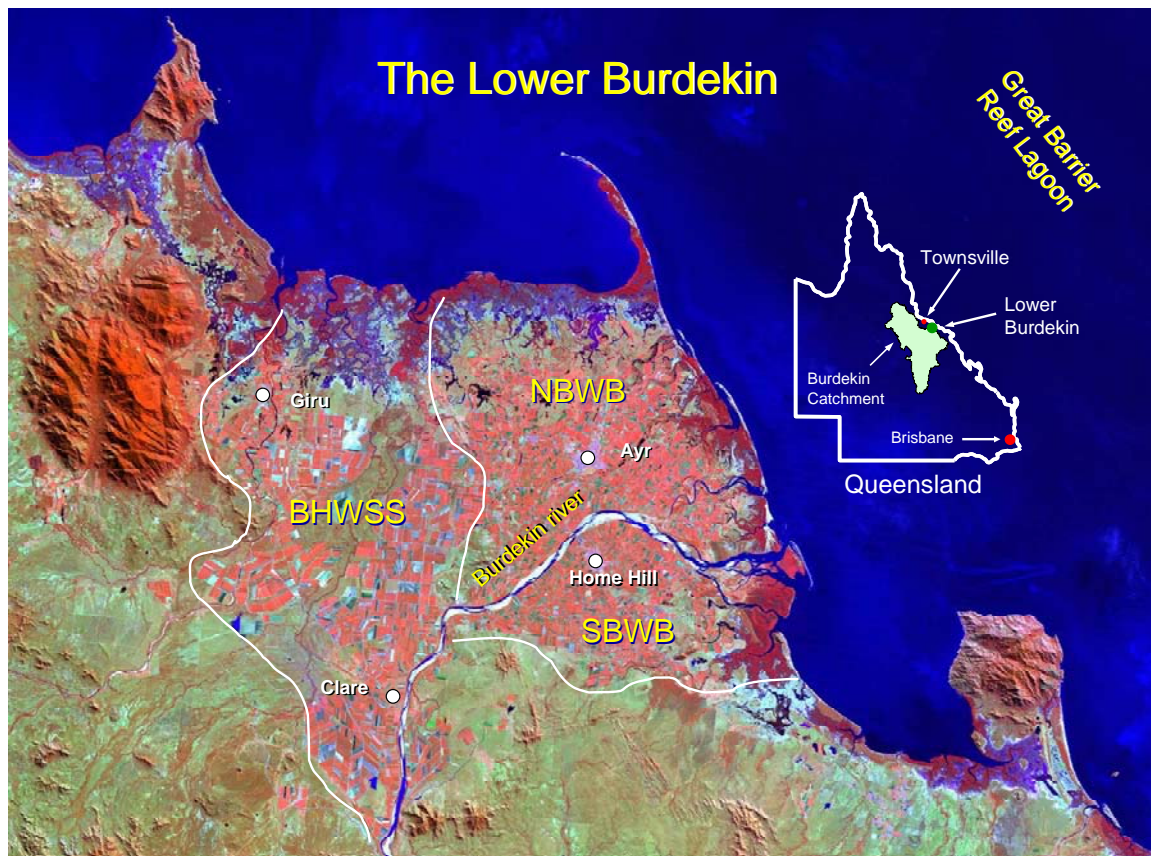


## CRC IF Annual Research Forum 2007

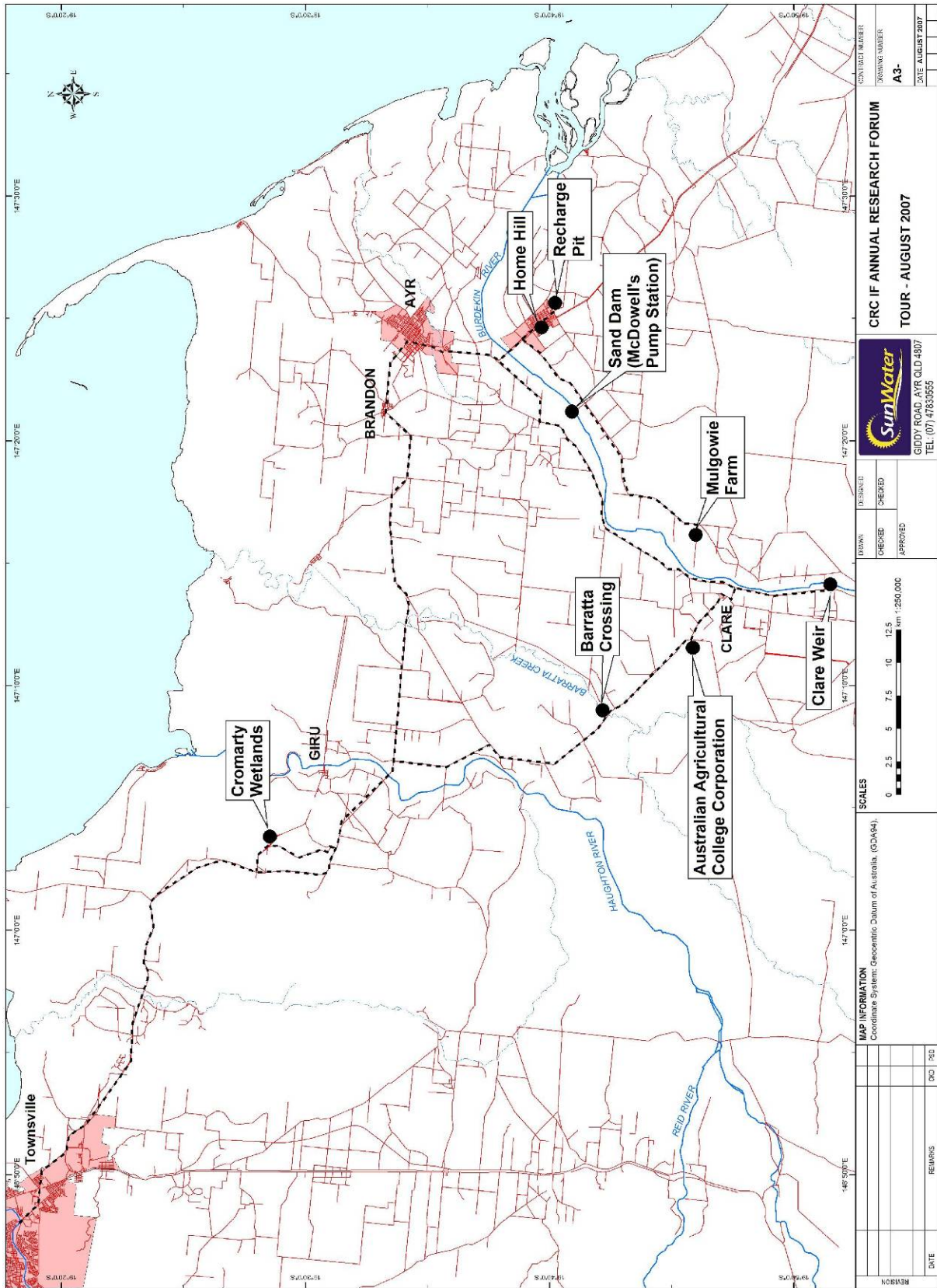
### Lower Burdekin Field Trip

12 September 2007



*The lower Burdekin floodplain, located some 90 kilometres southeast of Townsville, is Queensland's premier irrigation area with 3 subcomponents managed by the North Burdekin Water Board (NBWB), South Burdekin Water Board (SBWB) and SunWater (the Burdekin Haughton Water Supply Scheme BHWSS)*

# LOWER BURDEKIN FIELD TRIP ROUTE



<b>MAP INFORMATION</b> Coordinate System: Geocentric Datum of Australia (GDA94)		<b>SCALE</b> 0 2.5 5 7.5 10 12.5 km 1:250,000	
DRAWN <input type="checkbox"/> CHECKED <input type="checkbox"/> APPROVED	DESIGNED <input type="checkbox"/> CHECKED <input type="checkbox"/> APPROVED	<b>SunWater</b> GDDY ROAD AYR QLD 4807 TEL: (07) 47839555	
<b>CRC IF ANNUAL RESEARCH FORUM</b> <b>TOUR - AUGUST 2007</b>		DRAWING NUMBER <b>A3-</b>	DATE AUGUST 2007
REVISION NO. DATE DESCRIPTION	DATE	DRAWN	CHECKED

## LOWER BURDEKIN FIELD TRIP SCHEDULE

WEDNESDAY 12 <sup>TH</sup> SEPTEMBER 2007	
TIME	DETAILS
7.00 am	Coaches to collect delegates from: Holiday Inn, Hotel Ibis, Quest Apartments
7.30 am	Depart outskirts of Townsville
9.00 am	Arrive Mulgowie Farm ( <a href="http://www.mulgowie.com.au/">http://www.mulgowie.com.au/</a> ) Mark Goos to address delegates
10.00 am	Depart Mulgowie Farm
10.15 am	Stop at the McDowell's River Pump Station - Sand dam inspection Andrew Kelly to address delegates Biscuits, fruit & water available in eskies
10.45 am	Comfort Stop, Home Hill
11.00 am	Depart Comfort Stop
11.10 am	Arrive Recharge Pit – opposite Home Hill school Andrew Kelly to address delegates
11.45 am	Depart Recharge Pit
12.15 pm	Arrive Clare Weir Gary Everson (SunWater) to address delegates
12.45 pm	Depart Clare Weir
1.15 pm	Arrive Burdekin Agricultural College Welcome address by Robyn O'Sullivan Lunch provided
3.00 pm	Depart Burdekin Agricultural College
	Stop at Barratta's crossing Scott Crawford to address delegates – NRM, rising GW's, WQ issues
4.15 pm	Arrive Ramsar listed Cromarty Wetlands Mark Stoneman to address delegates Biscuits, fruit & water available in eskies
5.00 pm	Depart Ramsar Wetlands
5.45 pm	Arrive Townsville outskirts
6.00 pm	Return delegates to: Holiday Inn, Hotel Ibis, Quest Apartments
7.00 pm	CRC IF ARF Formal Dinner – Holiday Inn

## THE LOWER BURDEKIN – GENERAL OVERVIEW

The lower Burdekin coastal floodplain is situated in the wet-dry tropics approximately 90 kilometres southeast of Townsville on the northeast coast of Queensland, Australia. It is Queensland's premier irrigation area with more than 80,000 ha of irrigated land supported by plentiful supplies of sunshine (>300 days a year) and water, with the water supplied by rainfall, from large coastal groundwater systems, and from the Burdekin dam. The lower Burdekin is through its position located in close proximity to environmentally sensitive wetlands (Ramsar listed), waterways, estuaries, and the Great Barrier Reef Lagoon. The average annual rainfall and evaporation is about 1000 mm/yr and 2080 mm/yr, respectively. The rainfall is, however, highly variable with annual totals ranging from <200 mm/yr to >1800 mm/yr (Figure 1). In addition to having a highly variable inter-annual rainfall, the lower Burdekin also exhibits a strongly seasonal trend with two thirds of the rain falling in summer (January to March, inclusive; Figure 2).

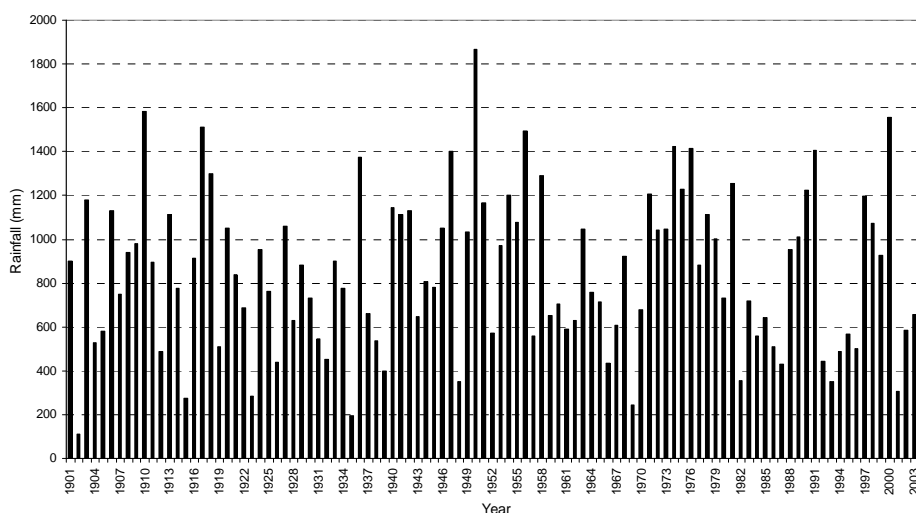


Figure 1: Annual rainfall at Claredale between 1901 and 2004

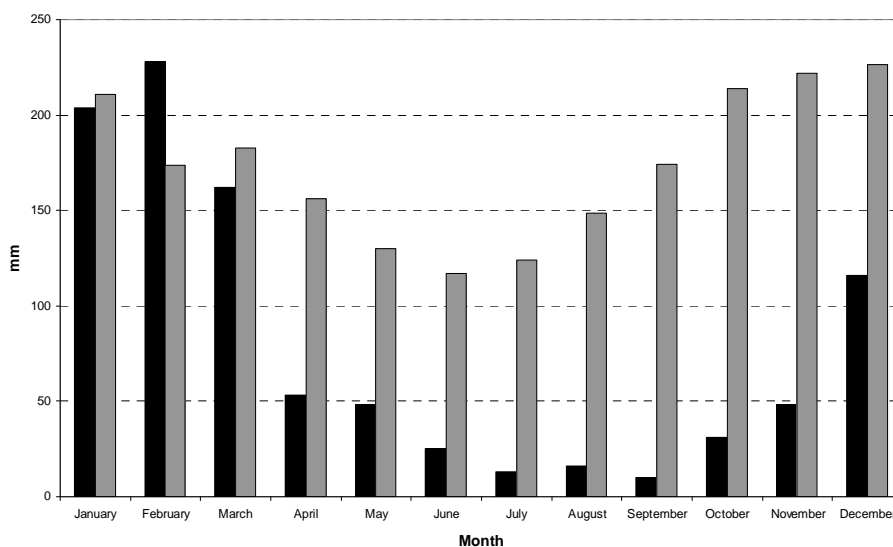


Figure 2: Average monthly rainfall (black) and average monthly evaporation (grey) recorded at the Ayr DPI station (55 years of data)

There are currently three different 'management zones' in the lower Burdekin (see figure on front page). The Burdekin-Haughton Water Supply Scheme (BHWSS) lies mainly to the north and west of the Burdekin River. It is underlain to a significant extent by relatively shallow groundwater systems, and is managed by SunWater, a government owned corporation. Rising water tables and secondary salinisation are an increasing concern in parts of the BHWSS. Nearly all of the remaining irrigated area falls within the Burdekin delta system, which lies closer to the coast on both the north and south side of the Burdekin River. These areas are managed by the North and South Burdekin Water Boards, respectively, which are autonomous Boards independently funded by industry. The delta Water Board areas are unique in that they overlies shallow major groundwater supplies which are used for irrigation and water pricing and water management practices have in general evolved in response to local needs. Considerable care is needed in the delta to maintain adequate groundwater levels to avoid the threat of seawater intrusion. The lower Burdekin as a whole has a reputation for producing some of the highest yields and highest quality sugarcane in Australia,

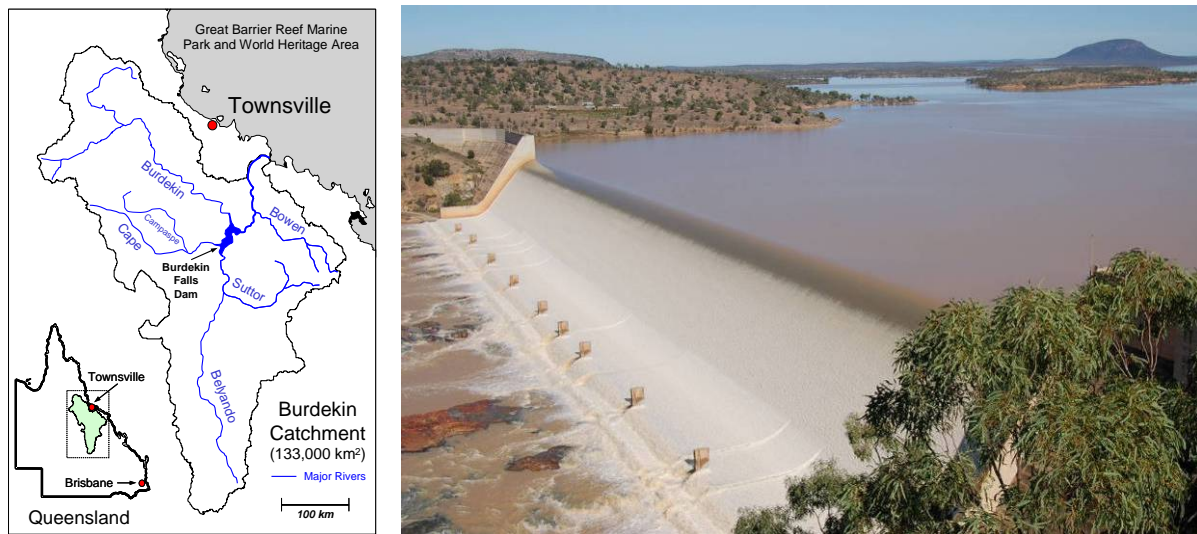
The main natural resource management issues in the lower Burdekin involve water quality (sediments, nutrients, salts, agrochemicals), salinity (dryland, irrigated, saltwater intrusion), land degradation (erosion, soil acidity, salinisation), weeds, loss of riparian vegetation and change to river flows, aquatic weeds, loss of biodiversity (native vegetation, animal species), loss of wetlands, and feral animals. The regional NRM body (Burdekin Dry Tropics NRM; <http://www.burdekindrytropics.org.au/>) is taking a proactive approach working with governments and community to address many of these issues. The Water Resource (Burdekin Basin) Plan 2007 (see <http://www.nrw.qld.gov.au/wrp/burdekin.html>) has also just been released. It currently deals only with the surface water, but will address both surface and groundwater as a single resource once the groundwater amendment is completed.

In 2005 the estimated population of the Burdekin Shire was 18,752. The main towns in the lower Burdekin are Ayr (pop 8515), Home Hill (pop 2946), Brandon (pop 850) and Giru (pop 589). A recent population profile has highlighted the trend toward an aging population with the 45+ age group now making up 38.7% of the population (up from 32.2% in 1991/92). The economy is heavily dependent upon agricultural industry with nearly 43% of the workforce employed directly in agriculture (26%) or manufacturing (16%; mainly in the 4 local sugar mills) with a significant majority of the remainder employed with associated support industries. Sugarcane dominates the economic landscape accounting for 78% of the Shire's 2001 agricultural production value. Beef (6%), melons (5%), mangos (5%) and other horticultural crops (capsicums, beans, pumpkins, tomatoes and eggplants) made up the rest. There is also a growing aquaculture industry in the lower Burdekin. The sugarcane industry often faces significant challenges with low world sugar prices and a variable exchange rate (note that the Queensland sugar industry exports more than 80 to 85 percent of its total raw sugar production). As a result, a number of crops complementary to the sugarcane rotation are being investigated by an increasing number of farmers. The proximity of Townsville, with a rapidly expanding population (currently estimated at 160,000) will have an impact upon economic development into the future.

## **THE BURDEKIN FALLS DAM**

The Burdekin Falls dam (Figure 3) forms Lake Dalrymple, which covers an area of 22,400 hectares, approximately five times the area of Sydney Harbour, and ponds water for 50 kilometres up the Burdekin River. As well as the 630,000 cubic metres of concrete that went into the main dam wall, earth and rockfill saddle dams also had to be built to prevent water held by the dam escaping through the low areas around the lake during flood events. These saddle dams are major constructions in their own right. The left bank saddle dam is 1,150 metres long and required 960,000 cubic metres of rockfill material, while the Mt Graham

saddle dam is 3,500 metres long and required 900,000 cubic metres of earth and rockfill material.



*Figure 3: The Burdekin catchment and a picture of the Burdekin Falls Dam wall. The size of the dam belies the amount of water that is actually overflowing the spillway (picture taken 4/7/07)*

Construction of the Burdekin Falls Dam was completed in 1987 and it filled to its storage capacity of over 1.8 million ML following the wet season in 1988. On the 4<sup>th</sup> July 2007 (Figure 3) the water was running 0.5 metre over the 504 m long spillway; a “spill” of about 20,000 ML per day. To put this number into context, the average daily consumption for SE Qld is around 542 ML.

One of the key unexpected issues associated with the dam is the permanent turbidity of the dam water. Three main sub-catchments feed into the Burdekin Dam; the Cape-Campaspe, the Belyando-Suttor and the Upper Burdekin (Figure 3). Due to the presence of widespread areas of very fine clay soils and the probable contributions from extensive land clearing, the Belyando-Suttor is very turbid. Large amounts of fine clay soils also come from other catchments during storm events. When flows from the Belyando-Suttor sub-catchment, and elevated flows from the other sub-catchments are trapped by the dam, some fractions of the sediment remain in suspension due to a complex interplay of mineralogy, pH, temperature and other physical and chemical factors. Despite presumptions that the impounded water would become clear (especially with “turn-over” of the dam due to temperature inversion) this has only occurred once since the dam filled in 1988, and that particular occurrence was after the floods precipitated by rainfall following Cyclone Joy in early 1991. Today, the main mechanism to control water quality is the ability to select water from particular strata in the water column, and the top 6 metres is normally used to minimise problems with alkalinity, turbidity, and low levels of oxygen. Temperature differences with depth are not normally an issue.

For further info on the Burdekin Falls Dam and associated issues see <http://www.clw.csiro.au/naif/documents/2007/ReportBurdekinDamFieldTrip04-07-07.pdf>

## **THE NORTH BURDEKIN (NBWB) AND SOUTH BURDEKIN WATER BOARD (SBWB)**

The North and South Burdekin Water Boards were established as independent groundwater replenishment authorities in 1965-66 to deal with a severe groundwater overdraft situation.

There was extensive seawater intrusion and the Burdekin delta aquifer was in a position of virtual collapse.



Ever since they were established, the primary purpose of the Water Boards has been environmental, namely to replenish the aquifer, including use of large recharge pits (see picture to the left), to maintain aquifer health. The survival of industry based on irrigated agriculture consequently depends on the Boards success or failure in achieving their replenishment goals. At the time, the concept of recharge on the scale envisaged was unique in Australia, as was the self funding and local management aspects of the Water Boards. Today the Water Boards remain

responsible for the economic and environmentally sustainable maintenance of the groundwater resource within respective water areas.

Sugarcane continues to be the predominant agricultural crop, and even at minimal profit levels, the cane industry employs over 1500 people directly, providing 4.1 M tonnes of sugar cane each year from 41,000 hectares of irrigated land.

The Burdekin Delta has managed its resource wisely through replenishment activities provided exclusively by the two Water Boards operating on a user pays cost recovery basis, collectively spending some \$5 M annually to administer the coastal aquifer systems.

Both Boards are registered Water Service Providers under the Queensland Water Act 2000 and hold a combined water allocation of 210,000 ML from the Burdekin Falls Dam, which is supplied by the Government Owned Corporation SunWater via the Burdekin River. In addition, a further 40,000 ML has been purchased between both Boards to service increased sales.

### ***The Burdekin Delta Aquifer***

The Burdekin Delta is an open aquifer. Good quality groundwater is contained against the sea with constant leakage to the ocean. The Delta Aquifer is subject to a number of processes which affect water levels, namely

- Rainfall recharge
- River recharge
- Artificial recharge
- Flood recharge
- Irrigation withdrawal
- Leakage to the Ocean

### ***Water Service and Access***

Customers who operate subartesian bores (to draw water for urban, domestic or irrigation purposes) directly from the aquifer replenished by the Board may access supply on a needs basis. No licence or Board approval for connection to the Boards groundwater system is required; however area rates apply to irrigated area.

Customers with Board approval to take surface water must comply with agreement conditions and pay for water used on a volumetric basis.

Key features and statistical information regarding the Burdekin Delta Water Boards are given in Table 1.

Table 1: Key features and statistical information regarding the North and South Burdekin Water Boards

	<b>North Burdekin Water Board 2006/2007</b>	<b>South Burdekin Water Board 2006/2007</b>
Total Benefited Area	26,825 ha	27,450 ha
Length of Pipelines	18.3 km	13.9 km
Length of Channels	203 km	116 km
Number of Recharge Pits	9	41
Farms Pumping from channels/lagoons	374	125
Number of Pumping Permits/Alternate Sites	411	231
Area under sugar cane	25,818 ha	15,191 ha
Other Crops	1,107 ha	467 ha
Surface Water pumped from Burdekin River into Water Area	156,000 ML	83,863 ML
Surface Water distributed to irrigate 9,180 ha	93,317 ML	51,074 ML
Replenishment via recharge pits	22,706 ML	8,827 ML
Replenishment via in-channel intrusion	39,977 ML	24,529 ML
<b>Water Charges</b>	<b>North Burdekin Water Board 2006/2007</b>	<b>South Burdekin Water Board 2006/2007</b>
Assessable Area Charge	\$102.00 per ha	\$78.36 per ha
Surface Water (up to 4 ML/ha)	\$4.80 per ML	\$5.40 per ML
Excess Surface Water (above 4 ML/ha)	\$13.97 per ML	\$13.97 per ML

## THE SUNWATER BURDEKIN HAUGHTON WATER SUPPLY SCHEME (BHWSS)

The first development in what today is known as the BHWSS area took place in the 1950s with the establishment of 5,000 hectares of irrigated farming land at Clare, Millaroo and Dalbeg. Water for this development, which was referred to then as the Burdekin River Irrigation Project, was secured from natural flows in the river. The inconsistent supply of water, particularly in the drier months, restricted further development in the region.

In March 1980, the Queensland Parliament announced plans to dramatically expand the Burdekin River Irrigation Project, developing new irrigation farms serviced by extensive channel systems. The Burdekin Falls Dam was constructed as a water source for this new farming venture. Details of the Burdekin Falls Dam are included above.

Water is released from the Burdekin Falls Dam (BFD; see the BFD section above) to Clare Weir, which forms a pumping pool and regulating structure. From here it is distributed through several pump stations, pipelines, balancing storages and channels to the irrigation area, and along the Burdekin River to the North and South Burdekin Water Boards and other river customers.

### **Clare Weir (see picture on right)**

- 3 Days travel time from BFD to Clare Weir
- Storage Capacity is 15,900 ML
- It includes 150 Hydraulic Gates
- River regulation and pumping pool



### Pump Stations

- Tom Fenwick (Haughton) 5 pumps; 1 conventional dry well, 4 concrete volute pumps
- Total Capacity is 35,000 L/s
- Pump stations for the Elliot, Clare, Millaroo and Dalbeg sections

### Water Distribution


- Water Ordering; Interactive Voice Recording (48 hrs advance notice)
- System hydraulically modelled to match demands and highlight system limits
- SCADA controlled regulation gates allow remote operational controls
- System closed for 2 weeks per year in June for maintenance

Customer allocations and water deliveries as given in the 2005/06 Annual Report are given in Table 2. Fees and charges for 2007/2008 are given in Table 3.

Table 2: Customer allocations and water deliveries (2005/06)

Customer segment	No. of customers	Customer Allocations (ML)	Water Deliveries (ML)
Industrial		776	961
Irrigation		608,523	509,928
Urban		10,538	3,091
<b>TOTAL</b>	<b>401</b>	<b>619,837</b>	<b>513,980</b>

Table 3: Fees and charges schedule for 2007/2008

Fees and charges schedule - 2007/2008 (Effective from 1st July 2007)			
<b>BURDEKIN HAUGHTON Water Supply Scheme</b>			
Charges for Rural Irrigation Water			
<b>Two Part Tariff</b>		<b>Charges</b>	<b>\$/ ML</b>
<b>Part A:</b> Based on your water allocation and applied quarterly in advance	Burdekin River	Part A	2.08
		Part B	12.27
<b>Part B:</b> Usage charge for the actual water you have used based on meter readings for the previous quarter	Burdekin Channel	Part A	25.80
		Part B	16.53
<sup>1</sup> The charges apply to water from Giru Groundwater Area (Giru benefited area), a watercourse supplemented from Haughton Main Channel, and Reedbeds re-lift	Burdekin Channel	Part A	12.28
		Part B	8.90
<b>Drainage Rates</b> - \$19.27 / ha of land	Gladys Lagoon:-	Part A	Nil
		Part B	Nil
	• Up to natural yield	Part A	24.56
		Part B	16.86
• Other than from natural yield			

### LOWER BURDEKIN WATER FUTURES (LBWF)

It is now widely recognised that the water reform agenda and increasing expectations and complexity in the water resources sector is placing increasing demands on local water service providers and managers, and increasing pressure/stress on the water systems whose health and resilience is imperative to the longer term future of the lower Burdekin.

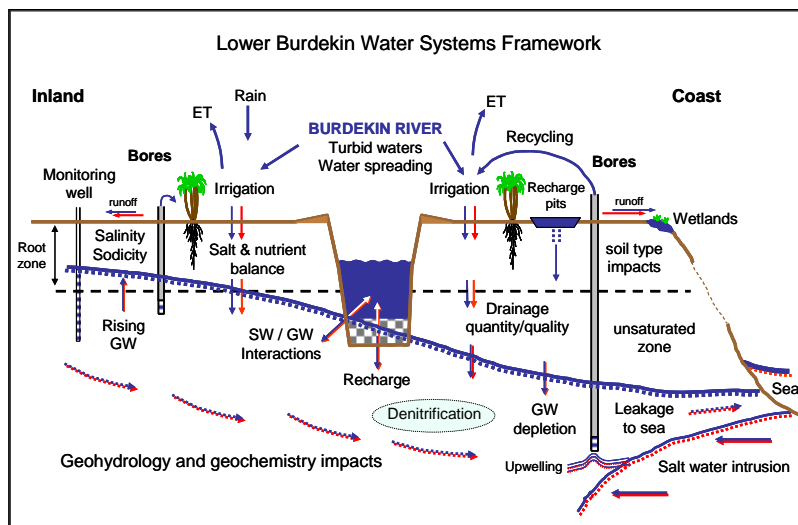
This led to formation of the Lower Burdekin Water Futures (LBWF) group, which was facilitated in 2006 by the Northern Australia Irrigation Futures (NAIF) project as a follow up to the earlier Lower Burdekin Initiative (LBI; <http://www.clw.csiro.au/lbi/>).

The LBWF Membership currently includes senior executives/staff from the Burdekin Shire Council, North and South Burdekin Water Boards, SunWater, Queensland Department of Natural Resources and Water, Burdekin River Irrigated Area Irrigators Committee (BRIA IC), Burdekin Dry Tropics NRM (BDTNRM), and CSIRO/NAIF/CRC IF.

The LBWF mission is to “Support a whole of system approach to understanding and managing the lower Burdekin water resources and associated systems to deliver long term economic, social and environmental outcomes”.

The LBWF meets on a monthly basis to discuss key water and related issues of concern to the lower Burdekin, and opportunities for securing and sharing resources for priority needs/projects. The LBWF has recently identified a list of key priority areas and is involved in various negotiations to secure funding and put in place collaborative arrangements to deliver on-ground benefits to the lower Burdekin.

The lower Burdekin is one of the key case study sites for the NAIF project, which is currently in the process of developing and implementing a prototype Sustainability Framework for the lower Burdekin in collaboration with the LBWF and other stakeholders.



The complexity and interconnectedness of the lower Burdekin water systems are demonstrated in the adjacent figure. It clearly highlights the need for both an individual and collective responsibility to ensure they are well managed for the benefit of future generations.



Distribution channels



Furrow irrigated sugarcane