

State code 18: Constructing or raising waterway barrier works in fish habitats

State Development Assessment Provisions guideline - State Code 18: Constructing or raising waterway barrier works in fish habitats. This guideline provides direction on how to address State Code 11 below.

Table 18.1 Operational work

Performance outcomes	Acceptable outcomes	Response
All development - Impacts on waterway		
<p>PO1 Waterway barrier works do not result in adverse impacts on waterways.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO1.</p> <p>The project involves the replacement of an existing dam to ensure compliance with dam safety regulations. The waterway has been impounded at this location on Six Mile creek since 1965 (59 years). The construction of the existing dam resulted in permanent impacts to the hydrology and ecology of Six Mile creek which will not be exacerbated by the proposed works. The new spillway will operate in an identical fashion to the existing spillway.</p> <p>The impacts of the Six Mile Creek Dam Safety Upgrade project, including consideration of the design, location, construction and operation of the waterway barrier works were comprehensively assessed via an Impact Assessment Report under the State Development and Public Works Organisation Act 1971.</p> <p>The Coordinator-General's findings (published in the Coordinator-General's Evaluation Report) in relation to the waterway barrier works remain relevant to this</p>

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		<p>application and include:</p> <ul style="list-style-type: none"> • I accept that the dam wall replacement is required to ensure the safety of downstream residential communities. I am satisfied that the operation of the modified design of the spillway that incorporates a hybrid labyrinth/ogee spillway design is unlikely to have a significant impact on downstream fish passage, while also achieving the hydraulic flow requirements to meet the new dam safety requirements. • I conclude that the project is unlikely to have a significant residual impact on the aquatic ecology of the area and the residual impact must be weighed up and balanced against the overall need to improve dam safety.
<p>PO2 Development is designed, constructed and maintained to avoid and minimise impacts on matters of state environmental significance.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO2.</p> <p>The proposed waterway barrier works will impact waterways providing for fish passage which is a matter of state environmental significance (MSES)QWER.</p> <p>As the project involves the replacement of an existing dam, there are no other locations, routes or designs that would avoid constructing or raising waterway barrier works and impacting on fish habitats.</p> <p>Impacts on MSES were comprehensively assessed via an Impact Assessment Report under the State Development and Public Works Organisation Act</p>

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		<p>1971.</p> <p>The Coordinator-General's findings in relation to impacts on aquatic ecology (including fish passage) are relevant to this performance outcome – “I conclude that the project is unlikely to have a significant residual impact on the aquatic ecology of the area and the residual impact must be weighed up and balanced against the overall need to improve dam safety.”</p> <p>The existing dam is for a water supply impoundment located on Six Mile Creek in the Noosa Shire. An option to decommission the dam was considered but discounted due to the impact on Seqwater operations (bulk treated water supply), particularly the immediate shortfall in water supply without reliable alternatives and the need for future water supply in the region, which would bring forward costs of new water supply.</p> <p>The proposed dam upgrade will largely be built and operated within the existing dam and impoundment footprint. The dam safety upgrade will not alter the existing dam full supply level (FSL), or the frequency of spilling flows downstream (hydrological or flow regime).</p>
<p>PO3 Where development impacts on matters of state environmental significance, development mitigates impacts and provides an offset for any acceptable significant residual impact on matters of state environmental significance.</p> <p>Statutory note: For Brisbane core port land, an offset may only be applied to development on land identified as E1 Conservation/Buffer, E2 Open Space or Buffer/Investigation in the Brisbane Port LUP precinct plan.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO3.</p> <p>The existing development approval for the permanent waterway barrier works was granted on the condition that an offset for fish passage is provided at Gympie Weir. The project will provide an offset for impacts to fish passage on Six Mile Creek.</p>
<p>All development in general</p>		

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<p>PO4 Aspects of development are only permitted within a waterway where there is a functional requirement, and the development cannot be feasibly located elsewhere. Ancillary elements are to be located outside of the waterway.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO4.</p> <p>Around 100 options were assessed to ensure the dam could continue to perform safely in the future, including decommissioning the dam. The preferred option is to remove and replace the existing spillway and embankments with new structures that comply with design and safety guidelines and standards, while essentially occupying the current dam footprint.</p>
<p>PO5 For the life of the barrier, adequate fish passage must be provided and maintained at all waterway barrier works through:</p> <ol style="list-style-type: none"> 1. fish way(s) that adequately provide for the movement of fish; or 2. the movement of fish is adequately provided for in another way. 	<p><i>For all crossings:</i></p> <p>AO5.1 Hydraulic conditions (depth, velocities and turbulence) from the downstream to the upstream limit of the structure allow for fish passage of all fish attempting to move through the crossing at all flows up to the drown out of the structure.</p> <p><i>For all other development no acceptable outcome is prescribed.</i></p>	<p>Not applicable.</p> <p>PO5 does not apply to barriers that are not crossings.</p>
<p>PO6 Waterway barrier works are designed, constructed, operated and maintained to provide lateral and longitudinal fish passage for all members of the fish community.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Does not comply with PO6.</p> <p>The proposed dam safety upgrade does not comply with PO6 for longitudinal passage for upstream movement. Failure to comply with PO6 is the driver for providing an offsite fish passage solution at Gympie Weir and has been supported by DAF since 2018 in their comments on the Coordinated Project.</p> <p>DAF confirmed in correspondence to the Coordinator-General [Reference: 003/0004943 (6808239)] in August 2018 that Fisheries Queensland supports (in principle) the following components of the proposal as outlined in the Seqwater memorandum dated 24 July 2018 and titled Six Mile Creek Dam: Waterway Barrier Works and Fish Passage.</p>

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		<p>Addressing impacts posed by the development to upstream fish passage at Six Mile Creek Dam through offsite mitigation works designed to improve bi-directional fish passage provisions at Gympie Gauging Weir on the Mary River.</p> <p>This is reflected in conditions attached to the existing waterway barrier works approval. Seqwater proposes to improve fish passage at Gympie Gauging Weir across all flows by demolishing part of the weir and installing a composite design fishway that includes a central trapezoidal chute with slotted baffles (akin to a vertical slot fishway), high flow rock ramp fishway, and a turtle ramp. The weir is a Seqwater asset, and the intent of the design is to facilitate bio passage for aquatic fauna for flows between 20 ML/day (0.23 m3/s) up to drawn out (6,000 ML/day approx.), while allowing the weir to retain its gauging functionality to operate a necessary water supply scheme.</p> <p>The dam upgrade complies with PO6 for longitudinal passage for downstream movement and lateral passage.</p> <p>Downstream movement – permanent barrier Downstream fish passage will be provided via spillway flows over an ogee crest, whereby opportunities for downstream fish passage will be available as soon as a spill commences.</p> <p>Downstream movement - temporary coffer dam The temporary coffer dam assessed and approved by the Coordinator-General, and approved in the initial waterway barrier works development approval, did not provide for downstream fish passage. Functional connectivity between Lake</p>

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		<p>MacDonald and Six Mile Creek dam was never envisaged during the construction program, as the proposed coffer dam did not spill, and almost all of the fish biomass within Lake MacDonald would have been removed as part of the lake lowering phase. This level of impact on the fisheries resource was deemed acceptable due to its temporary nature.</p> <p>Retention of a much larger volume of water in the lake (and a proportionate amount of fish biomass) introduces the risk that fish could spill over the coffer dam on 11 days per year. This will increase the likelihood that fish will be stranded in the stilling basin downstream and will require salvage and relocation.</p> <p>Fish passage is one environmental value which requires consideration in designing the temporary coffer dam. Seqwater is also obliged to reduce the risk of physical harm to threatened species which are MNES and MSES, particularly Mary River Cod and Queensland Lungfish. Unless safe fish passage can reasonably and practicably be provided over the temporary coffer dam, it is considered preferable that the risk to these species be reduced by minimising spill events.</p> <p>Refer to Section 2 of the WWBW Supporting Information for information on mitigating harm to fish throughout the construction period.</p> <p>Lateral movement The proposed dam safety upgrade will not be a barrier to lateral fish passage as it will not impede overland flow of water or change the current access to aquatic habitat, except for the period of construction where the lake extent is reduced.</p>

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<p>PO7 The development is designed and operated so that all components of waterway barrier works and pathways of potential fish movement provide for safe fish passage. Stepped spillways are not acceptable.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO7.</p> <p><u><i>Dam Spillway</i></u> As part of the dam safety upgrade, the spillway for Six Mile Creek Dam will be replaced with a design that can cater for the flood capacity that is required by dam safety guidelines. In the case of Six Mile Creek Dam, the dam must safely pass the Predicted Maximum Precipitation Flood (PMPF), which is equivalent an Annual Exceedance Probability (AEP) of around 1:10,000,000. For the purposes of assessment for safe fish passage, the fisheries operational range was taken as up to the 1:100 AEP flood event.</p> <p>The dam safety upgrade will install a dual-height spillway, such that the main (lower level) spillway will pass all flows up to the 1:100 AEP flood event. The secondary (upper level) spillway will pass larger flood events, which exceed the capacity of the main spillway.</p> <p>Seqwater has assessed the options for the dam safety upgrade since 2012, including the type of spillway that would be feasible for the site. The proposed spillway for Six Mile Creek Dam is a hybrid ogee and labyrinth design, with:</p> <ol style="list-style-type: none"> 1. An ogee crest proposed for the main spillway, catering for flows up to the 1:100 AEP flood event, and 2. A labyrinth type is proposed for the secondary upper spillway. <p>The main ogee spillway, including associated energy dissipation structures, is discussed here in response to PO6.</p> <p>The ogee spillway design was observed to provide</p>

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		<p>very benign tailwater conditions for fish. No obvious causes of fish injury in the tailwater pool were noted. CFD modelling was undertaken following the physical model observations, which further demonstrate the laminar flow profile through the spillway cross section and smooth transition from spillway to tailwater. The one area of concern noted in physical model observations was the shallowing of water depth on the spillway face, compared with the crest depth, potentially leading to shear forces (abrasion) on the spillway chute. A low-flow notch in the ogee crest was suggested as a possible approach to alleviate this issue. This possibility was ruled out as not feasible due to the existing full supply level (FSL) and the impact on hydraulics if a tiered ogee crest was used. To achieve a low-flow notch, the design would require lowering the impoundment FSL by 200-300 mm, which leads to a loss of 7-10% water capacity. As such, a low-flow notch is not proposed in the ogee spillway design. The potential for abrasion on fish moving downstream is considered to be acceptable and also comparable to similar sloped spillway structures, including the current spillway, where there is no history of observed fish injury due to abrasion. This potential impact will also be minimised through a concrete finish with low roughness and low surface erodibility over time (i.e. remaining smooth), which is stipulated in technical specifications for construction.</p> <p><u>Spillway Stranding</u> The proposed ogee spillway is relatively simple in terms of energy dissipation or tailwater control. Only the end sill structure is proposed downstream of the ogee, as discussed in spillway design. There is no need for tailwater control at Six Mile Creek because</p>

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		<p>the tailwater comes up rapidly and drowns out the end sill. The end sill is necessarily continuous across the width of the spillway to provide the function of lifting spillway flows off the downstream creek bed. Drainage slots cannot be accommodated within the end sill. Nevertheless, the ogee spillway basin will be finished at the elevation of the creek bed and a drainage channel provided to the right (east) side of the ogee spillway. This arrangement will maintain continuous, unimpeded connectivity between the spillway basin and the downstream creek, which has a depth of approximately 1 m on cease to flow conditions.</p> <p>The environmental flow outlet (described below) will discharge from the outlet structure on the left (west) side of the ogee spillway, into the spillway basin and subsequently drains to Six Mile Creek from the drainage channel on the right side. This arrangement will allow for maintenance of water quality through water exchange.</p> <p><u>Outlet structures</u> The dam outlet structure will incorporate two intake pipes for releases from Lake Macdonald – one for environmental flows and one for emergency release. The Water Treatment Plant inlet is an existing structure, not related to the dam upgrade, and is not considered here.</p> <p>The dam outlet structure is currently being redesigned, but the important details and commitments with respect to State Code 18 are described in this response.</p> <p><u>Environmental flow outlet</u> The environmental flow outlet will not provide for fish passage and will be screened to prevent</p>

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		<p>entrainment of fish. The purpose of this release is to meet downstream flow requirements of Seqwater's water licence. The pipework will consist of a DN250 mm outlet with two intake level options. Lake Macdonald does not typically face stratification or cold water effects as it is a relatively shallow impoundment, but two intake levels are provided for future flexibility. Operational releases from the dam will be made using the screened environmental flow pipework, which will be capable of releasing up to 16 ML/day.</p> <p>A screen will be fitted on the intake openings to prevent entrainment of fish. The screen will comprise of 20 mm diameter mesh panels with sufficient surface area to ensure inflows at the maximum flowrate do not exceed 0.1 m/s, even when partially blocked. This approach is consistent with a study by NSW Department of Primary Industries on the development of fish screening criteria for irrigation intakes (Boys, et al. 2012³). Results indicated that approach velocities were of greatest importance for small fish up to 150 mm in length and that there was little difference in the rate of screen contact or entrainment between 5, 10 or 20 mm woven wire mesh. A major recommendation of the study was that screen approach velocities do not exceed 0.1 m/s.</p> <p>Furthermore, 20 mm screening is proposed as the most suitable screen size for a high debris environment, due to the prevalence of aquatic plants (cabomba) in Lake Macdonald. There is potential for screen blockage between routine maintenance events, which would be detrimental to approach velocity as a key factor in preventing fish entrainment.</p> <p><i>Emergency release outlet</i></p>

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		<p>The emergency release pipe intake will not provide for fish passage. The purpose of this release outlet will be emergency drawdown of the impoundment where a dam safety issue is detected, for example if an earthquake occurs and causes deformation of the dam embankment and structural stability is in question. The ability for a dam owner to reduce water level to assess dam safety and make the structure safe is a standard inclusion in new dams; therefore, this feature is required for the dam safety upgrade of Six Mile Creek Dam. It is likely that emergency drawdown via the emergency release outlet will not be required for the life of the dam.</p> <p>The intake pipework on the emergency outlet will be coarse screened for debris but will not be screened to exclude fish due to the high flows required to meet dam safety guidelines on timeframes for emergency drawdown (e.g. 1 m diameter pipe, releasing around 2.8 m³/s). Under these conditions it is not feasible to screen for fish based on the criteria for approach velocity described above.</p> <p>The emergency release will not be used for operation or maintenance. Maintenance of emergency release pipework/fittings (e.g. valves) will be undertaken with upstream bulkheads in place to prevent inflows from the lake.</p> <p><u>Temporary Cofferdam</u> The temporary cofferdam does not have a stepped spillway. The proposed siphon system will manage a significant majority of lake inflows such that the cofferdam is only expected to spill at a depth that would potentially attract fish (>100mm) approximately 5 days per year.</p> <p>When the cofferdam does spill it will discharge into</p>

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		<p>a basin between the cofferdam and working platform. This basin forms adequate tailwater depth at the toe of the spillway at commencement to spill (over 30 percent of the head difference).</p> <p>Additional information on how the temporary coffer dam will achieve fish harm minimisation can be found in Section 2 of the WWBW Supporting Information.</p>
<p>PO8 The drownout characteristics of the waterway barrier works are designed and constructed to not result in adverse impacts to fish passage.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Not applicable.</p> <p>The proposed dam will not drown out. Spillway flows, up to the maximum predicted flood, will not provide hydraulic conditions suitable for upstream fish passage.</p> <p>The proposed cofferdam will not drown out. Spillway flows, up to the maximum predicted flood, will not provide hydraulic conditions suitable for upstream fish passage.</p>
<p>PO9 Development does not result in adverse impacts to fisheries resources.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO9.</p> <p>The impacts of the Six Mile Creek Dam Safety Upgrade project, including impacts on fisheries resources, were comprehensively assessed via an Impact Assessment Report under the State Development and Public Works Organisation Act 1971.</p> <p>The Coordinator-General's findings (published in the Coordinator-General's Evaluation Report) are relevant to this application. The CGER states that:</p> <ul style="list-style-type: none"> • My evaluation of the potential impacts on aquatic ecology has considered the assessment undertaken by the proponent, submissions received and advice of

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		<p>agencies, including the Commonwealth DEE and the Queensland DAF, DES, and DNRME. Where relevant, these agencies and the proponent have been consulted to adjust aspects of the proposal to reduce the potential for impacts, improve mitigation/management measures and develop appropriate conditions for the project.</p> <ul style="list-style-type: none"> <li data-bbox="1507 469 2078 1142">• I am satisfied that, while there will be temporary impacts to aquatic ecology—including the loss of habitat and species during lake drawdown—the mitigation and management measures proposed will reduce the level of impact. The temporary loss of habitat in the lake requires the effective management of current populations, particularly through aquatic fauna salvage and relocation for fish and turtles; as well as for waterbirds, frogs and platypi where it is found that they are unable to naturally migrate to other areas. I have imposed conditions (Appendix 2) to ensure that this occurs through a SEMP that will detail the adaptive management practices outlined in the draft EMP and include a comprehensive and adaptive management plan with a fauna salvage and relocation program. Drawdown of Lake Macdonald cannot commence until the approved SEMP is in place and is being implemented. <li data-bbox="1507 1177 2078 1327">• Downstream impacts on Six Mile Creek are also to be managed through the adaptive management plan and a flora and fauna management plan that I have conditioned. I require flow rates to be adjusted both during

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		<p>drawdown and during the two-year construction phase in response to impacts on instream habitats (Appendix 2).</p> <ul style="list-style-type: none"> • I accept that the dam wall replacement is required to ensure the safety of downstream residential communities. I am satisfied that the operation of the modified design of the spillway that incorporates a hybrid labyrinth/ogee spillway design is unlikely to have a significant impact on downstream fish passage, while also achieving the hydraulic flow requirements to meet the new dam safety requirements. My stated conditions for the design of the spillway (Appendix 3) will ensure that the dam allows for safe fish passage. • I conclude that the project is unlikely to have a significant residual impact on the aquatic ecology of the area and the residual impact must be weighed up and balanced against the overall need to improve dam safety. <p>Operation of upgraded Six Mile Creek Dam will be consistent with operation of the current dam and no changes to water quality are anticipated during operation once the refilled lake equilibrates.</p> <p>A Construction Environmental Management Plan (CEMP) that meets the requirements of Imposed Condition 3 (Sch.1, Part A) of the CG's evaluation report will be submitted for approval of the CG in due course as part of the coordinated project approval. It will include management measures for potentially hazardous substances (e.g. fuels and oils) and erosion and sedimentation controls. All</p>

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		<p>materials used in the construction of the dam will be suitable for use in waterways and in accordance with Australian Standards. An Adaptive Management Plan (AMP – available as Appendix B in the Supporting Documentation) that meets the requirements of Imposed Condition 5 (Sch.1, Part A) of the CG’s evaluation report will also be implemented to manage water quality within Lake Macdonald and Six Mile Creek downstream of the dam during the lake drawdown and construction.</p> <p>During construction, the water level in Lake Macdonald will be lowered to enable works to occur safely. This will reduce the habitat available to fish within and upstream of Six Mile Creek Dam for a period of up to 40 months. If not managed appropriately, the lowering of the lake could result in fish being injured or stranded. The AMP also addresses the management of potential impacts to aquatic fauna and habitat associated with lowering Lake Macdonald. The AMP was developed in consultation with regulatory agencies and recognised experts.</p> <p>The proposed approach to the Project is to build the upgraded dam generally within the existing dam footprint to minimise potential impacts, including disturbance of fish breeding habitat. Hydrological conditions that trigger breeding events will also be broadly similar during and after construction, as after the initial drawdown period lake levels will be maintained at a maximum height of RL93 throughout the duration of construction, with the majority of catchment inflows moving downstream into Six Mile Creek via the siphon system.</p> <p>Mozambique tilapia (a noxious fish under the Biosecurity Act 2014) have been observed</p>

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		<p>immediately downstream of the existing dam but have not been recorded upstream. The upgraded dam will act as a barrier to upstream movement of tilapia, with no upstream passage provided. During construction, biosecurity management will be implemented as part of the CEMP and AMP to manage the risk of tilapia moving upstream if the temporary coffer dam is drowned out.</p>
<p>PO10 The design, construction and maintenance of the development does not result in non-essential hardening or unnatural modification of the main channel of the waterway.</p>	<p>No acceptable outcome is prescribed.</p>	<p>Complies with PO 10.</p> <p>As described in response to PO3, erosion protection and some localised channel modification will be necessary immediately downstream of the proposed dam spillway. These modifications will largely be located within the existing disturbance footprint and will have minimal impact on fish passage as the dam prevents upstream passage. These channel modifications will be essential to protecting the integrity of the dam and the waterway channel immediately downstream. Rock protection (rip rap) will be used for erosion protection purposes. No other modification of upstream or downstream waterways is proposed.</p> <p>Natural fish habitat features will be retained wherever possible. The direct construction footprint is relatively minimal and will not impact fish habitat significantly on a long-term basis.</p> <p>No channel modification will be undertaken, other than that described in point 1 and PO3 above. The project will largely be built within the existing dam footprint</p> <p>Construction is expected to occur over four, possibly five, wet seasons. In order to complete the dam safety upgrade in a timely period, construction will continue over summer months. Planning and management for flow events will include appropriate</p>

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		monitoring of weather and responses for given conditions. The construction site will be planned and prepared in a manner to safely drown out a high flow and with contingency plans for return to construction when flows ease.
<p>PO11 The development retains natural fish habitat and features such as shade, pools, riffles, rock outcrops and boulders, wherever possible.</p>	No acceptable outcome is prescribed.	<p>Not applicable.</p> <p>The proposed works will not occur in a natural waterway. The permanent dam will be constructed in the same location as the existing dam. The temporary coffer dam will be constructed within Lake MacDonald, which is not a natural waterway.</p>
<p>PO12 The design, construction and maintenance of the development does not result in straightening of meandering waterways.</p>	No acceptable outcome is prescribed.	<p>Complies with PO12.</p> <p>The upgraded dam will pass water over the spillway at the same elevation as the existing dam. During operation, environmental flows will be implemented per Seqwater’s existing water licence to impound water of Six Mile Creek. Environmental flows will be released to the spillway basin in the upgraded dam (upstream of the spillway end sill), such that water exchange will be provided in the most upstream part of barrier.</p> <p>During construction, a low flow channel will be maintained through the existing spillway area, which will provide spilling flows similar to the existing conditions.</p> <p>The proposed dam safety upgrade will not modify water levels or flow characteristics of the upstream/downstream waterways compared with the existing situation where climatic conditions and water consumption regularly alter water levels within the Lake.</p>
<p>PO13 Where channels are to be significantly modified, the design and construction of the</p>	No acceptable outcome is prescribed.	Not applicable.

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development replicates natural waterways and habitat features.		Significant modification of the waterway has already occurred.
PO14 Where waterway barrier works will modify water levels or flow characteristics of the waterway , existing up and downstream structures are upgraded to provide adequate fish passage in accordance with the new levels or flow characteristics.	No acceptable outcome is prescribed.	Complies with PO14. Once operational, flow regimes will replicate the current hydrological regime.
PO15 The development is designed, constructed and maintained to provide water exchange sufficient to maintain or improve water quality and flow conditions on which fisheries resources depend.	No acceptable outcome is prescribed.	Complies with PO15. The operation of Six Mile creek dam, including environmental flow requirements, is already regulated by a water license. The current flow regimes will be reinstated once the waterway barrier is operational.
PO16 Development likely to cause drainage or disturbance to acid sulfate soils, prevents the release of contaminants and impacts on fisheries resources and fish habitats .	No acceptable outcome is prescribed.	Complies with PO16. The development will not disturb acid sulfate soils. A Preliminary acid sulfate soil investigation was completed as part of the project's Impact Assessment Report which did not find acid sulfate soils in the project area.
PO17 The development is designed, constructed and maintained to not result in adverse impacts to beds, banks and vegetation adjacent to the permanent development footprint.	No acceptable outcome is prescribed.	Complies with PO17. The project footprint has been limited to the minimum area required to safely construct the works. The maximum disturbance area is conditioned by both the Coordinator-General and the EPBC approval for the Project, which both consider impacts to MSES and MNES, as well as fisheries values.
PO18 After completion of works, disturbed areas of the bed and banks of the waterway outside the permanent development footprint are returned to their original profile and stabilised to promote regeneration of natural fish habitats .	No acceptable outcome is prescribed.	Complies with PO18. Following construction, all disturbed areas will be rehabilitated. This will include revegetation with local species, thereby ensuring that the reinstated dam will have the same footprint as the current dam. The

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		Coordinator-General has already imposed conditions requiring rehabilitation and revegetation of areas affected by the project to be included in the project Site Environmental Management Plan, that must be approved before project activities commence.
PO19 The development is designed and constructed to maintain or restore the natural substrate of the waterway bed.	No acceptable outcome is prescribed.	Complies with PO19. The permanent waterway barrier will reinstate existing processes within the waterway, as it will operate in an identical manner to the existing dam.
PO20 Development does not adversely impact on community access to tidal land and waterways .	No acceptable outcome is prescribed.	Complies with PO20. The development will reinstate existing community access arrangements once construction is completed.
PO21 Development does not adversely impact on community access to fisheries resources and fish habitats including recreational and indigenous fishing access.	No acceptable outcome is prescribed.	Complies with PO21. The development will reinstate existing community access to fisheries resources and fish habitats once construction is completed.
PO22 Development does not adversely impact on commercial fishing access and linkages between a commercial fishery and infrastructure, services and facilities.	No acceptable outcome is prescribed.	Complies with PO22. There will be no impact on commercial fisheries.
Development involving fish ways		
PO23 Having regard to the hydrology of the site and fish movement characteristics, the fish way is capable of operating, and will operate: <ol style="list-style-type: none"> 1. for as long as the waterway barrier work is in position; and 2. whenever there are inflows into the impoundment or waterway, release out of the impoundment and during overtopping events; and 3. when the impoundment is above dead storage level. 	No acceptable outcome is prescribed.	Not applicable.

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PO24 The development is designed, constructed and maintained to ensure the hydrology allows for fish movement for the life of the waterway barrier works .	No acceptable outcome is prescribed.	Not applicable.
PO25 Fish ways are designed, constructed and maintained to not adversely impact on fish and fish movement.	No acceptable outcome is prescribed.	Not applicable.
PO26 Fish ways are designed, constructed and operated to direct release water through the fish way as a priority over the outlet works.	No acceptable outcome is prescribed.	Not applicable.
PO27 Fish ways are designed, constructed and operated to ensure flows and releases of water do not result in adverse impacts to fish or fish passage .	No acceptable outcome is prescribed.	Not applicable.
PO28 The development is designed, constructed and operated to ensure fishway operational issues are promptly rectified for the life of the fishway including: 1. all components are designed to be durable, reliable and adequately protected from damage during high flow and flood events 2. all components can be replaced; and 3. a contingency plan ensures provision of alternate adequate fish passage during the fish way re-instatement process.	No acceptable outcome is prescribed.	Not applicable.
PO29 The development is designed to allow for installation of monitoring equipment and to allow access for monitoring and maintenance.	No acceptable outcome is prescribed.	Not applicable.
PO30 Fish ways are designed, constructed and operated to source water supply from surface water or equivalent water quality.	No acceptable outcome is prescribed.	Not applicable.
PO31 Tailwater control structures are designed, constructed and maintained to allow for fish passage .	No acceptable outcome is prescribed.	Not applicable.
Development involving floodgates		

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PO32 The design, construction and operation of a floodgate does not result in adverse impacts on fish, fish passage or fish habitat.	No acceptable outcome is prescribed.	Not applicable.
PO33 Floodgates are designed, constructed and maintained to ensure the invert is at bed level.	No acceptable outcome is prescribed.	Not applicable.
Temporary waterway barrier works		
PO34 The temporary waterway barrier works will exist only for a specified temporary period.	No acceptable outcome is prescribed.	<p>Complies with PO34.</p> <p>The proposed dam safety upgrade includes a temporary coffer dam comprised of sheet pile & rock (refer to the 90% design drawings provided in Appendix A of Supporting Documentation). This is anticipated to be in place for the duration of construction which is approximately 40 months, subject to the construction programme and wet weather events. A response to the temporary waterway barrier works performance outcomes has been provided for completion.</p>
PO35 The temporary waterway barrier works provides adequate fish movement	No acceptable outcome is prescribed.	<p>Does not comply with PO35.</p> <p>Upstream fish movement is already restricted with the existing dam. Currently downstream fish movement only occurs during spillover events. Downstream fish movement will be restricted for the life of the temporary coffer dam.</p> <p>To decrease the likelihood of harm to fish, it is proposed that a siphon system be installed to prevent the coffer dam spilling. The temporary coffer dam approved as part of the Coordinated Project, and the initial waterway barrier works application, did not provide downstream fish passage. There would have been no downstream movement of fish from Lake MacDonald to Six Mile Creek as the lake level was reduced to less than 5% and the coffer dam did not spill. The approved project/development did not comply with PO6.</p>

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		To minimise potential harm to fish, particularly threatened species which are MSES and MNES, it is proposed to limit downstream fish passage over the temporary coffer dam. This will prevent fish moving over the coffer dam and into the stilling basin, where they would require salvage and relocation.
PO36 The development is designed, constructed and maintained to ensure temporary barriers are removed and the bed and banks are returned to their original profile and stability.	No acceptable outcome is prescribed.	Complies with PO36. The temporary coffer dam will be located within Lak MacDonald, not the bed and banks of Six Mile Creek.
PO37 Temporary waterway barrier works are designed, constructed and maintained to allow for downstream movement during works, where required by species present.	No acceptable outcome is prescribed.	Does not comply with PO37. As discussed under PO6, PO7 and PO35, the approved temporary coffer dam did not provide for downstream movement of fish. The refined coffer dam design similarly does not provide for downstream fish passage.
PO38 The condition and value of aquatic macrophytes and other fish habitats is maintained.	No acceptable outcome is prescribed.	Complies with PO38.