

20 January 2022

Mr Harry Burkitt  
General Manager  
Colong Foundation for Wilderness  
PO Box K335  
Haymarket, NSW 1240

**By email/post/hand**

Dear Mr Burkitt,

**Advice in relation to the validity of the environmental impact statement for the  
proposed raising of Warragamba Dam**

The Colong Foundation for Wilderness ("Colong") has sought our advice on the Warragamba Dam Raising Environmental Impact Statement prepared by SMEC Australia dated 10 September 2021 ("Warragamba Dam EIS"). In particular, Colong has asked us to consider and confirm our earlier oral advice, the substance of which was contained in Chapter 2 of Colong's submission in response to the Warragamba Dam EIS.

We confirm our advice as restated below.

**1. Advice sought**

You have asked us to advise you in relation to the adequacy of the Warragamba Dam EIS, and in particular:

- (a) whether the Warragamba Dam EIS substantially complies with the legal requirements for an environmental impact statement ("EIS") prepared for a state significant infrastructure ("SSI") project; and
- (b) what implications any non-compliance might have for the Minister for Planning's ability to lawfully approve the raising of Warragamba Dam.

## 2. Summary of advice

- 2.1 For reasons discussed more fully below, we consider that the Minister for Planning cannot lawfully approve the raising of the Warragamba Dam based on the information contained in the Warragamba Dam EIS, because:
- (a) the Warragamba Dam EIS does not contain sufficient information and assessment of the operation of the dam for flood mitigation so as to constitute a proper EIS for that activity;
  - (b) the level of detail provided about the operation of the raised dam may have been appropriate for a staged infrastructure application, but this was not the application made by WaterNSW;
  - (c) the Warragamba Dam EIS contains vague, inconsistent, and inconclusive descriptions of the project's operation and critical aspects of its design; and
  - (d) the Warragamba Dam EIS does not meet the Secretary's Environmental Assessment Requirements ("SEARs");
- 2.2 Therefore, any decision by the Planning Minister to approve the Warragamba Dam Raising risks being afflicted by any or all of the following legal errors:
- (a) a fundamental statutory prerequisite to the exercise of the Planning Minister's power, being the preparation of an EIS, will not have been met;
  - (b) the decision will be uncertain or lack finality because key aspects of the proposal have not been properly and clearly articulated in the approval; and
  - (c) the decision will be made without considering a mandatory relevant consideration, being the full environmental impact of the proposal during operation.

## 3. Information and assumptions

- 3.1 We have considered the following information provided by you when preparing this advice:
- (a) the Warragamba Dam EIS (but see our comments in paragraph 3.2 below);
  - (b) the Revised Secretary's Environmental Assessment Requirements for the Warragamba Dam Raising dated 13 March 2018;
  - (c) a report by Slattery & Johnson titled "Warragamba Dam Raising - Environmental Impact Statement Review" dated December 2021; and

- (d) a summary table prepared by Colong containing extracts from the Warragamba Dam EIS ("Summary Table").

3.2 The Warragamba Dam EIS consists of several thousand pages in total, across 29 Chapters and over 50 documents of appendices. Because of this, we have not undertaken a thorough review of the whole EIS document. Instead, we have focussed our review on the Summary Table and the following key chapters and appendices of the Warragamba Dam EIS:

- (a) Chapter 1: Introduction;
- (b) Chapter 2: Statutory and planning framework;
- (c) Chapter 4: Project development and alternatives;
- (d) Chapter 5: Project description;
- (e) Chapter 15: Flooding and hydrology;
- (f) Chapter 29: EIS Synthesis, project justification, and conclusion; and
- (g) Appendix H1: Flooding and hydrology assessment.

3.3 We have also had the benefit of perusing draft copies of several submissions in reply to the Warragamba Dam EIS prepared by experts in the fields of ecology, risk assessment, engineering, and cultural heritage.

#### **4. Advice in detail**

##### **4.1 An EIS for operating the dam has not been prepared**

Courts have historically adopted a relatively lenient approach when determining whether an EIS meets the relevant legal requirements for its preparation. The test has frequently been described as one of "substantial compliance" with the EP&A Act and SEARs.<sup>1</sup> The Warragamba Dam EIS fails to meet even this low standard.

The Warragamba Dam EIS purports to have been prepared in support of an application for approval of both the physical raising of the Warragamba dam wall and the operation of the raised dam for flood mitigation purposes. In order to permit such an approval, the EIS must describe both the design of the physical infrastructure *and* the proposed operation of that infrastructure in adequate detail to allow for at least the outer parameters of the project to be defined and assessed.<sup>2</sup> However, the EIS currently on exhibition does not

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<sup>1</sup> *North Parramatta Residents' Action Group Inc v Infrastructure New South Wales (No 2)* [2021] NSWCA 146 at [72].

<sup>2</sup> *Community Action for Windsor Bridge Inc v NSW Roads and Maritime Services & anor* [2015] NSWLEC 167 at [63]-[68].

describe, and therefore cannot assess the impacts of the use of the raised dam wall for flood mitigation purposes.

The Warragamba Dam EIS itself properly acknowledges that both the design *and* operation of the raised dam will impact the extent of upstream flooding impacts, downstream flood mitigation, and impacts to the environment generally. In Chapter 4, the EIS states that:

*"the peak levels and duration of inundation upstream of a raised Warragamba Dam are a function of:*

- the height of the spillway*
- the size of inflows to the dam<sup>3</sup>*
- the rate at which the captured floodwaters in the FMZ are discharged after a rainfall event."<sup>4</sup>*

Despite this acknowledgement, the Warragamba Dam EIS admits that fundamental aspects of the project relating to the process for discharging floodwaters from the FMZ have not been decided. The rate at which captured floodwaters in the FMZ are discharged after a rainfall event will no doubt be determined by both the design of the dam's openings (namely, their size and location and whether they are gated or not) and how the dam's gates are operated (if the openings are gated). But the Warragamba Dam EIS admits that neither of these aspects of the proposal have been decided. Table 29-4 in Chapter 29 of the Warragamba Dam EIS lists "slots or conduits in the central spillway" as a "key uncertainty" of the project and states that:

*"Two options to release water from the dam via the central spillway are currently being investigated. These are:*

- gated conduits – the advantage of this alternative is that discharge rates from the dam would be able to be varied and controlled accurately. The disadvantages are that it would require complex operating procedures and maintenance requirements.*
- slots – the advantages of this alternative are there would be no operating procedures and maintenance requirements. The disadvantage is that discharge rates would be predetermined by flow and design, and not able to be varied.*

*A combination of slots and conduits is also being considered."*

This admission calls into question the hydrological modelling, detailed in Chapter 15, that forms the basis of the predicted upstream impact area relied upon by several specialist chapters of the Warragamba Dam EIS, including upstream biodiversity and Aboriginal cultural heritage. While all hydrological modelling is speculative, the degree of uncertainty can be narrowed where the design and operating rules are known. In the present case, neither the design, aside from the height of the spillway, nor, consequently, the operating rules have been determined.

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<sup>3</sup> In addition to the size of the inflows, we would add their duration.

<sup>4</sup> EIS Chapter 4: Project development and alternatives, section 4.4.3.



Chapter 15 the Warragamba Dam EIS contains several figures showing modelled flood impacts during the operation of the raised dam, both up and downstream (although noticeably less detailed upstream). These maps could not have been produced without relying on certain assumptions about how the dam's openings would be designed or operated during and after flood events, however, these assumptions have not been disclosed or described in the Warragamba Dam EIS.<sup>5</sup>

To resolve the uncertainty relating to the design of the dam's openings, the Warragamba Dam EIS proposes that:

*"The provision of conduits, slots or a combination of both would be determined during detailed design. Should potential impacts arise that have not been considered in the EIS, then an amendment report would be prepared and submitted to DPIE."*

Such an approach is not supported by the *Environmental Planning and Assessment Act 1979* (EP&A Act). Decisions relating to fundamental aspects of a proposal cannot properly be made after a proposal has already been approved, because a proposal cannot be approved if fundamental aspects of it have not been articulated by the proponent. To the extent that the Planning Secretary or WaterNSW propose to address the lack of detail about the design and operation of the dam's openings in a Preferred Infrastructure Report ("PIR"), this too is not supported by the EP&A Act.

Subsection 5.17(6)(b) of that Act empowers the Planning Secretary to require the proponent to submit:

*"a preferred infrastructure report that outlines any proposed **changes** to the State significant infrastructure to minimise its environmental impact or to deal with any other issue raised during the assessment of the application concerned."*

This provision operates to allow changes to a project that has already been defined and studied as the subject of a publicly exhibited EIS. In the current application, where neither the openings nor the operating rules have been defined, there is no object to "change".

Further, to wait until the preparation of a PIR, which is not required to be publicly exhibited,<sup>6</sup> to define two out of the three key components of the project (namely, the design of the dam's openings and how those openings are operated during a flood event) is contrary to both the requirements of the SEARs<sup>7</sup> and the fundamental community consultation objectives of the EP&A Act, including as set out in section 1.3(j).

Table 29-4 in Chapter 29 also identifies the lack of operational protocols as a source of uncertainty and concludes that the final operational protocol "may" result in "minor" changes in the flooding impacts and benefits. However, the Warragamba Dam EIS fails to

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<sup>5</sup> Johnson & Slattery, "Warragamba Dam Environmental Impact Statement Review", December 2021, page 7; Submission of Dr Anthony Green, page 4.

<sup>6</sup> The Planning Secretary has the discretion not to make the PIR publicly available (section 5.17(6)(b) of the EP&A Act) and there is no statutory requirement that the PIR be publicly exhibited so as to allow public submissions to be made in response to it.

<sup>7</sup> See also s.5.28(1)(c); s.5.29(h); cl 192(1)(a) EP&A Reg; State Significant Infrastructure Guidelines

provide any evidence or justification to support its conclusion that the final operational protocols would only result in "minor" changes.

Elsewhere, the Warragamba Dam EIS states that further approvals will be obtained for the dam's operations, "as appropriate"<sup>8</sup>. The nature of these subsequent approvals, or their statutory basis, is not described in the EIS, despite the fact that the SEARs expressly require the proponent to identify "a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out".<sup>9</sup>

The project purportedly on exhibition expressly includes not just the construction of the raised dam wall but "the operation of the dam for flood mitigation".<sup>10</sup> However, leaving aside the Warragamba Dam EIS's failure to define the dam's openings, as it does not address the dam's operation, any consequent approval would require the preparation of another EIS in order to be lawful. The EP&A Act provides that an EIS is required to be prepared for a Part 5 activity if the activity is likely to "significantly affect the environment".<sup>11</sup> It is undeniable that the operation of a raised Warragamba Dam for flood mitigation purposes will have a significant effect on both the downstream and upstream environments. Therefore, the *operation* of the raised dam itself carries with it a requirement for an EIS to be prepared, separate from any requirement to prepare an EIS for the construction of the raised dam.

#### 4.2 A staged infrastructure application has not been made

The Warragamba Dam EIS also admits that "the design and construction approach presented in this EIS is based on a *concept design* and is indicative only."<sup>12</sup> For whatever reason, WaterNSW has decided not to make a staged infrastructure application, which was a course open to it under Division 5.2, Subdivision 3 of the EP&A Act, and which in the circumstances of its indicative "concept design" would have been the appropriate path. Sub-section 5.20(1) of the EP&A Act provides:

*"For the purposes of this Division, a **staged infrastructure application** is an application for approval of State significant infrastructure under this Division that sets out concept proposals for the proposed infrastructure, and for which detailed proposals for separate parts of the infrastructure are to be the subject of subsequent applications for approval. The application may set out detailed proposals for the first stage."*

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<sup>8</sup> EIS Chapter 29: Summary, section 29.3.

<sup>9</sup> SEARs, requirement 2.1(o).

<sup>10</sup> EIS Chapter 5.1.

<sup>11</sup> Section 5.7 of the *Environmental Planning and Assessment Act 1979* ("EP&A Act"). This section does not apply directly to State significant infrastructure projects. However, section 5.12 of the EP&A Act and clause 1(1) of Sch 3 of the *State Environmental Planning Policy (State and Regional Development) 2011* ("SEPP") provide that infrastructure that, but for Division 5.2 of the EP&A Act would, in the opinion of the proponent, require an environmental impact statement to be obtained under "Division 5.1" (in the case of section 5.12 of the Act) or "Part 5" (in the case of Sch 3 of the SEPP) is State significant infrastructure. Therefore, the test of "likely to significantly affect the environment" applies to determine whether a proposal will be State significant infrastructure, and therefore, require an EIS (as all SSI does under section 5.16(2) of the EP&A Act).

<sup>12</sup> EIS Chapter 29: Summary, section 29.1.

Relevantly to the current proposal, the Warragamba Dam EIS sets out *detailed proposals* for only one of the three elements of the project, being the raising of the wall/ height of the spillway. The other two critical elements, namely the openings in the wall by which the dam will be “operated”, and rules for operating the dam in flood events, have yet to be determined. Moreover, the existence of Subdivision 3 implies as a matter of statutory construction that applications made on the basis of concept designs alone cannot be approved.

Sub-section 5.20(2) provides:

*“If approval is granted under this Division on the determination of a staged infrastructure application, the approval does not authorise the carrying out of any part of the State significant infrastructure unless –*

- (a) approval is subsequently granted to carry out that part following a further application for approval in respect of that part of the infrastructure, or*
- (b) the staged infrastructure application also provided the requisite details of that part of the infrastructure and approval is granted for that first stage without the need for further approval.”*

In relation to section 5.20(2)(b), the openings and gates, or slots (as the case may be) by which outflows can be controlled are so integral to the overall project, and the physical infrastructure in particular, that approval of the raising of the wall cannot occur until this aspect of the design is finalised and its impacts properly studied. The absence of details of the means by which outflows are controlled is patently an absence of “requisite details”. Were the proposal to be one of inserting new openings, gates or slots in the existing Warragamba dam wall, there is no doubt that an EIS would be required for that aspect alone. Regardless of whether it was SSI, the construction of the openings and gates would, of itself, be an activity that is likely to significantly affect the environment. Accordingly, final approval of the physical works is not available under section 5.20(2) even if WaterNSW had made a staged infrastructure application.

Despite this, WaterNSW wishes to obtain full approval for the construction and operation of a raised Warragamba Dam, without having first done the work to design the proposal with sufficient detail to allow it to be assessed or approved.

#### 4.3 Inconsistent, vague, and inconclusive descriptions of the operation of the proposal

Possibly as a consequence of the fact that the design and operation of the dam’s openings have not been decided by WaterNSW, the various chapters of the Warragamba Dam EIS contain inconsistent, vague, and inconclusive descriptions of how the dam will operate once raised. The table in **Appendix A** extracts several examples of this. In summary, from these extracts it is apparent that:

- (a) the size and location of the dam’s openings, and whether they will be

gated or fixed open, has not been determined;<sup>13</sup>

- (b) the operational protocols have not been devised for the project<sup>14</sup> (although admittedly, these cannot be developed until the design of the slots or gates has been settled because the Warragamba Dam EIS itself admits in Table 29-4 that if ungated slots are chosen, operational protocols will not be required);
- (c) the operational protocols will be subject to further consultation with relevant stakeholders and “approvals”, but this approval process has not been described;<sup>15</sup>
- (d) floodwaters will be held within the FMZ “temporarily”,<sup>16</sup> although no indication has been given as to what “temporarily” might mean. All water stored in any dam is stored temporarily. In the context of water stored in a dam, “temporarily” could mean anywhere from hours to years;
- (e) the Warragamba Dam EIS purportedly provides a “framework” for operational protocols,<sup>17</sup> however, to the extent that any framework can be gleaned from the Warragamba Dam EIS, it is extremely high level, inconsistent, and inconclusive. On any view, it does not constitute rules or protocols for the operation of the raised dam.<sup>18</sup>

<sup>13</sup> EIS Chapter 29: Summary, section 29.1 and Table 29-4.

<sup>14</sup> EIS Chapter 29: Summary, section 29-1; EIS Chapter 5: Project description, section 5.2.7.2.

<sup>15</sup> EIS Chapter 29: Summary, section 29-1; EIS Chapter 5: Project description, section 5.2.7.2.

<sup>16</sup> EIS Chapter 5: Project description, section 5.2.7.2; EIS Chapter 29: Summary, section 29-3; EIS Appendix H1: Flooding and hydrology, section 1.3.3.

<sup>17</sup> Chapter 29: Summary, Table 29-4.

<sup>18</sup> We also note the evidence given by the Minister responsible for the project, The Hon Stuart Ayres, to the Legislative Council on 27 October 2021. The Minister, in responding to questions about the lack of a legislative indemnity for the State’s operation of the dam for flood mitigation, said:

*“Legislation will need to be drafted to reflect the fact that you are now operating the dam in a dual fashion...”*

*“If the Government decides to present this legislation to the Parliament, it would be doing so on the basis that we would want to be able to protect Sydney’s drinking water assets as well as run flood mitigation capacity. If there were members of the Parliament that wanted to vote against that and allow the dam to fill and utilise all of the airspace that we have just built.”*

The apparent implication of the Minister’s extraordinary comments is that if the Parliament were to deny the government an indemnity for the use of the dam for flood mitigation, WaterNSW would use the FMZ for water storage. If this construction of the Minister’s evidence is correct, the application for planning approval should be rejected on this basis alone as it makes the whole premise of the application and the EIS a lie. A failure by the Planning Minister to clarify this position would also constitute a fundamental error.

Accordingly, even if the Warragamba Dam EIS was found to substantially comply with the SEARs and the EP&A Act, the Planning Minister has not been presented with a clear, certain, and final project that is capable of being approved.

#### 4.4 The Warragamba Dam EIS does not meet the SEARs

The SEARs explicitly require a description of the project, including “all components and activities (including ancillary components and activities) required to construct *and operate* it” (see requirement 2.1(b)). Requirement 20.6 of the SEARs also states:

*“The proponent must detail a framework for managing water releases from the dam that are capable of meeting the objectives of the project (in terms of flood mitigation), ensures impacts to upstream and downstream areas and ecosystems are minimised. The framework shall include consideration of the potential rates of rise and fall in the river, timing of water releases. These shall include consideration of antecedent, conditions within the river, flooding impacts, and transparent and translucent flows.”*

As demonstrated by the extracts in **Appendix A**, the Warragamba Dam EIS has failed entirely to meet these requirements because fundamental aspects of the dam’s design and operation have not been decided.

The SEARs also provide that the EIS must include “a description of feasible options within the project” (requirement 2.1(f)). This is distinct from the requirement to include “a description of any feasible alternatives to the project” (requirement 2.1(e)). The SEARs provide the following guidance on the difference between the two concepts:

*“Alternatives to a project are different projects which would achieve the same project objective(s) including the consequences of not carrying out the project. For example, alternatives to a road project may be a rail project in the same area and alternate routes for the road.”<sup>19</sup>*

*“Options within the project are variations of the same project. For example, options within a road project could be design of an intersection; the location or design of a bridge; locations for a vent stack.”<sup>20</sup>*

In other words, once a particular infrastructure solution has been decided, such as a raised dam wall, options “within” the project means the various ways that infrastructure could be constructed or operated. In the context of the Warragamba Dam Raising proposal, options within the project should properly include different design options and operating procedures for the raised dam wall.

The Warragamba Dam EIS claims to address requirement 2.1(f) in sections 4.3 and 4.4 of Chapter 4.<sup>21</sup> However, these sections do not consider options *within* the Warragamba Dam raising project. Rather, they provide an account of the alternatives to the project considered by the Taskforce when preparing the Taskforce Options Assessment Report in 2019, such as lowering the full supply level of the existing dam or changing the gate

<sup>19</sup> SEARs Footnote 2, page 2.

<sup>20</sup> SEARs Footnote 3, page 2.

<sup>21</sup> EIS Chapter 4: Project development and alternatives, Table 4-1.

operations of the existing dam. Presumably, the reason that the Warragamba Dam EIS has not provided this information is because the development and consideration of options within the project is still ongoing.

## 5. Conclusion

The fact that fundamental aspects of the proposal have not been determined, and that the Warragamba Dam EIS at best contains vague, inconsistent, and inconclusive statements as to how the dam will actually operate to mitigate flood impacts, preclude the Minister's ability to validly approve the proposal.

Without the re-submission and re-exhibition of a substantially reworked EIS, in which the proposed design and operation of the dam has been described with sufficient detail to allow the outer parameters of the proposal to be identified and studied, any decision by the Planning Minister to approve the operation of the raised dam would be invalid. Specifically, the Planning Minister's approval would be invalid because:

- (a) a fundamental statutory prerequisite to the exercise of his power, being the preparation of an EIS, would not have been met;
- (b) the decision would be uncertain or lack finality if key aspects of the proposal are not articulated in the approval; and
- (c) his decision would have been made without considering a mandatory relevant consideration, being the full environmental impact of the proposal during operation.

The sole purpose of the proposal is to raise and operate Warragamba dam for flood mitigation. Therefore, the design and operation of the dam's openings, which dictate how and to what extent floodwaters can be controlled, are the single most important aspect of the proposal. This is particularly pertinent given that project's operating objective of "minimising environmental impact" would require completely different operational procedures to the remaining operational objectives relating to minimising risk to life and property downstream. The development of operational protocols early on in the planning process is essential for the public and the Planning Minister to understand how this conflict would be managed during a flood event. Currently, the only insight we have into how these conflicting objectives will be managed is that minimising downstream flooding impacts will take priority over minimising environmental impact.<sup>22</sup> Determining discharges during flood events on a "case by case basis"<sup>23</sup> is not only irresponsible, having regard to the seriousness of the impacts from operating the discharges, it is completely at odds with the Warragamba Dam EIS's claims that a detailed operational protocol will be developed.

The proposal cannot possibly be assessed or approved until these aspects of the project have been decided. This proposal has the potential to cause immense environmental damage to areas of world heritage listed national park; further decimate populations of

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<sup>22</sup> EIS Chapter 29: Summary, section 29.1.

<sup>23</sup> EIS Chapter 15: section 15.8.4.



critically endangered species that cannot be offset;<sup>24</sup> and result in the destruction of numerous significant Aboriginal cultural sites.<sup>25</sup> The Warragamba Dam EIS is also claiming huge benefits in terms of mitigation of risks to life and property downstream. The information contained in the current EIS is not sufficient or transparent enough for the public, or the Planning Minister, to determine whether the author's determinations of likely environmental impacts are reasonable or whether the touted benefits will likely be realised.

I look forward to discussing this letter with you, once you have had an opportunity to consider it.

Yours sincerely,  
**CHALK & BEHRENDT**

**Andrew Chalk**  
Director

Encl

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<sup>24</sup> Refer to the submissions of Dr Stephen Douglas and Debbie Andrew in response to this EIS.

<sup>25</sup> Refer to the submission of Dr Paul Irish dated 16 December 2021.

## Appendix A

## Extracts from EIS describing operational protocols

Ref	Extract or summary (emphases added)	Comment
<b>Chapter 5: Project Description</b>  <b>5.2.7.2</b>	<p><b>Flood operations</b></p> <p>During large rainfall events when the storage level rises above FSL, flood operations mode would commence. In this mode, inflows to Lake Burragorang would be captured and <i>temporarily</i> stored (increasing water levels in Lake Burragorang and upstream tributaries). The raised dam would provide capacity (i.e. the FMZ) to capture temporarily around 1,000 gigalitres of water during a flood event.</p> <p><i>Water would be discharged in a controlled manner via the gated conduits or slots until the dam level returns to FSL.</i></p> <p><i>FMZ operating protocols would guide this process and be developed for approval by the relevant regulatory authorities.</i></p> <p>The raised dam would not be able to fully capture inflows from all floods. For floods that exceed the capacity of the FMZ, water would spill firstly over the central spillway and then, depending on the size of the flood, the auxiliary spillway.</p>	<ul style="list-style-type: none"> <li>• This section uses the word “temporarily” but gives no indication of what temporary might mean in this context. All water stored in any dam is stored temporarily. In the context of water stored in a dam, “temporarily” could mean anywhere from hours to years.</li> <li>• The phrase “discharged in a controlled manner” is vague. Subsequent chapter of the EIS (particularly Chapter 15) provide more detail on what “a controlled manner” might mean, however, these chapters are not conclusive and only slightly more detailed. This statement is also inconsistent with the description in Appendix H1 (extracted below) which states that “for larger floods the FMZ would be filled and <i>uncontrolled</i> discharge would occur over the central spillway, and potentially, auxiliary spillway of the dam.”</li> <li>• The process for approving the FMZ operating protocols is not described in the EIS. The use and operation of the raised dam for flood mitigation is an activity which, in itself, requires an EIS. The FMZ operating protocols would require a separate EIS for approval, and yet, despite no operating protocols having been developed, the “project” for which approval is sought includes the ‘operation’ of the dam.</li> <li>• 29.1 lists operational objectives of flood operations in order of priority. As with the Wivenhoe disaster, the complexity and conflict between the objectives highlight the need for clear and detailed operating rules/protocols on how the dam would be operated in the crisis of a major flood. The fact that the EIS says nothing about how these conflicts would be resolved in practice illustrates why the Planning Minister is not in a position to approve the “project”.</li> </ul>

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<b>Chapter 7:</b> <b>Air Quality</b>  <b>7.1</b>	<b>Flood operation</b> <p>Flood operations would apply when the water level is higher than the FSL. The FMZ would have sufficient storage to accommodate up to a 1 in 40 chance in a year flood. For larger floods the FMZ would be filled and uncontrolled discharge would occur over the central spillway and, potentially, the auxiliary spillway of the dam. Operational objectives are to:</p> <ul style="list-style-type: none"> <li>• maintain the structural integrity of the dam</li> <li>• minimise risk to life</li> <li>• maintain Sydney's water supply</li> <li>• minimise downstream impact of flooding to properties</li> <li>• minimise environmental impact</li> <li>• minimise social impact.</li> </ul>	<ul style="list-style-type: none"> <li>• Table 29-3 in Chapter 29 states that “one of the key operational objectives of the discharge protocol for the flood mitigation zone would be to minimise the duration and extent of upstream temporary inundation”, however, this does not appear to be reflected in the operational objectives described in section 7.1.</li> </ul>
<b>Chapter 15:</b> <b>Hydrology</b>  <b>15.8.1</b>	<p>Raising the dam wall and creation of the FMZ would require modification of the operational rules of dam releases. An initial assessment and development of preliminary operating protocols was done by WaterNSW (2017)... Final operational protocols will be further developed in conjunction with detailed design of the dam and in consultation with stakeholders responsible for flood management and emergency response in the downstream floodplain.</p>	<ul style="list-style-type: none"> <li>• This statement highlights the conceptual nature of the current proposal and yet final approval, as opposed to Subdivision 3 (Staged Infrastructure Applications), is being sought. This is not a course that is validly open to WaterNSW where 2 of the three key components to the project remain undetermined and, consequently, unstudied.</li> </ul>
<b>Chapter 15:</b>  <b>15.8.3</b>	<b>FMZ maintenance</b> <p>Minor rainfall events and associated inflows may result in small increases in the dam water level, which in turn may exceed the FSL. Once the water level in the dam reaches a nominated level above the FSL (and no significant rainfall is predicted), the FMZ maintenance protocols would be implemented. These include discharging approximately 48 gegalitres of water via the conduits until the dam water level drops to the FSL. While this could be undertaken in a single day with minimal downstream impacts, the discharge rate would be determined by several factors including downstream water</p>	<ul style="list-style-type: none"> <li>• This section is inconsistent with Table 29-4 in that it assumes that the timing and rate of discharge will be able to be controlled, when Table 29-4 indicates that it has not been decided whether the dam's openings will be gated or always open.</li> </ul>

	levels and the predicted short-term rainfall forecast. The need for maintenance discharges may be minimal depending on the environment flow release regime adopted.	
<b>Chapter 15:</b> <b>Hydrology</b>  <b>15.8.4</b>	<b>Discharge during flood events</b> The timing and rate of discharge during flood events would be determined on a <i>case-by-case basis</i> . Generally, the discharge of water from the FMZ during a flood event would only occur: <ul style="list-style-type: none"> <li>• when there was a reliable prediction of significant future rainfall</li> <li>• when the discharge would not cause unacceptable downstream flooding impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Leaving discharges to be determined on a “case-by-case” basis without developing operating protocols means there can be no certainty of impacts downstream or upstream during flood events. For a project with the potential to have devastating environmental impacts, including social and economic impacts, the Minister and the public are entitled to know what the operating rules are in advance of any construction, let alone a flood event, and the EP&amp;A Act requires it.</li> <li>• This section is also inconsistent with Table 29-4 in that it assumes that the timing and rate of discharge will be able to be controlled, when Table 29-4 indicates that it has not been decided whether the dam’s openings will be gated or always open.</li> </ul>
<b>Chapter 15:</b> <b>Hydrology</b>  <b>15.8.5</b>	<b>Discharge after a flood event</b> This section is too long to be extracted, however, it describes two potential methods for discharging water after a flood event: <ol style="list-style-type: none"> <li>1. piggy back discharges, whereby water is released from the FMZ after the peak flood level has been reached at a rate that does not exceed the previous flood level peak;</li> <li>2. constant discharge, whereby water is released from the FMZ at a constant rate of “around 100 gegalitres per day”</li> </ol>	<ul style="list-style-type: none"> <li>• This section of the EIS states that a constant discharge rate of around 100 gegalitres / day was assessed against a number of factors, however, the maximum discharge rate for the new outlet conduits are said to be 230 gegalitres/day.</li> <li>• It is not explained in the EIS how the authors decided on the discharge rate of 100 gegalitres/day for the purposes of assessment, as opposed to some higher or lower rate. It is not even stated that 100 gegalitres/day is going to be the likely discharge rate for a constant discharge scenario.</li> <li>• The EIS describes two potential methods for discharge after a flood event, but does not state which is the preferred method, or if both are to be used, nor how this decision would be made. Appendix H1 appears to provide that piggy backing will be used for major flood releases (flood events above 2.5% AEP), and constant discharge would be used for minor flood releases (flood events between 5%</li> </ul>

		<p>and 2.5% AEP). However, this is contained in a sub-consultant's report and is not confirmed anywhere in the body of the EIS.</p> <ul style="list-style-type: none"> <li>• This section is inconsistent with Table 29-4 in that it assumes that the timing and rate of discharge will be able to be controlled, when Table 29-4 indicates that it has not been decided whether the dam's openings will be gated or always open.</li> </ul>
<b>Chapter 29: Summary</b>  <b>29.1</b>	<p>The Project does not include a detailed operational protocol for the operation of the FMZ or the environmental flow release regime. These activities would be subject to separate approvals, as appropriate.</p>	<ul style="list-style-type: none"> <li>• The process for approving the FMZ operating protocols is not described in the EIS. The use of the raised dam for flood mitigation is an activity which, in itself, requires an EIS. The FMZ operating protocols would require a separate EIS for approval. [See comments in response to Chapter 5 above.]</li> </ul>
<b>Chapter 29: Summary</b>  <b>29.4</b>	<p>The design and proposed operational protocols presented in this EIS are indicative and subject to further detailed design and development, which may further minimise impacts. The design serves to:</p> <ul style="list-style-type: none"> <li>• confirm that the proposed performance and technical requirements can be achieved</li> <li>• validate the feasibility and potential operational protocols for flood mitigation</li> <li>• identify key risks, constraints and potential environmental impacts.</li> </ul> <p>There are some uncertainties relating to technical requirements and Project operations, which would be resolved during detailed design. A summary of the uncertainties that have the potential to impact on the environment, and how these would be resolved, is provided in Table 29-4. The identified uncertainties are not expected to result in significant or unacceptable impacts to the environment that would not be capable of mitigation or management.</p>	<ul style="list-style-type: none"> <li>• The design does not serve to confirm that the proposed performance and technical requirements can be achieved because key technical information and assumptions are not disclosed or are as yet undetermined.</li> <li>• The EIS provides no evidence or justification for the assertion that the identified uncertainties in Table 29-4 will not have unacceptable impacts to the environment that would not be capable of mitigation or management.</li> <li>• On the contrary, the modelling in the EIS around loss of vegetation and habitat, are built on assumptions that depend, amongst other matters, on knowing the methods and rates for discharge of anticipated flood waters and the operating rules for the dam, neither of which have yet been determined.</li> </ul>

<p><b>Chapter 29:</b></p> <p><b>Table 29-3</b></p>	<p>Table 29-3 lists environmental aspects and details how impacts are to be avoided or minimised.</p> <p>Against “upstream impact” it states:</p> <ul style="list-style-type: none"> <li>• “Provision of a 14 metre flood mitigation zone rather than a 20 metre FMZ. While a 20 metre FMZ would provide a greater reduction in flooding downstream compared to a 14 metre FMZ, the greater environmental costs from the longer period and extent of upstream temporary inundation were a major factor in discounting this alternative.”</li> <li>• “Emptying the FMZ as soon as practicable. One of the key objectives of the discharge protocol for the flood mitigation zone would be to minimise the duration and extent of upstream temporary inundation.”</li> </ul>	<ul style="list-style-type: none"> <li>• This section is inconsistent with the description of operational objectives contained in section 29.1, which does not list “minimising the duration and extent of upstream temporary inundation” as a key objective, and places “minimising environmental impact” as the second last of six objectives.</li> </ul>
<p><b>Chapter 29:</b></p> <p><b>Summary</b></p> <p><b>Table 29-4</b></p>	<p>Identifies “slots or conduits in the central spillway” as a “key uncertainty” for “hydrology” and states that “two options to release water from the dam via the central spillway are currently being investigated. These are:</p> <ul style="list-style-type: none"> <li>• gated conduits – the advantage of this alternative is that discharge rates from the dam would be able to be varied and controlled accurately. The disadvantages are that it would require complex operating procedures and maintenance requirements.</li> <li>• slots – the advantages of this alternative are there would be no operating procedures and maintenance requirements. The disadvantage is that discharge rates would be predetermined by flow and design, and not able to be varied.</li> </ul> <p>A combination of slots and conduits is also being considered.</p>	<ul style="list-style-type: none"> <li>• Whether the openings in the dam are gated or not, and therefore, whether they can be controlled or not, is a key aspect of how the dam will operate and will have inescapable implications for the extent of flood mitigation downstream and flood impact upstream. This level of detail would be required even at a concept phase.</li> <li>• This section is also inconsistent with other aspects of the EIS, such as the description of proposed operations in Chapter 5, Chapter 15, and Appendix H1, all of which state that floodwaters would be discharged in a controlled manner, at least for flood events up to the 2.5% AEP.</li> </ul>

	<p>The provision of conduits, slots or a combination of both would be determined during detailed design. Should potential impacts arise that have not been considered in the EIS, then an amendment report would be prepared and submitted to DPIE.</p>	
<p><b>Chapter 29: Summary</b></p> <p><b>Table 29-4</b></p>	<p>Identifies the operational protocols for the dam as a “key uncertainty” for “hydrology” and states that “a framework operational protocol for the flood mitigation operations has been developed and is presented in the EIS.</p> <p>A detailed operational protocol would need to be developed during the detailed design of the Project and in consultation with relevant stakeholders up and downstream of the dam.</p> <p>The final operational protocol may result in some minor changes in the flooding impacts and benefits. The final operational protocol would be developed during the detailed design and in further consultation with relevant stakeholders.</p>	<ul style="list-style-type: none"> <li>• The lack of detailed operating protocols is an uncertainty for all aspects of the EIS, and in particular impacts to upstream biodiversity and the effectiveness of downstream flood mitigation. This is because without knowing how the gates will operate, it is impossible to predict, with any certainty, the extent of upstream flood impact or downstream flood mitigation.</li> <li>• The process for approving the detailed operational protocol is not described in the EIS. The use of the raised dam for flood mitigation is an activity which, in itself, requires an EIS. The operational protocol would require a separate EIS for approval.</li> <li>• The EIS provides no justification or evidence to support the assertion that the final operational protocol may result in only minor changes to flooding impact and benefits.</li> </ul>
<p><b>Appendix H1: Flood and Hydrology</b></p> <p><b>1.3.3</b></p>	<p>Flood operations would apply when the water level is higher than the full supply level. The FMZ would provide capacity to capture temporarily around 1,000 gegalitres of water during a flood. For larger floods the FMZ would be filled and uncontrolled discharge would occur over the central spillway, and potentially, auxiliary spillway of the dam.</p> <p>When inflows are falling, the FMZ will be emptied to ensure capacity for any subsequent events. The rate of discharge from the FMZ would be determined based on several factors:</p> <ul style="list-style-type: none"> <li>• ensuring the FMZ is emptied in sufficient time to capture a subsequent flood event</li> </ul>	<ul style="list-style-type: none"> <li>• The description of the emptying protocols in this section is inconsistent with the description in Chapter 15 of the EIS.</li> <li>• This section is inconsistent with Table 29-4 in that it assumes that the timing and rate of discharge will be able to be controlled, when Table 29-4 indicates that it has not been decided whether the dam’s openings will be gated or always open.</li> </ul>

- minimising the duration of upstream catchment inundation
- not causing any increase in the extent of flooding downstream of the dam
- the need to keep downstream bridge river crossings open.

There will be two different emptying protocols:

1. Minor flood releases – releases of inflows captured from a 5% to 2.5% AEP event or at the tail end of larger floods. The rate of discharge of these releases will be identified based on potential flooding risks downstream, noting that as the dam raising will reduce the immediate exposure of downstream areas to these flood events, the subsequent release from the dam will need to be restricted to avoid increases in these reduced downstream flooding extents. Typically, discharges would be at 1,150 m<sup>3</sup> /s (around 100 GL/day) but would not occur until after the peak of the flooding downstream has passed.
2. Major flood releases – releases for significant flood events. As the FMZ is designed to contain a 5% to 2.5% AEP event above FSL, any event above this will cause spilling to downstream areas, albeit at a lower level. During this scenario there is an opportunity to increase the rate of discharge from the FMZ at a higher rate than for minor flood releases without increasing the extent of downstream flooding (that is, piggyback releases). This can typically occur for the first two days before the FMZ discharge rate would then be reduced to the same rate as for minor flood releases (that is, 1,150 m<sup>3</sup> /s).

For all events, the dam raising will cause a substantial reduction in the flow rate of spills over the dam. This will reduce flood levels and delay the downstream peak.

The extent and duration of inundation is important to defining potential impacts on environmental values...The Warragamba Dam Raising is expected to temporarily increase the existing impoundment area within the upstream reservoir from approximately 75 km<sup>2</sup> to up to 94 km<sup>2</sup>.