
Appendix D

Environmental risk assessment

This appendix provides an environmental risk assessment undertaken for the proposal to identify the potential key issues associated with the proposal, and the matters that require further consideration and assessment in the EIS.

D1 Methodology

To determine the residual impacts for each potential issue, a risk analysis involving a likelihood and consequence analysis was carried out in accordance with the principles of the Australian and New Zealand standard *AS/NZS ISO 31000:2018 Risk Management – Principles and Guidelines*.

The analysis involved identifying potential impacts resulting from the proposal and then assigning a rating of the risk of these impacts. The risk is determined through identifying the likelihood of an impact occurring (refer to Table D.1 for definitions) and the consequences of the impacts (refer to Table D.2 for definitions).

Using the identified likelihood and consequence the matrix outlined in Table D.3 is applied to identify a level of risk.

Table D.1 Risk analysis likelihood definitions

Likelihood	Qualitative measure of likelihood (how likely is it that this event/issue will occur)
Almost certain	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur in some circumstances but considered doubtful
Rare	May occur in exceptional circumstances

Table D.2 Risk analysis consequence definitions

Consequence level	Definition
Insignificant	<ul style="list-style-type: none"> Environmental impacts (flora, fauna, soil, air, water, noise, waste, heritage items) contained within site boundaries. Negligible impact on the environment, including flora, fauna and ecosystems. Change from normal conditions however remains within regulatory requirements, and industry guidelines. No remedial works are required to address pollution or damage.
Minor	<ul style="list-style-type: none"> Environmental impacts (flora, fauna, soil, air, water, noise, waste, heritage items) are minor, localised, short-term (for life of the project) and able to be repaired/ rehabilitated. Some localised impact on the environment, such as damage to flora, fauna or ecosystems which will recover in a short-term period. Complies with regulatory requirements; breach of industry guidelines. Minor /short-term site remedial works required to address pollution or damage.

Consequence level	Definition
Moderate	<ul style="list-style-type: none"> Moderate, short term environmental impacts (flora, fauna, soil, air, water, noise, waste, heritage items), able to be repaired/ rehabilitated. Damage to flora, fauna or ecosystems which will recover in a medium to long-term period. Breach of regulatory requirements or regulatory licences, issue of a warning or penalty notice. Threatens local area biodiversity, heritage, remediated lands management action required.
Major	<ul style="list-style-type: none"> Significant environmental harm (flora, fauna, soil, air, water, noise, waste, heritage items) requiring comprehensive remedial works. Loss of local populations of particular flora or fauna. Breach of regulatory requirements resulting in penalty notice and state-wide media attention. Medium to long term loss of flora/fauna from an area, or significant degradation of habitat quality, or loss/damage to a heritage item, or damage to remediated lands infrastructure.
Extreme	<ul style="list-style-type: none"> Severe environmental harm (flora, fauna, soil, air, water, noise, waste, heritage items) requiring extensive remedial works. Extinction, loss of species, ecosystems collapse and/or key phylogenetic individual. Significant breach of regulatory requirements resulting in prosecution and sustained national media coverage. Long-term or permanent loss of flora/fauna from an area, or significant degradation of habitat quality, or loss/damage to a heritage item, or significant damage to remediated lands infrastructure.

Table D.3 Risk rating matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Extreme
Almost certain	Medium	High	High	Very High	Very High
Likely	Low	Medium	High	High	Very High
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

D2. Summary of Environmental risk analysis

Based on the results of the analysis outlined in section D3 (including Table D.5) a review was undertaken for each of the environmental issues considered to confirm whether the risks/impacts considered would result in the issue being considered a key issue, requiring a detailed assessment or another issue, requiring a standard assessment; as defined in *State significant infrastructure guidelines – preparing an environmental impact statement*, (DPIE 2021a). A summary of the findings are provided in Table D4.

Table D4 lists the risk highest risk category identified. Where analysis identifies an environmental aspect with risks that have a range of ratings, the highest risk rating would determine the final risk category for that environmental aspect.

This assessment considers the risk prior to inclusion of the mitigation measure listed. This assessment does include the general concept design and assessment method proposed in the scoping report, which in themselves have been developed to design out impacts at an early concept stage.

Table D.4 Summary of environmental issue risk categories

Environmental Issue	Highest risk category before mitigation	Highest risk category after mitigation	Level of assessment
Hydrology and surface water	High (four risks)	High (two risks)	Detailed (see section 6 and 10)
Flooding	High (one risk)	Medium (one risk)	Detailed (see section 7)
Groundwater	Medium (one risk)	Low (three risks)	Detailed (see section 8)
Geomorphology	Medium (one risk)	Low (two risks)	Detailed (see section 9)
Aquatic flora and fauna	High (one risk)	Medium (two risks)	Detailed (see section 10)
Terrestrial flora and fauna	High (four risks)	High (three risks)	Detailed (see section 11)
Aboriginal heritage	Very high (one risk)	Very high (one risk)	Detailed (see section 12)
Non-Aboriginal heritage	Very high (two risks)	Very high (two risks)	Detailed (see section 13)
Land use, property and agriculture	Medium (four risks)	Low (five risks)	Standard (see section 14)
Traffic and access	Medium (one risk)	Low (six risks)	Standard (see section 15)
Noise and vibration	Low (three risks)	Low (three risks)	Standard (see section 16)
Visual amenity	Medium (two risks)	Low (two risks)	Standard (see section 17)
Public health and safety	Medium (two risks)	Low (four risks)	Standard (see section 18)
Social	Medium (two risks)	Low (two risks)	Detailed (see section 19)
Ground conditions and particulates	Medium (four risks)	Low (six risks)	Standard (see section 20 and section 21)
Waste management and resource use	Medium (one risk)	Low (four risks)	Standard (see section 22)
Sustainability and climate change	Low (three risks)	Low (three risks)	Standard (see section 2.8)
Cumulative impacts	Very high (one risk)	Very high (one risk)	Standard (see section 23)

D3. Identification of environmental risk categories

Using the methodology outlined in section D1, the environmental risk assessment results for the proposal are presented in Table D.5.

Table D.5 Environmental risk assessment

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Hydrology and surface water									
1.	Hydrology – Changes to flows downstream of the new regulators	Operation	-	-	-	Minor increase in annual flow volume at Darlot – Benefit to environment and businesses.	-	-	-
2.	Hydrology – changes to water velocities upstream and downstream of the new regulators	Construction Operation	Almost certain	Moderate	High	More likely at Hartwood regulator rather than Wanganella.	Almost certain	Moderate	High
3.	Hydrology – additional inundation of Billabong Creek upstream of the new regulators	Operation	Almost certain	Minor	High	Increase in weir pool depth will result in minor increase in weir pool lateral extent – noting there is an upstream hydraulic control feature that will remain; water velocity is directly related to depth.	Almost certain	Insignificant	Moderate
4.	Hydrology – an increase in the full supply level and depth of water in the new weir pools	Operation	Almost certain	Moderate	High	Water velocity is directly related to depth. Primarily associate with Hartwood weir pool. Not of 'benefit to environment' but may be for businesses.	Almost certain	Moderate	High

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
5.	Water quality – reduced water quality due to instream construction and demolition, dewatering, erosion and sedimentation	Construction	Likely	Moderate	High	<p>Main hazard is instream construction activities resulting in mobilisation of sediments.</p> <p>Likely to occur but be short-term and spatially limited.</p> <p>Noting also that Billabong Creek is a highly turbid waterway typically, and the aquatic values/communities are unlikely to be highly sensitive to this perturbation. Standard management measures will be used.</p>	Possible	Moderate	Medium
6.	Water quality – reduced water quality due to, leaks and spills.	Construction	Possible	Moderate	Medium	<p>If leaks or spills were to occur they would have a short-term and localised impact on aquatic values and habitats. Standard spill management measures will be used.</p>	Unlikely	Moderate	Medium

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
7.	Water quality – Surface water quality impacts due to erosion and sedimentation related to the new infrastructure, bank stabilisation works	Operation	Unlikely	Minor	Low	Assumed that design criteria include specific provision for erosion and sediment control – rock beaching and armouring, bank revegetation - noting significant erosion and bank destabilisation was noted at the existing structures, suggested highly energetic flows occur in the system.	Rare	Minor	Low
8.	Water quality – Surface water quality impacts due to leaks and spills	Operation	Possible	Moderate	Medium	If leaks or spills were to occur they would have a short-term and localised impact on aquatic values and habitats.	Unlikely	Moderate	Medium
9.	Water quality – thermal stratification of the weir pools	Operation	Possible	Moderate	Medium	Stratification is directly related to water depth in riverine systems; potential to exacerbate blue green algal (BGA) blooms and other algae; favour exotic pest species.	Possible	Moderate	Medium

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
10.	Water quality – Potential exposure of acid sulfate soils resulting in offsite discharge of acidic water	Construction	Possible	Moderate	Medium	Assessment of risk to be completed. Acid Sulfate Soil (ASS) management plan, if required.	Unlikely	Minor	Low
Flooding									
11.	Impacts on flooding due to the interruption of overland flow paths by temporary construction structures, materials, plant and equipment, etc	Construction	Possible	Moderate	Medium	Standard control measures. Design of access roads to include a ford to minimise flow interruption.	Unlikely	Minor	Low
12.	Impacts on flooding due to changes in overland flow paths as a result of the interruption of flood flows by permanent structures and regulator operations	Operation	Almost certain	Moderate	High	The design includes a new flood bypass channel at Wanganella. This would minimise flooding impacts to sensitive receivers and prevent interruption of flood flows.	Possible	Minor	Medium

Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Groundwater								
13. Impacts to nearby groundwater bores and groundwater dependent ecosystems due to groundwater drawdown, groundwater extraction for water supply, changes to groundwater quality and quantity and/or flow paths.	Construction	Unlikely	Minor	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low
14. Changes to local surface water and groundwater interactions from changes to weir pool levels through the operation of the regulators impacting groundwater levels and groundwater dependent ecosystems	Operation	Possible	Minor	Medium	Groundwater is disconnected from the weir pool and there is negligible chance of surface water effects. Minor to negligible effects on groundwater from weir pool reduction.	Unlikely	Minor	Low
15. Impacts on groundwater quality due to mobilisation of contaminants, acidification or leaks and spills.	Construction Operation	Possible	Minor	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low

Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Geomorphology								
16. Creek bank slumping and erosion, mobilisation of sediment and changes to bed profiles from construction activities and removal of existing weirs.	Construction	Unlikely	Minor	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low
17. Creek bank slumping and erosion, altered inundation of channel margins and changes to bed profiles from operations of the new regulators.	Operation	Possible	Minor	Medium	Measures to manage potential risks are incorporated into the design.	Unlikely	Minor	Low
Aquatic flora and fauna								
18. Impacts on aquatic ecology and threatened species, including as a result of riparian and aquatic vegetation removal, fauna injury or mortality, introduction of weeds and pathogens, or changes in geomorphology and water quality	Construction	Likely	Moderate	High	Highly likely that one of the risk pathways will occur during construction	Possible	Moderate	Medium

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
19.	Changes to flow rates impacting fish habitats aquatic ecology and threatened species.	Operation	Possible	Moderate	Medium	More likely at Hartwood regulator rather than Wanganella; flow dependant native species are known to occur through the proposal area – fish passage barrier will remain upstream and downstream of the proposal area, limiting breeding migration; greater area of slow-no flowing habitat has the potential to have exotic pest species.	Possible	Moderate	Medium
20.	Impacts to fish passage from changes to weir pool levels, operation of regulators or maintenance of the fishway	Operation	Rare	Minor	Low	Mitigated through fishway design. Existing barrier to fish passage will remain throughout the system both upstream and downstream of the two regulator sites.	Rare	Minor	Low

Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Terrestrial flora and fauna								
21. Clearing of native vegetation resulting in loss of threatened species habitat	Construction	Almost certain	Moderate	High	Residual impacts are near certain and will require biodiversity offsets. Regeneration could be achieved over much of the proposal footprint including the CAZ and power supply vegetation clearance corridor.	Almost certain	Moderate	High
22. Clearing of native vegetation resulting in habitat fragmentation and loss of connectivity	Construction Operation	Almost certain	Minor	High	Residual impacts are near certain however relatively minor in extent and duration. Understorey vegetation would regenerate and partial habitat connectivity could be maintained over much of the proposal footprint including the construction activity zone (CAZ) and power supply vegetation clearance corridor.	Almost certain	Minor	High

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
23	Adverse impacts to native vegetation of threatened species habitat from changes to hydrology	Operation	Possible	Moderate	Medium	Operation of the regulators will change the frequency, duration and depth of inundation of floodplain vegetation communities. Changes are likely to be within the range of tolerance of affected communities. Flood-sensitive vegetation is unlikely to be affected as changes would be limited to the lower floodplain.	Unlikely	Minor	Low
24	Direct removal of listed threatened flora species and endangered terrestrial populations and ecological communities	Construction	Likely	Moderate	High	Unlikely to result in impacts to endangered terrestrial populations and ecological communities however residual impacts to local populations of threatened flora species are likely. Measures to avoid and minimise impacts would reduce extent and consequence.	Likely	Minor	Medium

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
25	Direct removal or modification of potential habitat for listed threatened fauna species	Construction	Almost certain	Moderate	High	Residual impacts are near certain and would include removal of higher value fauna habitat features and resources. Measures to avoid and minimise impacts would reduce risk of harm to resident fauna and the extent and consequence of habitat removal.	Almost certain	Moderate	High
26	Increased native fauna mortality from risk of collision with construction vehicles, impacting populations	Construction	Unlikely	Moderate	Medium	Mitigation measures such as speed limits and daylight work hours would reduce likelihood.	Rare	Moderate	Low
27	Impacts to native vegetation (including EECs) and threatened species due to the transport of weeds and pathogens	Construction	Unlikely	Minor	Low	Mitigation measures such as excluding access beyond CAZs and vehicle hygiene protocols would reduce likelihood and consequence.	Rare	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
28	Impacts on groundwater dependent ecosystems	Construction	Unlikely	Insignificant	Low	No groundwater interception or extraction or substantial earthworks are proposed. Impacts would be restricted to minor changes to the catchment surface within earthworks areas. This would affect a negligible portion of the catchment and aquifer.	Unlikely	Insignificant	Low
29	Indirect impacts on threatened flora and plant communities due to increased dust, sedimentation and erosion during construction	Construction	Unlikely	Minor	Low	Standard construction industry mitigation measures would reduce likelihood and consequence.	Unlikely	Insignificant	Low
30	Indirect impacts on threatened flora and plant communities due to increased dust, sedimentation and erosion during periodic operation of the regulator	Operation	Rare	Insignificant	Low	Risk would decline significantly after construction. Standard environmental management measures would further reduce likelihood and consequence.	Rare	Insignificant	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
31.	Indirect impacts on fauna due to increased dust, sedimentation and erosion, noise and light during construction or operation of the regulator	Construction Operation	Unlikely	Minor	Low	Noise impacts would be restricted to daylight hours and light impacts would only occur under exceptional circumstances. Standard construction industry mitigation measures would reduce likelihood and consequence of all indirect impacts. Risk would decline significantly after construction	Unlikely	Insignificant	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
32	Impacts on the biodiversity values of protected and sensitive lands, including wetlands, National Parks and ecological conservation areas	Construction Operation	Rare	Insignificant	Low	There are sensitive wetlands near the proposal footprint on the north bank at Wanganella and the vicinity of the Forest Creek block bank. Mitigation measures such as excluding access beyond CAZs, soil and surface water management measures, and vehicle hygiene protocols would reduce likelihood and consequence of potential impacts from construction. Operational effects would be minor and beneficial to wetlands through slight increase in weir pool depth and extent and improved delivery of environmental water requirements.	Rare	Moderate	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
33	Poor regeneration of native species	Operation	Possible	Minor	Low	Operational activities and/or adverse weather or floodplain hydrology may limit regeneration of the CAZ and power supply construction areas. Could be mitigated through assisted regeneration through supplementary planting or water.	Unlikely	Minor	Low
Aboriginal heritage									
34	Impacts on registered Aboriginal heritage items/sites and areas of known Aboriginal cultural sensitivity. Impacts on areas of potential archaeological deposits	Construction	Almost certain	Major	Very High	The proposal will result in harm to Aboriginal cultural material in areas of ground disturbance should it be present within the study area. Five identified sites are expected to be destroyed or removed from current location. Proposal area is considered to have moderate archaeological potential.	Almost certain	Major	Very High

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
35	Impacts on unidentified Aboriginal heritage items or areas of archaeological sensitivity of cultural value	Construction	Possible	Moderate	Medium	Provision of unexpected finds process.	Possible	Minor	Medium
36	Impact on potential archaeological deposits, areas of known Aboriginal cultural sensitivity and unidentified items or areas during operation.	Operation	Unlikely	Minor	Low	Additional areas of impact are not anticipated during operation. An OEMP will include measures to manage maintenance activities.	Rare	Minor	Low
Non-Aboriginal heritage									
37	Impacts on listed heritage items and known areas of archaeological potential	Construction Operation	Almost certain	Extreme	Very High	Hartwood Weir (State Water S170 4550110) is of local significance, and works would cause permanent and irreversible changes to this heritage item.	Almost certain	Major	Very High
38	Impacts on newly identified heritage items	Construction Operation	Almost certain	Extreme	Very High	Wanganella Weir is of local significance, and works would cause permanent and irreversible changes to this heritage item.	Almost certain	Major	Very High

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
39	Impacts on unknown heritage items (e.g. archaeological items)	Construction	Possible	Major	High	Site-specific cultural heritage inductions and an unexpected finds protocol are to be implemented across the proposal.	Unlikely	Minor	Low
40	Impacts on heritage items due to changes in Billabong Creek water levels and flow speeds	Operation	Unlikely	Insignificant	Low	As there would be minimal change to water flows, neither heritage item would be subject to additional hydrological impacts.	Unlikely	Insignificant	Low
Land use, property and agriculture									
41.	Temporary changes to land use, access and agricultural productivity due to the leasing and use of land for the disturbance area, access and ancillary facilities.	Construction	Possible	Minor	Medium	Ongoing consultation with landowners.	Unlikely	Minor	Low
42.	Permanent changes to land use, agricultural productivity, severance of land, creation of an easement or acquisition of land for permanent infrastructure resulting in changes or limitations on land use (including private/public land)	Operation	Possible	Minor	Medium	Ongoing consultation with landowners.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
43	Effects to access to Travelling Stock Reserves and other stock movements	Operation	Possible	Minor	Medium	Impacts minimised to electricity pole installation.	Unlikely	Insignificant	Low
44	Introduction of biosecurity risks due to the movement and storage of machinery and materials, including the spread of weeds and pathogens	Construction Operation	Unlikely	Minor	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low
45	Impacts to the location and efficiency of water users' stock and domestic pumps	Construction Operation	Possible	Moderate	Medium	Distance from pumps and construction methodology selected for works are designed to minimise impacts.	Unlikely	Insignificant	Low
Traffic and access									
46	Changes to road network performance due to construction vehicle movements (including workforce)	Construction	Unlikely	Minor	Low	Proposal is expected to have minimal impacts to the peak hour traffic volumes.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
47	Impacts to condition of roads due to increased vehicular traffic	Construction	Unlikely	Minor	Low	Road Dilapidation Report prior to construction commencing and following completion of construction. Any defects attributable to construction activities shall be rectified or compensated in consultation with the relevant road authorities.	Unlikely	Minor	Low
48	Impacts on access to and within properties	Construction	Unlikely	Minor	Low	The construction traffic management plan shall indicate routes to be used to minimise impacts on properties, sensitive land uses and businesses.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
49	Impacts to the performance of the road network during operation	Operation	Unlikely	Minor	Low	No mitigation required the forecast traffic movements during operations are up to one inbound and outbound vehicle movement per day. Therefore, the impact on road network created by the proposal during the operational phase will be negligible.	Unlikely	Minor	Low
50	Deposits of construction materials on roads leaving to and from the proposal site.	Construction	Unlikely	Minor	Low	Monitor the roads leading to and from the proposal footprint and take necessary steps to rectify any road deposits caused by site vehicles as soon as reasonably practicable, to maintain the safety of road users. Where possible, offset the construction vehicle activity from peak periods of road network activity.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
51.	Safety implications arising from the general increase in traffic volumes	Construction	Almost Certain	Minor	Medium	The construction traffic management plan shall detail measures to manage traffic flows around the area affected by the construction of the proposal, including, as required, regulatory and direction signposting, line marking, and variable message signs and all other traffic control devices necessary for the implementation of the construction traffic management sub-plan	Unlikely	Minor	Low
Noise and vibration									
52.	Potential exceedances of airborne noise management levels from activities within and outside standard construction hours, including activities at construction compounds and construction traffic	Construction	Likely	Minor	Low	Implementation of construction noise environmental safeguards	Possible	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
53	Potential exceedances of human comfort vibration levels during construction or work within safe working distances to structures	Construction	Unlikely	Minor	Low	Maintain vibration safe working distances	Rare	Minor	Low
54	Noise impacts from the use of equipment and vehicles during operational activities such as maintenance	Operation	Unlikely	Minor	Low	Implementation of operational noise environmental safeguards	Rare	Minor	Low
Visual amenity									
55	Adverse impacts on visual amenity from private/public places due to construction activities (e.g. vegetation clearing and earthworks), lighting, construction traffic, ancillary infrastructure	Construction	Possible	Minor	Medium	Distance from sensitive receivers and standard site management measures will reduce likelihood of impacts.	Unlikely	Minor	Low
56	Adverse amenity impacts from the operational structures.	Operation	Possible	Minor	Medium	As vegetation re-establishes, new structures will be absorbed into the environment.	Unlikely	Minor	Low

Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures			
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating	
Public health and safety									
57	Potential risks to the proposal by bushfire, or bushfire risks due to the proposed activity in bushfire prone areas	Construction Operation	Possible	Minor	Medium	Bushfire risk management measures will be incorporated.	Rare	Minor	Low
58	Potential incidents associated with transport and storage of hazardous materials and dangerous goods	Construction Operation	Unlikely	Minor	Low	Transport and storage of hazardous materials not anticipated for the proposal.	Rare	Insignificant	Low
59	Potential risk to life and property from dam failure	Construction Operation	Unlikely	Minor	Low	Dam failure assessment carried out.	Rare	Insignificant	Low
60	Potential public safety risks, particularly for people swimming or boating, from the new regulators	Operation	Possible	Minor	Medium	Risks not greater than for existing structure. New structures will be safer than old weirs.	Rare	Insignificant	Low
Social									
61.	Disruptions to landholders due to access requirements for construction activities.	Construction	Possible	Minor	Medium	Ongoing consultation will manage and minimise impacts.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
62	Disturbance to recreational users of the river and recreational areas in close proximity to proposal sites due to construction amenity impacts.	Construction	Possible	Minor	Medium	Proposal sites will be restricted from access, minimising nearby amenity issues.	Unlikely	Minor	Low
63	Short term employment and business opportunities during construction of the proposal, including use of short term accommodation.	Construction	-	-	-	Benefit to local businesses and regional workforce	-	-	-
64	Improved water security for local and regional communities.	Operation	-	-	-	Benefit to regional communities	-	-	-
65	Improvement to potential cultural flows of water, contributing to improved environmental and Aboriginal cultural outcomes.	Operation	-	-	-	Benefit to Aboriginal communities and environment	-	-	-
66	Improved water reliability and management, benefiting regional industries and local businesses, particularly agricultural operations.	Operation	-	-	-	Benefit to regional communities and businesses	-	-	-

Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
		Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Ground conditions and particulates								
67. Physical or chemical changes to soil quality due to soil disturbance or compaction by construction activities and removal of vegetation.	Construction	Unlikely	Minor	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low
68. Disturbance/erosion of soils and contaminated soils, and subsequent mobilisation resulting impacts at adjacent receivers	Construction	Possible	Minor	Medium	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low
69. Exposure of acid sulfate soils or soil salinity during earthworks, and subsequent impacts to receiving environments and/or sensitive receivers.	Construction	Possible	Moderate	Medium	ASS and soil salinity management plans, if required.	Unlikely	Minor	Low
70. Contamination of soil due to leaks and spills	Construction	Possible	Moderate	Medium	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
71.	Erosion or contamination of soil due to leaks and spills during operational maintenance activities including vegetation management within easements	Operation	Possible	Moderate	Medium	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Minor	Low
72.	Local air quality impacts during construction or operation from dust or equipment.	Construction Operation	Unlikely	Insignificant	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Rare	Insignificant	Low
Waste management and resource use									
73	Litter and construction waste polluting downstream watercourses and land used during construction.	Construction	Possible	Insignificant	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Insignificant	Low
74	Generation of excess spoil that cannot be reused on site (unsuitable for reuse or insufficient space) and needs to be disposed of	Construction	Possible	Minor	Medium	Standard industry mitigation measures would reduce likelihood and consequence.	Unlikely	Insignificant	Low
75	Increased resource demand or water supply on local and regional resources resulting in a resource becoming in short supply	Construction	Unlikely	Minor	Low	Standard industry mitigation measures would reduce likelihood and consequence.	Rare	Insignificant	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
76	Inappropriate management of waste generated during operation	Operation	Unlikely	Insignificant	Low	Operational management and maintenance plans.	Rare	Insignificant	Low
Sustainability and climate change									
77	Impacts to infrastructure due to increased rainfall/flooding.	Operation	Unlikely	Minor	Low	Design will include this eventuality	Rare	Minor	Low
78	Impacts to infrastructure due to more frequent and severe heat events or droughts.	Operation	Unlikely	Minor	Low	Design will include this eventuality	Unlikely	Minor	Low
79	Carbon emissions during construction from embodied energy in materials, or emissions from construction plant and vehicles	Construction	Unlikely	Minor	Low	Standard industry mitigation measures would reduce consequence.	Unlikely	Minor	Low
Cumulative impacts									
80	Potential temporary cumulative impacts with other major projects	Construction	Possible	Minor	Medium	Construction methodology and standard industry mitigation measures would reduce consequence.	Unlikely	Minor	Low

	Risk prior to additional mitigation measures	Proposal phase	Environmental risk assessment before mitigation measures.			Comment / response	Environmental risk assessment after mitigation measures		
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
81.	Potential permanent cumulative impacts with other major projects.	Operation	Almost certain	Extreme	Very High	Hydrologically projects would benefit Billabong Creek by improving the management of water. The loss of non-Aboriginal heritage, cannot be full mitigated through interpretation, and would combine with the loss of weirs in other projects. All weirs are locally listed or valued.	Almost certain	Major	Very High