Australian Government
Department of the Environment

Referral of proposed action

Proposed action title: Boondooma Dam Spillway Repair Project

1 Summary of proposed action

1.1 **Short description**

The proposed action is the repair of damage caused to the existing Boondooma Dam spillway by the 2010/11 and 2013 flood events.

The proposed action intends to repair the spillway to ensure that the population at risk downstream remain suitably protected in accordance with dam safety guidelines and other regulatory requirements. The project will include:

- stabilisation of the right bank of the spillway
- construction of a secondary Erosion Control Structure (ECS) 30 metres upstream of the existing ECS
- strengthening the spillway chute through the use of defensive anchors
- strengthening the existing ogee crest structure.

The risk of further scour threatens the security of the water supply for water entitlement holders (existing customers). Failure of the ogee crest would reduce the full supply level (FSL) of the dam to 276.0 m AHD (approximately 70% of the current storage). The project will secure SunWater's ability to continue supply to customers. The works will not interfere with supply and the works will be managed in accordance with the current operating procedures for the Boyne River and Tarong Water Supply Scheme.

The action does not include minor physical disturbance necessary to undertake surveys, establish monitoring or associated with the mobilisation of plant, equipment, materials, machinery, temporary office buildings and personnel prior to commencement of construction activities.

To date, SunWater has undertaken the following investigations in relation to the proposed action:

- geotechnical drilling
- physical hydraulic modelling
- engineering design
- financial modelling
- options assessment
- comprehensive scour analysis.

1.2 **Latitude and longitude**

	Latitude			Longitude		
location point	degrees	minutes	seconds	degrees	minutes	seconds
See below						

A polygon layer of proposed referral area has also been attached.

Bounding location co-ordinates for works areas

Shown on Site Plan - Drawing No 246810 (Appendix A)

Works Area	
Lat	Long
-26.0913	151.4326
-26.0930	151.4335
-26.0926	151.4338
-26.0893	151.4320
-26.0888	151.4312
-26.0891	151.4310
-26.0891	151.4279
-26.0912	151.4249
-26.0931	151.4248
-26.0931	151.4289
-26.0914	151.4320
Site Office	
Lat	Long
-26.0945	151.4406
-26.0949	151.4409
-26.0947	151.4411
-26.0944	151.4408
Laydown area	
Lat	Long
-26.0945	151.4415
-26.0949	151.4420
-26.0945	151.4425
-26.0940	151.4420

Maps, design drawings and photos are also attached as appendices.

Appendix A - Project Drawings
- Locality plan - Drawing No. 246809
- Site Plan – Drawing No. 246810
- General Arrangement – Drawing No. 246811
- Ogee Crest and Apron Anchors Arrangement – Drawing No. 246812
- Environmental Features – Drawing No. 246827

Appendix B – Site photos
Appendix C - General Fisheries Permit
Appendix D - Ecological Assessment Report

1.3 **Locality and property description**

Boondooma Dam was constructed in 1983 across a narrow gorge located at 86.7km AMTD on the Boyne River, just downstream of the junction with the Stuart River approximately 22km north west of Proston in the South Burnett region of Queensland. The site is several hundred river kilometres from the sea. The dam provides water to the Tarong Power Station, operated by Stanwell and to urban, irrigation, stock and domestic water users. It is also used for recreational purposes.

The dam has two rockfill concrete faced embankment sections, the main section straddles the Boyne River, the other straddles Sandy Creek. The spillway consists of a 2m high uncontrolled ogee crest structure 115m long and unlined tapered discharge chute with a slope of 1 vertical to 8.66 horizontal which cuts through a ridge of volcanic rock.

The dam is located in the South Burnett Local Government Area and the Brigalow Belt Bioregion.

Photo 1: Aerial view of dam and spillway

1.4	**Size of the development footprint or work area (hectares)**	Approximately 5.1 ha
1.5	**Street address of the site**	Boondooma Dam Road, Proston - Queensland

1.6 **Lot description**

Lot 20 on Plan SP142310

1.7 **Local Government Area and Council contact (if known)**

South Burnett Regional Council
Manager Planning & Land Management – Chris Du Plessis
Phone: (07) 4189 9130
Email: cduplessis@southburnett.qld.gov.au
Address: PO Box 336, Kingaroy Qld 4610

1.8 **Time frame**

Commencement: November 2016
Completion: November 2017

1.9	**Alternatives to proposed action**		No
		✓	Yes, please also complete section 2.2
1.10	**Alternative time frames, locations or activities**		No
		✓	Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3 and 5 (where relevant).
1.11	**Commonwealth, State or Territory assessment**	✓	No
			Yes, please also complete section 2.5
1.12	**Component of larger action**	✓	No
			Yes, please also complete section 2.7
1.13	**Related actions/proposals**	✓	No
			Yes, provide details:
1.14	**Australian Government funding**	✓	No
			Yes, please also complete section 2.8
1.15	**Great Barrier Reef Marine Park**	✓	No
			Yes, please also complete section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

2.1 Description of proposed action

The purpose of the proposed action is to strengthen the existing spillway chute to retard the rate that scour will progress in future flood events. The design features a number of defensive mechanisms which are aimed at known weakness within the natural rock in the existing spillway chute. The existing spillway is part of the dam and as such the original dam construction footprint. Previous maintenance projects have also been carried out at this site in recent years. The spillway site consists largely of excavated volcanic rock and reinforced concrete, and is not a natural watercourse (as shown in the photo below). The dam wall is located on the Boyne River and is not part of the proposed works. The spillway is located to the left of the dam wall (facing downstream) and has been cut out natural rock hill at the time of dam construction. The spillway is located in between two natural tributaries that join the Boyne River above and below dam wall.

Photo 2: Construction site overview

The area encompassing the proposed action is shown in red (labelled works area) in Drawing 246180 (Appendix A), this area is referred to as the project area.

<u>Stabilisation of the Spillway Right Wall Immediately Downstream of the Erosion Control Structure (ECS)</u>
Investigations have shown that the area at the right (facing downstream), upstream corner of the plunge pool, immediately adjacent to and downstream of the ECS, is the most critical section of the spillway. Due to the geometry of the chute in this area, the jet flows are stronger and more concentrated which has led to a large scour hole forming at this location.

Photo 3: Lower Spillway Chute, wedge highlighted

Based on the available knowledge, this area of the spillway is a critical point and must be secured to avoid a damaging chain reaction of scour which would eventually threaten the spillway structure. Therefore, slope stability of the right wall (in the vicinity of the wedge) is a critical part of the design. The design includes a re-profiling of the slope of the right wall (near the wedge) to slopes with safe angles and benches. This will be done by pre-splitting from the top. The aim is to reduce the near vertical angle to a more stable one. Benches would separate each stage of excavation by nearly 15 m. Each bench would be used to pre-split material further down and the rock excavated material would fall into the plunge area.

The works associated with re-profiling the right spillway chute wall include:

- re-profiling control line ERTH02 of the right spillway wall downstream of the existing ECS
- construction of new permanent access road to the right side of the spillway upper cute, control line ERTH01
- construction of reinforced concrete gravity wall at the entry location of the access road to the spillway chute
- provision of a rock fall catch fence, road guard rail and road surface

The wedge stabilisation works will be achieved through one of the following methods:

- stabilising the wedge shape rock surface immediately downstream of the existing ECS by way of passive anchors, concrete grouting of the joint section. Providing joint treatment to the special area in spillway chute downstream of the ECS, or
- removal of the wedge and treatement of the remaining face by passive anchors

<u>Secondary ECS</u>

The design includes a secondary ECS which will act as an effective barrier to arrest the progress of scour once the existing ECS fails. The secondary ECS will be located 30 m upstream of the existing ECS. This location is upstream of the parallel spillway fault so as to ensure it will not be impacted by the existing ECS or scour of this fault. The top surface of concrete would match the rock level on both upstream and downstream sides. Long vertical and inclined anchors (about 20 m into rock) would ensure bonding with rock and provide additional protection against back scour.

<u>Defensive Anchors</u>

Defensive anchoring has been carried out in the spillway chute during the emergency repair program following both the 2010/11 and 2013 floods. Anchoring the rock would not improve the spillway's resistance to scour. Therefore, the effectiveness of the anchoring system in controlling scour depends on the strength of rock to resist fracturing or fatigue failure.

The two lines of anchors follow the principle explained above. The anchors will strengthen the rock by connecting it to the lower, more stable rock layers. This will increase the resistance of the rock against

dislodgement during future floods and work as a defence barrier against back scour of the spillway chute.

Capping of the Dykes

The two andesite dykes in the spillway chute are preferentially scourable. Without any treatment, they will act as a conduit to direct scour towards the spillway crest. The design includes measure that will protect the dykes against future scour. The treatment will include excavation along the dykes, anchoring into the adjacent volcanic rocks, and capping with reinforced concrete. The extent of this defensive measure is between the two ECS's (existing and proposed) and about 5 m further upstream of the new (secondary) ECS. The deformed anchors bars will ensure a sufficient bond will form between the capping and the surrounding rock.

Concrete Wall Protection between Crest and ECS

Investigations have shown that the spillway chute side walls are susceptible to instability. The instability is due to the vertical expansion of the rock due to natural geological processes (i.e. stress relief). The progression of further scour in the chute will lead to instability of the spillway chute side walls – particularly on the right.

To protect the side walls from collapse, the existing wall protection (at the ogee crest and existing ECS) will be extended through the length of the chute. The 500 mm thick wall would have sufficient drainage so as to control piezometric (hydrostatic ground water) pressures that may develop behind the wall. This would provide protection along the currently unprotected or partially protected rock chute walls between the crest and ECS and minimise the risk of wall failure in that area due to scour.
Rock anchors were also included in the design of the wall. Rock anchors are effective in controlling stress relief (exfoliation or sheet jointing) which has been observed in the left chute wall.

Strengthening existing ogee crest

The design includes measures that will strengthen the existing crest so that it will safely pass floods up to the dam crest flood. The original crest design included unprotected anchors which have a reduced life expectancy. Recent studies have shown that the use of unprotected anchors in spillway design is not effective. Due to the age of the anchors a deteriorated condition and the presence of corrosion is likely. Therefore, the increase the stability of the crest, passive anchors will be installed in the existing ogee. The anchors would be protected against corrosion using plastic sheathing. Passive anchors are relatively easy to install from the top of the crest and have the added benefit of not requiring inspections or restressing in the future.

In summary the works to strengthen the existing chute will include:

- installation of passive anchor in the existing spillway crest and apron
- installation of two lines of passive anchors in unlined upper chute floor
- construction of reinforced concrete wall slabs, passive anchors and drainage in spillway upper chute walls
- excavation and construction of reinforced concrete Spillway Defence Structure (SDS) and anchor the rock foundation
- excavation of two andesite dykes between the existing ECS and the Spillway Defence Structure and capping with reinforced concrete and anchor to rock.

Other works will include:

- core drill and saw cut the drummy concrete area in the spillway crest
- install starter bars and concrete fill the saw cut areas in the spillway crest.

Prior to commencing the right wall excavation the plunge pool area downstream of the ECS will be dewatered. The extent of these works are depicted by the new works (shown in yellow) shown on Drawing 246827 (Appendix A). The total area of impact for the works is approximately 5.1 ha, the area of each works area is provided below.

Table 1: Works footprint areas

Area	Ha
Spillway (new) works area	3.3
Proposed contractor site office	0.125
Proposed laydown area	0.49
Borrow areas	0.73
Disposal area	0.45
Total	5.1

Associated activities

Water
Non-potable water for construction purposes in likely to be sourced from the dam, upstream of the crest structure. Tank water will be utilised for the site offices, with bottled water provided for on-site personnel.

Transport and accommodation
Construction personnel will be housed off-site and transported to site for the duration of the project. It is currently envisaged that a mixture of existing accommodation in the town of Proston and the local caravan park will be utilised. Alternatively staff may be transported to site by bus from Brisbane. Peak workforce on-site is estimated to be between 30 and 60 construction personnel, with operational staff numbers remaining the same. There are two SunWater staff based locally with support provided from SunWater's Bundaberg and Brisbane offices. A traffic management plan will be developed and implemented to ensure the safe and efficient use of vehicles during construction. SunWater staff will be housed in existing dwellings owned by SunWater.

Sanitation
A collection system will be utilised to gather all sewerage waste from site facilities and all waste will be disposed off-site in accordance with local authority regulations.

Office accommodation and facilties
Temporary office accommodation and facilities will be located on-site, no overnight accommodation will be located within the work site. The office accommodation and facilities will include meeting rooms, ablutions, offices and a lunch room. Designated parking areas and dust free pedestrian paths will provide access.

Access roads, ramps and lay down areas (hardstands)
A new access road to the right side of the spillway will be constructed. Where required existing access tracks will be upgraded to ensure their suitability for construction vehicles. This may require the widening of existing track or changes to alignments. Ramps will be built to access works areas where required. Material for the construction of access roads, ramps and hardstand areas are likely to be sourced from a previously disturbed sites adjacent to the spillway, as shown in Appendix A – Drawing No 246810. If additional borrow material is required it will be sourced off-site from a licenced supplier. At the completion works all material from temporary acsess ramps will be removed and returned to the borrow area. The borrow area will be profiled to prevent erosion and sediment control measures installed. Any material sourced off-site will be disposed of off-site. Bunded fuel storage areas will also be located within the proposed lay down site.

Concrete batching
A temporary concrete batching plant will be located on-site and will be operated in accordance with the General Environmental Duty: Code of Practice for the Concrete Batching Industry (DEHP, 2016). The plant will be located in the lay down area as shown in Appendix A, Drawing No. 246810.

2.2 Feasible alternatives to taking the proposed action

There were four options identified for consideration in relation to the proposed action:

- Option 1 – Maintenance only (i.e. do nothing option)
- Option 2 – Engineered solutions
    a) Stilling basin
    b) Hydraulic jump
    c) Plunge pool
    d) Upstream secondary crest
    e) strengthening of existing crest and chute (preferred option)
- Option 3 – Reinstatement
- Option 4 - Decommissioning

The feasibility and impacts of each option both positive and negative have been assessed.

Option 1 – Maintenance only (do nothing option)
This option delays the upfront capital costs of major works. Instead, repairs would be undertaken in the upper chute as a response to each future flood event. This option does not meet SunWater's regulatory or commercial needs of providing a secure water supply and an insurable asset.

Option 2 – Engineered solutions
2a – would reduce the risk of future sour through dissipation of energy, cost estimate $260M
2b – reduces the risk of future scour through dissipation of energy, cost estimate $204M
2c – this option was eliminated due to concerns held by the design and technical review panel regarding the extreme turbulence and transient pressures that would occur in the pool.
2d – construction of a new spillway crest and defensive barriers, cost estimate $85.5M
2e – preferred option, construction of defensive barriers between the existing spillway crest and ECS, cost estimate $50.5M

Option 3 – Reinstate pre 2010 flood profile
This option considers the feasibility of undertaking works to repair the damage downstream of the ECS and involves concrete works where the plunge pool has formed. It does not mitigate the risk of significant capital expenditure of rebuilding a new spillway (if and when the existing spillway fails). The cost estimate for this option is $110M.

Option 4 – Decommission Dam
Decommissioning the dam would remove the ability to meet the current demand for water in the water supply scheme and have a significant commercial impact on the region and SunWater. Without the dam SunWater would not be able to meet its water supply arrangements including high priority supply to the Tarong Power Station.. As such decommissioning the dam is considered unacceptable.

2.3 Alternative locations, time frames or activities that form part of the referred action

Should construction delays occur or weather conditions prevent the scheduled commencement of construction it is likely that an additional dry season would be required to complete the works. A wet weather contingency plan and works schedule will be developed with the construction contractor. Thus proposed activites, location, nature and extent will remain the same with only the timeframe changing. As such the impacts would remain the same, occurring over an additional dry season.

2.4 Context, including any relevant planning framework and state/local government requirements

The dam's primary purpose is to supply water to Stanwell's Tarong Power Station. In addition to this, the dam supplies a small amount of water to irrigators and urban customers along the Boyne River. SunWater is required to operate and maintain the dam (and all other 22 referable dams within its

portfoilio) in accordance with the Water Supply (Safety and Reliability) Act 2008. The dam safety standards and guidelines issued by the Australian National Committee on Large Dams (ANCOLD) are also relevant and SunWater has incorporated these as best practice dam safety management.

As the dam owner, SunWater is obliged to ensure the structural and operational integrity of its facilities and the safety of downstream communities. To ensure that this obligation is properly discharged, SunWater utilises and has in place a Comprehensive Dam Safety Management Program (CDSMP) which adopts the standards and guidelines as stipulated by the Queensland Dam Safety Regulator and as recommended by ANCOLD.

In accordance with SunWater's CDSMP, regular annual dam safety inspections, five yearly comprehensive inspections, periodic safety reviews and Comprehensive Risk Assessments (CRA) are undertaken to identify any deficiencies within its portfolio of dams that do not meet acceptable risks or the current dam safety design standards. The CDSMP also includes regular review of the SunWater Portfolio Risk Assessment (PRA) that schedules any required remediation works to address non-conformances as a priority.

The CRA process considers the risks (societal, individual, economic, business, legal, environmental and stakeholder) as a whole and determines how they compare in relation to the recommended limits established by the ANCOLD Guidelines on Limit of Tolerability. For the dams that plot above the ANCOLD tolerability line or within the unacceptable risk region, it is SunWater's Policy to address these deficiencies as a matter of urgency. Dams that plot below the limit of tolerability but whose risks are not as low as reasonably practical (ALARP) are scheduled for an upgrade after addressing dams with deficiencies that plot in the unacceptable region.

The CDSMP standards and guidelines set out SunWater's obligations to make good critical water infrastructure that has previously failed or is likely to fail, especially where the asset carries a very high foreseeable risk of failing again during an extreme weather event.

From a strict liability (failure to supply) as well as an insurance coverage perspective, it is necessary for SunWater to undertake proactive steps in rectifying or repairing damage it is aware of or where it can be argued that SunWater should have known about the deficiencies. Otherwise, the 'do nothing' approach will either reduce or exclude both property and liability insurance coverage.

The state and local planning framework in relation to the construction activites will be largely managed under the Sustainable Planning Act 2009. The approval process will be co-ordinated by the State Assessment and Referral Agency (SARA) through the Integrated Development Assessment System (IDAS). Based on the desktop review, field survey, preliminary design and proposed construction methodology a list of the construction activities requiring approval at the State level is provided below.

Table 2: Approvals Overview

Activity	Approval	Assessment Manager	Legislation	Assessment notes
Dam Safety	Comprehensive Dam Safety Management Program	Department of Energy and Water Supply (DEWS)	Water Supply (Safety and Reliability) Act 2008	Comprehensive Risk Assessment identified risks to asset.
Clearing of Acacia grandifolia	EPBC Approval	Department of Environment	Environment Protection and Biodiveristy Conservation Act 1999	Clearing not likely to have a significant impact.
Vegetation clearing	Operational works for the clearing of regulated vegetation	Department of Infrastructure Local	Sustainable Planning Regulation 2009 Schedule 3 – Table 4, Item 1	To be confirmed upon completion of the design and construction methodology. Current proposed areas include spillway works area

		Government and Planning (DILGP) / Department of Natural Resource and Mines (DNRM)	Vegetation Management Act 1999	on right bank, lay down area, widening of existing access tracks and new access track.
Waterway barrier works	Operational works for the construction of permant waterway barrier works	DILGP / DAF	Sustainable Planning Regulation 2009 Schedule 3 – Table 4, Item 6 Fisheries Act 1994	To be assessed upon completion of design and construction methodology, likely to require development approval.
Building works	Building work that is self assessable development	South Burnett Regional Council	Wondai Shire Planning Scheme	Work carried out by or on behalf of the State or public sector entity.
Relocation of native fish	General fisheries permit	DAF	Fisheries Act 1994	If present relocation of fish from dewatering of spillway scour hole.
Activities in a watercourse	Riverine Protection Permit	DNRM	Water Act 2000	Exempt if minimum requirements are met.
Excavation	ERA 16	DEHP	Environmental Protection Act 1994	Possibly exempt, to be confirmed.

2.5 Environmental impact assessments under Commonwealth, State or Territory legislation

Not applicable.

2.6 Public consultation (including with Indigenous stakeholders)

SunWater has consulted a range of stakeholders in relation to the proposed action, including

- local council
- customers (including Stanwell Corporation who operates Tarong Power Station)
- local residents
- recreational users
- community groups
- dam safety regulator
- Shareholding Ministers (State)
- State and Federal Members of parliament

A communications management plan has been developed for the project and includes management strategies to ensure that stakeholders are actively engaged and informed. The following activities have been conducted or are proposed in communicating the project.

Table 3: Communication activities

Activity	Audience	Timing
Stakeholder meetings and briefing note to dam safety regulator	Local, State and Commonwealth representatives Shareholding Ministers	January 2016
Information sharing through Joint Working Group	Stanwell	Ongoing
SunWater website project section updates	Local community/stakeholders	Early 2016 and then ongoing updates as necessary
Reactive media	Print, online and broadcast local media	As required
Proactive media relations	Print online and broadcast local media	November 2016

2.7 A staged development or component of a larger action

Not applicable.

2.8 Related actions

Not applicable.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

3.1 (a) World Heritage Properties

Not applicable.

The Burnett River is not in a reef catchment and given the distance of the works upstream from the river mouth and the intervening dams and weirs, the likelihood of indirect impact at any level is essentially zero.

3.1 (b) National Heritage Places

Not applicable.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Not applicable.

The Burnett River does not discharge into the Great Sandy ramsar wetland and given the distance of the works upstream from the river mouth and the intervening dams and weirs, the likelihood of indirect impact at any level is essentially zero.

3.1 (d) Listed threatened species and ecological communities

Description

A search of the protected matters database identified threatened species and communities potentially occurring in the project area; they are detailed in the table below.

Table 4: Protected Matters Database Search Results

Threatened Communities & Species	Status	Presence
COMMUNITIES		
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	May
Weeping Myall Woodlands	Endangered	May
BIRDS		
Red Goshawk – *Erythrochis radiatus*	Vulnerable	Likely
Squatter pigeon (southern) – *Geophaps scripta scripta*	Vulnerable	May
Painted Honeyeater – *Grantiella picta*	Vulnerable	May
Swift Parrot - *Lathamus discolor*	Endangered	Likely
Black-throated Finch (southern) – *Poephila cincta cincta*	Endangered	May
Australian painted snipe – *Rostratula australis*	Endangered	May
Black-breasted Button-quail – *Turnix melanogaster*	Vulnerable	May
MAMMALS		
Large-eared Pied Bat – *Chalinolobus dwyeri*	Vulnerable	May
Northern Quoll – *Dasyurus hallucatus*	Endangered	Likely
Corben's Long-eared bat, south-eastern long eared bat – *Nycyophilus corbeni*	Vulnerable	May
Koala – *Phascolarctos cinereus*	Vulnerable	May
Grey-headed Flying Fox – *Pteropus poliocephalus*	Vulnerable	May
PLANTS		
Acacia grandifolia	Vulnerable	Known
Ooline – *Cadellia pentastylis*	Vulnerable	Likely
Small-leaved Denhamia – *Denhamia parvifolia*	Vulnerable	Likely
Tall Velvet Sea-berry – *Haloragis exalata subsp. velutina*	Vulnerable	May
REPTILES		
Yakka Skink – *Egernia rugosa*	Vulnerable	May
Collared Delma – *Delma torquata*	Vulnerable	May
Southern snapping turtle, white throated snapping turtle - *Elseya albagula*	Critically Endangered	Likely
Dunmall's snake – *Furina dunmalli*	Vulnerable	May
FISH		
Australian Lungfish – *Neoceratodus forsteri*	Vulnerable	Known

A field survey of the project area (Cardno, 2016) identified the following:

- No threatened ecological communites were identified within the project area
- One threatened plant, *Acacia grandifolia* occurs at a number of locations within the project area.
- No threatened fauna species were detected, however a threatened terrestrial vertebrate species (*Phascolarctos cinereus* - Koala) is considered likely to occur in the project area based on the presence of suitable habitat and nearby records
- No threatened fish species were observed during the field survey, however the Australian Lungfish *Neoceratodus forsteri* is known to occur in the Boyne River as it has been recorded by previous surveys and during maintenance activities. However it no longer occurs above the dam wall (DoE, 2016).
- It is considered possible that Murray Cod could occur in the project area, however the areas of habitat are isolated from the Boyne River. They have not been recorded or observed by operational staff. They were not also not captured or observed during the field survey.

An assessment of the likelihood of occurrence for those species identified by the database as likely to occur is presented below.

Table 5 Likelihood of occurence

Species Name	Conservation Status	Distribution	Habitat	Likelihood of Occurrence
Red Goshawk – *Erythrotriorchis radiatus*	Vulnerable	Sparsely distributed across large parts of northern and central Australia (DoE, 2016l).	Prefers forest and woodland with a mosaic of vegetation types, large prey populations and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins (DoE, 2016l).	The Red Goshawk was not detected at the project site during the recent ecological survey. The area in which the project is located lacks the mosaic of habitat types preferred by the Red Goshawk. It is considered unlikely to occur on the project site.
Swift Parrot – *Lathamus discolor*	Critically Endangered, Migratory	Found in south-east Australia and Tasmania. Breeds only in Tasmania and migrates to the mainland in winter, foraging and roosting mainly in Victoria and New South Wales. Recent records from southern Queensland have come from the Gold Coast, Noosa, Toowoomba, Warwick and Lockyer Valley areas (DoE, 2016d).	Inhabits dry sclerophyll eucalypt forests and woodlands (DoE, 2016d).	The project site is located north of the current distribution of the species. Therefore it is unlikely to occur on the project site.

Northern Quoll – *Dasyurus hallucatus*	Endangered	Found in parts of Queensland, the Northern Territory and Western Australia. In Queensland, the Northern Quoll occurs as far south as Gracemere and Mt Morgan, as far north as Weipa and extends as far west as Carnarvon Range National Park. Occasional records as far south as the Sunshine Coast hinterland (DoE, 2016c).	Occupies a diversity of habitats across its range, including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert (DoE, 2016c).	The project site is located approximately 250 km south of the core distribution of the species. The project site consists of sparsely vegetated and cleared areas that are unlikely to provide suitable habitat for the Northern Quoll. Therefore it is considered unlikely that this species occurs on the project site.
White throated snapping turtle – *Elseya albagula*	Critically Endangered	Restricted to the Fitzroy River drainage system (Cogger et al. 1993).	Inhabits rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles. Prefers areas with high water clarity (DoE, 2016e).	Unlikely to occur within the project site, preferred habitat of deep pools and riffles not present. The project site is also located outside the known area of distribution. Also not observed during field survey.
Ooline – *Cardellia pentastylis*	Vulnerable	Occurs on the wester edge of NSW north-west slopes and extends into QLD to Carnarvon Range, Callide Valley, and south west of Rockhampton. Also occurs in the Border River-Gwydir, Namoi, Burdekin, Burnett Mary regions (DoE, 2016m).	Grows in dry rainforest, semi-evergreen vine thickets and sclerophyll ecological communities.	Not identified during field survey, associated communities also not found within project area. Unlikely to occur within the project site.

Small-leaved Denhamia – *Denhamia parvifolia*	Vulnerable	Endemic to south-east Queensland has been recorded from the Evidsvold area, south to Chinchilla, and east to near Kingaroy (DoE, 2016n).	Grows on soils derived from various geological substrates including labile to sub-labile, siltstone, shale and acidic igneous rocks. Restricted to semi-evergreen vine thickets, Brigalow – softwood scrub communities.	Not identified during field survey, associated communities also not found within project area. Unlikely to occur within the project site.

Therefore based on the desktop and field asessments the threatened species known or likely to occur within the project area include the following:

- *Acacia grandifolia* – listed as Vulnerable (and least concern under the Nature Conservation Act 1992 (NCA)
- *Phascolarctos cinereus,* Koala – listed as Vulnerable (and under the NCA).
- *Neoceratodus forsteri,* Australian Lungfish – listed as Vulnerable.

Nature and extent of likely impact

The nature and extent of the likely impacts relate to the construction activities that will occur over the dry season with some potential for activities to occur early or late in the wet season. A significant impact assessment in accordance with the Significant Impact Guidlelines for each of the listed species known or likely to occur in the project area is presented below.

Acacia grandifolia

Acacia grandifolia is endemic to the Burnett District in south east Queensland. The species favors hilly terrain of various slopes, hillcrests, gullies and plains. It has been most frequently associated with ironbark gum and spotted gum forests (DoE. 2016a). The species is currently listed as Vulnerable under the EPBC Act.

There is no current specific recovery plan for the species. A multi-species recovery plan for *Acacia eremophiloides, Acacia grandifolia, Acacia porcata, Bertya grantica* and *Newcastelia veluntia* was developed by then Queensland Environmental Protection Agency in 2003.

Due to the high abundance of individuals recorded within the project area, densities were estimated using the point-quarter method. The results of are presented below in Table 4, from this it is estimated that the maximum number of individuals to be cleared will be approximately 476, over a total area of approximately 5.1ha. This relates to the works located within and adjacent to the spillway and to upgrade existing access tracks, including the upgrade of the existing Boyne River Crossing. This estimate will be reduced as much as possible through the implementation of mitigation measures (as outlined in Section 5). Mitigation measures for the *Acacia grandifolia* are described in detail in Table 17 and include the clearing of sparse areas of vegetation over dense areas and the alignment of access tracks to avoid *Acacia grandifolia*.

The areas of impact are shown on Drawing 246827 in Appendix A. The area to be cleared for excavation is outlined in yellow and labelled new works, acces tracks are shown in blue. The proposed disposal area and borrow areas are also shown in white and are located in previously disturbed areas. These areas were used during the construction of the dam and for previous maintenance and repair projects.

The densest population of *Acacia grandifolia* is located adjacent to the proposed lay down area. The proposed site office and laydown area will be located in areas to minimise clearing of vegetation and avoid *Acacia grandifolia*.

The number of plants to be cleared will be minismised through the implementation of mitigation measures, the estimated maximum extent of impact would total 476, which includes 408 adjacent to the spillway, 62 at the Boyne River Crossing and 6 at access track crossing. It is unlikely the the Acacia at the Boyne River Crossing will need to be cleared, this will be confirmed during the pre-clearing survey.

Table 6: *Acacia grandifolia* density by location

Location	Density of plants at this site (plants/ha)	Description
Spillway	408	Area of vegetation to be cleared for excavation approximately 1.74ha. The total footprint of the works within spillway is 3.3ha, however only 1.74ha of the footprint is vegetated.
Boyne River Crossing (Crossing A)*	62	Existing crossing may require upgrading to access for heavy machinery, clearing will be limited to that necessary to the upgrade and vegetation avoided where possible.

Spillway Access Track (Crossing B)*	6 individuals	Individuals likely to be cleared to upgrade the existing access track.
Laydown	865	Area of laydown site approximately 0.49ha, to be located adjacent to existing *Acacia grandifolia* in a previously disturbed cleared area.

*shown on Photo 2

The areas to be cleared include 1.74ha on the right bank of the spillway, this includes the area required for a new access track. Approximately 0.8ha will be cleared to widen existing access tracks. The widening of existing access tracks will largely involve the clearing of scattered individuals. The right bank is impacted by overtopping events, and if degradation of the spillway continues this area is likely to be scoured in future events resulting in removal of all downstream vegetation.

An assessment of the importance of the population located within the project area is presented below.

Acacia grandofolia has a range of 100km and encompasses an extent of occurrence approximately 4200km². It has been recorded from six State Forests as well as road verges, freehold and leasehold land with more than 18 populations recorded. It occurs as large colonies or scattered individuals with a population estimate of over 1 million individuals (DoE. 2014a). As such the population located within the project area is not considered key to the species breeding, dispersal or genetic diversity. The population within the project area is not at the limit of the range of the species. Thus the population potentially impacted by the project is not considered an important population as defined by the Significant Impact Guidelines.

The proposed action is also not considered likely to adversely impact habitat critical to the survival of the species because the area potentially impacted by the proposed action is not necessary for:

- breeding or dispersal – remaining individuals will ensure that breeding and dispersal of the species is not adversely impacted - only a portion of the species within the project area will be cleared
- the long-term maintenance of the species or genetic diversity - remaining individuals and natural regeneration will ensure existing genetic diversity is maintained (natural regeneration of previously disturbed areas demonstrates this, e.g. individuals are present in previously disturbed areas)
- the reintroduction of populations or recovery of the species – the existing threats of timber harvesting, fire and grazing regimes will not be exacerbated by the proposed action.

Table 7: Significant impact assessment for vulnerable species

Lead to a long-term decrease in the size of an important population of a species	The proposed action will not impact on an important population, as described above the population located within the project area is not an important population.
Reduce the area of occupancy of an important population	The proposed action will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The proposed action will not fragment an existing important population.
Adversely affect habitat critical to the survival of	As described above, the proposed action is not located in an area that contains habitat critical to the survival of the species.

the species	
Disrupt the breeding cycle of an important population	The proposed action will not disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of the habitat to the extent that the species is likely to decline	A total area of 1.74ha on the right bank of the spillway will be blasted as part of the proposed works to stabilise the spillway. The extent of occurrence for the species is approximately 4200km² (DoE, 2014a). This includes the Gayndah, Munduberra, Coulston Lake, Proston and Burnett Districts. The project is located west of Proston on the Boyne River which is part of the Burnett River catchment. The area of permanent impact is therefore considerably less than 1% (0.017km²) and as such is unlikely to lead to a decline of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	The introduction of invasive species will be managed during construction and ongoing operations through the implementation of pest management strategies, the CEMP and Weed Management Plan.
Introduce disease that may cause the species to decline	Vehicles will be washed down prior to entering the construction site.
Interfere substantially with the recovery of the species	The proposed action will not exacerbate the current threats of timber harvesting, inappropriate fire and grazing regimes. Clearing will be kept the minimum area necessary to undertake the works and avoided where possible.

Phascolarctos cinereus (Koala)

The combined Koala populations of Queensland, New South Wales and the ACT are listed as Vulnerable under the EPBC Act.

There is currently no recovery plan for the Koala but a number of conservation instruments exist in individual states. In Queensland the Nature Conservation (Koala) Plan 2006 and Management Program 2006-2016 is the current management plan for the species (DoE. 2016b). Key threats to the species include:

- habitat loss and fragmentation
- mortality due to dog attacks and vehicle strikes
- disease
- climate change and drought.

No state habitat mapping currently exists for the proposed works area as it is located to the west of the border of the South East Queensland Bioregion for the species. There is limited suitable habitat within the proposed works area which has been scoured as result of previous flooding events. The riparian vegetation upstream of the the existing Boyne River access crossing may be suitable habitat for the species. The works area within and downstream of the spillway does not contain suitable habitat for the species.

There are no database records of Koala within the project area however SunWater staff did observe an

individual adjacent to the project area in 2014 (near the dam wall access track towards the edge of the impoundment). The closest database record for Koala is approximately 18km from the project area. The field survey did not detect any evidence that there are any individuals currently present within the project area. No scats or scratches were observed.

Only one species of Koala food tree was observed along the fringes of and adjacent to the project area, the Forest Red Gum (*Euclayptus tereticornis*). The Forest Red Gum is located fringing the Boyne River and drainage lines, none are located within the spillway. This is shown on drawings 246810 and 246827 as the green shaded area between the dam wall and spillway located outside and fringing along the red project area line. The scouring and erosion downstream of the spillway and access crossing has degraded in this area to such an extent that is unlikely to be suitable habitat for the species. This has occurred due to the high velocities water passing through this area during spillway overtopping events which has destabilised and scoured the rock and stripped the area of vegetation.

The excavation and blasting will occur within the spillway which is not suitable habitat for the species. Habitat that is potentially suitable for the species is located upstream of the existing Boyne River access track crossing, however no clearing or excavation works will occur in this area. Potential impacts from associated construction activities such as clearing for widening existing access tracks and vehicle movement will be mitigated. If present, Koala feed trees (*Euclayptus tereticornis*)located along access tracks will be avoided.

In accordance with the EPBC Act referral guidelines for the vulnerable Koala, the habitat assessment tool has been used to consider the significance of the impacts on potential habitat for the species.

Table 8: Koala habitat assessment tool

Atribute	Score	Inland
Koala occurence	1	Desktop • EPBC PMST report identified that Koala may occur in the study search area • Qld Wildnet search did not return any results for the Koala within the study search area On-ground • SunWater staff observed an individual adjacent to the project area near the dam wall access track in 2014 • Ecological survey of the project area conducted in May 2016 did not detect any individuals or evidence of presence (i.e.scratches, scats).
Vegetation structure and composition	1	Desktop • No QLD Regional Ecosystems associated with essential habitat for the species mapped within the project area On-ground • Vegetation with 1 species of known Koala food tree • *Eucalyptus tereticornis* present in vegetation upstream of the Boyne River access crossing
Habitat connectivity	0	Vegetation containing Eucalytpus tereticornis is bordered by barriers including the spillway, dam wall and Boyne River.
Key existing threats	2	Desktop • No records in SunWater incident reporting system of dead or injured individuals On-ground • No observations during ecological survey of dead or injured individuals

Recovery value	0	Due to the physical barriers and vegetation composition the habitat is considered unlikely to be important for the recovery of the Koala.
Total	4	Not habitat critical to the survival of the Koala.

Consequently, any individuals or populations potentially present within the project area are not considered an important population as the project area does not contain sufficient habitat that is suitable to support:

- a key breeding population
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

Similarly the project area does not contain habitat that is critical to the survival of the species as the area does not contain habitat that is necessary for:

- activities such as breeding and foraging
- the long-term maintenance of the species
- maintaining genetic diversity and long term evoluntionary development
- the reintroduction or recovery of the species.

An assessment of the potential for the proposed works to have a significant impact on Koala is detailed below.

Table 9 Significant impact criteria for Vulnerable species

Lead to a long-term decrease in the size of an important population of a species	As described above, the project area does not support an important population. Therefore the proposed action will not lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population	The proposed works will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The area does not support an existing important population, thus will not fragment an existing important population.
Adversely affect habitat critical to the survival of the species	The project area does not contain habitat that is critical to the survival of the species.
Disrupt the breeding cycle of an important population	The proposed action will not disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of the habitat to the extent that the species is likely to decline	The availability or quality of habitat suitable for the species will not be modified, destroyed, removed or isolated by the proposed action.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	The proposed works will not alter the existing risks in relation to invasive species. The introduction of invasive species will be managed through the implementation of pest management strategies as part of the Construction Environmental Management Plan (CEMP).
Introduce disease that may cause the species to decline	The proposed works will not alter the existing risk in relation to disease. The CEMP and induction training will prevent handling of all wildlife, including Koalas. Any injured Koalas will only be handled by an appropriately trained and qualified Koala spotter catcher.
Interfere substantially with the recovery of the species	The proposed works will be temporary, to be completed over 2 dry seasons. The works will where possible avoid Koala feed trees.

To summarise in line with the EPBC Act referral guidelines for the vulnerable Koala:

- Section 1 - The project will not impact on the survival and recovery needs of the Koala. The project area does not contain habitat critical to the species survival and potential impacts such as vehicles strikes will mitigated through the implementation of the measures outlined in Section 5.
- Section 2 - A search of the protected matters search tool identified that the Koala may occur within the project area, potential impacts of the project will be managed through the implementation of mitigation measures (as detailed in Section 5 of this referral).
- Section 3- The project is located in the inland geoprahic context for the Koala, the average annual rainfall for the catchment is 750mm. Habitat includes red gum riparian vegetation.
- Section 4 - The project will not clear or fragment existing habitat for the Koala.
- Section 5 - An ecological survey of the project did not detect any individuals or evidence of individuals (scats, scratches).
- Section 6 - The project area does not contain habitat that is critical to the survival of the Koala, as described above.
- Section 7 - The project will not advsersely affect habitat critical to the survival of the Koala.
- Section 8 - As the project area does not contain habitat that is critical to the survival of the Koala it is unlikely to interfere substantially with the recovery of the Koala.

Neoceratodus forsteri (Australian Lungfish)

The Australian Lungfish is currently listed as Vulnerable under the EPBC Act. It is not listed as threatened under Queensland's Nature Conservation Act Act 1992, however the taking of Australian Lungfish has been prohibited since it was declared a protected species under the Queensland Fish and Oyster Act 1914. The collection and fishing of the species requires a permit under the Fisheries Act 1994 (DoE. 2016). The species is also listed as a no-take species under Schedule 2 of the Fisheries Regulation 2008, under the Fisheries Act 1994.

Development of a recovery plan for the species has commenced but not yet been completed. Key threats to the species include impoundments, recruitment, recreational fishing, exotic and translocated native species, widespread clearing of riparian vegetation, reduced food and breeding habitat availability (DoE. 2016).

Lungfish are known to occur in tributaries of the Burnett River, including 20km up the Boyne River from its junction with the Burnett River, as far as Boondooma Dam. Prior to construction of the dam their distribution extended further upstream. However they no longer occur above the dam wall (DoE, 2016). Suitable habitat for the species is present both upstream and downstream of the Boyne River access track crossing (Crossing A). However the species has not been observed at this site.

Downstream of the spillway (Crossing B) is generally isolated from the Boyne River except during high rainfall or flooding events. This area has been significantly degraded by scouring and erosion caused by previous flooding events. Within the spillway a large scour hole has formed, it is isolated from other watercourses except when Boondooma Dam is overtopping. Lungfish have been observed within the scour hole during previous maintenance works, however were not observed during the field survey. Due to the lack of presence upstream and the movement patterns of the species it is thought that the individuals seeking refuge from the fast flowing floodwaters become trapped in the scour hole as the floodwaters recede. During previous maintenance dewatering activities which have been conducted in liaison with the Queensland Department of Agriculture and Fisheries approximately 9 individuals (pers comm. 2016) have been relocated from the spillway to the Boyne River. During recent site visits and investigations staff have not obersved any Lungfish within the scour hole.

Prior to dewatering, if any individuals are present in the spillway scour hole they will be relocated to the Boyne River under SunWater's General Fisheries Permit (Appendix C) issued by the Queensland Department of Agriculture and Fisheries. Other potential indirect impacts from the works such as runoff to natural watercourses will be managed through a sediment and erosion control plan as part of the CEMP for the project.

The individuals potentially impacted by the project are disconnected from natural watercourses except during overtopping events. Thus not considered an key source population for breeding and necessary for maintaining genetic diversity. The project area is the limit of species range in the Burnett River catchment. The species range also extends to the Mary River Catchment. Therefore the trapped individuals are not considered an important population in relation to breeding or genetic diversity, however it is the limit of the range of the species in the Burnett catchment.

The spillway is not habitat that is necessary for breeding, genetic diversity or long term maintenance of the species. The spillway is only connected to flowing watercourses during flood events. It is not a suitable location for reintroduction of a population due to isolation from natural watercourses. Therefore the spillway is not habitat critical to the survival of the species. The habitat within the Boyne River, while potentially temporarily impacted by the construction, will not be permanently altered. The project will not exacerbate the existing threats, no additional impoundments will be created, breeding habitat will not be reduced and there will be no widespread clearing of riparian vegetation. Mitigation measures will be implemented to ensure that runoff from construction activities does not cause increased sedimentation to natural watercourses. The disturbance of habitat will be minimised through limiting clearing areas and the relocation of fauna from the project area. Vehicles washdowns will be implemented to ensure that pest species are not introduced. The upgrade of the existing Boyne River access track crossing has been designed in accordance with the Queensland Department of Agirculture and Fisheries code for waterway barrier works and will be constructed in accordance with the development approval for waterway barrier works.

Table 10 Significant impact assessment criteria

Lead to a long-term decrease in the size of an important population of a species	The size of the population will not be reduced, any individuals present within the scour hole will be relocated in accordance with SunWater's General Fisheries Permit.
Reduce the area of occupancy of an important population	The spillway area is not suitable habitat and does not contain a Lungfish population. Individuals will be relocated to the closest suitable habitat within the Boyne River.
Fragment an existing important population into two or more	There is no existing population at the spillway site, hence population will not be fragmented. Any individuals found in the scour hole will be relocated to the Boyne River.

populations	
Adversely affect habitat critical to the survival of the species	The spillway does not contain habitat critical to the survival of the species. Potential impacts to the Boyne River will be temporary, and mitigated through the CEMP and SunWater's certified Environmental Management System.
Disrupt the breeding cycle of an important population	The Lungfish spawns amonst aquatic macrophytes, there are no macrophytes within the spillway. Clearing for the upgrade of the access track crossing will be restricted to 5 metres either side of the existing crossing. The bank adjacent to the crossing will be rehabilitated upon completion of the upgraded crossing. Management measures to mitigate any potential impacts implemented through the CEMP and in accordance with State approvals.
Modify, destroy, remove or isolate or decrease the availability or quality of the habitat to the extent that the species is likely to decline	The availability and quality of habitat for the species will be largely unchanged upon completion of the crossing upgrade works.The site will be rehabilitated in accordance with the Riverine Protection Guidelines and Queensland Fisheries self assessable codes for waterway barrier works and development permit.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	The works will not alter the existing risks in relation to the introduction of aquatic invasive species to the project area. All vehicles will be washed down prior to entering the site to prevent any pest species from other areas being transported to site.
Introduce disease that may cause the species to decline	The proposed works will not alter the existing risks in relation to disease.
Interfere substantially with the recovery of the species	The works will be temporary in nature, no additional impoundments will be created and there will be no widespread clearing of riparian vegetation. The site will be rehabilitated upon completion of construction activities. The works also aim to reduce the amount of scouring and erosion downstream, protecting potential habitat for the species.

3.1 (e) Listed migratory species

Description

A search of the protected matters database identified migratory species potentially occurring in the project area. They are detailed in the table below.

Table 11: EPBC Protected Matters Database Search Results

Threatened Species	Status	Presence
MIGRATORY MARINE SPECIES		
Fork-tailed Swift – *Apus pacificus*	Migratory	Likely
MIGRATORY TERRESTRIAL SPECIES		
White-throated Needletail – *Hirundapus caudacutus*	Migratory	May
Oriental Cuckoo, Horsefield's Cuckoo – *Cuculus optatus*	Migratory	May
Yellow Wagtail – *Motacilla flava*	Migratory	May
Rainbow Bee eater – *Merops ornatus*	Migratory	May
Black-faced Monarch – *Monarcha melanopsis*	Migratory	Likely
Satin Flycatcher – *Myagra cyanoleuca*	Migratory	Likely
Rufous Fantail – *Rhipidura rufifrons*	Migratory	Likely
MIGRATORY WETLAND SPECIES		
Great/White Egret – *Ardea alba*	Migratory	Likely
Cattle Egret – *Ardea ibis*	Migratory	May
Latham's snipe, Japanese Snipe – *Gallinago hardwickii*	Migratory	May
Osprey – *Pandion haliaetus*	Migratory	Likely

The field survey did not detect any of the species listed above. An assessment of the likelihood of occurrence for those species identified by the database as likely to occur is presented below.

Table 12 Likelihood of occurrence for migratory species

Species Name	Status	Distribution	Habitat	Likelihood of occurence
Fork-tailed Swift – *Apus pacificus*	Migratory Marine	Widespread throughout Australia. Found in many countries throughout Asia (DoE, 2016f).	The Fork-tailed Swift is almost exclusively aerial. Mostly occurs over inland plains but sometimes above foothills or in coastal areas. Habitat includes cliffs, beaches, islands, over settled areas, riparian woodland, tea-tree swamps, low scrub, heathland, saltmarsh, grassland, sandplains, open farmland, sand-dunes, rainforests, wet sclerophyll forest, open forest or plantations (Higgins, 1999).	The Fork-tailed Swift was not detected at the project site during the recent ecological survey. Potentially suitable habitat for this species occurs above the project site. Given the aerial nature of the species, it is unlikely to be impacted by project activities.
Black-faced Monarch – *Monarcha melanopsis*	Migratory Marine	Widespread in eastern Australia. Also occurs in Papua New Guinea (DoE, 2016g).	Occurs mainly in rainforest habitat. Occasionally occurs in other habitat types during migration, including forests,	The Black-faced Monarch was not detected at the project site during the recent ecological survey. It is Unlikely to occur on

			woodlands, coastal scrub and gardens (DoE, 2016g).	the project site due to the absence of suitable habitat.
Satin Flycatcher – *Myiagra cyanoleuca*	Migratory Marine	Widespread in eastern Australia (DoE, 2016h).	Inhabits heavily vegetated gullies in eucalypt dominated forests and taller woodlands, and on migration, occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests. Mainly recorded in eucalypt forests, especially wet sclerophyll forest (DoE, 2016h).	The Satin Flycatcher was not detected at the project site during the recent ecological survey. Unlikely to occur on the project site due to the absence of suitable wet sclerophyll/forest habitat.
Rufous Fantail – *Rhipidura rufifrons*	Migratory Marine	Inhabits coastal and near coastal districts of northern and eastern Australia (DoE, 2016i).	Mainly inhabits wet sclerophyll forests and rainforests. Occasionally recorded in drier forests, parks and gardens during migration (DoE, 2016i).	The Rufous Fantail was not detected at the project site during the recent ecological survey. Unlikely to occur on the project site due to its coastal nature and the absence of suitable wet sclerophyll/rainforest habitat.
Osprey – *Pandion haliaetus*	Migratory Marine	Widespread and common in central and northern Australia (W.A., N.T., QLD), also found in lower numbers in N.S.W and S.A. Also occurs in Indonesia, Philippines, Palau Islands, New Guinea, Solomon Islands and New Caledonia (DoE, 2016j).	Inhabits coastal habitats and terrestrial wetlands. Prefers coastal areas. Requires extensive open water areas for foraging (Marchant and Higgins, 1993).	The Osprey was not detected at the project site during the recent ecological survey. Boondooma Dam provides an area of potentially suitable habitat for this species. The project works are restricted to wooded and disturbed areas below the dam that do not provide suitable habitat for the Osprey. Therefore it is unlikely that the project will impact this species.
Great/White Egret – *Ardea alba*	Marine	Widespread and common throughout Australia (Marchant and Higgins, 1990). Also found in Asia	Wetland habitats, such as swamps, marshes, lake margins, lagoons and tidal flats, as well as flooded grassland, pastures, reservoirs, channels and sewage	This species is known to occur in close proximity to the project site, but has not been detected within the works area. Boondooma Dam and

		and Australasia (DoE, 2016k).	treatment ponds (Marchant and Higgins, 1990).	the Boyne River provide a large area of suitable habitat for this species. The project works are restricted to wooded and disturbed areas below the dam that do not provide suitable wetland habitat for the Great Egret. Therefore it is unlikely that the project will impact this species.

Nature and extent of likely impact

As noted above a number of migratory species may be present with the region of the proposed action. In relation to presence of important habitat within the project area, the following is of note:

- the project area does not contain habitat utilised by an ecologically significant proportion of a population of a migratory species occasionally or periodically
- the project area does not contain habitat that is of critical importance to migratory species at particular life-cycle stages
- habitat that is utilised by species at the limit of its range or where the species is declining.

As the proposed action will be limited to a relatively small area, it is unlikely there will be significant impact. This is because the works will not:

- substantiall modify, destroy or isolate an area of important habitat for a migratory species
- result is an invasive species that is harmful to migratory species becoming established in the area
- seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

3.1 (f) Commonwealth marine area

Not applicable.

3.1 (g) Commonwealth land

Not applicable.

3.1 (h) The Great Barrier Reef Marine Park

Not applicable.

3.1 (i) A water resource, in relation to coal seam gas development or large coal mining development

Not applicable.

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a)	**Is the proposed action a nuclear action?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment		
3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment		
3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))		
3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))		
3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))		

3.3 Description of the project area and affected area for the proposed action

3.3 (a) Flora and fauna

Terrestrial Flora

A total of 39 flora species were recorded within the project area during the field survey, they are listed below. Those marked with an asterix are weeds and include three declared weed species (*Lantana camara*, *Optunia stricta* and *Opuntia tomentosa*).

Table 13 Flora Species List

Scientific name	Common name	EPBC Act	NC Act
Acacia grandifolia		V	LC
Acacia leiocalyx	Early flowering back wattle		LC
Acacia spectabilis	Mudgee wattle		LC
*Ageratum houstonianum**	Blue billygoat weed		-
Alphitonia excels	Red Ash		LC
Alyxia ruscifolia	Prickly alyxia		LC
Auranticarpa rhombifolia	Diamond-leaf Pittosporum		LC
Callitris glaucophylla	White cypress		LC
Capparis canescens	Native Pomegranate		LC

Cassinia laevis	Cough bush		LC
Casuarina cunninghamii	River Sheoak		LC
*Chloris gayana**	Rhodes grass		-
Chrysocephalum apiculatum	Yellow buttons		LC
*Cirsium vulgare**	Scotch thistle		-
*Conyza bonariensis**	Fleabane		-
Corymbia citriodora	Spotted gum		LC
Corymbia tessellaris	Moreton Bay Ash		LC
Cymnopogon refractus	Barbed wire grass		LC
Cyperus fulvus	Sticky sedge		LC
Dianella brevipedunculata	Blue flax lily		LC
Dianella caerulea	Blue flax lily		LC
Diospyros humillis	Black ebony		LC
Dodonaea sp	Hop bush		LC
Enneapogon sp	Bottlewasher grass		LC
Eucalyptus crebra	Red ironbark		LC
Eucalyptus tereticornis	Forest red gum		LC
Ficus opposita	Sandpaper fig		LC
*Glandularia aristigera**	Maynes pest		-
Heteropogon contortus	Black spear grass		LC
Jacksonia scoparia	Dogwood		LC
Jasminum didymium subsp lineare	-		LC
*Lantana camara**	Lantana	WONS	-
Lomandra confertifolia subsp pallida			LC
*Macroptilium atropurpureum**	Siratro		-
Mallotus phillippensis	Red kamala tree		LC
Melaleuca bracteata	Black tea tree		LC
Melaleuca viminalis	Weeping bottlebrush		LC
*Melinis repens**	Red Natal grass		-
Micromelum minutum	Lime berry		LC
*Opuntia stricta**	Prickly Pear	WONS	-
*Opuntia tomentosa**	Velvety tree pear		-
Petalostigma pubescens	Quinine bush		LC
*Portulaca pilosa**	Pigweed		-
Ptericaulon redolens			LC
Pterocaulon serrulatum	Pineapple daisy		LC
Salsola australis	Roly-poly		LC
*Sida cordifolia**	Flannel weed		-
*Sida rhombifolia**	Paddy's lucerne		-
Sporobolus caroli	Tall fairy grass		LC
*Tagetes minuta**	Stinking roger		-
Themeda triandra	Kangaroo grass		LC
Typha orientalis	Bulrush		LC
Wahlenbergia gracilis	Bluebells		LC
*Xanthium occidentale**	Noogoora burr		-
*Gomphocarpus physocarpus**	Ballon cotton bush		-

WONS - Weed of National Significance

Fauna

A total of 40 fauna species were identified during the field survey of the project area. Whilst no threatened fauna species were identified the area does contain suitable habitat for threatened species. Habitat features such as hollow bearing trees, logs and stick nests were recorded in low abundance

throughout the project area. A list of the fauna identified during the survey is below. Introduced or pest species are marked with an asterix.

Table 14 Fauna Species List

Class	*Scientific Name*	Common Name	NC Act Status
Amphibia	*Litoria latopalmata*	Broad-Palmed Rocket Frog	LC
Amphibia	*Rhinella marina**	Cane Toad	
Aves	*Alcedo azurea*	Azure Kingfisher	LC
Aves	*Climacteris picumnus*	Brown Tree Creeper	LC
Aves	*Corvus orru*	Torresian Crow	LC
Aves	*Cracticus nigrogularis*	Pied Butcherbird	LC
Aves	*Cracticus tibicen*	Australian Magpie	LC
Aves	*Dacelo novaeguineae*	Laughing Kookaburra	LC
Aves	*Fulica atra*	Eurasian Coot	LC
Aves	*Gallinula tenebrosa*	Dusky Moorhen	LC
Aves	*Trichoglossus haematodus*	Rainbow Lorikeet	LC
Aves	*Grallina cyanoleuca*	Magpie Lark	LC
Aves	*Haliastur sphenurus*	Whistling Kite	LC
Aves	*Manorina melanocephala*	Noisy Miner	LC
Aves	*Megalurus timoriensis*	Tawny Grass Bird	LC
Aves	*Microcarbo melanoleucos*	Little Pied Cormorant	LC
Aves	*Ninox connivens*	Barking Owl	LC
Aves	*Ninox novaeseelandiae*	Boobook	LC
Aves	*Pachycephala rufiventris*	Rufous Whistler	LC
Aves	*Pardalotus punctatus*	Spotted Pardalote	LC
Aves	*Pelecanus conspicillatus*	Australian Pelican	LC
Aves	*Phalacrocorax sulcirostris*	Little Black Cormorant	LC
Aves	*Platycercus adscitus*	Pale-Headed Rosella	LC
Aves	*Porphyrio porphyrio*	Purple Swamphen	LC
Aves	*Rhipidura albiscapa*	Grey Fantail	LC
Aves	*Rhipidura leucophrys*	Willie Wagtail	LC
Aves	*Strepera graculina*	Pied Currawong	LC
Aves	*Todiramphus chloris*	Collared kingfisher	LC
Aves	*Trichoglossus chlorolepidotus*	Scaly-Breasted Lorikeet	LC
Aves	*Vanellus miles*	Masked Lapwing	LC
Aves	*Zosterops lateralis*	Silver Eye	LC
Mammalia	*Bos Taurus**	Cow	
Mammalia	*Lepus capensis**	European Hare	
Mammalia	*Macropus giganteus giganteus*	Eastern Grey Kangaroo	LC
Mammalia	*Macropus parryi*	Whiptail Wallaby	LC
Mammalia	*Wallabia bicolor*	Swamp Wallaby	LC
Reptilia	*Ctenotus taeniolatus*	Copper-Tailed Skink	LC
Reptilia	*Diporiphora australis*	Tommy Roundhead	LC
Fish	*Leioptherapon unicoloris*	Spangled Perch	LC
Fish	*Macquaria ambigua*	Golden Perch, Yellowbelly	LC
Fish	*Gambusia holbrooki**	Mosquitofish	

Aquatic Habitat, Flora and Fauna

Instream and riparian habitat at the Boyne River access track crossing was relatively good, particularly upstream of the crossing. This area consists of large pools and slow flowing runs with a predominantly gravel stubstratum with some rocks. Downstream of the crossing the channel narrows, and the banks steeper and taller than upstream. The substratum is substantially covered with macrophytes, consisting

mostly of *Vallisneria nana* and sporadic *Pomatogeton sulcatus*. Riparian vegetation upstream of the crossing consisted mainly of Cumbungi (*Typha orientalis*), with some Giant Sedge (*Cyperus exaltatus*), River Clubrush (*Schoenoplectus validus*) and Schoenoplectus mucronatus also present. While the riparian vegetation downstream of the crossing consists largely of exotic weeds (Cardno, 2016).

Aquatic habitat downstream of the spillway is poor, waterbodies are not permanently connected to the Boyne River and receive no inflows from the dam except when over-topping occurs. The riparian zone has been degraded by flood events. The area downstream of the spillway consists of large pools of turbid water (less than 1m visibility) with only isolated patches riparian vegetation occurring towards the Boyne River. The substratum was predominantly gravel with some larger rock and bedrock (Cardno, 2016).

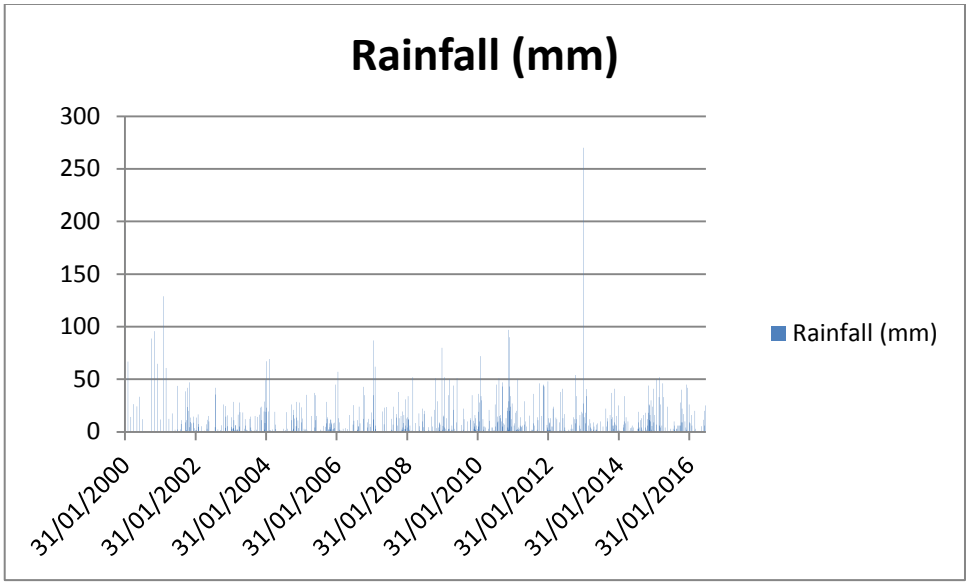
All aquatic sites surveyed showed signs of instability, erosion and bank failure. The Boyne River access crossing was more stable, particularly upstream. A rapid geromorphic assessment downstream of the spillway determined that these sites were considerably unstable. Native fish were present at all sites surveyed as was the declared pest Mosquitofish. River prawns were also captured upstream of Crossing A (Cardno, 2016).

3.3 (b) Hydrology, including water flows

Boondooma Dam is located on the Boyne River within the Burnett Basin catchment. The catchment includes the Burnett River, Kolan River, Elliott River, Gregory River, Isis River, Nogo River and Auburn River. It also includes the Boyne and Stuart Rivers, the Barker, Barambah and Three Moon Creeks and their tributaries. The Stuart River is the main tributary of the Boyne River and enters the Boyne River within the impoundment of Boondooma Dam. The Boyne River discharges in to the Burnett River at AMTD 250km which then flows into the Coral Sea near Bundaberg. The area lies between the tropical north and temperate south which makes rainfall highly variable. Streamflows within the catchment are highly modified by water resource development (NWC. 2014). Jones Weir is located at AMTD 240.1km on the Burnett River at Munduberra, Claude Wharton Weir is located at AMTD 202.4km on the Burnett River at Gayndah. While Paradise Dam is located at AMTD 131.4km on the Burnett River.

In total there are five water supply schemes within the catchment with Boondooma Dam the headworks for one of these. The Boondooma Dam has a catchment area of 4,025km², the total area of the Boyne River catchment is 5,651km². The mean annual rainfall for the dam catchment is approximately 750mm.

Table 15: Rainfall from 2000 to 2016



Boondooma Dam is part of the Boyne River and Tarong Water Supply Scheme (BTWSS). The BTWSS is centered on the Boyne River and extends from the upstream extent of Lake Boondoooma to the river's confluence with the Burnett River. At full capacity the dam stores 204,200 ML of which 8,360 ML is dead storage. The scheme's allocated annual yield is 45,700 ML of which 29,270 is allocated to the Tarong Power Station (operated by Stanwell Corporation) and 16,530 ML to urban, irrigation, stock and domestic water users. Water is supplied to Tarong Power Station via releases to the Boyne River which are then taken up by the Tarong piplines which consists of several balancing storages and pump stations.

Under the BTWSS Resource Operations Licence SunWater is authorised to divert, hold and distribute water from the Boyne and Stuart Rivers in accordance with the operating rules contained within the Burnett Basin Resource Operations Plan (ROP). The dam will continue to operate in accordance with the ROP during construction.

3.3 (c) Soil and Vegetation characteristics

Soil

The South Burnett Region encompasses an area of approximately 1,000,000 ha of south-east Queensland. The area is characteristed by two rivers and one major creek system, the Boyne River, Stuart River and Barker-Barramber Creek systems. The main geological feature influencing the area is the Yarraman Block. The Yarraman Block is comprised of the Maronghi Creek Beds and undifferentiated Paleozoic rocks intruded by Permain and Triassic granites and related rocks. The Tarong and Moreton Basins overlain the Yarraman Block to the south and south west with the Esk Trough to the east (Vandersee, Kent. 1983).

The Boondooma Dam spillway straddles two major geological units: the Aranbanga Volcanic Group and the Boondooma Igneous Complex. These geological units are intruded by two andesite dykes (a rock that cuts across another rock), in addition to other mafic (a rock comprised of magnesium and ferric rich minerals) and felsic (rock comprised of feldspar and silica minerals) dykes, that cut across both the granites and volcanics throughout the site. During flood events the force of the water preferentially scours the weathered granites and the dykes. This leads to the formation of scour holes in the spillway chute.

Soils associated with the Boondooma Igneous Complex include siliceous sands, podzolics, lithosol-podzolic intergrade, non-calcic brown soils, soloths, solodized solonetz, solodic soils, yellow earth and red earths (Vandersee, Kent. 1983). The soils encountered at Boondooma Dam include: Cd11 and Tb67 and are described from Australian Soil Resource Iinformation System(ASRIS) below.

Table 16: ASRIS Soil Types

Cd11	Moderate to steep hilly granitic country with rough stony slopes and crests, much rock outcrop; occasional flat-topped plateau remnants: chief soils are shallow stony sands (Uc2.12) on crests and steep slopes. Associated are stony and gravelly (Um2.12), and (Um4.1) with (Dy3.41) soils. Some (Dy3.42) and (Dy3.43) soils occur on colluvial slopes in minor valleys, while (Gn2.11) and (Dr2.41) soils occur on plateau remnants.
Tb67	Hilly granitic country of moderate relief with broad convex slopes, some tors, some small flat-topped lateritic knolls and hills; narrow drainage-ways: chief soils on the hills and broad convex slopes are hard acidic yellow and yellow mottled soils (Dy3.41) and (Dy3.31) with (Dy2.41) and (Dy2.31). Associated are a wide range of soils including: (Dy3.11), (Dy5.41), (Dr2.41), and (Dr2.21); (Dy2.42) and (Db1.43) on the broad convex slopes; gravelly (Gn2.11) soils on some lateritic scarps and crests; (Uc2.12) soils on some crests; and (Ug5.16) along some of the narrow valleys. Minor soil occurrences include (Gn3.11) and (Gn2.24) on some slopes below lateritic scarps.

The soil types present on the right and left bank of the spillway have also been described from data collected by SunWater's geotechnical investigations conducted in 2012 and 2016.

Table 17: Soil type information

Location	Borehole ID	Lithology	Grain Size	Description
Right Bank	DD65	Clayey GRAVEL (Decomposed GRANITE).		Dense. Medium plasticity. Fine to medium grained. Feldspar weathering to clay (25%). Coarse sand (25%) and gravel sized particles, angular. Alkali feldspar, plagioclase, muscovite, biotite and minor quartz (10%). Manganese staining (<2%). Mostly intact below 0.60 m.
Right Bank	DD66	Gravelly sandy CLAY (FILL)		Firm. Red brown high plasticity CLAY (60%), with coarse angular SAND (20%) and polymictic angular GRAVEL (20%).
Right Bank	DD67	Clayey gravelly SAND		Subrounded, quartz-lithic fine to medium grained SAND (50%) with brown high plasticity CLAY (25%) and angular polymictic gravel (25%).
		Decomposed GRANITE		
Right Bank	DD100	Gravelly Clayey SAND (FILL)	Fine - Coarse	DRILL PAD: Sub-rounded to sub-angular SAND (70 %). Angular GRAVEL from Ø 5 to 40 mm (25 %). Dark brown, high plasticity CLAY (5 %). Trace roots present.
		Clayey SAND	Medium - Coarse	Sub-rounded to sub--angular SAND (80 %) and brown, high plasticity CLAY (20 %). Rare orange mottling.
		SAND (Decomposed Biotite Granite)	Coarse	Sub-angular quartz. Decomposed granite. Rare orange mottling. Towards base the grains become more angular and can clearly see Quartz, feldspar and amphibole minerals.
		Gravelly SAND (Decomposed Biotite Granite)	Fine - Coarse	Decomposed granite, weakly preserved rock fabric throughout, effectively soil strength, however there are visible remnant defects. Angular to subrounded quartz crystals and decomposed feldspar crystals to Ø 3 to 5 mm with rare phenocrysts to 15 mm Ø. Possible presence of core stones within weathered profile with slightly improved strength. * Soil Strength *. Sand is angular, gravels are fine to medium. Material can be remoulded by hand and readily disaggregates with addition of water to the core or core pieces. NOTE: Decomposed Granite material recovered by drilling has a high dry strength and relatively deep (thick) weathering profile.
		Clayey SAND	Fine - Medium	Pale band of sub-angular SAND (80 %) with ¿medium plasticity CLAY (20 %).
		Gravelly SAND (Decomposed Biotite Granite)	Fine - Coarse	Decomposed granite, weakly preserved rock fabric throughout, effectively soil strength, however there are visible remnant defects. Angular to subrounded quartz crystals and decomposed feldspar crystals to Ø 3 to 5 mm with rare phenocrysts to 15 mm Ø. Possible presence of core stones within weathered profile with slightly improved strength. * Soil Strength *. Sand is angular, gravels are fine to medium. Material can be remoulded by hand and readily disaggregates with addition of water to the core or core pieces. NOTE: Decomposed Granite

				material recovered by drilling has a high dry strength and relatively deep (thick) weathering profile.
Right Bank	DD101	Sandy GRAVEL (FILL)	Fine - Coarse	Subrounded to subangular extremely to moderately weathered gravel, fine to coarse grained sand, some silt
		CORE LOSS		No Recovery
		SAND (FILL)	Fine - Coarse	Rounded to subrounded quartz, some gravels up to 15 mm, visibly compact
		Clayey, Gravelly SAND (FILL)	Fine - Coarse	Gravels are pale purple with black and red staining, fine to large with some cobbles up to 90 mm, medium plasticity clay
		Clayey SAND (FILL)	Fine - Coarse	Medium plasticity clay and some large gravels up to 15 mm
		Gravelly, Clayey SAND (FILL)	Fine - Coarse	Gravels are subrounded, fine to medium up to Ø 20 mm, medium plasticity clay
		Clayey SAND (FILL)	Fine - Coarse	Medium plasticity clay, some subrounded, large gravels, visbly compacted
		Clayey SAND (Decomposed Granite)	Fine - Medium	Possible Decomposed Granite. Soil strength. Quartz grains to 1 mm size. Material presents as a dense Clayey SAND, medium plasticity fines. No obvious rock fabric present.
Right Bank	DD102	Sandy CLAY	Medium - Coarse	Colluvium, Medium plasticity, Grains sub angular to angular of feldspar and quartz, with cobbles and boulders, up to ~180 mm of tuff, banded rhyolite, microgranite all angular to sub angular. Possible debris flow¿
Right Bank	DD103	Sandy Clayey GRAVEL (Decomposed Biotite Granite)	Fine	Wash boring precluded recovery of core. Material recovered was quartz and feldspar dominant. Material identification is based on local cutting/track exposures and core recovered after 2.05 m material. Presumed to be Decomposed Biotite Granite and highly weathered Biotite Granite. Surface material around collar can be remolded by hand and readily disaggregates with addition of water to the core or core pieces.
		Sandy Clayey GRAVEL (Decomposed Biotite Granite)	Fine	Gravel is quartz and feldspar dominant. Euhedral to subhedral quartz and feldspar crystals ranging up to 6 mm Ø. Granular texture. Biotite present (< 1%), sulphides present (<< 1%) as pyrite. Sand is medium to coarse grained. Material can be remoulded by hand and readily disaggregates with addition of water to the core or core pieces. NOTE: Decomposed Granite material recovered by drilling has a high dry strength and relatively deep (thick) weathering profile.
Right Bank	DD104	FILL	Fine - Medium	Recovered as Gravelly SAND. Gravel is angular, moderately weathered rhyolite (¿). Fill material placed to create drill pad during earlier earthworks. Fill depth approximate.

Right Bank	DD105	Decomposed GRANITE	Medium - Coarse	Recovered as medium to coarse SAND of pink and orange-brown, subangular plagioclase, quartz and biotite. The interpretation for this interval is based on local track exposures and core recovered after 2.20 m, material presumed to be Biotite Granite
Right Bank	DD106	FILL	Fine - Medium	Recovered as Gravelly SAND. Gravel is angular, fine to medium. Fill material placed to create drill pad during earlier earthworks.
		Gravelly SAND with CLAY	Fine - Medium	Residual soil and possible Extremely Weathered rock logged as Gravelly SAND with clay, gravel is angular, fine to medium, clay is medium plasticity. Note, arisings from wash-boring logged. Cut surface of clasts have a dull appearance. Material strength is estimated based on drilling progress.
Right Bank	DD107	FILL	Fine - Medium	Recovered as Gravelly SAND. Gravel is angular, fine to medium. Fill material placed to create drill pad during earlier earthworks.
Right Bank	DD108	FILL	Fine - Coarse	Fill-Uncontrolled. Recovered as Clayey gravel Subangular to angular gravels and cobbles, with clay and some fine to coarse grained sand
Left Bank	DD74			Limited return due to drilling method (auger). Most returned material contains sand silt and clay.
		Tonalite (Boulder)		Dark grey, fine grained, equigranular, high strength, fresh.
		Gravelly CLAY (FILL)		High plasticity. Fine to coarse grained. Very stiff. Brown high plasticity clay (80%) with polymictic subangular gravel (20%).
		CORE LOSS 0.35m (1.00-1.35) CORE LOSS		
		Gravelly CLAY (FILL)		Medium to coarse grained clasts. Firm. Brown high plasticity clay (80%) with polymictic subangular gravel (20%).
		Flow banded TUFF (FILL)		Purple to orange, aphanitic banding with pink prismatic crystals (?feldspar) to 1 mm. Haematite and iron staining common. Very high strength clast. Altered.
		Clayey Gravelly SAND (FILL)		High plasticity. Fine to medium grained sand. Stiff. Poorly graded angular lithic SAND (55%) with brown high plasticity CLAY (40%) and angular, polymictic, fine to medium GRAVEL (5%). Muscovite to 1 mm common.
		Gravelly CLAY (FILL)		Soft to firm. Monomictic medium to coarse GRAVEL (65%) comprised of highly weathered subangular crystal tuff, red brown high plasticity CLAY (30%) and medium to coarse SAND (5%).
		Clayey Silty SAND (FILL)		Loose. Poorly sorted fine to medium subangular SAND (30%) with high plasticity swelling CLAY (40%) and brown SILT (30%).
		Clayey Sandy GRAVEL (FILL)		High plasticity. Dense. Polymictic medium to coarse GRAVEL (65%) comprised of highly weathered subangular crystal tuff and highly weathered angular granite, red brown high plasticity CLAY (20%) and well graded fine to coarse SAND (15%).
		Clayey Sandy GRAVEL (FILL)		High plasticity. Very dense. Polymictic fine to medium subrounded GRAVEL (55%) with pale yellow brown high plasticity CLAY (35%) and coarse

				angular SAND (10%). Well compacted fill.
Left Bank	DD75	Sandy Clayey GRAVEL (FILL)		Dense. Polymictic angular GRAVEL (75%) with fine to medium SAND (15%) and brown high plasticity CLAY (10%). Gravel clasts predominantly high to very high strength.

From the information above the Revised Universal Loss Equation (RULSE) method has been utilised to estimate soil runoff rates. As shown in the graphs below the clayey sand has the highest estimated soil loss potential with sand (decomposed granite) have the lowest estimated soil loss. This data will be utilised determine where excavated material is suitable for use in construction. It will also be used to manage potential impacts through tailoring specific mitigation measures to suit the soil type and erosion potential.

Figure 1: Soil Erosion Assessment for 1:7 Slope Ratio

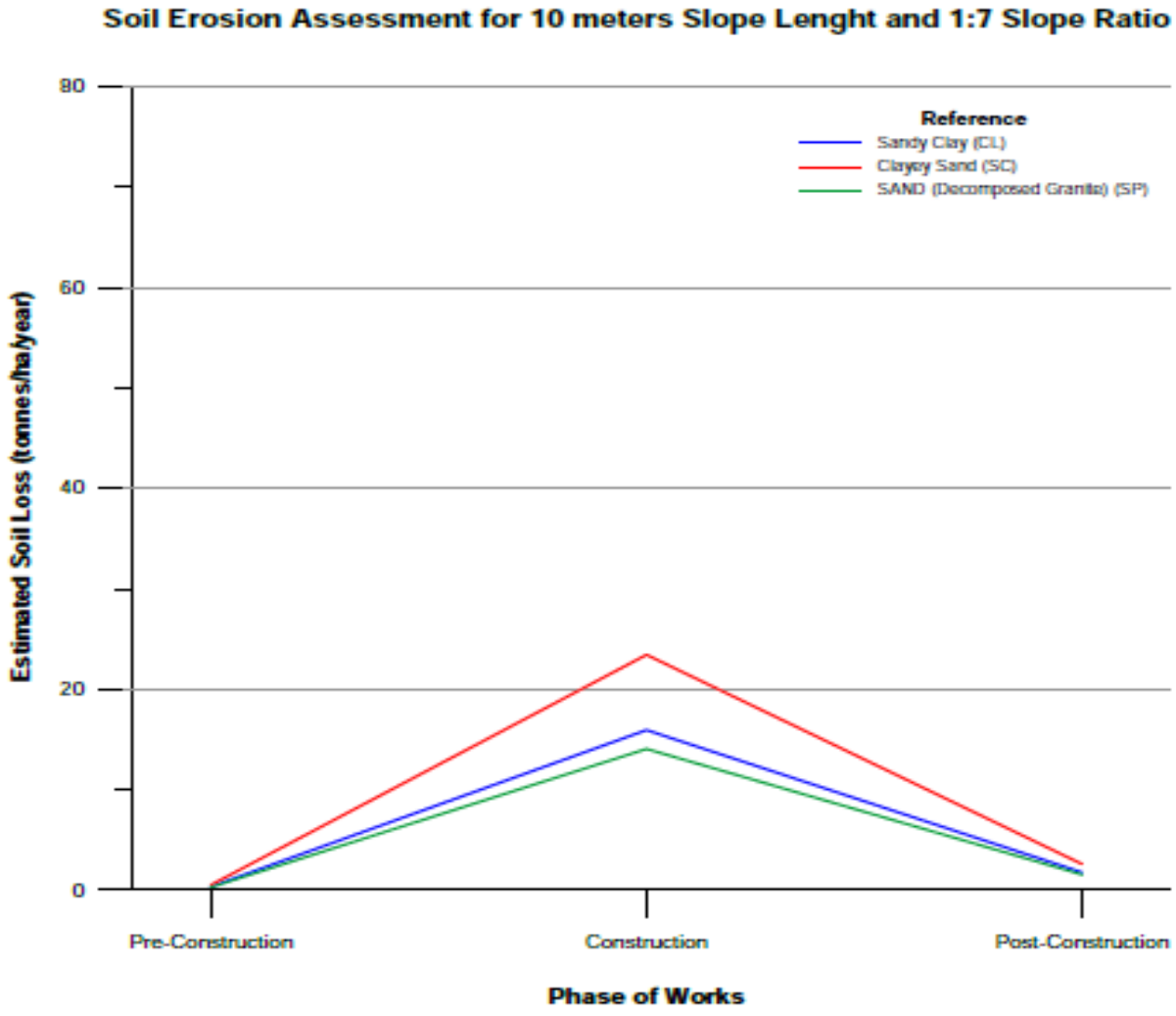
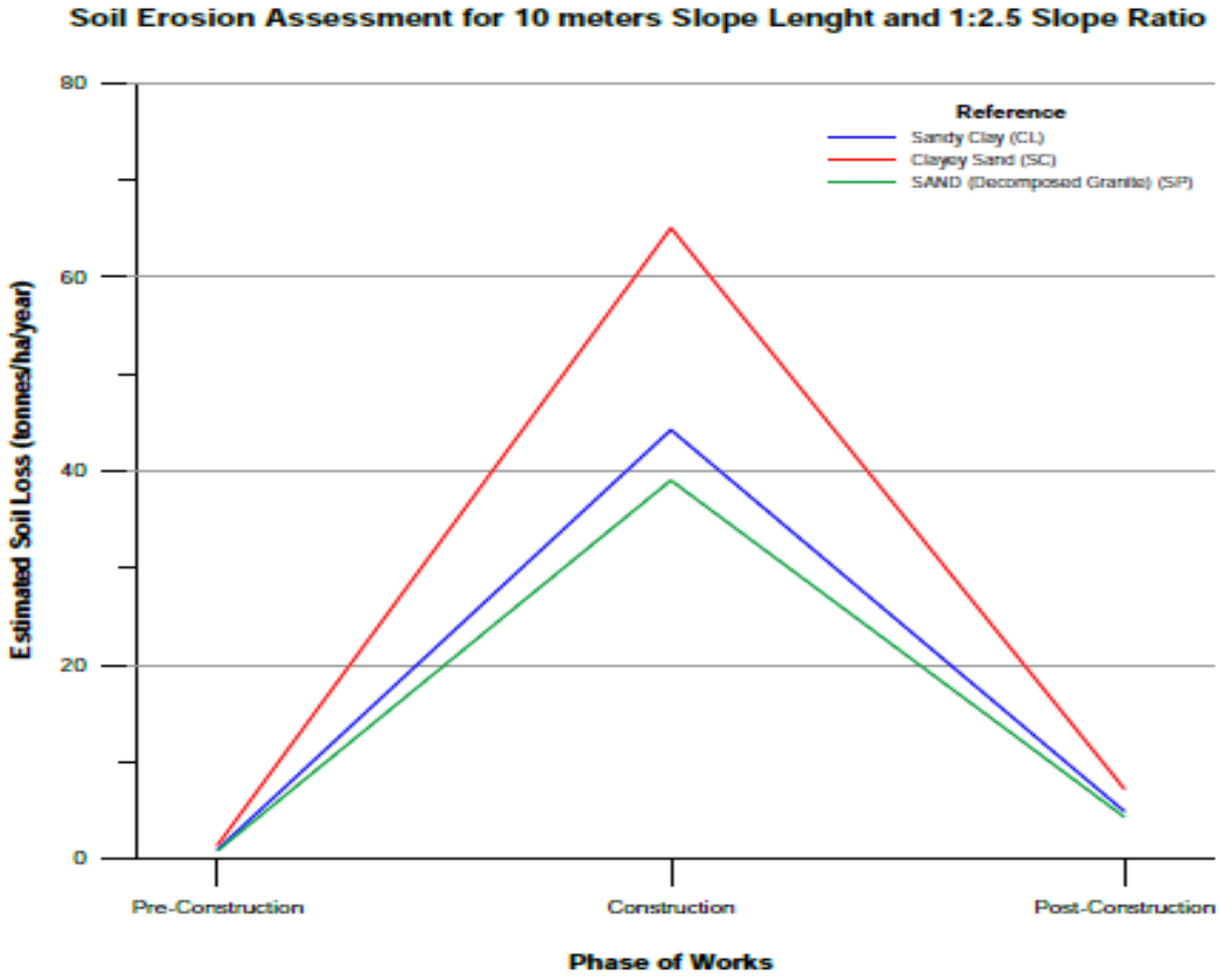


Figure 2: Soil Erosion Assessment 1:2.5 Slope Ratio



Vegetation

The project area contains three regional ecosystems, these communities are described below in table 6.

Table 18 Regional Ecosystems mapped within the project area

RE Code	Description	VM Act Status	Biodiversity Status	Area impacted	Type of impact
11.3.25	*Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines	Least concern	Of concern	5m*	Upgrade of existing Boyne River crossing
11.12.1	*Eucalyptus crebra +/- Corymbia erythrophloia* shrubby woodland. *E melanophloia* is often present and may be locally dominant. Also includes localised areas dominated by *E. persistens.*	Least concern	No concern at present	1.74ha 0.8ha	Blasting of spillway& construction of new access track Widening of existing access tracks
11.12.6b	*Callitris glaucophylla +/- Eucalyptus spp.* woodland.	Least concern	No concern at present	0	No clearing proposed

*either side of existing crossing

Eucalyptus tereticornis woodland

This vegetation community is described as *Eucalyptus tereticornis* open forest to woodland that fringes drainage lines. Within the project area it occurs along the Boyne River riparian corridor. Species commonly present and locally dominant include:

- *Eucalyptus tereticornis*
- *Casuarina cunninghamiana*
- *Corymbia tessellaris*
- *Melaleuca bracteata*
- *Melaleuca viminalis*
- *Acacia grandifolia*

Eucalyptus crebra woodland

This vegetation community is commonly described as shrubby woodland that occurs on ranges of igneous rock. This vegetation community occurs along either side of the spillway and adjacent to the office and lay down sites. Species locally dominant and commonly present include:

- *Eucalyptus crebra*
- *Corymbia citriodora*
- *Eucalytpus melanophloia*
- *Callitris glaucophylla*
- *Acacia spectabilis*
- *Acacia grandifolia*
- *Petalostigma pubescens*
- *Aphitonia excelsea*
- *Jacksonia scoparia*

Callitris glaucophylla woodland

This vegetation community is desrcribed as open forest on igneous rocks. Within the project area it occurs on the right bank of the spillway fringing the area between the spillway and the dam wall. Species locally dominant and commonly present include:

- *Callitris glaucophylla*
- *Eucalyptus crebra*
- *Acacia grandifolia*

3.3 (d) Outstanding natural features

Not applicable.

3.3 (e) Remnant native vegetation

As detailed above in 3.3(c).

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

Not applicable.

3.3 (g) Current state of the environment

The project area is owned and managed by SunWater as part of the Boyne River and Tarong Water Supply Scheme. With the exception of the site office which is being leased from the South Burnett Regioanl Council. As outlined in the description of the project, the area within and downstream of the spillway has been considerably eroded by previous flood events. Remnant vegetation occurs throughout the works area and is described above in section 3.3.

SunWater manages weed and pest animals through its certified Environmental Management System in accordance with the Queensland *Biosecurity Act 2014*. The area is not heavily infested with weeds or feral animals and is regularly monitored by local operational staff. Pest management strategies include the control of lantana through regular weed spraying. Control of feral pigs and dogs is carried out in conjunction with local council through baiting programs. The area is used exclusively by SunWater and is not currently leased for grazing or other purposes.

Land use surrounding the dam is predominantly grazing with some cropping, irrigated agriculture occurs downstream of the dam along the lower Boyne River floodplain areas.

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

Not applicable.

3.3 (i) Indigenous heritage values

Not applicable.

A search of the Cultural Heritage Database and Register was conducted and no results were returned for the project area. A Cultural Heritage Management Plan will be developed and implemented for the project.

3.3 (j) Other important or unique values of the environment

Not applicable.

3.3 (k) Tenure of the action area (e.g. freehold, leasehold)

The works are located on Lot 20 on SP142310 which is freehold land owned by SunWater.

3.3 (l) Existing uses of area of proposed action

Water supply for the Boyne River and Tarong Water Supply Scheme. Upstream of the proposed action the dam is used for recreational purposes. South Burnett Regional Council operates the Lake Boondooma Caravan and Recreational Park. Amenities include accommodation, boat ramps, fishing, picnic facilities, kiosk, pontoon, fish cleaning tables, toilets, showers, bins and dump point. These are located approximately 2.5km from the proposed action and will not be impacted by construction activities.

3.3 (m) Any proposed uses of area of proposed action

Water supply for the Boyne River and Tarong Water Supply Scheme.

4 Environmental outcomes

The proposed action has arisen due to damage sustained by the spillway in the 2010/11 and 2013 flood events. Analysis has shown that the spillway will continue to scour in future flood events. If the spillway chute is left untreated, the removal of material at these locations will contribute to further damage to the chute. This will eventually lead to failure of the spillway and a significant loss of water supply and damage to the downstream environment. As such the proposed action is required to reduce the risks to the downstream environment and populations at risk, and to ensure a secure future water supply. The project will also aid in minimising the amount of future scour and its impact on the environment.

The environmental outcomes for protected matters have been established from operational experience, baseline data collected by the desktop assessment and field surveys for the project, and relate specificily to *Acacia grandifolia*, the Australian Lungfish and Koala.

Acacia grandifolia

Impacts to the Acacia grandifolia are the clearing and blasting activites for the repair of the spillway and also clearing of individuals for the upgrade and construction of access tracks. The key outcome for the species will be no net loss outside the area cleared for the spillway repair. Revegtation of the immediate area surrounding the spillway is not possible for safety and operational reasons. Rehabilitation will be achieved through identifying areas of environmental value (i.e. areas where listed species or habitat for listed species are present) and investigating alternative options or implementing mitigation measures. For example, a rehabilitation plan with specific targets and outcomes to ensure natural regeneration of the species (as described below in Section 5). Monitoring by SunWater pre and post construction will be conducted to ensure clearing is limited to designated areas and the site is rehabilitated to pre-existing condition.

Australian Lungfish

Potential impacts to the Lungfish are the dewatering of the scour hole and sediment runoff to the Boyne River from construction activities. The key outcome for the species will be no loss of individuals during dewatering of the scour hole and no water quality impacts in the Boyne River caused by construction activities. This will be achieved by relocating individuals in accordance with SunWater's General Fisheries Permit under the Fisheries Act 1994 (Appendix B). SunWater regularly undertakes fish relocation as part of its operations in other parts of the Burnett and thus has a high degree of confidence in achieving this outcome.
Runoff will be managed by the sediment and erosion control plan (SECP) and water quality monitoring which will be contained within the CEMP (as described below in Section 5).

Koala

Potential impacts to the Koala relate to disturbance caused by construction activities such as blasting, clearing and vehicle movements. No widespread clearing of suitable Koala habitat or feed trees will occur as part of the project. The project area contains only a small area of suitable habitat for the species adjacent to the existing Boyne River access crossing. The key outcome for the species will be no injury or loss of individuals caused by construction activities and to avoid the clearing of any suitable habitat and feed trees. This will be achieved by examining alternative design and construction methodologies to avoid areas of suitable habitat for the species. This applies to the upgrading of the existing Boyne River crossing, it is not currently envisaged that any Koala feed trees will be cleared for the crossing. This will be confirmed once the final construction methodology has been completed.

SunWater possesses the systems and staff to ensure environmental outcomes are met. SunWater owns and operates regional network of bulk water supply infrastructure that spans across Queensland and includes 19 major dams, 63 weirs and barrages, 80 pump stations, 2,500km pipelines and channels and 730km of drains. Activites such as translocation of protected plants, relocation of threatened fish and rehabilitation of construction sites have previously been undertaken as part of SunWater's operations, development and maintenance projects. Examples from previous projects are listed below.

Woleebee Creek to Glebe Weir Pipeline

- Successful translocation of protected plant – *Desmodium macrocarpum*
- Narrowing of construction corridor to reduce clearing of Coolibah
- Relocation of wildlife by licenced fauna spotter-catcher prior to clearing of vegetation
- Rehabilitation of watercourse crossings
- Narrowing of construction corridor through watercourse crossings to reduce impacts
- Rehabilitation of the bed and banks of Cockatoo Creek at pipeline outworks site

Dewatering of Fred Haigh Dam spillway

- Fish salvage
- Turtle relocation
- Monitoring quality of water being discharged to a watercourse

Dewatering of Fairbairn Dam spillway

- Fish salvage
- Turtle relocation
- Monitoring of discharge water quality

5 Measures to avoid or reduce impacts

SunWater maintains and Environmental Management System to meet the requirements of AS/NZS ISO 14001. SunWater complies with all relevant environmental management legislation, related standards, and codes of practice, stakeholder agreements and other requirements. SunWater sets measurable objectives and targets for continual improcement, and reports annually on its environmental performance.

Enviromental management measures to avoid and reduce impacts has and will be implemented for all phases of the project from planning to construction. SunWater will incorporate contractual and management measures to ensure that the environmental values of the project area are protected. Management measures will include (but are not limited to) the following:

- Land and soil management
- Erosion, sediment and drainage management
- Contaminated land management
- Riverine management
- Surface water management
- Groundwater management
- Noise and vibration management
- Air quality (dust) management
- Heritage management
- Vegetation management
- Fauna management
- Livestock management
- Rehabilitation management
- Pest management
- Bushfire management
- Fuel, chemical and dangerous goods management
- Waste management
- Greenhouse gas, energy and emissions management.

Specific measures in relation to potential impacts on the identified matters NES are detailed below.

Acacia grandifolia

Table 19: CEMP Vegetation and Flora Management Measures

Objectives	• To minimise the extent of vegetation clearing within the project area • To minimise impacts on vegetation and floristic communities, particularly the listed threatened species *Acacia grandifolia* • To minimise impacts on and provide protection to identified flora species and communities
Management Measures	• Clearing areas defined and agreed prior to commencement of construction works • Identified clearing areas clearly marked and delineated on construction survey drawings • Clearing areas clearly marked and delinated with flagging tape/markers/pegs in the field prior to commencement of clearing activities • Clearing widths are minimised in sensitive areas such as watercourse crossings • Clearing outside of defined areas is strictly prohbiated without prior approval of SunWater and relevant regulators • Clearing is to be minimised through trimming branches and retention of mature trees in preference to the removal of entire mature trees • Avoidance of areas of dense mature vegetation over sparsely vegetated areas that have previously disturbed areas • Where vegetation of environmental value is identified within clearing areas and can be avoided this vegetation is to be flagged and retained • Should vegetation flagged to be retained need to be cleared, suitability qualified staff in conjunction with SunWater will be engaged to assess if clearing is acceptable • Vegetation requiring approval under State and Federal legislation will not be disturbed until all the relevant permits are granted • Realignment of construction activites around large mature trees and flora of environmental value will be undertaken where possible. • Design and construction methodologies will be aligned to favour lower impact pre-disturbed areas where possible • All realignments outside the original approved areas will require an additional walkthrough and assessment by suitably qualified staff prior to any works proceeding, including temporary work spaces, storage areas or access tracks • Cleared vegetation will be retained and placed within the construction area for reuse during rehabilitation. Cleared vegetation will not impede vehicle or wildlife movements • Clearing is to be undertaken in a manner that minimises disturbance to roots and soil within drip zones of vegetation • All construction staff will be trained in environmental management in relation to vegetation and flora on site including relevant operating procedures, protocols and practices

Koala

Table 20: CEMP Fauna Management Measures

Objectives	• To minimise impacts on fauna habitat • To minimise potential injury and death to fauna • To minimise impact to habitat of environmental value
Management Measures	• All habitat areas and features such as hollow logs and nests or other ecologically sensitive areas within the project area will be clearly flagged relocated or avoided • All habitat features within clearing areas will be clearly flagged and will only be disturbed in the presence of a licenced fauna spotter catcher • A licenced fauna spotter catcher will be on-call at all times during construction and will inspect all habitat areas prior to clearing and will capture and relocate any fauna, nests or hollows and flush any fauna to most suitable adjacent habitat • clearing will be conducted in sequential manner that allows fauna to move safely out of the works area • Koalas and Koala habitat will be managed in accordance with Policy 6 outlined in the Nature Conservation (Koala) Plan and Management Program 2006-2016 • Approvals under State and Federal legislation in relation to fauna will be obtained prior to conducting any activity that requires approval • Protected fauna habitat will be identified, flagged and excluded from construction areas • Construction activities will be restricted between dawn and dusk to minimise disturbace to adjacent habitat • Trees containing hollows will be cleared in such a manner that maximises the chances of survival for any fauna remaining within the tree • Hollow logs and any other habitat features are to be gently pushed to the edge of the constriction area to be utilised as habitat • Cleared vegetation will be stockpiled along the edge of the construction area where possible and utilised as habitat for rehabilitation • Placement of soil and vegetation stockpiles will not impede the movement of fauna • Daily survelliance by site staff for fauna will be carried out, siting of fauna will be reported to suitably qualified staff to manage • All fauna handling and relocations will be conducted by suitably qualified and licenced staff or contractors • Care will taken by all staff to prevent injury or death of fauna • All injured fauna will be immediately report to and managed by suitably qualified staff or contractors such as a fauna spotter catcher or wildlife carers group • All equipment on site will be stored to minimise the potential for fauna to become entrapped • Any excavated areas left open overnight will contain mechanisms to allow fauna to escape, batters of pond will be laid back to allow fauna to escape • All open excavated pits will be visually inspected prior to 9am on a daily basis for fauna prior to commencing works • The site will be kept free from scraps and rubbish to prevent scavenging animals entering the area

	• Vehicles and machinery will reduce speed and adhere to speed signage within the site • Hunting equipment, traps and fishing will be prohibited on-site. • Gathering or collection of native fauna is prohibited • All construction staff will be trained on environmental management in relation to fauna including operating procedures, protocols and practices

Lungfish

Table 21: CEMP Aquatic Fauna Management Measures

Objectives	• To minimise impacts on aquatic fauna • To minimise potential injury or death to aquatic fauna • To minimise impact to aquatic fauna habitat
Management Measures	• Development and implementation of safe work method statement for dewatering that includes management measures for aquatic fauna • Any fish found in scour holes will be relocated in accordance with SunWater's General Fisheries Permit (Appendix C), issues by the Qld Department of Agriculture and Fisheries • Development and implementation of a sediment and erosion control plan in accordance with IECA 2008 • Implement sediment controls such as silt curtains, bunding, straw bales, rip rap etc to protect the quality of downstream waters • Daily inspection of the integrity of sediment controls • Works will be timed to allow sediment to settle prior to discharging water • Extraction of water undertaken at a slow and steady rate • Protective cage fitted to inlet pipes to prevent aquatic fauna entrapment • Monitoring of pumping activities to ensure downstream waters are not impacted by dewatering • Fauna relocated by suitably qualified and licenced staff • Refuelling and maintenance activities will occur away from waters with adequate bunding and spill management equipment • Water quality will be monitored at specific locations to measure the performance of management measures • Where management measures are identified as inadequate action will be taken immediately to rectify the situation, e.g. change in pumping methodology to increase DO levels, decrease in pumping rate

A Rehabilitation Plan will be prepared to support the CEMP and provide a connection from construction to operation. The rehabilitation plan will contain the following:

- the method and species to be utilised in rehabilitation, including topsoil management
- Spatial configuration of revegetaion areas, plantings, seed mixes, areas for natural regeneration, hydromulching and watering requirements
- benchmark criteria for rehabilitation including monitoring of natural regeneration areas, requirements for final landform, vegetation cover, species composition and depth of topsoil
- ongoing monitoring and management recommendations.

6 Conclusion on the likelihood of significant impacts

6.1 Do you THINK your proposed action is a controlled action?

✓	No, complete section 6.2
	Yes, complete section 6.3

6.2 Proposed action IS NOT a controlled action.

The proposed action has been designed to avoid and minimise impacts on threatened species in the project area, this is demonstrated through:

- the location of the laydown area to avoid the densest area of *Acacia grandifolia*
- the use of existing access tracks and watercourse crossings
- the use of previously disturbed areas to source material
- design elements to minimise erosion
- restricting excavation and clearing to areas necessary to carry out essential works.

Upon completion of construction the project area will be rehabilitated to the pre-existing condition where possible. Areas destabilised and eroded by previous flood events will be re-profiled to repair scouring and minimise future erosion. The use of appropriate management measures including sediment and erosion controls, relocation of wildlife and rehabilitation of the site will ensure risks to threatened flora and fauna are minimised.

The permanent impact of removal and reprofiling of the spillway is limited to a small area that does not provide suitable long-term habitat for threatened species. The works aim to provide a positive outcome in reducing further damage to downstream environment in future flood events. Potential temporary impacts will be mitigated and managed through SunWater's EMS and the CEMP. As a result it is not likely that the proposed action will have a significant impact on matters protected under the EPBC Act.

7 Environmental record of the person proposing to take the action

		Yes	No
7.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details** SunWater has a long history of providing quality services to water users throughout Queensland. Over 80 years SunWater has built a regional network of water supply infrastructure throughout Queensland. SunWater's infrastructure supports agriculture, mining, power generation, industrial and urban development. As a specialist water service provider, SunWater has extensive expertise in designing, constructing, operating and maintaining dams, weirs, pump stations, pipelines, open channels and drainage systems. SunWater is committed to minimising environmental impact of its activities and preventing pollution for the benefit of current and future generations. SunWater maintains a certified Environmental Management System to meet the requirements of AS/NZS ISO 14001. SunWater provides adequate financial, human and educational resources to support good environmental management. SunWater complies with all relevant environmental management legislation, related standards, codes of practice, stakeholder agreements and other requirements.	✓	
7.2	**Provide details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:** **(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.** **If yes, provide details** In 2008 the Wide Bay Burnett Conservation Council Incorporated initiated proceedings in the Federal Court against one of SunWater's subsidiary companies Burnett Water Ltd, alleging it had breached a confition of the EPBC Act approval for the construction and operation of Paradise Dam. Judgement in favour of Burnett Water Pty Ltd was handed down on 4 March 2011. In addition, in 2007 an audit conducted by the then Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) found Burnett Water Pty Ltd's operation of Paradise Dam to be partially non-compliant. Following the handing down of the above judgement, SEWPaC issued an addendum to the Final Compliance Audit Report. The addendum refers to the above judgement and the finding that periods of non-operation of the fishway did not constitute a breach of the EPBC Act approval.	✓	
7.3	**If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework. and if and how the framework applies to the action.**	✓	

SunWater maintains a certified Environmental Management System to meet the requirements of AS/NZS ISO 14001.

SunWater Environmental Policy

SunWater is Queensland's major bulk water supplier. In addition to planning, designing and developing our own water infrastructure, we also offer our expertise to a range of industry clients who require qater infrastructure facility management and consultancy services.

SunWater is committed to minimising the environmental impact of these activities and preventing pollution for the benefit of current and future generations.

SunWater continues to maintain an Environmental Management System to meet the requirements of AS/NZS ISO 14001. We provide adequate financial, human and educational resources to support good environmental management.

SunWater complies with all relevant environmental management legislation, related standards, codes of practice, stakeholder agreements and other requirements. We set measurable objectives and targets for continual improvement, and report annually on our environmental performance.

SunWater management, staff and subcontractors exercise their environmental duty of care and take responsibility for minimising the environmental impact of their activities.

Through our systems and continual improvement processes, SunWater:

- Places uncompromising emphasis on environmental risk management,
- Responsibly manages any environmental impacts, design and services which minimise the impact on the environment,
- Actively supports government and community initiatives for good environmental management, and
- Applies research and development to identify other ways of improving our environmental performance.

The construction and operation of the proposed action will be undertaken in accordance with SunWater's EMS. A project specific Construction Environmental Management Plan (CEMP) will be developed to manage and mitigate potential impacts.

7.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?**	✓	

Provide name of proposal and EPBC reference number (if known)		
Burdekin pipeline – 2005/2209 Water for Bowen – 2006/2527 Moranbah Water Pipeline – 2006/2595 Goondicum Water Pipeline – 2006/3106 Extension of the existing Reed Bed Pipeline – 2007/3283 Translocation for the Boggomoss Snail – 2009/4898 Nathan Dam and Pipeline Project – 2008/4429 Lower Fitzroy River Infrastructure Project – 2009/5173 Chinchilla Weir Discharge and Pipeline Project – 2011/6000 Reedy Creek to Glebe Weir Pipeline (amended to Woleebee Creek to Glebe Weir Pipeline) – 2011/6181		

8 Information sources and attachments

8.1 References

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Department of the Environment (2016c). *Dasyurus hallucatus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat

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Department of the Environment (2016g). *Monarcha melanopsis* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat

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Leverington, A., R. Edgar & G. Gordon (2003). "*Multi-species recovery plan for Acacia eremophiloides, Acacia grandifolia, Acacia porcata, Bertya granitica and Newcastelia velutina 2003-2007*." Qld Parks & Wildlife Service. Qld Environmental Protection Agency.

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SunWater. 2016. Boondooma Dam Spillwayer Repair Project Business Case. SunWater Limited, Brisbane

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Webber, P. 2016 *Personal Communication*. SunWater Limited.

8.2 Reliability and date of information

The information used to prepare this referral included searches of state and federal databases, scientific reports and other publications and internal SunWater documents. These documents were produced through collaborative efforts with consultants, stakeholders and SunWater. These reports were prepared at different stages of the project, reports that contain general assessments have not been updated. Field assessments, desktop and databases searches relating to project have all been conducted in 2016. Where necessary information relating MNES will be updated prior to the commencement of the construction to inform the relavent management plans.

8.3 Attachments

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the locality of the proposed action (section 1)	✓	Appendix A – Drawing 246809
	GIS file delineating the boundary of the referral area (section 1)	✓	Attached as .zip file
	figures, maps or aerial photographs showing the location of the proposed action in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Appendix A – Drawings: • 246810 • 246811 • 246812 • 246827
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	✓	Appendix C – General Fisheries Permit
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	✓	Appendix D – Ecological Assessment Report
	copies of any flora and fauna investigations and surveys (section 3)	✓	Appendix D – Ecological Assessment Report
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3) conclusions in the referral (section 3 and 4)	✓	Appendix D – Ecological Assessment Report
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

All attachments are no larger than 3MB.

9 Contacts, signatures and declarations

Proposed action title:

9.1 Person proposing to take action

Name and Title:	Alex Fisher, Executive General Manager
Organisation:	SunWater Limited
Trust deed	□ attached; OR ☑ not applicable
ACN / ABN	ACN 131 034 985
Postal address:	PO Box 15536, Brisbane City East 4002
Telephone:	07 3120 0196
Email:	Alex.Fisher@sunwater.com.au
I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:	□ an individual; OR □ a small business entity (within the meaning given by section 328-110 (other than subsection 328-119(4)) of the *Income Tax Assessment Act 1997*); OR ☑ not applicable.
If you are small business entity you must provide the Date/Income Year that you became a small business entity:	
I would like to apply for a waiver of full or partial fees under regulation 5.21A of the EPBC Regulations. Under 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:	☑ not applicable.

Declaration: I declare that to the best of my knowledge the information I have given on, or attached to this form 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: [signature] Date: 28 SEP 16

9.2 Designated proponent

Name of proposed proponent: SunWater Limited

ACN / ABN (if applicable): ACN: 131 034 985

Postal address: PO Box 15536, Brisbane City East QLD 4002

Telephone: 07 3120 0196

Email: Alex.Fisher@sunwater.com.au

Declaration by the proposed proponent: I ALEX FISHER, the proposed proponent, consent to the proposed designation of myself as the proponent for the purposes of the action described in this referral.

Declaration by the person proposing to take the action: I ALEX FISHER, the person proposing to take the action, consent to the proposed designation of GENERAL MANAGER as proponent for the purposes of the action described in this referral.

Signature: [signature] Date: 28 SEP 16

9.3 Person preparing the referral information (if different from section 9.1)

Name: Kerrie Klopper

Title: Projects Advisor

Organisation: SunWater Limited

ACN / ABN (if applicable): ACN 131 034 985

Postal address: PO Box 15536, Brisbane City East 4002

Telephone: 07 3120 0284

Email: Kerrie.Klopper@sunwater.com.au

Declaration: I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.

Signature: K Klopper Date: 28/9/2016.