



Community Draft Environmental Values  
for the waters of the Burdekin Dry Tropics region

# INDEX



## Table of Contents

|  |    |
|--|----|
| Executive summary .....                      | 3  |
| Background .....                             | 4  |
| The Project .....                            | 5  |
| Determining draft Environmental Values ..... | 6  |
| Community consultation.....                  | 7  |
| Environmental Values survey .....            | 8  |
| Community Environmental Values.....          | 8  |
| Groundwater desktop study .....              | 14 |
| Groundwater use in urban centres.....        | 14 |
| Survey feedback on groundwater .....         | 15 |
| Acknowledgements .....                       | 17 |
| References .....                             | 17 |
| Appendix .....                               | 18 |

## Executive summary

The Environmental Values project built on the NQ Dry Tropics *Burdekin Water Quality Improvement Plan 2009* (BWQIP) and included a further desktop study to update the Environmental Values (EVs) established during the development of the BWQIP. This desktop study also considered the Don Basin and the eastern section of the Ross Basin.

The role of NQ Dry Tropics was to coordinate and obtain community input; as well as provide any necessary technical support; to develop draft EVs for the project waters. The project waters comprised all tidal and non-tidal waters and groundwaters of the Haughton, Burdekin and Don Basins, the eastern section of the Ross Basin, and the adjoining coastal waters to the limit of Queensland waters.

NQ Dry Tropics linked community engagement for the Environmental Values project to existing community meetings, activities and events. This included activities such as NQ Dry Tropics field days and workshops, via direct field officer contact with growers/producers, a Traditional Owner Management Group meeting, Landcare group meetings, and via events held by other organisations such as an AgForce forum held in Charters Towers. Additionally, over 100 emails were sent to landholders and stakeholder groups across the region seeking responses to a *SurveyMonkey* based survey.

The *SurveyMonkey* survey included questions on groundwater; a short report on ground water was commissioned through Dr. Ian Dight (Strategic NRM Outcomes); and discussions were held with Regional Councils regarding urban groundwater uses in the project area.

The community feedback highlighted concerns about current and future development, particularly through the mining and resources sectors and associated port development in coastal areas.

Draft Environmental Values were developed using data from the *Burdekin Water Quality Improvement Plan 2009*, the desk top studies and community feedback.

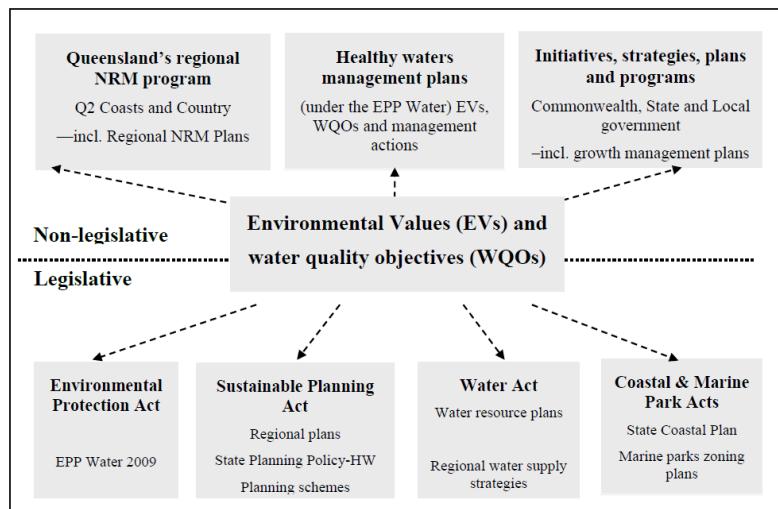
Through the Department of Environment and Heritage Protection, the draft EVs and Water Quality Objectives established for the project waters will be added to Schedule 1 of the Environmental Protection (Water) Policy 2009, after undergoing required community consultation.

## Background

Water quality for Queensland waters is managed under the *Environmental Protection Act 1994* and the *Environmental Protection (Water) Policy 2009*. The Policy establishes Healthy Waters Management Plans as a key planning mechanism to improve the quality of Queensland waters and provides the framework for establishing Environmental Values, water quality objectives and management goals for Queensland waters.

In order to determine what protection and enhancement of waters is required, it is necessary to ascertain the values attached to waters in any planning region. This report outlines the process and draft findings from consultations with stakeholders to determine Environmental Values (EVs) attached to waters in the project area of the Burdekin Dry Tropics. Key aspects of the process to develop EVs include appropriate consultation with the community and consideration of social and economic impacts of protecting the EVs. These draft EVs will inform the subsequent development of water quality guidelines, management goals and water quality objectives by the Department of Environment and Heritage Protection.

Establishing Environmental Values and water quality objectives for Queensland waters informs statutory and non-statutory natural resource management planning. The potentially broad influence of Environmental Values and water quality objectives in natural resource planning correspondingly provides wide-ranging implementation mechanisms (statutory and non-statutory). (Department of Environment and Heritage Protection)



**Figure 1.** From <http://www.ehp.qld.gov.au/register/p01551aa.pdf> Environmental values and water quality objectives links to planning and decision making instruments

Australian Government funding provided resources for NQ Dry Tropics to develop the *Burdekin Water Quality Improvement Plan* completed in 2009. Water Quality Improvement Plans (WQIP) are a ‘forerunner’ to Healthy Waters Management Plans, providing valuable information for their development, and the process for developing them was consistent with the *Environmental Protection (Water) Policy 2009*.

The Burdekin WQIP did not include the Don and Ross River Catchments. However, the subsequent development of the *Black-Ross Water Quality Improvement Plan 2010* (Townsville City Council) and the *Draft Ross River Basin Environmental Values and Water Quality Objectives 2012* (Department of Environment and Heritage Protection) included the Ross sub-catchment.

## The Project

The scope and deliverables for the project “Establishing draft Environmental Values for the NQ Dry Tropics region” were negotiated with the Department of Environment and Heritage Protection and agreed in late December 2012.

The main deliverable for the project was to identify, map and provide tabular draft EVs for the project waters and associated levels of aquatic ecosystems protection.

The project waters comprised the tidal and non-tidal waters, and groundwater of the Haughton, Burdekin and Don Basins, the eastern section of the Ross Basin, and the adjoining coastal waters to the limit of Queensland waters. NQ Dry Tropics utilised the 52 sub-catchments of the Burdekin Dry Tropics region in the development of the *Burdekin Water Quality Improvement Plan 2009*. For consistency, the sub-catchments were again utilised in the delivery of the project.

Dr. Ian Dight subsequently advised that the eastern section of the Ross Basin was included in the Haughton sub-catchment for the Burdekin WQIP. Additionally, draft Environmental Values and water quality objectives for the Townsville region waters were established through the Black and Ross (Townsville) WQIP and the Department’s Draft Ross River Basin Environmental Values and Water Quality Objectives document.

The project

- builds on the NQ Dry Tropics *Burdekin Water Quality Improvement Plan 2009*
- includes the Don Basin and the eastern section of the Ross Basin
- required further community consultation to confirm draft Environmental Values
- sought groundwater information, in particular the uses of groundwater across the region

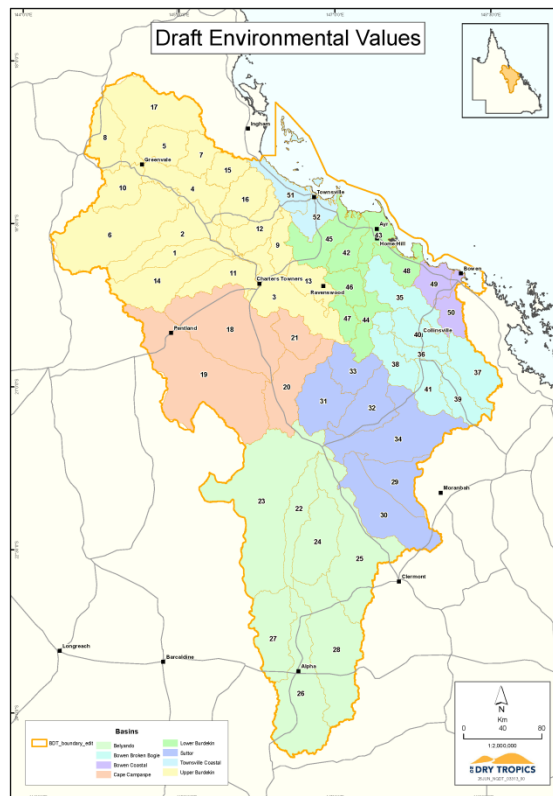


Figure 2. Project area













## Determining draft Environmental Values

Environmental Values are “the qualities of waterways that need to be protected from the effects of pollution, waste discharges and deposits to ensure healthy aquatic ecosystems and waterways that are safe and suitable for community use. They reflect the ecological, social and economic values and uses (e.g. swimming, fishing, agriculture) of the waterway.” Department of Environment and Heritage Protection.

The NQ Dry Tropics project team undertook a desktop study to update the Environmental Values within the project region. They concurrently sourced data for the Don Basin which had not previously been considered in the development of the *Burdekin Water Quality Improvement Plan (WQIP)*.

Further consultation with the community aimed to compare, and provide additional, information to that developed during the WQIP and desk-top study processes.

**Figure 3.** High Conservation/Environmental Value

| Environmental Values                              | Supporting Details   |
|---|--|
| <b>Aquatic Ecosystems</b>                         |  Supporting pristine or modified <b>Aquatic Ecosystems</b> – see details of three possible “Levels of Protection” (below)   |
| High conservation/ecological value systems (HCV). | These are systems that are largely unmodified or have undergone little change. They are often found within national parks, conservation reserves or inaccessible locations. Targets for these systems aim to maintain no discernable change from this natural condition (i.e. no physical, chemical and biological change).  |
| Slightly to moderately disturbed systems (SMD).   | These systems have undergone some changes but are not considered so degraded as to be highly disturbed. Aquatic biological diversity may have been affected to some degree but the natural communities are still largely intact and functioning. An increased level of change in physical, chemical and biological elements of these ecosystems is to be expected.                               |
| Highly disturbed systems (HD).                    | These are degraded systems likely to have lower levels of naturalness. These systems may still retain some ecological or conservation values that require protecting. Targets for these systems are likely to be less stringent and may be aimed at retaining a functional but highly modified ecosystem that supports other environmental values also assigned to it (e.g. primary industries). |
| <b>Primary Industries</b>                         |  <b>Irrigating</b> crops such as sugar cane, lucerne, etc   |
|   |  Water for <b>Farm Use</b> such as in fruit packing or milking sheds, etc   |
|   |  <b>Stock Watering</b>  |
|   |  Water for <b>Aquaculture</b> such as barramundi or red claw farming  |
|   |  <b>Human Consumption</b> of wild or stocked fish or crustaceans  |
| <b>Recreation &amp; Aesthetics</b>                |  <b>Primary recreation</b> with direct contact with water such as swimming or snorkelling   |
|   |  <b>Secondary recreation</b> with indirect contact with water such as boating, canoeing or sailing  |
|   |  <b>Visual appreciation</b> with no contact with water such as picnicking, bushwalking, sightseeing   |
| <b>Drinking Water</b>                             |  <b>Raw Drinking Water</b> supplies   |
| <b>Industrial uses</b>                            |  Water for <b>Industrial Use</b> such as power generation, manufacturing plants   |
| <b>Cultural &amp; Spiritual</b>                   |  Cultural and spiritual values  |

## Community consultation

Key stakeholders were identified during the scoping phase of the project and a draft list was included in the project plan. During development of a community engagement plan, a number of approaches were considered. Discussions with the coordinator of the Queensland Murray-Darling Committee EV project indicated that alternatives to holding public meetings should be explored as this option was not particularly effective in that area. The coordinator for the Southern Gulf project area also expressed concern about attendance at their proposed public meetings at the time, which subsequently was borne out with low attendances.

NQ Dry Tropics therefore proposed the linking of the EV project to existing events and activities as a major engagement process. The community engagement plan also proposed enlisting NQ Dry Tropics field staff to conduct EV surveys on field visits to landholders. A website link and an email out to landholders involved in NRM activities with NQ Dry Tropics were also proposed.

Subsequently, a range of field events and activities were utilised for the project and a *SurveyMonkey* based survey was developed for use by field staff and in the email campaign. The website link, however, was not established due to technical difficulties with the NQ Dry Tropics website.

Traditional Owners were engaged at an NQ Dry Tropics Traditional Owner Management Group meeting in Ayr on 9<sup>th</sup> May. A focus group meeting for regional stakeholders was held in Townsville on 24<sup>th</sup> May with 16 individuals/organisations invited, including the Great Barrier Reef Marine Park Authority (GBRMPA), Lower Burdekin Fish Restockers, WetlandCare Australia, Main Roads, Parks and Wildlife, Defence, Regional Councils and Growcom. Attendees included Dr. Ian Dight and representatives from GBRMPA, Burdekin Regional Council and the NQ Dry Tropics "Paddock to Reef" field officer, while representatives of other organisations subsequently completed the on-line survey. Departmental officers Brad Dines and Niall Connolly provided support to the meeting.

A series of consultation meetings with the horticulture, cane and grazing industries were also utilised when they were held over the 21<sup>st</sup> to 23<sup>rd</sup> May in Townsville. The meetings included representatives from Queensland Department of Agriculture, Fisheries and Forestry, Department of Science, Information Technology, Innovation and the Arts, CSIRO, James Cook University, Growcom, AgForce, Canegrowers Australia, horticulture and cane growers, graziers, NQDT field staff, , Sucrogen, Burdekin Bowen Integrated Floodplain Management Advisory Committee and consultant agronomists from Farmacist and Burdekin Productivity Services.

Comment was also sought on coastal waters from the Mackay Whitsunday Regional Economic Development Corporation in relation to the Don Basin, the commercial fishing industry through Arabon Seafoods at Bowen, Traditional Owners, and coastal groups including Wunjunga Progress Association south of Home Hill, the Sea Turtle Foundation, and the Queen's Beach Action Group at Bowen.

Over 100 emails were sent to landholders and the NQ Dry Tropics Board inviting them to participate in the EV survey. The landholders were identified by NQ Dry Tropics field staff, officers from the Central Highlands Regional Resources Use Planning Cooperative (CHRRUP) in Emerald, and through Landcare group coordinators and industry partners such as Growcom.

The *SurveyMonkey* survey included questions on groundwater uses but additional information was sought from Regional Councils specifically related to the uses of groundwater in regional towns. Additionally, Dr. Ian Dight (Strategic NRM Outcomes) was commissioned to investigate Departmental information on ground water uses across the region.

## Environmental Values survey

Responses were received from a total of 144 landholders or stakeholder groups through the workshops, personal liaison and on-line survey submission across all of the project area. Responses included:

| Dates                      | Location                                | Stakeholders  | Survey response |
|----------------------------|---|---|-----------------|
| 27 <sup>th</sup> March     | Charters Towers                         | AgForce forum   | 14              |
| 8 <sup>th</sup> April      | Collinsville                            | Graziers meeting  | 5               |
| 23 <sup>rd</sup> April     | Bowen                                   | Weed and pest forum   | 4               |
| 3 <sup>rd</sup> May        | Balfes Creek                            | Graziers meeting  | 3               |
| 6 <sup>th</sup> May        | Mt. Coolon                              | Graziers meeting  | 5               |
| 7 <sup>th</sup> May        | Ayr                                     | Lower Burdekin Landcare   | 7               |
| 9 <sup>th</sup> May        | Ayr                                     | Traditional Owner Management Group                                | 25              |
| 17 <sup>th</sup> May       | South-east of Charters Towers           | Dalrymple Landcare  | 5               |
| 21/22/23 <sup>rd</sup> May | Townsville                              | ABCD Framework horticulture, sugar and grazing industry workshops | 27              |
| 24 <sup>th</sup> May       | Townsville                              | Regional representatives meeting                                  | 7               |
| early June                 | Bowling Green Bay area                  | Project landholders   | 14              |
| May/June                   | Coastal catchments                      | Commercial fishers, TO's, coastal groups                          | 10              |
| May/June                   | Email out through NQDT and CHRUPP staff | Landholders involved with NQ Dry Tropics and CHRRUP               | 18              |
|                            |   | <b>TOTAL</b>  | <b>144</b>      |

**Table 1.** Community survey responses

## Community Environmental Values

There was some inconsistency in some community responses for surface water presumably due to a degree of interpretation of what the Environmental Values definitions meant.

Respondents reported confusion over the use of “values” particularly in relation to the definitions for Aquatic Ecosystems. A comment was that these are someone else’s values that don’t necessarily equate to their values “someone can highly value a creek or stream even if it is modified”. Other comments included “some of the ‘pristine environments’ in National Parks are highly degraded with weeds and other land management issues but are supposedly of high conservation value”. Generally, respondents rated Aquatic Ecosystems medium to high perhaps reflecting this confusion between a technical definition of EV’s and the communities “values”.

The EV’s for farm and stock water use were consistently rated high, as was irrigation where this was reported. It is noted that groundwater was reported to have been utilised for irrigation of grass for livestock and it is probable that surface water is also used for this purpose in many sub-catchments. However, drinking water uses were reported in some areas where the Burdekin WQIP and related groundwater responses indicate that groundwater is the more likely source for drinking water.

Concern was raised about the impact of the mining and resources sector on Environmental Values. Comment was made that it seemed pointless attributing Environmental Values when a whole environment can be removed by large scale mining activity.



Feedback from one Regional Council included “the environmental values of the region are unfortunately somewhat degraded due to grazing and mining activities. The full extent of this on aquatic values is yet to be determined”.

Aquaculture was reported in the Allingham and Burdekin River (above dam) sub-catchments which may be related to red claw farming. Aquaculture was also reported in the Glenmore Creek sub-catchment but from information in the Burdekin WQIP the area does not seem conducive to aquaculture. A number of coastal sub-catchments also reported aquaculture.

Some of the sub-catchments received no community responses. Community responses have therefore been aggregated into the major River Basins to provide a better indication of the community’s feedback on Environmental Values – see Table 2.

Generally, where one or more responses in the medium and high category have been recorded in the individual sub-catchment community feedback, these attributes have been included in the draft Environmental Values for that sub-catchment. Low responses alone have been discounted as there is some evidence that some respondents used this category when they meant “absent”. Community responses consistently provided evidence for Visual Appreciation across the project area. Therefore, this attribute has been inferred for all sub-catchments.

Community comment on the Environmental Values for coastal waters was focussed on the potential impacts of coastal development particularly dredging and port development.
























Some general feedback from respondents included:

- The commercial fishing industry needs clean ocean waters to survive and we are most concerned about the impact of dredging for port development on the future of the industry.
- The cumulative impacts of runoff water quality, and siltation and dredging activities from coastal developments are having serious consequences on the ability of seagrass to recover over large areas of the region.
- There are lots of turtles in our area but we are having problems with algal blooms affecting their feeding grounds while evidence has been found of elevated levels of cobalt in the turtles and we are worried about where that is coming from.

























Traditional Owners emphasised that all freshwater, tidal and coastal waters have high cultural values for their people. The Traditional Owner group was concerned about:

- The permanent loss of Environmental Values through mining and other development
- Continuous loss of habitat for aquatic species eg eels due to damming of rivers and creek
- The impact of water quality on turtles, dugongs, fish and other marine species













**Table 2.** Community responses













| Environmental Values   | Upper Burdekin Basin | Cape Campaspe Basin | Belyando Basin | Suttor Basin | Bowen Broken Bogie Basin | Lower Burdekin Basin | Coastal Waters | Bowen Coastal Basin | Coastal Waters | Ross (eastern section) |
|--|----------------------|---------------------|----------------|--------------|--------------------------|----------------------|----------------|---------------------|----------------|------------------------|
|  High Conservation Values     | 12                   | 0                   | 3              | 3            | 8                        | 9                    | 1              | 5                   | 1              | 6                      |
|  Slight/ moderate disturbance | 20                   | 4                   | 7              | 1            | 2                        | 18                   | 3              | 6                   | 2              | 2                      |
|  Highly disturbed             | 3                    | 2                   | 0              | 1            | 0                        | 5                    | 1              | 1                   | 1              | 1                      |
|  High                         | 12                   | 0                   | 0              | 0            | 3                        | 26                   | 0              | 9                   | 0              | 1                      |
|  Medium                       | 1                    | 0                   | 0              | 0            | 1                        | 3                    | 0              | 3                   | 0              | 5                      |
|  Low                          | 11                   | 1                   | 4              | 0            | 2                        | 2                    | 0              | 1                   | 0              | 1                      |
|  Absent                       | 15                   | 6                   | 6              | 5            | 5                        | 6                    | 6              | 0                   | 4              | 2                      |
|  High                         | 14                   | 1                   | 1              | 1            | 7                        | 24                   | 0              | 8                   | 0              | 0                      |
|  Medium                       | 7                    | 1                   | 3              | 1            | 1                        | 7                    | 0              | 4                   | 0              | 4                      |
|  Low                          | 11                   | 1                   | 4              | 1            | 2                        | 3                    | 0              | 1                   | 0              | 2                      |
|  Absent                       | 5                    | 4                   | 2              | 2            | 1                        | 2                    | 6              | 0                   | 4              | 2                      |
|  High                         | 31                   | 4                   | 7              | 4            | 9                        | 16                   | 0              | 4                   | 0              | 2                      |
|  Medium                       | 4                    | 2                   | 3              | 1            | 2                        | 9                    | 0              | 5                   | 0              | 2                      |
|  Low                        | 2                    | 1                   | 0              | 0            | 0                        | 7                    | 0              | 3                   | 0              | 1                      |
|  Absent                     | 0                    | 0                   | 0              | 0            | 0                        | 5                    | 6              | 1                   | 4              | 3                      |
|  High                       | 2                    | 0                   | 0              | 0            | 1                        | 6                    | 0              | 0                   | 0              | 0                      |
|  Medium                     | 1                    | 0                   | 0              | 0            | 0                        | 4                    | 3              | 6                   | 0              | 1                      |
|  Low                        | 3                    | 0                   | 2              | 0            | 3                        | 4                    | 3              | 5                   | 4              | 4                      |
|  Absent                     | 29                   | 7                   | 8              | 5            | 7                        | 22                   | 0              | 2                   | 0              | 3                      |
|  High                       | 8                    | 0                   | 0              | 0            | 1                        | 8                    | 3              | 8                   | 2              | 0                      |
|  Medium                     | 4                    | 0                   | 0              | 0            | 1                        | 12                   | 3              | 0                   | 0              | 4                      |
|  Low                        | 10                   | 2                   | 4              | 0            | 6                        | 7                    | 0              | 3                   | 2              | 1                      |
|  Absent                     | 13                   | 4                   | 6              | 5            | 3                        | 9                    | 0              | 2                   | 0              | 3                      |

NQ Dry Tropics Draft Environmental Values and Community Consultation Report

| Environmental Values   | Upper Burdekin Basin | Cape Campaspe Basin | Belyando Basin | Suttor Basin | Bowen Broken Bogie Basin | Lower Burdekin Basin | Coastal Waters | Bowen Coastal Basin | Coastal Waters | Ross (eastern section) |
|--|----------------------|---------------------|----------------|--------------|--------------------------|----------------------|----------------|---------------------|----------------|------------------------|
|  High     | 1                    | 0                   | 0              | 1            | 2                        | 4                    | 2              | 3                   | 1              | 5                      |
|  Medium   | 4                    | 0                   | 0              | 0            | 3                        | 11                   | 1              | 5                   | 2              | 0                      |
|  Low      | 14                   | 3                   | 5              | 0            | 3                        | 11                   | 3              | 4                   | 1              | 0                      |
|  Absent   | 7                    | 4                   | 5              | 4            | 3                        | 10                   | 0              | 1                   | 0              | 3                      |
|  High     | 14                   | 0                   | 0              | 1            | 3                        | 10                   | 5              | 6                   | 1              | 3                      |
|  Medium   | 4                    | 1                   | 0              | 0            | 3                        | 9                    | 1              | 4                   | 3              | 2                      |
|  Low      | 13                   | 1                   | 5              | 0            | 3                        | 13                   | 0              | 3                   | 0              | 0                      |
|  Absent   | 6                    | 5                   | 5              | 4            | 2                        | 4                    | 0              | 0                   | 0              | 2                      |
|  High     | 11                   | 0                   | 1              | 1            | 4                        | 5                    | 4              | 4                   | 2              | 5                      |
|  Medium   | 10                   | 1                   | 1              | 0            | 4                        | 16                   | 2              | 6                   | 2              | 3                      |
|  Low      | 10                   | 2                   | 4              | 1            | 2                        | 9                    | 0              | 3                   | 0              | 0                      |
|  Absent   | 1                    | 4                   | 4              | 3            | 1                        | 6                    | 0              | 0                   | 0              | 0                      |
|  High     | 17                   | 0                   | 5              | 1            | 5                        | 15                   | 0              | 6                   | 0              | 4                      |
|  Medium   | 3                    | 1                   | 0              | 0            | 3                        | 3                    | 0              | 0                   | 0              | 2                      |
|  Low      | 6                    | 0                   | 3              | 2            | 1                        | 10                   | 0              | 7                   | 0              | 0                      |
|  Absent | 12                   | 6                   | 2              | 2            | 2                        | 8                    | 6              | 0                   | 4              | 2                      |
|  High   | 2                    | 0                   | 0              | 0            | 0                        | 4                    | 0              | 1                   | 0              | 0                      |
|  Medium | 10                   | 0                   | 0              | 1            | 2                        | 5                    | 0              | 4                   | 0              | 3                      |
|  Low    | 1                    | 0                   | 3              | 1            | 1                        | 6                    | 0              | 6                   | 0              | 0                      |
|  Absent | 23                   | 7                   | 7              | 3            | 7                        | 21                   | 6              | 2                   | 4              | 5                      |
|  High   | 16                   | 0                   | 3              | 0            | 4                        | 9                    | 3              | 4                   | 2              | 5                      |
|  Medium | 3                    | 0                   | 0              | 0            | 0                        | 4                    | 1              | 4                   | 0              | 0                      |
|  Low    | 2                    | 1                   | 1              | 1            | 2                        | 14                   | 2              | 4                   | 2              | 1                      |
|  Absent | 15                   | 6                   | 5              | 3            | 5                        | 9                    | 0              | 1                   | 0              | 2                      |

**Table 3.** Draft Environmental Values ascertained from published sources and community feedback

| Burdekin Basins & sub-catchments |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| <b>Upper Burdekin Basin</b>      |   |   |   |   |   |   |   |   |   |   |   |   |
| 1. Allingham Creek               | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   |
| 2. Basalt River                  | ✓   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 3. Burdekin River (above dam)    | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 4. Burdekin River (Blue Range)   | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 5. Camel Creek                   | ✓   |   | ✓   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 6. Clarke River                  | ✓   |   |   | ✓   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 7. Douglas Creek                 | ✓   |   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 8. Dry River                     | ✓   |   |   | ✓   |   |   |   |   | ✓   |   | ✓   | ✓   |
| 9. Fanning River                 | ✓   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 10. Gray Creek                   | ✓   |   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 11. Hann Creek                   | ✓   |   | ✓   | ✓   |   |   | ✓   | ✓   | ✓   |   | ✓   | ✓   |
| 12. Keelbottom Creek             | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   |
| 13. Kirk River                   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   |
| 14. Lolworth Creek               | ✓   |   |   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |
| 15. Running River                | ✓   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 16. Star River                   | ✓   |   |   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 17. Upper Burdekin River         | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| <b>Cape Campaspe Basin</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| 18. Campaspe River               | ✓   |   | ✓   | ✓   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 19. Cape River                   | ✓   | ✓   | ✓   | ✓   |   |   |   |   | ✓   | ✓   |   | ✓   |
| 20. Lower Cape River             | ✓   | ✓   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 21. Rollston River               | ✓   |   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| <b>Belyando Basin</b>            |   |   |   |   |   |   |   |   |   |   |   |   |
| 22. Belyando floodplain          | ✓   | ✓   | ✓   | ✓   |   |   |   |   | ✓   | ✓   |   | ✓   |
| 23. Carmichael River             | ✓   |   | ✓   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 24. Fox Creek                    | ✓   |   |   | ✓   |   |   | ✓   |   | ✓   | ✓   |   | ✓   |
| 25. Mistake Creek                | ✓   | ✓   | ✓   | ✓   |   |   |   |   | ✓   | ✓   | ✓   | ✓   |
| 26. Native Companion Creek       | ✓   | ✓   | ✓   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 27. Sandy Creek                  | ✓   |   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 28. Upper Belyando River         | ✓   | ✓   | ✓   | ✓   |   |   |   |   | ✓   | ✓   |   | ✓   |

| Burdekin Basins & sub-catchments |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| <b>Suttor Basin</b>              |   |   |   |   |   |   |   |   |   |   |   |   |
| 29. Diamond Creek                | ✓   |   | ✓   | ✓   |   |   | ✓   | ✓   | ✓   |   |   | ✓   |
| 30. Logan Creek                  | ✓   | ✓   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 31. Lower Suttor River           | ✓   |   |   | ✓   |   | ✓   |   | ✓   | ✓   |   |   | ✓   |
| 32. Rosetta Creek                | ✓   | ✓   |   | ✓   |   |   |   |   | ✓   | ✓   | ✓   | ✓   |
| 33. Sellheim River               | ✓   |   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 34. Upper Suttor River           | ✓   |   |   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| <b>Bowen Broken Bogie Basin</b>  |   |   |   |   |   |   |   |   |   |   |   |   |
| 35. Bogie River                  | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |
| 36. Bowen River                  | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 37. Broken River                 | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |
| 38. Glenmore Creek               | ✓   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   |   |   | ✓   |
| 39. Little Bowen River           | ✓   |   | ✓   | ✓   |   |   | ✓   | ✓   | ✓   | ✓   |   | ✓   |
| 40. Pelican Creek                | ✓   | ✓   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 41. Rosella Creek                | ✓   |   |   | ✓   |   |   |   |   | ✓   |   | ✓   | ✓   |
| <b>Lower Burdekin Basin</b>      |   |   |   |   |   |   |   |   |   |   |   |   |
| 42. Barratta Creek               | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |   |   | ✓   |
| 43. Burdekin Delta               | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 44. Burdekin River (below dam)   | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 45. Haughton River               | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 46. Landers Creek                | ✓   | ✓   |   | ✓   |   |   |   |   | ✓   |   |   | ✓   |
| 47. Stones Creek                 | ✓   |   |   | ✓   |   |   | ✓   | ✓   | ✓   |   |   | ✓   |
| 48. Upstart Bay                  | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| Coastal Waters                   | ✓   |   |   |   |   | ✓   | ✓   | ✓   | ✓   |   |   | ✓   |
| <b>Bowen Coastal Basin</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| 49. Abbot Bay                    | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 50. Don River                    | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| Coastal Waters                   | ✓   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   |   |   | ✓   |
| <b>Black Ross Basin</b>          |   |   |   |   |   |   |   |   |   |   |   |   |
| 52. Ross River (eastern section) | ✓   | ✓   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |

## **Groundwater desktop study**

The aim of the desk-stop study undertaken by Dr. Ian Dight was to use available resources to identify the Environmental Values of groundwater within sub-catchments of the Burdekin Dry Tropics NRM region. This study excluded the Black and Ross (Townsville) sub-catchments, which have previously been documented.

The following sources of information were used to determine Environmental Values for groundwater:

- Personal knowledge and communications with landholders and community groups
- Department of Natural Resources and Mines (DNRM) Groundwater Database
- DNRM Interactive Resource and Tenure Maps
- Burdekin Water Quality Improvement Plan (WQIP) Catchment Atlas
- (Draft) North Queensland Regional Water Supply Strategy – Existing Water Availability Assessment Report, August 2010
- Evaluation of groundwater as a future water source option within the North Queensland Regional Water Supply Strategy area – Final Report, 2010

Personal knowledge and communications with landholders has confirmed that most grazing properties, particularly those in drier, more remote areas of the region, rely on bore water (groundwater) for farm use and stock watering. While rain water collected in tanks is preferred for drinking water, this source is usually supplemented by groundwater sources (including the use of spikes within wet or dry water courses) as rainwater availability decreases towards the end of the dry season and/or during low rainfall years.

The presence of bores in all sub-catchments, as ascertained by application of the DNRM Groundwater Database, reflects this widespread use of groundwater. It should be noted, however, that as licenses for the extraction of groundwater for farm use, small scale pasture irrigation and stock watering are not required outside prescribed areas along the coast (i.e. most of the Burdekin River Basin) information within the Groundwater Database on farm bores is incomplete.

The high density of bores in areas of intensive agriculture for sugar, horticulture and grains (the coastal sub-catchments between Giru and Bowen, and in the Suttor Basin) strongly reflects the use of groundwater within these sub-catchments for irrigation. The Burdekin WQIP Catchment Atlas identified the distribution of sub-catchments where intensive agriculture, including dryland cropping, was being undertaken.

Application of DNRM Interactive Resource and Tenure Maps for production permits granted for mining leases, where these coincided with the presence of bores, provided a strong indication of groundwater use for industrial purposes. The widespread use of groundwater for stock watering, farm use, irrigation and industrial purposes, as well as some town water supplies was confirmed in the use, irrigation and industrial purposes, as well as some town water supplies was confirmed in the North Queensland Regional Water Supply Strategy reports listed above and unpublished information collected through consultation with community groups for the Burdekin WQIP.

## **Groundwater use in urban centres**

The Charters Towers, Isaac, Barcaldine, Whitsunday and Burdekin Councils were contacted regarding groundwater use in urban centres. The majority of urban centres in the Charters Towers region utilise surface water supplies through direct pumping from rivers, dams, weirs or through spear points into nearby rivers or streams. However, some small townships such as Pentland, rely completely on

groundwater. Glenden is the main town within the Burdekin Catchment area of Isaac Council and is supplied via piped surface water sourced from the Bowen River.

There is limited underground water used for urban purposes in the Whitsunday Council region with the majority of water for Bowen, for example, piped from the Proserpine River, although this is supplemented by groundwater from the Bowen GMA – Don River aquifer. This would therefore be integrated into the full suite of domestic and urban uses for the town. Collinsville is supplied from the Bowen River Weir.

Alpha, in the Barcaldine Council area, is dependent on three bores for all domestic and urban uses, including drinking, parks and recreation eg the swimming pool, and light industrial.

The towns and residential areas surrounding Ayr and Home Hill in the Burdekin Council region are supplied by a number of bores. The water is used for all domestic and urban uses but has treatment and infrastructure maintenance issues due to high levels of iron and manganese. The small township of Dalbeg also relies on groundwater supplies supplied from three bores managed by SunWater.

### **Survey feedback on groundwater**





Not all survey respondents answered the groundwater questions. However, there was a total of 90 responses. Generally, all sub-catchments recorded high and medium values for farm, stock and drinking uses for groundwater.

Industrial uses were broadly reported and irrigation was also recorded outside of known irrigation areas. One comment indicated use for irrigation of grass for livestock “Gardens, household uses, irrigation of grass for stock, storing for emergency uses/for fire fighting, and store in tanks to use when rain water gets low”.

Other comments included “Groundwater is also used to reduce the risk of saltwater intrusion into coastal aquifers from strategic recharge pits in the lower Burdekin.”

A comment from the Burdekin (Blue Range) sub-catchment was about the use of groundwater in mining camps (gold, diatomaceous earth, other heavy metals) and for use in mining from the Rollston River sub-catchment.

**Table 4.** Draft Environmental Values for groundwater

| Burdekin Basins & sub-catchments |  |  |  |  |  |
|----------------------------------|---|---|---|---|---|
| <b>Upper Burdekin Basin</b>      |   |   |   |   |   |
| 1. Allingham Creek               | ✓   | ✓   | ✓   | ✓   | ✓   |
| 2. Basalt River                  | ✓   | ✓   | ✓   | ✓   | ✓   |
| 3. Burdekin River (above dam)    | ✓   | ✓   | ✓   | ✓   | ✓   |
| 4. Burdekin River (Blue Range)   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 5. Camel Creek                   |   | ✓   | ✓   | ✓   | ✓   |
| 6. Clarke River                  |   | ✓   | ✓   | ✓   | ✓   |
| 7. Douglas Creek                 |   | ✓   | ✓   | ✓   | ✓   |
| 8. Dry River                     |   | ✓   | ✓   | ✓   | ✓   |
| 9. Fanning River                 |   | ✓   | ✓   | ✓   | ✓   |
| 10. Gray Creek                   |   | ✓   | ✓   | ✓   | ✓   |
| 11. Hann Creek                   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 12. Keelbottom Creek             |   | ✓   | ✓   | ✓   | ✓   |
| 13. Kirk River                   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 14. Lolworth Creek               |   | ✓   | ✓   | ✓   | ✓   |
| 15. Running River                |   | ✓   | ✓   | ✓   | ✓   |
| 16. Star River                   |   | ✓   | ✓   | ✓   |   |
| 17. Upper Burdekin River         |   | ✓   | ✓   | ✓   | ✓   |
| <b>Cape Campaspe Basin</b>       |   |   |   |   |   |
| 18. Campaspe River               |   | ✓   | ✓   | ✓   | ✓   |
| 19. Cape River                   |   | ✓   | ✓   | ✓   | ✓   |
| 20. Lower Cape River             |   | ✓   | ✓   | ✓   |   |
| 21. Rollston River               |   | ✓   | ✓   | ✓   | ✓   |
| <b>Belyando Basin</b>            |   |   |   |   |   |
| 22. Belyando floodplain          |   | ✓   | ✓   | ✓   |   |
| 23. Carmichael River             |   | ✓   | ✓   | ✓   |   |
| 24. Fox Creek                    |   | ✓   | ✓   | ✓   |   |
| 25. Mistake Creek                | ✓   | ✓   | ✓   | ✓   | ✓   |
| 26. Native Companion Creek       | ✓   | ✓   | ✓   | ✓   | ✓   |
| 27. Sandy Creek                  |   | ✓   | ✓   | ✓   |   |
| 28. Upper Belyando River         |   | ✓   | ✓   | ✓   |   |
| <b>Suttor Basin</b>              |   |   |   |   |   |
| 29. Diamond Creek                | ✓   | ✓   | ✓   | ✓   |   |
| 30. Logan Creek                  | ✓   | ✓   | ✓   | ✓   | ✓   |
| 31. Lower Suttor River           |   | ✓   | ✓   | ✓   | ✓   |
| 32. Rosetta Creek                |   | ✓   | ✓   | ✓   | ✓   |
| 33. Sellheim River               |   | ✓   | ✓   | ✓   | ✓   |
| 34. Upper Suttor River           | ✓   | ✓   | ✓   | ✓   | ✓   |
| <b>Bowen Broken Bogie Basin</b>  |   |   |   |   |   |
| 35. Bogie River                  | ✓   | ✓   | ✓   | ✓   | ✓   |
| 36. Bowen River                  |   | ✓   | ✓   | ✓   |   |
| 37. Broken River                 |   | ✓   | ✓   | ✓   |   |
| 38. Glenmore Creek               |   | ✓   | ✓   | ✓   |   |
| 39. Little Bowen River           | ✓   | ✓   | ✓   | ✓   | ✓   |
| 40. Pelican Creek                | ✓   | ✓   | ✓   | ✓   | ✓   |
| 41. Rosella Creek                |   | ✓   | ✓   | ✓   | ✓   |
| <b>Lower Burdekin Basin</b>      |   |   |   |   |   |
| 42. Barratta Creek               | ✓   | ✓   | ✓   | ✓   | ✓   |
| 43. Burdekin Delta               | ✓   | ✓   | ✓   | ✓   | ✓   |
| 44. Burdekin River (below dam)   | ✓   | ✓   | ✓   | ✓   | ✓   |
| 45. Haughton River               | ✓   | ✓   | ✓   | ✓   | ✓   |
| 46. Landers Creek                | ✓   | ✓   | ✓   | ✓   | ✓   |
| 47. Stones Creek                 |   | ✓   | ✓   | ✓   | ✓   |
| 48. Upstart Bay                  | ✓   | ✓   | ✓   | ✓   | ✓   |
| <b>Bowen Coastal Basin</b>       |   |   |   |   |   |
| 49. Abbot Bay                    | ✓   | ✓   | ✓   | ✓   | ✓   |
| 50. Don River                    | ✓   | ✓   | ✓   | ✓   | ✓   |
| <b>Black Ross Basin</b>          |   |   |   |   |   |
| 52. Ross River (eastern section) | ✓   | ✓   | ✓   | ✓   | ✓   |



## Acknowledgements

Financial and in-kind support from the Queensland Government through Q2 Coasts and Country Regional NRM Program investment is gratefully acknowledged.

NQ Dry Tropics staff have been particularly helpful in delivery of the project and mention should be made of GIS support from Laise Harris, and Sayaka Amano; field officers Rosie Sheather, Lisa Baynes, Laura Dunstan, Jared Sunderland, Amy Basnett, and Laurent Verpeaux; TO coordinator Natalie Friday; and administration staff, especially Leeanne Cavanough for her organisational skills. Dr. Ian Dight, (Strategic NRM Outcomes), was a mine of information and help through his previous involvement in the development and publishing of the *Burdekin Water Quality Improvement Plan 2009*.

NQ Dry Tropics acknowledges the ongoing efforts of community members committed to sustainable natural resource management. In particular, the stakeholders and land managers, Traditional Owners, agricultural groups, industry, Council and Government officers including representatives from the Department of Environment and Heritage Protection for providing their views and advice on the Environmental Values of the waters that they manage and utilise.

## References

Bruinsma, C. et al 1999. *Queensland Coastal Wetland Resource Investigation of the Bowen Region, Cape Upstart to Gloucester Island*, QDPI Fisheries.

DEHP June 2012. *Draft Ross River Basin Environmental Values and Water Quality Objectives*, Healthy Waters Policy Unit, Department of Environment and Heritage Protection.

Dight I. et al 2007. *Draft Environmental Values and Water Quality Objectives for the Estuarine and Coastal areas of the Lower Burdekin region*. Burdekin Solutions Ltd, Townsville.

Dight, I. ed. June 2009. *Burdekin Water Quality Improvement Plan, Better Water for the Future*. NQ Dry Tropics, Townsville.

Dight, I. ed. June 2009. *Burdekin Water Quality Improvement Plan, Catchment Atlas*. NQ Dry Tropics, Townsville.

Greiner R., Hall N. 2006. *Social, Economic, Cultural and Environmental Values of Streams and Wetlands in the Burdekin Dry Tropics Region*. Burdekin Solutions Ltd, Townsville.

Parsons Brinckerhoff May 2006. *Initial Advice Statement, Water for Bowen Project*, SunWater.

Environmental values - Environmental Protection (Water) Policy 2009  
<http://www.ehp.qld.gov.au/water/policy/index.html>

Environmental values (EVs) and Water Quality Objectives (WQOs)  
[http://www.ehp.qld.gov.au/water/policy/what\\_are\\_evs\\_wqos.html](http://www.ehp.qld.gov.au/water/policy/what_are_evs_wqos.html)

Healthy Waters Management Plans (HWMPs) and Water Quality Improvement Plans (WQIPs)  
[http://www.ehp.qld.gov.au/water/policy/water\\_quality\\_improvement\\_plans.html](http://www.ehp.qld.gov.au/water/policy/water_quality_improvement_plans.html)

Frequently asked questions  
[http://www.ehp.qld.gov.au/water/policy/frequently\\_asked\\_questions.html](http://www.ehp.qld.gov.au/water/policy/frequently_asked_questions.html)

## Appendix

Example on-line survey (through *SurveyMonkey*)



### Environmental Values Survey

#### Introduction

Thank you for setting aside a short period of your time to complete this survey.

Your assistance will help build a clear understanding of the Environmental Values of the waters of the Burdekin Dry Tropics Region.

Environmental values are the qualities of waterways that need to be protected from the effects of pollution, waste discharges and other human induced threats.

Waterways have particular values that support aquatic ecosystems and make them suitable for various human and rural uses eg drinking water, fisheries, irrigation, stock water, and recreation.

The Environmental Values that are established will lead to the development of water quality guidelines for the waters of the Burdekin Dry Tropics region.

Next

### Basin and Sub-catchment

Environmental values for the sub-catchments of the Burdekin Dry Tropics region have been drafted following previous consultation and research. Your input will increase the understanding of these draft values.

Please think about the rivers, streams, creeks and wetlands on your property or in your area when you answer the following questions.

**Please select the sub-catchment relevant to your property's location.**

Please select the sub-catchment relevant to your property's location.



|      |      |
|------|------|
| Prev | Next |
|------|------|

## Environmental Values Survey

### Upstart Bay

Upstart Bay is a small coastal sub-catchment where the major land use is grazing on native pastures.

The icons shown below represent current recorded Environmental Values within this sub-catchment.



1. Please indicate the condition of Aquatic Ecosystems (i.e. the in-stream or water body, beds, banks and fringing vegetation) and their role within your area.

- High (unmodified, highly valued aquatic ecosystems in which ecological integrity is regarded as intact e.g. National Parks, conservation reserves &/or inaccessible locations)
- Medium (may have been reduced by farming, grazing, resource use or other activities, but where biological communities remain in healthy condition)
- Low (highly modified ecological values due to human, primary or secondary industry, resource use or other activities)

2. Please indicate if the following are found for waters in your area and describe the value you place on them.

|   | High                  | Medium                | Low                   | Absent                |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Irrigation e.g. cane irrigation, forage crops, horticulture etc | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Farm supply/use e.g. farm water supply, packing sheds etc       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Stock watering e.g. cattle                                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Aquaculture e.g. barramundi, prawns                             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Human consumption of wild or stocked fish etc                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Primary recreation e.g. swimming or snorkelling                 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|   | <b>High</b>           | <b>Medium</b>         | <b>Low</b>            | <b>Absent</b>         |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Secondary recreation e.g. fishing, canoeing, boating            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Visual appreciation e.g. picnic, bush walking, sightseeing      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Drinking water - water supplies for drinking                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Industrial use e.g. factories, energy industry                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cultural and spiritual values e.g. traditional lore and customs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**3. Do you utilise groundwater from bores etc and please indicate the values you place on that water.**

|   | <b>High</b>           | <b>Medium</b>         | <b>Low</b>            | <b>Absent</b>         |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Irrigation e.g. cane irrigation, forage crops, horticulture etc | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Farm supply/use e.g. farm water supply, packing sheds etc       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Stock watering e.g. cattle                                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Drinking water - water supplies for drinking                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Industrial use e.g. factories, energy industry                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**4. Please indicate any other uses of groundwater in your area.**