HASKONING AUSTRALIA PTY LTD.
Level 15
99 Mount Street
North Sydney NSW 2060
Australia

+61 2 8854 5000 T
project.admin.australia@rhdhv.com E
royalhaskoningdhv.com W

Frasers Property Australia
The Development Manager
L2, 1C Homebush Bay Drive
RHODES NSW 2138
Attn: Alex Facchin

alex.facchin@frasersproperty.com.au

Date:	6 February 2023	Contact name:	Greg Britton
Your reference:		Telephone:	+61 2 8854 5000
Our reference:	8A0132_L006.F01-addendum response	Email:	greg.britton@rhdhv.com

Dear Alex

PPSSTH-176 – SHELLHARBOUR – DA0276/2021 – COVE BOULEVARD, SHELL COVE - PRECINCT H SUBDIVISION
Addendum to Response to Comments from Southern Regional Planning Panel

Further to our recent discussions, this letter has been prepared as an Addendum to the Royal HaskoningDHV letter on the above matter dated 8 December 2022, for purposes of your additional discussions with Shellharbour City Council.

1. BACKGROUND

In my letter dated 8 December 2022, I set out responses to eight comments made by the Southern Regional Planning Panel in relation to PPSSTH-176-Shellharbour-DA0276/2021 – Cove Boulevard, Shell Cove – Precinct H Subdivision.

The responses dealt with, among other things, the three coastal hazards relevant for assessment of Precinct H, namely:

- beach erosion;
- shoreline recession; and
- coastal inundation.

Preparation of the responses was assisted by the determination, by Advisian, of the predicted extent of the combined erosion/recession hazard in 2125. The hazards were defined by both the Zone of Slope Adjustment (ZSA) and the Zone of Reduced Foundation Capacity (ZRFC), and included consideration of three different sea level rise scenarios as per the latest AR6 IPCC Report, namely:

- SSP2-4.5: Intermediate emissions scenario
- SSP3-7.0: High emissions scenario
- SSP5-8.5: Very High emissions scenario

In recent discussions between Council staff and Frasers Property clarification has been sought by Council regarding the dune crest levels adjacent to Precinct H adopted in the modelling by Advisian to determine the 2125 ZSA and ZRFC.

In my letter of 8 December 2022, in the response to Comment 1 (page 2), I noted that the pre-storm profile adopted in the modelling was a combination of existing LiDAR data and the design profile adjacent to Precinct H with a crest level of 5.5m AHD. I also stated elsewhere in the response to Comment 1 (page 6) that the proposed crest level of the dune system adjacent to Precinct H is 5.5m AHD.

It could possibly have been made clearer that reference to the design profile adjacent to Precinct H and the proposed crest level of the dune system adjacent to Precinct H were in relation to the reconstructed portion of the dune system, not the existing/undisturbed portion of the dune system.

As part of the work-as-executed survey of the reconstructed portion of the dune system, a survey of the crest level of the existing/undisturbed portion of the dune was also carried out. Advisian has used this most recent survey data, as opposed to relying on the previous combination of LiDAR data and the design profile, to re-determine the coastal hazard lines.

Comments on the 2125 erosion/recession hazard and coastal inundation hazard based on the re-determined hazard lines and the recent survey data are set out in the following sections.

2. RE-DETERMINED 2125 EROSIONS/RECESSION HAZARD

The re-determined position of the 2125 ZSA and ZRFC for the three sea level rise scenarios are shown in Figures 2-1, 2-2 and 2-3, together with the previous positions (in black). Advisian has included a notation on the Figures where the hazard lines have moved from their previous positions (up to 4m landward and up to 4m seaward).

Based on examination of the re-determined hazard zones the conclusions reached in my letter of 8 December 2022 do not change, ie. the predicted 2125 erosion/recession hazard is not considered to be a concern for Boollwarroo Parade or the carparks on the eastern side of Boollwarroo Parade.

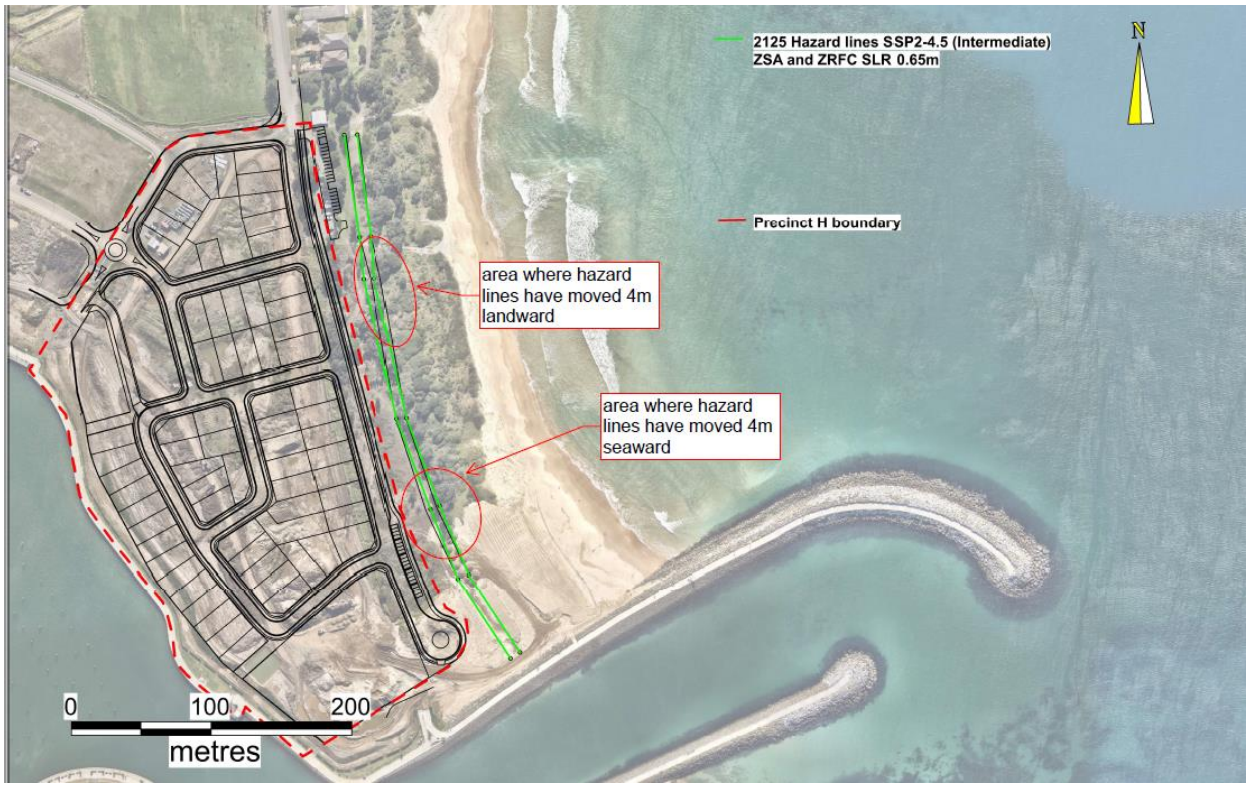

Figure 2-1 2125 coastal hazard zones (ZSA and ZRFC) for SSP2-4.5 (Intermediate)
(source: Advisian, January 2023)

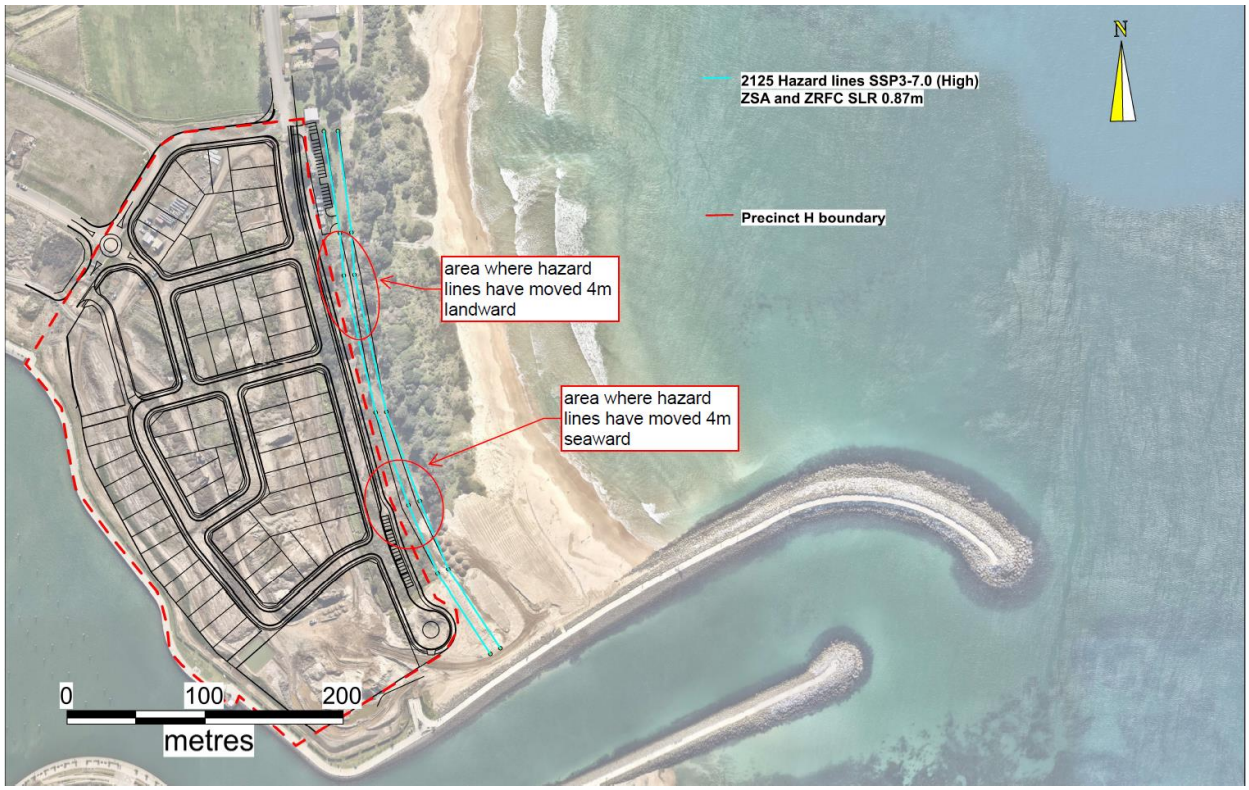

Figure 2-2 2125 coastal hazard zones (ZSA and ZRFC) for SSP3-7.0 (High)
(source: Advisian, January 2023)

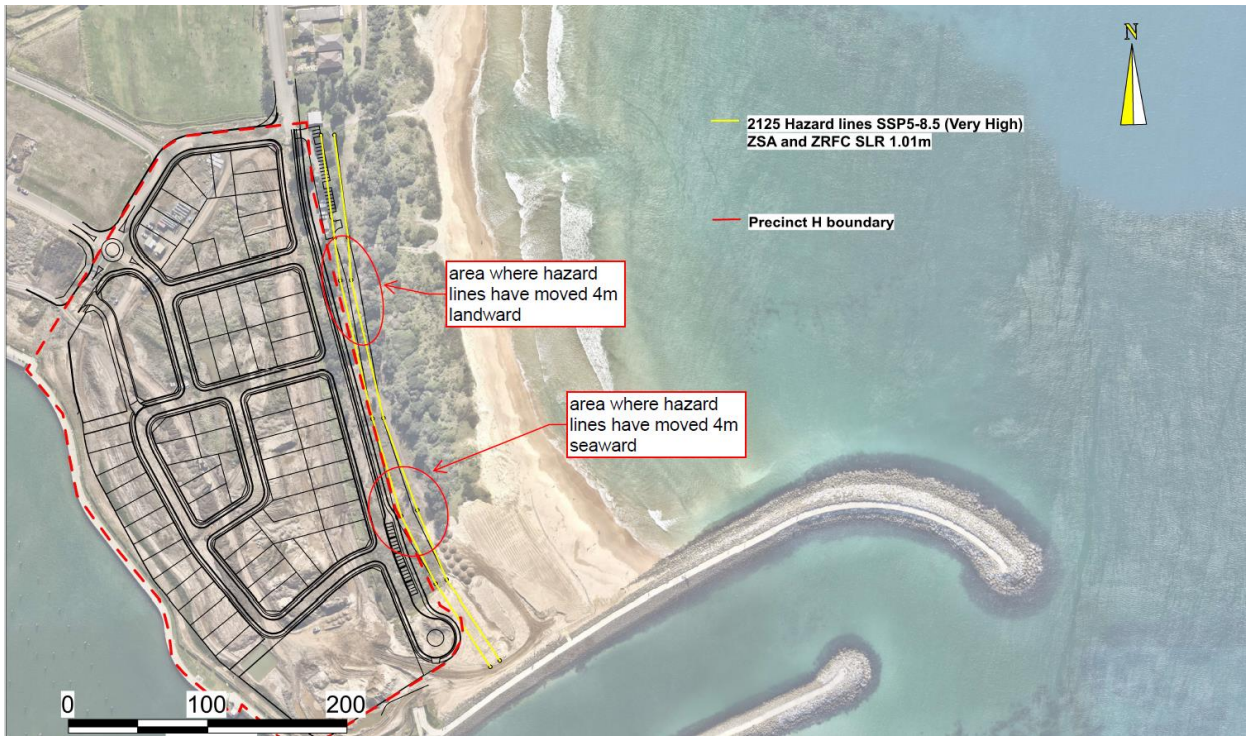

Figure 2-3 2125 coastal hazard zones (ZSA and ZRFC) for SSP5-8.5 (Very High)
(source: Advisian, January 2023)

3. COASTAL INUNDATION

In my letter of 8 December 2022, the following maximum inundation levels were estimated at 2125 for each of the three sea level rise scenarios:

- SSP2-4.5 (Intermediate) : 5.25m AHD
- SSP3-7.0 (High) : 5.47m AHD
- SSP5-8.5 (Very High) : 5.61m AHD

The actual dune crest level within the existing/undisturbed portion of the dune system from the recent survey data are somewhat lower than had been envisaged; crest levels vary locally from 4.02m AHD to 4.86m AHD, with an average level of 4.34m AHD.

A closer examination of the overtopping flow has been made in the knowledge that this flow would travel as a sheet flow or bore at shallow depth, spreading out and infiltrating into the sandy profile. There would also be considerable frictional resistance to the flow particularly where vegetation is encountered.

Based on the work of Cox and Machemehl (1986), it is estimated that the travel distance of the sheet flow or bore beyond the crest would be approximately 10 to 12m. Reference to the position of the 2125 ZSA for the two more realistic sea level rise scenarios (Intermediate and High emissions scenarios) indicates that the sheet flow may only just reach the northern carpark[1]. Here any overtopping flow would be captured in the drainage system and distributed away from building development.

Accordingly, as concluded in my letter of 8 December 2022, coastal inundation is not considered to be an issue for Precinct H.

[1] *The ZSA is the appropriate zone to consider for overtopping as this represents the physical sand erosion escarpment.*

4. REFERENCES

Cox, J and Machemehl, J, 'Overload Bore Propagation due to an Overtopping Wave', Journal of Waterway, Port, Coastal and Ocean Engineering, Vol. 112, No 1, pp 161-163

I trust the above is satisfactory. Please contact me should you require any clarification or additional information.

Yours faithfully

Greg Britton
Technical Director - Water, Australia