**Submission No 174**

# INQUIRY INTO MUSEUMS AND GALLERIES

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General Purpose Standing Committee No. 4
Legislative Council
Parliament of New South Wales
6 Macquarie Street
Sydney NSW 2000

Your Ref: Report 35 – Dec 2017
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Dear Members,

Re: Museums and galleries in New South Wales, First Report, 18 December 2017

By way of introduction, I am a Civil Engineer with expertise in flooding, its management and hazard mitigation. I have a PhD in river hydraulics, and decades of experience in the water engineering arena. As a professional engineer, I put the community's interest above all else.

I refer the above report just released, and in particular your Recommendation 4:

"That the NSW Government release the full business case for the Powerhouse Museum and all assessed proposals to the committee and the community for full public consultation before making its final decision."

In considering your recommendation it occurs to me that a business case review of the subject proposals may not be sufficient to capture what I consider to be the two of the very most important issues of relevance to the community at large:

1. a potential loss of life issue, due to increased community exposure to flood hazard; and
2. a potential loss of irreplaceable collections, due to their relocation directly within a flood hazard area.

Although your report well documents acceptance that the subject site is flood prone, I feel that this label is not sufficient to convey the gravity of the issue.

I refer to a draft report entitled *Update of Parramatta Floodplain Risk Management Plans for Parramatta City Council by Molino Stewart Pty Ltd, February 2016 (Doc. Ref. 0715 Updated Parramatta FRMP v3).* My view is that this report presents a reasonable interpretation of the flooding characteristics at the subject site, based on information that was currently available at the time the report was written.

I have attached three graphics from the Molino Stewart report: two that present *extent and peak flow depth information* at the site; and a third that presents *flood hazard classification* at the site. I would be pleased if you would consider my commentary and interpretation of this information, as relevant to the proposed Powerhouse Museum (PHM) relocation.

**Potential for loss of life**

Flood hazard classification is applicable to assessment of potential for loss of life. It is determined through consideration of the combined effect of overland (flood plain) flow velocity and depth. The resulting hazard classification indicates risk of a person being washed away, a loss of life scenario.

The attached Figure 9 was copied from MS2016 and modified to show the approximate location of the proposed PHM site. Please note the blue shaded legend depicting flood hazard. The overall

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spatial extent of hazard, as shown on Figure 9, corresponds to the estimated Probable Maximum Flood (PMF) flooding extents. That is, all areas affected by PMF inundation are classified with a *Low Hazard* classification, at least. Within and around the proposed PHM site, flood hazard classification is seen to be *High* along the river frontage, and *Medium* within the internal road/laneways/footpaths.

It is of relevance to note that roads, laneways and footpaths tend to attract increased flood hazard classification. This is because these locations tend to become active overland flow paths during flooding events.

It is also of relevance to note that flood hazard classification is not so much related to the size of a flood (e.g. PMF, or 20 Year ARI) but instead, on what the water flow velocity and depth becomes when it becomes inundated.

The attached Figure 8 was copied from MS2016 and modified to show the approximate location of the proposed PHM site. This figure indicates the extents of inundation within and around the proposed PHM site for flooding events of 20 Year ARI, 100 Year ARI and PMF.

It is significant to note that a fair portion of the site is affected by the 20 Year ARI event, as too are the roads/laneways/footpaths within and around the site.

In considering the above I conclude that locating the PHM at the proposed site would result in visitors to the PHM being exposed to unacceptable flood hazard.

**Potential loss of irreplaceable collections**

It follows that relocating the PHM to the proposed site would potentially expose the collections to damage or destruction if the site was inundated with floodwaters. It is assumed that most of the PHM's collections are irreplaceable and therefore invaluable.

Basic common sense, not to mention existing planning policy, would prohibit locating such a collection in a flood hazard area.

Standard contemporary practice uses the assessed line of inundation of the PMF to demarcate the extent of flood hazard. That is, a location must be sited outside the PMF flood extents to avoid flood hazard.

The attached Figure 10 was copied from MS2016 and modified to show the approximate location of the proposed PHM site. This figure shows the estimated depth of maximum inundation of the PMF above existing ground level. It is seen that the estimated depth of inundation within and around the PHM site is generally deeper than 4m. This is considerable.

Of course, water structures can be designed to exclude water to this depth, foundations can be sealed, watertight bulkheads can be installed, and a feasible business case may be put forward in justification.

However, despite the economics, there would remain good chance that the works would fail on at least one occasion during their life, through: human error, material failure, or occurrence of unexpected circumstances.

It therefore seems that the only viable consideration for a business case would be based around having the PHM complex constructed on top of piers extending above the level of the PMF. This, in my view, would not be a practicable solution.

## Conclusion

In conclusion, I would urge the Committee to consider revising their Recommendation 4 as follows:

- That the NSW Government release the full business case **and flood hazard appraisal** for the Powerhouse Museum and all assessed proposals to the committee and the community for full public consultation before making its final decision.

Thank you for giving your time to consider my submission.

Yours faithfully,

Dr John C. Macintosh, BE (Civil) PhD HonFIEAust CPEng RPEQ
Engineers Australia Professional Engineer of the Year
Director | Principal Water Engineer
**Water Solutions Pty Ltd**

Atts. (3)

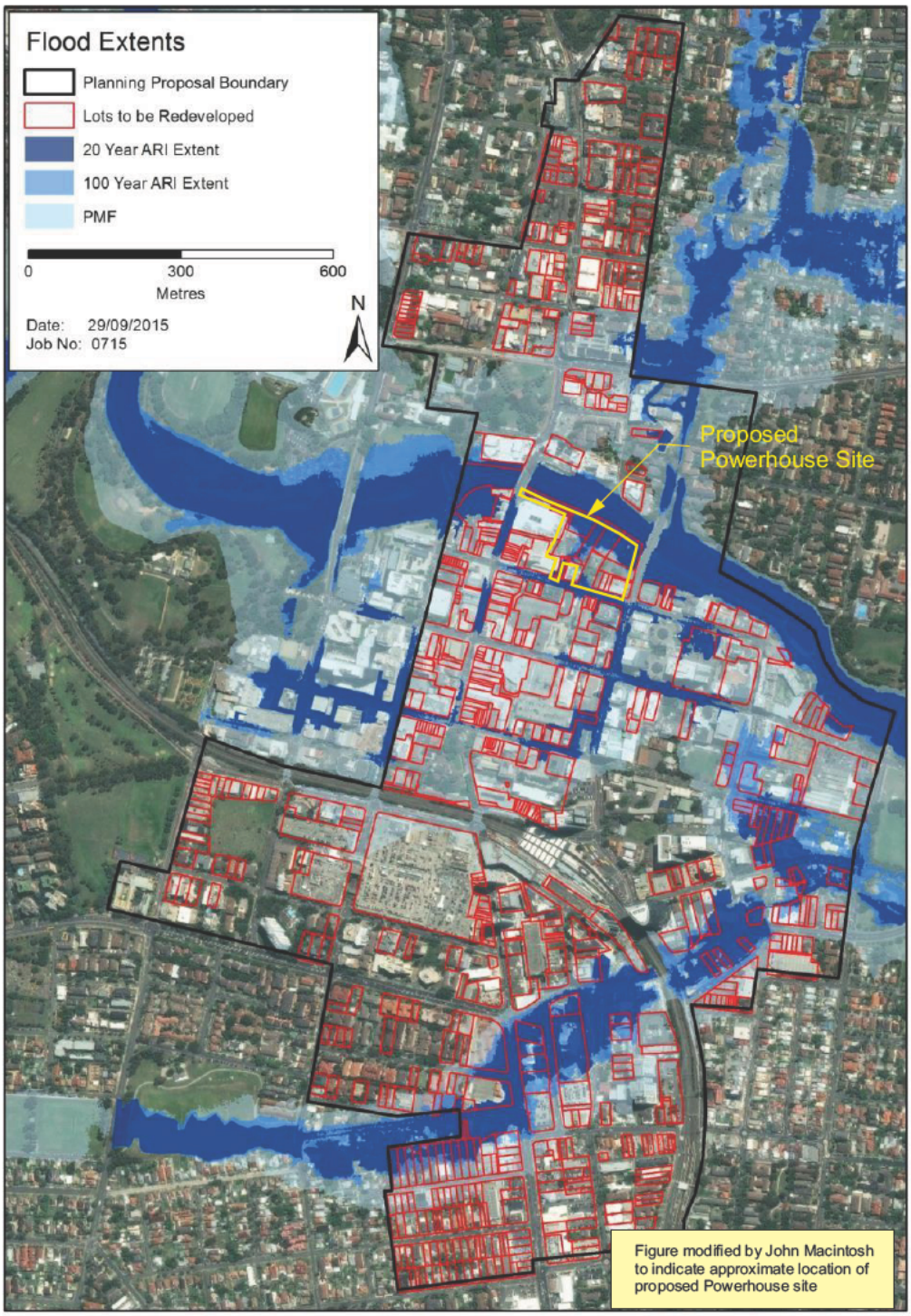


Figure 8 Flood Extents through the study area

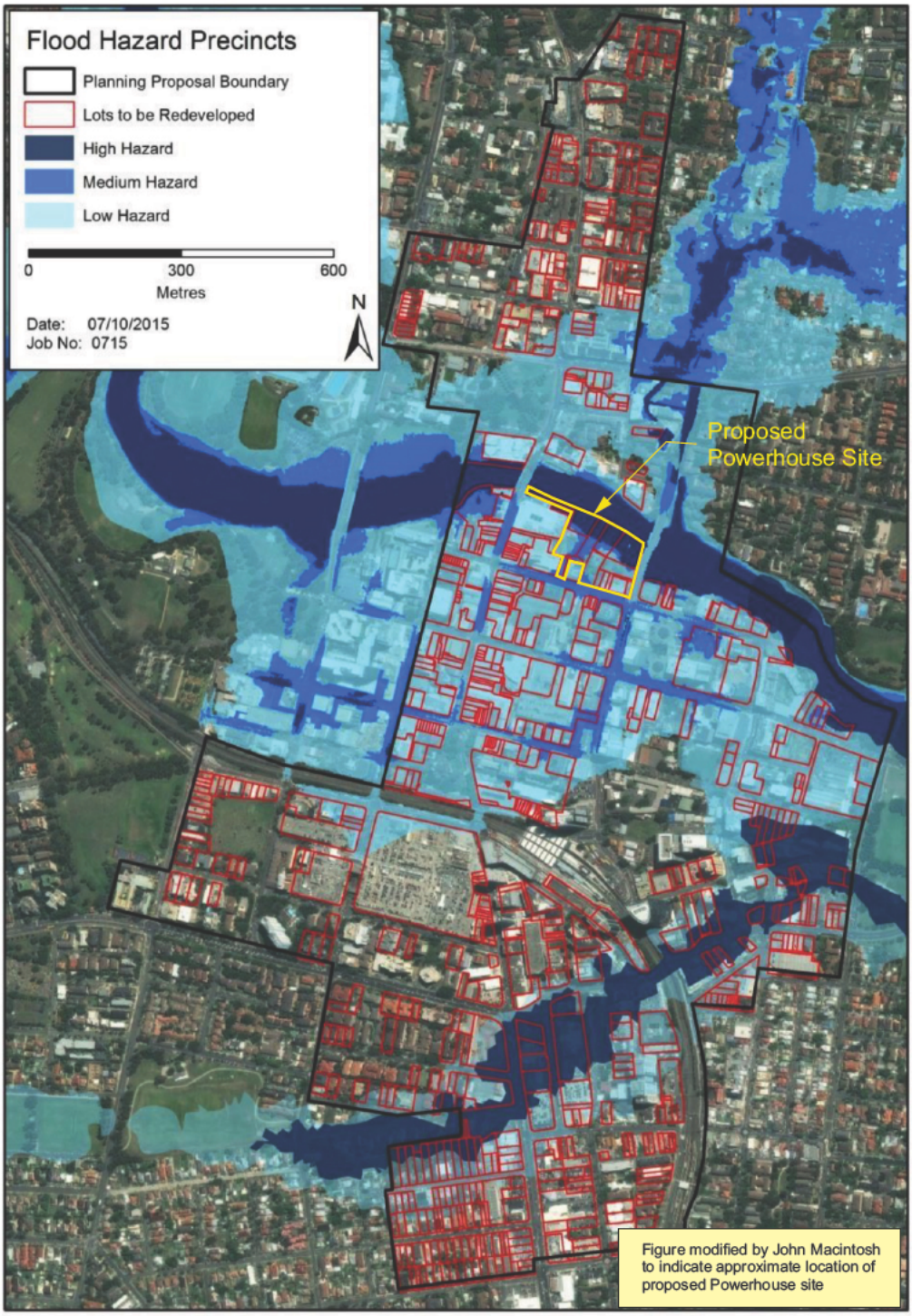


*Figure 9 Flood Hazard Precincts*

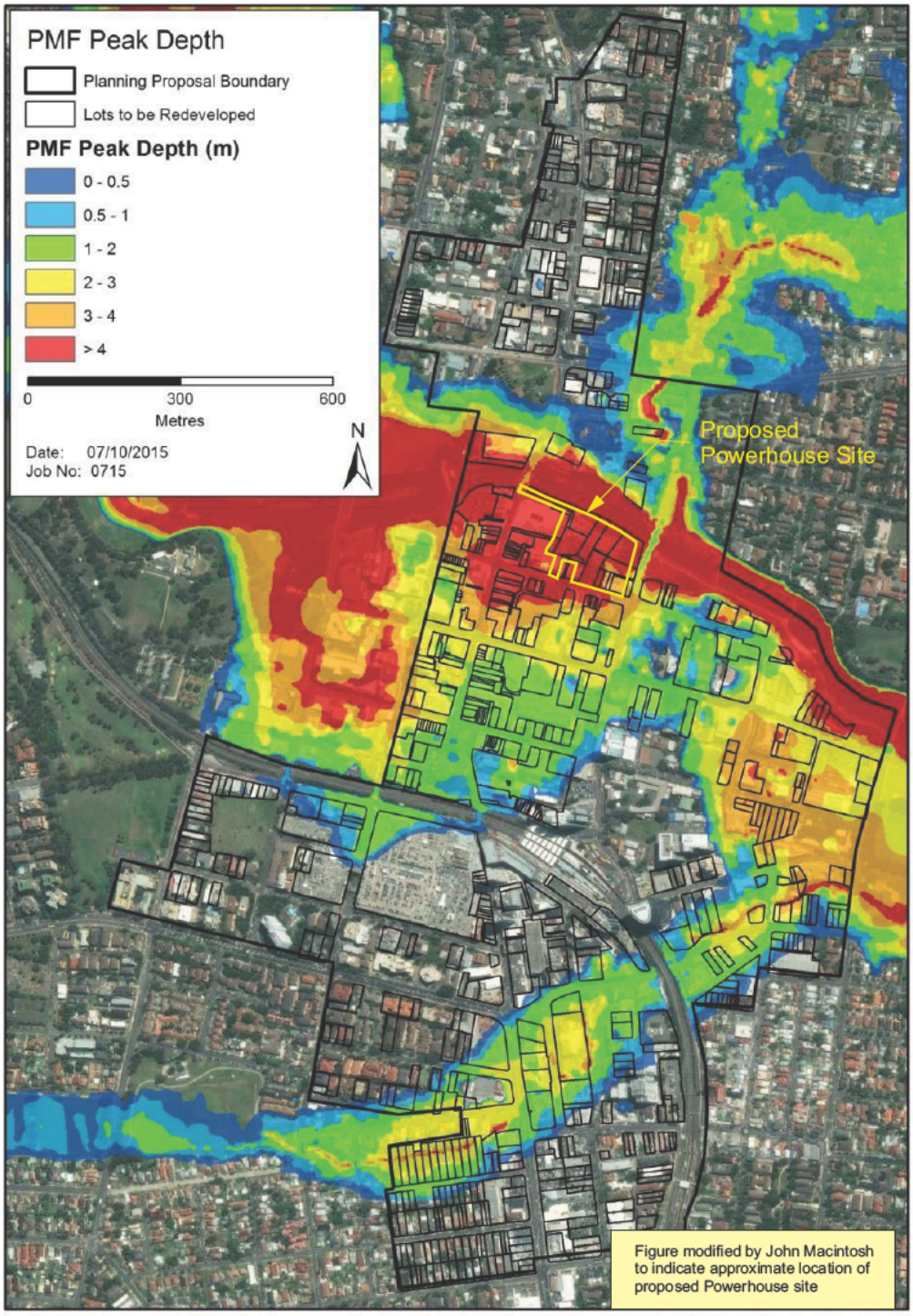


Figure 10 PMF Depth Map