sunwater

Initial Advice Statement

Burdekin Falls Dam Raising

June 2020

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Acronyms

Acronym	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AMTD	Adopted Middle Thread Distance
BFD	Burdekin Falls Dam
BHWSS	Burdekin Haughton Water Supply Scheme
BOM	Bureau of Meteorology
DBC	Detailed Business Case
EAP	Emergency Action Plan
EIS	Environmental Impact Statement
FSL	Full Supply Level
Ha	hectares
ML	Megalitre
PBC	Preliminary Business Case

Executive Summary

Burdekin Falls Dam (BFD or the dam) is located on the Burdekin River at Adopted Middle Thread Distance (AMTD) 159.3 km; 210 km south of Townsville. The dam completed in 1987, stores 1,860,000 ML of water at the design Full Supply Level (FSL) of EL 154.0 m AHD (Australian Height Datum). The dam is constructed of mass concrete and operates in conjunction with four earth and rock-fill saddle dams.

This Initial Advice Statement (IAS) provides Project information to regulators, interested stakeholders and the general public. It also identifies approvals that may be required for the implementation of the Project. The Project has complex approval requirements and is of local, regional and State strategic significance. The Project will need approval at the local planning scheme level as well as multiple State environmental approvals. It will also require Commonwealth approval due to the potential to have significant impacts on Matters of National Environmental Significance.

The project involves raising of the existing BFD by at least 2 metres and possibly up to 6 metres. The final decision as to the level of raising will be made through the Detailed Business Case (DBC) process which will be undertaken concurrent with the Environmental Impact Statement (EIS), if this is the determined assessment process, and will be informed by a thorough stakeholder engagement process. Some ancillary infrastructure will also require upgrade. The additional yield will be available for purchase to a range of clients including urban, mining and agricultural. As is now the case, the dam will be maintained to meet dam safety standards and Sunwater will operate the dam to comply with the Water Plan (Burdekin Basin), Operations Manual, Water Management Protocol, Resource Operations Licence and other relevant legislation.

Sunwater has followed the Building Queensland Project Assessment Framework when planning the project. A Strategic Business Case (SBC) was followed by a Preliminary Business Case (PBC). Sunwater has also developed a North Region Blueprint which incorporates the Department of Natural Resources, Mines and Energy's (DNRME) Queensland Bulk Water Opportunity Statement (QBWOS) and Department of State Development, Manufacturing Infrastructure and Planning (DSDMIP) State Infrastructure Plan (SIP) in identifying solutions. The stakeholder workshops for the development of the blueprint included government departments (DNRME) as well as diverse range of customers, community members, councils and industry groups. Sunwater has actively contributed to the development of the QBWOS through participation in workshops and collaboration with DNRME.

A demand assessment undertaken as part of the PBC supports the finding that **the need or objective for adequate and secure water supply to support development and growth in North Queensland for the next generation** is under threat from insufficient uncommitted allocation.

The service need is related to several opportunities, including:

- expansion of irrigated agriculture in North Queensland
- support for urban and industrial growth in Townsville
- support for industrial growth at Abbot Point SDA and Port of Abbot Point
- support for potential inland mining and industrial developments
- generation of commercially viable hydro power in North Queensland.

All benefits relate to provision of a secure water supply which is sufficient to support urban, industrial and agricultural growth which will in turn support a buoyant regional economy with continuing employment and suitable provision of services. Benefits sought by the Project include:

- secure reliable water supply attracts industry and supports population, quality of life in Townsville
- increased agricultural production (with regional economic benefits)
- economic development near Bowen
- industrial development in the Bowen and Galilee Basin
- more secure and environmentally friendly diversified power supply to NQ, generated locally
- enhanced access to goods and services due to injection of wealth into local economies
- generation of employment opportunities
- improved ability to access health services and recreational activities.
- increased availability of water for future generations.

The dam raising requires an EIS at both State and Commonwealth levels and construction cannot commence unless and until the approvals are obtained. While the EIS would address all issues of relevance, critical issues include (and are likely to be more significant at higher levels of raising):

- works are within a Great Barrier Reef catchment.
- environmental offsets may be significant.
- cultural heritage issues (indigenous and non-indigenous).
- land requirements and associated social impacts.

The primary social benefits relate to employment and expenditure during construction and again during operation. The construction phase carries both positive effects (personal income and support for businesses) and negative effects (land acquisition and severance, separation of workers from family, risk of traffic accidents), while the operations phase supports expansion of agri-business and potentially satisfies demands of other users. Employment and expenditure will accrue at the location of water use (Townsville, Bowen, mines, Burdekin agriculture).

1. Introduction

1.1. Background

Burdekin Falls Dam (BFD or the dam) is located on the Burdekin River at Adopted Middle Thread Distance (AMTD) 159.3 km; 210 km south of Townsville. The dam completed in 1987, stores 1,860,000 ML of water at the design Full Supply Level (FSL) of EL 154.0 m AHD (Australian Height Datum). The dam is constructed of mass concrete and operates in conjunction with four earth and rock-fill saddle dams.

Figure 1 shows the dam location within the Burdekin Catchment.

BFD is owned and operated by Sunwater and supplies water for agricultural irrigation, groundwater recharge and coal mine operations, and supplements supply to the Townsville Local Government Area. It is the largest water storage dam in Queensland and incorporates the largest spillway of dams in Australia with a total wall span of 876 metres (m), inclusive of a 504 m spillway.

BFD was the first major dam in the catchment and the site was chosen from several options considering multiple factors such as yield capability (the site captures all but one major tributary within the catchment), geology, constructability and proximity to potential water users.

The original design of the dam allowed for potential future increases in storage capacity and early scoping studies investigated options to raise the storage by 6, 10 and 14.6 m (DNR 1998). Original land purchase for the project included the land thought necessary to support future raising except at the upstream extent of affected rivers. The current Water Plan for the Burdekin Basin includes a Strategic Reserve allowing for a 2 m raising. The dam was also designed for possible future hydro-electric generation.

The Preliminary Business Case (PBC) concluded that there is an identified need for adequate and secure water supply to support development and growth in North Queensland for the next generation. This service need is under threat from insufficient uncommitted allocation to respond to any single significant short lead time demand. That is, there is a need to increase water storage capacity.

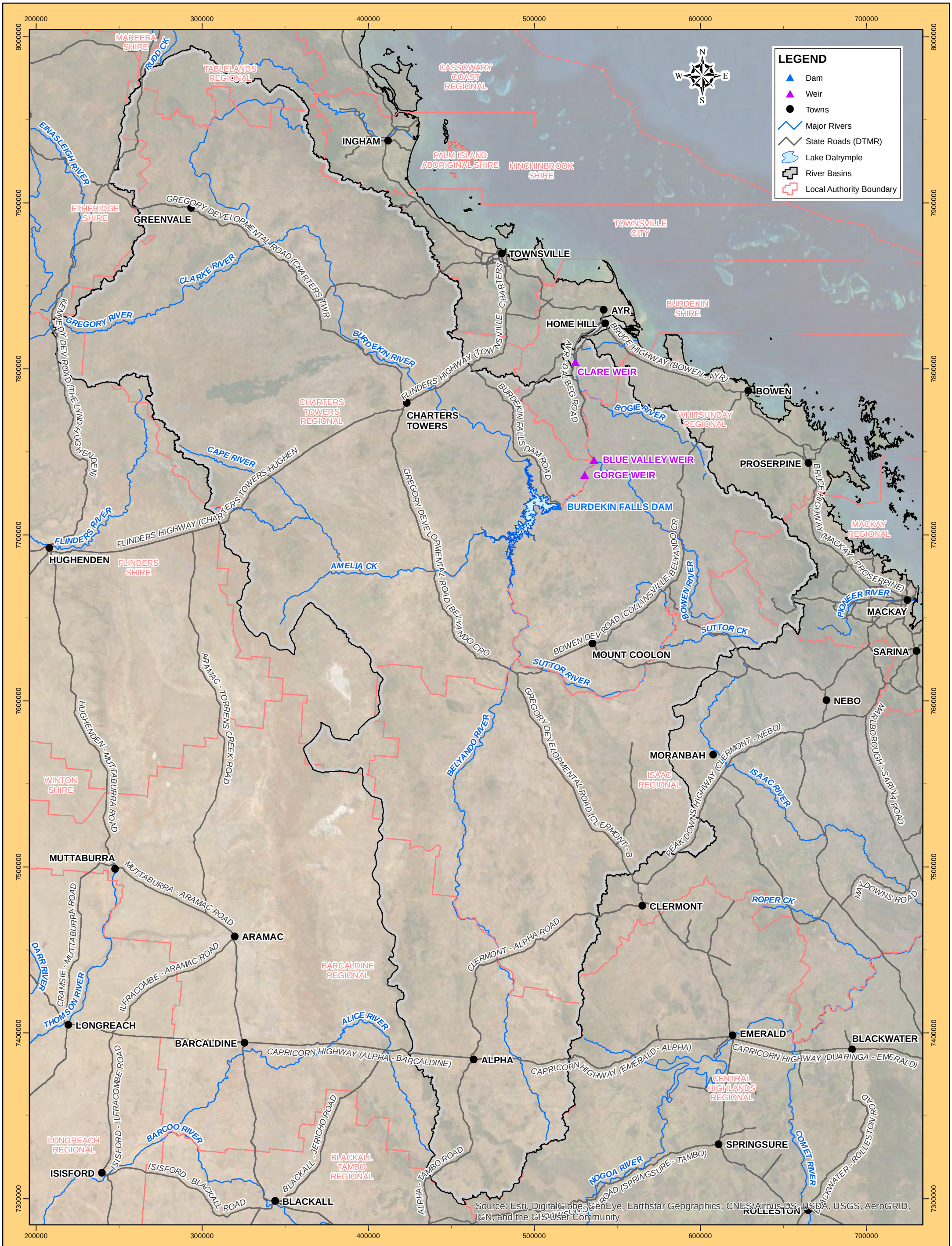
The PBC recommended that Sunwater progresses BFD Raising Options 3A (2 m raise) and 3B (6 m raise) for further evaluation in a Detailed Business Case (DBC). It was recommended that assessment within the DBC not be limited to the previously nominated heights, with a refined height between 2 m and 6 m nominated to best meet the service need (refer Appendix B).

The Sunwater Board endorsed the PBC's conclusions and recommendations.

1.2. Purpose

The purpose of this Initial Advice Statement (IAS) is to assist the Coordinator-General in determining whether the project should be declared a 'coordinated project' under Part 4 of the State Development Public Works Organisation Act 1971 (SDPWO Act) and the level of assessment required. The IAS identifies the potential Project impacts (positive and negative) to be investigated in detail in the Project EIS and gives an early indication of the mitigation and management measures for those identified impacts. The information presented in this document may alter as the design develops and feedback is obtained from stakeholders and interested parties.

The IAS provides Project information to interested stakeholders, customers, regulators and the general public. It also identifies approvals that may be required for the implementation of the Project. The Project has complex approval requirements and is local, regional and State strategic significance. The Project requires approvals at the local planning scheme level as well as multiple State environmental approvals. It will also require Commonwealth approval due to the potential to have significance impacts on Matters of National Environmental Significance. Further detail in relation to approval requirements are provided in Section 8.



Document: S:\BW Asset Delivery\Dev-SunWater\P-ASWP-0046-AA-40-26 Burdekin Raising Enviro Assessment\Drawings\ArcMap\252349-A.mxd
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MAP INFORMATION
Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)
0 20 40 60 80 100 km 1:2,000,000

BURDEKIN FALLS DAM
RAISING PROJECT
ENVIRONMENTAL ASSESSMENT
LOCATION PLAN

sunwater

DRAWING No. 252349 A

2. Proponent

Sunwater is the Project proponent as owner and operator of BFD, and the Resource Operations Licence (ROL) holder of the Burdekin-Haughton Water Supply Scheme (BHWSS). Through the *Government Owned Corporations Act 1993 (Qld)* (GOC Act) Sunwater was established in October 2000 to own, operate and facilitate development of bulk water supply infrastructure throughout Queensland (with the exception of South-East Queensland).

Sunwater owns and operates 19 dams, 64 weirs and barrages and 2,120 km of pipelines, and captures and delivers around 40% of the water used commercially in Queensland to more than 5,000 customers. Sunwater supplies urban and industrial customers across 31 bulk water and irrigation supply schemes. As a specialist bulk water service provider, Sunwater has extensive expertise in designing, constructing, operating and maintaining dams, weirs, pump stations, pipelines, open channels and drainage systems.

Sunwater has been the proponent for several coordinated projects including: Nathan Dam and Pipelines Project, Connors River Dam and Pipelines Project, Lower Fitzroy River Infrastructure Project; all of which received State and Commonwealth approval.

Sunwater is committed to minimising the 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.

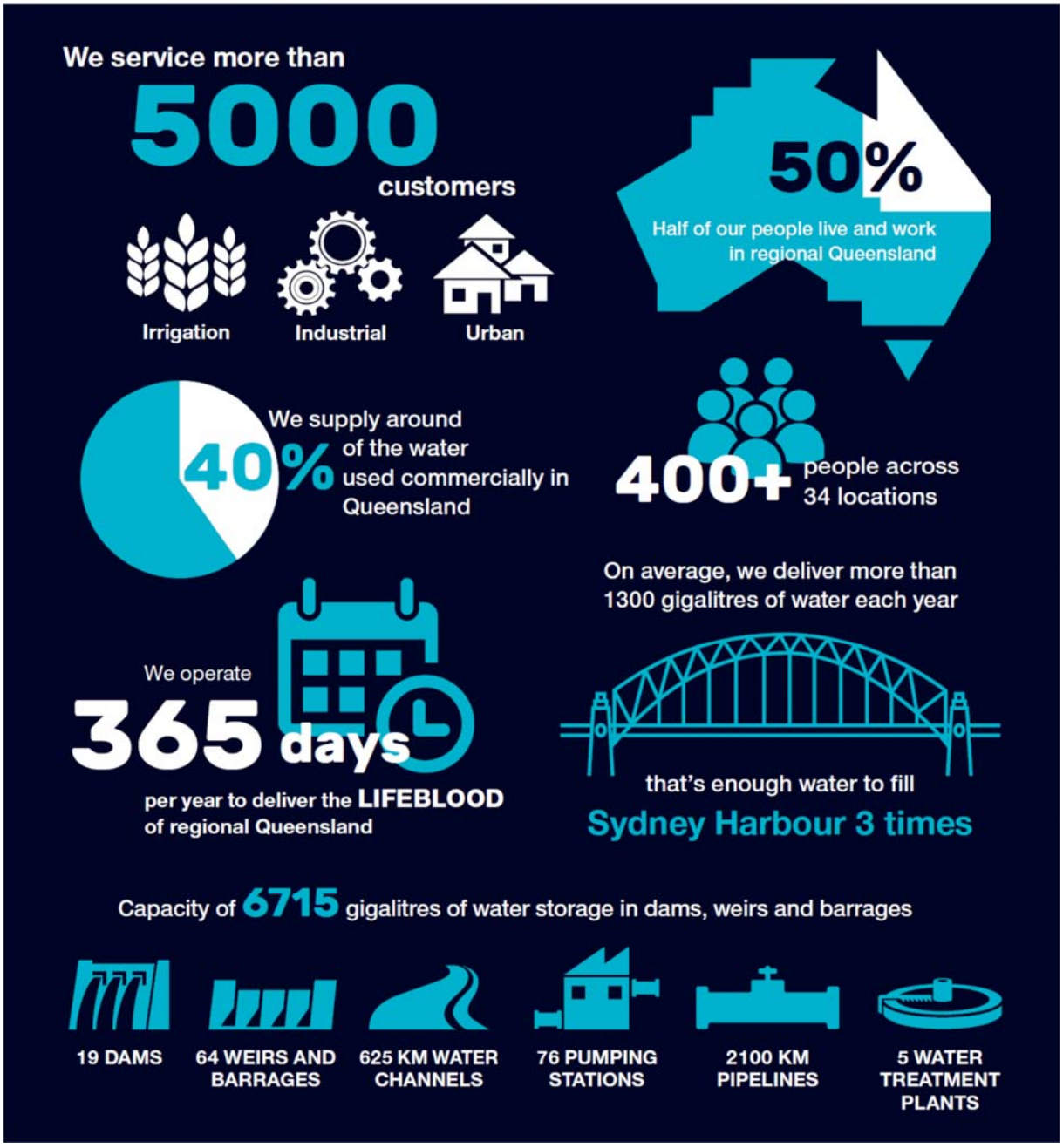
Sunwater's shareholding Minsters are currently the Hon Jackie Trad MP, Deputy Premier and Minister for Aboriginal and Torres Strait Islander Partnerships and the Hon Dr Anthony Lynham MP, Minister for Natural Resources, Mines and Energy.

Sunwater's head office is located at the following address:

Green Square North
Level 9, 515 St Pauls Terrace
Fortitude Valley, Queensland 4006

Figure 2: Irrigator Andrew Vassallo at his sugar and flower farm

Sunwater at a glance



2.1. Environmental record

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 condition of the *Environment Protection and Biodiversity Conservation Act 1999* (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.

Prior to the above judgement, 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 against a condition of approval under the EPBC Act. 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.

2.2. Scope of the project

The project involves raising of the existing BFD by at least 2 m and possibly up to 6 m. The final decision as to the level of raising will be made through the DBC process which will be undertaken concurrent with the EIS (if this is the determined assessment process) and will be informed by a thorough stakeholder engagement process. Some ancillary infrastructure will also require upgrade. The additional yield will be available for purchase to a range of clients including urban, mining and agricultural. As is now the case, the dam will be maintained to meet dam safety standards and Sunwater will operate the dam to comply with the Water Plan (Burdekin Basin), Operations Manual, Water Management Protocol, Resource Operations Licence and other relevant legislation.

The Burdekin Falls Dam Improvement Project ("DIP") is a related project that is currently being investigated by Sunwater. The DIP is a large-scale maintenance project which includes engineering works such as anchoring of the existing structure and raising the level of the saddle dams to accommodate the revised flood levels. However, Sunwater considers this to be outside of the scope of the Project and is not part of the proposed Project for the following reasons:

- The DBC being prepared by Sunwater, in collaboration with BQ, is for the DIP and the Project in order to examine the viability of the two projects. As part of the DBC, BQ is addressing various development scenarios which include separate or successive construction activities.
- Irrespective of the Project and whether it proceeds, Sunwater must complete the DIP before 2035 in order to meet Queensland's dam safety requirements under the *Water Supply (Safety and Reliability) Act 2008* (Qld). In response to the most recent prediction of flood levels required for an existing dam, Sunwater is required to upgrade infrastructure to comply with dam safety requirements,
- Should the DBC conclude that successive construction be the preferred approach, Sunwater would consider an appropriate approvals pathway the required works.
- If the DBC concludes that a raising can occur prior to 2035, then all necessary dam safety requirements will be met by the Project.

2.3. Land use

Most land adjacent to BFD and Lake Dalrymple is freehold land owned by Sunwater (Lot 13 MRY51). When the dam was built, the land to 169 m AHD (FSL plus 15 m) was acquired by the Queensland Government and included that needed for the works (dam construction) area, water storage area (to FSL), flood safety margin and to accommodate future raising of the dam. The upstream extent of purchase only extended to FSL as it was considered unlikely to be impacted by flood beyond which it already experienced. The land outside of the freehold land currently owned by Sunwater is Lands Lease tenure and some acquisition will be required in the

noted upstream reaches and in areas where recent detailed topographic information shows that the original purchase area should be updated.

The primary land use in the area surrounding BFD is free-range cattle grazing on native pastures, including in the flood margin. Grazing in sub-catchments above the dam often occupies over 80% of the land area. Sunwater recreation and camping facilities are present at the dam, including wood BBQs, picnic tables / shelters, toilets and showers, and a boat ramp. Lake Dalrymple is open to all boating activities and has been stocked with various fish species to support recreation.

Figure 3: Burdekin Falls Dam

2.4. Project need, justification and alternatives considered

2.4.1. Project need and justification

As noted in Section 1.1, the dam was originally built to allow for future raising and the Water Plan (2007) included a strategic reserve volume of 150,000 ML which could cater for a 2m raising.

Government policy initiatives have since stimulated further consideration of water resource planning in Northern Australia and the Burdekin region. The Strategic Considerations described in the PBC included:

- Sunwater Strategic Plan
- Our North, Our Future: White Paper on Developing Northern Australia (Australian Government, 2015)
- National Water Infrastructure Development Fund (note that four of the ten Queensland projects are in the Burdekin)
- Agricultural competitiveness white paper (Australian Government, 2015)
- Reef 2050 Long-term Sustainability Plan (Commonwealth of Australia, 2015)
- State Infrastructure Plan (Queensland Government 2018)
- Queensland Bulk Water Opportunity Statement (2018)
- Advancing North Queensland Policy (Queensland Government, 2016)
- Regional Water Supply Security Assessment for Townsville (DEWS, 2014)
- Report of the Townsville Water Security Taskforce (2017)
- Bowen and Galilee Basins Water Supply Strategy (State of Queensland, 2013)
- Whitsunday 2020 (Whitsunday Regional Council, 2014).

The PBC considered that the proposed raising aligned well with the government policy initiatives nominated above though noting competing objectives of regional development, particularly of irrigated agriculture, with some of the objectives of Reef 2050.

Sunwater has followed the Building Queensland Project Assessment Framework when planning the project. A Strategic Business Case was followed by a PBC. Sunwater has also developed a North Region Blueprint which

incorporates DNRME's QBWOS and DSDMIP SIP in identifying solutions. The stakeholder workshops for the development of the blueprint included government departments (DNRME) as well as diverse range of customers, community members, councils and industry groups. Sunwater has actively contributed to the development of the QBWOS through participation in workshops and collaboration with DNRME.

The North Queensland Regional Plan notes that Burdekin Falls Dam enables secure and sustainable irrigation. It also notes that the Burdekin River is the second most economically important river in Australia. Providing water supply to regional communities, grazing, mining and extractive resource operators.

A demand assessment undertaken as part of the PBC supports the finding that **the need or objective for adequate and secure water supply to support development and growth in North Queensland for the next generation** is under threat from insufficient uncommitted allocation.

Under the central case for demand (i.e. moderate demand forecasts), demand would outpace current allocations starting from about 2021. Even under a conservative demand scenario, it is noted that 'this would provide little capacity to support any single future major development'.

The service need is related to several opportunities, including:


expansion of irrigated agriculture in North Queensland


support for urban and industrial growth in Townsville


support for industrial growth at Abbot Point SDA and Port of Abbot Point


support for potential inland mining and industrial developments


generation of commercially viable hydro power in North Queensland.

The PBC noted that on-site solutions including demand management, recycling or re-use and balancing the mix of supply sources is the responsibility of the site manager, be it an urban water supply manager or a mine. The PBC focussed on those aspects which relate to bulk surface water supply to meet the needs of a range of potential end users as identified by the service sub-needs.

2.4.2. Alternatives

The State Infrastructure Plan (SIP) sets out an approach to options assessment and prioritising further infrastructure projects. The categories included in the SIP are:

- **Reform**: non-asset initiatives (policy etc., education)
- **Better use**: improving service performance (efficiency)
- **Improve existing**: low cost augmentation or asset-light solutions
- **New:** new assets

The service need and options addressed in the PBC are considered to align with the aspects of the SIP above by recognising the initiatives in the Regional Water Supply Strategies for Townsville and other relevant regions and by providing a range of bulk water management solutions covering each of the SIP categories.

The long list of options assessed in the PBC are grouped in Table 1 into SIP categories.

Table 1: SIP options

Topic	Options
Reform	Option 1A - Improve BHWSS rules of operation Option 1B - Increase on-farm water use efficiency Option 1C - Improve conjunctive use with groundwater Option 1D - Increase groundwater entitlements Option 1E - Increase water harvesting entitlements
Better use	Option 2A - Improve water trading Option 2B - Improved water storage and distribution efficiency Option 2C - Enhance capacity and utility of existing infrastructure
Improve existing	Option 3 - Raise Burdekin Falls Dam
New Build	Option 4A - Hells Gate Dam - Provides increased bulk water supply Option 4B - Urannah Dam - Provides increased bulk water supply

The PBC concluded that for Option 1A, the extent of benefit is currently unknown and may be significant and while it was addressed generally by other ongoing processes (DNRME reviews), the accounting rules within the BHWSS Operations Manual regarding losses and announced allocations should be specifically targeted for resolution. This option is being further addressed in the project planning phase.

It was concluded Options 1C, 1D, 1E and 2C could not provide the increased water supply necessary so were not preferred and not further assessed. These options are being driven primarily by DNRME, who has an active program to develop a groundwater strategy for the area.

Options 1B and 2A could potentially provide significant benefit but it would accrue at the farm scale, so the benefits would be limited to the existing BHWSS and to irrigated agriculture. These options rely upon uptake of efficiency measures by farmers and on voluntary use of the water trading system, which are factors beyond Sunwater's' control.

For Option 2B the water volume benefit was also relatively low but as it accrued to the scheme operator, it could service any need. This option also provided direct environmental benefits associated with reduced groundwater accessions. The proposed works have been separately submitted by Sunwater for NWIDF funding.

Option 4A is upstream of BFD on the Burdekin River. It is a stand-alone project targeting irrigated agriculture and electricity generation. It does not propose to service the mining industry but could potentially provide water to Townsville in the long term if the needs of Townsville ever exceeded the supply from BFD (which Townsville has identified as its core source of water supply). If constructed as planned, this project may impact the reliability of supply from BFD. As it is being addressed by a separate proponent, initially with NWIDF funding, it was not considered further in the PBC.

Option 4B is on a tributary (Bowen-Broken) which enters downstream of BFD and could potentially satisfy the suite of identified needs. As it is being progressed by a separate proponent, initially with NWIDF funding, it was not considered further in the PBC.

Option 3 Raising BFD was considered to meet multiple service needs and is likely to have lower impacts than new build alternatives (Option 4A and 4B). It would also not prohibit those new build alternatives. The PBC

concluded that the most appropriate level of raising should be investigated but was likely to be between 2 m and 6 m.

The efficiency related options (Reform and Better Use) were pooled and treated as a delay to the need to implement an option which increased bulk water supply. This analysis also suggested that planning for raising of BFD should commence immediately.

A high-level risk assessment was undertaken as part of the PBC. The risk assessment identified the following key risks:

- environmental approvals
- access to dam crest
- frequency and duration of major wet weather event, especially during the dry season
- geotechnical conditions
- resource availability
- restrictions on being able to sell water allocation due to groundwater issues in the Lower Burdekin and subsequent restrictions on irrigation.

Also, as noted in Section 2.2, Sunwater is undertaking a DBC for the DIP. Options being assessed include sub-elements of the Dam raising construction activities. The DIP is seeking to improve the dam's capacity to pass larger flood events. Therefore, the design response to overcome the increased demands on the dam structure are the same between both projects, however smaller for the DIP, to which a slightly different design solution is being assessed.

The material differences between the Dam Improvement Project and the Dam Raise Project are:

- The Dam Improvement Project does not require raising of the Primary Spillway **(no increased inundation impact)**
- Installation of Post-tensioned anchors to the main dam would be required, which is an activity not otherwise required for the Dam Raise Project **(not required for raising);**
- Saddle dams would require raising but to lower levels then required for the Dam Raise Project **(reduced disturbance footprint and material demand)**;
- Construction of a new Right Bank Saddle dam would be required, however to a lower height then required for the Dam Raise Project **(reduced disturbance footprint and material demand)**;
- Downstream buttressing of the main dam abutments to a lesser thickness then required for the Dam Raise Project **(reduced material demand);**
- Smaller construction workforce **(reduced office and accommodation requirement)**;

Hence relative to the raising project, the DIP:

- Would not increase the storage capacity or yield of the dam
- Would not increase the inundation area
- Would not lead to a change in the flow regime downstream
- Would not alter customers or means of supply to customers

- Only potentially has impacts related to construction as it does not alter day to day operations,

To clarify, the proposed Project is the raising of Burdekin Falls Dam which will satisfy all dam safety related requirements.

As the owner of the dam, Sunwater is the only proponent for the Project.

2.4.3. Benefits

Benefits related to construction phase direct employment are detailed in Section 3.8 and an on-site workforce peak of 150 is anticipated. Off-site construction phase jobs (engineering, planning, accounting, material supply etc), will provide additional jobs. During construction an active policy of sourcing goods and services within the region will be implemented. This will apply to both the Dam Improvement Project and the raising project and provide a sustained stimulus to the regional economy.

Growth in operations phase direct employment is predicted to be relatively small as Sunwater already has operational staff in the region but indirect employment as a result of expansion of industries which make use of the available water can be substantial. For example, an extra worker is required for each additional 100 ha of sugar cane and 1-5 workers for each 10 ha of horticulture. Operations phase indirect employment will also grow as the expanding regional industries require support and through the provision of services to the growing population.

Many of the products potentially stimulated by the increased availability of water are export orientated (mining, sugar, other agricultural products) while others are of national level significance (other agricultural products, secondary processing industries). A secure and substantial water supply for Townsville removes one impediment to growth of support and processing industries associated with mining or agriculture.

The PBC undertook a preliminary Social Impact Assessment which concluded the predicted positive effects all had a significance rating of high. These were:

- enhanced access to goods and services due to injection of wealth into regional economies
- enhanced access to goods and services due to creation of direct and indirect employment opportunities in regional economies
- reduced financial stress.

These reflect the substantial social benefits associated with the capital expenditure and subsequent direct injection of wealth into local economies along with the potential indirect economic opportunity created through the development potential associated with enhanced water supply. The existence of a secure water supply and availability of water for future generations was also recognized as a significant benefit. There were no identified Project related impacts which were assessed as being of high significance post the application of proposed mitigation measures.

The social benefits derived from dam raising are regional in scale. The overall conclusion of the SIE was that the social effect of all Options is considered to be positive.

2.5. Development activities and infrastructure

2.5.1. Project components to be declared

The proposed works specifically related to the dam site include:

- raising of the spillway by at least 2 m and up to 6 m
- associated raises of the left and right abutments to contain the selected design flood (Probable Maximum Flood PMF)
- raising of the Left Bank and Mt Graham saddle dams to contain the selected design flood

- construction of a new right bank saddle dam
- adjustments to apron and splitter piers, and
- roadworks realignment on Right Abutment extension, and roadworks on access road to the dam North of Mount Graham North Saddle Dam and the North Abutment Saddle dam depending on final design and raise height.

In order to undertake those works, the following is required:

- establishment of site offices, storages/stockpile areas, lay down areas – where possible will be located in similar locations as the original works (such as cleared and car park areas around the current recreational facilities)
- re-establishment of construction camp
- re-establishment and establishment of temporary haul roads as required
- establishment of concrete batching plants
- development of material extraction and borrow areas including:
    - re-establishing quarries that were utilised during the original construction of the dam for rock, sand and gravel, all of which are located within approximately 5 km of the dam site, and
    - establishing new quarries for rock, sand and gravel within approximately 10 km of the dam site as the former quarries are unlikely to be able to supply all the material required.
- if the water storage is at high water levels, temporary lowering of the water level will be required for safety reasons and to access the top of the main spillway
- realignment of the road leading to the right abutment, and
- upgraded facilities (water and wastewater).

At the conclusion of works, the construction camp will be removed, the recreational facilities reinstated and a site rehabilitation program undertaken.

Water development infrastructure is to be determined during the progression of the business case and further decisions being made on the Project within the EIS phase. The raised water level will inundate existing land and infrastructure. As a result, the following constitute part of the project and are also to be declared:

- clearing of vegetation from within the increased inundation area (in accordance with a strategy to be developed).
- removal of redundant or otherwise dangerous infrastructure (houses, other buildings, fuel tanks, yards, fences, windmills, powerlines (by the infrastructure owner) etc.
- treatment of contaminated land.
- replacement of Scartwater crossing on the Suttor River.
- replacement and realignment of several rural roads or farm accesses.
- replacement and/or realignment of power supply and telecommunications to farms (by the infrastructure owner).

Relocating private infrastructure required to support continued use of land not affected by the Project e.g. existing farm pumps used to access water from the dam.

Throughout the construction phase, exclusion of public access from the vicinity of construction is anticipated. Public access to other parts of the lake area is expected to be restricted only where warranted for public safety.

2.5.2. Components not to be declared

A number of planning phase activities can be undertaken by Sunwater as part of standard processes, thus do not require declaration as part of this project. Outcomes from these activities would be included in an EIS. They include surveys and investigations related to:

- geotechnical issues (including in resource extraction areas)
- topography and bathymetry
- hydrology and hydraulics
- contaminated land
- ecology (aquatic and terrestrial, and
- geomorphology.

As the dam is an existing operational structure, any aspect of its operation and maintenance is also not considered part of the raising project. While hydro-power has been investigated previously it does form part of this raising project.

2.6. Infrastructure requirements

While it may be unlikely that any major new supporting infrastructure (such as access roads, provision of power or telecommunications, local water supply or waste disposal) will be required, this is to be determined during progression of the business case further decisions being made on the Project within the EIS phase. Existing roads may require upgrades to accommodate construction traffic. Currently, the following upgrades may be required:

The adjacent airport and helipad to enable emergency access and evacuation of staff.

Ancillary facilities such as power supply, instrumentation and communications, water treatment, wastewater treatment and communications systems at the dam facility.

However, if the separate dam improvement project proceeds prior to the raising, it is assumed any necessary upgrades will have been undertaken by that project and approved separately if need be.

Any new water supply scheme supporting infrastructure (including new weirs or channels) to support the project will be determined during progression of the business case and further decisions being made on the Project within the EIS phase. It is not expected that any water supply scheme supporting infrastructure or pipelines would be considered within the scope of an EIS process for this project.

Figure 4: Burdekin Falls Dam spilling water

2.7. Project timeframes

Table 2 outlines the project schedule based on a 6 m raise of the BFD. Approval to enter the planning phase was granted by the Sunwater board in November 2018. The planning and approvals phase is expected to take approximately 5 years. The construction phase (project execution) is likely to extend over four years.

Table 2: Project Schedule

Activity	Start	Finish
Planning Phase		
EIS including preliminary studies, IAS, EPBC referral, CG report and EPBC approval.	Aug-19	Mar-23
Detailed Business Case 1	Jan-20	Jul-21
Detailed Business Case update post-EIS	Feb-23	Jun-23
Sunwater & BQ Board – DBC approval	Jul-23	Aug-23
Shareholding Minister – DBC approval	Sep-23	Nov-23
Project Execution (based on 6 m Raise)		
Consultant selection and Detailed Engineering Design	Dec-23	Nov-24
Contractor selection and mobilisation	Nov-24	May-25
Construction delivery including works, demobilisation, rehabilitation	May-25	Jul-28
Water sales and marketing	Jan-24	Dec-28
Completions, testing and acceptance of works	Jul-28	Sep-28
Handover to Sunwater Operations	Sep-28	Dec-28

2.8. Construction and operational processes

While Sunwater does not anticipate any changes or upgrades to the existing dam outlets to occur, this is to be determined during progression of the business case and further decision being on the Project within the EIS phase. The dam is expected to remain operational during construction and will meet Water Allocation Security Objectives (WASO's) and Environmental Flow Objective (EFO) requirements.

A revised sediment and erosion control plan will be developed for the Project within EIS phase.

Water supply for construction purposes will be drawn from the existing water storage, largely using existing infrastructure. It is noted that Sunwater is the infrastructure owner, ROL holder and holds allocations in the storage. Existing infrastructure includes water treatment and wastewater treatment infrastructure though this may need to be upgraded.

A construction waste management plan will be required. The amount and type of waste generated during operation (e.g. construction waste and that generated by operation of the site and amenities) is likely to vary substantially from that currently generated. Demolished concrete may be suitable for re-use. While as much as possible of the vegetation to be cleared will be beneficially re-used, some may require burning on site.

While Sunwater does not anticipate that any upgrade to roads or intersections will be necessary, Traffic Management Plans and Road Use Management Plans will be determined during progression of the business case and further decisions being made of the Project within the EIS phase. Repair of Burdekin Falls Dam Road will likely be required after works are concluded.

On completion of works the construction areas will be rehabilitated to suit their intended ongoing use. This includes re-instating the recreation areas and boat ramps.

An Environmental Offset Plan will be prepared and may include rehabilitation of ecosystems on Sunwater land surrounding the water storage.

Figure 5: Sunwater staff inspecting Burdekin Falls Dam wall

2.9. Workforce requirements during construction and operation

2.9.1. Construction workforce

Initial estimates of workforce sizing based on concept design indicate average size of 125 workers with a peak at around 150 workers. During initial market sounding a local participation target for the project of 30% (of total project workforce) was noted as being achievable. As a result of actively souring project from local communities the likelihood of positive impact is enhanced. The jobs are short-term employment that would not continue beyond the construction phase. Local communities surrounding the project include Ravenswood, Charters Towers, Clare, Ayr, Collinsville, Bowen and Townsville.

A preliminary resource loaded schedule will be produced as part of the preliminary engineering design to support the DBC. Cost estimation is currently being developed and will provide a break-down workforce estimate for unskilled, skilled and management.

Indirect employment opportunities include new jobs associated with increased agricultural and mining activity due to the provision of additional water.

The base case Cost-Benefit Analysis (CBA) conservatively assumes that mining and industrial projects will still occur without raising BFD and are therefore not a benefit directly generated by the project. However, it should be noted that mining and industrial activity is critically reliant on a secure potable and industrial water supply, and that the project offers the potential to support substantial economic benefits through the facilitation of these activities. The 2 m and 6 m raising options will also result in avoided capital and operating costs arising from alternative water supply solutions for these projects.

2.9.2. Operational workforce

Operational phase direct employment will be minor. Sunwater offers staff accommodation on site and a major regional operations centre exists in Clare.

Indirect employment as a result of expansion of industries which make use of the available water may be substantial. For example, an extra worker is required for each additional 100 ha of sugar cane and 1-5 workers for each 10 ha of horticulture. Operations phase indirect employment will also grow as the expanding regional industries require support and through the provision of services to the growing population. Based on employment rates calculated in the economic analysis of the PBC, a total of approximately 2000 jobs would be created over the short- and long-term demand scenarios for the 2m raising. Approximately 7500 would be created by the 6m raising. Demand serviced by existing supply and any jobs associated with high priority supply to mines or urban areas is not included.

2.10. Economic indicators

The preliminary economic analysis undertaken within the PBC considered each of the “bookend” raising levels against three demand scenarios, creating a total of 10 distinct supply/demand combinations.

The analysis provides an overview of net economic costs and benefits associated with the project options. Consistent with the Building Queensland Cost Benefit Analysis Guide (Building Queensland, 2016), the options have been analysed over a period of 30 years including construction.

The costs and benefits have been assessed against three real discount rates (4%, 7% and 10%) with the focus primarily on the standard seven percent discount rate. The geographical scope of the project impact is the State of Queensland. The Net Present Value (NPV) and Benefit Cost Ratio (BCR) are the primary decision criteria for the economic appraisal.

The 2 m raising options provide a stronger return across all the demand scenarios, though still significantly negative at a seven percent discount rate. The limited instances and late timing within the analysis for significant demand to take up the yield from a 6 m raising reduces the option’s relative competitiveness over a 30-year analysis period. A longer analysis period may prove more positive for the 6m raising option, should demand conditions prove favourable into the future.

2.11.Financing requirements and implications

An Opinion of Probably Construction Costs (AACE Class 5) was developed based on Concept Design for the PBC in 2018. A summary is provided for each option in Table 3.

Table 3: Cost estimate (Burdekin Falls Dam Raising Preliminary Business Case)

Class 5 estimate	Range of total estimated cost with contingency (A$M)		
Option description	Low end range (110%)	Probable construction costs	High end range (+40%)
2 m raise	322	358	502
6 m raise	598	665	931

This information is under review as part of the Preliminary Engineering design to support the DBC. A preliminary resource-loaded schedule will be produced as part of these works. The cost estimation work underway as part of this will provide a complete break-down of costs.

Expenditure from the use of the water is likely to be significant, it is expected that the Demand Study developed during the DBC phase will determine funding and Commercial Contracts, due to the significant capital costs of the project it is expected that government funding will be required to subsidise the capital costs of either dam raise option. Sunwater has the financial capacity to undertake the IAS and EIS process and will further develop the DBC to determine the most appropriate funding methodology. Sunwater will be working with its Shareholding Ministers with regard to Project funding beyond the DBC.

3. Location of key project elements

3.1. Location

BFD is located in North Queensland, approximately 210 km, by road, south-east of Townsville and approximately 80 km south of the small historic township of Ravenswood. The dam wall is located at latitude 20°38' South and longitude 147°08' East (Figure 1) and 159.3 km upstream from the river mouth. It was built atop Burdekin Falls and now forms Lake Dalrymple, which covers an area of approximately 28,650 ha at FSL (including 2,879 ha of islands) and ponds water 50 km up the Burdekin River, and 70 km up the Belyando-Suttor arm.

The dam is reached by Burdekin Falls Dam Road which joins the Flinders Highway at Mingela. It can also be reached directly from the lower Burdekin area by the Ayr-Ravenswood road.

Figure 1 shows the project location within the Burdekin Catchment.

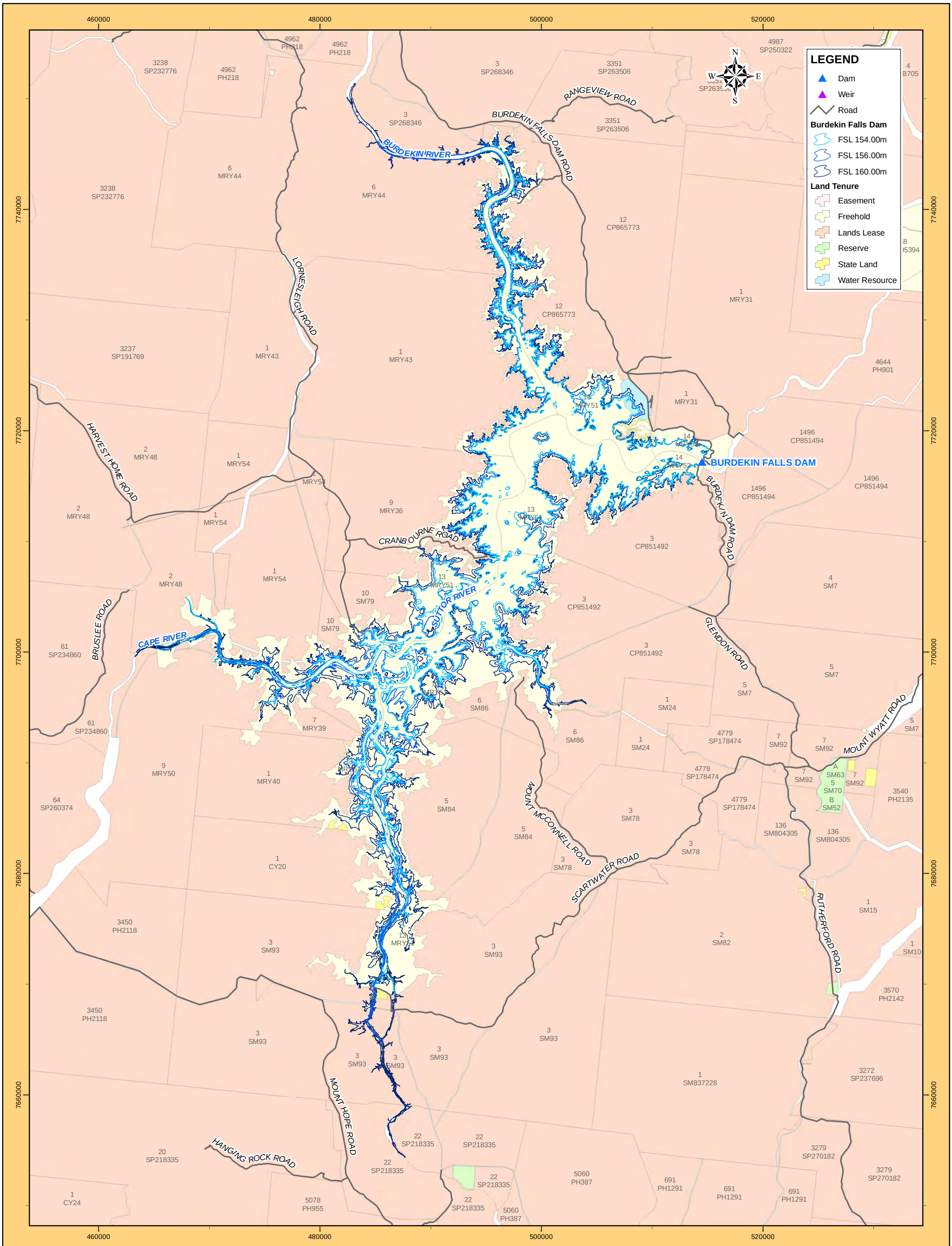
3.2. Tenure

Most land adjacent to BFD and Lake Dalrymple is freehold land owned by Sunwater (Lot 13 MRY51). For a 2 m only 81.9 ha of this is beyond Sunwater's current land ownership and will require purchase or the taking of an easement for the flood margin. For a 6 m raising this number increases to approximately 1,235.9 ha. The number of properties affected by this tenure change is approximately 4 and 11 respectively. Land requirements are further discussed in 5.3.1 and shown in Figure 6. Property details of the impacted land is detailed in Table 4.

The inundation area and dam are located within the Charters Towers Regional Council and Whitsunday Regional Council areas. The downstream areas are located within the Whitsunday Regional Council, Burdekin Shire and Charters Towers Regional Council areas.

Table 4: Property details

Property description	Area (hectares)		
	Sunwater land	2 metres	6 metres
Lot 10 on MRY33	591.1		
Lot 13 on MRY51	73,510.0		
Lot 14 on MRY 52	2,191.0		
Lot 3 on CP851492		0.1	0.5
Lot 3 on SM93		44.6	982.3
Lot 3 on SP268346		15.6	68.6
Lot 6 on MRY44		21.6	82.8
Lot 10 on SM79			0.03
Lot 22 on SP218335			5.6
Lot 2 on MRY48			0.001
Lot 4 on SM801624			78.4
Lot 6 on SM86			0.1
Lot 7 on MRY39			0.008
Lot 9 on MRY50			2.8
Emt A on RP895517			14.8
Total	76,292.1	81.9	1,235.9



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Printed: Wednesday, 25/03/2020 08:32:04 AM

MAP INFORMATION

Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)

0 3 6 9 12 15 km 1:300,000

BURDEKIN FALLS DAM

RAISING PROJECT ENVIRONMENTAL ASSESSMENT LAND TENURE PLAN

sunwater

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4. Description of the existing environment

4.1. Natural environment

4.1.1. Land

The dam is fed by a catchment of approximately 114,770 km2 comprising the Burdekin River and its tributaries to the north, the Belyando-Suttor systems to the south, and the Cape/Campaspe to the west.

There is considerable variation in the topography, geology and soils upstream and downstream of BFD. In the vicinity of the dam, there is igneous rock at approximately 160 m AHD elevation that is surrounded by mountain ranges that are up to 250 m AHD high. The dam is built atop Burdekin Falls which sits within a rocky gorge extending downstream to Gorge Weir.

Around and upstream of BFD, much of the landscape is undulating old sedimentary basins or alluvial plains, with open acacia and eucalypt woodlands interspersed with limited areas cleared for improved pastures and dryland cropping (NQ Dry Tropics, 2016).

Downstream of Gorge Weir is undulating terrain that reaches 100 m elevation and is primarily alluvium. Below this is the Lower Burdekin and Bowen areas, the landscape ranges from coastal plains and delta areas which incorporate areas of irrigated agriculture, to beaches, to hilly country used for pastoral agriculture.

There are no areas of conservation estate within or near the direct impact area but the coastal waters of the region include the Bowling Green Bay National Park and Ramsar wetland as well as Bowling Green Bay and Upstart Bay Fish Habitat Areas and Dugong Protection Areas and the Great Barrier Reef Marine Park (Figure 12).

4.1.2. Water

Water resource development in the Burdekin Region

Intensive irrigation in the Burdekin region commenced in the 1950s using groundwater in the delta area and surface water in riparian areas of the Burdekin River. The Burdekin River Irrigation Area (BRIA) was established using surface water on 7,500 ha at Clare, Millaroo and Dalbeg, on the riparian levee soils of the lower Burdekin floodplain upstream of the delta area.

Water supplies for an upstream soldier settlement area came from Gorge Weir (constructed in 1953) and Blue Valley Weir (constructed in 1963 downstream of the junction with the Bowen River). Clare Weir was constructed in 1978. In the 1970s this supply was supplemented from Eungella Dam, on the upper Broken River. Continued growth led to the construction of BFD and the associated BHWSS in 1987. This provided additional water supplies for irrigated agriculture, domestic, stock, urban and industrial development purposes in the Townsville/lower Burdekin area as well as spare capacity for future development.

The BHWSS comprises a series of water storage and supply assets, including BFD, regulating weirs (Gorge Weir, Blue Valley Weir and Clare Weir on the Burdekin River; Val Bird Weir and Giru Weir on the Haughton River) and a series of channel, river or groundwater distribution systems (Clare, Millaroo, Dalbeg, Barratta, Haughton and Giru Benefitted Area) delivering water to purpose-designed irrigation areas (Department of State Development, 2016). Figure 8 provides an overview of Sunwater infrastructure in the Lower Burdekin Catchment including Burdekin Haughton irrigation infrastructure (adapted from DNRME, 2015).

Channels have been developed on both sides of the Burdekin River and each section is served by major pump stations located on Clare Weir. The pump stations divert water into main channels on each bank of the river and then to customers by a system of distribution channels. The Tom Fenwick Pump Station services the Barratta Main Channel (BMC) and Haughton Main Channel (HMC) systems, which provide water to customers between the Burdekin and Haughton rivers.

In 1988 the Townsville/Thuringowa Water Supply Board (NQ Water) completed construction of a pumping station and pipeline from the Haughton Balancing Storage to the headwaters of the Ross River Dam to provide

emergency urban water supplies to Townsville. The Townsville Water Security Taskforce recently determined that BFD would become the primary source of water to the city and are now constructing enhanced water transfer infrastructure.

In the delta area the North and South Burdekin Water Boards were established in 1965-66 in response to critically declining groundwater levels brought about by the combined effects of a major increase in the area assigned to sugarcane (and hence pumping of groundwater) and several years of drought which failed to replenish the aquifer. This led to saltwater intrusion and commencement of the largest aquifer recharge project in Australia. Lower Burdekin Water (LBW) formed through amalgamation of the two former boards in 2015. A significant proportion of the water released from BFD and Clare Weir is directed to Lower Burdekin Water to supplement groundwater supplies.

The Board of LBW is an autonomous statutory groundwater resource management authority, responsible for the economic and environmentally sustainable management of the groundwater resources in the area. LBW supplies 521 customers (web page accessed September 2019) while Sunwater supplies a further 413 customers from the dam, with one of them being LBW (Sunwater annual report 2017-2018).

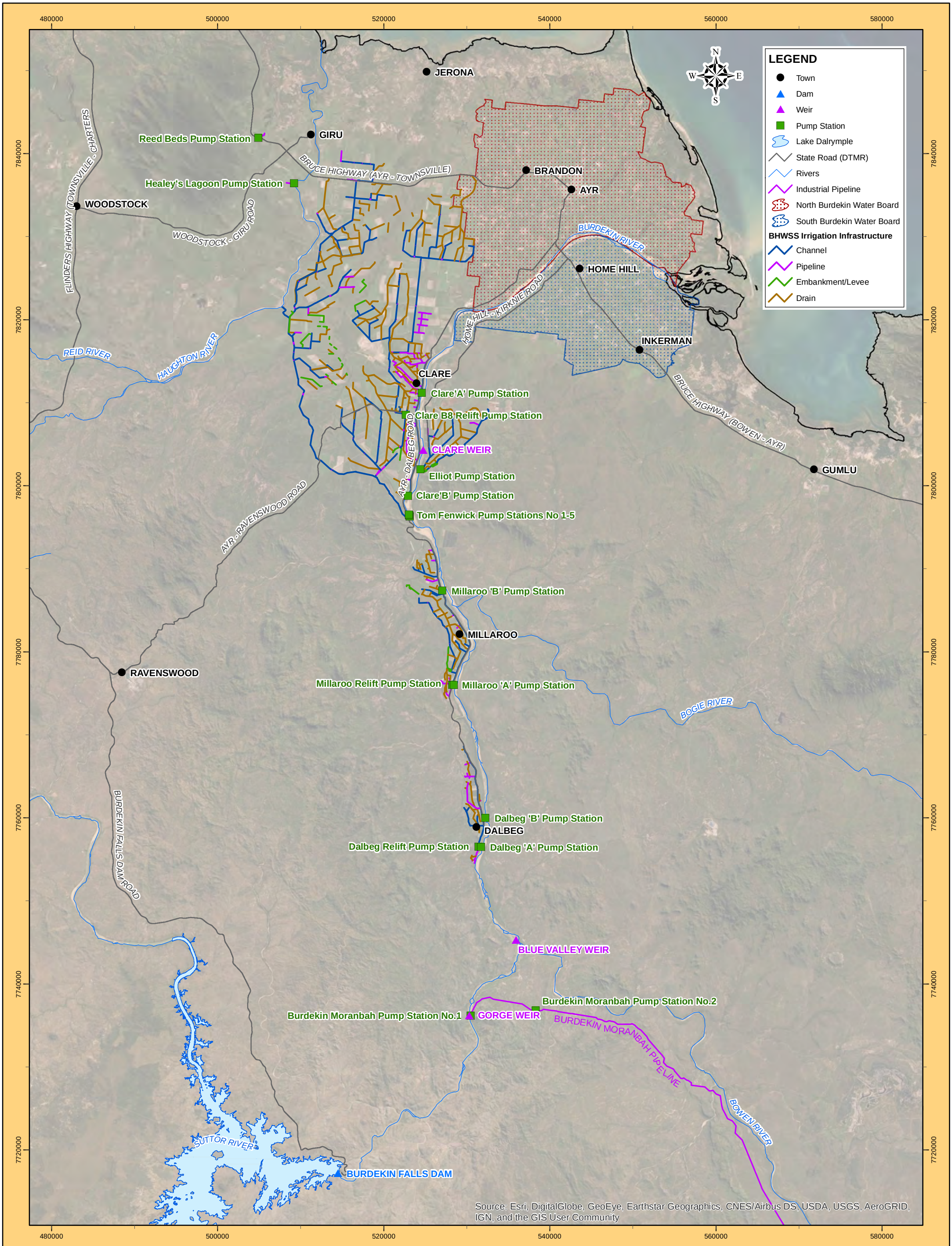
Today the Burdekin area is Queensland's largest irrigation region and producer of sugarcane with approximately 90,000 ha grown in the Lower Burdekin. The sugar industry accounts for 90 % of water demand in the catchment. The region (including the coastal districts towards Bowen) also supports other cropping such as horticulture and vegetable production, along with cattle grazing.

Figure 7: Sugarcane crop in the Burdekin

Hydrology

The Burdekin Basin is the second largest river basin (in area) draining to the Great Barrier Reef (GBR) lagoon and has the largest mean annual discharge (Clare gauge 1976-2016; 8,327,681 ML; DNRME Water Monitoring Portal June 2017). The Burdekin Basin covers an area of approximately 129,595 km2 and is made up of six major sub-catchments:

- Upper Burdekin
- Cape-Campaspe
- Belyando
- Suttor (including Sellheim River)
- Bowen-Broken-Bogie
- Lower Burdekin.



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Printed: Wednesday, 25/03/2020 08:17:11 AM

MAP INFORMATION
Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)
0 4 8 12 16 20 km 1:400,000

BURDEKIN FALLS DAM
RAISING PROJECT
ENVIRONMENTAL ASSESSMENT
INFRASTRUCTURE
LOCATION PLAN

sunwater

Most rainfall is in summer, with about 80% recorded between December and April. Average annual rainfall varies from 2,500 mm at Paluma near the coast to about 600 mm at Albro station in the Belyando–Suttor sub-catchment. Flow is strongly seasonal, with a summer wet season, but it is also highly variable and reflects local patterns. With a relatively low ratio of mean annual inflow to storage volume, BFD spills commonly during wet season flows. The dam does not have any specific flood control capacity (no gates) but does act to impede flood peaks via the constraint of the spillway and outlet valve capacity. Other than BFD, there are three weirs in the Lower Burdekin sub-catchment (Gorge, Blue Valley and Clare) below the dam with a total storage capacity of nearly 29,000 ML. Very little storage exists above the dam (Charters Towers Weir for example).

Mitchell et al, 2007 estimated that, on average, approximately 50% of the water exported from the Burdekin river mouth is derived from the Upper Burdekin catchment, which drains the western side of the Great Dividing Range within the southern wet tropics area.

The Suttor River similarly drains the western side of the Great Dividing Range west of Mackay while the Cape and Belyando systems drain large drier western and southwestern catchments. They have very low gradient and extensive floodplains, with many permanent waterholes scattered through anastomosing river channels.

The other five sub-catchments each contribute around 10% to the total discharge at the end of the Burdekin River. All but the Bowen-Broken, Bogie and Lower Burdekin enter the Burdekin River above BFD. Water from the Bowen-Broken sub-catchment enters the Lower Burdekin between Gorge Weir and Blue Valley Weir, so flow from these areas is in part available for distribution through the BHWSS. The Bogie River enters downstream of Clare Weir near Millaroo.

The Lower Burdekin, including the Burdekin Delta, is the largest floodplain system on the Australian east coast. It has diverse coastal ecosystems, including significant wetlands that provide important physical, biogeochemical and biological process functions for the GBR World Heritage Area (GBRWHA) (GRBMPA, 2013).

Groundwater

There is currently a lack of information regarding groundwater in the area surrounding BFD itself.

The Burdekin Region Water Quality Improvement Plan 2016 (WQIP) notes that groundwater quality issues in the Lower Burdekin include salinity, sodicity and elevated concentrations of nitrate and pesticides. There has been a steady increase in the salinity of the groundwater in some areas. The cause of rising salinity levels has been associated with evapotranspiration of irrigation water, displacement of unsaturated zone solutes, enhanced mixing with relict seawater and seawater intrusion (in delta and Giru areas).

The most recent review into groundwater in the Lower Burdekin (DNRM, 2017), which focused on Burdekin Groundwater Management Area (BGMA) and the Leichhardt irrigation area, found that over the last 20 years increased irrigation in the area has increased deep drainage into the underlying aquifer, resulting in a rise in groundwater levels. Groundwater levels are within 3 m of the ground surface under approximately 15% of the irrigated land within the Lower Burdekin Groundwater Strategy area. However, the situation is more acute in some areas where the groundwater table has been measured at only 0.5 m below the surface.

Groundwater Announced Allocations have remained at 100% or above in all areas of the BGMA, except for Horseshoe Lagoon, since establishment. The Horseshoe Lagoon Sub Area was assigned a zero percent Announced Allocation from the early 1990s until the 1997/1998 water year due to saltwater intrusion. Saltwater intrusion is a separate issue to groundwater rise and salinisation of lands further inland. This is the issue largely addressed by LBW who recharge the aquifers using surface water and this prevents saltwater intrusion.

The Department of Natural Resources and Mines is currently managing the Lower Burdekin Groundwater Strategy Project and it is expected that this will inform management of areas affected by groundwater rise or salinity and those areas at risk of such issues.

Water quality

Water Quality Objectives (WQOs) and Environmental Values (EVs) for the Burdekin basin freshwater sub-catchments are included within the WQIP (NQ Dry Tropics, 2016) and the draft Schedule 1 (EPP Water) guidelines (Newham, Moss, Moulton, & Thames, 2017). Locally specific WQOs and EVs are not provided for the dam itself.

As part of the aquatic ecology baseline surveys conducted by GHD and Frc Environmental, in-situ water quality sampling was undertaken. The results showed:

- electrical conductivity and turbidity were often higher than the WQO
- dissolved oxygen was sometimes lower than the WQO, with some results also showing percent saturation slightly higher than the WQO range
- pH typically compiled with the WQO,
- variable results at some sites, for example sites SUT1 and SUT2 complied with the WQO for electrical conductivity in June 2008 but were higher than the WQO in November – December 2018.

Water in the Burdekin River below BFD is permanently turbid due to the presence of the dam (ACTFR, 1999). Previously, the river used to be turbid during and after high flow events but ran clear during the lengthy periods of lower flow. When flows from the Belyando-Suttor sub-catchment, and elevated flows from the other sub-catchments, are trapped by the dam, the fine sediment they contain remains in suspension due to the combination of a low sinking rate and turbulence (wind-driven) within the dam. Water is regularly released from the dam, thus ensuring that the downstream river is permanently turbid. The dam has partially cleared (become significantly less turbid) for only brief periods since its construction.

Modification of the catchment for agricultural and urban uses as well as changes to the hydrological regime has contributed to the declining water quality and resultant loss of seagrass meadows and coral cover in the region (NQ Dry Tropics, 2016). However, since 2008, modelling has shown a steady but gradual improvement in modelled end of catchment pollutant loads (NQ Dry Tropics, 2016).

The priority water pollutants identified in the WQIP for management include total suspended solids (TSS), particulate nutrients, dissolved inorganic nitrogen (DIN) and photosystem-II inhibiting herbicides (PSII herbicides). Grazing land is the largest contributor to TSS and 65 to 70% of the regional particulate nutrient load is estimated to be derived from grazing lands, while sugarcane is the greatest contributor of DIN and PSII herbicide loads (NQ Dry Tropics, 2016). Sewage treatment plant discharges from urban areas are considered the largest contributor of nutrients.

The WQIP notes that sugarcane, dryland cropping and horticulture are the major agricultural intensive land uses in the region, with high concentrations and loads of DIN reported from sugarcane. Ninety percent of the anthropogenic DIN in streams that drain sugarcane areas is considered to come from fertiliser residue.

The major source of herbicide loads from the Burdekin Region is the Lower Burdekin sugarcane area. The main PSII herbicides used and found in receiving waters are atrazine, ametryn, hexazinone and diuron. The herbicide tebuthiuron has been detected in runoff originating from grazing lands in the Burdekin River but loads have been comparatively low when compared to the Fitzroy River.

4.1.3. Air

The air quality within the Project area and surrounds is considered to be consistent with a rural landscape and of high quality. Localised air quality impacts are from dust generated from stock movements, dust of natural origin, bushfires and controlled burns, and vehicular movements on unsealed roads.

4.1.4. Noise

Noise generating activities and land uses vary across the region. Around BFD the land use is primarily agricultural and recreational. Sources of noise associated with these land uses may include farm equipment and stock, vehicle traffic, dam maintenance work, and recreation vehicles (e.g. boats). Additional noise

sources through the region may include rural-residential and rural-industrial areas, as well as irrigation and cropping equipment. Natural noise sources are also present (e.g. wind, wildlife).

4.1.5. Ecosystems

Terrestrial

Sunwater commissioned GHD and Epic Environmental Pty Ltd (Epic) to undertake contemporary surveys to document the baseline terrestrial ecological values of the study area (Figure 9). These surveys included a dry season survey (November 2018, GHD) and post wet season survey (May-June 2019, Epic).

The study area is located mainly within the Cape River Hills subregion of the Brigalow Belt North Bioregion with the northernmost section within the Einasleigh Uplands Bioregion. A number of vegetation communities such as brigalow (Acacia harpophylla) woodland and semi-evergreen vine thickets have been historically intensively cleared throughout the bioregion, as these communities usually occur on fertile soils suitable for agriculture (McDonald 2010; DoEE 2018).

Of the 23,142 ha of additional area contained within an FSL of 160 m (that is, associated with a 6 m raising), remnant vegetation formed 20,469 ha (88.4%), non-remnant vegetation formed 2,673 ha (11.6%). In total, 19 ha of vegetation listed as Endangered under the EPBC Act and VM Act, 7,724 ha of Of Concern vegetation and 12,725 ha of Least Concern vegetation has been mapped within the 160 m inundation corridor.

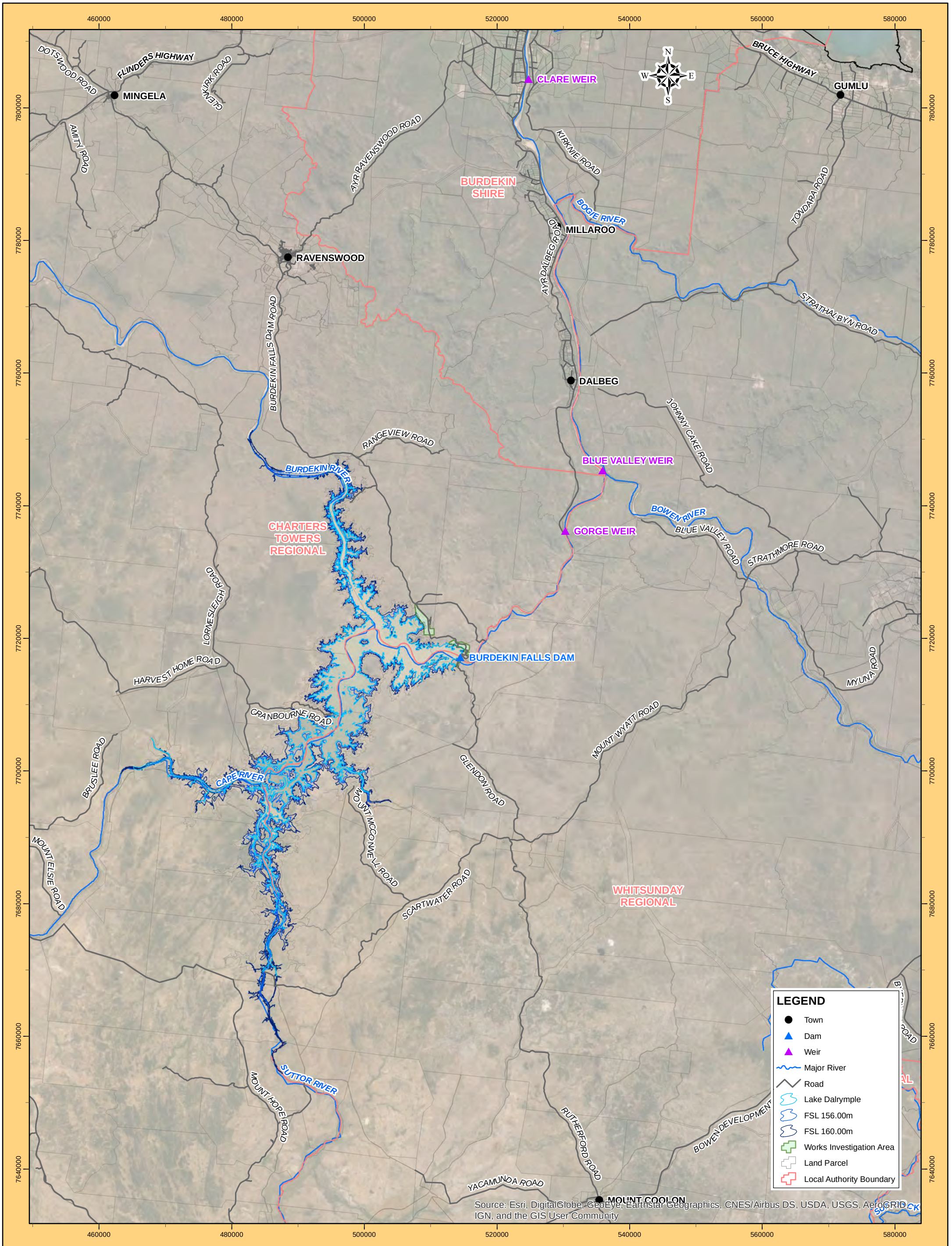
A total of 19 ha of the Brigalow Dominant and Co-dominant TEC (RE 11.3.1; Acacia harpophylla and/or Casuarina cristata open forest on alluvial plains) was mapped as being impacted within the 160 m inundation area and <1 ha was mapped within the 156 m inundation contour.

Within the areas to be directly impacted by the raising of the dam and increased inundation area, there are no National Parks, State Forests or environmental reserves of national or state environmental significance. There are no designated precincts of strategic environmental importance under the Regional Planning Interests Act 2014, nor high risk areas on a flora survey trigger map, nor legally secured offset areas. There are no areas of essential habitat mapped within the impact area. The impact area includes tracts of remnant vegetation including within Biodiversity Planning Assessment corridors, being of State and regional significance.

There are two mapped wetland protection areas within the inundation area (Figure 10). One located within the main body of the inundation area, and the other located on the Suttor River arm. The wetland protection areas are both associated with RE 11.3.27 – palustrine or lacustrine wetland (least concern).

The integrity of the vegetation communities throughout the study area has been affected by anthropogenic activities, as well as natural disturbances such as erosion. Although these disturbances generally only occurred at a localised scale, a diversity of introduced flora species was recorded during the field survey.

Development in the lower Burdekin floodplain has extensively modified the coastal ecosystems. Predevelopment floodplain forest and forest coastal ecosystems have been extensively cleared and developed for agriculture. Remnant vegetation in these areas is generally confined to riparian zones, tidally influenced estuary areas, as well as near Cape Upstart National Park. Given the extent of existing development on the coastal plain, the remaining remnant vegetation and wetlands are of high environmental value.



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MAP INFORMATION
Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)
0 5 10 15 20 25 km 1:500,000

BURDEKIN FALLS DAM
RAISING PROJECT
ENVIRONMENTAL ASSESSMENT
STUDY AREA

sunwater

DRAWING No. 252350 A

460000 480000 500000 520000

7740000 7720000 7700000 7680000 7660000

N W E S

LEGEND

- Dam
- Weir
- Road
- HES Wetlands
- Flora Survey Trigger Map
- VM Essential Habitat

Burdekin Falls Dam

- FSL 154.00m
- FSL 156.00m
- FSL 160.00m

RANGEVIEW ROAD
BURDEKIN FALLS DAM ROAD
BURDEKIN RIVER
LORNESLEIGH ROAD
HARVEST HOME ROAD
GORGE WEIR
BURDEKIN FALLS DAM
BURDEKIN DAM ROAD
CRANBOURNE ROAD
BRUSLEE ROAD
CAPE RIVER
GLENDON ROAD
MOUNT WYATT ROAD
MOUNT MCCONNELL ROAD
SCARTWATER ROAD
RUTHERFORD ROAD
MOUNT HOPE ROAD
HANGING ROCK ROAD
SUTTOR RIVER

460000 480000 500000 520000

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MAP INFORMATION
Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)
0 3 6 9 12 15 km 1:300,000

BURDEKIN FALLS DAM
RAISING PROJECT
ENVIRONMENTAL ASSESSMENT
PROTECTED AREAS
INUNDATION AREA

sunwater

DRAWING No. 252353 A

Aquatic

Sunwater commissioned Epic environmental, GHD and frc environmental to undertake contemporary surveys to document the baseline aquatic ecological values of the study area (Figure 9). These surveys included a dry season survey (November - December 2018, GHD) and post wet season survey (May 2019, frc environmental). A thorough survey of the same sample sites was also completed in 2008 (Ecowise 2009).

Aquatic habitat within the study area was dominated by Lake Dalrymple. This habitat is mapped as a Wetland of National Significance as it provides an important dry season refuge for species within a catchment prone to drought conditions.

In the upstream section of the Study Area, mapped floodplains are restricted along the river channel of the Burdekin River and to a lesser extent along the Sellheim River, but are typically broader along the Cape and Suttor Rivers (Figure 10). Immediately downstream of the dam the Burdekin River flows through a confined gorge, with narrow floodplains evident downstream of Gorge Weir and more extensive floodplains further downstream near Clare (Figure 12).

There are mapped palustrine wetlands in the upstream section of the Study Area on the Suttor River, with several of these wetlands in the future FSL extents, although there are more mapped wetlands beyond the Study Area further upstream on the Suttor and Cape Rivers (Figure 10). There are a number of mapped palustrine and lacustrine wetlands in the downstream part of the Study Area, with the palustrine wetlands predominantly located near Dalbeg.

Riverine habitats upstream of the lake support a diversity of aquatic habitat types including permanent pools, runs and riffles. The value of these riverine habitats is, however, influenced by seasonal variability with substantial lengths or river and stream completely dry during the dry season. Habitat connectivity to upstream habitats is limited during the dry season when full supply level of the lake decreases. Wet season flows facilitate longitudinal and lateral migration to floodplains and off-stream waterbodies.

The areas downstream of the dam encompass the Lower Burdekin Catchment, the Burdekin Delta and the marine environment (Figure 12). There are several areas of national and state environmental significance (Matter of National Environmental Significance; MNES, Matter of State Environmental Significance; MSES) in these areas including:

- high ecological significance wetlands (MSES)
- Ramsar Wetland (MNES)
- Great Barrier Reef World Heritage Area (MNES)
- State Marine Park
- declared fish habitat area (MSES)
- wildlife habitat – dugong (MSES).

The freshwater and estuarine wetlands of the Lower Burdekin are reported to provide food resources and an essential habitat in the lifecycle of up to 70% of local marine fishery resources (Veitch & Sawynok, 2005). Many of the wetlands in the Lower Burdekin act as permanently inundated conduits for bulk water supply and runoff from sugarcane farms (NQ Dry Tropics, 2016), which has contributed to a decline in their condition.

The Lower Burdekin area also contains a number of permanent smaller watercourses and lacustrine and palustrine wetlands. However, the catchments assessed for the Water for Bowen EIS are naturally much drier and the interval between flow events is long enough to ensure that the vast majority of aquatic habitats either completely dry out or shrink to the point where conditions substantially deteriorate and many aquatic biological communities perish (Figure 12).

Groundwater dependent ecosystems

Relatively extensive mapped surface expression groundwater-dependent ecosystems (GDEs) occur in the upstream part of the Study Area along the Cape, Suttor and Sellheim Rivers, with slight overlap of mapped GDE areas and future FSL extents. There are no mapped subterranean GDEs in the Study Area (but there are some beyond the Study Area north of the town of Charters Towers, Figure 10).

Figure 11: Burdekin Falls Dam spilling water

480000 500000 520000 540000 560000 580000 600000

7880000 7860000 7840000 7820000 7800000 7780000 7760000 7740000 7720000

N W E S

LEGEND

- Dam
- Weir
- Ramsar Sites (Qld)
- HES Wetlands
- Flora Survey Trigger Map
- VM Essential Habitat

Coastal Marine Park Zones

- Conservation Park Zone
- General Use Zone
- Habitat Protection Zone
- Marine National Park Zone
- Preservation Zone
- Scientific Research Zone

Burdekin Falls Dam

- FSL 154.00m
- FSL 156.00m
- FSL 160.00m

TOWNSVILLE
JERONA
Bowling Green Bay
GIRU
BRUCE HIGHWAY (AYR - TOWNSVILLE)
BRANDON
AYR
WOODSTOCK
WOODSTOCK - GIRU ROAD
TOWNSVILLE - CHARTERS TOWERS
BURDEKIN RIVER
HOME HILL
HOME HILL - KIRKNIE ROAD
INKERMAN
FLINDERS HIGHWAY (TOWNSVILLE - CHARTERS TOWERS)
REID RIVER
HAUGHTON RIVER
CLARE
CLARE WEIR
BRUCE HIGHWAY (BOWEN - AYR)
GUMLU
ELLIOT RIVER
GUTHALUNGRA
AYR - RAVENSWOOD ROAD
MILLAROO
RAVENSWOOD
AYR - DALBEG ROAD
BOGIE RIVER
DALBEG
BURDEKIN FALLS DAM ROAD
BLUE VALLEY WEIR
BOWEN RIVER
GORGE WEIR
BOWEN DEV ROAD (BOWEN - COLLINSVILLE)
COLLINSVILLE
SCOTTVILLE
SUTTOR RIVER
BURDEKIN FALLS DAM

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Printed: Wednesday, 25/03/2020 08:31:33 AM

MAP INFORMATION
Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)
0 5 10 15 20 25 km 1:500,000

BURDEKIN FALLS DAM
RAISING PROJECT
ENVIRONMENTAL ASSESSMENT
DOWNSTREAM PROTECTED AREAS INUNDATION AREA

sunwater

DRAWING No. 252354 A

4.1.6. Flora and fauna

Terrestrial

An ecological assessment has been prepared by Epic Environmental to document the baseline terrestrial ecological values of the study area. The assessment included a desktop review and post-wet terrestrial ecological survey and summary of previous dry season survey efforts by GHD.

In total, 64 families, 166 genera and 271 vascular plant species were identified during the post-wet flora survey, comprising two species listed as Vulnerable under the EPBC Act, one species listed as Vulnerable under the NC Act, and 44 introduced species including seven species scheduled as Restricted Class three invasive plants under the Queensland Biosecurity Act 2014.

Waxy Cabbage Palm (*Livistona lanuginosa*) and Black ironbox (*Eucalyptus raveretiana*), both vulnerable plants listed under the EPBC Act and NC Act were recorded at 32 and nine locations respectively across the Study Area. No other threatened species were assessed as Likely to Occur but two were thought Possible (Bluegrass *Dichanthium setosum* Vulnerable under EPBC Act, and *Cerbera dumicola* Near Threatened under NC Act).

The post-wet/winter fauna survey recorded 178 species of terrestrial vertebrate, comprising 35 mammal, 124 bird, 13 reptile and six frog species. This included one species listed as Vulnerable (squatter pigeon) under the EPBC Act and NC Act, two species listed as Migratory (Caspian Tern and Gull-billed Tern) under the EPBC Act and nine introduced species. Combined with previous survey by GHD, the species assemblage would likely be 211 species, comprised of 36 mammal, 148 bird, 16 reptile and 11 frog species.

One other threatened fauna species was assessed as Likely to Occur downstream of the dam wall (Salt-water Crocodile *Crocodylus porosus* V,M (NC Act/EPBC Act)), and 9 were thought Possible (Koala (V,V), Greater Glider (V,V), Red Goshawk (E, V), Australian Painted Snipe (V,E), Curlew Sandpiper (E, CE and M), Black throated finch (E,E), Yakka skink (V,V), Common death adder (V, Not listed) and Ornamental Snake (V,V)).

Aquatic

Due to its turbidity, aquatic flora within Lake Dalrymple and the Belyando-Suttor arms is of low diversity and abundance (ACTFR, 1999). In the Lower Burdekin in-stream plants are also uncommon, and aquatic weed infestation has been well documented (Davis, Pearson, Kneipp, Benson, & Fernandes, 2015).

Approximately 94 native species of wetland indicator plants (excluding trees and shrubs) were assessed as potentially or likely to be in the Study Area, however a large number of these species, especially many species of sedges (Cyperaceae), grasses (Poaceae), sun dews (Droseraceae), pipeworts (Eriocaulaceae) and Plantaginaceae are more likely to be associated with floodplain wetlands adjacent to watercourses than the watercourses themselves. Twenty-one species were recorded in the Sunwater surveys at riverine / reservoir sites.

All native species of aquatic plant potentially or likely to occur in the Study Area are common, widespread and not listed as threatened. One species of aquatic plant that is recorded from the Burdekin Basin is endemic to Queensland (i.e. *Nymphaea vaporalis*), and this species possibly occurs in the Study Area.

Nine species of aquatic weeds have the potential to occur in the Study Area, although water hyacinth and Salvinia have not been recorded. Water hyacinth, Salvinia and Hymenachne are listed Restricted Biosecurity Matters. Paragrass is not a biosecurity matter, although it is known to adversely impact the quality of aquatic habitats (DAFF 2012).

The macroinvertebrate communities are relatively diverse. All macroinvertebrate taxa recorded, and all taxa likely to occur in the Study Area, are common and widespread.

Five species of turtle may inhabit the study area but only three have been captured in field surveys. None are listed as threatened.

Forty-two native fish species are thought to occur in the catchment and 24 have been captured in recent surveys in and near the study area. Several fish species have been stocked within Lake Dalrymple to support

recreational fishing values. No fish species in the area is listed under the EPBC Act or NC Act. BFD is a waterway barrier but its net effect, given it was built atop a significant natural barrier (Burdekin Falls) has been suggested as not significant (Hydrobiology 2018). A number of other waterway barriers are also present downstream and together these are likely to have influenced the composition of aquatic communities upstream. Clare Weir has a fish lock (upgraded in 2005 from the original 1978 fishway design) for provision of fish passage.

While returned from database searches, the freshwater sawfish (*Pristis pristis*) is not expected to occur upstream of Gorge Weir and to be an uncommon occurrence below it.

Estuarine crocodile, (*Crocodylus porosus*)) may occur and was confirmed present within the study area during previous surveys (SKM 2005) and anecdotal evidence during the 2018 survey has indicated their presence within the impoundment.

Platypus (*Ornythorhinchus anatinus*), listed as Special Least Concern under the NC Act is a possible occurrence though none were observed during the field surveys.

4.2. Social and economic environment

The inundation area and dam are located with the Charters Towers Regional Council area and the Whitsunday Regional Council area; downstream areas are located within the Burdekin Shire. There are no towns located in the impact area and the wider area is sparsely populated. There are no homesteads affected by the 2 m raising but one would be affected by a 6 m raising. The nearest township is Ravenswood, and the Ravenswood State Suburb had a population of 255 at the 2016 Census. The next closest larger centres are Ayr and Home Hill to the east with populations of 8,738 and 2,954 people respectively (Census, 2016).

The Charters Towers Regional Council area covers 68,388 km2 which primarily supports large cattle stations along with interspersed mining activities. The town of Charters Towers was established following the discovery of gold and in the early 1900's and at one point was the second largest town in Queensland with over 30,000 residents. A decline in mining and the sheep industry has seen the population of Charters Towers decline, however it remains a key service centre in the region.

Townsville (210 km north east of BFD) is the largest city in northern Australia and a key centre in terms of regional infrastructure and services.

The Burdekin Shire has a distinctly agricultural orientation dominated by sugar cane farming, with key communities being Ayr and Home Hill.

In the Whitsundays Regional Council area there is a mix of tourism, mining and supporting industries and key communities include Collinsville, Proserpine and Airlie Beach.

4.2.1. Cultural heritage (Indigenous and non-indigenous)

There are no places of Aboriginal cultural heritage recorded on the Cultural Heritage Database and Register within the inundation area of the proposed 6 m raising though 40 are recorded in the greater area surrounding Lake Dalrymple. These places are primarily to the east of the existing inundation area and near the Suttor River, and comprise artefact scatters, a scarred / carved trees, isolated finds, a well, a quarry, a hearth/oven, and a stone arrangement (Converge, 2018). There is also potential for Aboriginal cultural heritage to be associated with mature and/or remnant vegetation and water sources such as creeks, rivers, billabongs, lakes and springs.

There are no listed local, Queensland or National heritage places in the vicinity of the existing dam or extent of proposed inundation area but there is potential for places such as homesteads and associated infrastructure to have historic heritage value in the vicinity. Downstream of the existing dam and in the Lower Burdekin, there are some Queensland heritage places. These are primarily associated with towns and will not be impacted by the raising of the dam.

4.3. Built environment

Due to the remote location of the dam, there is very little infrastructure in the study area. Mapping indicates there are no major roads, railways, towns, or other public infrastructure that will be impacted by the raising of the dam. There is no reticulated water supply or sewerage in the area with the exception of the recreational area at the main dam. The inundation area associated with the 6 m raising would impact several kilometres of local sealed and unsealed road and SWER power lines as well as farm infrastructure such as fences and watering points.

Table 5: Infrastructure impacts

Description	2 m raise	6 m raise
Sealed road	50m Boat Ramp Rd (Sunwater)	130m Boat Ramp Rd (Sunwater)
Formed unsealed road	Nil	560m Scartwater Road 740m Lornesleigh Road 20m Cranbourne Road 150m Mt Ravenswood Road
Powerline	210m near Boat Ramp Rd	320m near Boat Ramp Road 120m near Scartwater Road

Recreation and camping facilities are present at the dam.

Two full time Sunwater dam operators live at the dam and there are an additional two Sunwater houses available to staff whilst at the dam. There is also a disused airstrip located near the dam.

4.3.1. Land use and tenure

Most land adjacent to BFD and Lake Dalrymple is freehold land owned by Sunwater (Lot 13 MRY51), land outside of the freehold land currently owned by Sunwater is Lands Lease tenure. The predominant land use in the area surrounding Lake Dalrymple is cattle breeding and fattening on large low intensity grazing properties.

4.4. Native title

Native title has been extinguished on Sunwater Lot 13 MRY51 however Native title determination QCD2012/009 for the Jangga People covers the surrounding area up the Suttor arm including the Sellheim River and Cape River and also the western side of the Burdekin arm.

Native title is also found to exist for the Birriah People on the eastern side of the Burdekin arm (QCD2016/001 and QCD2016/011).

Figure 13 shows the native title determinations for the area.

460000 480000 500000 520000

7740000 7720000 7700000 7680000 7660000

LEGEND

- Dam
- Weir
- Road

Burdekin Falls Dam

- FSL 154.00m
- FSL 156.00m
- FSL 160.00m
- Registered Native Title Determination Applications

Determination Type

- Conditional - Full
- In effect - Finalised
- In effect - Not Finalised

N W E S

BURDEKIN FALLS DAM

Part B
QCD2016/011

Birriah People
QCD2016/001

Jangga People #2
QC2018/002

Jangga People
QCD2012/009

RANGEVIEW ROAD
BURDEKIN FALLS DAM ROAD
BURDEKIN RIVER
LORNESLEIGH ROAD
HARVEST HOME ROAD
CRANBOURNE ROAD
BRUSLEE ROAD
CAPE RIVER
GLENDON ROAD
MOUNT WYATT ROAD
MOUNT MCCONNELL ROAD
SCARTWATER ROAD
RUTHERFORD ROAD
MOUNT HOPE ROAD
HANGING ROCK ROAD
SUTTOR RIVER

460000 480000 500000 520000

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MAP INFORMATION

Projected Coordinate System: Mapping Grid of Australia (MGA94), Zone 55.

SCALES (A3 SIZE)

0 3 6 9 12 15 km 1:300,000

BURDEKIN FALLS DAM
RAISING PROJECT
ENVIRONMENTAL ASSESSMENT
NATIVE TITLE

sunwater

DRAWING No. 252356 A

4.5. Planning instruments and government policies

This section describes the relevant legislation and government policies for the Project. Section 7 identifies the potential approvals required for the proposed Project.

4.5.1. Relevant legislation – Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

Amongst other things, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage matters of national environmental significance (MNES). The nine MNES categories protected under the EPBC Act are:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the GBRMP
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act enables bilateral management of relevant matters between the Australian and State Governments. The EPBC Act focuses Australian Government interests on the protection of MNES, with the states and territories having responsibility for MSES and MLES (Matters of Local Environmental Significance).

A referral to the Commonwealth Department of Environment and Energy will be made in relation to the Project. It is assumed the Project will be declared a controlled action and a bilateral assessment will be undertaken with the Queensland EIS process.

Native Title Act 1993

The *Native Title Act 1993* (NT Act) provides recognition for the rights and interests over land and water possessed by Australian indigenous people under traditional laws and customs. The NT Act sets out specified processes that must be followed for any 'future act' on land or waters that would affect native title rights and interests.

A registered claim gives a native title party certain procedural rights, such as the 'right to negotiate' with applicants regarding future acts for areas covered by the claim. The NT Act also allows applicants and registered and determined native title parties to make Indigenous land use agreements (ILUAs) about how land and waters in the agreement area will be used and managed in the future.

4.5.2. Relevant legislation – Queensland

State Development and Public Works Organisation Act 1971

The purpose of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) is to facilitate the timely, coordinated and environmentally responsible infrastructure planning and development to support Queensland's economic and social progress. The SDPWO Act gives the Coordinator-General significant powers to, among other things:

- manage major infrastructure projects
- declare a project to be a 'coordinated project' and coordinate an environmental impact statement (EIS) of a project
- coordinate and regulate a program of works

- enter and authorise entry onto land to undertake works
- compulsorily acquire land
- implement and manage state development areas.

A proponent may apply for a 'coordinated project' declaration, or, a declaration can be made by the Coordinator-General independently. If an application is made, the Coordinator-General needs to be satisfied that the project has at least one of the following features:

- complex approval requirements
- strategic significance to an area, including for the infrastructure, economic and social benefits, capital investment or employment opportunities it may provide
- significant environmental effects, or
- significant infrastructure requirements.

Planning Act 2016

The purpose of the *Planning Act 2016* is to establish an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, development assessment and related matters that facilitate the achievement of ecological sustainability.

The *Planning Act 2016* mandates the framework and process for development assessment and the basic requirements for an application. Under the Planning Act, development may be categorised as accepted development, assessable development (code and impact) and prohibited development. Development approval may be required for matters identified in the relevant planning scheme as well as matters of state significance.

Environmental Protection Act 1994

The purpose of the *Environmental Protection Act 1994* (EP Act) is to protect Queensland's environment while allowing for development that improves the total quality of life, now and in the future, in a way that maintains the ecological processes on which life depends.

The EP Act establishes a number of mechanisms to achieve its objectives; including, creating a 'general environmental duty', regulating contaminated land, licencing of Environmentally Relevant Activities (ERAs) and issuing the Environmental Protection Policies (EPPs) and Regulations under the Act. EPPs include:

- Environmental Protection (Air) Policy 2019
- Environmental Protection (Water and Wetland Biodiversity) Policy 2019
- Environmental Protection (Noise) Policy 2019.

The EP Act also regulates some activities in Great Barrier Reef catchments via Chapter 4A. The purpose of this chapter is to:

- reduce the impact of agricultural activities on the quality of water entering the reef; and
- contribute to achieving the targets about water quality improvement for the reef under agreements between the State and the Commonwealth from time to time.

The latter refers to the current Reef Water Quality Protection Plan. The chapter identifies agricultural ERA's and refers to fertiliser application requirements and Environmental Risk Management Plans. As a result, a change in farming practices will be required, less use of nutrients on-farm and minimising sediment runoff. Management actions will include improved irrigation efficiency. Sunwater will investigate the following potential solutions:

- assistance to farmers to develop and implement the various management and efficiency plans and the regulatory impact statement suggest farm profitability will improve after the initial capital outlay
- more efficient irrigation which will assist in achieving the Reef 2050 targets.

Nature Conservation Act 1992

The purpose of the *Nature Conservation Act 1992* (NC Act) is the conservation of nature while allowing for the involvement of indigenous people in the management of protected areas in which they have an interest under Aboriginal tradition or Island custom.

It is an offence to 'take' protected wildlife without a license, permit or other authority (s 320). It is also an offence for a person, without a reasonable excuse, to tamper with an animal breeding place that is being used by a protected animal to incubate or rear the animal's offspring (s 332, Nature Conservation (Wildlife Management) Regulation 2006).

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) establishes the framework for the management of vegetation in Queensland except for state forests, national parks, forest reserves and certain other tenures defined under the *Forestry Act 1959 and the Nature Conservation Act 1992*. The relevant provisions of the VM Act are implemented in conjunction with the Planning Act.

Generally, clearing of vegetation to which the VM Act applies is 'assessable development' under the Planning Act and will require a development approval in accordance with that Act, unless an exemption under the Planning Regulation applies.

Environmental Offsets Act 2014

The *Environmental Offsets Act 2014* (EO Act) provides for environmental offsets to counterbalance significant residual impacts of particular activities on particular matters of national, State or local environmental significance and to establish a framework in relation to environmental offsets.

Water Act 2000

The purpose of the *Water Act 2000* is to provide for the sustainable management of water and other resources and the establishment and operation of water authorities, and for other purposes. The Water Act regulates the taking of and interference with water, excavation or placing of fill in a watercourse, for waters recognised as waterways under the Water Act.

BFD is located in the Burdekin Water Plan Area. The Water Plan (Burdekin Basin) 2007 was amended by the Water Amendment Plan (Burdekin Basin) 2019 in August 2019. The purpose of the amendments are to provide a framework for the allocation and sustainable management of surface water and overland flow water in particular parts of the plan area. The amendments also allow an additional 50 000 ML to be traded from the Burdekin Falls Dam ponded area to meet emerging water demands.

Amendment to the Water Plan to facilitate a large raising than that currently allowed for will require assessment of the impacts on the Environmental Flow Objectives and the environment from the increased take of water. Sunwater's current modelling suggest that even under the existing Water Plan, once the necessary studies and assessment are undertaken Sunwater will seek to amend the Water Plan.

Water Supply (Safety and Reliability) Act 2008

The *Water Supply (Safety and Reliability) Act 2008* (WSSR Act) is an act to provide for the safety and reliability of water supply. Relevantly, the WSSR Act includes provisions for the registration of service providers who supply water, reporting requirements for service providers, management of dam safety including failure impact assessment, emergency action planning, flood mitigation and other general matters related to referrable dam management.

Fisheries Act 1994

Amongst other things, the *Fisheries Act 1994* establishes a risk hierarchy for waterway barrier works across Queensland and guides the design and assessment process for the implementation of new waterway crossings. Culverts, bridges and other temporary or permanent waterway barrier works that cannot comply

with existing self-assessable codes will result in waterway barrier works designs requiring approval from the Department of Agriculture and Fisheries (DAF).

The relevant provisions of the Fisheries Act are implemented in conjunction with the Planning Act.

Land Act 1994

The purpose of the *Land Act 1994* is to administer and manage non-freehold land and deeds of grant in trust and the creation of freehold land, and for related purposes. Land to which the Act applies must be managed for the benefit of the people of Queensland. The majority of the land impacted by the inundation area is freehold land and so not impacted by this Act. The areas of Lands Lease in the upper reaches of the Burdekin and Suttor Rivers will require further investigation to determine if acquisition or taking of a lease for the flood margin will be required.

Forestry Act 1959

The purpose of the *Forestry Act 1959* is to provide for forest reservations, the management, silvicultural treatment and protection of State forests, and the sale and disposal of forest products and quarry material, the property of the Crown on State forests, timber reserves and on other lands and other purposes.

The DAF sells quarry material from land where such material has been reserved to the State. It also includes certain roads, leasehold land and freehold land but excludes lakes and watercourses below the high-water mark in coastal areas, where not subject to a lease under the *Land Act 1994*.

Marine Parks Act 2004

The purpose of the *Marine Parks Act 2004* (MP Act) is to provide for the protection of the marine environment. The MP Act allows for the declaration of state marine parks (for example, the Great Barrier Reef Coast Marine Park (GBR Coast MP) and the establishment of zones, designated areas and highly protected areas within marine parks. The GBR Coast MP provides protection for Queensland tidal lands and tidal waters.

Aboriginal Cultural Heritage Act 2003

The *Aboriginal Cultural Heritage Act 2003* (ACH Act) provides for the effective recognition, protection and conservation of Aboriginal cultural heritage in Queensland. Section 23 of the ACH Act sets out a cultural heritage duty of care. The duty of care requires land users to take all reasonable and practicable measures to ensure their activity does not harm Aboriginal cultural heritage. This duty of care applies to any activity where Aboriginal cultural heritage is located. This includes cultural heritage located on freehold land and regardless of whether it has been identified or recorded in a database.

Queensland Heritage Act 1992

The *Queensland Heritage Act 1992* (QH Act) provides for the conservation of Queensland's non-indigenous heritage. The QH Act provides for the establishment and maintenance of the Queensland Heritage Register and aims to regulate development of registered places. The QH Act also requires local government to prepare and maintain a local heritage register.

Native Title (Queensland) Act 1993

The *Native Title (Queensland) Act 1993* was enacted to provide clarification around past acts and rights, and to establish consistency for future native title dealings under Queensland law in accordance with the Commonwealth NT Act.

4.5.3. Relevant policies

State Planning Policy

The State Planning Policy (SPP) commenced on 03 July 2017 and contains 17 state interests that are important to protect and enhance through Queensland's continued development. The SPP provides a consolidated and comprehensive view of the state's interests in land use planning and development. It sets out the matters that must be addressed in local government planning schemes and regional plans.

The SPP applies as a 'matter to have regard to' under the Planning Regulation 2017 only if the relevant state interests in the SPP are identified as having not been appropriately integrated in a local planning instrument, and only to the extent of any inconsistency. This applies to both code and impact assessment. Where the State government is an assessment manager or referral agency then Part C: Purpose and guiding principles and Part D: The state interest statements of the SPP apply to the assessment of the application.

To the extent that the water quality assessment benchmarks in the SPP have not been appropriately identified in a local planning instrument then the performance outcomes in the SPP will apply to certain development applications listed in Part E of the SPP.

State Development Assessment Provisions

State Development Assessment Provisions (SDAP) provide assessment benchmarks for the assessment of development applications where the chief executive is the assessment manager or a referral agency. The SDAP is structured in a performance-based code format, whereby applicants can address performance criteria to demonstrate that a development appropriately manages any impacts on a matter of state interest, and/or protects a development from impacts of matters of state interest. In making a development application to State Assessment and Referral Agency (SARA), applicants should respond to each of the relevant provisions of the applicable state codes in the SDAP.

The SDAP includes State codes that are locational and use-based. The relevant State codes for the project are likely to include:

- State code 9: GBR wetland protection areas
- State code 10: Taking or interfering with water
- State code 15: Removal of quarry material from a watercourse or lake
- State code 16: Native vegetation clearing
- State code 18: Constructing or raising waterway barrier works in fish habitats
- State code 20: Referable dams
- State code 22: Environmentally relevant activities.

The SDAP outlines a purpose statement for each state code, as well as performance outcomes and acceptable outcomes.

4.5.4. The Reef 2050 Plan

The joint Australian and Queensland Reef 2050 Long-term Sustainability Plan (Reef Plan) provides an overarching strategy for managing the GBR. It addresses the findings of the GBR Marine Park Authority's (GBRMPA) Outlook Report 2014 and builds on the comprehensive strategic environmental assessment of the World Heritage Area and adjacent coastal zone completed in 2014. A Reef-wide Integrated Monitoring and Reporting Program is being implemented to monitor the success of the Plan and inform adaptive management.

Reef Plan sets out an Outcomes Framework with seven overarching themes, being: ecosystem health, biodiversity, heritage, water quality, community benefits, economic benefits and governance. These themes reflect the priority areas for action identified by governments and other stakeholders.

The Reef Plan considers the risks from current and future threats to the GBRs ecological and heritage values. The following four themes represent the highest risks to the Reef identified by the Outlook Report 2014; climate change, land-based run-off, coastal land use change and direct use.

Cumulative Impact Management Policy

The Australian Government released the Cumulative Impact Management Policy (CIM) in July 2018 to provide a systematic and consistent approach to managing and reducing cumulative impacts on the Great Barrier

Reef. The objective of the CIM is to reduce pressures on Great Barrier Reef values from multiple sources through rigorous decision-making that:

- identifies past, present and reasonably foreseeable pressures
- examines their combined effects on Great Barrier Reef values, and
- designs and applies appropriate management measures to avoid and mitigate impacts.

5. Potential project impacts

5.1. Natural environment

5.1.1. Land

Construction related impacts on environmental values of land (soils and geology) are not expected to be a material issue. Earthworks related to the Project will require an erosion and sediment control plan (ESCP) which will be a sub-plan of the Construction Environmental Management Plan (CEMP). The ESCP will be consistent with current practice for construction projects and align with International Erosion Control Association (IECA) guidance.

The raised FSL of the storage will make land below FSL unavailable for farming or other uses and the increased flood inundation of land above FSL will lead to altered uses and limitations on use.

5.1.2. Hydrology

There will be no change to flows upstream of the dam as a result of the raising but the flood storage required of the dam will increase. The area of land required to accommodate temporary flood storage (current FSL) at the dam was taken into account when the dam was constructed and that land is now owned by Sunwater, this margin includes that associated with a 2 m – 6 m raising of the dam wall.

The dam significantly changes current downstream flows. Its current storage volume (1,860,000 ML) allows it to take small to moderate floods into storage (with varying effect depending on the antecedent air space in the storage at the time) and then to release regulated flows for supply to downstream users.

Depending on the location of the demand, the potential medium priority yield from a 6 m dam raising would range from 575,000 ML/annum if taken at the dam to 400,000 ML/annum to if taken from Clare Weir (Hart & Broit, 2018). The equivalent yield of a 2 m raising would be 150,000 ML and 110,000 ML.

Current Water Act related planning instruments do not take into account the possible future raising of BFD beyond 2 m. Yield analysis indicated that while the current water allocation security objectives can be met if the storage was raised by 6 m, the medium and high flow EFOs cannot (Hart & Broit, 2018). However, the results were generally <5% from the current EFOs, and failure could possibly be mitigated by spillway design, modified release rules, and / or other operational considerations (Droop, 2018). This will require further investigation in later project stages.

Impacts on existing un-supplemented water users downstream will need to be considered. Secondary or consequential flow regime impacts may arise from increased irrigation, mining or industrial water use. These are discussed in Section 6.5.

5.1.3. Groundwater

At the full extent of inundation, the FSL of the 6 m raised dam would not impinge on the Plan area included within the *Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017*. The Burdekin Groundwater Management Area as described in the *Water Regulation 2016* covers the coastal areas primarily within the BRIA so also does not include the dam area.

5.1.4. Water quality

The primary direct impacts of the dam raising on water quality relate to the inundation of what is currently grazing land, and changes related to the sediment trapping efficiency of the storage. Depending on the level of raising, the area of newly inundated land (at FSL) could vary between approximately 6,000 and 20,000 ha. The area of grazing land in the Burdekin region is approximately 12,600,000 ha, most of which is upstream of the dam, so that grazing land which is lost to the additional inundation area would result in a negligible reduction of impacts associated with grazing.

Alluvium Consulting investigated the change in sediment trapping efficiency of the 2 m raised dam during the Preliminary Business Case. Suspended solids is a key water quality characteristic targeted for significant

reduction by the Burdekin WQIP and Reef 2050. In summary, the enlarged dam will have greater capacity to capture sediment. Modelling predicts a 14% increase in trapping efficiency over the period of the model or an approximate reduction of 132,000 tonne/year in sediment passing the dam.

The newly inundated area will be shallow (maximum equal to the level of raising) and the water level will fluctuate with seasonal flows and dam operations so it will alternately be in various states of wet or dry. Cattle will be able to access the area as they currently access the shallow areas of the existing storage. In areas of the storage largely within watercourses and with riparian cover this will not greatly affect water quality but in areas that are currently more open the water quality in these large expanses of shallow edges will vary substantially and often be poor due to disturbed sediment (by wind and animals), animal waste, potential algal production and short-term growth of invasive plants which will die off when next inundated. As a proportion of the total volume of water within the dam the water affected in this way is relatively minor but the local influences may be significant and constitute an incremental increase on existing such impacts.

Other than as noted above, the water quality characteristics of the dam are unlikely to alter significantly assuming the upstream catchment remains in relatively the same state. ACTFR (1999) noted that one obvious impact of the existing dam is that the water in the Burdekin River below the dam is now permanently turbid. Previously, the river used to be turbid during and after high flow events but ran clear during the lengthy periods of lower flow.

5.1.5. Ecosystems

Terrestrial

Within the areas to be directly impacted there are no conservation areas such as National Parks, State Forests or environmental reserves of national or state environmental significance. There are no designated precincts of strategic environmental importance under the Regional Planning Interests Act 2014, nor high risk areas on flora survey trigger maps, nor legally secured offset areas. There are no areas of essential habitat mapped within the impact area.

The direct impacts to national and state significant sensitive environmental areas from the dam raising are expected to arise predominately from flooding of vegetation and the associated land clearing. Wetland areas are located on the edge of the increased inundation area and are likely to experience more frequent inflows and longer periods of inundation.

Protected Regional Ecosystems (RE) would be impacted by the project including one endangered RE (Brigalow; 19 ha at a 6 m raising), 5 Of Concern RE's (7,724 ha at a 6 m raising) and 26 Least Concern RE's (12,725 ha at a 6 m raising).

Threatened species confirmed by field survey were:

- Squatter Pigeon (southern subspecies) Geophaps scripta scripta (Vulnerable)
- Waxy Cabbage Palm Livistona lanuginose (Vulnerable)
- Black Ironbox Eucalyptus raveretiana (Vulnerable)

Several other threatened species are considered likely or possible to occur in the impact area.

Raising of BFD is unlikely to result in impacts to terrestrial environments downstream as while floods will be reduced to an extent, the existing components of the water supply scheme and their operation will remain essentially as is.

Aquatic

The increased inundation area will be relatively shallow and will often experience poor water quality as noted above. Despite this, the raising is not expected to significantly impact on existing aquatic environmental values, however, the change from a riverine to a lacustrine environment may alter the relative composition of aquatic communities, including fish. The dam is expected to continue to be popular with campers, recreational anglers and those enjoying other water sports.

The enlarged dam will have greater capacity to capture sediment but this is not expected to materially affect downstream freshwater environments but it may assist to achieve targets for TSS under Reef Plan.

While Sunwater does not anticipate any change to fish passage as a result of the dam raising, this will be further investigated during the EIS Phase. Environmental Offsets

If the project is approved but significant residual impacts remain on matters of national, State or local environmental significance, offsets will be provided in accordance with current regulations and policy.

5.2. Social and economic environment

The primary social impacts relate to employment and expenditure during construction and again during operation. The construction phase carries both positive effects (personal income and support for local and regional businesses) and negative effects (land acquisition and severance, workers being separated from family, higher risk of traffic accidents from increased construction traffic), while the operations phase supports expansion of agri-business and potentially satisfies demands of other users. Employment and expenditure will accrue at the location of water use (Townsville, Bowen, mines, Burdekin agriculture).

Potential beneficial and adverse socio-economic effects were identified during the PBC. Project related effects include:

- positive effects are generally associated with the capital expenditure and include:
  - enhanced access to goods and services due to injection of wealth into local economies.
  - enhanced access to goods and services due to creation of direct and indirect employment opportunities in local economies.
  - improved ability to access health services and recreational activities.
- negative effects are generally associated with construction are primarily localised to the Dam wall construction site which is in an isolated location with no directly affected permanent residents. Landowners surrounding the existing footprint of the Lake will experience an impact due to a greater area of inundation/ flood buffer; however, considering the nature of land use (i.e. low intensity grazing) and the scale of the properties and the area already owned by Sunwater; the significance of such impacts is considered to be low but will need to be assessed on an individual basis. Other negative effects may include:
  - reduced tourism activity during construction due to recreation facility closure.
  - possible disturbance or destruction of Indigenous cultural heritage due to project works.

5.2.1. Air, Noise and Vibration

A preliminary noise assessment was undertaken for an earlier proposed hydropower project at the dam site. This assessment identified the following sensitive noise receptors in the vicinity of BFD wall:

- recreation area
- sunwater office
- caravan park, and
- Sunwater residential dwellings (ViPac, 2011).

During construction, these areas will be closed or become part of the construction site. Noise and vibration associated with the operation of heavy equipment and blasting (if required) may affect these areas.

Air emissions associated with construction activities could influence air quality, including particulates (dust) but the site is in a remote location.

Air pollution, noise and vibration during operation of the dam are not anticipated to increase.

5.2.2. Greenhouse gas emissions

Besides construction related emissions and emissions related to transport and packaging, dam reservoirs emit greenhouse gases (methane, carbon dioxide, and nitrous oxide) produced by the rotting of flooded terrestrial organic matter (e.g. vegetation) and organic matter that flows into, and is produced in (e.g. plants, plankton, algae), the reservoir (Deemer, et al., 2016). Sediment trapped in reservoirs may act as a carbon sink.

5.2.3. Landscape and visual amenity

The current visual amenity of the area comprises Lake Dalrymple, open bushland and grazing land. During construction visual amenity may be impaired at recreational facilities if they remain operational; however, as it is proposed to raise an existing dam, visual amenity is considered unlikely to change in the operational phase.

5.2.4. Cultural heritage

Aboriginal cultural heritage has the potential to be disturbed by the raising of BFD. The Project has been assessed as being a Category 5 risk under the Cultural Heritage Duty of Care Guidelines. Cultural heritage assessment will be undertaken in agreement with the relevant Traditional Owners.

There are no places listed on the Queensland Heritage Register in or adjacent to the proposed inundation area. However, four historic places may be affected including:

- Lornesleigh Head Station
- Home Harvest Head Station
- St Pauls Head Station, and
- remnants of the former soldier settlement at Scartwater (Converge, 2018).

A non-indigenous heritage survey will be conducted and further assessed in the EIS Phase.

5.3. Built environment

Private property impacts, including impacts to property access as a result of permanent or flood related inundation and impacts to farm buildings, fences, amongst other things, have the potential to occur and will be investigated further.

Temporary infrastructure will be required to support the construction of the raised dam. This may include accommodation units, offices, storage and waste disposal facilities, quarries, batching plants, vehicle service and wash-down facilities and fuel storage. Some of this infrastructure may be retained after construction to support ongoing operational and monitoring requirements of the storage. Location of the temporary construction footprint is to be further determined during progression of the business case and further decisions being made on the Project within the EIS phase.

5.3.1. Property

Floods will be retarded to a greater extent by the raised dam leading to a need to increase the temporary flood storage. The 1 in 100 AEP flood for the 6 m raising reaches 167.1 m AHD, and approximately 10,166 ha of the additional 28,524 ha required to accommodate the increased storage area is not currently owned or leased by Sunwater. The potentially impacted lots (above the current flood margin) are listed below in Table 6.

Table 6: Impacted properties

Lot and Plan	Tenure Type	Land use	Location
13 MRY51	Freehold	Reservoir, Dams, Bores	Inundation area
10 MRY33	Water Resource	Cattle breeding and fattening	Saddle dam
14 MRY52	Freehold	Water supply	Dam wall
1 SP139576	Lands Lease	Reservoir, Dams, Bores	Immediately downstream of dam wall
3 SP268346	Lands lease	Cattle breeding and fattening	Burdekin River arm
10 SM79	Freehold	Cattle breeding and fattening	Suttor River arm
22 SP218335	Lands lease	Cattle breeding and fattening	Suttor River arm
7 MRY39	Freehold	Cattle breeding and fattening	Suttor River arm
6 MRY44	Lands lease	Cattle breeding and fattening	Burdekin River arm
6 SM86	Lands lease	Cattle breeding and fattening	Sellheim River arm
3 CP851492	Lands lease	Cattle breeding and fattening	Sellheim River arm
4 SM801624	State land	Vacant rural land	Suttor River arm
3 SM93	Lands lease	Unknown	Suttor River arm
9 MRY50	Lands lease	Cattle breeding and fattening	Cape River arm
2 MRY48	Lands lease	Cattle grazing and breeding/cattle breeding and fattening	Cape River arm
ARP895517	Easement	Unknown	Sandy Creek trib. to Cape River arm

5.4. MNES under the EPBC Act

An EPBC Act Protected Matters search was been undertaken for the Project (0) prior to targeting field surveys. The field surveys confirmed the presence of the following:

- listed threatened species and ecological communities:
  - Brigalow, *Acacia harpophylla* (Dominant and Co-dominant) – Threatened Ecological Communities.
  - Squatter Pigeon (southern subspecies), *Geophaps scripta scripta* - Vulnerable
  - Waxy Cabbage Palm, *Livistona lanuginose* - Vulnerable
  - Black Ironbox, *Eucalyptus raveretiana* - Vulnerable.
- migratory species protected under international agreements:

- Caspian Tern, *Hydroprogne caspia*
- Gull-billed Tern, *Gelochelidon nilotica*.

Several other threatened species were considered likely or possible occurrences. Further targeted survey may be undertaken to better estimate impacts.

Impact to coastal and marine MNES during the construction phase is not considered likely, assuming standard EMP elements are implemented to minimise water quality related impacts.

The significance of impacts to MNES will be determined against the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DEE 2013).

The assessment of operational impacts to MNES would likely focus on changes to the downstream flow regime and water quality. Hydrologic modelling will be required to determine the extent of change and if any mitigation is required. Further impacts to terrestrial MNES are not anticipated during operations.

Indirect or facilitated impacts may arise from use of the water, including via increased areas of irrigated land. These aspects will be further assessed during detailed design and the EIS process.

Given the potential for Project impacts discussed above, an EPBC Act referral will be required to address legislative requirements in relation to MNES. Sunwater will submit an EPBC referral for the project shortly after submission of the coordinated project application. Sunwater expects that the Project could be declared a 'controlled action' and, if that is the case, will request that the project is assessed under the Queensland bilateral agreement.

5.5. Cumulative and indirect impacts

Sunwater is responsible for the storage and distribution of bulk raw water and usually has no obligation or means to manage use of the water once it is delivered to clients. It is the responsibility of the clients to gain the necessary permits and approvals for their projects, including any related to water use.

BFD is part of the existing Sunwater owned and operated BHWSS which primarily supports irrigated agriculture. The dam also supplies water to Townsville for urban and industrial use and to Bowen Basin coal mining areas. All of these supplies could be augmented as a result of the raising and new developments could be supported if proponents of those developments sought water from the dam. While demand estimates have been made, there is no guarantee which demands will eventuate or in what order.

At present Sunwater does not plan to develop any new water supply schemes in its own right to utilise the increased yield from the dam but other proponents may put forward such schemes. Similarly, while upgrades to other components of the BHWSS are planned, they are independent from the raising project and any necessary approvals will be sought separately.

Other proponents have suggested major water supply developments for the Burdekin Basin, including Hells Gates Dam with its irrigation / pumped hydro scheme upstream of BFD on the Burdekin River; and Urannah Dam with its associated water distribution pipelines on the Broken River, a sub-catchment downstream of BFD. To be clear, Sunwater is not the proponent of either of these projects. These projects are in the early stages of development and any decision to proceed will be made by Government sometime in the future and very likely after a decision is made on raising BFD.

6. Environmental management and mitigation measures

Environmental issues will initially be addressed through stakeholder engagement and project design.

As noted in Section 2, Sunwater maintains an Environmental Management System that meets the requirements of AS/NZS ISO 14001.

Environmental management measures to avoid and reduce impacts will be implemented for all phases of the project from planning to construction to operation. Environmental management plans (EMP's) will be developed as part of the Project's assessment and approvals phase.

As part of the construction phase of the Project a Construction Environmental Management Plan (CEMP) will be developed and will form an important management tool for the Project's impacts and mitigation measures. The CEMP will incorporate environmental and social mitigation measures from the impact assessment as a framework for the ongoing management, monitoring, reporting and improvement during construction. Its primary purpose will be to identify the environmental values potentially affected by the Project and detail measures to manage the risk of potential adverse impacts to these environmental values. For each component, the CEMP will outline the following:

- environmental values
- potential impacts
- environmental protection objectives
- management controls, and
- monitoring programs.

The CEMP will incorporate means to address any relevant conditions attached to approvals for the project.

The operations phase will be governed primarily through obligations on Sunwater as the owner of the infrastructure and Resource Operations Licence holder under the Water Act and Water Supply (Safety and Reliability) Act, as they are now.

6.1. Natural environment

6.1.1. Land

Earthworks related to the Project will require an Erosion and Sediment Control Plan (ESCP) which will be a sub-plan of the CEMP. The ESCP will be consistent with current best practice for construction projects and align with IECA Best Practice Erosion and Sediment Control documents.

Impacts on environmental values of land (soils and geology) are not expected to be a material issue during construction.

6.1.2. Water

Hydrology

The dam is expected to remain operational during construction and will meet supply and EFO requirements. Management during the operations phase will comply with the Water Plan and associated documents.

Groundwater

Groundwater issues are not envisaged at the dam or inundation area, however further analysis will be required. Any further use of surface water in the Lower Burdekin will be partly informed by the outcomes of the Lower Burdekin Groundwater Strategy currently being managed by DNRM.

Water quality

During construction the ESCP will aim to prevent release of contaminants (primarily sediment) into the Burdekin River. Other relevant management measures will relate to rapid rehabilitation of disturbed areas,

correct storage and handling of chemicals, fuels, oils etc. and spill response procedures. Monitoring of water quality in the works area and downstream will be required and responses made as necessary to ensure water quality objectives are achieved.

The effects on water quality of the raised BFD and the subsequent increase in the impounded area of water will require assessment during the EIS.

6.1.3. Ecosystems, flora and fauna

Terrestrial

A clearing plan will be established to manage any vegetation clearing undertaken and will include requirements for fauna relocation.

Sunwater currently holds a Damage Mitigation Permit which allows relocation of wildlife from dangerous situations. It is also likely that professional fauna "spotter-catchers" will be employed during any vegetation clearing associated with construction.

Aquatic

The EMP will address any actions possible to mitigate impacts and enhance positive outcomes within the storage and downstream. This sometimes includes not clearing vegetation near the new FSL to provide habitat for aquatic fauna and to provide stability for the shoreline.

6.2. Built environment

Given the significant re-use of existing facilities on site and the minimal impact offsite, built environment impacts are expected to be subject to routine impact assessment. Recreation facilities will be re-instated upon completion of construction.

Sunwater will liaise with the relevant local government regarding impacts to roads and with residents with respect to impacted private facilities.

6.3. Cultural heritage

Liaison with the relevant Aboriginal parties will determine the requirement and type of cultural heritage management to be implemented on this project. It is envisaged that this can progress as a routine assessment, including a cultural heritage survey of the Project area.

A Cultural Heritage Management Plan (CHMP) or agreement will be required, including consultation and any field investigation and monitoring necessary with the involvement of the relevant Aboriginal Party. Any activities that may cause ground disturbance will need to comply with the Duty of Care Guidelines.

A non-indigenous heritage survey will be required and any management actions will be determined based on the results of the survey.

6.4. Greenhouse gas management plan

A greenhouse gas management plan will be developed as required, addressing the various stages of the development and emissions anticipated to require management. Previous EIS's for dams have suggested adopting measures such as beneficial reuse of cleared vegetation, avoiding on-site burning, replanting vegetation, and, for areas inundated for the majority of the time, clearing carbon rich topsoil for beneficial use in other locations. These opportunities would be investigated during the EIS.

6.5. Waste management

A construction waste management plan will be required. The amount and type of waste generated during operation (e.g. from maintenance and amenities) is unlikely to vary substantially from that currently generated.

6.6. Hazard, risk and health and safety

Hazard, risk and health and safety management plans will be developed as required for the construction and operation phases of the Project. Many of the components will be engineering-focused and covered in the required design documents and operational manuals. In the operations phase, little change from existing Sunwater procedures would be expected.

7. Approvals required for the project

Sunwater is seeking declaration of the Project as a coordinated project pursuant to s.26 of the SDPWO Act (Qld). As part of this declaration, Sunwater is seeking to utilise the EIS process. Information to support the EIS process for this Project is provided throughout this IAS.

Section 4.5 outlines the Acts and policies that were assessed as relevant to the Project. A preliminary review of required approvals has been undertaken and documented in Table 7.

Once the Project description has been sufficiently completed, a finalised list of required approvals will be presented as part of the EIS. As a result, further approvals may be identified, while others that were identified at the preliminary stage, may not be required.

7.1. Potential approvals

Table 7: Potential Project Approvals

Legislation	Approval name	Relevance	Coordinated approval/responsible department
Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Controlled action approval	The Project has the potential to impact several MNES including: • Listed threatened and species and communities • Listed migratory species • Great Barrier Reef Marine Park • World Heritage Property • National heritage place • Wetlands of national importance • Commonwealth marine areas Impacts may be either the direct and indirect consequence of an action. The use of water could be considered to be an indirect impact of the raising of the dam because of the provisions in s.527E of the EPBC Act.	Yes Department of Agriculture, Water and the Environment (Cth)
Commonwealth Native Title Act 1993 (NT Act) **and Native Title (Queensland) Act 1993 (QNT Act)**	Indigenous land use agreement	The raised dam will inundate areas where native title has been determined to exist and areas where native title has not been extinguished. The State will require Sunwater to extinguished native title in those areas where native title has been determined to exist or cannot be shown to be extinguished on the basis that inundation is completely incompatible with native title. The State will not agree to apply a provision under the NTA that relies on the non-extinguishment principle (such as 24KA). The State will require Sunwater to seek to negotiate an ILUA with each of the relevant native title groups for the surrender of native title in the areas required. The State must be a party to the ILUA where native title is surrendered. The State may agree	Yes • Department of Natural Resources, Mines and Energy

Legislation	Approval name	Relevance	Coordinated approval/responsible department
		to use compulsory acquisition powers if an ILUA cannot be negotiated (but only after Sunwater has made reasonable attempts to negotiate an ILUA) .	
State Development and Public Works Organisation Act 1971 (SDPWO Act)	Coordinated project declaration	This IAS forms part of the application to the Coordinator General to declare the Project a 'coordinated project' to allow the preparation of an EIS under the SDPWO Act.	Yes • Coordinator General
Planning Act 2016 (Planning Act) **Planning Regulation 2017** **Charters Towers Town Plan** **Whitsunday Regional Council Planning Scheme**	Material change of use Operational works	Development approvals will be required for matters identified in the relevant planning schemes as well as matters of state significance. The likely development approvals required include: • Material change of use for environmentally relevant activity (inundation area) • Operational work for reconfiguration of a lot (inundation area) • Operational work for taking or interfering with water (for construction water) • Operational work for waterway barrier works (for raising the dam) • Operational work for clearing native vegetation (for clearing/inundation of regional ecosystems) • Operational work for removing quarry material (for construction materials) • Operational works for referable dam (for raising the dam) • Building work (for site construction facilities) • Operational work for particular dams (for raising the dam) Any other development permits required by the relevant planning schemes (for raising the dam and irrigation area).	Yes • Department of State Development, Manufacturing, Infrastructure and Planning
Environmental Protection Act 1994 (EP Act)	Environmental Authority – prescribed ERA	**Contaminated land** A disposal permit to treat, remove and/or dispose of any identified contaminated soil from any impacted land on the Environmental Management Register or Contaminated Land	Yes • Department of Environment and Science

Legislation	Approval name	Relevance	Coordinated approval/responsible department
		Register. A site remediation plan and site management plan may be required for contaminated sites impacted by the project. **Environmentally Relevant Activities (ERAs)** • Environmental authority for a prescribed ERA. ERAs may be applicable, including regulated waste transport, chemical storage (over a particular threshold), sewage treatment (for construction compounds or facilities over a particular threshold), and extractive and screening materials. These may be held by the construction contractor, or other contracted parties (i.e. waste removal contractors). • Registered suitable operator status to allow application for environmental authority.	
Nature Conservation Act 1992 **(NC Act)**	Clearing Permit – protected plants Permit to tamper with animal breeding places	**Protected Plants** It is an offence to take protected plants without authorisation. Listed plant species have been identified during survey so a protected plant clearing permit is required to clear (or inundate) the plants. **Species Management Program (SMP)** A low risk SMP would be required if breeding habitat of a least concern species is to be disturbed. A high risk SMP will be required for Squatter pigeon, Gull-billed tern, Caspian tern, Short-beaked echidna and possibly others yet to be confirmed.	Yes • Department of Environment and Science
Vegetation Management Act 1999 (VM Act)	See Planning Act, approval via SARA	Clearing of native vegetation, including the inundation of native vegetation would require approval. See Planning Act.	Yes • Department of Natural Resources, Mines and Energy
Aboriginal Cultural Heritage Act 2003 (ACH Act)	Cultural Heritage Management Plan	There is a general requirement for the project to comply with the Cultural Heritage Duty of Care. The project may require a Cultural Heritage Management Plan (CHMP) where an EIS is required for the Project. The CHMP would normally include consultation and any field investigation and monitoring necessary with the involvement of the relevant Aboriginal Party, and agreement of measures to mitigate the	Yes • Department of Aboriginal and Torres Strait Islander Partnerships

Legislation	Approval name	Relevance	Coordinated approval/responsible department
		impact of the project on any Aboriginal cultural heritage that is present in the project area.	
Water Act 2000 (Water Act) **Water Supply (Safety and Reliability) Act 2008**	Water licence See Planning Act, approval via SARA	Certain approved entities (including government departments and water service providers under the WSSR Act) are exempt from obtaining a Riverine Protection Permit (RPP) under the RPP Exemption Requirements, and would need to comply with the requirements of the exemption with respect to excavating and filling within a watercourse. Where this is not possible, a Water Licence and potentially Quarry Material Allocation may be required, for watercourses recognised under the Water Act. Taking of water for use in construction may require water permits under the Water Act. Exemption requirements for constructing authorities for the take of water without a water entitlement (2016) may be applicable as Sunwater is recognised as a constructing authority under the Acquisition of Land Act 1967. Alternatively, Sunwater holds entitlements. Other Water Act approvals that may be required include: • Amendment to a resource operations licence • Application for quarry material allocation • Application by an entity for licence to interfere with flow by impounding water • Certification for dam safety (WSSR Act) • Operational works for a referable dam (see Planning Act) (WSSR Act)	Yes • Department of Natural Resources, Mines and Energy
Fisheries Act 1994 **(Fisheries Act)**	See Planning Act, approval via SARA	The raising of the BFD will constitute waterway barrier works and will require approval. The current dam does not have provision for fish movement.	Yes • Department of Agriculture and Fisheries
Forestry Act 1959	Sales permit	A permit for taking quarry material which is owned by the State from land outside a watercourse may be necessary for material for the construction of the works.	Yes • Department of Natural Resources, Mines and Energy

Legislation	Approval name	Relevance	Coordinated approval/responsible department
Environmental Offsets Act 2014 (EO Act)	See Planning Act and EPBC Act	Offsets may be required under s.8 of the EO Act, where there is a significant residual impact on a MNES, MSES or MLES.	Yes • Department of Environment and Science
Transport Infrastructure Act 1994 (TIA)	Road closure permit	Permits for road closures and temporary closures to accommodate works may be required.	Yes • Department of Transport and Main Roads
Regional Planning Interests Act 2014	Regional Interests Development Approval	n/a- not in an Area of Regional Interest	n/a

8. Costs and benefits summary

8.1. Local, state and national economies

The PBC identified a need for adequate and secure water supply to support development and growth in North Queensland for the next generation. This service need is related to a number of opportunities, including:

- expansion of irrigated agriculture in North Queensland
- support for urban and industrial growth in Townsville
- support for industrial growth at Abbot Point SDA and Port of Abbot Point
- support for potential inland mining and industrial developments, and
- generation of commercially viable hydro power in North Queensland.

All benefits relate to provision of a secure water supply which is sufficient to support urban, industrial and agricultural growth which will in turn support a buoyant regional economy with continuing employment and suitable provision of services. Benefits sought by the Project include:

- secure reliable water supply attracts industry and supports population, quality of life in Townsville.
- increased agricultural production (with regional economic benefits).
- economic development near Bowen.
- industrial development in the Bowen and Galilee Basin.
- more secure and environmentally friendly diversified power supply to NQ, generated locally.
- enhanced access to goods and services due to injection of wealth into local economies.
- generation of employment opportunities.
- improved ability to access health services and recreational activities.
- increased availability of water for future generations.

Since the service need was first identified in the Strategic Business Case for the raising of BFD, further definition of regional demand profiles have identified an even greater demand, with service need being under threat from insufficient uncommitted allocation to respond to any single significant short lead time demand. That is, an increase in water supply capacity is required.

8.2. Natural and social environments

The dam raising requires an EIS at both State and Commonwealth levels and construction cannot commence unless and until the approvals are obtained. While the EIS would address all issues of relevance, critical issues include (and are likely to be more significant at higher levels of raising):

- works are within a Great Barrier Reef catchment.
- environmental offsets may be significant.
- cultural heritage issues (indigenous and non-indigenous).
- land requirements and associated social impacts.

The primary social benefits relate to employment and expenditure during construction and again during operation. The construction phase carries both positive effects (personal income and support for businesses) and negative effects (land acquisition and severance, separation of workers from family, risk of traffic accidents), while the operations phase supports expansion of agri-business and potentially satisfies demands of other users. Employment and expenditure will accrue at the location of water use (Townsville, Bowen, mines, Burdekin agriculture).

9. Community and stakeholder consultation

The consultation during the PBC phase of the Project focussed on developing awareness of the project (the "inform" component of engagement), gaining a better understanding of demand for water and establishing the basis upon which ongoing engagement will be recorded.

The following stakeholder engagement activities were undertaken during the development of the PBC:

- "Consultation Manager" was established as the database for the Project.
- web based information was developed covering all projects underway or planned for the Burdekin Region and launched on the Sunwater website.
- the Sunwater website provided the opportunity for any interested party to make contact for individual consultation purposes.
- all project team members were kept aware of key messages.
- Business Queensland and DNRME were engaged through workshops on PBC process, Service need, options and options filtering.
- Shareholding Ministers and key Commonwealth and State agencies were briefed late in the Preliminary Business Case process to inform them of the outcome and next steps.
- Sunwater presentations to existing liaison groups.
- on acceptance by the Board, the Sunwater website was updated to reflect the outcome and next steps, including notification of project contact details.
- media release.

A Draft Stakeholder Engagement Plan for future stages of the project was included within the PBC. It is planned to commence engagement upon declaration as a coordinated project.

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Appendix A: Financial and technical capability statement

Appendix B: Preliminary Business Case Summary