



Our ref: L.A11754.PenrithLakes_SmartPoles_FIA.docx

11 April 2022

Joanna Ward
National Planning Manager - Wireless
Service Stream Limited
Level 3, Tower B, Zenith Centre
821 Pacific Highway, Chatswood NSW 2067
Attention: Joanna Ward

Dear Joanna

RE: PENRITH LAKES SMART POLES FLOOD IMPACT ASSESSMENT

This document outlines the background, methodology and results of the flood impact assessment (FIA) undertaken for the proposed smart poles at the Penrith Regatta Centre located at 153 Old Castlereagh Road, Castlereagh NSW (referred to as the 'Site'). The purpose of this FIA is to assess the potential impact of the proposed two smart poles on flood behaviour at the Site and across adjoining properties to address the requirements outlined in the Penrith Lakes State Environmental Planning Policy (SEPP). This document provides a summary of the flood modelling undertaken and its findings including relevant mapping.

Yours Sincerely,

BMT

A handwritten signature in blue ink, appearing to read 'Nathan', enclosed in a light blue rectangular box.

Nathan Cheah
Associate Principal Engineer

1 Background

The Penrith Regatta Centre (“the Site”), which is situated at 153 Old Castlereagh Road, Castlereagh NSW, lies on the eastern bank of the Nepean River. The Site is managed under the Penrith Lakes State Environmental Planning Policy (SEPP) and is subject to mainstream flooding from the Nepean River which is bordered to the west and south of the Site.

Optus Mobile are proposing to install two smart poles at the Site. The location of the smart poles is as shown in Figure 1.1. The smart poles have an approximate diameter of 0.573 m and height in excess of 9 m, and they will be connected to the nearby proposed underground fibre cable and power pits. As the Site is managed under SEPP, a flood impact assessment is required for the proposed smart poles installation to address the requirements of Clause 33.

The TUFLOW model developed for the Penrith Lakes Development Cooperation (PLDC) as part of the ‘*Penrith Lakes Scheme Summary Flood Impact Report*’ (BMT WBM, 2015) has been found to be suitable for assessing design floods and setting Flood Planning Levels (FPLs) for the Penrith Lakes Development Area (PLDA) where the Site is located. This TUFLOW model was adopted for the flood impact assessment herein¹ to simulate the 1% Annual Exceedance Probability (AEP) design flood event under existing (pre-development) and proposed (post-development) conditions.

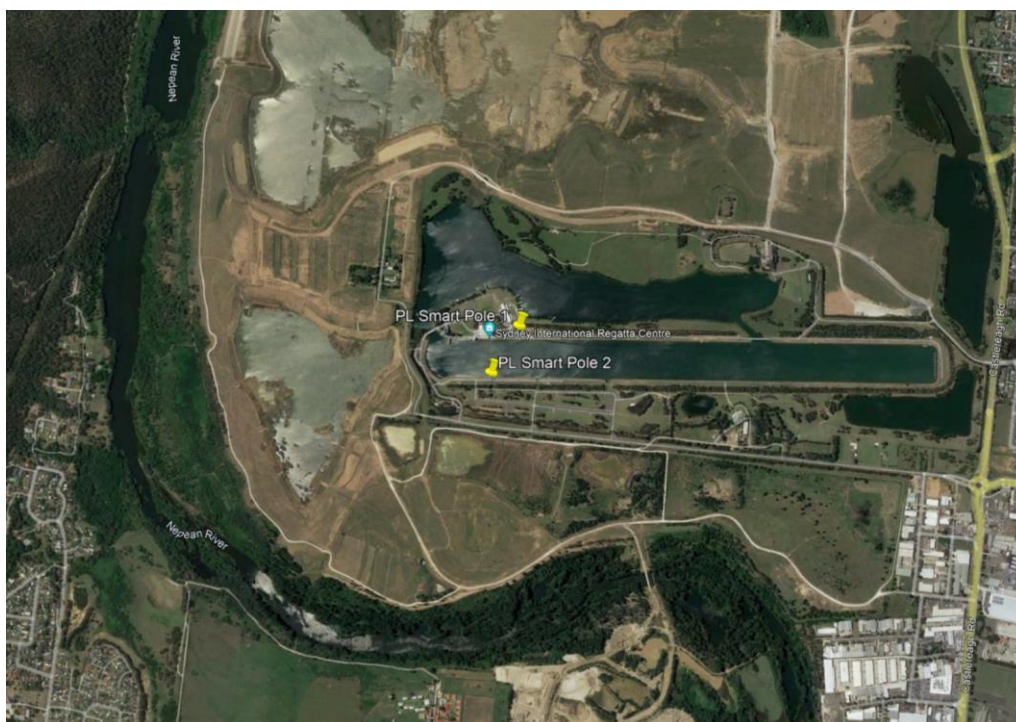


Figure 1.1 Location of the proposed two smart poles

¹ PLDC has granted permission to use the model for this assessment based the following conditions:

- No warranty or guarantee is provided by PLDC and no liability is accepted by PLDC for any loss or damage resulting from the use of this model;
- The reporting and model are not to be distributed; and
- The model will be used for this assessment at our own risk.

2 Flood Modelling Approach

2.1 Existing (Pre-Development) Conditions Model

The following is a summary description of the TUFLOW model from the '*Penrith Lakes Scheme Summary Flood Impact Report*' (BMT WBM, 2015) adopted for the assessment herein:

- The TUFLOW model was primarily based on the previous SOBEK Nepean River model developed by Cardno for PLDC with some components of the previous RMA model developed by Worley Parsons for Penrith City Council (PCC) also incorporated;
- The TUFLOW model is a linked 1D/2D (one-dimensional/two-dimensional) model extending along the reach of the Nepean River and floodplain from 2.3 km upstream of the M4 Freeway Bridge in the south to 1.9 km downstream of the Nepean River/Grose River confluence in the north;
- The ground surface elevations for the TUFLOW model grid points were sampled directly from the digital elevation model (DEM) established for the model area, which was derived from a combination of topographical data sets gathered from 2011 to 2015. Additional topographic refinements were also introduced as part of the BMT WBM (2015) study;
- A 2D domain model resolution of 15m was adopted, with DEM elevations being sampled every 7.5 m. This resolution was selected to provide a sufficiently accurate representation of floodplain topography whilst still resulting in acceptable model simulation times;
- The adopted inflow hydrographs were based on the inflow hydrographs used in the previous SOBEK and RMA models. It should be noted that no allowance has been made for direct rainfall onto the TUFLOW model domain or for any significant lateral inflows to the floodplain area within the model domain. Neither of these assumptions are expected to have any significant influence on predicted peak flood levels;
- A stage-discharge relationship was adopted at the downstream model boundary (as used in the RMA model);
- The different hydraulic roughness (Manning's 'n') zones assigned across the model domain were primarily based on the previous SOBEK and RMA models;
- Key structures located within the modelled area including bridges, culverts, weirs and underpass structures were represented in the model; and
- The TUFLOW model was deemed suitable for undertaking design flood assessments and setting FPLs for the PLDA.

The TUFLOW model configuration is as shown in Figure 2.1. This model was adopted to simulate the 1% AEP event existing flood conditions around the Site.

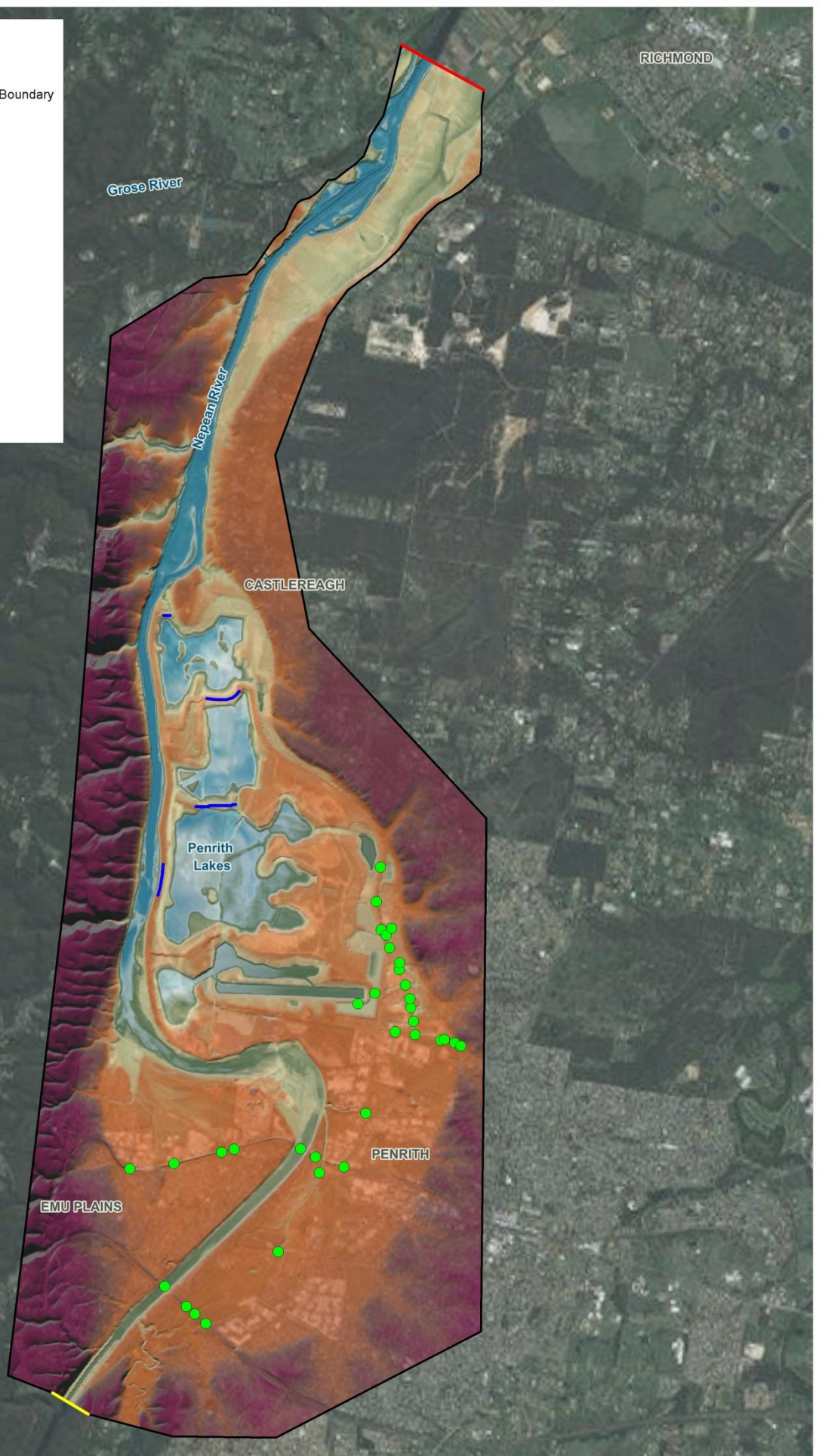
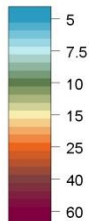
2.2 Proposed (Post-Development) Conditions Model

The proposed condition was represented and simulated in the TUFLOW model by introducing a layered flow constriction layer for each proposed smart pole. . The layered flow constriction approach works by adjusting the flow width of the 2D model cell to represent blockages and head (friction) losses (in this case caused by the smart poles). A blockage value of 4% and a form loss coefficient of 0.04 were determined based on the effective flow area width of the model cell, and in accordance with '*Hydraulics of Bridge Waterways*' (Bradley, 1960).

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- 2D TUFLOW Model Extent
- Downstream Stage-Discharge Boundary
- Upstream Flow Boundary
- Weir Location
- Structure Location

Elevation (m AHD)



Title:
TUFLOW Model Configuration

Figure:
2-1

Rev:
A

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0 1.25 2.5km
Approx. Scale



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3 Flood Modelling Results

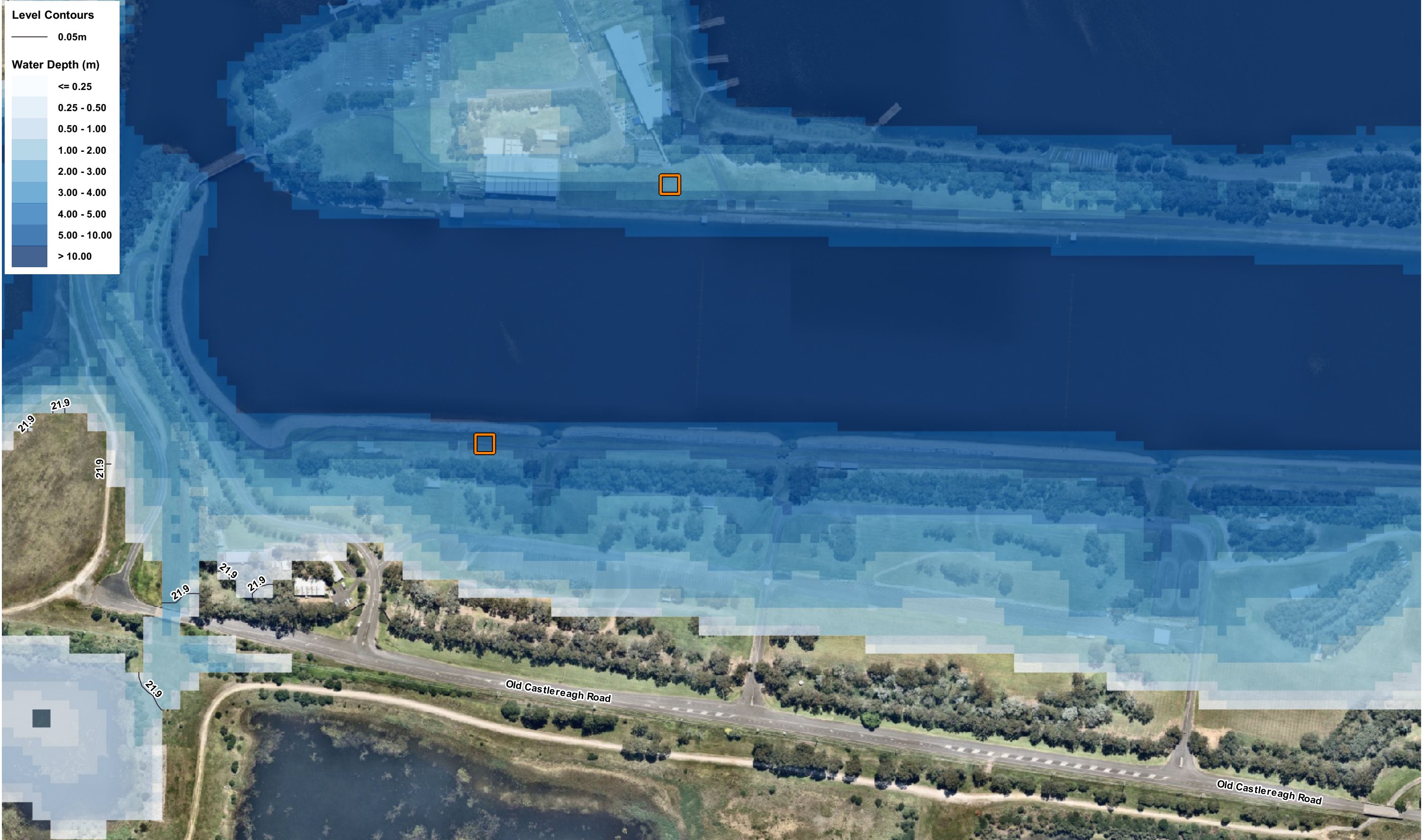
The flood modelling results are presented as follows:


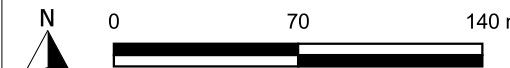

- Figure 3.1 – 1% AEP peak flood depth and level (existing conditions);
- Figure 3.2 – 1% AEP peak flood velocity (existing conditions);
- Figure 3.3 – 1% AEP peak flood level impact (proposed conditions); and
- Figure 3.4 – 1% AEP peak flood velocity impact (proposed conditions).

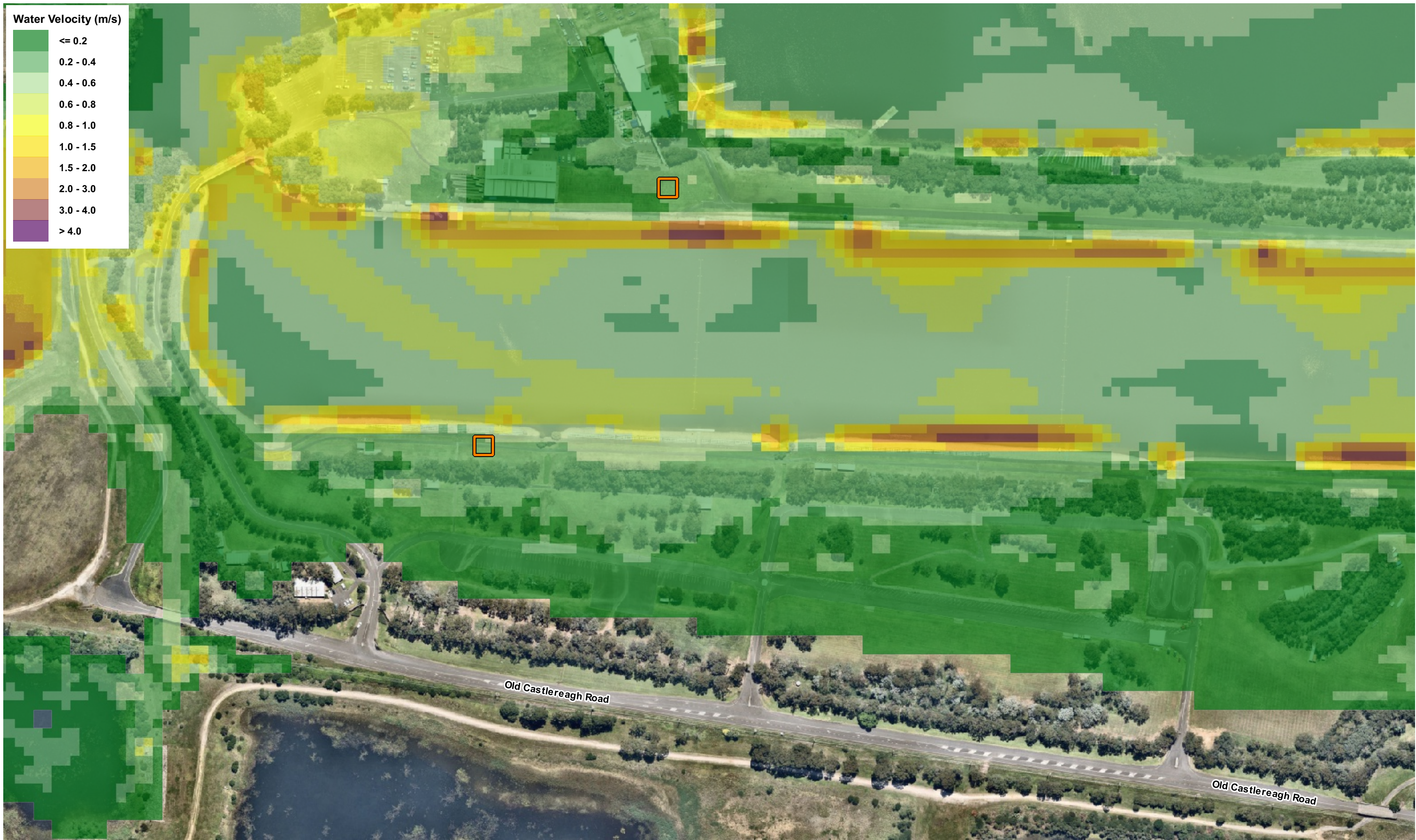
Referring to Figure 3.1, the majority of the Site is subject to significant inundation in excess of 1.0 m for the 1% AEP event. At the location of the proposed smart poles, the 1% AEP peak flood depths can reach approximate 6.0 m. Referring to Figure 3.2, the 1% AEP peak flood velocities are generally less than 0.5 m/s at the location of the proposed smart poles, signifying slow moving floodwaters. Hence, the existing flood behaviour around the Site can be characterised as driven by volume of floodwaters overtopping from the Nepean River for the 1% AEP design flood event.

The proposed smart poles installation was assessed in terms of potential adverse impacts on the 1% AEP existing flood behaviour. Flood level and velocity difference mapping was prepared by subtracting peak existing water levels/velocities from peak developed water levels/velocities and indicate the magnitude and location of changes associated with the proposed works.

The flood impact maps shown in Figure 3.3 and Figure 3.4 demonstrate that there are negligible predicted flood level and velocity impacts from the proposed two smart poles within the Site and across adjoining properties for the 1% AEP flood event. Flood levels at the Site are primarily driven by the total volume of floodwater originating from the Nepean River. The minor alteration to the existing conditions at the Site was predicted to have an insignificant effect on the total volume of available flood storage within the Site during flood events, as demonstrated by the results of the modelling.



LEGEND  Proposed Smart Poles	Title: 1% AEP Peak Flood Depth and Flood Level (Existing Conditions)		Drawing: 3-1	Rev: A
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LEGEND

 Proposed Smart Poles

Title:

1% AEP Peak Flood Velocity (Existing Conditions)

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0 70 140 m

Drawing:

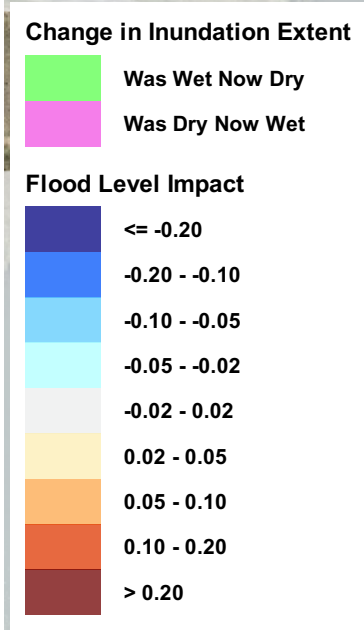
3-2


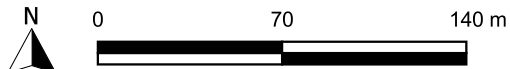

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LEGEND  Proposed Smart Poles	Title: 1% Peak Flood Level Impact (Post-Developed Conditions)		Drawing: 3-3	Rev: A
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Flood Velocity Impact

<= -1.00

-1.00 - -0.50

-0.50 - -0.25

-0.25 - -0.10

-0.10 - 0.10

0.10 - 0.25

0.25 - 0.50

0.50 - 1.00

> 1.00

Change in Inundation Extent

Was Wet Now Dry

Was Dry Now Wet



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4 Conclusion

The flood impact assessment undertaken herein demonstrates that the proposed two smart poles at the Penrith Regatta Centre will result in negligible at-Site and off-site flood level and velocity impacts for the 1% AEP flood event. The existing flood behaviour and flood risks to life around the Site remain unchanged. The proposed installation of the two smart poles will result in negligible impact to the nearby riparian vegetation, as well as stability of the riverbanks or watercourses. Further, it will not result in unsustainable social and economic costs to the community as a consequence of flooding impacts. As such, the requirements of Clause 33 of the Penrith Lakes SEPP are met for the installation of the proposed works.

The flood loading on the proposed smart poles installation and their foundation design, as well as the flood compatibility of the materials used in their construction have not been assessed as part of this assessment.