Title of Proposal - Six Mile Creek Dam Safety Upgrade Project

Section 1 - Summary of your proposed action

Provide a summary of your proposed action, including any consultations undertaken.

1.1 Project Industry Type

Water Management and Use

1.2 Provide a detailed description of the proposed action, including all proposed activities.

Six Mile Creek Dam, commonly referred to as Lake Macdonald, is located on the Sunshine Coast in Noosa Shire and is one of two principal raw water sources that supply potable drinking water to the residents of Noosa Shire. Ownership of the dam was transferred from Noosa Council to Seqwater on 1 July, 2008. The Project site and its position within the shire are presented in Figure 1 of Attachment A.

The dam requires an upgrade to meet modern safety standards and the performance requirements of the Queensland dam safety regulations into the future. The upgrade will allow the dam to better manage severe weather and earthquake events. This includes improving the spillway discharge capacity and earthquake stability while maintaining water supply security. Studies have considered a range of options including decommissioning of the dam, retrofitting of strengthening works and new build options.

In 2012, Seqwater commissioned a Portfolio Risk Assessment of its 26 regulated dams. The key risks identified during the risk assessment for Six Mile Creek Dam were piping through the embankment and foundation liquefaction under the spillway.

The societal risk for Six Mile Creek Dam plots just above the ANCOLD defined limit of tolerability. Based on the definitions provided by ANCOLD, this risk is considered unacceptable and action should be taken.

The proposed upgrade of Six Mile Creek Dam does not change the scale of the existing water impoundment. The dam’s Full Supply Level (FSL) will remain the same post-upgrade and the proposed dam infrastructure will largely occupy the existing footprint. The operation of the upgraded dam will effectively reinstate the existing situation, with some improvement in flow regime anticipated.

The concept design has been finalised and detailed design will commence in October 2017. The detailed design is not anticipated to differ significantly from the concept design described below. The finalised option will be the basis for the environmental assessment.

Upgrade of Six Mile Creek Dam will include the replacement of the spillway and improvements to the left and right embankments. The upgrade works will require lowering the lake

(impoundment) level to facilitate construction, removal of the existing spillway and construction of a new concrete spillway founded on weathered rock, and improvements to the existing embankments. More details of the key components are provided below:
- Temporary work in preparation for removal of the existing spillway:
- Installation of a temporary sheet pile cofferdam upstream of the existing dam to maintain a reduced impoundment level at 90.5 m AHD during construction (10.5%
- Lowering the impoundment level to 90.5 m AHD, by way of pumping, to reduce the life safety risk associated with potential failure of the temporary cofferdam. The lowered level of the impoundment has not been finalised, however this is considered the worst case design at present.
- Excavation of the existing spillway structure. The bulk of the existing spillway is expected to be removed in four to five days.
- Construction of a low-flow diversion between the cofferdam and removed spillway (through the work site) to channel nominal catchment inflows during the construction phase.
- Construction of a new spillway structure with a mass concrete foundation based in the underlying weathered rock. The spillway will be constructed from the foundation level of the existing dam 'in the dry' and will be sequenced to allow the low-flow diversion to operate throughout the Project to manage catchment inflows. With the spillway foundations complete, the new spillway will comprise a labyrinth-type with a crest width of 135 m, designed to safely pass the Probable Maximum Flood (PMF).
- Right (eastern) embankment construction – demolition of the existing embankment; foundation improvement works to address seepage, piping and liquefaction risks; and major reconstruction of a flatter embankment section (i.e. reduced embankment slope)
- Left (western) embankment construction – reduction of the embankment height to flatten the slope and improve stability, while also installing a 1.5 m concrete parapet wall on the crest to preserve the existing bank height. A filter buttress will also be installed on the downstream toe of the embankment to address piping and stability risks. The proposed approach to flatten the embankment, by reducing the earthfill height and substitute a concrete wall on the crest, allows the required stability to be achieved while minimally affecting the existing alignment of Lake Macdonald Drive and associated pipelines.
- Potentially construct a saddle dam on Collwood Road – The need for a saddle dam is still to be determined, based on ground levels, final design option, and expected flood water levels. If needed, a 100-150 m section of Collwood Road (approx.) immediately east of Noosa Water Treatment Plant, would be built up by 1-2 m via an earthen embankment. This would ensure that flood waters are channelled through the proposed dam spillway, rather than shortcutting through a low section, though this will depend on expected flood water levels.

During construction, stormwater flows in Six Mile Creek will pass over the cofferdam through the work area via a diversion channel. Stormwater management within and through the work area will be required.

There will be no requirement for an on-site quarry as concrete aggregates and other rock materials will be imported from offsite sources. Existing embankment materials excavated from under the spillway slabs and the right embankment will be stockpiled on site for use in embankment reconstruction. There may be the requirement for an earthfill borrow area to supply supplementary embankment material. A borrow source/location has not yet been identified but could be located along the perimeter of the storage or with target spoil material

stockpiled at the right abutment during previous construction works, pending assessment of the suitability of these materials.

The operation of the upgraded dam will effectively reinstate the existing situation, and so is unlikely have any significant operational impacts on threatened aquatic species in relation to downstream flows. The Mary River Basin Resource Operations Plan currently requires the operational regime to minimise changes to the low flow regime of the creek and to minimise changes to the hydraulic habitat requirements of species such as the Mary River cod and lungfish. Optimisation of flows will occur during the detailed design phase with the view to improve the performance of the current situation.

It is anticipated that the upgraded dam will result in improvements on the existing operational scenario, including optimisation of environmental releases and specific spillway design features for safe downstream passage of fauna during spills. An updated framework for environmental flow releases will be prepared as part of the Project and will be subject to focused assessment in association with Seqwater's existing water licence conditions under the Mary Basin Resource Operations Plan (ROP).

The proposed dam safety upgrade concept design is shown in Figure 2 of Attachment A.

1.3 What is the extent and location of your proposed action? Use the polygon tool on the map below to mark the location of your proposed action.

Area	Point	Latitude	Longitude
Downstream area	1	-26.370666547	152.92667239401
Downstream area	2	-26.370974142932	152.9334530184
Downstream area	3	-26.379894068797	152.93577044699
Downstream area	4	-26.379970961715	152.92933314535
Downstream area	5	-26.37074344606	152.92684405539
Downstream area	6	-26.370666547	152.92667239401
Construction works area	1	-26.380047854583	152.92933314535
Construction works area	2	-26.379932515262	152.93581336233
Construction works area	3	-26.380201640165	152.93637126181
Construction works area	4	-26.381816376413	152.93667166922
Construction works area	5	-26.382969745627	152.92868941519
Construction works area	6	-26.380047854583	152.92933314535

Area	Point	Latitude	Longitude
Lake Macdonald inundation area	1	-26.383085081916	152.92873233054
Lake Macdonald inundation area	2	-26.381701038858	152.93688624594
Lake Macdonald inundation area	3	-26.381585701188	152.93924658987
Lake Macdonald inundation area	4	-26.382623736072	152.94182151053
Lake Macdonald inundation area	5	-26.385007336428	152.94598429892
Lake Macdonald inundation area	6	-26.383815542399	152.95091956351
Lake Macdonald inundation area	7	-26.387659995118	152.95568316672
Lake Macdonald inundation area	8	-26.387852214395	152.95332282278
Lake Macdonald inundation area	9	-26.387506219467	152.95070498679
Lake Macdonald inundation area	10	-26.388159764572	152.9461559603
Lake Macdonald inundation area	11	-26.387044891283	152.94237941
Lake Macdonald inundation area	12	-26.390543250673	152.94662802908
Lake Macdonald inundation area	13	-26.391811860311	152.94525473807
Lake Macdonald inundation area	14	-26.389889719057	152.94117778036
Lake Macdonald inundation area	15	-26.391888745295	152.94122069571
Lake Macdonald inundation area	16	-26.39315734015	152.94675677512
Lake Macdonald inundation area	17	-26.392580707853	152.95147746298
Lake Macdonald inundation area	18	-26.393618643914	152.95293658469
Lake Macdonald inundation area	19	-26.396117340603	152.94675677512
Lake Macdonald inundation area	20	-26.399154145307	152.94607012961
Lake Macdonald inundation area	21	-26.398116259015	152.9583868334
Lake Macdonald inundation area	22	-26.401076132316	152.96242087576
Lake Macdonald inundation area	23	-26.404920010316	152.96194880698

Area	Point	Latitude	Longitude
Lake Macdonald inundation area	24	-26.402344626209	152.95765727255
Lake Macdonald inundation area	25	-26.404035929713	152.95297950003
Lake Macdonald inundation area	26	-26.406150024235	152.94667094443
Lake Macdonald inundation area	27	-26.401998674712	152.94289439413
Lake Macdonald inundation area	28	-26.39973074477	152.93890326712
Lake Macdonald inundation area	29	-26.39619422272	152.94109194968
Lake Macdonald inundation area	30	-26.3951947512	152.93804496023
Lake Macdonald inundation area	31	-26.399769184632	152.93800204489
Lake Macdonald inundation area	32	-26.403190281059	152.94079154227
Lake Macdonald inundation area	33	-26.410647151018	152.94134944174
Lake Macdonald inundation area	34	-26.412146154326	152.93289511893
Lake Macdonald inundation area	35	-26.40330559715	152.93293803427
Lake Macdonald inundation area	36	-26.393580202004	152.93092101309
Lake Macdonald inundation area	37	-26.385930007231	152.93594210837
Lake Macdonald inundation area	38	-26.385622451116	152.9342254946
Lake Macdonald inundation area	39	-26.392311611795	152.93006270621
Lake Macdonald inundation area	40	-26.387929102016	152.93087809775
Lake Macdonald inundation area	41	-26.386583561256	152.93006270621
Lake Macdonald inundation area	42	-26.383085081916	152.92873233054

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for

off-shore actions, shortest distance to mainland).

The Project is located in the Noosa Shire, Queensland. The closest town to Lake Macdonald is Cooroy, with the town centre being approximately 10 km from the proposed construction area. Tewantin and Noosa are the next closest urban centres. The proposed construction area is adjacent to Lake Macdonald Drive and Collwood Road. Residential properties are present on the western side of Lake Macdonald Drive within approximately 100 m of the proposed construction area.

Lake Macdonald is located on Six Mile Creek approximately 5-10 km downstream of the main headwater tributaries and 40 km upstream of the confluence of Six Mile Creek and the Mary River (Attachment A, Figure 3). The catchment area of Lake Macdonald is 49 km2. The Six Mile Creek Dam catchment is characterised by undulating pasture and a high proportion of semi-rural residential land-uses and ‘lifestyle’ type allotments. In general, the dam catchment is previously disturbed by clearing for logging and farming.

1.6 What is the size of the proposed action area development footprint (or work area) including disturbance footprint and avoidance footprint (if relevant)?

Construction works footprint approximately 25 ha.

1.7 Is the proposed action a street address or lot?

Lot

1.7.2 Describe the lot number and title. Lot 118 MCH814 and Lot 1 RP800331

1.8 Primary Jurisdiction.

Queensland

1.9 Has the person proposing to take the action received any Australian Government grant funding to undertake this project?

No

1.10 Is the proposed action subject to local government planning approval?

No

1.11 Provide an estimated start and estimated end date for the proposed action.

Start date 04/2019

End date 04/2021

1.12 Provide details of the context, planning framework and State and/or Local government requirements.

Seqwater submitted an Initial Advice Statement to the Queensland Coordinator General seeking a declaration of the Project as a coordinated project pursuant to the *State Development Public Works Organisation Act 1971* (Qld). As part of this declaration, Seqwater seeks to utilise the Impact Assessment Report (IAR) process in accordance with Part 4, subdivision 2 of the *State Development Public Works Organisation Act 1971*. Seqwater is seeking a bilateral assessment process between the Queensland State Government and Commonwealth Government under the IAR process.

The safety upgrade of the Six Mile Creek Dam is essential work to ensure the safety and security of the water supply on the Sunshine Coast. The upgrade works have been designed to minimise any environmental, social and economic impacts. Physical construction works will largely be confined to the existing dam footprint and a comprehensive dam lowering management plan (including during the construction period) will be developed to manage water quality risks during construction. Furthermore, any operational change will be minimal, with potential improvements associated with optimisation of flows probable.

On the basis that the Project's environmental impacts will be confined to the construction period, will largely be managed through well understood environmental risk mitigation measures, Seqwater believes the use of an IAR process under the SDPWO Act proposed is the most suitable approach to prepare a targeted environmental assessment that addresses the critical environmental issues. State planning and environmental approvals required to undertake the Project will be confirmed through the IAR. A preliminary review of the likely approvals required for the Project has been undertaken and documented in Attachment B.

1.13 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders.

Seqwater will consult and engage with stakeholders and the local community in accordance with regulatory requirements and in consideration of relevant guidelines. This includes local, Queensland and Commonwealth Government authorities, potentially affected neighbours, local communities and special interest groups in the Project area.

A Communications Action Plan (CAP) has been developed and Seqwater has commenced early engagement with the local community including the establishment of a Project Community Reference Group (CRG). The CAP aligns with the engagement approach of the International Association of Public Participation (IAP2), including the core values and spectrum of public participation.

The CAP provides for communications and community engagement activities (fact sheets, website, attendance at local events, community information stands, information sessions etc.) during the Project's lifecycle, including an IAR or EIS process. Community feedback is managed within Seqwater's Customer Relationship Management Policy (POL-00049) and enquiries are tracked through a supporting stakeholder database.

Community engagement to date has included the establishment of the Project CRG, which has met several times, as well as regular e-news updates distributed to interested residents that will continue to be delivered on a regular basis throughout the duration of the project. In addition, residents and recreational users of the Lake and other facilities will have the opportunity to provide feedback regarding the Project using web/app based community engagement mapping software (Social Pinpoint).

The IAR will describe the consultation that has taken place and how the responses from the community and government authorities have been incorporated into the design and outcomes of the Project. A public consultation report will be included in the IAR, which will identify how the CAP was implemented and will present a summary of results of the IAR consultation process.

Community feedback

In May 2015, Seqwater established a CRG for the Six Mile Creek Dam Improvement Project (Lake Macdonald). The CRG acts as a reference group for community input and feedback on the project and members are a conduit for the local community. The CRG works to:

- identify the positive and negative impacts of the Project on community interests

- provide Seqwater with relevant and timely community feedback to assist in addressing issues and opportunities resulting from the Project

- provide Seqwater with an indicator of community perceptions and understanding of the Project

- convey project information to the broader community through members' networks.

The eight members of the CRG were selected to achieve a diverse representation of the local community and include neighbours of Lake Macdonald, recreation users, catchment groups and special interest groups.

Since its establishment, CRG members have provided input and feedback on the conceptual designs, community impacts and the desired future state for Lake Macdonald. In depth conversations have included (but have not been limited to):

- explanation of Seqwater's Portfolio Risk Assessment and regulatory requirements under the Water Act

- the requirement to remove and reconstruct the current dam

- the proposed methods of construction work

- design options and comparative costs between design options

- IAR application process

- geotechnical drilling investigations

- discussions pertaining to construction sequencing

- the potential impacts of the construction work to nearby residents

- potential alterations to recreation facilities during construction

- potential methods to manage traffic and noise during construction

- stakeholder mapping – the CRG has been involved in identifying stakeholder groups and their needs

- discussion regarding downstream environmental flows

- safety aspects for downstream residents

- fish passage options.

A goal of the CRG is to ensure the community understands the need for the upgrade, the scope of work, likely impacts and the benefits of the Project. Matters of concern, as raised by the CRG, are addressed in the meetings with the most up to date information available, this has resulted in a well informed and engaged CRG.

Several CRG meetings have been hosted to date, to coincide with newly available information or proposed changes to the Project schedule. An introductory meeting was held in late 2015 and three meetings were held in 2016. Subsequently, the CRG agreed to postpone further meetings until the Project progressed past geotechnical assessments and new information was available for discussion.

Indigenous stakeholders

It is anticipated that a cultural heritage management plan (CHMP) will be required and consultation with the appropriate Cultural Heritage Party for the Project area will be undertaken. This process will allow for valuable engagement with indigenous stakeholders to discuss the project and any areas of concern or benefit.

1.14 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project.

The project is proposed to utilise the IAR process under the *State Development and Public Works Organisation Act 1971*, including detailed impact assessments for all environmental values impacted by the project. Seqwater has engaged SMEC to undertake detailed environmental assessments to support the IAR including detailed terrestrial and aquatic ecology surveys and impact assessments, a water quality impact assessment, and traffic and transport studies amongst other assessments. In addition to these detailed future studies, several preliminary investigations have been undertaken including:

- An aquatic ecology assessment was conducted by FRC Environmental (2016) to determine fish and turtle communities present in Lake Macdonald and both upstream and downstream in Six Mile Creek.

- An assessment of aquatic fauna passage and biodiversity offset options and constraints by AECOM in (2016). This report summarised the FRC results and provided a review of potential passage design solutions.

- A desktop terrestrial ecology assessment prepared by URS (2014) to summarise ecological and environmental values associated with Lake Macdonald. This aimed to establish baseline ecological values within the proposed footprint. No further detailed terrestrial ecological assessments have been conducted at this stage.

1.15 Is this action part of a staged development (or a component of a larger project)?

No

1.16 Is the proposed action related to other actions or proposals in the region?

No

Section 2 - Matters of National Environmental Significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest. Consideration of likely impacts should include both direct and indirect impacts.

Your assessment of likely impacts should consider whether a bioregional plan is relevant to your proposal. The following resources can assist you in your assessment of likely impacts:

• Profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;

• Significant Impact Guidelines 1.1 – Matters of National Environmental Significance;

• Significant Impact Guideline 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.

2.1 Is the proposed action likely to have ANY direct or indirect impact on the values of any World Heritage properties?

No

2.2 Is the proposed action likely to have ANY direct or indirect impact on the values of any National Heritage places?

No

2.3 Is the proposed action likely to have ANY direct or indirect impact on the ecological character of a Ramsar wetland?

No

2.4 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes

2.4.1 Impact table

Species	Impact
Mary River cod (Maccullochella mariensis)	The Mary River cod has a preference for deep

Species	Impact
(Endangered)	pool habitats with large woody debris and is therefore sensitive to changes in water levels. This species is known to occur in Six Mile Creek, particularly within the downstream zone of Lake Macdonald. The population downstream can be classed as key breeding population within a key habitat area, therefore a significant source of recruitment (FRC, 2016). It is also likely that a small population exists within Lake Macdonald and may be classed as a breeding population with limited recruitment (FRC, 2016). This is likely to be attributed to historical stocking of Mary River cod within the lake. The significant impact criteria for critically endangered and endangered species as listed in the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DoE, 2013) have been considered for the Mary River cod. The key potential impacts of the project are discussed below. The project will require temporary lowering of water levels in the dam. The dam will be lowered to approximately 10-20% capacity to allow safe working conditions on the spillway and embankments. Lowering the water level in the impoundment has the potential to create shallower pools, thereby resulting in some habitat loss or degradation both in the impoundment and potentially downstream in Six Mile Creek. The conditions of Six Mile Creek and receiving environments may be temporarily affected by any changes in flow regimes from Lake Macdonald, though the specifics of these changes have not yet been determined. It is anticipated that water will be progressively released from Lake Macdonald, so as not to flood the downstream environment. During construction, a low flow diversion channel will be maintained at all times to ensure downstream flows can pass the dam site with suitable water quality. Higher flows will also be passed through the site by controlled overtopping of the coffer dam. This is expected to occur several times per year during construction. It will be important to maintain incident high flows during spring and summer

Species	Impact
	months when the Mary River cod tends to move upstream to Six Mile Creek from Mary River. Deep excavation is proposed to occur for construction of the dam upgrade. This has the potential to expose acid sulfate soils below the spillway. Lake Macdonald is identified as having a high risk of inland acid sulfate soils due to the geology below the spillway, though these soils may have already been disturbed in previous construction activities. During construction, significant rainfall events may result in increased sedimentation, thereby reducing water quality in the impoundment and downstream Six Mile Creek, thereby causing temporary degradation of habitat, particularly if acid sulfate soils are present. Cabomba caroliniana (a submerged exotic weed) is present in Lake Macdonald. A monitoring and eradication program undertaken by CSIRO was unsuccessful and it is now considered that the eradication of Cabomba within the impoundment is not possible. It is anticipated that the lowering of the water level in Lake Macdonald to facilitate construction may result areas that were previously too deep for Cabomba growth, to become suitable habitat. Impacts associated with Cabomba on the Mary River cod within the Lake will be assessed and necessary mitigation measures proposed. Mitigation measures will also be put in place to minimise the transport of the weed into Six Mile Creek downstream. Operational phase impacts are not expected to be significant. Investigations into the installation of an aquatic biopassage structure are underway as part of the upgrade project. There is currently no upstream aquatic biopassage at Six Mile Creek Dam and downstream movement is provided only through spillway flows. An aquatic biopassage to facilitate movement over the dam may be implemented if deemed feasible and likely to provide beneficial outcomes for target species. A detailed assessment of construction phase impacts on the Mary River cod will be undertaken as part of the proposed IAR. The most significant impacts are likely to be

Species	Impact
	associated with the construction phase and operational impacts are likely to be negligible from the current situation. The detailed assessment will identify the necessary mitigation measures to avoid and minimise impacts as far as practicable.
Australian lungfish (Neoceratodus forsteri) (Vulnerable)	This species is known to occur in Six Mile Creek, particularly within the downstream zone of Lake Macdonald. However, the abundance of lungfish in this area is much lower than in other tributaries of the Mary River where submerged aquatic plants are abundant (FRC, 2016). The Australian lungfish has a preference for deep pool habitats with large woody debris and is therefore sensitive to change in water levels that may occur during the construction phase of the project. An aquatic assessment conducted by FRC (2016), in consultation with experts in this field, concluded that the population downstream of the dam can be classed as a breeding population, with limited recruitment. It was determined that some recruitment by Australian lungfish may occur in Six Mile Creek downstream of the dam in undercut banks amongst fine root systems some years, though breeding habitat is marginal compared with other known areas of occupancy such as Mary River tributaries. The population within Lake Macdonald is unknown as there is little survey data available. FRC (2016) noted that the limited suitable habitat and fluctuations in water levels that currently occur are likely to limit the abundance and recruitment success of lungfish. While the species is likely to occur within Lake Macdonald, it is well documented that lungfish do not breed in impounded waters (Kind 2002). FRC (2016) concluded that the population within Lake Macdonald can be classed as non-breeding, occasional occurrence in marginal habitat. Minor and temporary impacts to individuals of the Australian lungfish may occur both within Lake Macdonald and in Six Mile Creek downstream. This includes the following: - erosion and sedimentation impacts during times of elevated flow or vegetation clearing within Six Mile Creek - potential exposure of

Species	Impact
	acid sulfate soils during times of elevated flow through the construction phase - indirect impacts to habitat through increased growth of Cabomba - temporary changes to suitable habitat through alterations to flow regimes (changes to depth of pools); however, it is anticipated that water will be progressively released from Lake Macdonald, so as not to flood the downstream environment. A detailed assessment of construction phase impacts on the Australian lungfish will be undertaken as part of the proposed IAR. Given that the lungfish population within Lake Macdonald and Six Mile Creek is not considered to be a key population, and the temporary nature of the proposed disturbance, the lowering of water levels and changes to flows during construction are unlikely to result in a significant impact to this species. The detailed assessment will identify the necessary mitigation measures to avoid and minimise impacts as far as practicable.
Mary River turtle (Elusor macrurus) (Endangered)	The Mary River turtle has been identified as potentially occurring within Six Mile Creek on a periodic basis, though is considered unlikely to breed in this area (FRC, 2016). Six Mile Creek is not identified as one of the Mary River tributaries known to contain significant populations of the species (Limpus, 2008). It has been concluded that the species is likely to utilise Six Mile Creek as a dispersal and migration corridor to an extent, though the existing dam would be a barrier to movement (FRC, 2016). The Lake provides suitable but limited non-breeding habitat for the Mary River turtle. Any population within the Lake has been classed as a non-breeding population, occasional occurrence in marginal habitat (FRC, 2016). Recent surveys by FRC (2016) conducted within and around Lake Macdonald did not identify any individuals. Minor and temporary impacts to individuals of the Mary River turtle may occur both within Lake Macdonald and in Six Mile Creek downstream. This includes the following: - erosion and sedimentation impacts during times of elevated

Species	Impact
	flow or vegetation clearing within Six Mile Creek - potential exposure of acid sulfate soils during times of elevated flow through the construction phase - indirect impacts to habitat through increased growth of Cabomba - temporary changes to suitable habitat through alterations to flow regimes (changes to depth of pools); however, it is anticipated that water will be progressively released from Lake Macdonald, so as not to flood the downstream environment. As the Mary River turtle is a cloacal breather, physiological stress and impaired capacity for cloacal respiration may occur due to sediments originating from construction works resulting in stratified, low oxygenated, turbid waters downstream, particularly during flood events. However, it is considered possible to minimise potential impacts associated with sedimentation through the implementation of erosion and sediment controls throughout the construction phase. A detailed assessment of construction phase impacts on the Mary River Turtle will be undertaken as part of the proposed IAR. Given that the Mary River turtle population within Lake Macdonald and Six Mile Creek is not considered to be a key population, and the temporary nature of the proposed disturbance, the lowering of water levels and changes to flows during construction are unlikely to result in a significant impact to this species. The detailed assessment will identify the necessary mitigation measures to avoid and minimise impacts as far as practicable.
White-throated snapping turtle (Elseya albagula) (Critically endangered)	The white-throated snapping turtle is been identified as potentially occurring within Six Mile Creek on a periodic basis, though it is considered unlikely to breed in this area (FRC, 2016). Six Mile Creek is not identified as one of the Mary River tributaries known to contain significant populations of the species (Limpus, 2008). Aquatic surveys undertaken by FRC found there to be limited suitable habitat for residing and breeding in the downstream section of Six Mile Creek. The white-throated snapping turtle population downstream is considered to be rare, and have limited

Species	Impact
	recruitment (FRC, 2016). Very little survey data is available on the white-throated snapping turtle within Lake Macdonald. Aquatic surveys conducted within, upstream and downstream of Lake Macdonald did not identify any individuals. Following the aquatic assessment and consultation with experts, it was concluded that Lake Macdonald provides very limited suitable habitat and the population within the dam has been classed as species rare, non-breeding (FRC, 2016). Minor and temporary impacts to individuals of the Mary River turtle may occur both within Lake Macdonald and in Six Mile Creek downstream. This includes the following: - erosion and sedimentation impacts during times of elevated flow or vegetation clearing within Six Mile Creek - potential exposure of acid sulfate soils during times of elevated flow through the construction phase - indirect impacts to habitat through increased growth of Cabomba - temporary changes to suitable habitat through alterations to flow regimes (changes to depth of pools); however, it is anticipated that water will be progressively released from Lake Macdonald, so as not to flood the downstream environment. As the white-throated snapping turtle is a cloacal breather, physiological stress and impaired capacity for cloacal respiration may occur due to sediments originating from construction works resulting in stratified, low oxygenated, turbid waters downstream, particularly during flood events. However, it is considered possible to minimise potential impacts associated with sedimentation through the implementation of erosion and sediment controls throughout the construction phase. A detailed assessment of construction phase impacts on the white-throated snapping turtle will be undertaken as part of the proposed IAR. Despite the potential impacts discussed above, the population of white-throated snapping turtle in Lake Macdonald and Six Mile Creek downstream of the dam is unknown but expected to be limited and non-breeding, if any. Any impacts to this species are likely to be temporary in nature and

Species	Impact
	are not expected to be significant. The detailed assessment will identify the necessary mitigation measures to avoid and minimise impacts as far as practicable.
Giant barred frog (Mixophyes iterates) (Endangered)	A Queensland essential habitat record for the giant barred frog is located along Six Mile Creek approximately 150 m downstream of the dam, and a second record is located approximately 1.2 km further downstream. Critical habitat for the giant barred frog is defined in the Recovery plan for stream frogs of south-east Queensland 2001 – 2005 (Hines et al, 2002) as permanent freshwater streams from 0-700 m altitude, in rainforest and other forest communities of the McPherson, Main, D'Aguilar, Blackall Range, Conondale Range and the Bunya Mountains. This includes narrow riparian rainforest remnants along streams and their major tributaries including Mary River, of which Six Mile Creek is a major tributary. The abundance or distribution of this species in the area has not been quantified through field surveys at this stage of the project. The environmental assessment will undertake targeted surveys for the giant barred frog along Six Mile Creek, targeted areas of the impoundment and Collwood Road. Therefore, the construction and operational stage could potentially impact this species, though the nature and extent of this is currently unknown. No vegetation is expected to be to be cleared along Six Mile Creek downstream of the dam where the records of the frog are located. Any clearing for the saddle dam is unlikely to be in suitable habitat for the giant barred frog. Indirect impacts to the giant barred frog that may be triggered by the project include changes in water flow regimes, degradation of water quality and disturbance to riparian vegetation. Increased silt and changes in water flow may affect embryos and tadpoles, thereby reducing reproduction and recruitment. Flood events during construction have the potential to impact giant barred frog individuals (if present) and suitable habitat through transport of exposed sediments. Acid sulfate soil, if present,

Species	Impact
	may also adversely impact giant barred frog habitat through decreasing the pH of downstream flows. A detailed assessment of impacts on the giant barred frog will be undertaken as part of the proposed IAR. Any impacts to this species are unlikely to be significant. The detailed assessment will identify the necessary mitigation measures to avoid and minimise impacts as far as practicable.
Koala (Phascolarctos cinereus) (Vulnerable)	Essential habitat for koala is mapped across the remnant vegetation communities downstream of the site. Minor clearing of RE 12.3.2 (Eucalyptus grandis tall open forest on alluvial plains) may be required immediately downstream of the dam wall. Clearing of RE 12.9-10.1/12.9-10.17 may be required if a saddle dam is required to be constructed. Both RE 12.3.2 and RE 12.9-10.1/12.9-10.17 occur extensively in the surrounding area and any removal will constitute a very small percentage reduction in the total area this vegetation occupies. Minor clearing of vegetation not recognised as remnant may also be necessary. A preliminary assessment of the vegetation that may require clearing has been conducted using the koala habitat assessment tool (coastal context) provided in the EPBC Act referral guidelines for the vulnerable koala (DoE, 2014). According to this assessment, the vegetation communities along Six Mile Creek are ‘habitat critical to the survival of the species’. However, the area of vegetation removal required for the project will be minimal. It will also not fragment any habitat or create isolated patches in the area. Some koala habitat trees are expected to be removed, though this will be kept to the minimum possible. There is a risk of vehicle strike to koala during construction as a result of increased vehicle traffic to and from the dam. Speed limits will be implemented to minimise this risk. Specific restrictions on vehicle speeds and proposed management measures will be developed through the IAR process. Indirect disturbance may also occur to this species through the construction phase, including noise and light generating activities. Construction

Species	Impact
	Environmental Management Plans will be prepared and implemented to mitigate potential impacts to koala during construction. A detailed assessment of impacts on the koala will be undertaken as part of the proposed IAR. Any impacts to this species are unlikely to be significant. The detailed assessment will identify the necessary mitigation measures to avoid and minimise impacts as far as practicable.
Southern penda (Xanthostemon oppositifolius) (Vulnerable)	The southern penda is known from three general localities in south-east Queensland, covering a range of approximately 250 km. It is known from Kin Kin-Boreen Point–Cooroy District, near Noosa; Teddington Weir, south of Maryborough; and Granite Creek and Broken Creek, south-west of Miriam Vale (Barry & Thomas, 1994; Queensland Herbarium, 2008). Penda is found predominantly along watercourses, on sandy clays derived from sedimentary rocks. Penda grows in various types of vine forest with Hoop Pine (Araucaria cunninghamii var. cunninghamii) emergents, or in transitional rainforest with rainforest species restricted to a developing understorey or mid-storey (Barry & Thomas, 1994). Specimens are known to occur near Six Mile Creek and Lake Macdonald; however outside of the project impact area. In the vicinity of Lake Macdonald, specimens were generally found in association with RE 12.3.1 (Gallery rainforest (notophyll vine forest) on alluvial plains), which occurs along the Six Mile Creek (Left Arm), west of the Lake (Northern Pipeline Interconnector Stage 2 EIS, 2008). Construction works areas will utilise previously cleared and disturbed land as much as possible. Any clearing of previously undisturbed areas will be minimised. During the environmental assessment, a targeted survey will be undertaken to confirm the absence of the plant in the impact area. The Project is not anticipated to have an impact on the southern penda.

2.4.2 Do you consider this impact to be significant?

Yes

2.5 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed migratory species, or their habitat?

Yes

2.5.1 Impact table

Species	Impact
Cattle egret (Ardea ibis)	This species has previously been recorded at Lake Macdonald (LMCCG, 2001). It is a highly mobile species noted to be widespread and common according to migration movements and breeding localities surveys (DoE, 2017). Cattle egrets occur in a variety of habitats from wetlands to farmland with livestock to rubbish tips. No breeding sites are known near the proposed activity; however, the species breeds around wetlands and therefore it is possible for breeding sites to be present. Field surveys will be conducted to determine the presence of any breeding sites in the vicinity of the proposed works. Minor disturbance to cattle egret or breeding habitat may occur during construction activities such as increases in noise, light and dust. It is noted that these will be temporary and managed through implementation of various management plans. Given the limited extent of proposed works and the mobile nature of this species, a significant impact is not considered likely as it will not substantially modify an important habitat, result in invasive species becoming established or seriously disrupt the lifecycle of an ecologically significant proportion of the population.
Eastern great egret (Ardea modesta)	This species has previously been recorded at Lake Macdonald (LMCCG, 2001). It is widespread across Australia and inhabits a wide range of wetland habitats, including both inland and coastal, saline and freshwater (DoE, 2017). A very small area of vegetation is likely to be cleared for the project. Water levels within Lake Macdonald will be reduced during construction to create a safe working zone,

Species	Impact
	though a limited amount of water will still exist throughout the duration. Suitable habitat for the eastern great egret may be temporarily impacted or reduced and construction disturbance may occur, though given the range this species occupies, it is not expected to be significant. Given the limited extent of proposed works and the mobile nature of this species, a significant impact is not considered likely as it will not substantially modify an important habitat, result in invasive species becoming established or seriously disrupt the lifecycle of an ecologically significant proportion of the population.
Glossy ibis (Plegadis falcinellus)	This species has previously been recorded at Lake Macdonald (LMCCG, 2001). Glossy ibis is highly mobile and inhabits large areas of suitable habitat, moving across its migratory range depending on rainfall (DoE, 2017). A very small area of vegetation is likely to be cleared for the project. Water levels within Lake Macdonald will be reduced during construction to create a safe working zone, though a limited amount of water will still exist throughout the duration. Suitable habitat for the glossy ibis may be temporarily impacted or reduced and construction disturbance may occur though given the range this species occupies, it is not expected to be significant. Given the limited extent of proposed works and the mobile nature of this species, a significant impact is not considered likely as it will not substantially modify an important habitat, result in invasive species becoming established or seriously disrupt the lifecycle of an ecologically significant proportion of the population.

2.5.2 Do you consider this impact to be significant?

No

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

No

2.7 Is the proposed action to be taken on or near Commonwealth land?

No

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

No

2.9 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

2.10 Is the proposed action a nuclear action?

No

2.11 Is the proposed action to be taken by the Commonwealth agency?

No

2.12 Is the proposed action to be undertaken in a Commonwealth Heritage Place Overseas?

No

2.13 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

Section 3 - Description of the project area

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed in Section 2).

3.1 Describe the flora and fauna relevant to the project area.

The Project site 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 (Sattler and Williams, 1999). Lake Macdonald supports habitat values for native fish, waterbird, amphibian, mammal and reptile fauna. Species of conservation significance potentially utilise the dam. A search of the wildlife online database identified records of 207 fauna species and 252 plant species within a 5 km radius of the Project.

In the immediate area of works, vegetation has largely been removed for the Noosa Water Treatment Plant. On-ground ecological assessments conducted for the project are limited to date. Aquatic surveys were undertaken by FRC consulting in 2016. These surveys investigated fish and turtle species within Lake Macdonald and upstream / downstream. The surveys identified 26 native fish species and four alien pest species that are known or likely to occur in Six Mile Creek. Six native turtle species were identified as known or likely to occur in the Mary River and Six Mile Creek. The aquatic assessment report is provided in Attachment C which cannot be uploaded due to file size (this file can be provided on request).

Desktop mapping identifies remnant vegetation communities downstream of the dam, along Six Mile Creek and Tewantin National Park. These are discussed further in response to Question 3.5. Essential habitat is mapped for two species within the project area, comprising koala and giant barred frog. Three migratory wetland species have also been identified in the project area previously, being glossy ibis, cattle egret and eastern great egret. Terrestrial data has been reviewed and collated by URS (2014) however, a site assessment was not included as part of this study. The report concluded potential occurrence of 31 conservation significant flora and fauna species, and potential occurrence of an additional nine EPBC listed migratory species.

3.2 Describe the hydrology relevant to the project area (including water flows).

As part of the Mary Basin Resource Operations Plan (ROP), Seqwater operates Six Mile Creek Dam under licence to impound and take water.

Six Mile Creek in its entirety extends from headwaters around Cooroy northwards to the Mary River near Gympie. The Six Mile Creek catchment is bordered by Mount Tinbeerwah to the east, Black Mountain to the south and the Kin Kin Creek catchment to the north. Under existing conditions, Six Mile Creek has reasonably constant flow, with flows greater than 10ML per day approximately 80% of the time. The volume of flow is an order of magnitude lower than the

upper Mary River downstream (AECOM, 2016). Changes to the flow as a result of the project will be assessed in more detail as the impact assessment process progresses.

Six Mile Creek Dam is located 5-10 km downstream of the main headwater tributaries and 40 km upstream of the confluence of Six Mile Creek and the Mary River (refer to Attachment A, Figure 3). In general, the dam catchment is previously disturbed by clearing for logging and farming.

As a water storage asset, the existing dam and proposed safety upgrade are intimately related to waterways and flooding. While Six Mile Creek Dam is primarily a water storage dam with no flood mitigation objectives, a comparison of the inflow and outflow at Six Mile Creek Dam indicates that the dam currently provides some level of flood attenuation (Lake Macdonald Dam – Preliminary Design Hydrology, Seqwater 2009).

During construction, stormwater flows in Six Mile Creek will pass over the cofferdam through the work area via a diversion channel. Stormwater management within and through the work area will be required. The diversion channel will be located within the footprint of the existing inundation area and dam.

Flooding of the site is expected to occur during Project construction because of the location of necessary works within the dam outlet area.

The operation of the upgraded dam will effectively reinstate the existing situation, and so is unlikely have any significant operational impacts on threatened aquatic species in relation to downstream flows. The Mary River Basin Resource Operations Plan current requires the operational regime to minimise changes to the low flow regime of the creek and to minimise changes to the hydraulic habitat requirements of species such as the Mary River cod and lungfish. Optimisation of flows will occur during the detailed design phase with the view to improve the performance of the current situation.

It is anticipated that the upgraded dam will result in improvements on the existing operational scenario, including optimisation of environmental releases and specific spillway design features for safe downstream passage of fauna during spills. An updated framework for environmental flow releases will be prepared as part of the Project and will be subject to focused assessment in association with Seqwater's existing water licence conditions under the Mary Basin Resource Operations Plan (ROP).

3.3 Describe the soil and vegetation characteristics relevant to the project area.

Within the Project area, vegetation to the north east of the spillway is situated within the Great Sandy subregion. This subregion comprises sand masses and the sandstone hills and riverine plains of the upper Noosa River catchment. Major vegetation types include notophyll rainforest, mixed eucalypt open forests, banksia woodland and *Melaleuca quinquenervia* woodland (Sattler and Williams, 1999).

According to the regional ecosystem mapping and descriptions (version 10.0), vegetation

communities within the project site are underlain by recent Quaternary alluvial systems (land zone 3), including closed depressions, paleo-estuarine deposits under freshwater influence and inland lakes. This may include a variety of soil types, though Vertosols and Sodosols are the most common.

Further downstream of the project site, remnant vegetation communities are mapped as being on fine and course grained sedimentary rocks (land zone 9 – 10). The fine grained sedimentary rocks associated with land zone 9 generally have little or no deformation and form undulating landscapes including siltstones, mudstones, shales, calcareous sediments and sandstones. Soils are often Vertosols, Sodosols or Chromosols. The medium to coarse grained sedimentary rocks associated with land zone 10 from plateaus, benches and scarps. This includes quartzose sandstones, conglomerates and minor interbedded volcanics. Soils are generally shallow Rudosols and Tenosols.

The Queensland DME 1:100,000 series map (1999) supports the above geological mapping, identifying quaternary alluvium overlying Upper Triassic-Jurassic period Myrtle Creek sandstone, comprised of quartzose, sandstone, orthoquartzite, sub-labile to labile sandstone, siltstone and shale.

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area.

Tewantin National Park is located immediately north of the project site and Noosa Water Treatment Plant. Tewantin National Park is broken up into six separate sections and is separated by Yurol and Ringtail State forests and Tewantin National Park (Recovery). Tewantin forest reserves 1 and 3 are lineal tracks within the national park and provide access for horse riding.

Tewantin National Park supports remnant vegetation contiguous with other local protected areas such as:

- the Great Sandy National Park

- Harry Spring Conservation Park

- Yurol State Forest

- Ringtail State Forest.

No additional outstanding natural features occur within the project area.

3.5 Describe the status of native vegetation relevant to the project area.

Regional ecosystem mapping (version 10.0) identifies of concern RE 12.3.2 (*Eucalyptus grandis* +/- *E. microcorys*, *Lophostemon confertus* tall open forest with vine forest understorey (wet

sclerophyll)) occurring immediately downstream of the dam and to the north of the right embankment, including over Collwood Road (refer to Attachment A, Figure 4). The description for this RE also notes that patches of *Eucalyptus pilularis* are sometimes present, especially in the vicinity of sedimentary rocks, and that it occurs along streams and in narrow gullies in high rainfall areas.

The following REs occur within the project area and may require some clearing if the saddle dam is required to be constructed (Attachment A, Figure 4):

- RE 12.9-10.1 (of concern) - Tall open forest. Canopy species include *Eucalyptus resinifera, E. grandis, E. robusta, Corymbia intermedia* +/- *E. microcorys, Melaleuca quinquenervia, Syncarpia glomulifera subsp. glomulifera* and *Lophostemon confertus*.

- RE 12.9-10.17 (least concern) - *Eucalyptus acmenoides, E. major, E. siderophloia* +/- *Corymbia citriodora subsp. variegata* woodland on sedimentary rocks

An of concern RE 12.3.4 (Open forest to woodland of *Melaleuca quinquenervia* and *Eucalyptus robusta)* which occurs fringing drainage lines and on floodplains, is mapped outside the project area, but within 1 km downstream of the Project.

None of the REs mapped within the Project area or downstream are analogous to the Lowland Rainforest of Subtropical Australia Threatened Ecological Community (TEC) or Subtropical and Temperate Coastal Saltmarsh TEC, which are listed in the protected matters search within a 10 km radius. It is therefore considered unlikely that these TECs occur within the broader area and will be impacted by the Project.

Mapped vegetation communities and non-remnant vegetation have not yet been field verified. This will be undertaken as part of the IAR process.

3.6 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

not applicable

3.7 Describe the current condition of the environment relevant to the project area.

The immediate area of works is predominantly occupied by existing dam infrastructure. Vegetation has largely been removed for construction of the dam and Noosa Water Treatment Plant which includes pipelines, bridge, access roads, administrative buildings and associated infrastructure such as treatment process buildings/tanks, chemical storage, pump stations and waste handling infrastructure.

Cabomba caroliniana (a submerged exotic weed) is present in Lake Macdonald. A monitoring and eradication program undertaken by CSIRO was unsuccessful and it is now considered that the eradication of Cabomba within the impoundment is not possible.

Vegetation downstream of Lake Macdonald, largely associated with Six Mile Creek and Tewantin National Park, is still in-tact and comprises remnant and regrowth vegetation communities.

3.8 Describe any Commonwealth Heritage Places or other places recognised as having heritage values relevant to the project area.

nil

3.9 Describe any Indigenous heritage values relevant to the project area.

The DATSIP Cultural heritage database and register revealed one cultural heritage site within Lot 118 MCH814. This is listed as a cultural site and earthen arrangement. While site investigations are yet to be undertaken, there is potential for other cultural heritage values to exist. Further assessments will be undertaken at a later date to determine existing values and potential impacts. The project has been assessed as a Category 5 activity under the *Aboriginal Cultural Heritage Act 2003* (Qld) duty of care guidelines and is likely to require a Cultural Heritage Management Plan.

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area.

The construction footprint is located within Lot 118 MCH814, Lot 1 RP800331 and also within the road reserves of Lake Macdonald Drive and Collwood Road. The tenure of Lot 118 MCH814 and Lot 1 RP800331 is freehold and owned by the proponent (Seqwater). Lake Macdonald Drive and Collwood Road are road reserves controlled by Noosa Shire Council.

3.11 Describe any existing or any proposed uses relevant to the project area.

Existing land uses within the catchment are reflected in the planning scheme zones, comprising larger rural lots, historic smaller rural allotments and more recent rural residential developments. A land use map is provided in Attachment A, Figure 6. The zoning assigned to allotments within the Project area includes Rural Settlement, Rural, Community Services and Open Space Conservation as prescribed by the Noosa Plan. As classified by the Queensland Land Use Mapping Program (QLUMP), the catchment contains various land use areas including:

- grazing native vegetation

- intensive animal husbandry

- plantation forestry

- irrigated perennial horticulture

- residential

- manufacturing and industrial

- commercial services

- waste treatment and disposal

- other minimal uses.

Section 4 - Measures to avoid or reduce impacts

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action.

As previously discussed, the upgrade works have been designed to minimise any environmental, social and economic impacts. As far as practical, the construction works areas will be confined to the existing dam and inundation area footprint and areas previously cleared for the water treatment plant. If the saddle dam is required, additional clearing will be necessary outside of the currently impacted areas. This will be confirmed during detailed design and will be minimised as far as practical for safe construction and operation.

The impacts will generally be temporary and associated with the construction activities. The most significant of impacts will relate to changes in water quality and flows in Six Mile Creek during the construction period. To minimise impacts associated with water quality and flows during construction a detailed assessment of impacts will be undertaken and an effective management framework will be developed to mitigate these impacts.

The detailed environmental assessment will identify and quantify the potential impacts from the project. Following this, a comprehensive Environmental Management Plan (EMPs) will be prepared and will form part of the IAR. The EMPs will be designed to minimise negative impacts and enhance beneficial outcomes. Furthermore, throughout the environmental assessment and detailed design, the environment and design teams will work together to avoid impacts as far as practical.

The following management plans are proposed for various aspects of the Project:

- Construction Environmental Management Plan (CEMP) and associated sub-plans to specifically address key environmental concerns- Dam Lowering Management Plan including water quality management throughout construction- Social Impact Management Plan- Traffic Management Plan- Cultural Heritage Management Plan, if required.

Detailed environmental assessments undertaken through the IAR process will determine the key impacts of the project. Specific mitigation and management measures will be developed to address the issues identified. Preliminary management measures are discussed below.

Water

Focused assessment will be required to confirm the Project impacts on water values and appropriate mitigation measures.

The controlled reduction of the water level from the Lake Macdonald impoundment, and its safe management throughout construction will require careful planning. A Dam Lowering Management Plan will be developed to document the range of impacts and mitigation measures related to this aspect, including dewatering for impoundment lowering and the management of erosion, water quality and aquatic fauna in the lowered impoundment. The plan is anticipated to include the monitoring of water quality and environmental flows with comparison to baseline levels.

Flood risk during construction crosses-over with construction planning and safety for the Project, as it feeds into the design and height of the temporary coffer dam for construction. Flood risk associated with the project will be documented within the IAR, but assessments and management plans are anticipated to be incorporated into dam operations and dam safety aspects of the Project.

The Project's operational impacts on Six Mile Creek flow regime will be considered as part of the IAR or EIS, largely in relation to aquatic fauna. An updated framework for environmental flow releases may be considered as part of the Project but will be subject to focused assessment in association with Seqwater's existing water licence conditions under the Mary Basin Resource Operations Plan.

Ecosystems, including flora and fauna

Effects on ecosystems will be carefully monitored, minimised and, as far as practical, managed during design and construction. Monitoring and management plans will be implemented for the species present in Lake Macdonald and areas immediately downstream of the construction area. Impacts are expected to be modest, but vegetation offsets and rehabilitation will be proposed to account for unavoidable impacts, in line with industry best practice and regulatory guidelines.

The Project's expected operational impacts are limited to aquatic flora and fauna. These impacts will be potentially minimised through environmental flows, aquatic weed management and fauna passage. The plan for fauna passage at Lake Macdonald will be subject to assessment and stakeholder negotiation, but will likely involve an engineered solution at the dam that will require expert input in options assessment and design input.

Land

Earthworks related to the Project will require an erosion and sediment control plan (ESCP) which will be a sub-plan of the CEMP. This plan will specifically address the proposed demolition of the existing spillway, which will be undertaken over a short duration to minimise the risk of inclement weather. The ESCP will be consistent with current practice for construction projects and align with International Erosion Control Association (IECA) guidance.

Air

Air quality impacts including dust will be managed through the CEMP. Any impact mitigation measures are expected to be relatively typical of a construction project and conform to industry best practice relating to exposed soils, stockpiles and construction equipment.

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved.

The environmental outcomes for Mary River cod are to maintain or enhance any existing suitable habitat for this species, to sustain the existing populations, continue breeding of populations, and to improve movement opportunity for this species across the dam through the introduction of an aquatic fauna passage structure.

The environmental outcomes for Australian lungfish are to maintain or enhance any existing suitable habitat for this species and to improve movement opportunity for this species across the dam through the introduction of an aquatic fauna passage structure.

The environmental outcomes for Mary River turtle are to maintain or enhance any existing suitable habitat for this species and to improve movement opportunity for this species across the dam through the introduction of an aquatic fauna passage structure.

The environmental outcomes for white-throated snapping turtle are to maintain or enhance any existing suitable habitat for this species and to improve movement opportunity for this species across the dam through the introduction of an aquatic fauna passage structure.

The environmental outcomes for koala are to maintain contiguous habitat for the species so that any species currently in the area are able to continue living there, without any additional barriers.

The environmental outcomes for giant barred frog are to conserve suitable habitat for this species near the project. Rehabilitation of habitat will be undertaken in impacted areas as necessary. The species will continue to occur downstream of Lake Macdonald in Six Mile Creek.

Section 5 – Conclusion on the likelihood of significant impacts

A checkbox tick identifies each of the matters of National Environmental Significance you identified in section 2 of this application as likely to be a significant impact.

Review the matters you have identified below. If a matter ticked below has been incorrectly identified you will need to return to Section 2 to edit.

5.1.1 World Heritage Properties

No

5.1.2 National Heritage Places

No

5.1.3 Wetlands of International Importance (declared Ramsar Wetlands)

No

5.1.4 Listed threatened species or any threatened ecological community

Listed threatened species and communities - Yes

5.1.5 Listed migratory species

No

5.1.6 Commonwealth marine environment

No

5.1.7 Protection of the environment from actions involving Commonwealth land

No

5.1.8 Great Barrier Reef Marine Park

No

5.1.9 A water resource, in relation to coal/gas/mining

No

5.1.10 Protection of the environment from nuclear actions

No

5.1.11 Protection of the environment from Commonwealth actions

No

5.1.12 Commonwealth Heritage places overseas

No

5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action.

Not applicable because there may be possible significant impacts on listed threatened species and communities.

Section 6 – Environmental record of the person proposing to take the action

Provide details of any proceedings under Commonwealth, State or Territory law against the person proposing to take the action that pertain to the protection of the environment or the conservation and sustainable use of natural resources.

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Please explain in further detail.

Seqwater is a statutory authority (the Queensland Bulk Water Supply Authority) established under the *South East Queensland Water (Restructuring) Act 2007*.

Seqwater is one of Australia's largest water businesses, with the most geographically spread and diverse asset base of any Australian capital city water authority. Seqwater manages more than $11 billion of water supply assets and the natural catchments of the South East Queensland's major water supply sources; including dams, weirs, conventional water treatment plants and climate resilient sources of water through the Gold Coast Desalination Plant and the Western Corridor Recycled Water Scheme. A 600 km reverse flow pipeline network allows drinking water to be transported to where it is needed most, from the Sunshine Coast to Greater Brisbane, to Redlands and south to the Gold Coast.

Seqwater is committed to ensuring environmental compliance and preventing environmental harm from its operations. This commitment is being met through the implementation of dedicated environmental resources and the decision to adopt Australian Standards 14001: 2004 Environmental Management Systems (EMS) as the framework for guiding workplace environmental management practices and performance. The components of the EMS including risk assessments, environmental management manuals and procedures are the key tools that aid in highlighting and mitigating risks across Seqwater's operations.

The EMS is currently certified across several assets within the Seqwater operational portfolio (Ten WTPs, head office locations and the bulk water distribution system). The systemised management tools are also being implemented across other assets outside the certification scope and are currently implemented across an additional 24 WTPs and five water quality management facilities (WQMF's).

Through the progressive evaluation of environmental risks associated with Seqwater's asset base and operations, significant risks are highlighted and documented in alignment with Seqwater's risk management framework.

6.2 Provide details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either (a) the person proposing to take the action or, (b)

if a permit has been applied for in relation to the action – the person making the application.

nil

6.3 If it is a corporation undertaking the action will the action be taken in accordance with the corporation's environmental policy and framework?

Yes

6.3.1 If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework.

Refer to the Environmental Policy provided in Attachment D.

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes

6.4.1 EPBC Act No and/or Name of Proposal.

2007/3686 SOUTHERN REGIONAL WATER PIPELINE COMPANY PTY LTD TRADING AS LINKWATER/Water Management and Use/Noosa and Maroochy Shires/Queensland/Northern Pipeline Interconnector Stage 2

2007/3396 CABOOLTURE SHIRE COUNCIL/Water Management and Use/Bribie Island/Queensland/Banksia Beach Water Treatment Plant

2006/3211 Gold Coast City Council/Water Management and Use/Nerang/Queensland/Hinze Dam Upgrade

2006/3157 QUEENSLAND WATER INFRASTRUCTURE PTY LTD/Water Management and Use/Teviot Brook near Boonah/Queensland/Wyaralong Dam

2003/1118 – SEQWater/Water management and use/Wivenhoe/QLD/Wivenhoe Dam Upgrade

Section 7 – Information sources

You are required to provide the references used in preparing the referral including the reliability of the source.

7.1 List references used in preparing the referral (please provide the reference source reliability and any uncertainties of source).

Reference Source	Reliability	Uncertainties
FRC 2016 – Fish and Turtle Survey, Aquatic Habitat Assessment and Matters of National Environmental Significance (Appendix A of AECOM 2016)	high	Surveys were undertaken in accordance with relevant guidelines, however there is always potential for species to occur in the assessment area or other parts of Six Mile Creek that were not detected at the time of the survey.
Kind 2002 – Movement Patterns and habitat use in the Queensland lungfish, Neoceratodus forsteri	high	None – this was prepared as part of a PhD thesis at the University of Queensland.
DoE 2017 - Ardea modesta in Species Profile and Threats Database, Department of the Environment	high	None - Commonwealth government provided data source, based on literature relevant to the species.
DoE 2017 – Plegadis falcinellus in Species Profile and Threats Database, Department of the Environment	high	None - Commonwealth government provided data source, based on literature relevant to the species.
DoE 2017 – Ardea ibis in Species Profile and Threats Database, Department of the Environment	high	None - Commonwealth government provided data source, based on literature relevant to the species.
DoE 2014 – EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	high	None - Commonwealth government provided data source, based on literature relevant to the species.
URS 2014 – Lake Macdonald Ecology Review	high	None - though the results in this study have not been verified in the field and are therefore limited by being desktop only.
LMCCG 2001 – Environmental	high	None – the recovery plan has

Reference Source	Reliability	Uncertainties
Recovery Plan April 2002 – Cabomba control by mechanical harvesting and habitat restoration using native water grasses		been prepared by a catchment care group to address a specific species, with input obtained from researchers where appropriate.
AECOM 2016 – Lake Macdonald Dam Safety Upgrade Preliminary Design Project Assessment of Aquatic Fauna Passage and Biodiversity Offset Options and Constraints	high	None – information collated by experienced consultants. The only risk is if the design and / or footprint change, in which case the study will not be comprehensive and may need to be revised.
Hines, H. B. and the South-east Queensland Threatened Frogs Recovery Team 2002 - Recovery plan for stream frogs of south-east Queensland 2001-2005	high	None - Commonwealth government provided data source, based on literature relevant to the species.

Section 8 – Proposed alternatives

You are required to complete this section if you have any feasible alternatives to taking the proposed action (including not taking the action) that were considered but not proposed.

8.0 Provide a description of the feasible alternative?

As part of Seqwater's Dam Improvement Program, a range of options were considered to reduce the safety risks identified for Six Mile Creek Dam. In general, the options considered were:

- Adopt risk reduction strategies – this option would maintain the dam in its current condition, but limit the impact of dam failure by reducing the population at risk. This would be done primarily through the purchase of 'at risk' properties downstream of the dam, and would also include improvements to dam monitoring and early warning systems. This option would fail to satisfy legislative risk requirements and was ruled out.

- Partial dam upgrade – this option was eliminated due to the presence of potentially liquefiable material beneath the existing spillway foundation and the associated residual dam safety risks of post-earthquake dam performance.

- Reconstructing the embankment and relocating the spillway to the right of the dam – this option was subsequently eliminated due to poor foundation conditions, regulatory approval, land ownership and environmental issues.

- Decommissioning the storage – this option was subsequently eliminated primarily due to the potential impacts on Seqwater operations, the cost of providing an alternate water source to meet future demand, and the potential long-term environmental impacts of rehabilitating the Six Mile Creek ecosystem.

- Replacing Six Mile Creek Dam with a 2,000 ML weir structure located downstream of the existing dam – this option was subsequently eliminated due to the need to augment the regional water supply with an additional storage identified at Coles Crossing Weir, an increase in the downstream flooding impacts and potential water quality and environmental impacts due to the smaller storage size.

- New dam options – a range of new dam options were considered in locations upstream, downstream and at the existing dam location. These new dam options looked attractive and a preferred upstream dam location was initially preferred. However, the costs of the new dam options increased substantially based on the outcomes of geotechnical investigations undertaken in 2015 and a new dam was ruled out.

8.1 Select the relevant alternatives related to your proposed action.

8.27 Do you have another alternative?

No

Section 9 – Contacts, signatures and declarations

Where applicable, you must provide the contact details of each of the following entities: Person Proposing the Action; Proposed Designated Proponent and; Person Preparing the Referral. You will also be required to provide signed declarations from each of the identified entities.

9.0 Is the person proposing to take the action an Organisation or an Individual?

Organisation

9.2 Organisation

9.2.1 Job Title

GM, Seqwater Asset Portfolio

9.2.2 First Name

Arran

9.2.3 Last Name

Canning

9.2.4 E-mail

Arran.Canning@seqwater.com.au

9.2.5 Postal Address

117 Brisbane Street
Ipswich QLD 4305
Australia

9.2.6 ABN/ACN

ABN

75450239876 - Queensland Bulk Water Supply authority

9.2.7 Organisation Telephone

1800771497

9.2.8 Organisation E-mail

communications@seqwater.com.au

9.2.9 I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

Not applicable

Small Business Declaration

I have read the Department of the Environment and Energy's guidance in the online form concerning the definition of a small a business entity and confirm that I qualify for a small business exemption.

Signature:..... Date: .....

9.2.9.2 I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations

No

9.2.9.3 Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made

Person proposing the action - Declaration

I, Arran Canning, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature:..... Date: 18/10/17

I, _____, the person proposing the action, consent to the designation of _____ as the proponent of the purposes of the action describe in this EPBC Act Referral.

Signature:..... Date: .....

9.3 Is the Proposed Designated Proponent an Organisation or Individual?

Organisation

9.5 Organisation

9.5.1 Job Title

General Manager – Seqwater Asset Portfolio Development & Delivery

9.5.2 First Name

Arran

9.5.3 Last Name

Canning

9.5.4 E-mail

Arran.Canning@seqwater.com.au

9.5.5 Postal Address

PO Box 328
Ipswich, QLD
4305

9.5.6 ABN/ACN

ABN

75 450 239 876 (Queensland Bulk Water Supply Authority t/a Seqwater)

9.5.7 Organisation Telephone

1800 771 497

9.5.8 Organisation E-mail

communications@seqwater.com.au

Proposed designated proponent - Declaration

I, Arran Canning, the proposed designated proponent, consent to the designation of myself as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature:..... Date: .....18/10/17.....

Signature:..... Date: .....

9.6 Is the Referring Party an Organisation or Individual?

Organisation

9.8 Organisation

9.8.1 Job Title

Principal Environmental Scientist

9.8.2 First Name

Damien

9.8.3 Last Name

Taylor

9.8.4 E-mail

Damien.Taylor@smec.com

9.8.5 Postal Address

480 Saint Pauls Terrace
Fortitude Valley QLD 4006
Australia

9.8.6 ABN/ACN

ABN

47065475149 - SMEC AUSTRALIA PTY. LIMITED

9.8.7 Organisation Telephone

+61 7 3029 6600

9.8.8 Organisation E-mail

Damien.Taylor@smec.com

Referring Party - Declaration

I, DAMIEN TAYLOR, I declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature:..... Date: 18/10/17.

Appendix A - Attachments

The following attachments have been supplied with this EPBC Act Referral:

1. 20171008_six_mile_creek.zip
2. attachment_a_lake_macdonald_epbc_referral_figures_rev_0.pdf
3. attachment_b_-_approvals_schedule.docx
4. attachment_d_2016_policy_statement_environment.pdf
5. lake_macdonald_seqwater_smec_signed_declarations.pdf