

Attachment 7 – “Environment and Heritage” tables Appendix F-12

Dam Wall - Risk and Opportunity Assessment

| Activity Description | Aspect | Attribute | Impact | Environment and Heritage | | | | | | | | | | | | | | | | | | Mitigation Measures |
|---|---|--------------------------------------|--|--------------------------|-------------------|---------------|------------------|----------------------------------|---------------|------------|----------------------------------|---------------|------------|----------------------------------|---------------|------------|----------------------------------|---------------|------------|----------------------------------|---------------|---|
| | | | | Local | | | | | | | | | Regional | | | | | | | | | |
| | | | | Immediate | | | Short Term | | | Long Term | | | Immediate | | | Short Term | | | Long Term | | | |
| | | | | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | |
| Construction of RCC dam wall, earth embankment and spillway | Dust from haulage vehicles travelling along unsealed areas | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 5 Rare | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | Educate workers on driving practices to minimise dust Use posts/kerbs to restrict travel on un-designated routes Water unpaved roads @ 2 l/m ² /hr, or as required to prevent visible dust Seal regular trafficked areas, where possible Minimise vehicle speeds on unsealed roads in high risk areas (~20km/hr) Use dust suppressants (chemical binding agents, compacted road base, aggregate etc) |
| Construction of RCC dam wall, earth embankment and spillway | General activities associated with construction of the Dam Wall | Landscape Character & Visual Amenity | Potential for visual obtrusion to existing views | 1 Almost certain | 1 Major (impact) | VH | 1 Almost certain | 1 Major (impact) | VH | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 2 Moderate (impact) | M | 4 Unlikely | 2 Moderate (impact) | M | 4 Unlikely | 3 Minor (impact) | L | Protect and enhance the landscape and visual amenity of the visual catchment during construction of the Project. Engage affected communities and individuals in the landscape design of the Project. Protection and management of native vegetation within the dam wall construction area footprint particularly downstream riparian vegetation and remnant native forest and bushland vegetation above the spillway. Land-forming and landscape treatment of spoil placement adjacent to the downstream face of the wall to reduce the apparent height of the wall and provide a suitable foundation for screen planting and other uses. Spoil is to be placed in a form consistent with local topography and landscape to avoid simply enlarging the engineering bulk of the impoundment structures |
| Construction of RCC dam wall, earth embankment and spillway | Exhaust emissions from construction vehicles and equipment | Air | Potential degradation of local air quality due to the suspension of dust | 4 Unlikely | 5 Minor (benefit) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Maximise buffer distance to sensitive places Regularly maintain construction vehicles and equipment Minimise extended engine idle times |
| Construction of RCC dam wall, earth embankment and spillway | Dust from unloading and placement of excavated materials and during construction of embankment wall | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Maximise buffer distances to sensitive places Minimise speed of vehicles (including scrapers, spreaders and dozers) Stabilise areas as soon as practicable Use of water sprays during unloading and on unsealed areas Install temporary wind/dust fencing around works, as required |
| Construction of RCC dam wall, earth embankment and spillway | Dust from drilling and blasting rock from spillway | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Water sprays and bag filters on drills Prohibit blasting during periods when strong winds are blowing towards sensitive receivers Design blasting program to minimise dust emissions |
| Construction of RCC dam wall, earth embankment and spillway | River channel diversion | Water Quality | Potential degradation of water quality due to increase in turbidity and/or suspended solids downstream | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Appropriate construction, erosion and sediment control measures per the Queensland Guidelines for Erosion and Sediment Control Appropriate timing and duration of construction activities to minimise exposure to wet season/wet weather conditions |
| Construction of RCC dam wall, earth embankment and spillway | Release of water from retention ponds during flood events | Water Quality | Potential degradation of water quality due to increase in turbidity and/or suspended solids downstream | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Designed for once in 10 year flood Appropriate construction, erosion and sediment control measures per the Queensland Guidelines for Erosion and Sediment Control Appropriate timing and duration of construction activities to minimise exposure to wet season/wet weather conditions |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities and bunding | Terrestrial Flora and Fauna | Noise disturbance to local fauna causing displacement of fauna | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Noise mitigation measures on site construction equipment |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities and bunding | Aquatic Flora and Fauna | Increased sediment runoff, increase in turbidity and/or suspended solids downstream and modification to in-stream habitat | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Appropriate timing and duration of construction activities to minimise exposure to wet season/wet weather conditions Appropriate erosion and sediment control measures per the Queensland Guidelines for Erosion and Sediment Control. Gradual clearing of vegetation from the inundation area |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities and bunding | Groundwater | Dewatering of the alluvium during excavations for dam wall foundations | 3 Possible | 3 Minor (impact) | M | 3 Possible | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Discharge to stream to maintain baseflow, undertake dewatering in a staged approach to minimise the extent of impact |
| Construction of RCC dam wall, earth embankment and spillway | Vehicle and machinery access to river bed down banks | Water Quality | Increased sediment runoff resulting from construction activities, increase in turbidity and/or suspended solids downstream | 2 Likely | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Appropriate timing and duration of construction activities to minimise exposure to wet season/wet weather conditions Appropriate erosion and sediment control measures per the Queensland Guidelines for Erosion and Sediment Control |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities and bunding | Water Quality | Increased sediment runoff resulting from construction activities, increase in turbidity and/or suspended solids downstream | 2 Likely | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Appropriate timing and duration of construction activities to minimise exposure to wet season/wet weather conditions Appropriate erosion and sediment control measures per the Queensland Guidelines for Erosion and Sediment Control |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities bunding | Aquatic Flora and Fauna | Potential loss of aquatic flora and fauna | 3 Possible | 3 Minor (impact) | M | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Minimise construction footprint. Best practice management of construction to ensure this is achieved |
| Construction of RCC dam wall, earth embankment and spillway | Coffer dams | Aquatic Flora and Fauna | Temporary blockage | 3 Possible | 3 Minor (impact) | M | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Manual removal of aquatic fauna |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities and bunding | Noise and Vibration | Noise nuisance to noise sensitive receivers | 2 Likely | 3 Minor (impact) | M | 2 Likely | 3 Minor (impact) | M | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Community consultation to notify noise sensitive receivers of construction activities Noise mitigation measures on site construction equipment |
| Construction of RCC dam wall, earth embankment and spillway | Blasting | Noise and Vibration | Noise nuisance to noise sensitive receivers | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Community consultation to notify noise sensitive receivers before blasting. Reduce amount of explosives per blast |

Dam Wall - Risk and Opportunity Assessment

| Activity Description | Aspect | Attribute | Impact | Environment and Heritage | | | | | | | | | | | | | | | | | | Mitigation Measures |
|--|--|--------------------------------------|---|--------------------------|---------------------|---------------|------------------|---------------------|---------------|------------------|----------------------------------|---------------|------------|----------------------------------|---------------|------------|----------------------------------|---------------|------------|----------------------------------|---------------|--|
| | | | | Local | | | | | | | | | Regional | | | | | | | | | |
| | | | | Immediate | | | Short Term | | | Long Term | | | Immediate | | | Short Term | | | Long Term | | | |
| | | | | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | Likelihood | Con | Residual Risk | |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations for site buildings and preparation for site facilities and bunding | Geomorphology | Localised bed degradation and bank erosion resulting from in-stream excavation | 3 Possible | 2 Moderate (impact) | M | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Adherence to guidelines for in-stream material extraction and closure and rehabilitation plan |
| Construction of RCC dam wall, earth embankment and spillway | Vehicle and machinery access to river bed down banks | Hydrology | Flows | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 4 Unlikely | 3 Minor (impact) | L | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | Throughout construction period environmental flows are to be maintained via the scheduling of works outside of the bed and banks of the Mary River until the final stage. Low flows The access will need to incorporate a culvert or pipe to ensure flows can pass downstream. This will need to be sized to carry baseflows + passflows for Borumba orders downstream. High flows The access will need to be contained within the banks such that it will be drowned out at bank full flow. If this is done, the likelihood of flood impacts on the floodplain is minimised |
| Construction of RCC dam wall, earth embankment and spillway | Excavation of foundations | Hydrology | Flows | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | 4 Unlikely | 3 Minor (impact) | L | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 4 Insignificant (impact/benefit) | L | Throughout construction period environmental flows are to be maintained via the scheduling of works outside of the bed and banks of the Mary River until the final stage. Once the final coffer dams are installed, in preparation of building the final section of Roller Compacted Concrete, environmental flows will be maintained via syphoning or pumping water around the works and releasing the water down stream. The diversion and coffer dams must be sized appropriately and constructed appropriately |
| Construction of RCC dam wall, earth embankment and spillway | Vehicle and machinery access to river bed down banks | Soils and Geology | Destabilisation, of banks, resulting in erosion and sediment transport | 3 Possible | 2 Moderate (impact) | M | 3 Possible | 3 Minor (impact) | M | 3 Possible | 4 Insignificant (impact/benefit) | L | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 5 Rare | 4 Insignificant (impact/benefit) | L | Sediment Erosion Control Plans, suitable mine plan and design |
| Construction of RCC dam wall, earth embankment and spillway | Establishment of spillway area | Soils and Geology | Erosion and sediment transport, ground stability and failure | 3 Possible | 2 Moderate (impact) | M | 3 Possible | 3 Minor (impact) | M | 3 Possible | 4 Insignificant (impact/benefit) | L | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 5 Rare | 4 Insignificant (impact/benefit) | L | Sediment Erosion Control Plans, suitable mine plan and design |
| Construction of RCC dam wall, earth embankment and spillway | Dam wall | Landscape Character & Visual Amenity | Potential for visual obstruction to existing views | 1 Almost certain | 2 Moderate (impact) | H | 1 Almost certain | 2 Moderate (impact) | H | 1 Almost certain | 2 Moderate (impact) | H | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | Integrate landscape design and the management of visual impacts into the detailed design and operation of the dam wall. Landscape design of the spillway including the proposed treatment of the cut rock face on the eastern side to avoid visual exposure of this scar. Protection and management of native vegetation within the dam wall construction area footprint particularly downstream riparian vegetation and remnant native forest and bushland vegetation above the spillway. |
| Crushing and screening of aggregate | Dust from crushing and screening of aggregate | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Maximise buffer distances to sensitive places (at least 100m, subject to outcomes of detailed Air Quality Management Plan) Locate facilities and stockpiles in areas sheltered from prevailing winds Utilise dust/wind fencing, as appropriate Install water sprays at crusher discharge and screens, as appropriate |
| Electricity and fuel consumption during construction | Exhaust emissions from construction vehicles and equipment | Air | Potential degradation of local air quality | 4 Unlikely | 5 Minor (benefit) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Maximise buffer distance to sensitive places Regularly maintain construction vehicles and equipment Minimise extended engine idle times |
| Electricity and fuel consumption during construction | Greenhouse gas emissions | Air | Potential degradation of local air quality | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 3 Possible | 3 Minor (impact) | M | Design construction program to source construction materials locally, wherever possible, to reduce material transport distances Design construction site to minimise haulage distances & fuel consumption Maintain construction equipment to maximise fuel efficiency |
| Operation of concrete batch plants | Wind blown dust from sand, aggregate stockpiles and unsealed areas | Air | Potential degradation of local air quality due to the suspension of dust | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Design storage areas to enclose truck unloading bays and minimise spillage of fine material on paved areas Regular cleanup of spills |
| Operation of concrete batch plants | Dust from haulage of sand/ aggregate from stockpiles and unloading at batch plants | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Minimise drop heights for material deliveries Regular watering of stockpiles and unsealed haulage routes |
| Operation of concrete batch plants | Dust from delivery, mixing and transfer of cement and fly-ash at batch plants | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 5 Rare | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | Maximise buffer distance to sensitive places Maximise topographical shielding Ensure dust tight systems and filters installed on truck discharge to silos and transfer systems within plant Enclose conveying systems |
| Operation of dam | Electricity and Fuel consumption during operation | Aquatic Flora and Fauna | Barrier impacts on aquatic fauna (restriction of movement upstream and downstream of inundation area) | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | Incorporation of fish lift lock into dam design to facilitate movement of fish and other aquatic fauna upstream and downstream of the impoundment. Incorporation of turtle ramp into dam design to facilitate movement of turtles upstream and downstream of the impoundment. |
| Site establishment works, construction of site offices, batch plants, haulage routes and storage/stockpile areas | Burning of cleared vegetation | Air | Smoke causing potential degradation to local air quality | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | 4 Unlikely | 3 Minor (impact) | L | Maximise buffer distances to sensitive places Avoid vegetation burning |
| Site establishment works, construction of site offices, batch plants, haulage routes and storage/stockpile areas | Wind blown dust from sand, aggregate stockpiles and unsealed areas | Air | Potential degradation of local air quality due to the suspension of dust | 3 Possible | 3 Minor (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 5 Minor (benefit) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | Minimise extent of unsealed areas at any time Stabilise worked areas as soon as possible after completion of works Regular watering of areas during dry and windy conditions |
| Site establishment works, construction of site offices, batch plants, haulage routes and storage/stockpile areas | Vegetation clearing, mulching and stockpiling | Soils and Geology | Erosion and sediment transport associated with surface runoff over exposed soils | 3 Possible | 2 Moderate (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | Implementation of Sediment Erosion Control Plans |
| Site establishment works, construction of site offices, batch plants, haulage routes and storage/stockpile areas | Excavation of foundations for site buildings and preparation for site facilities and bunding | Soils and Geology | Erosion and sediment transport associated with surface runoff over exposed soils | 3 Possible | 2 Moderate (impact) | M | 3 Possible | 3 Minor (impact) | M | 4 Unlikely | 3 Minor (impact) | L | 5 Rare | 4 Insignificant (impact/benefit) | L | 5 Rare | 3 Minor (impact) | L | 5 Rare | 3 Minor (impact) | L | Implementation of Sediment Erosion Control Plans |