

### 3. Isaac–Connors catchment

#### 3.1 Amendment area characteristics

The proposed amendment area is shown in Figure 2. The Isaac–Connors system includes the following subcatchments:

- Clarke Creek
- Funnel Creek
- Denison Creek
- Nebo Creek
- Bee Creek.

The streams and tributaries of the Isaac–Connors system start in the Connors and Broadsound ranges to the east and the Denham Range to the north and west.

The Connors River and Funnel Creek drain the wetter, north-eastern part of the catchment, supported by inflows from the more northerly Bee, Nebo and Denison creeks. The drier, western parts of the amendment area are principally drained by the Isaac River and Phillips and Stephens creeks.

The Connors River enters the Isaac River in the south-eastern corner of the draft amendment area, from where the Isaac River continues on its south-easterly course before discharging into the Mackenzie River, a chief tributary of the Fitzroy River.

Groundwater in the amendment area is important for consumptive use for industries and towns, as well as for non-consumptive values and industries whose interests are supported by water that remains in the system to perform its natural function.

Water use in the catchment is dominated by irrigated agriculture and mining. Stock and domestic use is important in the region.

Groundwater plays a critical part in maintaining the health and biodiversity of numerous ecosystems. Groundwater-dependent ecosystems supported by dry season discharge include the plant and animal communities associated with in-stream waterholes and river reaches and off-stream billabongs and other floodplain wetlands. Aquifers also sustain many deep-rooted woodland habitats that may be located at some distance from watercourses.

Non-consumptive water uses with a direct economic value include grazing and dryland cropping, although these are more associated with surface infiltration of rainfall, rather than through direct connection to an aquifer. Groundwater discharge from the Isaac–Connors system also contributes to downstream non-consumptive industries such as fisheries.

Parts of four local government areas fall within the draft amendment area (Figure 2). The most significant of these is Broadsound Shire Council, which occupies 55 per cent of the amendment area and accounts for 29 per cent of its population, followed by Nebo Shire Council (30 per cent and 8 per cent respectively). However, the smaller areas administered by Belyando (12 per cent) and Sarina (2 per cent) are home to a comparatively high proportion of the population, accounting for 47 per cent and 16 per cent of residents respectively.



*Stockyard windmill*

#### 3.2 Climate

The Isaac–Connors rivers system mainly has a dry tropical climate with warm to hot summers and cool to warm winters. Mean annual rainfall ranges from less than 600 mm in the western parts of the catchment to more than 1600 mm in small pockets in the north-east of the catchment. Rainfall predominates in summer, is highly variable, and decreases markedly from east to west (Figures 3 and 4).

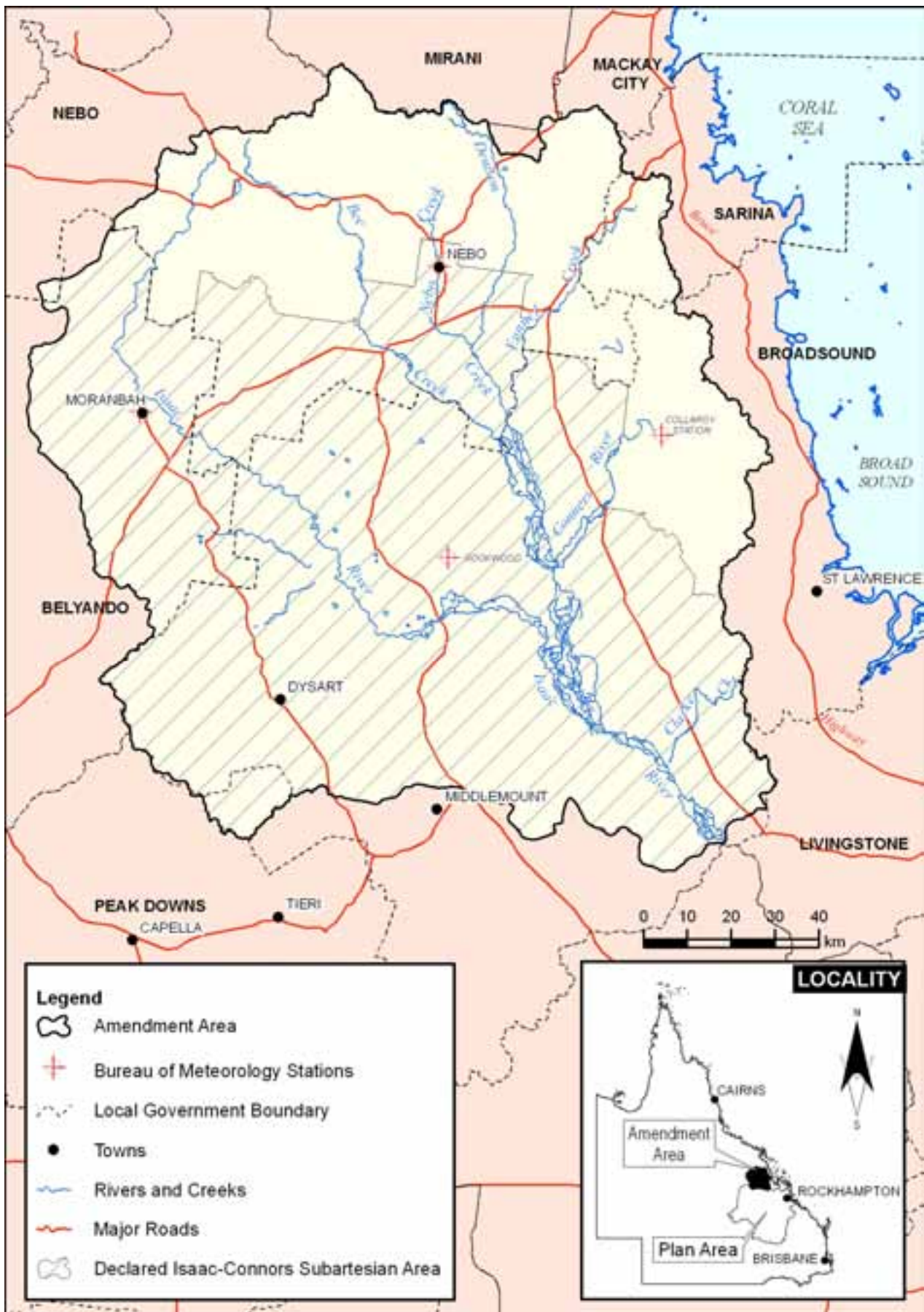
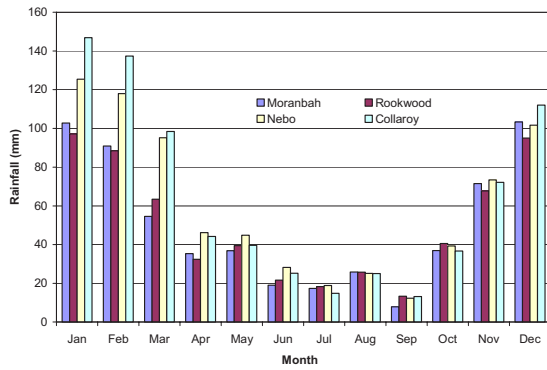
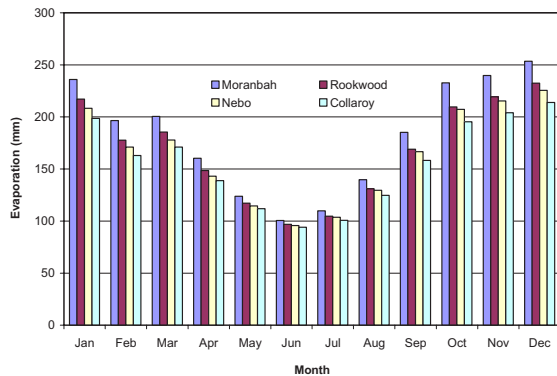


Figure 2: The draft amendment area showing the Isaac-Connors catchment

Occasional cyclones produce above average rainfall and flooding. Evaporation increases slightly towards the west (Figure 4), with a monthly minimum of about 95 mm in June and a maximum of about 250 mm in December. More detailed rainfall information is contained in Appendix C.



**Figure 3: Mean monthly rainfall (mm) for Moranbah, Rookwood, Nebo and Collaroy, 1970–2005**



**Figure 4: Mean monthly evaporation (mm) for Moranbah, Rookwood, Nebo and Collaroy, 1970–2005**

### 3.3 Geology

The most commonly utilised aquifers in the amendment area are formed from loose sand and gravel deposits (quaternary age alluvial deposits) that accumulated along riverbeds over millennia. These alluvial deposits overlie

impervious formations described by geologists as mostly upper Permian lower Bowen volcanic and sedimentary rocks.

In some areas the rock base is overlain with volcanic rocks (tertiary basalts) that can also constitute useable aquifers (Jensen et al. 1966).

Detailed land resource mapping has been completed in the Isaac–Connors River catchments, particularly in the Windeyers Hill area where field investigations were used to compile baseline data on soils and the landscape (Burgess 1997, Burgess 2003).

### 3.4 Hydrogeology

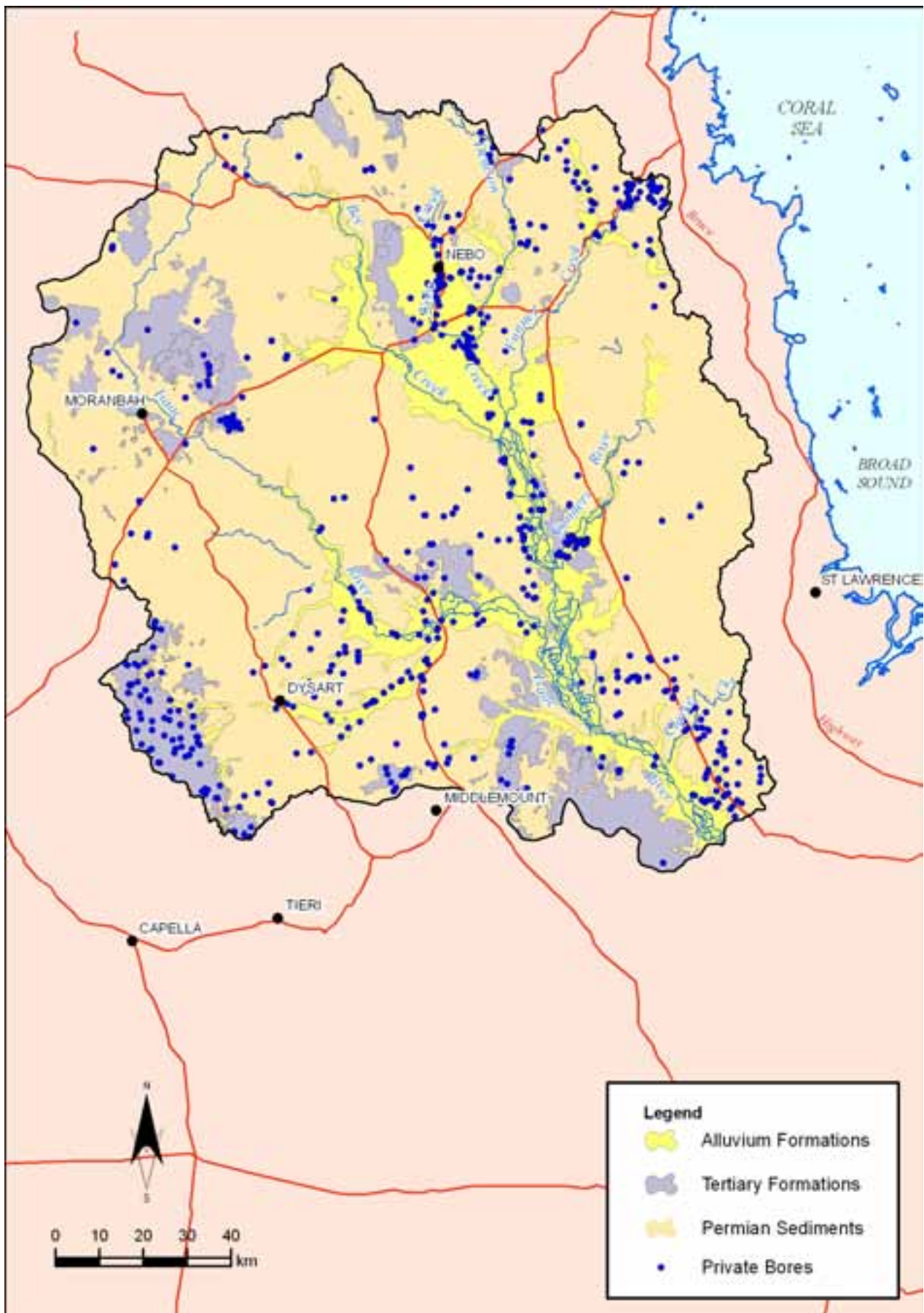
Groundwater resources in the area are principally found in layers of alluvial sand, gravel and clay that lie beneath and to either side of watercourses. The alluvial layer that spreads from beneath Nebo and Denison creeks reaches a thickness of up to 35 metres.

The lateral spread of the alluvial deposits over the amendment area is illustrated in Figure 5.

Generally, the alluvial aquifers of the Connors River system contain less clay, perform better and are more extensive and cleaner than those of the Isaac River system.

Similarly, the fresh to moderately saline groundwater of the Connors River system is of better quality than that of the Isaac River system. Groundwater associated with the Isaac River alluvial deposits is generally more saline because of the presence of sedimentary rocks formed during the Triassic period when the area was inundated by seawater.

Some basalts in the catchment yield useful supplies of groundwater, although previous investigations concluded that bore yields in these areas were generally low and that the water was often of low quality (Coffey Geosciences 2004).



**Figure 5: The Isaac River and Connors River catchment showing private bores, generalised geology and the extent of alluvial deposits**

Source: Compiled from Jensen et al. 1966

### 3.5 Recharge patterns

Aquifers in the Isaac–Connors catchment, especially those of the wetter Nebo, Denison and Funnel creeks within the Connors subcatchment, are recharged by direct infiltration from rainfall and floodwater, most notably following cyclonic episodes.

Cyclones are the most extreme rainfall events within the amendment area’s climatic cycle although their occurrence is sporadic. While cyclones are of unquestioned value to aquifer recharge, they cannot be relied on to perform this function to the same extent as more ‘normal’ wet period rainfall patterns. Because cyclones cannot be anticipated from year to year with the level of confidence traditionally possible with annual rainfall patterns, aquifer management strategies should recognise their important but sporadic contribution.

Graphs illustrating the extent to which rainfall deviates from the average within a given period of record at Moranbah, Rookwood (previously Bombandy), Nebo and Collaroy are shown in Appendix C. Note that the zero on the right-hand axis of each graph represents average rainfall for the period.

Of particular note is the pronounced positive deviation at Nebo observable in the period 1988–91, a period of significant cyclonic activity and substantial recharge for the Braeside borefield and other downstream aquifers. This positive deviation from average is also evident in the graphs for Rookwood and Collaroy and to a lesser extent for Moranbah. A downward trend can be clearly seen to have occurred from 1991–2005.

### 3.6 Socio-economic character and land use

The Isaac–Connors river system is located some 80 km south-west of Mackay.

The major towns are Moranbah, population 6673 (Belyando Shire), Dysart, population 2476 (Broadsound Shire), Middlemount, population 2020 (Broadsound Shire) and Glenden, population 914 (Nebo Shire).

Land use in the Isaac–Connors catchment is outlined in Table 1 and in Figure 6.

**Table 1: Land use in the Isaac River and Connors River catchment**

Land use code	Land use classes	area	area
		ha	%
1	Conservation and natural environments	55 013	2.48
1.1	Nature conservation	39 055	1.76
1.2	Managed resource protection	13 535	0.61
1.3	Other minimal use	2 423	0.11
2	Production from relatively natural environments	2 066 444	93.28
2.1	Grazing natural vegetation	2 010 871	90.77
2.2	Production forestry	55 573	2.51
3	Production from dryland agriculture and plantations	55 350	2.50
3.3	Cropping	55 350	2.50
4	Production from irrigated agriculture and plantations	1 839	0.08
4.3	Irrigated cropping	1 640	0.07
4.4	Irrigated perennial horticulture	200	0.01
5	Intensive uses	34 709	1.57
5.2	Intensive animal production	71	<0.01
5.3	Manufacturing and industrial	498	0.02
5.4	Residential	1 613	0.07
5.5	Services	604	0.03
5.6	Utilities	94	<0.01
5.7	Transport and communication	240	0.01
5.8	Mining	31 588	1.43
6	Water	1 921	0.09
6.1	Lake	24	<0.01
6.2	Reservoir/dam	1 721	0.08
6.5	Marsh/wetland	176	0.01
	Grand total	2 215 276	100

As indicated, beef-cattle grazing is the dominant land use. Other significant land uses include mining, irrigated and dryland cropping and production forestry.

The value of production from the most important industries is given in Appendix D, with mining by far the largest contributor to the local economy, generating \$2.2 billion, \$333 million and \$297 million for Belyando, Broadsound and Nebo shires respectively (NLWRA 1997). The total value of production for beef cattle grazing across Belyando, Broadsound and Nebo shires was \$143 million and for cropping is \$67 million.

The North Bowen Basin, which overlaps Nebo Shire, contains around 30 registered coal deposits and 12 operational or partially developed sites. Mining employs nearly three

## Isaac–Connors catchment—information report

times as many people as agriculture in Belyando Shire (CRC 2003).

Following a significant increase in mining activity in recent years, the population of the Isaac–Connors catchment is estimated at 11,500, or about 0.37 per cent of the Queensland total. About 2 per cent of the amendment area population is of Aboriginal or Torres Strait Islander descent.

In the longer term, the population is expected to decline marginally due to the development and expansion phase of mining activity concluding and mines moving to a long-term operational mode. Employment (and thus residential population) is expected to adjust accordingly.

Although communities such as Moranbah and Nebo are currently dealing with challenges in urban water supply, it is predicted that urban demand in the Isaac–Connors river system will decline over time due to:

- expected reductions in population due to slowing mining development
- the uptake of water-use-efficiency measures and demand management initiatives by local government authorities.

Existing groundwater entitlement held by mining companies is considered sufficient to meet current demand. However, due to the diminished availability of the groundwater resource, supply from the proposed Burdekin-to-Moranbah pipeline is crucial in meeting current and future needs of the mining sector.

Existing groundwater entitlement for irrigation approximately matches short-term demand.

However, it is considered that the diminished availability of the groundwater resource in recent years has been an impediment to any irrigation expansion. Provided current market conditions prevail for irrigated crops, there is likely to be further interest in expanding irrigation demand above current needs, particularly for groundwater. However, the Central Queensland Regional Water Supply Strategy has predicted that irrigation demand is unlikely to exceed 14 000 ML of maximum annual diversion in the medium to longer term.

Current entitlements for feedlots (the only beef cattle industry requiring a groundwater licence) approximately match short- to medium-term demand.

A more comprehensive socio-economic analysis, entitled Draft Stage 1 Report: Economic and Social Assessment in the Isaac–Connors catchment is being compiled to provide the economic and social context required to inform groundwater management considerations. This report will be provided for the consideration by the community reference panel (CRP).

The economic and social aspects of any groundwater management options considered during the development of the draft amendment will be assessed. The outcomes of this assessment will be outlined in a subsequent Stage 2 report.

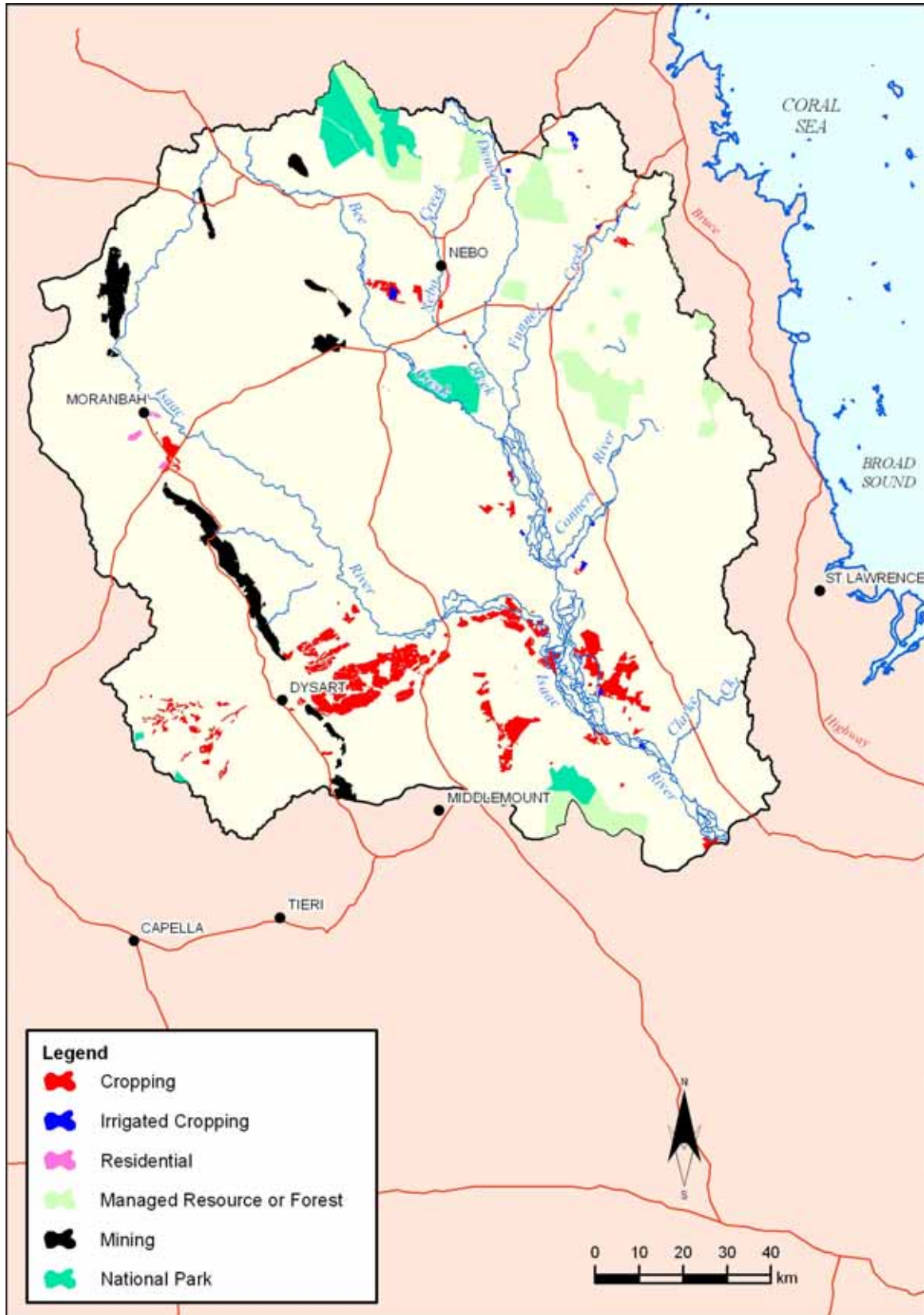


Figure 6: Land use in the Isaac River and Connors River catchment