

**Re: Increased Impervious
Fraction Analysis
[REV 1]**

Level 1, 215 Pacific Highway
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ABN 81 094 433 100

Matilda Kaveney
Palm Lake Works Pty Ltd
106 Forest Lane and Lot 1 Lewis Street
Old Bar NSW 2430

27 July 2026
Palm Lake Resort, Old Bar Beach
NL223154

Dear Matilda,

Northrop Consulting Engineers Pty Ltd (Northrop) has been engaged by Palm Lake Works Pty Ltd to prepare a flood assessment for the proposed development at Palm Lake Golf Course, Old Bar, NSW, herein referred to as the subject site.

In 2024 Northrop prepared an Engineering Design Report (Revision D; 5 July 2024) to support the Modification Development Application to amend the previously approved Golf Course Layout and incorporate updates to the proposed water quality and quantity management measures at the site.

A flood modelling exercise was included within the Engineering Design Report (Northrop, 2024) to analyse the previously approved and updated developed case flood behaviour at the subject site and vicinity.

Flood modelling prepared for the purposes of the Engineering Design Report (Northrop, 2024) used the original Racecourse Creek Flood Study (FS) and Options Assessment prepared by Manly Hydraulics Laboratory (MHL) and dated October 2020, herein referred to as the Racecourse Creek FS (MHL, 2020).

The purpose of this correspondence is to present the results of a sensitivity analysis prepared at the subject site with respect to the assumed impervious percentage.

Included herein is a summary of the model updates, the results and discussion of the findings of the analysis.

MODEL UPDATES

The original Racecourse Creek FS (MHL, 2020) TUFLOW model has been used for the purposes of this analysis. The original Racecourse Creek FS (MHL, 2020) TUFLOW model was updated to incorporate an assumed 60% and 75% impervious fraction for the western and northern precincts respectively.

These updates were made in the TUFLOW Materials File (TMF) with both the Initial and Continuing Loss reduced from the adopted 9.1mm and 1.68mm/hr respectively to 3.64mm/0.67mm/hr (60%) and 2.28mm/0.42mm/hr (75%).

The extent of the Northern and Western Precincts was also updated to match the latest layout as presented in Figure 1 of Attachment 1.

All remaining model parameters and variables adopted by the original Racecourse Creek FS (MHL, 2020) TUFLOW model were then maintained for the purposes of the analysis.

RESULTS

The updated TUFLOW model was run for the 1% AEP design storm event, including both the one (1) and, thirty-six (36) hour durations. The results were then enveloped and compared to those determined by the original Racecourse Creek FS (MHL, 2020) TUFLOW model.

A comparison of the flood elevations is presented in Figure 2 of Attachment 1. The results show an increase in flood levels around the golf course in the order of approximately 5-6mm.

Slightly larger increases of up to approximately 11mm are observed in Racecourse Creek downstream of the subject site while an increase of approximately 8mm is observed in Lot 4 DP594864 located south of the subject site.

CONCLUSION

Northrop Consulting Engineers Pty Ltd have prepared a sensitivity test to review the change in flood levels that occurs when the assumed impervious fraction modelled by the original Racecourse Creek FS (MHL, 2020) is increased.

The results show an increase in flood levels around the subject site and vicinity in the order of 5-11mm during the 1% AEP design storm event when compared to the original Racecourse Creek FS (MHL, 2020) results.

If you have any queries regarding this correspondence, please don't hesitate to contact the undersigned on (02) 4943 1777.

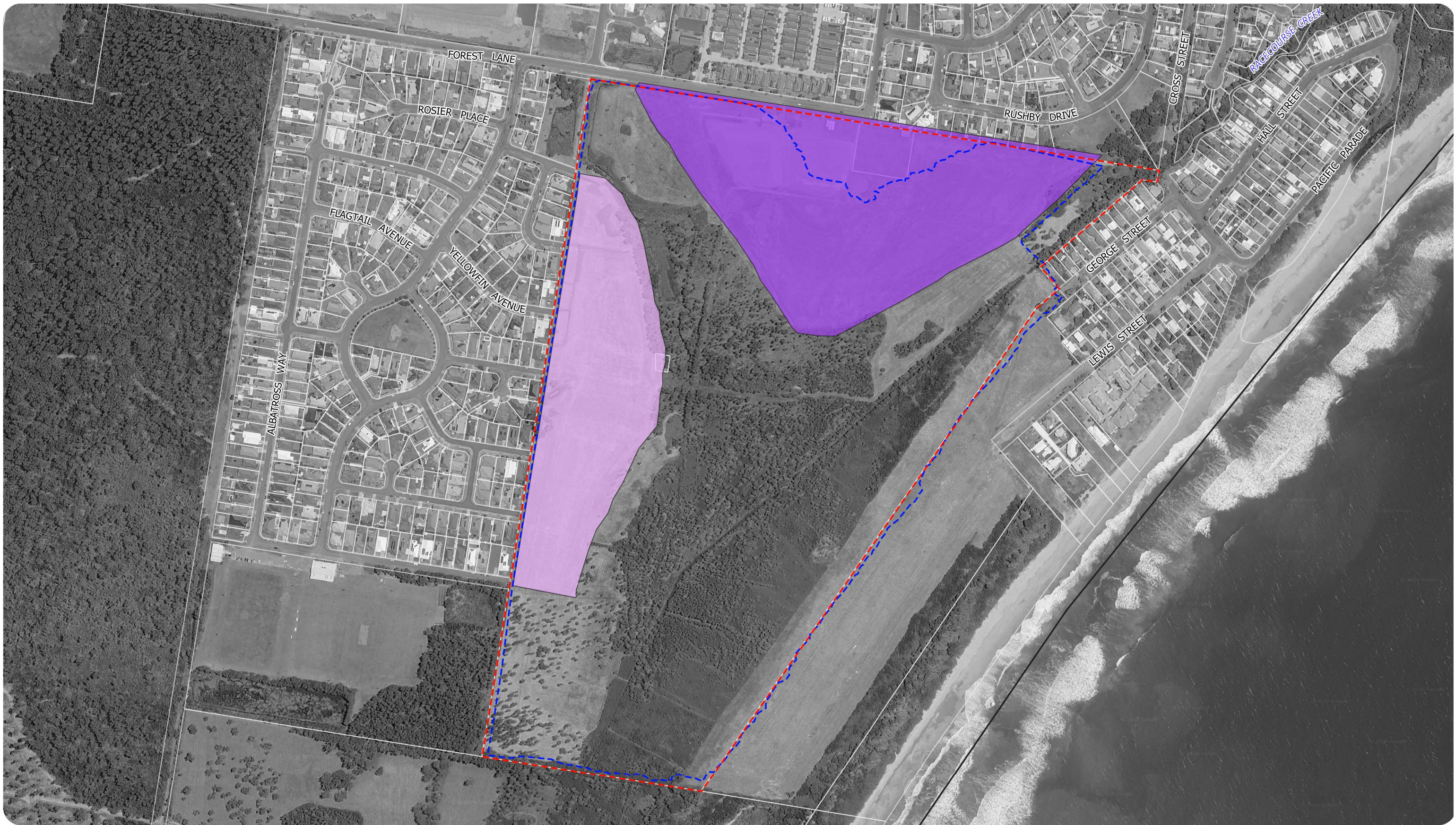
Yours sincerely,

Laurence Gitzel

Associate | Group Manager | Senior Flood Engineer

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1:5,000



0 100 200 m

Legend

 Site boundary

 Model Extent

 Extent Golf Course DEM (2009)

Impervious Fraction

60% Impervious

75% Impervious

JOB NUMBER
NL223154

JOB NAME
Palm Lake Resort, Old Bar

NORTHROP

Figure 1

Modelled Impervious Fraction
Western and Northern Precinct



NRP Modified Impervious Scenario minus MHL Model



JOB NUMBER
NL223154

JOB NAME
Palm Lake Resort, Old Bar

- Legend
- Site boundary
 - Model Extent
 - Extent of Approved Golf Course DEM(2009)

Level Difference (m)	
<= -0.010	0.002 - 0.005
-0.010 - -0.002	0.005 - 0.010
-0.002 - 0.002 (not shown)	> 0.010

Figure 2

1% AEP

Flood Level Difference