufficient to cause a typical vehicle to float.</i> <i>Martens's February 2022 Response:</i> <i>The carpark is not affected by the 1% AEP flood.</i> <i>GRC Hydro May 2022 comment:</i> <i>MA (Feb, 2022) response addresses DCP control.</i>	-
7 <i>Reliable access for pedestrians or vehicles shall be provided during a 1% AEP flood.</i> <i>Martens's February 2022 Response:</i> <i>The northern carpark access is available during events up to and including the PMF event.</i> <i>GRC Hydro May 2022 comment:</i> <i>H5 hazard flooding affects the southern carpark entrance. The southern parking entrance should be moved to an area of low hazard. DCP compliance not presented (see Table 3). The hazard of the proposed swale to pedestrians should be considered with details around the proposed management of this risk included (fencing, warning signage etc.)</i>	Refer to response to Table 1 Point 13, 14 and 15 of this letter. To minimise risks to pedestrians, we propose the swale boundary is fenced.
8 <i>Reliable access for pedestrians or vehicles shall be provided from the building commencing at a minimum level equal to the lowest habitable floor level to an area of refuge above the PMF level</i> <i>Martens's February 2022 Response:</i> <i>Ground floor levels of the existing and proposed buildings are above the PMF level. Evacuation from the site to an area of refuge above the PMF level is available through the no.</i> <i>GRC Hydro May 2022 comment:</i> <i>Significant flood depths are now noted along the north-western property boundary in the PMF with flood levels above the building floor levels. Flood levels shall be above the higher of the PMF or 1% AEP + 0.5 m.</i>	Refer to response to Table 1 Point 12 of this letter.

GRC Hydro Comments	MA Response
9 Adequate flood warning systems, signage and exits shall be available to allow safe and orderly evacuation without increased reliance upon the SES or other authorised emergency services personnel Martens's February 2022 Response: A more detailed preliminary FERP has been provided in Section 5 for the proposed flood warning system strategic level advice and assumes that detailed design of various site controls (ie. Signage and exists) will be undertaken prior to issue of construction certificate. GRC Hydro May 2022 comment: The FERP provides some advice related to exiting the carpark, however, the risk to people trying to enter the carpark needs also be considered. The development should not increase reliance on the NSW SES (see Table 3).	Refer to response to Table 1 Point 14 of this letter. The development will not increase reliance on NSW SES.
10 The development shall be consistent with any relevant flood strategy, Floodplain Risk Management Plan adopted by Council or similar plan Martens's February 2022 Response: Preliminary FERP provided in Section 5 has been prepared consistent with the flood specific controls in Council's DCP Chapter 40 Part C 'Flood Risk Management'. GRC Hydro May 2022 comment: MA (Feb, 2022) response addresses DCP control, noting other comments made above.	-
11 An engineer's report shall be provided to certify that an area of refuge is available if circumstances are possible where the evacuation of persons might not be achieved within an effective warning time. Martens's February 2022 Response: PMF refuge is available on the ground floor and levels above of each building GRC Hydro May 2022 comment: Floor level compliance requires review to confirm (see above).	Refer to response to Table 1 Point 12 of this letter.
12 Applicant shall demonstrate that area is available to store goods above the PMF level. Martens's February 2022 Response: The ground floor levels of the proposed and existing buildings are above the PMF level. GRC Hydro May 2022 comment: Floor level compliance requires review to confirm (see above).	Refer to response to Table 1 Point 12 of this letter.

GRC Hydro Comments		MA Response
13	No storage of materials which may cause pollution or be potentially hazardous during any flood is permitted below the 1% AEP plus 500 mm. Martens's February 2022 Response: Ground floor of each building will be above the flood planning levels. GRC Hydro May 2022 comment: Floor level compliance requires review to confirm (see above).	Refer to response to Table 1 Point 12 of this letter.
Table 3 of the Letter		
Car Parking and Driveway Access		
2	Garages shall have a minimum finished floor level no lower than the 1% AEP flood plus 200mm freeboard. GRC's comment: Confirmation of compliance required.	Proposed development complies with this control. Carpark level is 70 mAHD which is 0.6 m higher than the 1% AEP flood level (69.4 mAHD) at the entrance.
3	The level of the driveway providing access between the road and parking space shall be no lower than 300mm below the 1% AEP flood or such that the depth of inundation during a 1% AEP flood is not greater than either the depth at the road or the depth at the car parking space. GRC's comment: The mapping shows significant flood depths and H5 hazard affecting the southern car park entrance. It appears that the proposed entrance does not comply with this control. The carpark entrance should be relocated to the east of the currently proposed location in an area of lower hazard. The flood model must include the hydraulic effects of the proposed bridging structure. Confirmation of compliance	Refer to response to Table 1 Point 15 of this letter.
4	Basement garages and car parking areas with floor level below the 5% AEP flood or more than 0.8m below the 1% AEP flood level, shall have a pump-out system, adequate warning systems, signage and exits. GRC's comment: Confirmation of compliance required.	Proposed development complies with this control. Refer to response to Table 3 Point 2 of this letter.
6	The crest of the driveway providing access between the road and basement garages shall be a minimum of 200mm above the level of the 1% AEP flood. GRC's comment: Confirmation of compliance required.	Proposed development complies with this control. Carpark level is 70 mAHD which is 0.6 m higher than the 1% AEP flood level (69.4 mAHD) at the entrance.
Evacuation		

GRC Hydro Comments	MA Response
4 Adequate flood warning systems, signage and exits shall be available to allow safe and orderly evacuation without increased reliance upon the SES or other authorised emergency services personnel. GRC's comment: The FERP refers to 'evacuation order being issued by NSW SES'. The development must not increase reliance upon the NSW SES. Confirmation that the development complies with this control is required.	Refer to response to Table 1 Point 14 of this letter. Evacuation orders are automated, and hence the development will not increase reliance upon the NSW SES.

Table 2: Comparison of flood planning levels within consideration of climate change.

Building	Flood Level (mAHD)			FPL ¹ (mAHD)	FPL with climate ¹ change (mAHD)	Ground Floor Level (mAHD)	Complies?
	1% AEP	1% AEP with climate change	PMF				
West Wing	69.62	69.66	69.85	70.12	70.16	70.30	Yes
Foyer	71.03	71.07	71.87	71.87	71.87	71.91	Yes
Existing Hydrotherapy Pool	71.03	71.07	71.87	71.87	71.87	71.91	Yes
East Wing	NA ²	NA ²	NA ²	NA ²	NA ²	70.09	Yes

- SSC requires the flood planning level to be the greater of the 1% AEP flood level + 0.5 m and the PMF level.
- These buildings do not have nearby flood water in the proposed conditions 1% AEP flood event.

If you require any further information, please do not hesitate to contact the undersigned.

For and on behalf of
MARTENS & ASSOCIATES PTY LTD

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