

APPENDICES

E

**OVEN MOUNTAIN PUMPED HYDRO
ENERGY STORAGE EIS**

Mitigation measures



**OVEN MOUNTAIN
PUMPED HYDRO STORAGE**



Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Terrestrial ecology				
Harm to native habitat	TE01	Native vegetation and fauna habitat will be retained, wherever possible, with clearing minimised to the extent required to safely construct and operate the Project.	Prior to, during and post-construction	OMPS and contractor
Harm to native habitat	TE02	The removal of large trees (>0.5 m diameter at breast height (dbh)), would be avoided, wherever practicable.	Prior to, during and post-construction	OMPS and contractor
Harm to native habitat	TE03	Exclusion zones around all areas of retained vegetation and fauna habitat will be set up where practicable.	Pre-construction	OMPS and contractor
Harm to native habitat	TE04	Where feasible and required to protect significant vegetation, tree protection zones (TPZs) will be set up.	Pre-construction	OMPS and contractor
Harm to native habitat	TE05	When accessing construction sites, contractors would use only designated routes on existing tracks.	Construction	Contractor
Harm to native flora	TE06	No materials, spoil or machinery should be stored or parked within the drip-line of any trees to be retained.	Construction	Contractor
Harm to native fauna	TE07	The potential for increased traffic during construction to result in increased mortality of native animals should be minimised, where feasible, by the implementation of construction traffic driving rules in high risk sections of road at night. Relevant mitigation measures are included in the Traffic Impact Assessment.	Prior to, during and post-construction	OMPS and contractor
Insufficient understanding of present fauna species	TE08	Clearing of native vegetation and fauna habitat have potential to harm native fauna species. To minimise harm, prior to vegetation clearing, pre-clearance surveys will be undertaken by appropriately qualified ecologists.	Pre-construction	OMPS and contractor
The destruction of salvageable habitat elements	TE09	Where practicable, removal of hollow bearing trees would be undertaken in spring (September to November), and outside the main breeding period for hollow-dependent fauna.	Pre-construction and construction	OMPS and contractor
Insufficient understanding relating to tree hollows to be removed	TE10	If hollow-bearing trees are to be removed prior to September and after November, monitoring of breeding activity would be carried out by an ecologist/s approximately one week prior to the proposed tree removal	Pre-construction and construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Potentially excessive environmental harm	TE11	Vegetation clearing works are to follow a two-phase process, as outlined below: <ul style="list-style-type: none"> Phase 1 will include the removal of all non-habitat vegetation; and Phase 2 will include the removal of all habitat features. 	Construction	Contractor
Harm to native fauna	TE12	Where practicable, any fauna species are to be relocated to habitat identified during the pre-clearing process or, if injured, transported to a veterinarian or wildlife carer.	Prior to, during and post-construction	OMPS and contractor
The introduction and/or spread of weeds, or plant pathogens	TE13	A comprehensive weed control protocol will be developed as part of the biodiversity management plan.	Pre-construction	OMPS
Adverse impacts to native habitat	TE14	After completion of the Project's construction, extensive areas of the site will be rehabilitated. The proposed rehabilitation measures outlined will be developed into a comprehensive rehabilitation management plan to be prepared post-approval.	Post-construction	OMPS and contractor
Adverse impacts to groundwater dependent ecosystems	TE15	A monitoring program will be implemented to ensure actual impacts are within or less than predicted. If actual impacts are greater than predicted, adaptive management will be implemented. The monitoring program will be determined as a part of the Biodiversity and Groundwater Management Plans to be developed post-approval.	Pre-construction	OMPS
Aquatic ecology				
Potential impacts on the Southern Purple-spotted Gudgeon and the Manning River Helmeted Turtle.	AE01	<ul style="list-style-type: none"> Undertake further field sampling to document the presence/absence of the Southern Purple-spotted Gudgeon and the Manning River Helmeted Turtle (e.g. targeted habitat sampling, eDNA sampling) to expand their known range, reducing impact on the overall population. 	Prior to construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Short-term minor decrease in surface water volume and flow within the Macleay River and associated tributaries as a result of reservoir construction and filling.	AE02	<ul style="list-style-type: none"> The baseflow of the Macleay River should be maintained during dry conditions in accordance with the relevant licensing provisions (SPAL) approved for the Project. Surface water, flow and quality should be monitored upstream and downstream of the water extraction site within the Macleay River, prior to, during and post-construction to detect changes outside of expected ranges and in accordance with the relevant licensing provisions (i.e. the SPAL). Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Prior to, during and post-construction	OMPS and contractor
Initial and short-term periodic degradation in surface water quality (including breach of relevant WQO; salinity, nutrients and/or metal concentrations) due to evapoconcentration within the Macleay River as a result of water extraction.	AE03	<ul style="list-style-type: none"> Sediment control devices should be used around construction areas (e.g. silt fences in areas where construction runoff may enter waterway). Surface water, flow and quality triggers should be established for the Macleay River to detect changes in salinity and other parameters relevant to aquatic ecology, particularly during initial filling of the reservoirs, and to further inform monitoring programs. Surges of water after rainfall naturally flush waterways to prevent stagnation; therefore it is recommended that the SPAL considers filling of the reservoirs should be delayed post-initial flush where feasible. Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Prior to construction	OMPS and contractor
Aquatic fauna mortality attributed to extraction of water from the Macleay River.	AE04	<ul style="list-style-type: none"> Water extraction infrastructure should be designed, constructed and operated in alignment with Boys (2021) and Boys et al. (2021), and "fish friendly" end-of-pipe screens should be selected to minimise mortality of fish, Platypus, amphibians and turtles, and to prevent infrastructure damage. 	Prior to, during and post-construction	OMPS and contractor
Disturbance of waterway beds and banks as a result of water extraction.	AE05	<ul style="list-style-type: none"> Ensure water extraction infrastructure is raised off the sediment to minimise erosion of the benthos. 	Prior to, during and post-construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Disturbance of waterway beds and banks, decrease in short to medium term water and sediment quality, short-term impediment of fish passage and impacts to potential Platypus burrow habitat as a result of the construction and installation of bridge/road crossings and power transmission lines.	AE06	<ul style="list-style-type: none"> • Ensure all waterway crossings comply with <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (Fairfull and Witheridge 2003) and <i>Policy and guidelines for fish habitat conservation and management</i> (Department of Primary Industries 2013). • Ensure Project management plans contain provisions for managing impacts and monitoring water quality, key fish habitat and fish passage during Project construction, in particular, bridge/road and transmission line waterway crossing installation. • Ensure the sections of waterway to be impacted by Project construction (i.e. bridge/road crossings, water extraction infrastructure installation) are surveyed for Platypus burrows and individuals and, if Platypus are located, that relocation surveys are undertaken prior to clearing and construction works. • Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Prior to and during construction	OMPS and contractor
Additional surveys and monitoring to identify any potential Project-specific impacts to aquatic vertebrate fauna species not yet identified from the Macleay River within the Project area.	AE07	<ul style="list-style-type: none"> • If practical, undertake follow up aquatic vertebrate fauna monitoring using a boat electrofisher as some areas with deeper water couldn't be accessed due to lack of boat access at the time of the field surveys. • Alternatively, purchase historic monitoring data from the DPI Fisheries. 	Prior to construction	OMPS
Erosion, siltation, scouring and degradation of the riparian zone, including an increase in instability of waterway banks and beds, as a result of construction activities.	AE08	<ul style="list-style-type: none"> • Ensure Project-specific management plans and relevant licenses contain provisions for managing water quality, water flow, aquatic habitat and riparian habitat, and include erosion and sediment management and mitigation measures such as silt fencing and sediment capture downslope of construction areas. • Ensure construction staff use specific tracks when accessing and moving through riparian corridors. • Fence off areas of riparian vegetation to exclude cattle and livestock. • Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Prior to and during construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Decrease in short to medium term water and sediment quality as a result of Project activities adjacent to the Macleay River.	AE09	<ul style="list-style-type: none"> • Ensure Project-specific management plans contain provisions for the management of construction pollutants (i.e. hydrocarbons, chemicals) to ensure that no contamination of waterways (or nearby soil) occurs. • Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Prior to and during construction	OMPS and contractor
Decrease in short to medium term water and sediment quality as a result of runoff and sedimentation attributed to inadequate post-construction rehabilitation and/or stabilisation methods.	AE10	<ul style="list-style-type: none"> • Ensure Project-specific management and rehabilitation plans contain provisions for managing water and sediment quality, downslope of constructed areas, postProject construction. • Undertake periodic monitoring or inspection of adjacent aquatic and riparian habitat during and postconstruction. • Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Construction	OMPS and contractor
Loss and/or reduced recruitment of native riparian plants, including potential loss of habitat and exacerbation of existing weed infestations, due to vegetation clearing, construction activities and water extraction during water extraction.	AE11	<ul style="list-style-type: none"> • Ensure that aquatic and riparian zones are progressively rehabilitated, if necessary, and managed in accordance with Project rehabilitation plans, and that adjacent disturbed areas are also rehabilitated (weed management, native vegetation planning, erosion control/prevention, fencing of waterways, etc), where practicable. • Ensure Project-specific management plans and relevant licenses contain provisions for managing water quality, water flow, aquatic habitat and riparian habitat, and include erosion and sediment management and mitigation measures such as silt fencing and sediment capture downslope of construction areas. Ensure construction staff use specific tracks when accessing and moving through riparian corridors. • Fence off areas of riparian vegetation to exclude cattle and livestock. • Ensure Project-specific management plans are prepared and implemented, prior to construction. 	Construction and post-construction	Contractor
Decrease in short to medium term water and sediment quality	AE12	<ul style="list-style-type: none"> • Consider developing site-specific water and sediment quality criteria for use in future monitoring. 	Prior to and during construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Risk of a lack of understanding and subsequent challenging by relevant regulatory departments and stakeholders of management approaches and aquatic offset strategy.	AE13	<ul style="list-style-type: none"> • Consultation with relevant regulatory departments should be undertaken as soon as practicable to ensure management of the Project in relation to aquatic, subterranean and groundwater dependent ecology, aligns with expectations, including but not limited to the DPI Fisheries and the Natural Resources Access Regulator (NRAR). • Consult with the DPI Fisheries regarding the implementation of an aquatic offset package if feasible for the Project, in alignment with <i>NSW Biodiversity Offsets Policy for Major Projects Fact sheet: Aquatic biodiversity</i> (Department of Primary Industries 2014). 	Prior to and during construction	OMPS and contractor
Aboriginal heritage				
Impact to known and unknown heritage sites and items	AH01	<p>An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared prior to construction and implemented to guide the process for management and mitigation of impacts to Aboriginal objects. The ACHMP will:</p> <ul style="list-style-type: none"> • include measures to further explore potential impacts and management prior to construction within the disturbance footprint • investigate, salvage or conserve ex situ areas of high research potential • outline specific requirements associated with archival recording and any other recovery and/or collection procedures • include other suitable monitoring, management, analysis, reporting and document lodgement procedures. 	Pre-construction, construction, operation	Contractor
Impact to known heritage sites and items	AH02	<p>Additional investigations, and, where deemed appropriate, salvage for ex situ conservation will be undertaken for sites OMPS-FA1, OMPS-FA3, OMPS-FA4 and OMPS-FA12, OMPS-FA2, OMPS-FA3, OMPS-FA4, OMPS-FA8, OMPS-FA9, OMPS-FA10, OMPS-FA11, and OMPS-FA13-15, amongst others. Post excavation analysis and reporting will also be undertaken.</p>	Pre-construction, construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Adverse visual impacts to heritage sites	AH03	Further consultation with relevant parties and, if appropriate, site visits to three potentially impacted cultural sites will be undertaken prior to construction. The sites are East Kunderang Station, Lower Creek/Long Flat camp, and AHIMS# 21-5-0023. Outcomes should include the identification of any impacts by the works and the identification suitable mechanisms to reduce or remove identified impacts, and these should be included in the ACHMP.	Pre-construction, construction	OMPS
Adverse cultural impacts	AH04	The development and implementation of an interpretation strategy and interpretation plan. These documents should focus on the ethnographic and historical record, consultation and input from the RAPs, and information obtained from the archaeological excavations and findings	Pre-construction, construction	OMPS
Adverse cultural impacts from excessive water use	AH05	Water taken from the Macleay River for the initial filling of the reservoirs and for periodical top ups is proposed to be taken from the Macleay River through a SPAL under the WM Act. The application for the SPAL is to consider the cultural significance of flows, which might include a background description of Aboriginal sites, objects, places and values, and their significance. Further investigation may be required for any potential impacts not identified in the ACHA.	Construction , operation	OMPS
Culturally modified trees will be damaged	AHR06	Where identified, culturally modified trees will be subject to inspection by an arboricultural consultant and treated as an Aboriginal site with appropriate management measures if no reasonable explanation for the tree's modifications is forthcoming.	Pre-construction, construction	OMPS and contractor
Adverse cultural impacts during construction and rehabilitation	AHR07	The Construction Environment Management Plan (CEMP), or equivalent, will reinforce how the cultural landscape is considered throughout the Project and detail the rehabilitation of the disturbance footprint.	Pre-construction	OMPS and contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Historic heritage				
Historic heritage	HH01	<p>A Historic Heritage Management Plan will be prepared to guide construction and operational activities of the Project. The management plan will include:</p> <ul style="list-style-type: none"> • historical heritage induction requirements • no-go areas • areas where further archaeological excavation is required • archival recording requirements • interpretation and reporting requirements • unexpected finds protocol. <p>The Plan will include the site specific management identified in the SOHI for Long Flat Station, Kunderang East Pastoral Station, the cultural landscape and any features identified with the Long Flat Station squatting run.</p>	Prior to construction	Contractor
Historic heritage	HH02	<p>The following site specific management measures are noted for heritage sites within the Project area, and are to be incorporated into the Historic Heritage Management Plan:</p> <ul style="list-style-type: none"> • Long Flat Station – Unexpected finds protocol, interpretation if relics are found. • Travelling Stock Camp [Crown Reserve No. 1075] – Unexpected finds protocol, interpretation if relics are found. • Kunderang East Pastoral Station – Archival photography. • Cultural landscape – Archival photography. • Any features identified with the Long Flat Station squatting run – Unexpected finds protocol. • Any other heritage items identified – Unexpected finds protocol. 	Prior to construction	Contractor/ OMPS
Water				
Groundwater inflow and drawdown	WM01	<ul style="list-style-type: none"> • Pre-grouting and post-grouting of fractures communicating groundwater. 	Construction	Construction contractor
Groundwater quality and drawdown	WM02	<ul style="list-style-type: none"> • Development of a SWMP with trigger levels assigned to water quality and groundwater levels. 	Pre-construction	OMPS

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Groundwater quality and drawdown	WM03	<ul style="list-style-type: none"> Continued monitoring during construction and operation of the Project, to align with the SWMP. 	Pre-construction, construction and operation	OMPS
Groundwater drawdown	WM04	<ul style="list-style-type: none"> Validation of the groundwater model prior to construction and considered every two years. 	Pre-construction, construction and operation	OMPS
Reduced Macleay River streamflow	WM05	<ul style="list-style-type: none"> General construction water to be sourced in accordance with rules specified in the relevant water sharing plan. 	Construction	Construction contractor
Reduced Macleay River streamflow	WM06	<p>The following measures will be applied to the extraction of water for initial storage fill and operational top-up:</p> <ul style="list-style-type: none"> extraction will only occur during high-flow (greater than 50th percentile) conditions extraction will not occur during extended dry periods or drought no extraction will occur during the first seven days of the first high-flow event following extended dry periods or drought to allow the river to recharge. 	Construction and operation	Construction contractor and OMPS
Surface water quality (stormwater discharge)	WM07	<ul style="list-style-type: none"> SWMPs and ESCPs will be developed for all construction areas. Stormwater system to be designed and constructed using industry standard practices. Sediment basins will be constructed where practical to capture and treat stormwater runoff. Areas with elevated risk of contamination will be separated from stormwater network. 	Construction	Construction contractor
Surface water quality (process water)	WM08	<ul style="list-style-type: none"> Source controls to be implemented to manage the volume and quality of process water produced. Process water will be treated for re-use to minimise risk of discharges. Surplus process water will be treated prior to discharge. 	Construction	Construction contractor
Surface water quality (wastewater)	WM09	<ul style="list-style-type: none"> Sewage treatment plants will be established to treat wastewater prior to discharge. Temporary ablution facilities with a pump out arrangement are proposed for low occupancy areas. 	Construction	Construction contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Surface water quality (spoil emplacements)	WM10	<ul style="list-style-type: none"> Runoff from upstream areas will be diverted to minimise the volume of water that contacts the emplacements. 	Construction and operation	OMPS
Instream structures	WM11	<ul style="list-style-type: none"> Instream structures and waterway crossings will be designed and constructed in general accordance with the relevant guidelines. 	Construction	Construction contractor and proponent
Increase flood level and extent	WM12	<ul style="list-style-type: none"> Macleay River bridge design to provide adequate waterway area to pass flood flows and minimise flood impacts. 	Construction	OMPS
Land				
Soil management	L01	<p>The primary objective of the soil management approach is to reinstate disturbed areas to as near as practical to pre-existing environmental conditions by:</p> <ul style="list-style-type: none"> Avoiding, minimising or mitigating impacts to soils. Maintaining soil quantity and quality. Restoring land to its pre-activity use but that it is also returned to its pre-activity productive capacity or potential productive capacity as soon as possible following completion of the activity. Returning the land to a stable landform (i.e. no subsidence or major erosion) with no greater management inputs than those required prior to land disturbance. <p>Soil Stripping and Management Plan (SSMP)</p> <p>Prepare a SSMP to ensure the preservation of soil resources, including quantity and quality to be managed, through the implementation of soil management measures, including guidance on:</p> <ul style="list-style-type: none"> clearing and grubbing soil stripping soil stockpiling soil amelioration soil reinstatement. 	Prior to construction	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Erosion and sediment control	L02	<p>Overarching principles of ESC are to include or consider:</p> <ul style="list-style-type: none"> • Prevention or minimisation of erosion where possible. • Minimising extent and duration of soil disturbance and avoiding land disturbance and construction during the wet season. • Suitable sediment control measures. • Where sediment basins are required (as above e.g. where soil loss exceeds 150m³/y) but where it is not practical to install (local management areas), ensure a compensatory level of erosion and temporary sediment controls are implemented to achieve an equivalent level of turbid water treatment. • Install stabilised construction exits where there is a risk of mud tracking onto public roads. <p>Detailed design</p> <ul style="list-style-type: none"> • Undertake suitable Project design that considers the soils, terrain and erosion hazard including erosion and landform modelling, soil loss calculations for sediment basin requirements and coagulant and flocculant bench testing. <p>Management plans</p> <p>Prepare suitable management plans for the management of soil and water for all Project disturbances in accordance with IECA (2008) and Landcom (2004), including:</p> <ul style="list-style-type: none"> • SWMP • ESCPs • Environmental Work Methods Statements (EWMSs) for planned and unplanned (emergency) works in sensitive environments. 	Prior to construction	Contractor
Site and landform stability	L03	<p>Geotechnical and erosion modelling is to be carried out as part of the detailed design and design parameters and measures adopted to minimise risks to landform stability.</p>	Detailed design	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Land use conflict	L04	<p>The performance targets associated with the potential high-risk conflicts to be adopted to manage potential land use conflicts include:</p> <ul style="list-style-type: none"> • The Construction Environmental Management Plan will include a complaint resolution and disciplinary procedure as a mechanism to address any issues identified by the local community and other roads users in relation to safety. • The Bush Fire Emergency and Evacuation Plan will be reviewed after incidents of bushfire or other fire events, as well as annually at the end of each bushfire season. The Bush Fire Emergency and Evacuation Plan will be amended after the review process, if required, to increase its effectiveness. 	Prior to construction	Contractor
Progressive rehabilitation	L05	Detailed Site Rehabilitation Plan(s) are to be prepared for progressive rehabilitation and are to consider the methods outlined in the Project Rehabilitation Strategy.	Construction	Contractor
Final land use	L06	A Rehabilitation and Final Land Use Plan is to be developed.	Prior to decommissioning	Contractor/Operator
Transport				
Narrow section of Kempsey Armidale Road and blind corners	T01	<p>A detailed Construction Traffic Management Plan (CTMP) will be prepared for the Project. The narrow sections of the road and corners where OSOM vehicular traffic may not be possible, appropriate traffic control measures will be implemented. The specific areas to assess include Kempsey Armidale Road at Pee Dee Creek, Five Day Creek, McGees Flat, Smiths Bluff.</p> <p>A framework of the CTMP is provided in Appendix R and includes, general requirements, vehicles types and routes, traffic control measures, outline emergency activity strategy, staff induction and other measures.</p>	Construction contractor	Prior to construction

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
	T02	Localised widening to be assessed at sections along Kempsey Armidale Road between, Pee Dee Creek and Pee Dee Road, O’Sullivan’s Gap, Blackbird Flat, McGees Flat, Smiths Bluff (refer to Appendix R for specific locations).	OMPS, Armidale Regional Council and Kempsey Shire Council (works are to approved the councils and funded by OMPS)	During construction
Rockfall, landslips etc at various sections of Kempsey Armidale Road	T03	Armidale Regional Council and Kempsey Shire Council current road reinstatement works as described in Appendix R.	Armidale Regional Council and Kempsey Shire Council	Multi-year program
The northbound right turn from Waterfall Way is too short for deceleration and storage due to the close proximity to an existing bridge. The approach to Waterfall Way from Kempsey is depressed in side cuts reducing intervisibility between vehicles on Waterfall Way and approaching vehicles from Kempsey. There are no acceleration lanes on Waterfall Way.	T04	Turn treatment assessment results require BAL/BAR for this intersection. Since the intersection has AUL/AUR turn treatment, which is a higher order turn treatment, additional turning lanes are not required. Stop sign warrant has identified the sight distance to be approximately 100 m which is less than the required 115 m. Rather than installing a ‘Stop’ sign it is recommended that vegetation and earth bank is cleared on the right side of Kempsey Armidale Road approach to increase available sight distances. This will be further considered during the detailed design phase Nevertheless, given the low volumes of heavy vehicles via Armidale and it is an existing road deficiency with no crash history, a ‘Stop’ sign should be considered for this intersection control. Furthermore, consideration to be given for temporary reduction of speed limit to 60 km/h on approach to Waterfall Way from Kempsey Armidale Road. The above recommended measures should improve safety at this intersection and will be further considered during the detailed design phase.	OMPS/ Construction contractor and Armidale Regional Council	During construction.

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Identified hazards in relation to bridges along the main haulage route from Kempsey	T05	<p>All bridges along the main haulage route from Kempsey to be subject to structural assessment during the detailed design phase.</p> <p>Alternating traffic control along single lane and narrow sections of bridges to be implemented where necessary.</p>	OMPS, Armidale Regional Council and Kempsey Shire Council (works are to be designed and approved by the councils and funded by OMPS)	Prior to construction
Roadside hazards along secondary haulage route from Armidale	T06	<p>A full review of the roadside vegetation and overgrown vegetation along the secondary haulage route from Armidale will be assessed during the detailed design phase. Vegetation should be regularly assessed and maintained along the entire haulage route during construction.</p> <p>Drivers to be aware of roadside hazards as per the Driver Code of Conduct.</p> <p>A comprehensive signage plan should be implemented along sections of Kempsey Armidale Road and will be assessed during the detailed design phase. Some suggested signages are presented in Appendix R.</p> <p>At some sections, guard rail and Road Edge Guide Post with Reflectors may be necessary.</p> <p>Speed limits along Kempsey Armidale Road should be reviewed and reduced where necessary. Speed limit should be posted along the road at critical points.</p> <p>Alternating traffic control for up to 5 km sections for periods of busy construction traffic where necessary, allowing one direction of traffic only. This is a secondary access route with low volumes and is operating within the design limitations of road.</p> <p>During adverse weather condition, an appropriate risk management should be undertaken, subject to the discretion of the contractor.</p> <p>During emergency situations, traffic movements to be assessed and may need to be temporarily ceased during adverse weather condition to avoid rockfalls.</p>	OMPS/ construction contractor, Armidale Regional Council, Kempsey Shire Council and TfNSW	Prior to construction

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Ongoing damage and dilapidation to the road and bridge once constructed.	T07	<p>Appropriate road management strategy needs to be in place. Any damaged section of the road needs to be repaired quickly, based on maintenance and dilapidation program agreed with council.</p> <p>Bridge parapets should be painted adequately where necessary.</p>	OMPS/ construction contractor, TfNSW, Armidale Regional Council and Kempsey Shire Council.	Post construction
Roadside hazards along main haulage route from Kempsey.	T08	<p>The existing line markings along the main haulage route needs to be reviewed during the detailed design phase. Faded lines need to be repainted.</p> <p>Proposed minimum 7.2 m sealed width between Pee Dee undertaken by Kempsey Shire Council and site access via EAR, subject to local design constraints e.g. minimum shoulder widths and possible need for guardrail and selected design vehicle.</p> <p>Drivers to be aware of road hazards as per the Driver Code of Conduct.</p> <p>Appropriate risk management should be undertaken on a regular basis, subject to the discretion of the contractor.</p>	OMPS/ construction contractor, TfNSW, Armidale Regional Council and Kempsey Shire Council.	Prior to construction
North Street is a narrow urban street with housing on one side of the road. An increase in heavy vehicle traffic may impact local noise levels and increase the risk of an accident involving a child or a vehicle accessing a driveway.	T09	<p>Drivers to take appropriate measure while driving through residential neighbourhoods as per the Driver Code of Conduct.</p> <p>Local noise levels to be managed as per recommendations of the Noise and Vibration Impact Assessment.</p> <p>To ensure safety to the school children, truck movements will be restricted during school term in NSW for the AM and PM peak school hours in school zones along the Kempsey Armidale Road.</p>	Construction contractor	During construction
Recreational motor bike riders along Kempsey Armidale Road are known to travel in bunches and sometimes arrive at high speeds increasing the risk of head-on crashes.	T10	<p>Motor bike riders to be alerted by appropriate signage of increased heavy vehicle traffic due to Project.</p> <p>Construction heavy vehicle drivers to be made aware of motor bike riders as per Drivers Code of Conduct.</p>	OMPS, construction contractor Armidale Regional Council and Kempsey Shire Council	During construction

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
In the mountainous sections of Kempsey Armidale Road, dense fog was observed severely restricting sight distances.	T11	Driver’s code of conduct to be followed. All vehicles to use headlights and fog lights during fog conditions.	Construction contractor	Prior to construction
In the east-west section travelling from Kempsey in the afternoon and vice versa in the mornings, sun glare was observed to be an issue.	T12	Driver’s code of conduct to be followed. Drivers to travel with appropriate caution and awareness of speed during critical morning and afternoon peak periods.	Construction contractor	During construction
Wet and dry weather hazards	T13	Drivers’ code of conduct to include driving in rainy weather in the area. Consider watering for dust control without creating other hazards e.g. slippery road surfaces.	Construction contractor	During construction
Existing road geometry and road conditions pose serious risks and hazards for OSOM vehicle movements	T14	A series of road modifications, traffic control measures and traffic sign removal and replacement measures are presented in the OSOM reports in Appendix R. The extent of road modifications required will be further detailed in the detailed design stage.	OMPS, construction contractor, Armidale Regional Council, Kempsey Shire Council and National Heavy Vehicle Regulator (NHVR)	During construction
Impacts on public transport buses, cyclists and pedestrians.	T15	The Project is unlikely to have any significant impact on public transport, cyclists and pedestrians. However, local schools should be informed about the presence of additional trucks in the area.	Construction contractor	During construction
Road signage deficiencies	T16	A comprehensive signage plan should be prepared for Kempsey Armidale Road for consideration of both Armidale Regional Council and Kempsey Shire Council respective local traffic committees.	Construction contractor	During construction

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Amenity				
Visual impacts during construction	LCV01	<ul style="list-style-type: none"> • Locate laydown areas in areas with limited visibility from residences and public roads. • Minimise creation of dust from vehicles and wind. • Restore or remediate any earthworks undertaken during construction. • Keep clearing and trimming of vegetation to a minimum. 	Detailed design	Contractor
Lighting design	LCV02	<ul style="list-style-type: none"> • Use landforms to shield the Project from view. • Use landscape elements (trees, mounding, walls) to shield effects of lighting from view. • Minimise upward spill light. • Direct light downwards, not upwards. • Use shielded fittings. • Avoid 'over' lighting. • Switch lights off when not required. • Use energy efficient bulbs. • Use asymmetric beams, where floodlights are used. • Ensure lights are not directed towards reflective surfaces. • Use warm white colours in lighting. 	Detailed design	Contractor
Vegetation retention	LCV03	<ul style="list-style-type: none"> • Minimise the amount of clearing will help reduce the visibility of the transmission corridor. • Consider retaining trees adjacent to roads as they form an existing screen. • Consider retaining trees along the river as an effective screen from the river and the National Trail. 	Detailed design	Contractor
Additional screening	LCV04	<ul style="list-style-type: none"> • Carry out further, targeted consultation at dwellings of visually impacted landowners to determine the effectiveness and feasibility of additional vegetation screening to reduce visual impacts 	Detailed design	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Construction noise	N01	<ul style="list-style-type: none"> • A construction noise and vibration management plan (CNVMP) that will address noise and vibration management and mitigation options (where required) will be prepared prior to construction. • The CNVMP will detail how construction noise and vibration impacts will be minimised and managed. • The CNVMP will describe how construction noise levels will be managed where predicted noise levels above the NMLs have been identified. • The CNVMP will address noise mitigation and management to reduce construction noise levels at the potentially most affected assessment locations. • The CNVMP will outline a procedure to: <ul style="list-style-type: none"> • Measure construction noise levels at early stages to validate the predicted construction noise levels. • Re-evaluate the predicted construction noise levels at assessment locations, and where required review noise management and mitigation measures to reduce levels as close to NMLs as possible. This may include (but is not limited to): <ul style="list-style-type: none"> – limiting construction within a certain distance of assessment locations during the evening and night-time period – selecting quieter equipment or reduced equipment fleet – measuring construction noise levels at assessment locations, especially during the evening and night-time period, if relevant, and implementing further noise management and mitigation measures where an exceedance of NMLs is identified, or – entering into a negotiated agreement with affected landholders. • Affected landholders should be consulted prior to and during construction where an exceedance of NMLs has been predicted and should be notified of proposed mitigation measures that will be used to manage construction noise levels to below ICNG NMLs where practicable. 	Prior to construction	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Vibration	V01	<ul style="list-style-type: none"> • The CNVMP will include as a minimum: <ul style="list-style-type: none"> – identification of nearby residences and sensitive land uses along with appropriate corresponding vibration criteria – a description of approved hours of work and what work will be undertaken – a description of what work practices will be applied to minimise vibration – a description of the complaints handling process – a description of monitoring that is required. • If the safe working distances are encroached vibration monitoring will be carried out at nearby heritage or infrastructure structures. If required, the monitoring system will be fitted with an auditory and visual alarm that triggers when vibration levels reach the nominated criteria. This would indicate if and when alternate work practices should be adopted (such as decrease vibratory intensity, alternate equipment selection, etc). • Blast practices should be reviewed when blasting occurs in the vicinity of significant heritage items listed. This may include limiting the MIC or re-assessing the significant and/or the sensitivity of these items to vibration prior to construction commencing in the area. • The potential for blast impacts on residents during the night period is considered highly unlikely given the distance and topography separation between construction and nearest residences. Notwithstanding, blast practices will be constantly reviewed and adapted if complaints are received from residents due to night blasting. • A survey of heritage items and other potential vibration sensitive receivers should be undertaken in the blast offset zone identified around the tunnel excavation portal. 	Prior to construction	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Operational Noise	N02	<p>All operational plant and equipment including ventilation, pumps, generators, transformers, VSD or other plant associated with the operation of the Project shall be subject to detailed acoustic review prior to final specification.</p> <p>Design shall be assessed against the requirements of the NPfI and consider the amenity criteria for passive recreation.</p>	During detailed design	Contractor
Air quality				
Particulate matter emissions	AQ01	<ul style="list-style-type: none"> • Dozer working areas will be watered. • Wind erosion from spoil disposal areas will be controlled through watering. • Unpaved roads within spoil movement areas will be watered using water carts. 	Construction and operations	Contractor
Diesel combustion emissions	AQ02	<ul style="list-style-type: none"> • More recent emission standard than USEPA Tier 2 will be sourced for mobile and stationary equipment where feasible. • Unpaved roads will be routinely maintained to reduce truck tyre rolling resistance. • All equipment will be routinely serviced to maintain manufacturers' emission specifications. • Idling of diesel equipment will be minimised wherever feasible. • Low-sulphur diesel fuels and lubricants will be used where feasible. 	Construction and operations	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
GHG	GHG01	<ul style="list-style-type: none"> Haul distances will be minimised in Project design as far as practicable to reduce diesel consumption. Haul roads will be routinely maintained to reduce truck tyre rolling resistance. Extraction practices will be reviewed to minimise double handling of materials and ensure that haulage is undertaken using the most efficient routes. Alternative fuels (e.g. low sulphur) will be considered where economically and practically feasible. Diesel equipment idling will be minimised wherever feasible. All equipment will be routinely serviced to maintain manufacturers' emission specifications to ensure operational efficiency. Monitor and report on developed targets for GHG emissions and energy use on a scheduled basis. Perform pre-start inspections at each shift on mobile plant and vehicles. Track electricity bills and fuel usage. 	Construction and operations	Contractor
Climate change	GHG02	<ul style="list-style-type: none"> Future design and construction management phases of the Project are to consider and incorporate where feasible, climate change adaptation measures. 	Construction and operations	Contractor
Hazards				
Risk from bushfires	HAZ01	APZs to be implemented in accordance with building classes.	Construction	Contractor
Risk from bushfires	HAZ02	Site rehabilitation and/or revegetation is not to occur where it will impact on APZ requirements for permanent/operational infrastructure.	Construction	Contractor
Risk from bushfires	HAZ03	Water supply requirements for firefighting, including the provision of hydrants and hose reels, are designed and constructed in accordance with the relevant Standards and <i>Planning for Bushfire Protection (PBP) 2019</i> .	Construction , operation	OMPS/contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Risk from bushfires	HAZ04	<p>A Bushfire Emergency and Evacuation Management Plan (BEEMP) is to be prepared for the Project Area. The BEEMP will include:</p> <ul style="list-style-type: none"> • site specific hazards and risk at each main works site • procedures to maintain bushfire awareness • ignition prevention measures • bushfire mitigation measures • fire preparedness actions • fire response actions • bushfire recovery steps. 	Pre-construction	OMPS
Increased risk from bushfires	HAZ05	On-site refuge buildings shall comply with BAL-12.5 construction standards of AS3959-2018 or the NASH Standard and Section 7.5 of PBP.	Construction	Contractor
Risk from bushfires	HAZ06	All habitable buildings proposed within the Accommodation Camp shall comply with BAL-29 construction standards of Australian Standard AS3959-2018 or the NASH Standard. Other buildings will be constructed in accordance with relevant National Construction Code provisions.	Construction	Contractor
Risk from bushfires	HAZ07	All permanent structures will be constructed as appropriate with respect to their BAL exposure, vulnerability and criticality.	Construction	Contractor
Risk from bushfires	HAZ08	Access roads and tracks will be constructed, upgraded and/or maintained to comply with performance criteria and/or acceptable solution requirements of PBP 2019 and NSW Rural Fire Service Fire Trail Standards.	Construction , operation	OMPS/contractor
Risk from bushfires	HAZ09	Low voltage powerlines are to comply with the performance criteria and/or the acceptable solutions of PBP 2019.	Construction , operation	Contractor
Flooding due to dam break	HAZ10	A coffer dam and diversion tunnel will be installed upstream of dam and reservoir construction areas to mitigate impacts to watercourses during construction and reduce flood risk. The coffer dam will be designed to bypass flows and provide flood immunity up to the 1% AEP design flood event.	Construction	Contractor
Flooding	HAZ11	Flood risk management procedures during construction and operation will be documented within a Project specific Flood Management Plan (FMP) to be developed prior to the commencement of construction. The FMP will include emergency management procedures for site access and egress during inundation of the low level bridge during flood and/or heavy rainfall events, such as evacuation of workers.	Pre-construction	Contractor

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Increased EMF due to electrical transmission infrastructure	HAZ12	After the HV powerline and associated substations have been installed, it is recommended that another EMF survey be conducted for assuring compliance with the applicable health and safety and radio frequency interference requirements.	Following construction	Contractor
Dangerous goods	HAZ13	Any transport of any dangerous goods is to be in accordance with the <i>NSW Work Health and Safety Act 2011</i> .	Construction	Contractor
Dangerous goods	HAZ14	Any storage of dangerous goods are to comply with the requirements of AS 2187.1:1998.	Construction	Contractor
Social				
Locality	SI01	<p>Ongoing consultation with landowners and the local community will be key in mitigating potential 'Locality' impacts and enhancing benefits. Ongoing consultation with landowners would be undertaken during the finalisation of the design to ensure the final design minimises any high visual impacts on the landscape and on local residences. Consultation would also be undertaken to keep the community informed as construction progresses, particularly in relation to key stages where impact to amenity may occur.</p> <p>The Project would develop strategies to encourage operation workers to contribute to the local community through volunteerism or other initiatives and would develop a Community Engagement Plan including initiatives to contribute to maintaining social cohesion in the local area.</p> <p>Development of strategies to increase the number of locally hired workers through upskilling and training would also minimise impact and enhance benefits.</p>	Pre, during and post-construction	OMPS
Infrastructure and services	SI02	<p>A workforce housing and accommodation strategy would be developed, detailing how the construction workforce will be housed prior to the completion of the accommodation camp. It is also proposed that the Project consult Kempsey Shire and Armidale Regional Councils and other relevant authorities to confirm the appropriateness of the strategy.</p> <p>It is proposed that the Project consult with NSW Health to confirm capacity of existing service provision and implement measures such as provision of on-site medical facilities to prevent competition for the GP services most proximal to the site.</p>	Pre-construction	OMPS

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Recreation	SI03	Notification of amenity impacts would be communicated to potential visitors including the Project’s stakeholder list and key tourism agencies such as the National Trail organisation and Destination NSW. The development and implementation of a workforce accommodation strategy would reduce the impact of reduced availability of tourist accommodation due to increased competition from the Project.	Pre-construction and during construction	OMPS
Traffic	SI04	The Project would provide SMS notifications to the community on the timing and frequency of road closures, over-sized over-mass vehicle movements and other key traffic movements in the local and regional area. In addition, the Project should consider reducing shift lengths for workers driving in separate vehicles to/from the Project area (not via bus) to manage fatigue.	Pre, during and post-construction	OMPS
Water	SI05	Given the high importance of the Macleay River to the community, the implementation of engagement responses is proposed to assist in quick issue identification and resolution, should issues be raised. This includes regular community construction updates to identify the Project actions taken to prevent risks, and to provide a pathway for community awareness and reporting of any issues. Further, accessible complaints and reporting pathways should be enacted to enable fast responses to any residual impacts affecting the community. An adaptive Water Management Plan would be prepared for the Project in consultation with NSW government agencies.	Pre, during and post-construction	OMPS
Culture	SI06	Detailed design for the Project would consider modification to avoid sites or objects of high cultural significance where possible. The effective implementation of the proposed Aboriginal Cultural Heritage Management Plan (ACHMP), as outlined in the ACHA, is key to improving cultural outcomes and to social cohesion between Aboriginal groups.	Pre-construction and during construction	OMPS

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Engagement	SI07	A comprehensive Communication and Engagement Plan (CEP) would be developed and implemented and would outline an effective approach to communication and engagement underpinned by a proactive issues-management approach, open and transparent two-way communication processes and responsiveness to the communication needs and expectations of key stakeholders and the broader community.	Pre - construction	OMPS
Economic				
Insufficient local employment opportunities	E01	Employ regional residents preferentially where they have the required skills and experience and can demonstrate a cultural fit with the organisation.	Construction and operation	OMPS and contractor
A lack of engagement with the local community	E02	Participating, as appropriate, in business group meetings, events or programs in the regional community. Provision of community enhancement schemes through various initiatives and programs within the local community, including the housing, education, arts, sporting, and culture sectors.	Construction and operation	OMPS and contractor
Insufficient local economic opportunities	E03	Locally sourcing non-labour inputs where local producers can be cost and quality competitive. Providing training and development to increase local economic opportunities.	Construction and operation	OMPS and contractor
A lack of local economic benefits arising from the Project	E04	OMPS will enter into Voluntary Planning Agreements (VPAs), or similar, with Armidale Regional and Kempsey Shire councils generally in accordance with Division 7.1(a) of Part 7 of the EP&A Act and/or community enhancement schemes. Payments to the councils can then be directed to a range of community infrastructure needs and programs.	Construction and operation	OMPS

Table E.1 Mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Waste				
Waste	W01	<p>A Construction Waste Management Plan (CWMP) will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The CWMP will include but not be limited to:</p> <ul style="list-style-type: none"> • measures to avoid and minimise waste associated with the Project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • spoil management measures and emplacement locations and designs • monitoring, record keeping and reporting. 	Pre-construction Construction Operation	Contractor
Waste	W02	The management and disposal of waste will be undertaken in accordance with Waste Classification Guidelines (NSW EPA, 2014a) and other relevant government policies.	Pre-construction Construction Operation	Contractor
Resource Recovery	W03	<p>Resource recovery will be applied when feasible. Instances may include:</p> <ul style="list-style-type: none"> • The recovery of resources for reuse – reusable materials generated by the Project will be segregated for reuse on site, or off site where possible, including the reuse of VENM when suitable. • Off-site recycling of materials generated during construction such as plastics, metals, and cardboards. • The recovery of resources for reprocessing – cleared vegetation will be used wherever possible to produce woodchips, compost, and mulch for rehabilitation purposes. 	Detailed design Pre-construction Construction	Contractor
Management of unexpected waste materials	W04	Unexpected waste materials, including contaminated materials, will be planned for through the preparation of appropriate areas for their storage or stockpiling. These areas will be stabilised, bunded, and hardstand or lined as applicable.	Detailed design Pre-construction Construction	Contractor