

## 9. World Heritage properties and National Heritage places

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## 9.1 Overview

This chapter provides an assessment of potential impacts on World Heritage properties and National Heritage places as a result of the Lower Fitzroy River Infrastructure Project (Project). The Project is located on the Fitzroy River which flows into the Great Barrier Reef. The Great Barrier Reef is listed as both a World Heritage property and a National Heritage place. No other World Heritage properties or National Heritage places occur in proximity to the Project. Cumulative impacts on the Great Barrier Reef, including changes to flow and water quality, are assessed in Chapter 12 Cumulative and consequential.

## 9.2 World Heritage properties

### 9.2.1 Description of the Great Barrier Reef World Heritage Area

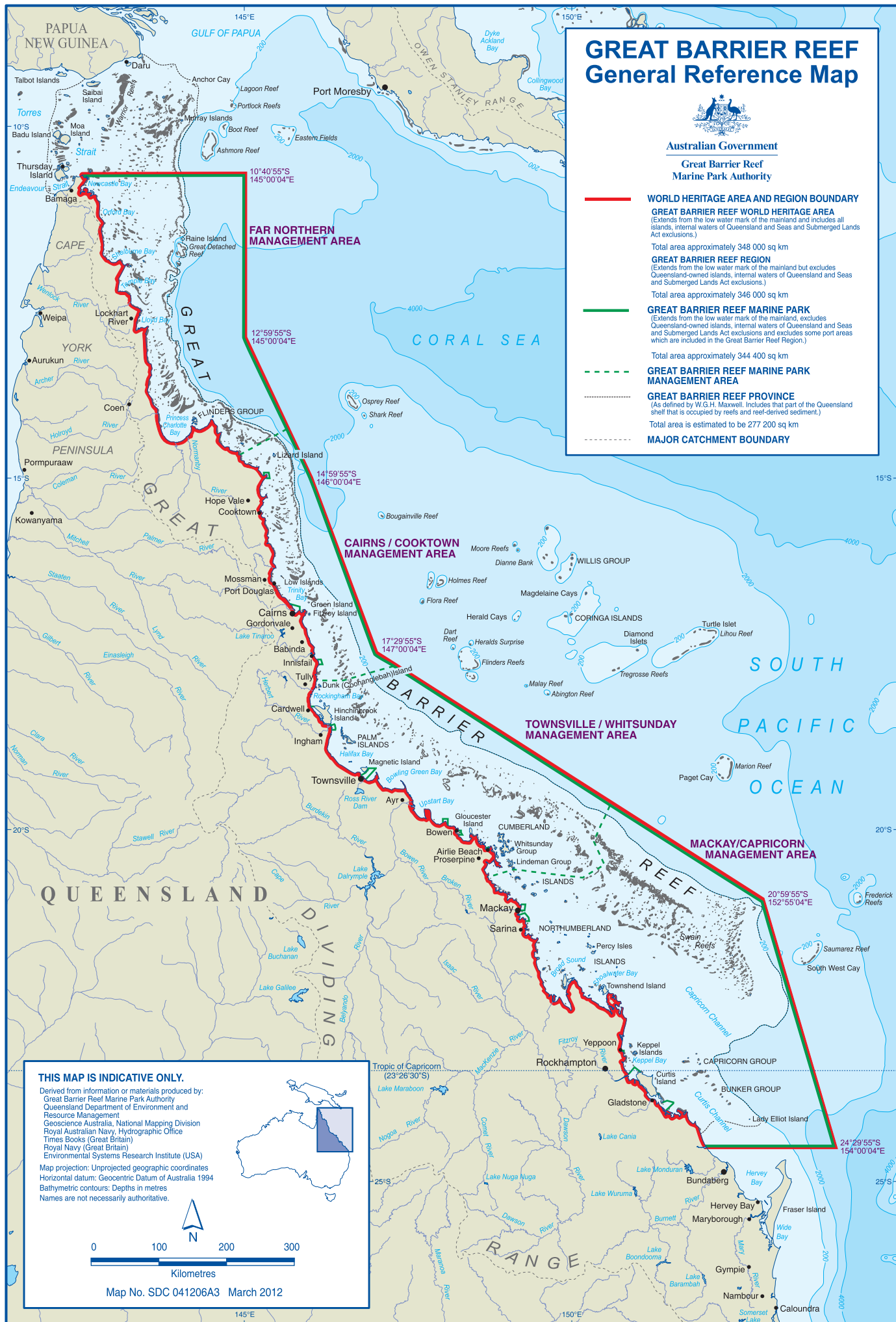
The Great Barrier Reef World Heritage Area (GBRWHA) extends along the Queensland coast from the Cape York Peninsula to just north of the city of Bundaberg and from the low water mark to the outer boundary of the Great Barrier Reef Marine Park, which is beyond the edge of the continental shelf (Figure 9-1). The GBRWHA does not extend inland along tidal rivers and waterways. The Fitzroy River flows into the southern end of the GBRWHA at Keppel Bay in the Capricorn-Bunker Group. The location of the Project in relation to the GBRWHA is shown in Figure 9-2.

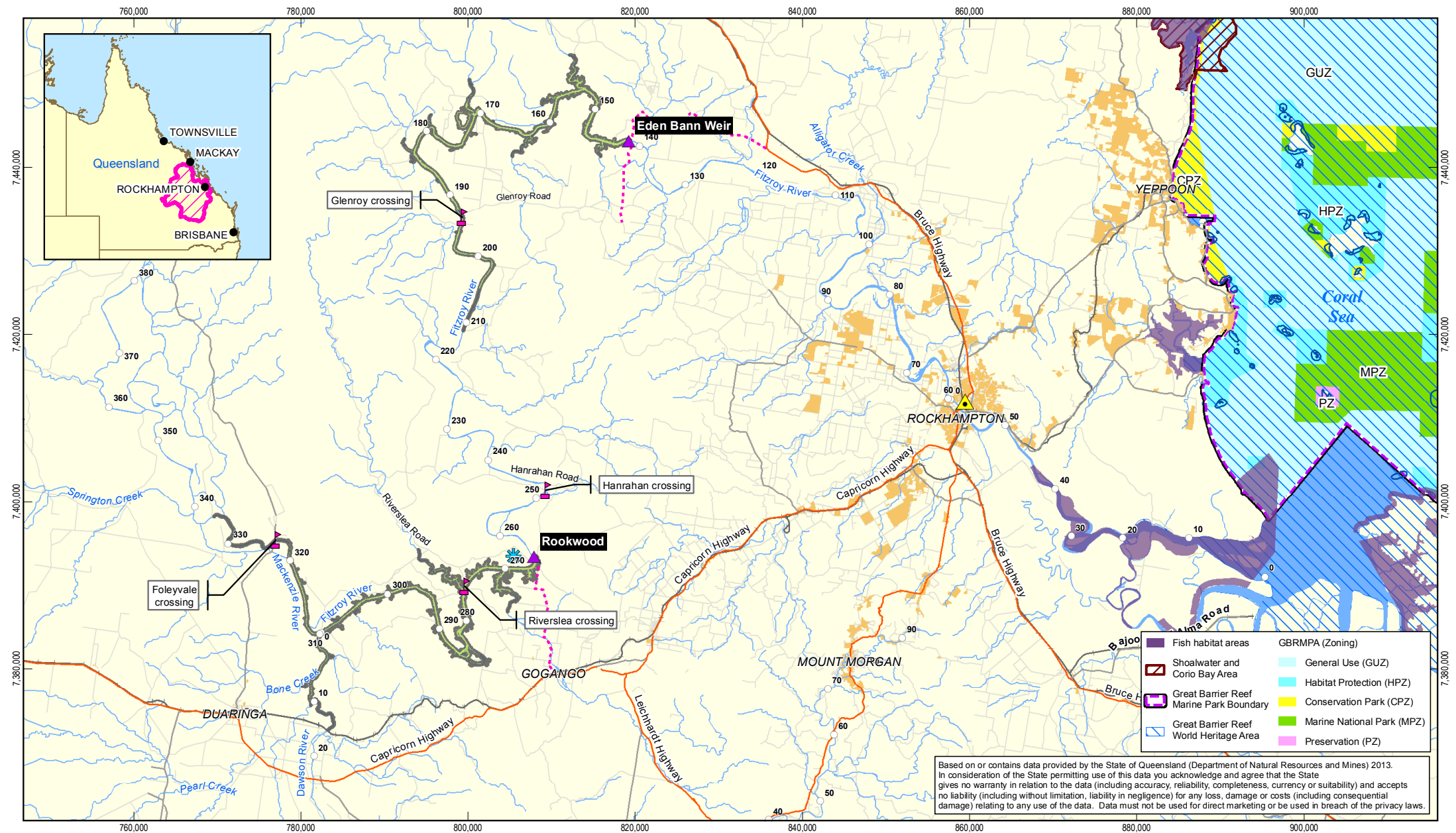
The GBRWHA is the largest coral reef ecosystem and one of the most diverse natural ecosystems on earth. It extends over 2000 km and covers an area of 348 000 km<sup>2</sup>. The GBRWHA contains extensive areas of seagrass, mangrove, sandy and muddy seabed communities, inter-reefal areas, deep oceanic waters and island communities (DSEWPAC 2012). It attracts more than 1.6 million visitors each year, contributes more than \$5 billion to the Australian economy, and generates about 63,000 jobs (DSEWPAC 2012).

The Great Barrier Reef was inscribed on the World Heritage List in 1981 and was recognised for the following values (Lucas et al. 1998):

- An outstanding example representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features
- An outstanding example representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals
- Contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
- Contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Figure 9-1 Great Barrier Reef World Heritage Area



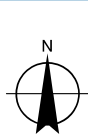


1:600,000 (at A4)

0 5 10 15 20

Kilometres

Map Projection: Universal Transverse Mercator  
Horizontal Datum: Geocentric Datum of Australia (GDA94)  
Grid: Map Grid of Australia 1994, Zone 55



#### LEGEND

○ AMTD (km)

▲ Weir Location

▲ Fitzroy Barrage

⚙ Saddle dams

▬ River Crossing

▬ Highway

▬ Major Road

▬ Streets (Local)

▬ Access Road

▬ Fitzroy Basin

▬ Urbanised Area

▬ Rookwood Weir Stage 1 impoundment

▬ Rookwood Weir Stage 2 impoundment

▬ Rookwood Weir Stage 2 impoundment

▬ Eden Bann Weir Stage 2 impoundment

▬ Eden Bann Weir Stage 3 impoundment

▬ Eden Bann Weir Stage 3 impoundment



Gladstone Area Water Board, SunWater  
Lower Fitzroy River Infrastructure Project

Project location in relation to the  
Great Barrier Reef  
World Heritage Area

Job Number 41-20736  
Revision K  
Date 09 Feb 2015

Figure 9-2

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## 9.2.2 Potential indirect impacts

### 9.2.2.1 Surface water flows

Modelling and statistical analysis has shown that with the Fitzroy Basin Resource Operations Plan in place there are no significant differences between current modelled freshwater flow regimes and the flow regimes projected with any additional infrastructure associated with the Project in place. Detail on changes to freshwater flows is provided in Chapter 8 General impacts.

### 9.2.2.2 Water quality

#### Construction

As described in Chapter 8 General impacts, construction activities may result in temporary, localised impacts on water quality within the Fitzroy River:

- Increased turbidity through terrestrial sediment laden runoff from erosion as a result of ground disturbance (excavation and earthworks, road construction) or vegetation removal and on-site cleaning activities (for example concrete batching plant, vehicle wash downs, etc.)
- Increased turbidity and sedimentation as a result of in-stream works (earthworks, dewatering of foundations and cleaning foundations and grouting)
- Pollution of waterways through contaminant spillage (including hydrocarbons), release of untreated water from storages or through during dewatering or disturbance of existing contaminated land.

Further to undertaking in-stream works during drier periods and sequencing works to account for periods of high flows and rainfall events, construction impacts will be managed through development and implementation of a construction environmental management plan, inclusive of erosion and sediment controls and will as a minimum include the following:

- Significant ground disturbing activities are scheduled to be undertaken during drier periods reducing the potential for erosion and sediment laden runoff entering the watercourse
- Installation of diversions and erosion controls such as sediment basins will direct clean water away from construction areas and allow site affected water to settle prior to re-entering the river
- Wastewater from all sources will be stored, treated and tested prior to release to the environment
- Clearing of vegetation for site facilities and access will be restricted to minimum areas required to undertake the works reducing the extent of exposure of soil to erosion influences
- Storage and use of potentially contaminating and polluting materials such as hydrocarbons, service and refuelling areas will be restricted to defined and protected (bunded) areas
- Storage and handling of contaminants will comply with relevant guidelines and Australian standards.

Given the composition, temporary nature and localised extent of potential impacts during construction and the distance to estuarine and marine waters (more than 80 km) it is not expected that water quality within Keppel Bay or the GBRWHA will be impacted as a result of construction activities.

## Operation

### *Erosion*

While it is possible that some localised erosion may occur downstream at the weir sites it is considered that the potential contribution to current sediment load will be negligible. Further, erosion protection works downstream of the weirs will reduce the potential for scour and erosion thereby minimising the potential to increase sediment loads. Similarly, it is proposed to retain vegetation within the impoundments prior to and during inundation. This will minimise exposed areas and reduce the erosion potential.

With design measures in place, downstream erosion and associated impacts on water quality are expected to be minimal. No predicted significant operational impacts on the GBRWHA are expected as a result of erosion.

### *Nutrients*

It can be expected that some reduction in water quality will occur during the first filling period particularly with regard to nutrients (total nitrogen and total phosphorous) and subsequently dissolved oxygen (DO) and turbidity.

Prior to the first fill, it is not intended to clear vegetation from within the watercourse. Consequently that vegetation will decay (over time) releasing methane, carbon dioxide and nutrients and reducing dissolved oxygen levels in the water column. Nutrients may then be conveyed downstream and output to the Fitzroy River estuary, particularly during flood events.

An assessment was performed to determine the potential contribution of nutrients using the FullCAM program as described in Chapter 8 General impacts. The overall contribution of nutrients to the system is predicted to be low in the context of the overall quantity of nutrients that are transported annually from the Fitzroy Basin to the GBRWHA (as described by Johnston et al. 2008). Moreover, the percentage contribution will decline markedly after the first year to negligible proportions after several years.

During detailed design, operational strategies (including initial operation) will be developed including water quality monitoring programs covering upstream, impoundment and downstream environments. Differential offtakes will facilitate mixing to improve the quality of water released.

### *Dissolved oxygen*

DO levels within the impoundments will vary through the water column, reducing only slightly with depth which may result in weak stratification. Storages within the Fitzroy Basin are reported to be unstratified most of the year, or only slightly stratified during the warmer months (September – January) (SKM 2010). Differential (multi-level) offtakes will facilitate that water released through outlet works is mixed, improving the DO (together with mediating temperature) to achieve the water quality objectives. This is currently achieved at Eden Bann Weir.

Discharges of poorly oxygenated water to the GBRWHA are not expected.

### *Sedimentation*

The Fitzroy Basin is one of the major contributors of the anthropogenic total suspended solids load to the Great Barrier Reef lagoon, with grazing lands (gully and hillslope erosion) and streambank erosion the main sources. Fine sediment (under 16 micrometres) material is the

fraction most likely to reach the Great Barrier Reef lagoon, and is present at high proportions in total suspended solids from the Fitzroy Basin (Kroon et al. 2013).

The Project itself is not expected to adversely impact on sedimentation (neither increase nor decrease) movement within the system. Project design facilitates that sediment will be swept over the weir as the channel velocities (determined through hydraulic modelling) are in excess of 5 m/s. Local deposition at the upstream face of the new weirs is expected and low level outlets are provided to assist in flushing this sediment downstream. Aside from local areas of lower velocity around weir structures such as towers and intakes, the weirs are expected to provide unimpeded transfer of sediment down the river.

### 9.2.2.3 Aquatic ecosystems

The Fitzroy River estuary supports a number of sensitive environmental areas and conservation significant species. The flow regime in this region is currently regulated by releases from the Fitzroy Barrage and habitats have been modified as a result of previous and existing human land use. As described in Section 9.2.2.1, there are no significant differences between current modelled flow regimes and the flow regimes projected with any additional infrastructure associated with the Project in place. As described in 9.2.2.2, no significant change to the quality of water delivered to the GBRWHA is expected. Impacts to the sensitive environmental areas and conservation significant species are therefore expected to be minimal.

### 9.2.3 Assessment of significance

As the Great Barrier Reef is the only World Heritage property triggered for the Project, impact assessment has been undertaken focusing on World Heritage values for the Great Barrier Reef.

The Significant impact guidelines 1.1 (DoE 2013) provide overarching guidance on determining whether an action is likely to have a significant impact on a World Heritage property. An action is likely to have a significant impact on World Heritage if there is a real chance or possibility that it will cause:

- One or more of the World Heritage values to be lost
- One or more of the World Heritage values to be degraded or damaged
- One or more of the World Heritage values to be notably altered, modified, obscured or diminished (DoE 2013).

An assessment of Project impacts on the GBRWHA values is provided in Table 9-1. The assessment concluded that with the proposed mitigation and management measures in place, no World Heritage values will be lost, degraded, damaged, notably altered, modified, obscured or diminished as a result of the Project and therefore no significant impact on a World Heritage property.

**Table 9-1 World Heritage values potentially indirectly impacted by the Project**

World Heritage Area values	OUV Components of the Great Barrier Reef*	Relevance to Project	Potential impacts on World Heritage Area values
<b>Criterion vii</b> Contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance	<ul style="list-style-type: none"> <li>Water clarity</li> <li>Scenic vistas</li> <li>Visible from space</li> <li>Complex string of reef structures</li> <li>Unparalleled aerial panorama</li> <li>Whitsunday Islands</li> <li>Hinchinbrook Island and Channel</li> <li>Breeding colonies of seabirds and marine turtles</li> <li>Over-wintering butterflies</li> <li>Cod Hole</li> <li>Coral diversity</li> <li>Reef fish</li> <li>Number of whales</li> </ul>	<ul style="list-style-type: none"> <li>The Project has the potential to alter the rate and timing of sediment moving downstream and thus water clarity</li> <li>The Project will not impact upon scenic vistas or the aerial view within the GBRWHA</li> <li>The Whitsunday Islands, Hinchinbrook Island and Channel, breeding colonies of seabirds, marine turtles and over-wintering butterflies and the Cod Hole are not located in proximity to the Project area</li> <li>There are no coral reef systems within proximity of the Project area and the Fitzroy River estuary provides limited habitat for reef fish</li> <li>Whales are not known to feed, rest or calve in Keppel Bay downstream of the Project</li> </ul>	<p>As currently occurs, large amounts of sediment will move downstream during large flow events following construction of the weirs and impact water clarity. The Project itself is not expected to adversely impact on sedimentation (neither increase nor decrease) movement within the system.</p> <p>Project design facilitates that sediment will be swept over the weir during high flow events. Low level outlets are provided to assist in flushing sediment deposited at the upstream face of the weir downstream. Aside from local areas of lower velocity around weir structures such as towers and intakes, the weirs are expected to provide unimpeded transfer of sediment down the river.</p> <p>No significant impact on water clarity is predicted.</p>
<b>Criterion viii</b> An outstanding example representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features	<ul style="list-style-type: none"> <li>Geomorphological evolution Reef building/development</li> <li>Record of sea level change</li> <li>Inshore fringing reefs, mid-shelf reefs and outer reefs</li> <li>Continental slope</li> <li>Beaches</li> </ul>	<ul style="list-style-type: none"> <li>Eden Bann Weir and the proposed Rookwood Weir are approximately 141 km adopted middle thread distance (AMTD) and 265 km AMTD upstream from the GBRWHA respectively</li> <li>Project area is not located in proximity to significant coral communities</li> <li>Project area is not in proximity to features such as inter-reef lagoonal areas</li> <li>Project area is not in proximity to beach areas or the continental slope</li> </ul>	<p>Changes to flow and water quality can have the potential to indirectly impact on ecosystem function in areas where World Heritage features are represented. As described in Section 9.2.2.1 and Section 9.2.2.2, no significant change to freshwater flows and the quality of water delivered to the GBRWHA is expected.</p> <p>No impacts to features of the GBRWHA representing major stages of earth's history or on-going geological processes are anticipated.</p>
<b>Criterion ix</b> An outstanding example representing significant ongoing ecological and	<ul style="list-style-type: none"> <li>Physical processes</li> <li>Connectivity</li> <li><i>Halimeda</i> beds</li> </ul>	<ul style="list-style-type: none"> <li>Potential for impact on physical processes through changes to flow and water quality</li> <li>The Project will not impact on connectivity</li> </ul>	<p>Changes to flows and water quality to the marine environment have the potential to indirectly impact on ecological and biological processes.</p> <p>No significant change to flow regimes is anticipated</p>



World Heritage Area values	OUV Components of the Great Barrier Reef*	Relevance to Project	Potential impacts on World Heritage Area values
biological processes in the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals	<ul style="list-style-type: none"> <li>Continental islands</li> <li>Evolutionary history</li> <li>Hard corals</li> <li>Island plants</li> <li>Aboriginal and Torres Strait Islander sea country</li> </ul>	<p>within the GBRWHA</p> <ul style="list-style-type: none"> <li>No <i>Halimeda</i> beds in proximity to the Project area</li> <li>Curtis Island is located 12 km from the mouth of the Fitzroy River</li> <li>Project area is not located in proximity to significant coral communities</li> <li>The Project will not alter access or use of Aboriginal and Torres Strait Islander sea country</li> </ul>	as a result of the Project. Similarly, discernible changes in water quality at the Fitzroy River mouth are not expected to occur as a result of the Project.
<p><b>Criterion x</b></p> <p>Contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation</p>	<ul style="list-style-type: none"> <li>400 species of coral</li> <li>Lagoon floor</li> <li>Half the world's diversity of mangroves and many seagrass species</li> <li>Dugong</li> <li>Whales and dolphins</li> <li>Marine turtles</li> <li>Raine Island turtle breeding site</li> <li>Seabird breeding sites</li> <li>Flora on continental islands and coral cays</li> </ul>	<ul style="list-style-type: none"> <li>There are no species of coral or inter-reefal areas in proximity to the Project area.</li> <li>Mangroves are present in the intertidal areas of the Fitzroy River estuary</li> <li>Absence of seagrass in the Fitzroy River estuary is likely attributed to high turbidity and sediment loads</li> <li>Marine species populate the mouth of the Fitzroy River</li> <li>Raine Island is not located within or near the Project area</li> <li>The Project area does not impact indirectly on seabird breeding sites or flora on continental island or coral cays</li> </ul>	<p>Changes to water quality can have an impact on habitats utilised by marine species of outstanding universal value.</p> <p>Discernible changes in water quality at the Fitzroy River mouth are not expected to occur as a result of the Project.</p> <p>No significant impact on biological diversity and species of outstanding universal value are anticipated.</p>

\*Source: UNESCO 2013

### 9.3 National Heritage places

#### 9.3.1 Description of the National Heritage listing

The National Heritage List has been established to list places of outstanding heritage significance to Australia. It includes natural, historic and Indigenous places that are of outstanding national heritage value to the Australian nation.

The Great Barrier Reef was placed on the National Heritage List in May 2007 in accordance with the provisions of item 1A of Schedule 3 of the *Environment and Heritage Legislation Amendment Act (No. 1) 2003* (Cth). The Minister for the then Department of Environment and Water Resources determined that the Great Barrier Reef should be included on the National Heritage List as the National Heritage values were demonstrated to be achieved through corresponding World Heritage values identified in Section 9.2.1.

The National Heritage criteria for the Great Barrier Reef are listed below with reference to the corresponding World Heritage criteria:

- a) The place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history

Corresponding to World Heritage criteria (vii), (viii), (ix) and (x)

- b) The place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

Corresponding to World Heritage criteria (x)

- c) The place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history

Corresponding to World Heritage criteria (viii), (ix) and (x)

- d) The place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:
  - i. A class of Australia's natural or cultural places; or
  - ii. A class of Australia's natural or cultural environments

Corresponding to World Heritage criteria (viii), (ix) and (x)

- e) The place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

Corresponding to World Heritage criteria (vii)

The Great Barrier Reef is also of Indigenous cultural importance for Aboriginal and Torres Strait Islanders. Non-Indigenous heritage values are also represented and include mapped historic shipwrecks which occur throughout the reef mosaic. These, along with its biological diversity, represent features that are of outstanding national heritage value to Australia which led to the Great Barrier Reef being registered as a place of National Heritage.

### 9.3.2 Potential indirect impacts

Potential indirect impacts to the National Heritage listed area of the Great Barrier Reef include changes to surface water flows, water quality and aquatic ecosystems. Further details on these impacts can be found in Section 9.2.2.

### 9.3.3 Assessment of significance

As the Great Barrier Reef is the only National Heritage place triggered for the Project, an impact assessment has been undertaken focusing on National Heritage values for the Great Barrier Reef.

The Significant impact guidelines 1.1 (DoE 2013) provide overarching guidance on determining whether an action is likely to have a significant impact on a National Heritage place. An action is likely to have a significant impact on National Heritage values if there is a real chance or possibility that it will cause:

- One or more of the National Heritage values to be lost
- One or more of the National Heritage values to be degraded or damaged
- One or more of the National Heritage values to be notably altered, modified, obscured or diminished (DoE 2013).

As described in section 9.3.1, the values of the Great Barrier for which it was listed as a National Heritage Place are the same values for which it was listed as a World Heritage property. As such, the assessment of potential impacts on these values is the same and with the proposed mitigation and management measures in place, no National Heritage values will be lost, degraded, damaged, notably altered, modified, obscured or diminished as a result of the Project and therefore no significant impact on a National Heritage place is likely.

## 9.4 Summary

The Project will not have any direct impact on the World Heritage values or the National Heritage values of the Great Barrier Reef as the Project is located 141.2 km AMTD upstream of the Great Barrier Reef. Potential indirect impacts on the Great Barrier Reef resulting from changes to flow and water quality have been assessed as follows:

- Modelling and statistical analysis has shown that with the Fitzroy Basin Resource Operations Plan in place there is no significant differences between current modelled freshwater flow regimes and the flow regimes projected with any additional infrastructure associated with the Project in place
- While it is possible that some localised erosion may occur at the weir sites during operation, it is considered that the potential additional contribution to the current sediment load entering the Great Barrier Reef will be negligible
- Other than from decaying vegetation, the Project will not directly contribute nutrients downstream of the Fitzroy River and subsequently the Great Barrier Reef. Water quality impacts as a result of decaying vegetation will be short term during the initial years of operation and will not persist into long-term operations
- Weir design and operations will seek to reduce the potential for the release of poor quality water, through measures such as multi-level off takes discharges of poorly oxygenated water to the Great Barrier Reef are not expected

- Aside from local areas of lower velocity around weir structures such as towers and intakes, the weirs are expected to provide unimpeded transfer of sediment down the river.

The above impact assessment has concluded that with the management and mitigation measures in place, no significant impacts to the Great Barrier Reef are expected as a result of the Project. Furthermore, based on the assessment of potential indirect impacts against Great Barrier Reef values, the Project will not significantly impact directly or indirectly on the World Heritage values or National Heritage values of the Great Barrier Reef.