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RE: LAKE LYELL PUMPED HYDRO ENERGY STORAGE (PHES)
APPLICATION NO: SSI-77018220

I accept the Department's disclaimer and declaration and confirm that this submission does not contain offensive, threatening, defamatory or inappropriate content.

1. PURPOSE OF THIS SUBMISSION

This submission provides an advisory assessment of the Environmental Impact Statement (EIS) for the Lake Lyell Pumped Hydro Energy Storage proposal, prepared by EMM Consulting Pty Limited on behalf of the proponent. The EIS has been developed in accordance with the NSW Secretary's Environmental Assessment Requirements (SEARs), relevant legislative provisions under the *Environmental Planning and Assessment Act 1979* and *Regulation 2021*, and applicable State significant infrastructure guidelines.

As part of the exhibition and submissions process, this assessment identifies areas where further clarity, integration, or refinement may assist in strengthening the understanding of environmental, social, cultural, and economic impacts and their management.

1.1 Author Expertise and Independence

This submission is informed by my professional experience as a Certified Environmental Practitioner (CEnvP) and Certified Professional Soil Scientist (CPSS), with over 20 years working within the Lithgow Local Government Area. This includes 12 years as Environmental Team Leader at the Mount Piper and Wallerawang ash placement sites, and a further nine years consulting on soils and environmental matters across the region, including the preparation of development applications within the Sydney Drinking Water Catchment.

My technical background includes water cycle studies and water quality assessment, as well as specialist advice in soils, contamination, preliminary site investigations, Neutral or Beneficial Effect (NorBE) assessments, BASIX, S3QM, waste management, and soil reuse. This experience informs the observations and technical considerations presented, particularly in relation to water quality, hydrological processes, and site-specific environmental management.

The submission is provided in an independent capacity and presents an objective, technical perspective on site-specific environmental conditions and the management of potential impacts.

2. POSITION STATEMENT

This submission **supports the project** in principle as a long-term energy concept with the potential to maintain the relevance of power generation at the Mount Piper Power Station within the Seven Valleys region. **However, it raises concerns** regarding the assessment and management of site-specific environmental and community impacts as currently presented in the EIS.

In this context, the EIS does not yet provide sufficient clarity to support a fully informed assessment.

3. SUMMARY

This submission identifies key areas where further clarity and refinement are required to strengthen confidence in the management of site-specific environmental and community impacts.

The EIS identifies approximately 63–68 mitigation measures, reflecting the scale and complexity of potential impacts on the environment and the immediate community; however, these measures are dispersed across a fragmented and uneven framework, making it difficult to assess their completeness and consistency. This approach constrains the ability to clearly link identified impacts to specific mitigation commitments and, in turn, limits confidence in the adequacy and enforceability of the proposed environmental management framework, particularly in the context of balancing these impacts against the stated benefits of the proposal.

The following sections outline these matters and their relevance to the overall assessment.

4. BACKGROUND TO THE APPROVALS PROCESS

The project is declared Critical State Significant Infrastructure (CSSI), reflecting its importance to the State in economic, environmental, and social terms. As such, it is subject to assessment under the *Environmental Planning and Assessment Act 1979*, including consideration of ecologically sustainable development and the balance between local impacts and broader public benefits.

The EIS has been prepared on the basis of a concept design, with further refinement anticipated through detailed design and consultation. The assessment process includes technical studies across multiple disciplines and incorporates community feedback received to date.

The proponent has proposed measures to address impacts, including a Neighbour Agreement Guide and a Shared Benefits Program. These initiatives form part of the broader impact management framework and will be considered alongside technical assessments and further refinement arising from the submissions process.

(Further technical detail is provided in Addendum 1.)

5. KEY ASSESSMENT ISSUES AND AREAS FOR FURTHER CLARIFICATION

The following key issues have been identified in the Environmental Impact Statement and are considered material to the assessment of the proposal under Section 4.15 of the Environmental Planning and Assessment Act 1979.

5.1 Strategic Context and Site-Specific Assessment

Environmental acceptability must be determined on the basis of site-specific evidence rather than analogy with existing pumped hydro developments.

Strategic relevance is acknowledged; however, environmental acceptability must ultimately be determined on the basis of site-specific evidence. Pumped hydro energy storage is a recognised component of Australia's long-duration energy storage strategy and plays an important role in supporting renewable energy integration. While the proposal is broadly consistent with energy transition objectives, the EIS provides limited detail on how the project is positioned within the evolving energy system, including its functional role relative to other storage and generation technologies.

In this context, strategic alignment does not reduce the need for a rigorous assessment of local environmental impacts. Pumped hydro developments vary significantly in scale, configuration, and environmental setting, and their performance and impacts are inherently site-specific. As a result, direct comparison with other schemes has limited relevance for assessing impacts at Lake Lyell. Assessment outcomes are therefore dependent on local hydrological, ecological, and landscape conditions, and on the extent to which impacts can be clearly characterised and managed based on project-specific evidence rather than analogy with existing facilities.

(Further technical detail is provided in Addendum 2.)

5.2 Operational Regime and Hydrological Impacts

The EIS suggests a lack of detail regarding immediate impacts to the confluence of Farmers Creek, Coxs River and the inlet/outlet.

- *Lack of modelling for daily/twice-daily operation and spatial differentiation of impacts.*
- *No clearly defined operational regime, including frequency, timing, and magnitude of water level fluctuations.*
- *Limits in the ability to assess hydrological impacts on lake stability, shoreline, and downstream systems.*

Approval based on the current level of detail, with reliance on subsequent detailed design to resolve key matters, may limit the robustness of the assessment. While hydrological changes are acknowledged, the EIS does not clearly demonstrate how proposed mitigation measures would effectively manage the magnitude, frequency, and spatial distribution of impacts under realistic operating conditions.

The EIS does not clearly define the proposed operational regime, including the frequency, duration, and magnitude of pumping and generation cycles, nor does it translate the stated reliance on electricity market demand into a representative or modelled operating scenario. This limits understanding of the associated hydrological implications for Lake Lyell and connected systems.

In addition, there is insufficient technical clarity regarding the spatial extent of both construction and operational zones. The EIS references varying project footprints (137 ha, 146 ha, and 197 ha as noted in Appendix H – Water Licensing), without clearly reconciling these figures. There is also limited site-specific detail, including cross-sections and mapping, to identify the precise location and extent of key project components and activities, such as coffer dam placement, areas of stream flow interaction, drawdown and recharge zones, and potential pressure and turbulence effects on both infrastructure and ecological systems.

While Appendix F (Annexure G) identifies a daily pumping and release cycle and includes cross-sectional and velocity-based analysis, this information is not integrated into a cumulative assessment of hydrological interactions. In particular, the combined effects of discharge at the Farmers Creek diversion, inflows from the Coxs River, and broader lake level fluctuations are not assessed in a coordinated manner.

As a result, the magnitude, frequency, and spatial distribution of impacts are not fully characterised under realistic operational conditions, and the scale, and interaction of impacts—particularly within the lower reaches of Farmers Creek—are not clearly characterised.

(Further technical detail is provided in Addendum 3.)

5.3 Water Quality Objectives and Performance Criteria

Binding water quality criteria with measurable trigger values and enforceable trigger–action–response frameworks for managing Neutral or Beneficial Effect.

- *No defined criteria for achieving neutral or beneficial outcomes; reliance on elevated baseline conditions.*
- *Absence of binding water quality objectives and enforceable trigger–action–response mechanisms.*
- *Cannot determine whether water quality impacts can be effectively managed.*

Although the EIS identifies potential water quality impacts and proposes management measures, it does not clearly demonstrate how these measures would achieve neutral or beneficial outcomes in practice, particularly in the absence of defined performance criteria and enforceable thresholds.

The water quality framework would benefit from clearer definition of performance criteria, including whether neutral or beneficial outcomes are required and how these would be measured through binding thresholds and trigger–action–response mechanisms. The use of an already elevated baseline for nitrogen and phosphorus concentrations is not appropriate in the context of in-lake works within a drinking water catchment, where more stringent water quality objectives would typically apply.

The extent and persistence of water quality impacts are not fully characterised, particularly under repeated operational cycles.

(Further technical detail is provided in Addendum 4.)

5.4 Subsurface Construction and Groundwater Impacts

Management of subsurface construction impacts on the full water column and groundwater systems.

- *Limited modelling of groundwater connectivity and full water column impacts.*
- *Insufficient detail on excavation below water table and groundwater interaction.*
- *Uncertainty in extent of groundwater drawdown and contamination risk.*

While potential groundwater and subsurface impacts are identified, the EIS does not demonstrate how these interactions would be effectively monitored, controlled, or mitigated over time. In this respect, the EIS does not clearly demonstrate mitigation or validation of pipeline pressure and loss assumptions.

Additional information is also required regarding subsurface excavation works, including potential interactions with groundwater systems and implications for the full water column within the lake environment. It is understood that the increase in generation capacity from 330 MW to 440 MW may be achieved through increased pipeline pressure, which may in turn affect hydraulic losses and the assumptions used in pipeline performance modelling.

(Further technical detail is provided in Addendum 5.)

5.5 Monitoring, Compliance and Verification

Definition and public disclosure of the operational regime, including the frequency and magnitude of water level fluctuations.

- *Absence of baseline data, reporting protocols, and audit mechanisms.*
- *Monitoring regime not fully defined or independently verifiable.*
- *Limits enforceability and long-term accountability of mitigation measures.*

The proposed monitoring and compliance arrangements would benefit from further detail, including baseline environmental data, ongoing monitoring methodologies, reporting requirements, and independent verification processes.

The absence of clearly defined monitoring and verification frameworks limits the ability to demonstrate that proposed mitigation measures would be effective and enforceable over the operational life of the project.

(Further technical detail is provided in Addendum 6.)

5.6 Tourism and Recreational Impacts

Measures to protect tourism values, landscape character, and recreational access, including maintenance of safe and reliable access points. Notably, the high impact of traffic on the region, residents and the township of Lithgow with the Town Camp.

- *Lack of site-specific mitigation linked to fluctuating water levels.*
- *No enforceable measures to maintain recreational access or visitor experience.*
- *Ongoing risk to tourism viability and regional economic outcomes.*

Further assessment is required in relation to potential impacts on tourism, landscape character, and recreational use of Lake Lyell, including access arrangements and the reliability of ongoing recreational activities. Potential changes to access, shoreline conditions, and recreational safety have not been sufficiently quantified or resolved.

(Further technical detail is provided in Addendum 7.)

5.7 Landscape and Visual Impacts

The EIS identifies landscape and visual impacts associated with shoreline change and fluctuating water levels; however, there is limited evidence demonstrating how these impacts would be effectively mitigated over time, particularly in relation to shoreline scarring and altered lake character.

5.8 Aquatic Ecology

The EIS provides limited assessment of ecological response to daily hydrological change, and mitigation measures are not clearly linked to operational water level fluctuations. As a result, the potential for ongoing ecological disturbance is not fully characterised.

5.9 Adaptive Management

Adaptive management provisions to respond to unforeseen impacts over the life of the project.

- *No structured response framework for unforeseen impacts.*
- *Adaptive management provisions are not clearly defined or enforceable.*
- *Reduces capacity to respond to long-term or cumulative impacts.*

Adaptive management provisions would benefit from further clarification, particularly in relation to how unforeseen environmental impacts would be identified, addressed, and managed over the operational life of the project. This is relevant to the irrevocable loss of indigenous heritage, ecological habitat destruction of biodiversity, impacts to adjoining land holders during the construction phase and contingency plans under drought conditions.

(Further technical detail is provided in Addendum 8.)

5.10 Primary Impact Zone – Farmers Creek

- *No assessment of cumulative interactions between pumping, discharge at Farmers Creek diversion, Coxs River inflows, and lake level fluctuations.*
- *EIS does not identify or assess the lower reaches of Farmers Creek as the primary operational impact zone, some information is found in the Annexure G of Appendix F.*
- *Limited ability to characterise spatial distribution of impacts and assess downstream and localised hydrological effects.*

Details relevant to the primary impact zone, including the potential for bank and lakebed scouring, are presented in Annexure G (Cross-section Average Velocity Calculations) of Appendix F (Surface Water Assessment) of the EIS. The annexure states that the Lake Lyell PHES scheme will typically operate on a daily cycle, comprising a generation phase (discharge to Lake Lyell) and a recharge phase (pumping to the upper reservoir). Peak flow rates of approximately 210 m^3/s for discharge and 190 m^3/s for pumping from the Farmers Creek arm are identified, with the potential to cause erosion of sediments along the lakebed and banks.

To assess erosion risk, the annexure presents calculations of average (uniform) flow velocities across a series of cross-sections within the Farmers Creek arm, based on the maximum discharge flow of 210 m^3/s. These calculations are described as approximations derived from assumed cross-sectional areas and simplified flow conditions. A total of 12 cross-sections were analysed over a distance of approximately 600 metres downstream of the pipe outflow, representing largely natural bed conditions, with some sections (5, 6 and 7) incorporating proposed laydown infill. The creek bed profiles are illustrated in Figure G.2, and Table G.1 presents calculated velocities across a range of lake levels (approximately 780 m, 781 m, and 784.5 m AHD) for peak flow conditions.

While these calculations provide an indication of potential flow behaviour, they are based on simplified assumptions and do not fully characterise site-specific hydraulic conditions or sediment response. In particular, the interaction between repeated daily operational cycles, variable lake levels, and local sediment characteristics is not comprehensively assessed.

As a result, the magnitude, spatial extent, and persistence of erosion risk within the Farmers Creek arm are not fully characterised. The potential for cumulative impacts under repeated operational cycles—such as progressive bank instability, sediment mobilisation, and downstream effects—remains uncertain. This limits the ability to clearly link identified impacts within the primary impact zone to specific, enforceable mitigation measures, and to demonstrate how these impacts would be effectively managed over the operational life of the project.

5.11 Mitigation Framework (Appendix E)

The mitigation framework is predominantly focused on construction-phase impacts, with limited development of enforceable or quantified controls for long-term operational impacts.

- *Duplication, missing sequences, and lack of consolidated register.*
- *Fragmented and inconsistent mitigation ID system across Appendix E.*
- *Limits transparency, traceability, and confidence in mitigation completeness.*

The mitigation framework presented in Appendix E of the EIS does not clearly demonstrate a consistent and consolidated structure, with mitigation measures dispersed across multiple tables and categorised by discipline-specific ID systems rather than a unified framework. The absence of a single, sequential register of mitigation measures, combined with duplication (e.g. TR02), missing sequences, and uneven distribution across impact categories, limits transparency and makes it difficult to verify completeness or internal consistency. In addition, several mitigation measures are embedded within management plans without discrete identification, further reducing traceability. This fragmented approach constrains the ability to clearly link identified impacts to specific mitigation commitments, and limits confidence in the adequacy and enforceability of the proposed environmental management framework. Overall, there is limited linage to long-term operational impacts.

While mitigation measures are identified, their presence does not in itself demonstrate a robust or comprehensive assessment. Rather, the key issue is the proportionality of impacts on residents, the township, and the tourism economy, and whether these impacts have been adequately characterised and managed.

As a result, while mitigation measures are identified, the EIS does not clearly demonstrate that they are sufficiently integrated, enforceable, or capable of effectively managing the identified impacts over time.

Despite the presence of 21 proposed management plans, the underlying mitigation framework of the EIS does not clearly demonstrate sufficient clarity, consistency, and linkage to key impact areas. As a result, the number of plans does not resolve the identified deficiencies or provide confidence in the effectiveness of the proposed environmental management approach. Thus, the existence of multiple management plans does not, in itself, demonstrate the adequacy of the mitigation framework, particularly where underlying measures lack definition, consistency, and clear linkage to identified impacts.

As a result, there is insufficient information to reliably characterise the scale, duration, and distribution of impacts or to demonstrate that proposed mitigation measures would be effective.

This limits the ability to clearly link identified impacts to specific, enforceable mitigation measures.

(Further technical detail is provided in Addendum 9.)

6. ASSESSMENT CONSIDERATIONS

The matters identified in this submission are relevant to the consideration of environmental, social, and economic impacts under Section 4.15 of the *Environmental Planning and Assessment Act 1979*, and the extent to which those impacts can be effectively avoided, mitigated, or managed over the life of the project.

While the project is recognised as strategically relevant within the energy transition, environmental acceptability must be determined on the basis of site-specific evidence. In this regard, the EIS does not consistently demonstrate how key impact pathways—particularly those relating to hydrology, water quality, groundwater interaction, and landscape and ecological change—have been sufficiently characterised under realistic operating conditions.

A central consideration is the absence of a clearly defined operational regime, which limits the ability to assess the magnitude, frequency, and spatial distribution of impacts, including cumulative interactions within the Lake Lyell system and the lower reaches of Farmers Creek. This is compounded by the lack of clearly defined water quality performance criteria, incomplete assessment of subsurface and groundwater interactions, and insufficiently developed monitoring, compliance, and verification frameworks.

The mitigation framework, while extensive, does not clearly demonstrate integration or how identified impacts would be managed over time, particularly for long-term operational effects. In addition, reliance on adaptive management for key uncertainties limits confidence in the ability to respond to potential impacts where performance criteria and response mechanisms are not clearly established.

Collectively, these matters indicate that, while impacts are identified. Further refinement, integration, and definition of key impact pathways and mitigation measures would assist in strengthening confidence in the overall assessment.

7. RISK SIGNIFICANCE MATRIX

The following matrix provides an indicative assessment of the relative significance of potential impact areas based on the current level of information contained within the EIS. It reflects information adequacy rather than final environmental impact outcomes.

The following assessment reflects not only the nature of identified impacts, but also the degree to which the EIS demonstrates that those impacts can be effectively mitigated.

Impact Area	Risk Significance	Advisory Basis
Hydrology (water level fluctuation regime, lake stability, downstream effects)	High	Limited definition of operational regime and magnitude of daily fluctuations

Impact Area	Risk Significance	Advisory Basis
Water Quality (including TARP framework and compliance thresholds)	High	Absence of binding criteria and enforceable performance thresholds
Groundwater and Subsurface Impacts	High	Uncertainty regarding excavation effects on hydrogeology and full water column
Tourism Impacts (visitor economy, perception, visitation patterns)	Moderate–High	Potential sensitivity to landscape change and access disruption – traffic management and road upgrading
Recreational Use (safety, access, boating, fishing, swimming)	High	Dependence on stable shoreline and lake level conditions
Landscape and Visual Amenity	Moderate–High	Changes to shoreline character and visual continuity
Monitoring and Compliance Framework	High	Insufficient definition of baseline data, reporting, and verification
Adaptive Management Capacity	High	Limited detail on response mechanisms for unforeseen impacts

8. EXECUTIVE SUMMARY

The following Executive Assessment Summary consolidates the key findings of this submission.

The project represents a strategically relevant long-duration energy storage proposal; however, its environmental acceptability must be determined on the basis of site-specific evidence.

The Environmental Impact Statement (EIS) identifies a range of environmental and socio-economic impacts but does not consistently demonstrate how proposed mitigation measures would achieve effective, measurable, and enforceable outcomes over the life of the project. Key deficiencies are evident in relation to the definition of the operational regime and associated hydrological impacts, the absence of a clearly defined water quality framework with binding performance criteria, and the limited assessment of groundwater and subsurface interactions.

A central issue is the lack of a clearly defined operational regime, which limits the ability to assess the magnitude, frequency, and spatial distribution of impacts under realistic operating conditions. In particular, the spatial extent and interaction of impacts—especially within the lower reaches of Farmers Creek—are not adequately characterised, and cumulative hydrological interactions are not assessed in an integrated manner.

The EIS identifies the Farmers Creek arm as a primary impact zone, with Annexure G indicating that daily pumping and discharge flows of up to 210 m^3/s may result in bank and lakebed erosion. However, the supporting velocity modelling is based on simplified assumptions and does not fully assess site-specific hydraulic behaviour or sediment response under repeated operational cycles. As a result, the magnitude, spatial extent, and cumulative effects of erosion risk are not clearly characterised, limiting confidence in the effectiveness of proposed mitigation measures.

As outlined in Section 5.11, the mitigation framework presented in Appendix E of the EIS does not clearly demonstrate integration and internal consistency. Mitigation measures are fragmented, with limited linkage between identified impacts and enforceable mitigation commitments, and a strong focus on construction-phase impacts. There is limited development of clearly defined, enforceable controls for long-term operational impacts, which represent the primary source of environmental change.

While the EIS proposes monitoring and adaptive management approaches, these are not supported by clearly defined performance criteria, response mechanisms, or verification frameworks. In this context, reliance on adaptive management extends to matters that are fundamental to impact assessment, limiting confidence that impacts can be effectively managed at the time of determination.

Collectively, these matters indicate that, while impacts are identified, the EIS does not yet provide sufficient clarity to demonstrate that they can be effectively avoided, mitigated, or managed over the operational life of the project. This, in turn, limits the ability to meaningfully weigh identified impacts against the stated benefits of the proposal.

The key issue is not the project outcome, but whether the pathway to achieving that outcome provides sufficient certainty that site-specific impacts can be effectively managed and appropriately balanced against its stated benefits.

9. FINAL STATEMENT

This submission identifies key areas where further clarification, integration, and refinement would assist in strengthening the assessment of the proposal and improving confidence in the management of environmental and socio-economic impacts over its operational life.

While the project is recognised as a strategically relevant component of long-duration energy storage infrastructure, its environmental acceptability remains dependent on the extent to which site-specific impacts can be clearly characterised and effectively managed.

Across multiple impact areas, the EIS identifies potential impacts but does not consistently demonstrate, with sufficient clarity or evidence, that proposed mitigation measures would achieve effective, measurable, and enforceable outcomes over time. This is particularly relevant to hydrology, water quality, groundwater interaction, monitoring and compliance, and adaptive management, where key aspects of impact pathways and performance criteria remain insufficiently defined.

As outlined in Section 5.11, the mitigation framework, while extensive, does not clearly demonstrate integration or clear linkage between identified impacts and enforceable mitigation commitments, and is predominantly focused on construction-phase impacts. There is limited development of robust controls for long-term operational impacts, which represent the primary source of environmental change.

In this context, reliance on adaptive management extends to matters that are fundamental to impact assessment, limiting confidence that impacts can be effectively managed based on the information currently provided.

Accordingly, while the project outcome is recognised, the EIS does not yet provide sufficient clarity to demonstrate that the pathway to achieving that outcome adequately manages impacts at a local and site-specific level. The key issue is whether that pathway provides sufficient certainty that impacts can be effectively managed and appropriately balanced against the project's stated benefits.

Further refinement of key impact pathways, mitigation measures, and performance frameworks would assist in supporting a more robust and fully informed assessment.

Dr Jane Aiken MSuAg BSc MEIANZ CPSS CEnvP

Dr Jane Tracy Aiken is an environmental and soil scientist with over 30 years of experience in contaminated land, water quality, resource recovery, and sustainable land development. Her work is grounded in scientific integrity and focuses on the practical application of environmental management within regulatory frameworks.

Dr Aiken holds a PhD in Environmental Studies from Western Sydney University and a Master of Sustainable Agriculture from Charles Sturt University. Her expertise includes soil systems, water quality, nutrient cycling, and the assessment and management of environmental impacts associated with land use and development.

She has extensive experience in the safe and effective reuse of industrial and organic materials, including coal combustion products, composts, and biosolids, in both agricultural and land rehabilitation contexts. Her work supports improved soil function, resource recovery, and the reduction of waste to landfill while maintaining environmental protection standards.

Dr Aiken has worked across consultancy, research, and advisory roles, supporting government, industry, and land managers. She is a Certified Environmental Practitioner (CEnvP), Certified Professional Soil Scientist (CPSS), and a member of the Environment Institute of Australia and New Zealand (EIANZ).

10. SUPPORTING DETAIL (Addenda)

- Addendum 1 – Approvals Context and Stated Environmental Impacts
- Addendum 2 - Strategic Context
- Addendum 3 – Operational Regime and Hydrology
- Addendum 4 – Water Quality
- Addendum 5 – Groundwater and Subsurface
- Addendum 6 – Monitoring and Biodiversity
- Addendum 7– Tourism and Regional Impacts
- Addendum 8 – Adaptive Management
- Addendum 9– Mitigation Gap Analysis

ADDENDUM – 1 – Approvals Context and Stated Environmental Impacts

A1.1 A Declared Critical State Significant Infrastructure (CSSI)

The Lake Lyell Pumped Hydro Energy Storage project is declared Critical State Significant Infrastructure (CSSI), reflecting its designation as essential infrastructure for the State for economic, environmental, and social reasons. As such, the proposal is subject to assessment under the *Environmental Planning and Assessment Act 1979*, including consideration of the principles of ecologically sustainable development and the balancing of biophysical, social, and economic impacts.

The EIS has been prepared on the basis of a concept design, with further refinement anticipated through detailed design and construction planning. The assessment process has included community consultation, technical studies across key disciplines (including traffic, biodiversity, cultural heritage, visual, and noise), and the incorporation of additional mitigation measures in response to identified impacts.

The project proponent has also proposed mechanisms to address local impacts, including a Neighbour Agreement Guide for directly affected landholders and a broader Shared Benefits Program for the regional community and State. These measures form part of the broader assessment framework and may be considered alongside the level of information provided to support an understanding of impacts and their management.

A1.2. Summary of Key Impacts

The EIS identifies a range of potential impacts across environmental and socio-economic domains, with particular concerns raised by the community including long-term visual impacts, biodiversity and platypus habitat, Aboriginal cultural heritage, construction traffic and noise, changes to recreational use of Lake Lyell, and broader social impacts associated with workforce integration. The EIS also notes that some community members consider the project unsuitable in its current location and have expressed concern regarding the adequacy of available information.

In response, the EIS includes detailed technical assessments and proposes mitigation measures intended to avoid, minimise, or manage impacts. Construction-phase impacts such as traffic, noise, dust, and workforce pressures are generally addressed through standard mitigation and management frameworks. Additional measures include compensation mechanisms for affected landholders and targeted biodiversity and cultural heritage strategies.

However, several impacts are identified as longer-term or more complex in nature, including landscape transformation, hydrological change, ecological response to fluctuating water levels, and uncertainty regarding ongoing recreational use. These impacts are more dependent on operational conditions and long-term management, and their mitigation is less clearly demonstrated. As a result, while both adverse and beneficial outcomes are identified, the balance between them remains contingent on the effectiveness and enforceability of proposed mitigation measures.

A1.3. Evaluation and Justification Framework (Public Interest & Trade-Off)

The EIS concludes that the project is justified in the public interest, citing its contribution to energy security, emissions reduction, and long-term economic benefits, alongside proposed mitigation and compensation measures. As a CSSI project, the assessment necessarily involves a balance between localised impacts and broader State-wide benefits.

This introduces a key evaluation consideration: the extent to which local, site-specific environmental and community impacts can be appropriately managed in the context of broader public good outcomes. While the project offers strategic benefits, including contributions to the National Electricity Market and regional economic activity, these benefits do not remove the need for a robust and clearly demonstrated assessment of local impacts.

The EIS indicates that residual risks can be managed through mitigation measures, offsets, adaptive management, and negotiated agreements. However, it also acknowledges that aspects of the design remain subject to refinement and that some uncertainties will be resolved through future consultation and detailed design.

In this context, the justification of the project is closely linked to the level of confidence that impacts can be effectively avoided, mitigated, or managed. Where key aspects of impact assessment, mitigation design, or performance criteria remain uncertain or deferred, this may limit the ability to fully evaluate the trade-off between local impacts and broader public benefits at the time of determination.

ADDENDUM – 2 – Strategic Context and Project-Specific Assessment Considerations

Executive Summary

Strategic relevance is acknowledged; however, environmental acceptability must be determined on site-specific evidence. The Lake Lyell Pumped Hydro Energy Storage project represents a long-duration energy storage proposal aligned with Australia's transition to renewable energy and increasing reliance on solar and wind generation. Pumped hydro is a mature and strategically significant technology; however, its performance and environmental impacts are inherently site-specific, determined by local hydrological, ecological, and topographical conditions. While the sector is expanding, each project requires independent assessment and cannot be reliably compared with large-scale, established schemes such as Tumut 3. The Lake Lyell proposal differs substantially in scale, configuration, and environmental context, operating within a relatively small and constrained water body. Accordingly, its environmental acceptability must be determined solely on the basis of site-specific evidence rather than comparative analogy.

The Lake Lyell Pumped Hydro Energy Storage project is designed for a 100-year operational lifespan and offers potential long-term benefits through the repurposing of existing assets and the industrial legacy of the Mount Piper Power Station. Pumped hydro is a mature and well-established form of large-scale energy storage with relatively low degradation compared to chemical battery systems. It operates by using water stored in reservoirs to generate and store energy, as demonstrated at projects such as Snowy Hydro's Talbingo Dam, which has operated since 1970. The project has a long-term role in the regional economic context and supports the transition of the energy sector within an evolving economic system.

While emerging technologies may influence short-term market dynamics, pumped hydro remains a critical form of long-duration storage that supports system stability and renewable energy reliability. These factors reinforce the long-term significance of the project within a transitioning energy system increasingly reliant on renewable sources such as solar and wind. By 2050, these sources are forecast by the Australian Energy Regulator to account for approximately 65% of grid electricity supply. To achieve this approximately 13.5 GW of generation capacity in a combined portfolio of over 50 renewable energy, storage, and transmission projects, not exclusively pumped hydro that are currently under assessment. In this context, the Lake Lyell Project may support the continued relevance of power generation as an industry within the Seven Valleys region.

Pumped hydro is a limited but strategically significant form of energy storage in Australia, with only a small number of large-scale operational schemes nationally, concentrated in New South Wales. The sector is currently undergoing rapid expansion and includes two major project announcements both located on WaterNSW land also recently identified as Critical State Significant Infrastructure (CSSI), being the Western Sydney Pumped Hydro Project at Lake Burragorang (a 2,000 GL volume) and the Yarrabin (Phoenix) Pumped Hydro Project at Burrendong Dam (a 2,027 GL volume site) near Mudgee Importantly, each of these projects will require independent assessment based on their own environmental and locational characteristics, with performance, impacts, and feasibility fundamentally determined by local hydrology, topography, reservoir configuration, and environmental constraints.

Existing facilities such as the Tumut 3 component of the Snowy Hydro scheme operate within a vastly different hydrological and environmental context, including a storage capacity of approximately 921 GL and generation capacity of approximately 1,800 MW, supported by large-scale system integration and a long-established, highly modified alpine water network.

By contrast, the Lake Lyell proposal relies on a significantly smaller and fundamentally different system configuration, utilising the existing 34.2 GL Lake Lyell as the lower reservoir and proposing a new 5.3 GL upper reservoir, with a generation capacity of approximately 385 MW and pumping flows of around 190 m^3/s and up to 240 m^3/s. In this case the lower reservoir is approximately 3.4 % of the volume of Talbingo Dam and operates within a materially different catchment, ecological setting, and confined recreational landscape context.

Thus, each project must instead be assessed strictly on site-specific evidence. Reliance on non-equivalent analogies undermines the integrity of the assessment process and does not support approval in the absence of sufficient site-specific evidence to properly quantify and mitigate impacts.

Accordingly, it is not appropriate to extrapolate environmental performance, risk profiles, or acceptability thresholds from large-scale, long-established schemes such as Tumut 3 and apply them to the Lake Lyell proposal on a proportional or comparative basis. Each pumped hydro project must instead be assessed independently on the basis of its own site-specific environmental impacts, cumulative effects, and local constraints, and for the Lake Lyell Project, this must be about the daily operation and impacts to a water body of 34.2 GL that is potentially part of the flow regime of the Coxs River and the Sydney Drinking Water supply.

ADDENDUM – 3 – Operational Regime and Hydrological Impacts

The EIS provides limited definition of the operational regime and does not present an integrated assessment of hydrological interactions associated with pumping, discharge, and inflows—including at the Farmers Creek confluence—which may limit the ability to fully characterise site-specific impacts.

For example, the operational regime for the proposed PHES is not clearly defined within the Environmental Impact Statement (EIS). While the documentation states that "the PHES will be operated based on electricity market demand," this is not translated into a quantified or representative operational profile. In particular, there is limited clarity regarding the frequency, duration, and sequencing of pumping and generation cycles on a daily basis. As a result, the magnitude and spatial distribution of water level fluctuations are not sufficiently characterised, with impacts largely assessed at a whole-of-lake scale rather than differentiated across immediate, upstream, and downstream environments, including the lower reaches of Farmers Creek.

Detailed operational information is only provided in Appendix F, Annexure G, which identifies a daily pumping and release cycle and includes cross-sectional and velocity-based analysis of flow direction. However, this analysis does not extend to a combined assessment of flow interactions. In particular, the cumulative effects of discharge at the Farmers Creek diversion, inflows from the Coxs River, and broader Lake Lyell water level fluctuations are not assessed in an integrated manner, limiting understanding of how these components interact within the system.

The proposed pumping regime, involving flows of approximately 190 m^3/s and the transfer of 5.3 GL over an estimated 7.7-hour period, represents a drawdown of approximately 15.5% of the total storage volume. While this indicates a substantial operational influence on lake levels, the implications of repeated or daily cycling are not clearly evaluated. In addition, the EIS indicates that system capacity may increase from 330 MW to 440 MW, likely through increased pipeline pressure, which may have implications for hydraulic losses and groundwater interaction. These factors are not fully explored within the assessment.

Hydrological management under variable conditions is also not clearly articulated. This includes the absence of defined mitigation approaches for drought conditions and limited assessment of controlled discharges of treated stormwater and contaminated water, which are identified in Appendix F (Surface Water Assessment) as potentially reaching up to 7 ML/day during wet weather events. The interaction of these discharges with operational flows and natural inflows is not assessed cumulatively.

Construction-phase impacts are similarly not fully defined. The location and duration of coffer dam installation and associated dewatering over the proposed 4–5-year construction period are not clearly specified. Appendix H (Water Licensing Strategy) indicates that construction water demand will be sourced from groundwater (approximately 86 ML/year), with an additional 34 ML/year during operation. However, associated wastewater generation is not clearly incorporated into the site water balance. For example, an accommodation camp of approximately 600 personnel, each using an estimated 120 L/day, would generate approximately 72,000 L/day of wastewater requiring off-site transport, which is not reflected in the traffic assessment or supporting infrastructure planning.

In addition, there are inconsistencies in the description of operational lake levels. The EIS indicates an operating range between approximately 781.0 m AHD and 784.5 m AHD, requiring an active storage volume of approximately 33,000 ML (approximately 3.5 m variation). This differs from other references within the EIS suggesting a 2.5 m fluctuation, and it is not clearly stated whether these variations would occur on a daily basis. The temporary lowering of the full supply level by approximately 3.2 m during construction is also not clearly identified as potentially persisting for the full duration of the 4–5-year construction period.

Finally, project overview documentation, including Figure 2.1 in Appendix H (Water Licensing Strategy), does not clearly represent the extent of impacts at the confluence of Farmers Creek and Lake Lyell. This may limit understanding of the spatial extent of impacts and the identification of the primary operational impact zone.

ADDENDUM – 4 – Water Quality and Subsurface Impacts

Potential operational impacts of the project on the biophysical environment are identified in the EIS and include a range of changes to aquatic and shoreline systems. These include the potential loss of both native and introduced fish species associated with the PHES inlet, as well as localised shoreline scouring resulting from pumping and discharge activities. The EIS indicates that such impacts may be managed through measures such as shoreline armouring where required.

Additional considerations include stormwater runoff from infrastructure areas and the potential for seepage from project structures during operation, as well as dilution effects associated with interaction with lake water. The EIS proposes that these risks would be actively managed through monitoring and treatment where necessary, based on water quality outcomes measured against minimal harm criteria. However, the Neutral or Beneficial Effect (NorBE) water quality modelling does not clearly demonstrate defined management criteria, and existing exceedances of Total Nitrogen and Phosphorus guideline values introduce additional uncertainty regarding baseline conditions and the effectiveness of proposed management responses.

The project would also result in fluctuating water levels and increased mixing within the water column of Lake Lyell, leading to destratification. While the EIS identifies this as having potential beneficial effects, the extent and distribution of these outcomes are dependent on operational conditions and warrant further consideration in the context of the broader lake system.

In addition, there is limited evidence provided regarding the impacts of subsurface construction below the water table on the full water column, including potential interactions between excavation activities, groundwater systems, and lake water quality. This represents a further area where additional clarification would assist in understanding both construction and operational phase impacts.

ADDENDUM – 5 – Subsurface Construction and Groundwater Impacts

Further areas of uncertainty are identified in relation to water quality and subsurface interactions. The EIS does not adequately address turbidity impacts at depth, including within deeper sections of the water column (e.g. around 20 metres), where sediment mobilisation and reduced light penetration may have implications for aquatic ecosystems. In addition, the relationship between thermal effects and operational efficiency—such as heat generation associated with approximately 80% system efficiency—is not clearly linked to potential water quality outcomes, including temperature variation within the lake.

The extent of groundwater interaction also warrants further consideration. The EIS identifies that groundwater impacts may extend up to approximately 1.1 kilometres during and after construction, indicating a broad area of influence; however, the implications of these changes for both groundwater systems and surface water interactions are not fully characterised.

While the EIS quantifies certain losses, including up to approximately 20 ML per year, the long-term implications of these changes across construction, operation, and closure phases are not clearly integrated into a comprehensive assessment of cumulative impacts. Additional clarification of these pathways would assist in understanding the full extent and duration of potential impacts over the life of the project.

ADDENDUM – 6 – Monitoring, Compliance, and Verification

The EIS section 20.63 Key biophysical impacts, identifies a range of direct impacts on Aboriginal cultural heritage, biodiversity, and aquatic ecology arising from construction and operation of the project. In relation to Aboriginal cultural heritage, construction activities—particularly earthworks and excavation—would result in the removal of the upper soil profile across parts of the construction envelope, leading to impacts on five identified Aboriginal sites. Of these, three sites (LL AS3, LL AS4 and LD 13) are assessed as being of high significance. These sites are located in proximity to key project infrastructure, including the upper reservoir footprint and the banks of the Farmers Creek arm of Lake Lyell, and the EIS indicates that avoidance is unlikely to be feasible. As such, mitigation is largely limited to archaeological investigation and salvage of subsurface materials, with residual impacts remaining.

Impacts to aquatic habitat are also identified, including the loss of approximately 11.88 hectares of key fish habitat and associated macroinvertebrate assemblages within Lake Lyell. This includes effects on platypus burrowing and feeding habitat, although no threatened aquatic species are recorded within the lake.

Broader biodiversity impacts include the clearing of approximately 130 hectares of native vegetation in varying condition, of which approximately 102 hectares would require offsetting. This includes the loss of habitat for threatened species, including breeding habitat for the Gang-gang Cockatoo and Glossy Black Cockatoo. Assessments undertaken in the EIS conclude that the project is likely to have a significant impact on these species, as well as the Koala under the EPBC Act. While no habitats associated with SAII candidate species are identified within or adjacent to the construction envelope, the scale and nature of vegetation loss and habitat disturbance represent a substantial component of the project's environmental impact profile.

ADDENDUM – 7 – Tourism, Environmental and Regional Impacts

Executive Summary

The Lake Lyell Pumped Hydro Project presents both opportunities and risks for tourism in Lithgow, with outcomes dependent on the effectiveness of environmental management. While the project aligns in principle with the objectives of the Destination NSW Act 2011, the Tourism and Recreation Impact Assessment identify a greater number of short-term adverse impacts than long-term benefits. Construction impacts, including increased traffic, noise, and restricted access, may temporarily reduce visitation. More significantly, long-term operational impacts—particularly daily water level fluctuations of up to approximately 2.5 metres (noting variation in reported values within the EIS)—represent a fundamental change to the lake's recreational and landscape function. These changes may affect access, safety, and the reliability of water-based activities, as well as visual amenity and visitor perception. As a result, there is limited confidence that tourism values can be sustained under the proposed operational regime.

The EIS indicates limited integration with the emerging Seven Valleys tourism economy, including alignment with the Destination NSW Act 2011. While the project is positioned as broadly consistent with regional tourism and economic diversification objectives, this alignment is contingent on effective environmental management. The Tourism and Recreation Impact Assessment (Appendix O) identify a greater number of adverse impacts in the short term (12 identified impacts) compared with beneficial impacts in the longer term (4 identified benefits).

While the project may generate economic and tourism-related benefits, these are dependent on the effectiveness of proposed mitigation measures. However, the mitigation framework for tourism, landscape, and recreational impacts (including measures identified in Appendix E) does not clearly demonstrate how key impacts—particularly those associated with fluctuating water levels—would be avoided, mitigated, or managed over the life of the project.

In the short term, construction impacts including increased heavy vehicle movements, noise, and restricted access to Lake Lyell are likely to reduce visitation. While these impacts are generally consistent with construction-phase effects and are partially addressed through standard mitigation measures, they represent a temporary conflict with tourism objectives.

In contrast, long-term operational impacts present a more significant and ongoing risk. Daily water level fluctuations of up to approximately 2.5 metres represent a fundamental change to the physical and visual characteristics of Lake Lyell, altering its function as a stable recreational and environmental asset. These changes may affect the reliability of activities such as swimming, kayaking, and fishing by limiting safe access, exposing mudflats, and reducing the usability of infrastructure such as boat ramps. While these impacts are identified, the EIS does not clearly demonstrate how mitigation measures would maintain consistent recreational access or visitor experience under daily operational conditions.

Similarly, landscape and visual impacts associated with vegetation clearing and fluctuating water levels may alter scenic quality and influence visitor perception. While mitigation measures are proposed, their effectiveness in addressing ongoing operational changes to shoreline condition and visual amenity is not clearly demonstrated. In tourism contexts, perception is a critical factor, and even moderate environmental change may have disproportionate effects on visitation.

These issues highlight a broader policy tension between infrastructure development and tourism objectives under the Destination NSW Act 2011. While the project may contribute to regional economic development and visitor dispersal, this outcome is conditional. The EIS does not clearly demonstrate that the environmental qualities underpinning tourism—particularly landscape character, water-based recreation, and ecological values—can be maintained through the proposed mitigation framework.

Accordingly, while the project has the potential to contribute to the visitor economy, the adequacy and enforceability of mitigation measures for long-term operational impacts remain uncertain. Without clearer linkage between identified impacts and effective mitigation measures, there is limited confidence that tourism values can be sustained over the life of the project.

While the EIS identifies tourism-related impacts and proposes mitigation measures, it does not clearly demonstrate how these measures would maintain recreational access, landscape values, and visitor experience under ongoing operational conditions, particularly in the context of daily water level fluctuations.

ADDENDUM – 8 - Adaptive Management

The EIS indicates that the project is based on a concept design, with further optimisation and detailed design to occur following approval. In this context, mitigation and monitoring measures are proposed to support an adaptive management approach where impacts are uncertain (Section 20.8 EIS). This includes, for example, ecological impacts such as potential platypus response to fluctuating water levels, where acknowledged data limitations exist.

The EIS further states that mitigation measures will be refined through detailed design and implemented through management plans, including a proposed Biodiversity Management Plan (Section 7.4.2 EIS), with monitoring, trigger values, and response actions to be developed. It also identifies that, in some cases, mitigation is limited and residual risks may be addressed through adaptive management and long-term monitoring (Section 19.3 EIS).

While this approach recognises uncertainty and provides flexibility in project delivery, it also indicates that key aspects of impact assessment, mitigation design, and performance criteria are not yet fully defined at the EIS stage. As a result, the effectiveness of proposed mitigation measures cannot be clearly demonstrated, and reliance is placed on future design development and post-approval management to resolve currently identified uncertainties.

Accordingly, while adaptive management is an appropriate tool for managing residual or unforeseen impacts, its application in this context appears to extend to matters that are fundamental to the assessment of the project. This may limit the ability to determine, at the EIS stage, whether potential impacts can be effectively avoided, mitigated, or managed over the life of the project.

Adaptive management is typically applied to residual or unforeseen impacts; however, in this instance it appears to be relied upon to address uncertainties that would typically be resolved through the impact assessment process.

ADDENDUM - 9 – Mitigation Gap Analysis (Appendix E Review)

Purpose

This appendix provides a structured assessment of the mitigation framework presented in Appendix E of the Environmental Impact Statement (EIS). It identifies key gaps between assessed impacts and proposed mitigation measures and evaluates the adequacy of those measures in supporting a comprehensive assessment.

Table A8.1 – Mitigation Gap Analysis

Impact Area	Key Impact Identified	Mitigation Measures (EIS Ref)	Adequacy	Key Gap	Assessment Implication
Operational Hydrology	Daily water level fluctuations (~2.5m), shoreline instability	Limited linkage to SW measures	**Low**	No defined operational regime or spatial differentiation of impacts	Limits assessment of magnitude, frequency, and localised hydrological impacts
Water Quality	Elevated N & P, turbidity, stratification risks	SW02–SW08	**Low–Moderate**	No binding criteria or trigger–action–response framework	Unable to determine if neutral or beneficial outcomes are achievable
Groundwater & Subsurface	Excavation below water table, pressure effects	GW03–GW05	**Low**	Limited modelling and unclear groundwater interaction	Uncertainty in drawdown, connectivity, and contamination pathways
Pipeline / Hydraulic Performance	Increased pressure to achieve 440 MW output	Not explicitly addressed	**Low**	No mitigation linked to revised hydraulic assumptions	Undermines confidence in modelling and system performance
Aquatic Ecology	Habitat disturbance, fish impacts	AE08–AE11	**Moderate**	Not clearly linked to fluctuating water regime	Ecological response to daily fluctuation not demonstrated

Impact Area	Key Impact Identified	Mitigation Measures (EIS Ref)	Adequacy	Key Gap	Assessment Implication
Terrestrial Biodiversity	Vegetation clearing, habitat loss	TE01–TE12	**Moderate–High**	Limited linkage to long-term operational impacts	Strong for construction, weaker for operational phase
Aboriginal Heritage	Loss of cultural heritage	AH01–AH05	**Moderate**	Focus on management rather than avoidance	Residual impacts remain significant
Historic Heritage	Disturbance of heritage items	HH01–HH03	**Moderate**	Generic mitigation measures	Limited site-specific response
Tourism & Recreation	Reduced access, altered lake function	S01–S11	**Low–Moderate**	No enforceable access or experience measures	Ongoing risk to tourism viability
Landscape & Visual	Shoreline scarring, visual change	LV01–LV06	**Moderate**	Limited capacity to mitigate fluctuating water levels	Likely long-term visual impacts
Traffic & Transport	Heavy vehicle movements	TR01–TR09	**High (construction)**	Strong coverage for construction only	Adequately addressed (short-term)
Noise & Vibration	Construction and operational noise	NV01–NV03	**Moderate**	Limited operational detail	Acceptable with standard controls
Soils & Rehabilitation	Erosion, disturbed land	SLR08–SLR13	**Moderate**	Focus on construction rehabilitation	Long-term shoreline impacts not addressed
Hazards & Contamination	Fuel, chemical risks	CON01–CON07	**Moderate–High**	Standard mitigation framework	Generally acceptable
Bushfire	Fire risk	BF1, BF2, BF8	**Moderate**	Standard measures	Acceptable

Impact Area	Key Impact Identified	Mitigation Measures (EIS Ref)	Adequacy	Key Gap	Assessment Implication
Climate Change	Emissions, resilience	CC1	**Low**	Minimal mitigation detail	Not adequately addressed
Waste	Construction waste	WM01	**Low**	Single mitigation measure only	Insufficient detail

Key Observations

- The mitigation framework is **predominantly focused on construction-phase impacts**, with limited development of enforceable or quantified controls for long-term operational impacts.
- There is **no consistent linkage between identified impacts and mitigation measures**, particularly for hydrology, water quality, and groundwater systems.
- Several mitigation measures are **not supported by defined performance criteria or monitoring frameworks**, limiting enforceability.
- The absence of a **consolidated mitigation register** reduces transparency and makes it difficult to verify completeness.
- Absence of quantitative impacts to residents – other than a Shared Neighbour Plan.

Conclusion

The mitigation framework does not demonstrate a clear or consistent relationship between identified impacts and enforceable mitigation measures, particularly for long-term operational effects. As a result, it does not provide sufficient confidence that environmental and socio-economic impacts can be effectively avoided, mitigated, or managed over the life of the project.

This addendum supports the findings outlined in the Executive Assessment Summary and Key Deficiencies Table.