
Executive Summary



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Executive Summary

Project Overview

Six Mile Creek Dam, more commonly known as Lake Macdonald, is in the Noosa Shire, about four kilometres north-east of the township of Cooroy. It is an important drinking water source in the South East Queensland Water Grid and one of two main water sources supplying drinking water to the Sunshine Coast and Noosa regions. The Six Mile Creek Dam Safety Upgrade Project (the Project) aims to bring the dam in line with the latest engineering standards and dam safety guidelines and will be the first major upgrade since the dam walls were raised in 1980.

The Project will allow the dam to better withstand extreme flood events and potential earthquakes. The Project will involve demolishing the existing spillway, building a new 'labyrinth' spillway, reconstructing the existing earth embankments (dam walls), and constructing a saddle dam along Collwood Road to provide further flood mitigation. The dam's full supply level and water impoundment footprint will not change as part of the Project and the dam infrastructure (spillway and embankments) will largely occupy the existing footprint. The existing operation of the dam will effectively be reinstated once the Project is complete.

The Queensland Bulk Water Supply Authority, trading as Seqwater, is the proponent for the Project, which is currently scheduled to occur between 2020 and 2022. Lake Macdonald will not be used for water supply during the Project demolition and construction periods. The Noosa region will source alternative supplies from within the SEQ Water Grid during construction to continue to provide drinking water to customers. Once the Project is complete, Lake Macdonald will continue to be used as a primary drinking water source for the Sunshine Coast and Noosa regions.

Seqwater submitted an Initial Advice Statement to the Queensland Coordinator General on 15 September 2017 in accordance with the *State Development Public Works Organisation Act 1971*. The Project was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 6 December 2017 due to the potential impact on listed threatened species and communities. On 22 December 2017, the Coordinator General declared the Project to be a 'coordinated project', for which an Impact Assessment Report is required.

Water Resources

Surface Water Hydrology

Six Mile Creek is classified as non-perennial (i.e. has no flow for part of the year) under the Water Act 2000 and ultimately discharges to the Mary River. Six Mile Creek Dam is located in the upper reaches of Six Mile Creek and has a relatively small catchment of 49 km². The dam and is regularly at full supply with the dam frequently spilling throughout the year. Water balance modelling indicates that the existing dam and water extraction slightly decreases the proportion of time for any given flow to the downstream receiving environment compared to the conditions before the dam was originally constructed.

Potential impacts to hydrology (movement of water) associated with the Project are:

- Flow regime changes during dam lowering
- Breaches of the Mary Basin Water Resources Plan flow objectives
- Changes to water availability for during construction
- Flooding during construction and changes to flooding once the dam is operational.

An assessment of these potential impacts indicates the residual risks will be low to medium where appropriate mitigation measures are in place. Appropriate mitigation measures may include lowering the lake with consideration of the natural flow regime, supplementing natural flows with an alternative source to meet the Mary River Basin Water Resources Plan flow objectives, undertaking core construction in the dry season, and implementing a communication plan to inform impacted stakeholders and communities of the impacts.

Surface Water Quality

Water quality in Six Mile Creek typically meets the relevant water quality objectives for the protection of identified environmental values, such as aquatic ecosystems, irrigation and farm supply, in the *Environmental Protection (Water) Policy 2009 Mary River Environmental Values and Water Quality Objectives Basin No. 138, including all tributaries of the Mary River*. However, at times, a number of water quality parameters in Lake Macdonald and/or the tailwater do not comply with the water quality objectives.

Potential impacts to water quality associated with the Project include increased turbidity and total suspended solids, decreased pH, reduced dissolved oxygen, increased nutrient and dissolved metal concentrations, and contamination from spilt fuels, oils or other chemicals.

An assessment of these potential impacts indicates the residual water quality risks will be low where appropriate mitigation measures are in place. Recommended mitigation measures include:

- Minimising disturbance of unconsolidated bed sediments
- Taking water from mid-depth, or a mix of depths during the lake lowering
- Avoiding or managing areas of potential erosion
- Implementing real-time water quality monitoring
- Managing dissolved oxygen concentrations in Lake Macdonald and Six Mile Creek
- Minimising the exposure of deep sediments with high metal and nutrient concentrations
- Implementing measures to reduce the likelihood of spills or leaks.

Groundwater

Within 2 km of Lake Macdonald there are 45 registered groundwater bores, three aquatic groundwater dependant ecosystems (GDE's) that are likely to rely on the surface expression of groundwater, and six terrestrial GDEs that are likely to rely on the subsurface presence of groundwater.

Potential impacts to groundwater from the Project include a decrease in the water available for groundwater recharge during construction and the surface discharge of groundwater dewatered from the construction site. Analysis indicates the groundwater drawdown around Lake Macdonald would be limited in magnitude and highly localised for the construction period. With this being the case, it is not anticipated that anthropogenic and environmental groundwater users will be negatively impacted. The spillway construction is also not expected to significantly impact groundwater flow as the design will permit groundwater to flow around the structure.

Where appropriate mitigation measures are in place, the residual risk of impacts to groundwater quantity and quality is expected to be low. Mitigation measures recommended include maintaining environmental flows within Six Mile Creek, implementing measures to reduce the potential for spills or leaks, and implementing a dewatering management plan for spillway excavation.

Aquatic Ecology

The aquatic ecological values of Six Mile Creek and Lake Macdonald were assessed through a literature and database review, a synthesis of existing data from previous surveys (2013 - 2016), a field survey (2018), and consultation with recognised experts. In total, aquatic ecology was assessed at 15 sites across all surveys. The assessment determined that aquatic ecological value is *very high* in Six Mile Creek downstream of the dam and *high* in Lake Macdonald and Six Mile Creek upstream of the lake. The key findings of existing values were:

- Disturbance of aquatic habitat being relatively minor other than the presence of Six Mile Creek Dam and Lake Macdonald
- aquatic plants are absent or rare downstream of the dam, but the noxious weed *Cabomba caroliniana* is abundant in Lake Macdonald
- Macroinvertebrate communities are highly variable, with low taxonomic diversity where microhabitat diversity was low
- Fish communities are in good condition downstream of the dam, with several species only caught in this section of Six Mile Creek, and less diverse in Lake Macdonald, with conditions likely to favour some species native to Six Mile Creek, as well as stocked recreational species
- Six turtle species may occur, but only four common species were caught during surveys – saw-shelled turtle (*Wollumbinia latisternum*), Krefft's river turtle (*Emydura macquarii krefftii*), eastern long-necked turtle (*Chelodina longicollis*) and broad-shelled river turtle (*Chelodina expansa*)
- Confirmed records of platypus in Six Mile Creek and Lake Macdonald.

Two fish species and two turtle species listed as Matters of National Environmental Significance (MNES) under the EPBC Act are known from the Six Mile Creek catchment. Mary River cod (*Maccullochella mariensis* – endangered) and Australian lungfish (*Neoceratodus forsteri* – vulnerable) are known to inhabit Six Mile Creek downstream of the dam, with Mary River turtle (*Elusor macrurus* – endangered) and white-throated snapping turtle (*Elseya albagula* – critically

endangered) sometimes occurring in the lower reaches. Upstream of Lake Macdonald, Mary River cod are known to occur, Australian lungfish may occur, and Mary River turtle and white-throated snapping turtle are likely to be rare or absent. During field surveys, Mary River cod and Australian lungfish were only caught downstream of the dam, and no Mary River turtles or white-throated snapping turtles were caught.

Potential impacts to the aquatic values of Six Mile Creek and Lake Macdonald during the construction period, may include:

- Changes to water quality and aquatic habitat
- Direct impacts to aquatic fauna and flora
- Spread of biosecurity matters
- Barriers to fish passage.

Using a risk-based assessment approach, most Project activities were identified as having a low residual risk on aquatic fauna, including MNES species, when appropriate mitigations are applied.

Notwithstanding the implementation of suitable mitigation measures, the temporary loss of aquatic habitat in Lake Macdonald due to the drawdown of the lake during construction represents a moderate risk to aquatic fauna. The lowering of the lake is required before work can begin for the safety of those working on the dam and living downstream and therefore, the risk to aquatic fauna is unavoidable. A comprehensive and adaptive lake lowering management plan including aquatic fauna salvage has been prepared in response to this unavoidable risk.

The primary objective of the Lake Macdonald Lowering – Adaptive Management Plan is to prevent environmental harm in Lake Macdonald and Six Mile Creek as a result of lowering the lake prior to construction and then managing the impoundment area during the construction period. It is proposed to drawdown Lake Macdonald in a staged approach over three months in order to manage environmental impacts. The plan describes the process for lowering and maintaining the water level in the lake, potential impacts associated with the lowering, management measures to be implemented (including a detailed fauna salvage program), and incident and contingency planning for the lowering.

Assessment of aquatic MNES species against the EPBC Act Significant Impact Criteria indicates that, while there may be temporary impacts, following the implementation of appropriate mitigation measures and a comprehensive fauna salvage operation, a significant impact on these species as a result of the Project is unlikely.

Terrestrial Ecology

The Project area is located within the South East Queensland bioregion, which is known to have high floristic and faunal diversity created by the bioregion's unique combination of landform, soil and climate. The terrestrial ecological assessment was conducted based on a detailed desktop assessment and subsequent field investigation in the Lake Macdonald study area in February 2018. The assessment considered threatened flora, fauna and ecological communities, migratory species, pest species, and vegetation communities. Field survey techniques were varied and conducted in accordance with relevant guidelines.

The survey confirmed that mapping of remnant vegetation communities is largely correct, though where a combination of RE 12.9-10.1 (tall open forest often with *Eucalyptus resinifera*, *E. grandis*, *E. robusta*, *Corymbia intermedia*) and RE 12.9-10.17 (*Eucalyptus acmenoides*, *E. major*, *E. siderophloia* +/- *Corymbia citriodora* subsp. *variegata* woodland) are mapped, the community within the Project area is predominantly RE 12.9-10.1. While there is a record of southern penda (*Xanthostemon oppositifolius*) approximately 1 km downstream of the dam wall, no threatened flora species were identified within or are considered likely to occur within the Project area. Variation in habitats around Lake Macdonald enables a diversity of flora and fauna species to be supported. However, the field survey found that most forest areas lack important habitat features such as hollow-bearing trees and fallen logs, which limits the presence of species that require these mature forest elements.

Two threatened frog species, the giant barred frog (*Mixophyes iteratus*) and the tusked frog (*Adelotus brevis*), were recorded in the vicinity of the Project during the field survey. The giant barred frog was detected along Six Mile Creek, downstream of the dam, and the tusked frog was recorded in the upper lake and along Collwood Road. With implementation of appropriate mitigation and management measures, a significant impact is not expected to occur to either species. Richmond birdwing butterfly was observed during the survey, but is not expected to be impacted by the Project as no food plants for this species were detected. No other threatened fauna species were recorded. Anecdotal evidence indicates there is potential for koala and grey-headed flying-fox to utilise the Project area despite no evidence of these species during the survey. An impact assessment for these species indicated that a significant

impact is not likely to occur despite the removal of up to 1.45 ha of vegetation within the Project area as it borders an already highly modified environment and does not affect habitat connectivity or wildlife corridors.

Migratory aquatic and forest birds listed under the EPBC Act use the open waters and fringing vegetation of Lake Macdonald and moist forest habitats, including habitat within the proposed construction area and will be subject to minor and temporary habitat loss.

Biosecurity

A total of 55 exotic species were recorded during the terrestrial flora survey. Of these, two are classified as Weeds of National Significance, five are listed as category three biosecurity matters under the Queensland *Biosecurity Act 2014* and 11 are regarded as environmental weeds by Noosa Shire Council. The listed weed species, with the exception of lantana (*Lantana camara*), were generally present in low abundance.

Eight restricted biosecurity matters are present in Six Mile Creek and/or Lake Macdonald including eastern gambusia (*Gambusia holbrooki*), carp (*Cyprinus carpio*), tilapia (*Oreochromis mossambicus*), salvinia (*Salvinia molesta*), water hyacinth (*Eichhornia crassipes*), Hygrophila (*Hygrophila costata*), Cabomba (*Cabomba caroliniana*), and cane toad (*Rhinella marina*). Restricted matters from the lake are likely transported downstream when the dam overtops, which occurs frequently. Tilapia are a highly invasive pest fish that were first recorded in Six Mile Creek downstream of the dam in January 2018, but which have not been recorded from Lake Macdonald or Six Mile Creek upstream of the dam.

Fish passage is currently not provided at the Six Mile Creek dam. While fishway options have been considered for the Project, preliminary advice from the Department of Agriculture and Fisheries indicates that several factors outweigh the benefit of providing fish passage over the dam, including site constraints, the risk of aiding upstream dispersal by the noxious fish, tilapia, and the anticipated regional benefits of an alternative off-site mitigation option that was readily available to Seqwater. Therefore, off-site mitigation measures for fish passage have been proposed, specifically at the Gympie Weir on the Mary River.

The potential spread of restricted terrestrial weeds from Project activities will be managed through the implementation of weed hygiene measures. The potential spread of aquatic weeds will be managed through weed hygiene measures for construction equipment and plant used in the lake and through restricting the relocation of fauna during salvage activities based on biosecurity criteria. The potential for aquatic weed dispersal downstream of Lake Macdonald through lake lowering is also considered low risk, due to weed materials already passing downstream through existing spillway flows and observation showing that conditions are not favourable establishment.

Traffic and Transport

The impacts of additional traffic generated during the Project on the local road network were assessed in accordance with the Department of Transport and Main Roads Guide to Traffic Impact Assessment. Access to the Project site is limited to two possible routes, using local roads including Elm Street, Lake Macdonald Drive, Sivyers Road, Gumboil Road and Collwood Road.

An assessment of key intersections on these possible routes was undertaken. The assessment found additional construction vehicles would have minimal impact on the operation of the three study intersections – Elm Street—Lake Macdonald Drive, Lake Macdonald Drive—Seqwater access road to the project site (existing access to Noosa Water Treatment Plant), Cooroy Noosa Road—Sivyers Road. Signalised and unsignalised Intersection Design and Research Aid (SIDRA) analysis undertaken for the Project found intersections would operate satisfactorily in terms of degree of vehicle saturation, queue length, level of service and delay during the peak construction months. It is concluded the intersection performance is acceptable with the anticipated additional Project traffic.

More general risks associated with Project construction include:

- Increased traffic on local roads
- Construction activities impacting on local road network (e.g. partial road closures)
- Workers' vehicles parking on local roads in the vicinity of the Project.

In addition, the condition of local roads such as Gumboil and Collwood and general road safety were identified as social impacts during the social impact assessment.

A traffic management plan will be prepared before the Project begins outlining the management of construction vehicles, parking, temporary road closures, safety and management. Specific safety recommendations from the traffic and transport assessment included:

- Upgrade lane markings at the Noosa-Cooroy Road / Sivyers Road intersection to Channelised Right Turn (short) – if this intersection is used for heavy vehicles
- Temporary trucks turning sign (T2-25) at the intersection of Lake Macdonald Drive and the Seqwater access road into the Project area for the duration of heavy vehicle operations
- Relocate 80 / 60 speed zone change on Lake Macdonald Drive, currently near the intersection with the Seqwater access road into the Project area, to around 200 m north of this intersection around bend. This change will provide safe intersection sight distance and is a recommended permanent change.

Air Quality

The topography surrounding the Project is relatively flat with small-lot rural residential properties located along Lake Macdonald Drive, directly to the west. Potentially affected sensitive receptors include residences near Collwood Road and Lake Macdonald Drive, as well as residences adjacent to Lake Macdonald. Tewantin National Park, located to the north of the Project area, is also considered a sensitive receptor.

Existing air quality at the Project site is expected to be good given the undeveloped nature and low population density of the surrounding area. No significant industrial or commercial emissions sources have been identified in the surrounding area.

The most significant emissions to air associated with the proposed Project activities will be emissions of particulate matter from the excavation, handling and transport of soil and rock, as well as from wind erosion of raw material stockpiles. The potential impacts of emissions of particulate matter on air quality is likely to be minimal with the implementation of mitigation measures such as watering for dust suppression and vegetative cover for long term stockpiles.

Noise and Vibration

Noise monitoring was undertaken at two sites adjacent to the Project to quantify the existing acoustic environment and provide context to the predicted construction emissions. Construction scenarios with the potential to generate noise impacts were analysed using typical plant items and areas of operation defined across the entire Project area. Airborne noise from construction activities was then predicted at identified noise sensitive receptors and the predicted noise levels compared to the Project construction noise targets, which were based on relevant legislation.

The implementation of proposed mitigation measures would minimise adverse impacts resulting from noise and vibration. Given the close proximity of sensitive receptors to the Project and the intensive nature of the demolition and construction works, potential for exceedances of the noise targets have been identified. In accordance with the relevant regulations and standards, all reasonable and practicable on-site mitigation and management measures have been considered in these cases. Certain construction activities have the potential to exceed the Project construction noise targets even with mitigation measures in place. Additional consultation with residents affected by noise target exceedances will be necessary to discuss additional mitigation measures, such as temporary relocation or double glazing.

Ground vibration is expected to be compliant with nominated cosmetic damage criteria, based on the relevant assessment standards. However, any complaints received from throughout the construction period should be investigated.

Social Impact Assessment

The local community highly values Lake Macdonald for its environmental values, visual amenity and recreational opportunities. It is about six kilometres from Cooroy, which has a population of about 3,000 residents providing a range of retail, educational, health and commercial services. A social impact assessment was undertaken to identify and assess potential impacts and benefits associated with the Project in accordance with the guideline issued by the Queensland Department of State Development, Manufacturing, Infrastructure and Planning. A total of 31 social impacts were identified and assessed including:

- Direct effects from noise, dust and vibration on residential properties on Lake Macdonald Drive within 200 m of the construction site
- Loss of amenity due to lake lowering and traffic and construction activities affecting enjoyment (and subsequent reduced patronage) of the Noosa Botanic Gardens
- The temporary loss of recreational and leisure opportunities, currently afforded by the lake
- Traffic effects.

It was determined that more than 80% of the identified social impacts will occur in the construction phase. Furthermore, the distribution of impacts is localised with 90% of impacts occurring in the area directly surrounding Lake Macdonald, 41% in the Cooroy urban centre, 16% directly downstream of the dam (within 15 km), and 9% predicted in the regional study area. While most of the impacts identified were negative, these would largely be localised and restricted to the construction phase of the Project as expected. Post construction, the Project would derive positive social benefits through delivering improved dam safety and enabling the preservation of the lake for the enjoyment of current and future generations.

Cultural Heritage

Historical Heritage

No historical heritage places or landscapes have been registered or listed in local, State or other registers in the vicinity of the Project. Nevertheless, a physical inspection of the Project area identified several features of local heritage significance. Of the sites identified as having local significance, the Project works will directly impact the original dam wall and spillway, and a nearby brick structure on the western shoreline of Lake Macdonald with dedication plaque. Indirect impacts have also been identified to the structures at Camp Cooroora due to their proximity to the works area.

The impacts on the original dam wall and spillway cannot be avoided as removal of these features is the primary reason for the Project. As such, photographic recording is recommended before demolition. The brick structure with dedication plaque is also likely to be demolished as part of the construction works and photographic recording and relocation of the dedication plaque is recommended. To mitigate indirect impacts to structures at Camp Cooroora, a temporary exclusion zone and/or fencing is recommended.

Aboriginal Cultural Heritage

There is one record of an Aboriginal heritage site within the Project area, which may be impacted by the Project, though the nature of the site and location are not clear. Analysis of the wider Project area identified that significant ground disturbance has previously occurred across much of the site through vegetation clearance and earthworks occurred before and during the construction of the original dam wall and embankments. Seqwater will engage with the Kabi Kabi First Nation People and develop an agreement for management of Aboriginal cultural heritage values and risks, likely through a Cultural Heritage Management Plan.