WARRAGAMBA DAM SUBMISSION
PAUL MATTHEWS OCTOBER 2021

This EIS is a total disaster. The project must not be permitted to proceed. It is clear that the deliberate omission of serious engineering aspects of the proposal means the estimated price of only A$1 Billion is grossly under estimated. This project presents unacceptable risk to the possibility of total dam failure and loss of Sydney's primary water supply.

If this proposal is even feasible, it is clear that the project works will ultimately exceed 10 years in length and cost at least $20 billion dollars. The omission of this true cost calculation is masking the favorability and feasibility of alternative options.

I can't believe it's possible to print so many words, while completely avoiding the primary question which is:

CAN THE DAM BE RAISED, WHAT ARE *THE RISKS ASSOCIATED WITH THE PROJECT*, ARE THEY CONTROLLABLE AND HOW MUCH WILL IT COST?

Lets deal with the issues one by one shall we:

1.) **There has been NO geological study results because NO proper feasibility study and costing has been conducted.**

Referring to Appendix N2:

Nowhere in the EIS is there a geological engineering statement outlining the capability of the surrounding area to withstand the additional forces created around and under the existing dam when the dam capacity is increased. Questions associated with groundwater hydrology on pages 18 and 19 of Appendix N2 have been deliberately blanked out, with this document completely skirting over this critical issue.

Appendix N2 only seems to be concerned with inflows and outflows of the reservoir, not the geological stability of the dam itself or the surrounding rock faces and foundation.

There is no other document provided in the EIS referring to the effect of the project on the water table and rock underneath and immediately surrounding the dam.

2.) **There is NO risk assessment in regards to potential dam failure or surrounding geological support failure leading to potentially total devastation of the Sydney basin, potentially with millions of lives lost.**

Not one of the EIS documents refers to the risk associated with geological faults or the risk of dam failure and yet, this is the PRIMARY RISK associated with this project.

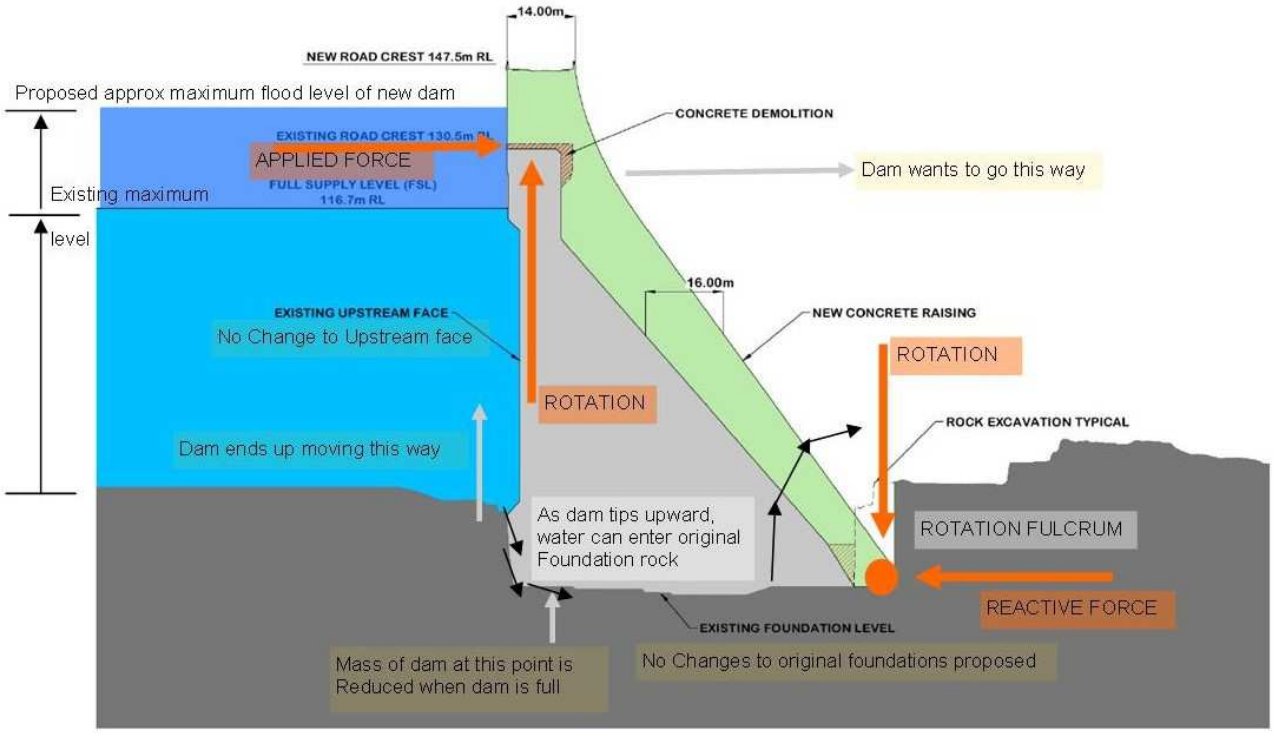
3.) **There is NO tabulation of how the existing dam has performed and moved and continues to move since it was constructed in the 1950s, nor any explanation of how the proposed additions may affect this movement or the ground water penetration underneath the dam foundations.**

Warragamba Dam has moved and continued to move and leak since its earliest days of construction. I would expect as a bare minimum, any EIS would tabulate all movements and leaks suffered by the dam in it's life span so far and detail how these have been handled, drawing conclusions as to how the proposed structure is likely to change these.

4.) **There is NO explanation of the ongoing survey and maintenance requirements which will be required to sustain the modified structure and surrounding rock faces.**

5.) **There is NO explanation as to the geological risk of the dam becoming undermined as a result of "gravity dam rotation effect":**

"Gravity Dam Rotation" (refer attached figure) takes place as a result of a dam being made too steep in reference to its base. The downstream base of the dam acts as a rotation point, around which the dam is somewhat free to rotate upwards when the average position of additional force is applied to the top of the dam by increasing the storage capacity.



Elevation section taken from page 5-8 of "Project Description" document

The Sydney sandstone upon which Warragamba Dam sits, is porous to water and acts somewhat as a sponge to water under high pressure. The downward pressure imposed on the sandstone by the heavy gravity dam, works to create pressure within the rock which is greater than the pressure of the water, ensuring water cannot enter the sandstone and sustaining the dam foundations, preventing ingress of moisture.

However if Warragamba dam is raised in capacity without the addition of substantial upstream deep foundations and mass, **the dam will tend to be "pushed back" when full**. This creates a "rotation effect" on the dam whereby more pressure is placed downward at the downstream base causing a reduction of pressure at the upstream base, in effect **"tipping the dam over".**

While admittedly it is unlikely the dam would ever be "pushed over", the action of repeated application and removal of pressure (as the dam is suddenly filled by a flood and then allowed to quickly empty back to supply level) will tend to reduce pressure at the upstream base and allow water to penetrate the existing dam foundations and surrounding rock at each end.

Without adequate engineering treatment such as a drastic increase of the dam mass at the upstream base and increased foundation treatments, the flow of water under the dam through the rock will create cracks and eventually water filled caves through the soft sandstone. Sediment is then washed away into the water table surrounding the dam, eventually finding its way to lower pressure outlets further downstream.

Left to itself, this action will eventually undermine the dam. It will cause dam failure as water attempts to find its way downstream under and around the dam, through the soft sandstone rock fissures that exist. The failure would likely not happen straight away, rather it would happen many decades after the project is

complete and after many flood events have systematically placed and then removed rotational pressure on the dam. Each each flood event will cause a small, invisible amount of movement upwards and subsequent damage in the rock foundations under and surrounding the dam.

Once the damage is discovered it will be too late to do anything about it without draining the reservoir completely. If the damage remains hidden and undetected, total dam failure will become possible. This would likely happen at the worst possible time i.e. during a record flood event when the water table below the dam is already high and the downstream communities and catchments are already flooded and saturated.

The only way the Warragamba dam can be sufficiently extended and reinforced at its upstream base will be to *completely drain the reservoir and provide a bypass tunnel around the dam* for the Warragamba River – as was originally carried out for the initial construction of the dam in the 1950s. The cost of this activity, both in dollar terms and in terms of the loss of Sydney's water supply for several years, would be immense.

6.) **There is NO worldwide precedent for creation of a flood mitigation dam on top of an existing working water supply dam for which foundations have already been completed many decades beforehand.**

I would expect an EIS to at least provide a section detailing similar projects overseas, the risks created and how these risks were controlled. The section "Environmental risk assessment procedure" doesn't even mention the engineering and geological risks associated with raising the dam wall at all! Are we to assume this means these risks aren't even going to be included in the procedure?

7.) **There is NO explanation of how existing dam foundations will be changed by addition of new dam mass on the top and downstream side of the dam.**

Indeed the "Project Description" document merely suggests the new work is to be literally "plonked" on top of the existing dam like a jacket (on the downstream side only) with no changes or improvements to the existing foundations or upstream face of the dam.

8.) **There is NO evident explanation of how Sydney's principal water supply will be protected during construction and most importantly how the construction may behave or ow risks may be controlled <u>in the event that an extreme weather event takes place during construction</u>.**

9.) **There is NO adequate explanation and costing of the practical alternatives, especially provision of sufficient flood escape routes and widening / altering course of Hawkesbury River at Sackville.**

The grossly underestimated cost of the Warragamba Dam Wall Raising project masks the effectiveness and worthiness of alternative community based projects which will more effectively mitigate flood risk.

<u>Executive Summary</u>

This EIS is a totally inadequate attempt to justify a project which is impractical when total cost is compared with alternatives, both short and long term. The EIS does not address significant risk associated with the project, in particular risk of long term possible geological failure of the dam and / or surrounding rock faces and subterranean fissures leading to potential severe disaster of a total dam failure.

<u>This project MUST NOT be allowed to proceed.</u>

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