

Our ref: OUT23/18100

Anthony Ko  
Planning and Assessment Group  
NSW Department of Planning and Environment

Email: [anthony.ko@planning.nsw.gov.au](mailto:anthony.ko@planning.nsw.gov.au)

2 November 2023

---

**Subject: Oven Mountain Pumped Hydro Energy Storage (SSI-12422997) - Environmental Impact Statement**

Dear Anthony Ko

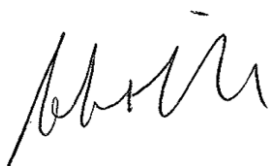
I refer to your request for advice sent on 15 September 2023 to the Department of Planning and Environment (DPE) Water about the above matter.

The project relates to the construction and operation of a pumped hydro energy storage system on a tributary of the Macleay River between Kempsey and Armidale in NSW. The project is to consist of an upper and lower reservoir, an underground tunnel and hydro-electric power station.

DPE Water has reviewed the Environmental Impact Statement and makes recommendations regarding water take and licensing, surface water and groundwater impact assessment, and works on waterfront land. Please see Attachment A for more detail.

Should you have any further queries in relation to this submission please do not hesitate to contact DPE Water Assessments [water.assessments@dpie.nsw.gov.au](mailto:water.assessments@dpie.nsw.gov.au).

Yours sincerely



Rob Brownbill  
Manager, Assessments, Knowledge Division  
**Department of Planning and Environment: Water**

## Attachment A

# Detailed advice to DPE Planning & Assessment regarding the Oven Mountain pumped hydro energy storage (SSI-12422997) - Environmental Impact Statement

---

## 1.0 Water supply and licencing

---

### 1.1 Recommendation – prior to determination

The proponent should demonstrate the ability to obtain the necessary water entitlement in the relevant unregulated surface water source/s to account for water take during the construction and operational phases of the project.

#### Explanation

The proponent currently does not hold sufficient entitlement to account for water take due to the project in unregulated surface water sources and is reliant on a strategy to trade with existing entitlement holders. This trading is proposed either within the relevant water source, or via trade into the water source where permitted. This approach is primarily required to account for the operational demands of the project, as the proponent is proposing to apply for a Specific Purpose Access Licence/s to account for most of the construction demands.

DPE Water considers that although there is generally sufficient water entitlement in water sources relevant for this project (apart from the Macleay Gorges water source), there is significant risk in being able to acquire the necessary entitlement due to limited trading history.

The Water Sharing Plan for the Macleay Unregulated and Alluvial Water Source allows for carryover of unregulated river water up to a maximum of 100%. In practice this means the maximum volume of water taken in any one water year could only be 2 times the entitlement, with only 300% being allowed to take in 3 consecutive years. Therefore, while carryover could be used to increase the volume of water taken in a particular year, it will not make up the highly likely shortfall on unregulated river licence entitlement required for the operational phase.

It is recommended the proponent complete further investigations to confirm the ability to acquire the necessary entitlement and develop contingency measures should this not be possible.

### 1.2 Recommendation – prior to determination

The proponent should improve the maximum annual groundwater take estimation from aquifer interference activities and/or other groundwater extraction. This estimation should be itemised by groundwater source for each water year of the five-year construction period and for the operational life of the scheme. The ability to obtain sufficient entitlement in the water source/s needs to be demonstrated.

#### Explanation

There is uncertainty in the volumes of groundwater take from both aquifer interference activities and water supply extraction to meet construction and/or operational needs.

The potential for inflows from fractures does not appear to have been considered in the modelling for the report. This is a concern as the presence of modern groundwater in samples from both shallow and deep monitoring bores indicates relatively rapid recharge which could be attributed to preferential flow paths. These inflows may be significant in the estimation of groundwater take volumes for the project.

The groundwater impact assessment (Appendix N in the Environmental Impact Statement (EIS)) states pre grouting and post grouting will be used to manage those locations where fracture flows are substantial. However, there is a high degree of uncertainty around the applicability of these methods to the surrounding rock mass and their effectiveness at reducing groundwater take over the life of the scheme.

The EIS included varying volumes for the groundwater inflow. For example, the groundwater model report identified more than 600ML of groundwater inflow in year 1 of construction which was above the maximum volume of 417ML detailed in the groundwater impact assessment.

The volumes of water take required for construction and operation are identified by the proponent to be a combination of surface water and groundwater, and that these volumes are likely to be dependent on climatic conditions. The specific volumes from the respective water sources have not been provided. Clarification of the annual water requirements from each water source for each year of the five-year construction period, as well as for a range of dry and wet weather climatic conditions during the operational phase of the project is required to properly understand the maximum volumes of water take.

### **1.3 Recommendation – prior to determination**

The proponent should update the water licensing requirements for the project to include the need to account for the predicted 67ML/yr of water take in the Macleay Gorges water source due to runoff captured in the project's upper dam.

#### **Explanation**

The proponent has proposed that the 67ML/yr of captured runoff in the upper dam can be exempt from the requirement for a Water Access Licence (WAL) under the harvestable rights provisions of the *Water Management Act 2000*. DPE Water advises that under paragraph 8(a) of the Harvestable Rights (coastal-draining catchments) Order 2023, water captured or stored in a harvestable rights dam must not be moved to an excluded work or to any other dam on the landholding that is not a harvestable rights dam. As the lower dam and reservoir are not considered harvestable rights dams the harvestable rights WAL exemption is not applicable and entitlement must be held.

### **1.4 Recommendation – prior to determination**

The proponent should confirm the requirement to construct and operate groundwater supply bores for the project. Should bores be required, the proponent should provide an impact assessment on water users, water source/s and dependent ecosystems.

#### **Explanation**

The groundwater impact assessment for the project (Appendix N to the EIS) mentions that water supply for construction may be accessed from groundwater supply bores if required. Confirmation of this requirement and an impact assessment of their construction and operation has not been included. DPE Water recommends the inclusion of all water supply works, including bores, within the project assessment. This is to enable an exemption from the requirement for a water supply work approval and to provide a clear identification of project impacts, water demands from each water source and water availability.

### **1.5 Recommendation – post approval**

The proponent should ensure that applications submitted to DPE Water for Specific Purpose Access Licences (SPAL) are for the minimum volume required and are supported with appropriate justification.

## Explanation

The proponent is proposing to apply for a SPAL with 10 000 unit shares to account for water take for the construction and initial storage fill requirements. This volume is to incorporate a 20% buffer to cover potential losses or an extended construction program. Under clause 40(1) of the Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016, a SPAL cannot be granted unless the Minister is satisfied that the share and extraction component of the access licence is the minimum required to meet the circumstances in which the access licence is proposed to be used. The proponent would be required to provide supporting justification with any SPAL application to justify the volume is the minimum required and how this incorporates a contingency buffer.

### 1.6 Recommendation – post approval

The proponent should acquire sufficient water entitlement in a Water Access Licence (WAL), in the relevant water source/s, to account for the maximum predicted water take prior to the take occurring.

#### Explanation

This is to meet the regulatory requirements of the *Water Management Act 2000*. The WAL must also be linked to a relevant work which requires an application to change the WAL which needs to be submitted to WaterNSW.

## 2.0 Groundwater impacts and modelling

---

### 2.1 Recommendation – prior to determination

The proponent should provide potential viable options for managing the infiltration and groundwater mounding arising from reservoir and tunnel construction/operation.

#### Explanation

The proponent has reported impacts of reservoir and tunnel construction will include infiltration from the reservoirs causing groundwater mounding. This is predicted to increase baseflows in watercourses across the project area and the Macleay River. This has the potential to increase the risk of water quality degradation due to mobilisation of subterranean sediments, minerals, and other contaminants.

The proponent should consider:

- methods to divert a component of reservoir inflows equivalent to seepage
- bypass structures to reduce and distribute groundwater discharge to the Macleay River and minimize water quality and erosion impacts
- incorporating impacts of groundwater mounding (e.g. water quality changes) into erosion and contaminant controls.

### 2.2 Recommendation – prior to determination

The proponent should provide a detailed tabulation that describes how the monitoring and modelling requirements advised by DPE Water have been incorporated into:

- the monitoring network
- the initial numerical model design
- ongoing refinement of the model at review milestones.

#### Explanation

The proponent has not provided clear documentation to demonstrate how DPE Water's previous advised requirements have been incorporated. Rather, the documentation relies on a statement that the monitoring network was developed in consultation with DPE Water. A

detailed tabulation is requested to support this statement and to include any advice provided by DPE Water regarding the numerical model design and any ongoing refinement of the model at review milestones. This tabulation is to provide specific details to demonstrate how previously advised requirements have been incorporated and not to rely on cross-referencing other documents.

One concern identified by DPE Water was the ground and groundwater conditions have not been fully investigated across the scheme footprint. This is based on the conceptual model diagram indicating that none of the investigation boreholes shown extend to the maximum depth of the proposed tunnelling.

### 2.3 Recommendation – post approval

The proponent should develop a construction and operational groundwater management plan in consultation with DPE Water that includes a groundwater monitoring, reporting and trigger action response programme. The construction and operational plans must include:

- specific groundwater dependent ecosystem (GDE) monitoring to enable detection of potential water table drawdown during the construction phase
- monitoring of mounding effects during the operational phase, which could enhance baseflow discharge to the Macleay River valley and spring discharges.

#### Explanation

DPE Water recommends a groundwater management plan to monitor, manage and mitigate impacts for the project. The project construction and operational phases have different potential water quantity impacts on GDEs (drawdown and mounding, which can change in time). Hence, the groundwater monitoring and management plan must include GDE-specific monitoring to enable timely detection of potential effects on the water table. The monitoring must be able to determine effects during the construction and operational phases on the Macleay River valley baseflows and spring discharges.

The proponent is required to develop the groundwater management plan in consultation with DPE Water. The plan will need to address the construction and operational phases of the project and identify triggers for suitable parameters and corresponding actions as part of a trigger action response plan.

### 2.4 Recommendation – post approval

The proponent should install monitoring device/s and or bore/s close to and deeper than the deepest part of the scheme. These are to be located near the station cavern and deeper than its base, and installed and used as follows:

- the deep monitoring setup must be installed as soon as practicably possible to enable the use of its data in the required first round of model validation and updating
- monitored to collect hydrogeological data to confirm the parameter values used in the corresponding model layer
- monitored to use groundwater head data in model validation (post-audit) that is required to be part of future model updating
- included in the monitoring plan.

#### Explanation

The deeper layers in the model are not parameterised based on real data and the model calibration at that depth is limited due to missing observations. Therefore, the proponent is required to collect geotechnical and hydrogeological parameter measurements from point's near and deeper than the deepest component in the scheme to assist with model parameterisation and calibration. Since modelling is an iterative process and models are required to be validated to ensure their predictions have been within acceptable ranges,

groundwater head data are required to be collected from that depth and used in future model validation and re-calibration as necessary.

The deep monitoring setup must be installed as soon as practicably possible to enable the use of its data in the required first round of model validation and updating, which is in no more than three months from the end of the first year of construction.

The new monitoring setup must be planned to enable continued use throughout the lifetime of the project to:

- help with future model validation and updates
- enable checking of the compliance to regulatory and design criteria.

## 2.5 Recommendation – post approval

The proponent should complete groundwater model validation (post audit) and updating as follows:

- validate and update the model within three months of the following milestones:
  - i. One year and 3 years from the start of construction
  - ii. One year and 6 years from the end of the construction, the later corresponds to 10 years from the start of construction.
- incorporate deep layer measurements (parameters and observed heads)
- consider all remaining comments from the independent peer review in the future models
- check model validity using recently collected data
- refine and/or recalibrate the model if needed
- revise predictions if needed, including uncertainty analysis.

### Explanation

The groundwater model reviewed is well thought out, executed, and reported. Due to inherent uncertainty in models, modelling is an iterative long-term process. The uncertainty in the model is partially related to the limited spatial and temporal data on the hydrogeological system. In addition, there could be changes in project construction design and the hydrogeological conditions and characteristics which may differ from what was envisaged during the model setup.

To maintain the groundwater model as a useful tool, its predictions must be validated (post-audited) against data collected after the completion of the model setup. This must include data from unexplored depths. Information obtained from the model validation will determine if the model should be re-calibrated or not.

The reviewed modelling report indicates that the model has benefited from most of the independent review comments. The next update of the model is required to consider all the remaining comments, which at this stage are thought not to have affected the model trustworthiness. However, this needs to be confirmed in the future when new data are collected to represent additional time and positions.

The model predictions must be revised where required by the validation process or if the project design changes.

## 3.0 Surface water impacts

---

### *Surface water modelling and ecological assessment*

#### 3.1 Recommendation – prior to determination

The proponent should provide:

---

- additional details on the modelling used to estimate flow metrics and changes to flow regimes to enable further consideration of potential impacts on aquatic ecology and dependent species
- additional details on the specific operational regimes that would be implemented under average, drought and flood conditions
- an updated impact assessment on ecologically significant flows and consequences for critical life stages of flow dependent species, eg. fish.

### Explanation

The proponent has included information on the minimum river flow rates for commencing extraction, and maximum extraction rates, as well as the cease to pump rules for low flow conditions as specified in the water sharing plan for the Macleay Surface Water and Alluvial Water Sources (2016). However, to assist DPE Water in completing its assessment of hydrological and ecological impacts, further clarification is needed from the proponent about:

- how daily extraction rates will be scaled with changes in flows under average, drought and flood conditions
- detailed water extraction information (i.e. operational regime) of the project during the construction and operational phases
- what assumptions were made for any hydrological modelling (e.g. activation of water entitlement by other users, climatic conditions during the modelled period, and assumed operational regime).
- potential changes to inundation areas of the Macleay River where key ecological habitat eg. key fish habitat, has been identified.

The proposed extraction rates may result in significant change in the hydrological regime depending on how rapidly the extraction rate was scaled up and the seasonality of the flow. The proposed maximum daily extraction rate of 84.6 ML/d at a daily flow of 683 ML/d represents 12.6% of daily flows based on the 50<sup>th</sup> percentile for the period of data that was analysed in the EIS. However, the 50<sup>th</sup> percentile can change depending on seasonal flows which may cause ecologically significant shifts in the flow regime if the proponent chooses to extract during a low flow period. For example, based on the period of record at gauge 206024 (Macleay River d/s Georges River), the 50<sup>th</sup> percentile ranges from 344 ML (Oct) to 1032 ML (Feb) during the spring and summer months. It is unclear from the EIS what the potential extraction regime might be if the initial fill was to be commenced under a low flow/drought year.

The proponent has attempted to quantify the potential for modification of the flow regime during the construction, initial fill and operational phases of the proposed project. This has included general descriptions of operational regimes and average hydrological outcomes and mitigation measures during typical flows. However, the proponent has not considered impacts on ecologically significant flows and consequences for critical life stages for flow dependent fish populations such as bass and mullet.

### 3.2 Recommendation – prior to determination

The proponent should review the cease to pump (CtP) and commence to pump (Commtp) rules for the initial fill and operational phases in consultation with DPE Water.

### Explanation

The proposed extraction rules in the EIS have changed from the rules discussed with DPE Water in 2021. These changes relate to the commence/cease to pump flow percentile, time of the year for pumping and the first flush rule. DPE Water requests further consultation to ensure the extraction flow range minimises impact on ecologically significant flows and

other water dependent users. This consultation will need to be supported with the information requested in recommendation 3.1 above.

## **Geomorphology/riparian land**

### **3.3 Recommendation – prior to determination**

The proponent should provide further detail on the riparian habitat features to be impacted and include detail on how, where and when the proposed mitigating measures are to be implemented.

#### **Explanation**

The works in the project area will include clearing, in-stream works, infrastructure, and new land formations from the spoil generated by excavations, dam construction and tunnelling.

These works are predicted to:

- modify the water quality and hydraulics of the receiving waterways
- increase erosion and bank destabilization
- result in loss or modification of aquatic habitat and risk of geomorphic degradation.

The proponent has indicated in the EIS and associated appendices that appropriate measures will be taken to minimize these impacts. However, it is difficult to assess the effectiveness of the mitigation measures without further detail and specific information about the riparian features and how, where and when the measures will be implemented.

Further detail on the riparian habitat features can be provided in the form of a schematic or map along the length of the Macleay River channel. This is to include the channel and a 40m riparian strip on each bank adjacent to the construction envelope, and depict features such as substrate, woody habitat and hydrological habitat/mesohabitat. DPE Water will utilise this information to assess the vulnerability of the habitat features to geomorphic change from events such as siltation or flood damage that may occur from modified riparian zones during the construction and operational phases.

### **3.4 Recommendation – prior to determination**

The proponent should provide further detail and impact assessment of the proposed bridge over the Macleay River. This is to include:

- a detailed plan showing its position and orientation in relation to the river
- a risk evaluation of disturbance to unconsolidated bars, benches and banks of the Macleay River. This is to assess:
  - the hydraulic conveyance along the Macleay River between East Kunderang and Comara, and
  - the shear stress and competence of bed materials, bars and sediment conveyance through the bridge
- a preliminary design plan for the approaches to, abutments and deck height of the proposed bridge. This is to include a justification based on the assessment in the previous point
- updated mitigation measures.

### **3.5 Recommendation – prior to determination**

The proponent should provide a preliminary design plan for the proposed road and watercourse crossings between the development site, including Carrols Creek, Oaky Creek and Waterloo Creek. These designs should consider channel constraints and potential impacts to bed and banks of the watercourses that require a bridge or culvert crossing and a justification for preferred options.

## Explanation

Insufficient information has been provided to understand the potential geomorphic impacts and adequacy of the proposed design and mitigation options for structures proposed in or across waterways.

The geomorphological assessment (Attachment B of Appendix M) only considered existing processes and likely impacts to Fingerboard Creek. No analysis of existing processes or assessment of risk to channel features of the Macleay River occurring due to the proposed bridge or other creek crossings was undertaken. Due to the scale of these activities and the size of the watercourses, further detail on the bridge/crossing designs between the development site and the proposed bridge, combined with a supporting impact assessment on the hydrology and geomorphology is required.

### 3.6 Recommendation – prior to determination

The proponent should provide mitigation actions to improve watercourses in the Macleay River catchment due to the hydrologic and geomorphic impacts to Fingerboard Creek.

#### Explanation

The modification to the hydrology of Fingerboard Creek between the two storages will inevitably cause long term impacts to channel form and sediment supply into the Macleay River. However due to its catchment size, this is unlikely to cause measurable alteration in flow or sediment budgets into or through the Macleay River. A mitigation strategy to remediate Fingerboard Creek is unlikely to have a measurable effect. Any mitigation to the loss of Fingerboard Creek is recommended to focus on remediation of degraded watercourses elsewhere in the Macleay catchment. An appropriate mitigation action would aim to improve local watercourse structure and sediment transfer into the Macleay River.

### 3.7 Recommendation – post approval

The proponent should prepare a Water Management Plan for construction and operational phases to:

- monitor and manage geomorphic processes in the Macleay River to address the following:
  - identification of risks/changes to channel form, sediment transportation and shear stress on the bed and banks of the Macleay River, in its current state, and from alterations that may result from the proposed bridge construction.
  - the inclusion of a trigger action response plan to detect and remediate impacts caused by redirection of flows and/or accumulation of sediment to the bridge and approaches.
- monitor, manage and remediate potential impacts to sections of Carrols Creek and other watercourses affected by the project.
- detail specific erosion prevention and mitigation measures
- rehabilitate the riparian zone
- monitor, manage and remediate surface and groundwater quality impacts.

**End Attachment A**