Submission No 200

INQUIRY INTO PROPOSAL TO RAISE THE WARRAGAMBA DAM WALL

Name: Name suppressed

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Submission to the Legislative Council Select Committee on the Proposal to Raise the Warragamba Dam Wall

We are writing this submission as concerned residents of Mulgoa. Recently we attended presentations by WaterNSW and "Give a Dam" on raising of Warragamba Dam wall. These meetings were conducted jointly by Wallacia and Mulgoa Progress Associations and Mulgoa Landcare. As a consequence of, at times, conflicting information presented, we put forward the following comments for consideration.

In the face of changing climate and highly variable rainfall patterns, as well as population growth, the biggest challenge for the water utilities is to make socially, environmentally and economically viable decisions on the timing, the size, and the operation of the water infrastructure investments in flood mitigation without compromising water security. Until the EIS is released, it is impossible for the community to guage the effects raising the dam wall will have.

MITIGATING FLOOD RISKS

Pittoch (2018)[1] has identified how flood risks can be mitigated:

1. Stop putting people in harm's way
2. Improve evacuation routes and flood forecasting
3. Relocate the most flood prone residents
4. Alternative flood storage in Warragamba dam

The question is what weight and funding should be put to each of these alternatives?

Constraining residential development on flood plain

Infrastructure NSW consultants Molino Stewart (2012)[2] reported that flooding is constraining residential development, and, for example, is preventing up to 4,900 residential lots at Penrith Lakes[3]. The NSW Government's 2017 flood risk strategy planned to allow an additional 130,000 people to reside on the Nepean floodplain in the next 30 years[4].

It is good town planning that constrains development in hazardous areas. Residential areas must not be built in flood zones as traffic is limited to the capacity of designated evacuation routes.

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[1] Pittock, J. (2018) Managing Flood Risk in the Hawkesbury-Nepean Valley, Australia National University

[2] Molino Stewart , 2012, Hawkesbury-Nepean Flood Damages Assessment Final Report prepared for Infrastructure NSW by Molino Stewart P/L, Parramatta, NSW.

[3] PCC Nepean River Flood Study at https://www.yoursaypenrith.com.au/draft-nepean-river-flood-study-public-exhibition. The study states: *The final proposed landscape is to consist of extensive parkland surrounding the Penrith lakes, and some, as yet undecided development across the eastern upland area between the main lakes and the eastern lakes. This is likely to consist of residential, commercial and industrial development.*

[4] Molino Stewart, 2012, Hawkesbury-Nepean Flood Damages Assessment Addendum Report: Answers to Recent Questions, page 1 ; Infrastructure NSW (2017) Resilient Valley, Resilient Communities: Hawkesbury-Nepean Valley Flood Risk Management, p.19

"*In the floodplain below the Warragamba dam resides one of Australia's largest and most diverse local economies with an annual gross regional product of over A$95 billion as at 2010/11 (DPI, 2014). However, within the floodplain approximately 73,000 people are currently living in areas prone to flooding. 13,000 of these are living in homes that could be severely damaged by a 1 in 200 chance per year flood where water levels could rise by 2m (DPI, 2014**). Despite this risk a large proportion of the future new homes and jobs projected in the Strategy for Sydney (NSW Government, 2014) are anticipated to be located within the floodplain.** Due to the natural characteristics of the floodplain it is highly susceptible to floods with potential loss of life and property.*

Since 2014, over development of the Cumberland Plain has continued. 2016 figures quoted by Infrastructure NSW (A. White at a meeting at Wallacia 27th August 2019) are:
1 in 100 year flood: 64,000 need to evacuate, 5000 houses impacted
1 in 500 year flood: 90,000 need to evacuate
These 2016 figures and associated modelling for flood mitigation need to be updated in light of the massive housing developments that have occurred on flood prone sites!

And what of the additional runoff from tarmac areas in new developments in catchments above and below the Dam, including from the new Badgery's Creek Airport and Aerotropolis? Proposed major urban development, described in *Resilient Valley, Resilient Communities* as transformation from "a semi-rural landscape to an urbanized floodplain" (Infrastructure NSW, 2017, p.19.) The NSW government expects this major event, the development of the Metropolitan West Sub-region, to include at least 39,000 homes and 37,000 jobs in the region in question.

In the "Resilient Valley, Resilient Communities, Hawkesbury – Nepean Valley Flood Risk Management Strategy" (Infrastructure NSW 2019), the current 1 in 100 flood planning level is to be maintained to determine housing development. With the predicted extreme weather events associated with climate change should this level be reviewed?

Alternative flood storage in Warragamba dam

Flood mitigation not water storage?

WaterNSW is stressing that raising the dam wall is for flood mitigation and not water storage as the full storage level will not change.

Options for flood storage mitigation include

a) raising the dam wall to offer airspace to assist flood mitigation (WaterNSW preferred option), and
b) an alternative option[5], namely to lower the full storage level (FSL) in the current dam and utilise desalination to support water security with lower dam capacity.

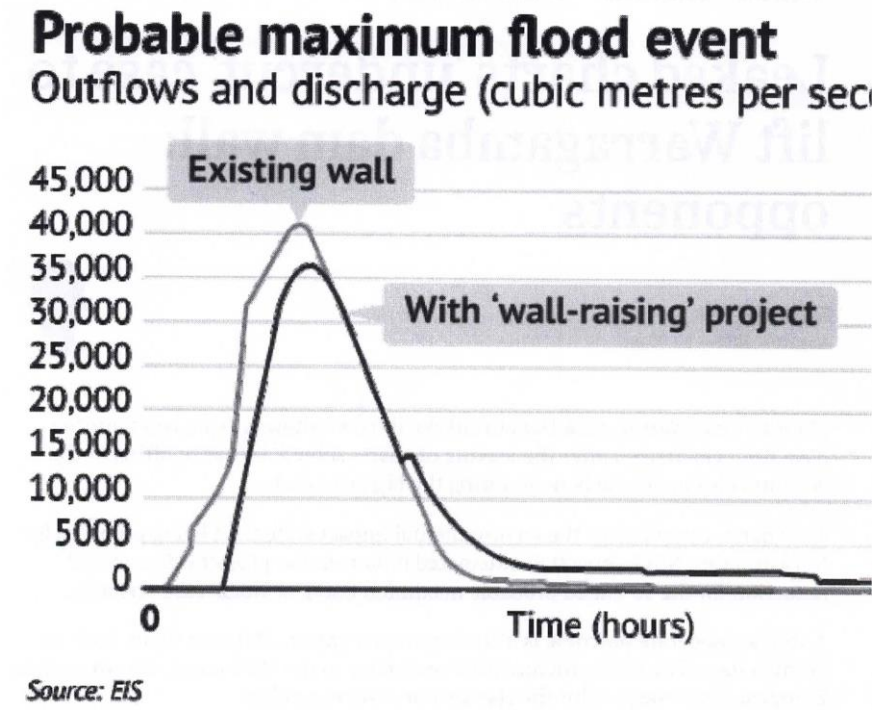
[5] Turner, A., Sahin, O., Giurco, D., Stewart, R. and Porter, M. (2016) The potential role of desalination in managing flood risks from dam overflows: the case of Sydney, Australia. *J. Cleaner Product.,* **135***,* 342-355.

The former involves a costly construction investment and *"would cause significant detrimental environmental damage upstream under more severe events*" (Molino Stewart 2012)[6].
An advantage of rain-independent sources such as desalination (or recycling plants) is that they can offer continuous water supply to a city in periods of low rainfall and ultimately reduce the rate of depletion of reservoir storages.

WaterNSW admits that the desalination unit is currently working to capacity and water usage restrictions are in place, so **more desalination units are inevitable with climate change and an increasing Sydney population.** Lowering the FSL by up to -12m provides potential flood storage capacity, however, it also represents a significant loss in dam capacity, up to 39% (Molino Stewart, 2012b; DPI, 2014), requiring the desalination need to be addressed sooner.

The modelling of Turner et al.[7] and scenario analyses provided evidence that shows that by operating the desalination plant and lowering the full storage level, additional flood mitigation can be bought more cheaply than by raising the dam wall, which offers a higher level of flood protection at higher cost. The -12m option provides sufficient flood protection and water security because the currently adopted Metropolitan Water Plan 2017 (page 28, Figure 5) shows that level 2 water restrictions and 40% water storage will trigger Sydney Desalination Plant Stage 2. With the option of lowering the full supply level with desalination, there can be greater optimisation of existing and new supply expansion infrastructure, which can achieve the dual objectives of mitigating flood risk while maintaining adequate water security for the region.

What the dam wall raising proposal provides is a false sense of security that puts people at risk as it will not save residents from flooding in some floods (SMH August 5, 2019):



[6] WaterNSW states those areas will only be flooded for an average of 14 days.
[7] Turner, A., Sahin, O., Giurco, D., Stewart, R. and Porter, M. (2016) The potential role of desalination in managing flood risks from dam overflows: the case of Sydney, Australia. *J. Cleaner Product.,* **135**, 342-355.

It may however give people time to evacuate flood prone areas.

Water quality and environmental impacts downstream

If the WaterNSW option is to be used, Khan (2018)[8] claims this would present significant water quality risks, including risks to public health, for Sydney Water drinking water customers. The likely impacts to water quality should be very carefully assessed before such a project is progressed[9].

Infrastructure NSW states that raising the dam wall by 14m will cause an incremental increase in temporary upstream inundation. Khan (2018) quotes "a catchment, which is generally not inundated, but may become inundated during rare or occasional circumstances only, is akin to a catchment which has remained relatively dry during an extensive period of drought. During such circumstances, contaminants are known to accumulate (Mosley, 2015). Rainfall following prolonged periods of drought can mobilise heavily accumulated sediment and nutrients in a water catchment, leading to sudden influxes to streams and reservoirs (Wright *et al.*, 2014). In this way, drought-breaking rains can wash off accumulated organic carbon in a large 'flush' and organic carbon concentrations may remain elevated in reservoirs for a considerable period of time (Ritson *et al.*, 2014)".

But Infrastructure NSW at a meeting of Wallacia and Mulgoa residents (27 August) stated that there is little sediment in the dam. The spokesperson claimed that water quality would be negatively affected by lowering the full supply level, with less water withdrawing points for obtaining better quality water. **Who is correct?**

"A *reduced full supply level behind Warragamba Dam would translate to greater volumes of water being more regularly released to the Warragamba and Nepean Rivers. The increased flow regimes would have a positive environmental impact on the Nepean River. In addition to improved ecology, this would improve the value of the river as a recreational resource, for activities including swimming and fishing. Furthermore, increased flow and water availability in the Nepean River would improve water quality used as the raw drinking water supply for parts of North West Sydney served by the North Richmond Water Filtration Plant"* (Khan 2018).

It should be remembered that the coincidence timing of tributary inflows can exacerbate flooding. This is of particular importance when designing a dam operation strategy to ensure that the timing of dam outflows and rain falling downstream of the dam don't coincide. It is also of importance in evacuation planning. The timing of tributary inflows was calculated for the following catchments compared to the Warragamba River timing: Nepean River, Grose River and Colo River by Babister et al 2015[10].

[8] Khan (S) 2018. Submission to INQUIRY INTO WATER NSW AMENDMENT (WARRAGAMBA DAM) BILL 2018
[9] Khan (S) 2008. Submission to INQUIRY INTO WATER NSW AMENDMENT (WARRAGAMBA DAM) BILL 2018
[10] Babister M, Retallick M, Loveridge M, Testoni I, Varga C, Craig R. Monte Carlo modelling in decision making. In36th Hydrology and Water Resources Symposium: The art and science of water 2015 (p. 1514). Engineers Australia.

Half of all floodwaters in the Hawkesbury-Nepean originate from catchment areas that are not upstream of Warragamba Dam[11]. This means that even if a raised Warragamba Dam was to hold back some flood waters, other catchments could still cause significant flooding in the valley. In fact, flood waters from the Grose River alone can cause moderate to major flooding of Richmond in the lower Hawkesbury[12]. Additionally as WaterNSW points out, there is a "bathtub" effect because between Sackville and Brooklyn there are choke pits caused by narrow sandstone gorges and there is only a 0.5m fall between Windsor and the ocean.

Environmental Significance of Raising the Dam Wall

See Australian Government Department of Environment and Energy Referral of Proposed Action (2016) which states:

3.1 Matters of national environmental significance

The area(s) to be considered for the assessment of the Proposal have been described in the context of both the stage of the works (construction and operation) and geographic extent of possible effects and impacts. The Project will have two broad impact areas:

- The **Construction Area** includes the area in and around the existing Dam including the dam wall itself, a central drum gate and spillway, four radial gates and auxiliary spillway as well as auxiliary access roads and dam site buildings. The township of Warragamba and areas immediately upstream and downstream of the Dam could be affected by the construction works. The construction may also include impacts on the immediate road network. (see Figure 1-1)
- The **Operation Study Area** includes the areas upstream and downstream of the Dam that could be affected by the future operation of the Dam with a raised dam wall.
    - Upstream of the dam includes but is not limited to Lake Burragorang (i.e. the reservoir formed by Warragamba Dam), and part of the Burragorang State Conservation Area (SCA) and the broader Greater Blue Mountains World Heritage Area (GBMWHA).
    - Downstream of the dam includes the freshwater and estuarine reaches of the river system between Warragamba Dam where it joins the Nepean River near Wallacia (not including the reach of the Nepean River upstream of Warragamba River) and Wisemans Ferry as well as the adjacent riparian zone, floodplain and wetland/lagoon waterbodies (see approximate extent in Figure 1-2).

Damage in the Wilderness Area of Blue Mountains National Park

From Australian Government Department of Environment and Energy Referral of Proposed Action (2016):

The GBMWHA occurs adjacent to the northern and southern banks of Lake Burragorang and also crosses part of the Hawkesbury-Nepean River downstream of Warragamba Dam. The extent of the property excludes the plateau south of the Wollondilly River arm of Lake Burragorang and the area northwest of the Coxs River. The GBMWHA in the context of Warragamba Dam and Lake Burragorang is shown in Figure 3-1.

The listing description of the GBMWHA provided by the UNESCO World Heritage Centre is provided below:

> *The Greater Blue Mountains Area consists of 1.03 million ha of sandstone plateaux, escarpment and gorges dominated by temperate eucalypt forest. The site, comprised of eight protected areas, is noted for its representation of the evolutionary adaptation and diversification of eucalypts in post-Gondwana isolation on the Australian continent. Ninety-one eucalypt taxa occur within the Greater Blue Mountains Area which is also outstanding for its exceptional expression of the structural and ecological diversity of the eucalypts associated with its wide range of habitats. The site provides significant representation of Australia's biodiversity with ten percent of the vascular flora as well as significant numbers of rare or threatened species, including endemic and evolutionary relict species, such as the Wollemi pine, which have persisted in highly-restricted microsites.*

In SMH July 3, 2019, it was reported that the World Heritage Commission has concerns that the Blue Mountain's outstanding universal values will be affected by raising the dam wall and has requested

[11] Department of Primary Industries (2014), Office of Water. *Hawkesbury-Nepean Valley Flood Management Review Stage One*. Available Online: https://bit.ly/2JxtchB

[12] Australian Water and Coastal Studies (AWACS). 1997. Lower Hawkesbury River

that Australia submits the Environmental Impact Statement (EIS) for the proposed Dam Wall raising to it for review before any final approvals are made. **We ask that this occurs and that any subsequent advice received from the World Heritage Committee on the proposal be made publicly available.**

Preliminary modelling by WaterNSW indicates a temporary inundation increase in the Greater Blue Mountains World Heritage Area of 0.04 to 0.05% of the total area (1,000,000 hectares) and there would be no change to the level or extent of inundation for the Kowmung River, its streams or tributaries, with the proposed wall raising (https://www.waternsw.com.au/projects/greater-sydney/warragamba-dam-raising/facts). At a public meeting at Wallacia, WaterNSW indicated there would be temporary inundation for 14 days and that there is no silting in the Burragorang Valley.

At a meeting of Give a Dam at Wallacia we were shown alarming photos of the siltation in the Valley (which would affect water quality with any water level rise). Raising the dam wall will result in permanent environmental changes, affect 1,300 hectares (0.12% of the heritage listed area), and 500 Aboriginal historical sites and 83 threatened listed species and 36 listed migratory species. 0.12% may sound an insignificant percentage but most of the park is sandstone plateau, so this **0.1% represents "an extensive and significant effect" as it comprises the wild rivers and valleys which are important ecologically.**

Michael Jackson, an archaeologist who gave evidence on 4 October 2018 to the inquiry into the Water NSW Amendment (Warragamba Dam) Bill 2018, said that there are probably at least 500 archaeological sites with tangible evidence, "*but you have to remember that it is all one big site because the whole area is covered by a creation story*". **This could be destroyed by inundation.**

Effect on the Construction Area of Warragamba, on Wallacia and the Mulgoa Valley

The Australian Government Department of Environment and Energy Referral of Proposed Action (2016) states:

Construction phase activities, including potential drawdown of waters below FSL. These activities will generate noise and if not appropriately managed sediment/pollutants that will be discharged into the local aquatic environment. Construction phase activities may also require some clearing of vegetation communities in the Construction Impact Area.

Anecdotally, work will take place 6 days per week, there will be 2 cement plants and sand and soil depots will be close to the school, travel routes for 40-150 trucks per day would be via Park and Mulgoa Roads through Wallacia and Mulgoa Villages. Viewing platforms will be closed. **This construction over 5-7 years will have a major effect on tourism in Warragamba and the Mulgoa Valley and the amenity of its villages. Sediment and pollutants could affect the water quality of the Nepean River and affect aquatic activities and tourism.**

CONCLUSION

Residents are confused as to the true reasons for NSW Government wanting to raise the dam level. No one argues with the need for flood mitigation (caused by overdevelopment of the Cumberland Plain which continues today even on flood plains).

The general public is cynical and believe that the major reasons for raising the dam wall are (a) to minimise government liability for development on flood plain sites and (b) to allow further development, (especially as Infrastructure NSW has stated that the current 1 in 100 flood planning level is to be maintained!). Infrastructure NSW admits in the Hawkesbury-Nepean Regional Flood Study 2019 that the study will provide "*more accurate pricing of flood risk to help infrastructure owners make decisions about flood risk mitigation measures and for the insurance industry to more accurately price insurance premiums*".

Has the cost benefit analysis underlying the NSW government's proposal to raise the crest of Warragamba Dam wall adequately considered the likely impacts of current and proposed major urban developments on its estimation of various flood mitigation costs and benefits? Infrastructure NSW at the Wallacia meeting on 27 August, admitted that their data was based on 2016 housing data and would need to be re-evaluated given the development which has occurred recently on flood prone sites.

With the desalination unit currently working to capacity and Sydney's population rapidly expanding, why not lower the full supply level of the dam and bring forward additional desalination units? But as Infrastructure NSW states, the top 12m holds 40% of Sydney's water and it would reduce Sydney's water supply by 30%. However opponents argue that the -12m option provides sufficient flood protection and water security because the currently adopted Metropolitan Water Plans 2010 triggers have been adjusted to accommodate the 40% loss in dam capacity. **Detailed modelling of the feasibility and economics of the 2 options (preferably by different groups of scientists) may resolve this conundrum.**

Residents are confused by the conflicting information provided by WaterNSW and independent University based scientists. WaterNSW studies are not peer reviewed or published as scientific papers, for independent scrutiny. **The high flood risk in the Hawkesbury-Nepean valley requires the best available information on the potential for flooding and means to mitigate it. We suggest that when the EIS is released, all data and submissions on the effects of climate change (extreme rainfall events, sea level rises), flood affected areas (now and into future), houses threatened, modelling techniques used (Monte Carlo, hydrologic, hydraulic), etc are reviewed by an independent body of leading experts in engineering, economics and environmental science, along with the mitigation methods that could be employed.**

We request that these matters be considered in the Inquiry and its report.