Dear Mr O'Brien

Greater Macarthur Investigation Area - Flood Risk Management Comments

I refer to the Office of Environment and Heritage (OEH) letter to you dated 3 December 2015, providing comment on the Greater Macarthur Land Release – Preliminary Strategy and Action Plan. OEH flagged in that letter that its comments on the Greater Macarthur Water Management Report (GHD, 2015) would be provided at a later date. Please find below OEH's comments on this report.

The primary objective of the Government’s Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods. The most appropriate method to assess the development of flood prone land is through the floodplain risk management process, which is detailed in the NSW Floodplain Development Manual (2005). A primary objective of Section 117 Direction 4.3 'Flood Prone Land' of the Environmental Planning and Assessment Act 1979, is to ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005.

The consultant GHD has developed hydrologic model XP-RAFTS and hydraulic 1D model HEC-RAS covering the catchments of the Greater Macarthur area. The models have been utilised as a preliminary assessment to estimate existing flooding behaviour and to outline flooding impacts due to development. The potential impacts from climate change on flooding behaviour due to increased rainfall intensities have been documented.

Verification of GHD model for existing condition

GHD (2015) indicates that, the outcomes from this assessment should only be viewed as a baseline assessment for further refinement in each development. The report states “Since there has been limited information available to verify the hydraulic modelling, it is recommended that, should further investigations be undertaken for the Study Area and there be a significant flood event, then flood levels should be collected to provide verification data for a future model review. It is also recommended that periodic updating of the hydrologic and hydraulic assessment be completed as any future planning proceeds for potential urban development.”
However, at this stage, GHD's assessment results can be verified against the 'Nepean River Flood Study, WorleyParsons (WP) April 2015' at the Grater Macarthur downstream boundary, for existing condition. Camden Council has undertaken this detailed flood study assessment for the Upper Nepean River Catchment (Nepean River Flood Study, WP April 2015). The outcomes of this study, at its upstream boundary, can be used as the benchmark against which the Greater Macarthur development impacts can be assessed.

**Verification method and requirements**

It is recommended that Camden Council provide the 5% to 1% AEP hydrographs from the updated Nepean River Flood Study (WP, 2015), for identified critical durations, at the upstream boundary of the model (i.e. downstream Hume Highway). Then GHD can then compare the 5% to 1% AEP calculated hydrographs from its report with the provided hydrographs.

It is required that,
- the peak flows of the GHD calculated hydrographs should not exceed the peak flows in the WP report; and
- the GHD calculated hydrographs should match hydrographs in the WP report to an acceptable limit agreed by relevant councils.

**Cumulative impacts of developments within the GM Area**

A similar assessment should be undertaken when assessing the cumulative impacts of various development within the Greater Macarthur area using GHD's baseline model. The following steps may be undertaken:

The proponent’s consultants to incorporate the 1% AEP hydrographs from the GHD report baseline model as inputs to the upstream boundary of its hydraulic models. Then compare the calculated hydrographs at the downstream boundary of the development with the baseline model hydrographs at that boundary. The peak flow of the estimated hydrograph should not exceed the baseline model peak flow. Both hydrographs should be matched to an agreed/acceptable limit. This work should be undertaken in close consultation with both Wollondilly Shire Council and Campbelltown City Council.

**Flood Hazard**

It has been noted that under the Urban Capable boundary scenario, the developable areas in the north western downstream boundary of the Greater Macarthur area has been extended to include an area identified by both WP (2015) and GHD (2015) as a ‘High Hazard Area’. In this regard, the relevant reference is Figure H-1 in the GHD report, the area classified as H6 "Not suitable for people, vehicle or building". The 1% AEP flood depth is ranged between (3-6 m) with extra 3m depth in the PMF event according to WP (2015).

Such a high hazard area is not suitable for any land-use except recreation development. Accordingly, it is prudent in the early stage of planning to allocate various land-uses, within the Greater Macarthur, in accordance with their vulnerability to the flood risk.

The report classifies Hazard H1 as ‘No Restriction’ Area, this should be amended to H1 ‘Low Hazard’ Area. This is to correctly inform decisions on suitable development and building controls that are required to manage flood impact and to reduce damages in this hazard area. The area is a low hazard zone in the 1% AEP flood, accordingly building and development controls would be applied to various land-uses.

**General comments**

Potential earthworks/filling should not adversely impact on flood behaviour and should be based on understanding of cumulative flood impacts.

The report outlines a preferred WSUD strategy. However, a range of management measures which would need to be implemented in order to manage the development related flood risks and impacts should also be considered during the assessment of individual development within the Greater Macarthur area.
Specific measures that would need to be incorporated into the detailed design in order to mitigate the residual flood related impacts should be identified when assessing individual development.

An Emergency Response Plan (ERP) to manage floods above the flood planning level is required. The plan should include the evacuation planning outlined in Section 9, and should not compromise the capacity or operation of existing regional evacuation routes. Consultation with the State Emergency Service (SES) is essential.

If you have questions please contact me on 9995 6864 or susan.harrison@environment.nsw.gov.au.

Yours sincerely

S. Harrison 14/12/15

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