Department of Science, Information Technology, Innovation and the Arts

Land Use Summary 1999–2012

for the Bremer River sub-catchment within SEQ

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To access land use datasets it is recommended that the Queensland Government Information Service (QGIS) be used. Search for **"land use mapping"** in the type of data search after restricting your search to **"cadastral and land planning"** in the topic category field. Metadata is also available from QGIS.

Acknowledgements

We wish to acknowledge the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) who coordinate the Australian Collaborative Land Use and Management Program (ACLUMP).

The QLUMP team includes staff from DSITIA in Brisbane and four business centres of the Department of Natural Resource and Mines (DNRM) South Region. The input from the regions has been extremely valuable in respect of their mapping skills, local knowledge and capacity to engage regional experts in compiling updated land use mapping data.

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Introduction

The Queensland Land Use Mapping Program (QLUMP) is a joint initiative of the Department of Science, Information Technology, Innovation and the Arts (DSITIA) and the Department of Natural Resources and Mines (DNRM). QLUMP is part of the Australian Collaborative Land Use and Management Program (ACLUMP) coordinated by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). ACLUMP promotes nationally consistent land use information.

Land use and land management practices have a profound impact on Queensland's natural resources, agricultural production and the environment. The availability of consistent and reliable spatial information regarding land use is critical for sustainable natural resource management by Australian, Queensland and local Governments, Natural Resource Management regional groups, industry groups, community groups and land managers.

QLUMP has updated land use mapping in the South-East Queensland (SEQ) Natural Resource Management Region to 2011 or later. Mapping has been compiled at the catchment level, with the exception of the Brisbane catchment, which has been divided into its sub-catchments (Brisbane River, Stanley River, Lockyer Creek and Bremer River) due to the size and diversity of the area. Apart from the Maroochy and Noosa catchments (2011) and the Brisbane River sub-catchment (2013), remaining catchments in SEQ were updated to 2012.

This report presents and summarises land use mapping in the Bremer River sub-catchment (which accounts for 9% of SEQ total area) including:

- revised 1999 and 2006 land use datasets including improvements and corrections to the originals
- 2012 land use dataset
- land use change datasets from 1999–2006, 2006–2012 and 1999–2012
- summary statistics derived from the above spatial datasets
- results of the accuracy assessment of the 2012 land use dataset.

Methodology

Mapping is performed in accordance with ACLUMP guidelines. The methodology is accurate, reliable, cost-effective, and makes best use of available databases, satellite imagery and aerial photography. QLUMP maps each catchment with the most recent suitable imagery available. The updated land use datasets for each catchment within SEQ range from 2011 to 2013.

The Australian Land Use and Management (ALUM) classification (Figure 1, page 5) shows five primary classes, identified in order of increasing levels of intervention or potential impact of land use; *water* is included separately as a sixth primary class. Within the primary classes is a three-level hierarchical structure. Primary, secondary and tertiary levels broadly describe the potential degree of modification of or impact of land use on the landscape. The secondary level in the three-level hierarchical structure is the minimum attribution level for land use mapping in Queensland.

Primary and secondary levels relate to land use (i.e. the principal use of the land in terms of the objectives of the land manager). The tertiary level includes data on commodities or infrastructure, (e.g. crops such as cereals or infrastructure such as *urban residential*). Where possible, class

attribution is performed to the tertiary level. For instance, QLUMP consistently maps land use classes *sugar* and *cotton* (dryland and irrigated) to tertiary level.

The mapping scale is 1:50,000 with a minimum mapping unit of two hectares and a width of 50 metres for linear features.

The 1999 (or later where available) baseline land use dataset formed the basis for the 2012 land use dataset. The 1999 and 2006 land use maps were revised and improved in addition to compiling an updated land use map for 2012. This was achieved primarily by interpretation of SPOT5 satellite imagery, high-resolution orthophotography, scanned aerial photography and inclusion of expert local knowledge. An ESRI ArcSDE geodatabase replication environment was utilised to overlay land use datasets on imagery and digitise or modify areas previously omitted or incorrectly mapped in the 1999 and 2006 mapping, as well as areas of actual land use change (2012). Land use change mapping products were then derived (at the secondary level of the ALUM classification) between 1999–2006, 2006–2012 and 1999–2012.

Some land uses are difficult to differentiate using satellite imagery and existing databases, for example, dryland and irrigated *agriculture*. To overcome this, local expert knowledge was an important component of the mapping methodology. This was provided by regional staff in state government agencies, natural resource management groups, shires, agricultural industries and landholders. Field survey is also undertaken to verify areas of uncertainty in the land use mapping.

The land use mapping methods used by QLUMP are described in full in the ABARES handbook: Guidelines for land use mapping in Australia: principles, procedures & definitions – Edition 4

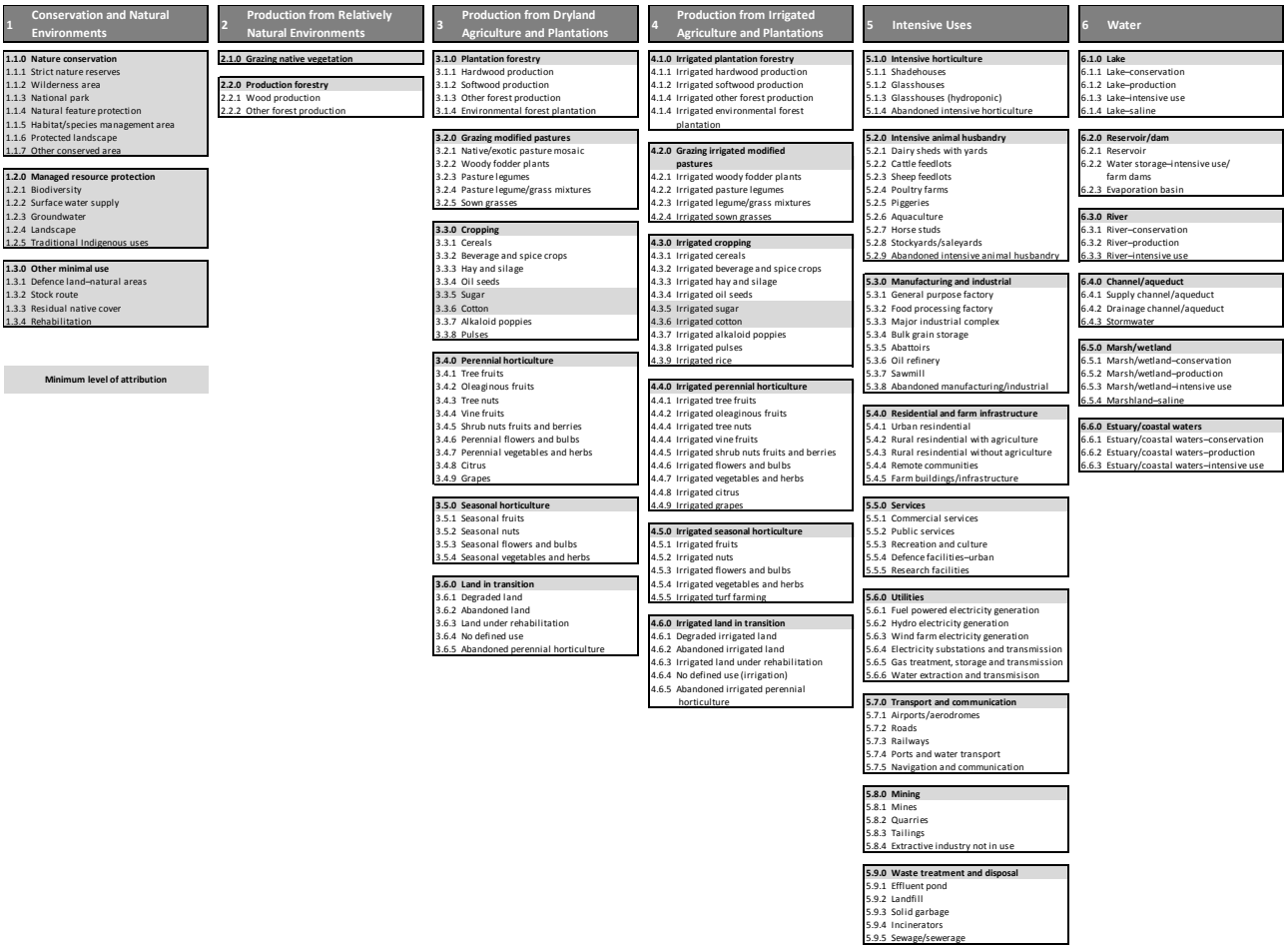

Figure 1: Australian Land Use and Management (ALUM) classification, Version 7

Data Limitations

Land use features that are linear, such as roads and railways, are not mappable at a scale of 1:50,000 with a specified minimum mapping width of 50 metres. As a result, the area estimates of these **linear features** represent only a small proportion of the actual area within this land use type in Queensland. This is of relevance to the following land use classes:

- *transport and communication*
- *utilities*
- *rivers*

Similarly, land uses that fall under the QLUMP minimum mapping area of two hectares are not explicitly mapped but aggregated into the surrounding land use class. This will have the effect of over-estimating the area of some land use classes, for example *other minimal use* and *grazing native vegetation*, whereby tracks and farm infrastructure, road reserves, drainage lines, cleared and uncleared land adjacent to rivers as well as land immediately adjacent to or between cropped paddocks are included.

Livestock grazing occurs on a range of pasture types including native and exotic as well as mixtures of both. Identifying and separating these using imagery, aerial photography and field observation is difficult and unreliable. Therefore, the ALUM classification secondary classes of *grazing modified pastures* and *irrigated grazing modified pastures* have not been mapped explicitly by QLUMP. Where possible (for example, with the benefit of field verification), these classes can be mapped (for example, dairy pastures and fodder crops). Areas of pasture which appeared to be harvested for fodder or grazed off were mapped as *cropping*. This may contribute an over-estimation of cropping in the region. The appearance of these can be highly variable and classification may therefore not be consistent.

The distinction between (dryland) *cropping* and *irrigated cropping* was not always evident and it is likely there is some misclassification in these classes. Proximity to water sources (watercourse or dam) as well as information from water entitlements (irrigation licences), field survey and local knowledge were used to confirm areas of irrigation as much as possible. Areas mapped as *irrigated cropping* are potentially irrigated on a supplementary basis and may not have actually been irrigated in 1999, 2006 or 2012.

The *rural residential* land use class is a source of possible thematic error. Properties on the fringes of suburban settlements, hobby farms and subdivisions in isolated localities with comparatively small lot sizes were mapped to this class. The use of Queensland Valuation System (QVAS) (valuation information) was helpful in mapping this class, based on whether or not the land owner was classified as a primary producer. Residential features greater than 0.2 hectares and less than 16 hectares were mapped as *rural residential.* This class may be misclassified with *grazing native vegetation* and o*ther minimal use*, especially on larger properties.

A combination of the Queensland Herbarium's wetlands and regional ecosystem datasets provided the basis for mapping *marsh/wetlands*, *lakes*, *rivers* and *reservoir/dams*. The ephemeral nature of many of these water features can lead to confusion insofar as they may be present in imagery of one date and either absent or of differing extent in imagery of subsequent or previous dates. As a result, there may be errors, omissions and disagreement in the mapping of features such as farm dams, reservoirs, lakes, wetlands and other water features. Many water features, whilst exceeding the minimum mappable area requirements, do not meet the criteria for linear or uniform features.

The 1999, 2006 and 2012 land use datasets are a snapshot of what was interpreted as the primary land use in these years. However, effort was given to distinguishing between an actual land use change and a rotation. For example, an area that is usually cropped, but is not used for that particular purpose in the year of interest, was still mapped as *cropping* in the 2012 dataset even though no crop was present in that year. This was not considered an actual land use change, but rather a rotation, as the primary land use for that paddock would still be *cropping*.

Some confusion in thematic accuracy occurred in the Bremer sub-catchment between the *cropping* and *grazing native vegetation* and/or *irrigated cropping* land use classes. The point in time at which an area of *cropping* changes land use due to degradation or abandonment varies depending on individual interpretation and additional information. These thematic errors are shown in the accuracy assessment (page 24).

Refer to metadata for details on the mapping of specific classes.

Products

1999, 2006 and 2012 land use datasets

Figure 2 (page 9), Figure 3 (page 10) and Figure 4 (page 11) show the 1999, 2006 and 2012 land use datasets respectively, for the Bremer River sub-catchment, presented at the secondary level of the ALUM classification (Figure 1, page 5). Table 1 (page 12), Table 2 (page 13) and Table 3 (page 14) provide the summary statistics for each. All statistics presenting the area of land use classes are reported in hectares (ha).

Table 3 (page 14) shows that *grazing native vegetation* (69%), *other minimal uses* (6%) and *residential and farm infrastructure* (5%) are the major land use classes for 2012 in the Bremer River sub-catchment.

Analysis of the overall change between land use classes shows the primary land use class of *conservation and natural environments* remained static between 1999–2006 before increasing significantly by 14% or 3,061ha from 2006–2012. The majority of this change was reflected in the growth of the *managed resource protection* secondary land use class which increased by 2,967ha in 2006–2012 as a result of the SEQ Forest Agreement (whereby state forests have been progressively added to the conservation reserves estates).

Analysis of the agriculture primary land use classes showed that *production from dryland agriculture and plantations* increased significantly by 171% or 3,455ha in 1999–2006, before decreasing slightly by 9% or 473ha in 2006–2012. *Production from irrigated agriculture and plantations* has shown a decrease in each epoch—9% or 1,460ha in 1999–2006 and a further 11% or 1,734ha in 2006–2012.

For the *intensive uses* primary land use class, the majority of this growth was observed in the *residential and farm infrastructure* secondary land use class, which increased by 5% or 487ha in 1999–2006 and then by 4% or 420ha in 2006–2012.

A steady decline has been observed in the *mining* secondary land use class. *Mining* decreased by 14% or 309ha in 1999–2006 and by 10% or 175ha in 2006–2012.

Analysis of the specific land use changes from one secondary class to another for 1999–2006 and 2006–2012 is presented in the section on page 15. Analysis of the land use change from 1999–2012 has been included as Appendix A, on page 21.

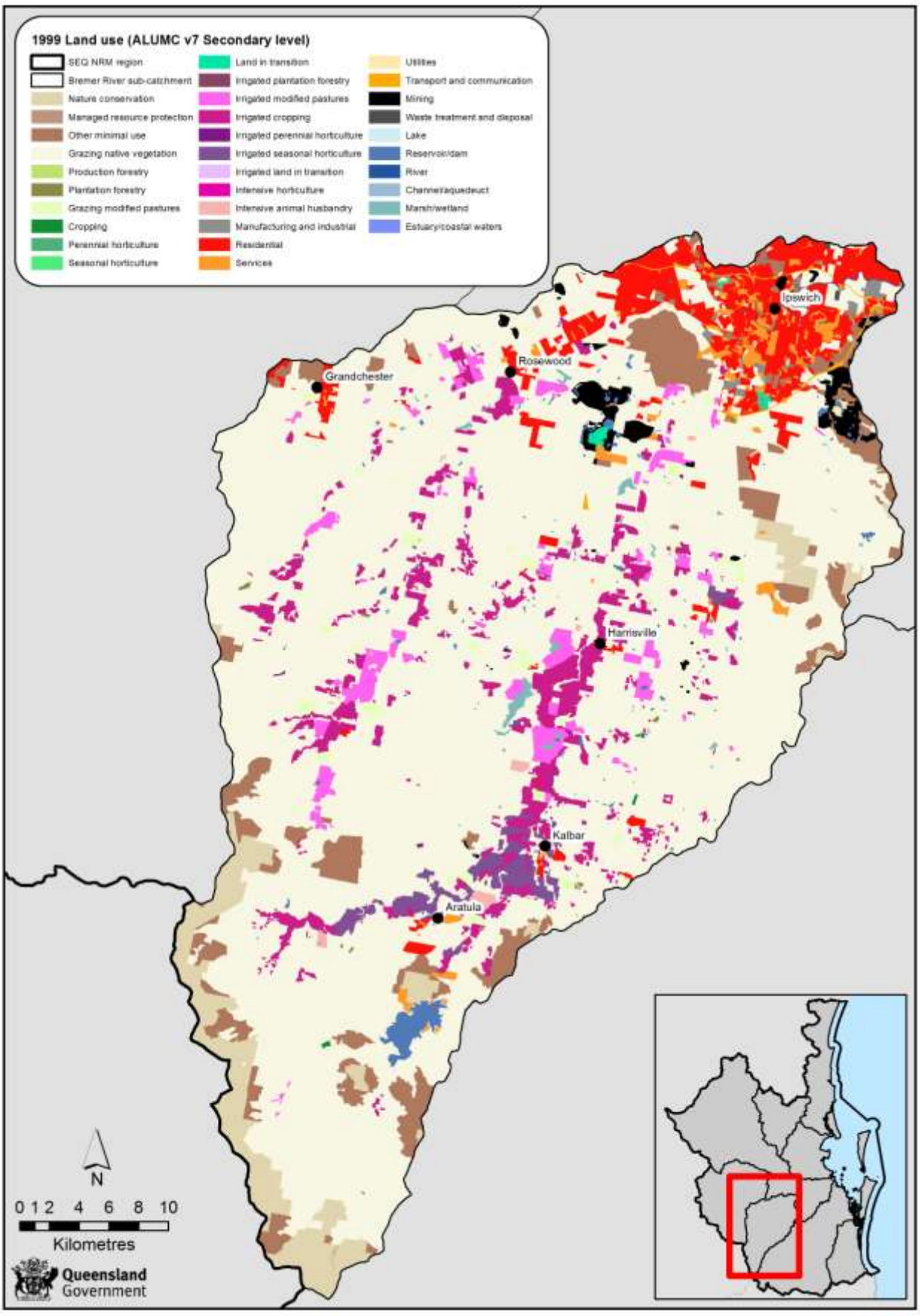

Figure 2: 1999 land use map for the Bremer River sub-catchment

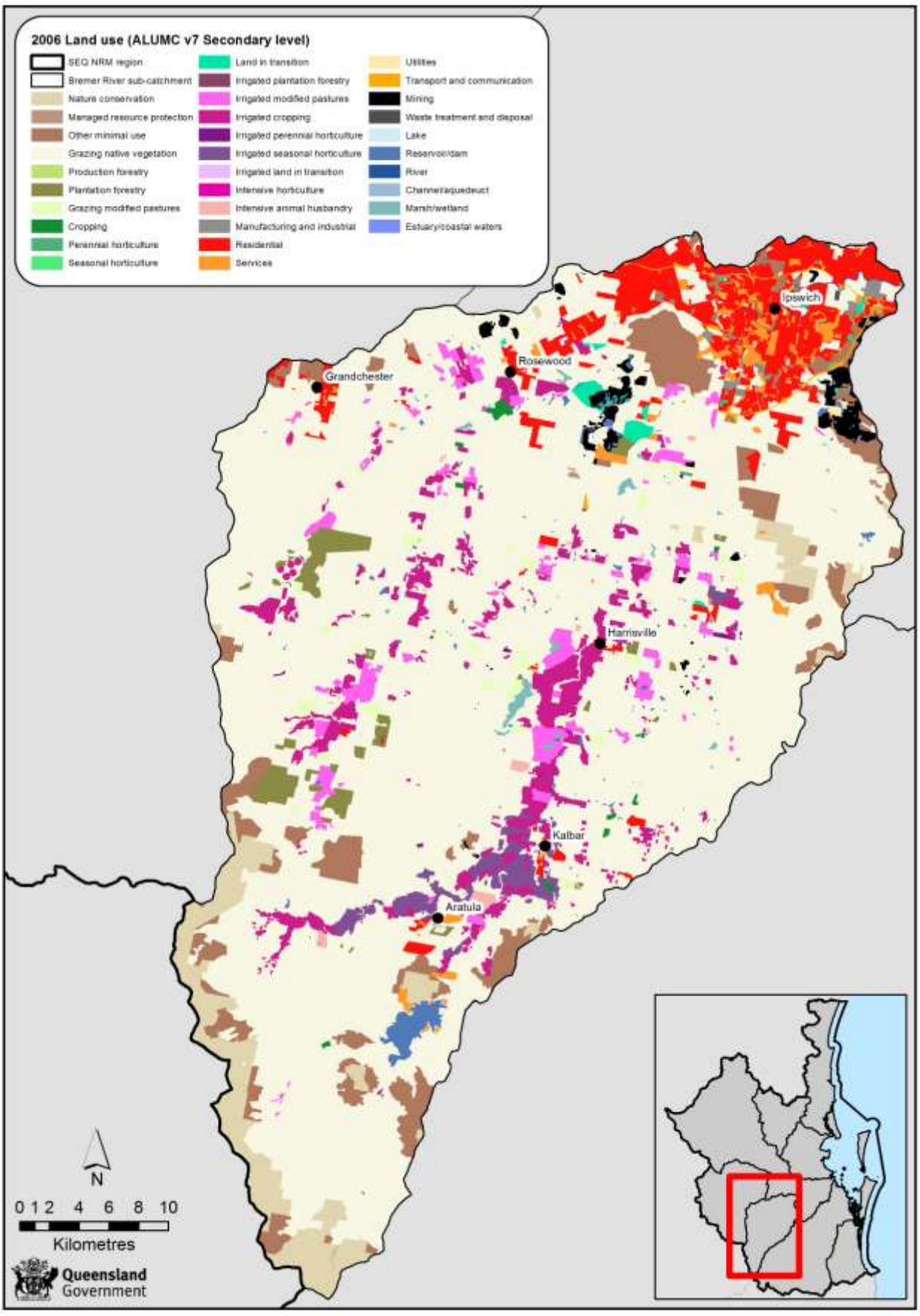

Figure 3: 2006 land use map for the Bremer River sub-catchment

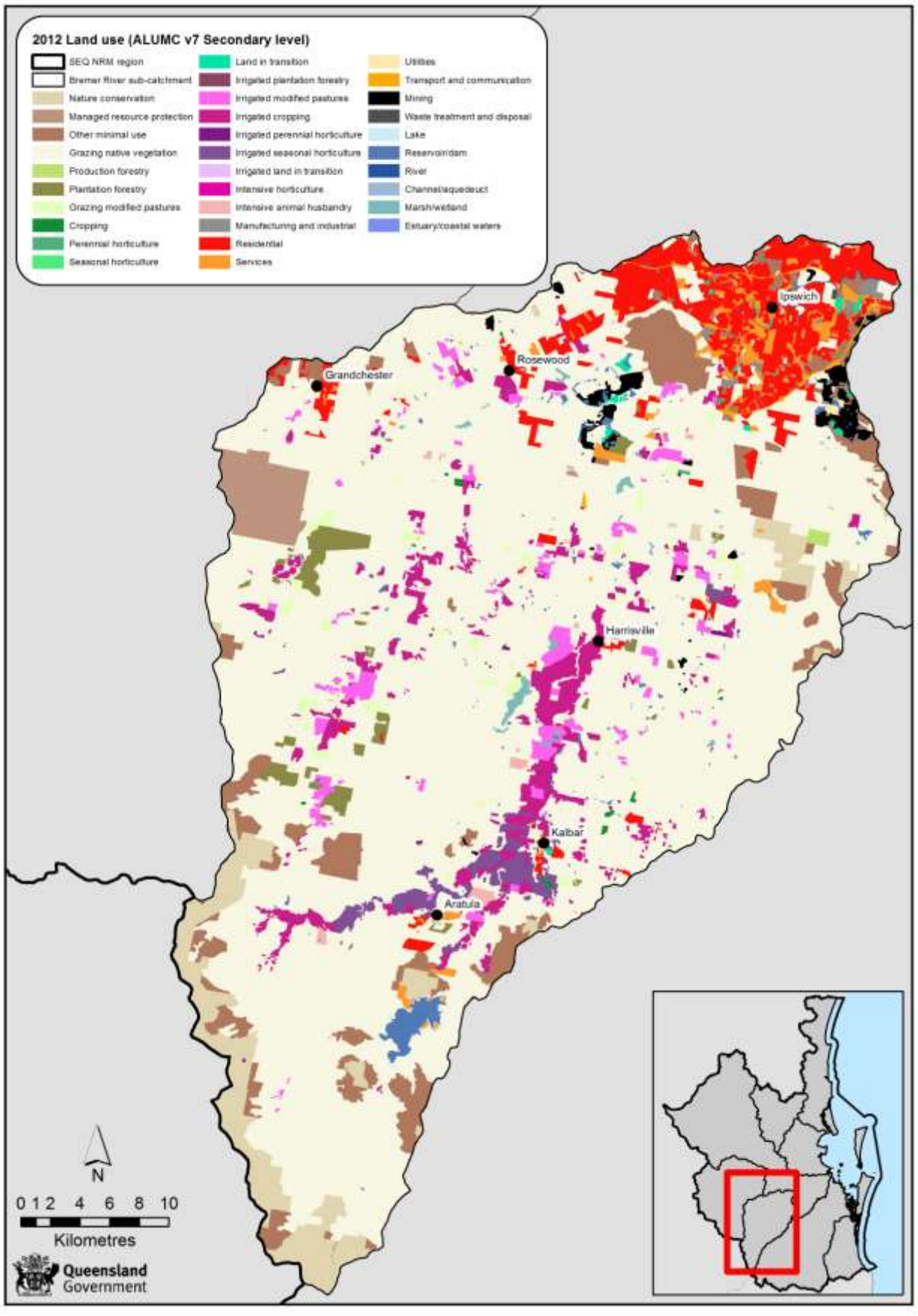

Figure 4: 2012 land use map for the Bremer River sub-catchment

Table 1: Summary statistics of land use in 1999 in the Bremer River sub-catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	21,286	10.48
1.1	Nature conservation	9,109	4.49
1.3	Other minimal use	12,178	6.00
2	Production from relatively natural environments	144,205	71.03
2.1	Grazing native vegetation[1]	144,205	71.03
3	Production from dryland agriculture and plantations	2,017	0.99
3.1	Plantation forestry	74	0.04
3.2	Grazing modified pastures[2]	1672	0.82
3.3	Cropping	48	0.02
3.4	Perennial horticulture	3	<0.01
3.6	Land in transition	220	0.11
4	Production from irrigated agriculture and plantations	17,116	8.43
4.2	Irrigated grazing modified pastures[2]	4,275	2.11
4.3	Irrigated cropping	10,440	5.14
4.4	Irrigated perennial horticulture	45	0.02
4.5	Irrigated seasonal horticulture	2,356	1.16
5	Intensive uses	16,239	8.00
5.2	Intensive animal husbandry	423	0.21
5.3	Manufacturing and industrial	484	0.24
5.4	Residential and farm infrastructure	10,167	5.01
5.5	Services	2,478	1.22
5.6	Utilities	75	0.04
5.7	Transport and communication	420	0.21
5.8	Mining	2,135	1.05
5.9	Waste treatment and disposal	58	0.03
6	Water	2,170	1.07
6.2	Reservoir/dam	1,519	0.75
6.3	River	120	0.06
6.5	Marsh/wetland	531	0.26
	Grand Total	**203,033**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures* and *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Table 2: Summary statistics of land use in 2006 in the Bremer River sub-catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	21,417	10.55
1.1	Nature conservation	9,240	4.55
1.2	Managed resource protection	33	0.02
1.3	Other minimal use	12,145	5.98
2	Production from relatively natural environments	141,731	69.81
2.1	Grazing native vegetation[1]	141,731	69.81
3	Production from dryland agriculture and plantations	5,472	2.69
3.1	Plantation forestry	2,609	1.28
3.2	Grazing modified pastures[2]	1,863	0.92
3.3	Cropping	303	0.15
3.4	Perennial horticulture	22	0.01
3.6	Land in transition	674	0.33
4	Production from irrigated agriculture and plantations	15,656	7.71
4.2	Irrigated grazing modified pastures[2]	3,976	1.96
4.3	Irrigated cropping	9,255	4.56
4.4	Irrigated perennial horticulture	100	0.05
4.5	Irrigated seasonal horticulture	2,325	1.15
5	Intensive uses	16,553	8.15
5.1	Intensive horticulture	7	<0.01
5.2	Intensive animal husbandry	432	0.21
5.3	Manufacturing and industrial	500	0.25
5.4	Residential and farm infrastructure	10,654	5.25
5.5	Services	2,562	1.26
5.6	Utilities	93	0.05
5.7	Transport and communication	420	0.21
5.8	Mining	1,826	0.90
5.9	Waste treatment and disposal	58	0.03
6	Water	2,205	1.09
6.2	Reservoir/dam	1,554	0.77
6.3	River	120	0.06
6.5	Marsh/wetland	531	0.26
	Grand Total	**203,033**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures* and *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Table 3: Summary statistics of land use in 2012 in the Bremer River sub-catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	24,478	12.06
1.1	Nature conservation	9,250	4.56
1.2	Managed resource protection	3,000	1.48
1.3	Other minimal use	12,228	6.02
2	Production from relatively natural environments	140,409	69.16
2.1	Grazing native vegetation[1]	140,267	69.09
2.2	Production forestry	141	0.07
3	Production from dryland agriculture and plantations	4,999	2.46
3.1	Plantation forestry	2,288	1.13
3.2	Grazing modified pastures[2]	2,201	1.08
3.3	Cropping	141	0.07
3.4	Perennial horticulture	22	0.01
3.6	Land in transition	347	0.17
4	Production from irrigated agriculture and plantations	13,922	6.86
4.2	Irrigated grazing modified pastures[2]	3,360	1.65
4.3	Irrigated cropping	8,128	4.00
4.4	Irrigated perennial horticulture	117	0.06
4.5	Irrigated seasonal horticulture	2,318	1.14
5	Intensive uses	16,959	8.35
5.1	Intensive horticulture	9	<0.01
5.2	Intensive animal husbandry	495	0.24
5.3	Manufacturing and industrial	493	0.24
5.4	Residential and farm infrastructure	11,074	5.45
5.5	Services	2,648	1.30
5.6	Utilities	118	0.06
5.7	Transport and communication	420	0.21
5.8	Mining	1,651	0.81
5.9	Waste treatment and disposal	51	0.03
6	Water	2,266	1.12
6.2	Reservoir/dam	1,603	0.79
6.3	River	120	0.06
6.5	Marsh/wetland	543	0.27
	Grand Total	**203,033**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures* and *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Land use change datasets (1999–2006, 2006–2012 and 1999–2012)

Figure 5, 6 and 7 (pages 16, 17 and 22), show the land use change datasets for the Bremer River sub-catchment. The data has been presented relative to the **change in intensity** of the land use at the secondary level of the ALUM classification.

For example, change from 2.1.0 (*grazing native vegetation*) to 2.2.0 (*production forestry*) is an increase in land use intensity, whilst change from 2.1.0 (*grazing native vegetation*) to 1.1.0 (*nature conservation*) is a decrease. This is highlighted in the ALUM classification (Figure 1, page 5). Moving down and from left to right through the classification, the level of intervention or potential impact of land use increases.

Land use change mapping products for this sub-catchment have been compiled for three epochs (1999, 2006 and 2012). At the secondary level of the ALUM classification, the total area of land use change is:

- 1999–2006: 8,523ha (4% of the sub-catchment). Of this 4,871ha (57% of the total change) is mapped as an increase in land use intensity, whilst 3,652ha (43%) is a decrease.
- 2006–2012: 9,604ha (5% of the sub-catchment). Of this 2,117ha (22% of the total change) is mapped as an increase in land use intensity, whilst 7,487ha (78%) is a decrease.
- 1999–2012: 15,445ha (8% of the sub-catchment). Of this 5,963ha (39% of the total change) is mapped as an increase in land use intensity, whilst 9,482ha (61%) is a decrease.

The land use change totals between the two eras (1999–2006 and 2006–2012) will not add up to match those compiled for the 1999–2012 era. This is because land use change mapping only accounts for land use at a specific moment in time; some change will result from rotation, whilst some may be the result of more than one change event. An example of this scenario is an area that was mapped as *grazing native vegetation* in 1999 may have been mapped as *land in transition* in 2006 before finally becoming *residential* in 2012. These changes would be reflected in each of the land use change mapping products as change from *grazing native vegetation* to *land in transition* in the 1999–2006, and change from *land in transition* to *residential* in 2006–2012, and lastly change from *grazing native vegetation* to *residential* in 1999–2012.

Summary statistics presenting the land use change at the secondary level for 1999–2006 and 2006–2012 are shown in Tables 4 and 5 (pages 18 and 19). The change from 1999–2012 is presented in Appendix A (page 21).

The 1999–2006 land use change shows that change from *grazing native vegetation* to *plantation forestry* accounted for 2,411ha or 28% of all the total change mapped. Figure 5 (page 16) shows these more intense changes on the western side of the sub-catchment. Other changes identified were 1,094ha (13%) of *irrigated cropping* changing to *grazing native vegetation*. Collectively, all the land use change to *residential and farm infrastructure* accounts for 507ha or 6% of the total for 1999–2006.

For 2006–2012, the largest land use changes were observed from *grazing native vegetation* to *managed resource protection* (2,948ha or 31%) and *irrigated cropping* to *grazing native vegetation* (1,207ha or 11%). Collectively, for 2006–2012 the land use change to *residential and farm infrastructure* accounts for 452ha or 5% of the total.

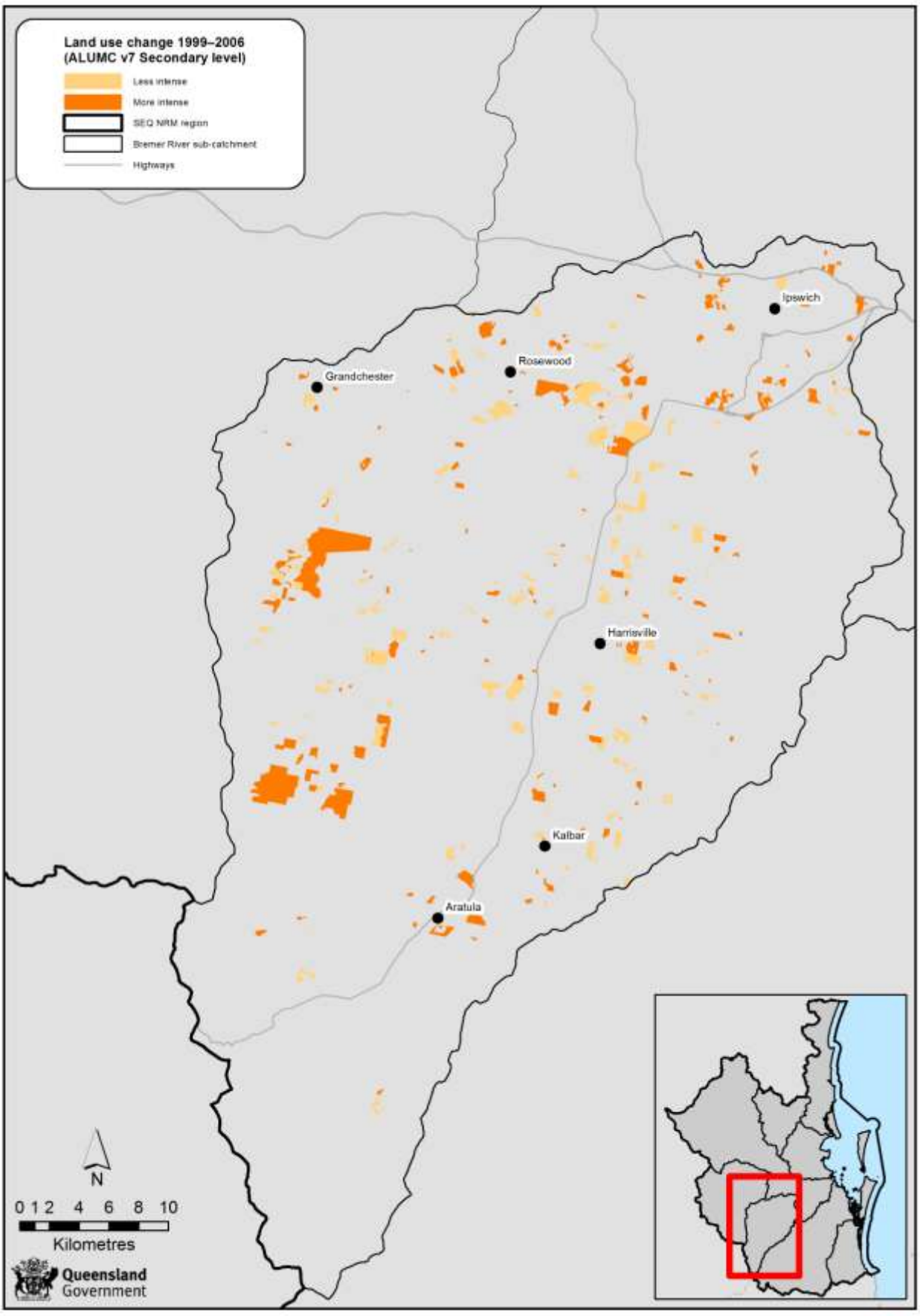

Figure 5: 1999–2006 land use change map at secondary level for the Bremer River sub-catchment

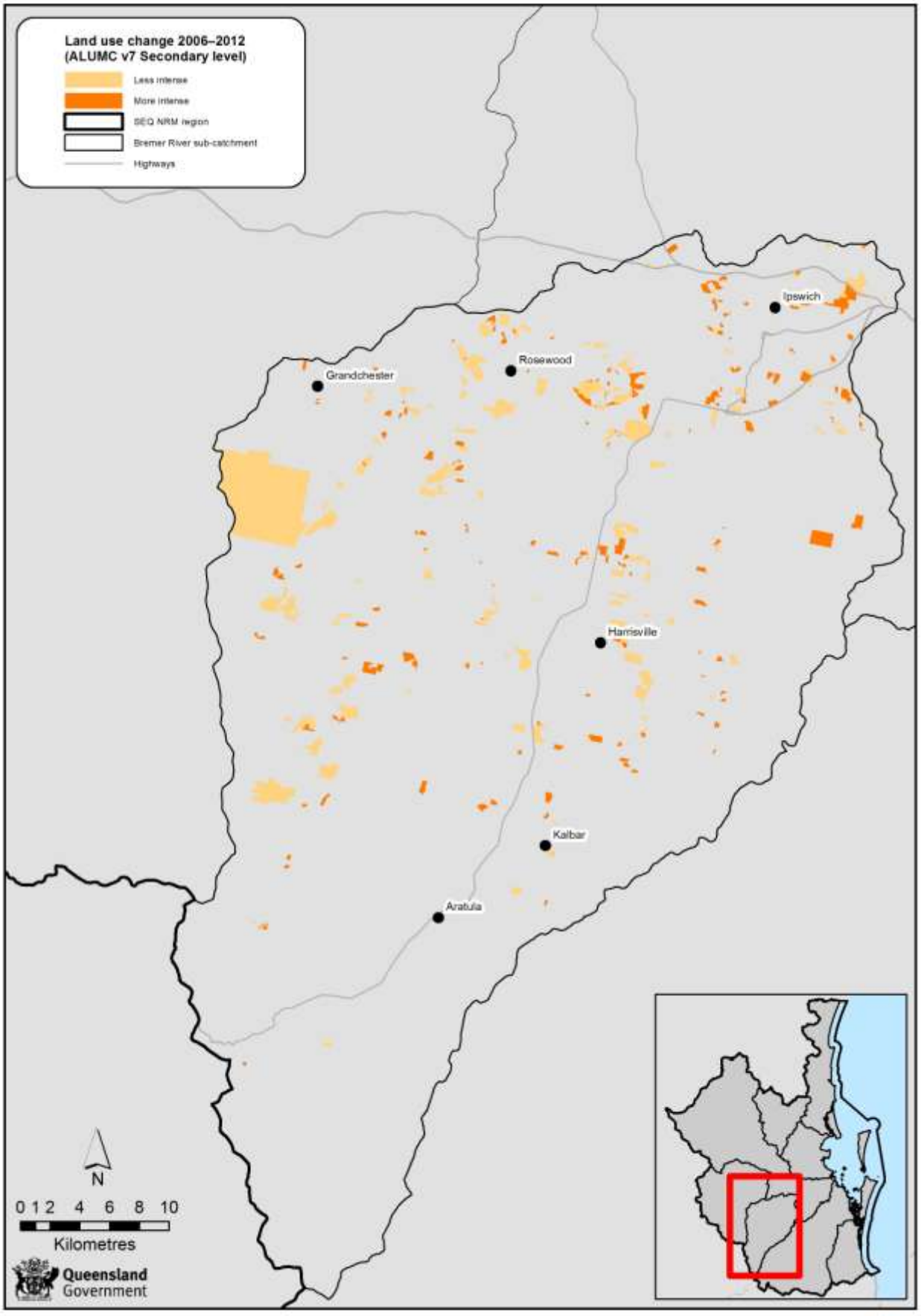

Figure 6: 2006–2012 land use change map at secondary level for the Bremer River sub-catchment

Table 4: Summary statistics for land use change at secondary level for 1999–2006 in the Bremer River sub-catchment (showing only the land use changes > 20ha)

Land use code 1999	Land use class 1999	Land use code 2006	Land use class 2006	Area (ha)	Area Change (%)	Total change (%)
2.1.0	Grazing native vegetation	3.1.0	Plantation forestry	2,411	1.19	28.29
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	1,094	0.54	12.83
5.8.0	Mining	3.6.0	Land in transition	499	0.25	5.85
4.2.0	Irrigated modified pastures	2.1.0	Grazing native vegetation	344	0.17	4.04
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	334	0.16	3.91
4.3.0	Irrigated cropping	3.2.0	Grazing modified pastures	320	0.16	3.76
4.2.0	Irrigated modified pastures	4.3.0	Irrigated cropping	286	0.14	3.35
2.1.0	Grazing native vegetation	4.3.0	Irrigated cropping	280	0.14	3.29
2.1.0	Grazing native vegetation	5.8.0	Mining	270	0.13	3.17
4.2.0	Irrigated modified pastures	3.2.0	Grazing modified pastures	222	0.11	2.61
3.2.0	Grazing modified pastures	4.2.0	Irrigated modified pastures	206	0.10	2.42
4.3.0	Irrigated cropping	4.2.0	Irrigated modified pastures	198	0.10	2.33
2.1.0	Grazing native vegetation	4.2.0	Irrigated modified pastures	198	0.10	2.32
2.1.0	Grazing native vegetation	3.6.0	Land in transition	160	0.08	1.88
4.3.0	Irrigated cropping	3.3.0	Cropping	153	0.08	1.80
3.2.0	Grazing modified pastures	2.1.0	Grazing native vegetation	132	0.06	1.54
3.6.0	Land in transition	2.1.0	Grazing native vegetation	125	0.06	1.46
2.1.0	Grazing native vegetation	3.3.0	Cropping	102	0.05	1.20
3.2.0	Grazing modified pastures	4.3.0	Irrigated cropping	89	0.04	1.04
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	85	0.04	0.99
2.1.0	Grazing native vegetation	5.5.0	Services	80	0.04	0.94
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	80	0.04	0.94
1.3.0	Other minimal use	5.4.0	Residential	80	0.04	0.93
4.3.0	Irrigated cropping	3.1.0	Plantation forestry	71	0.04	0.84
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	70	0.03	0.83
2.1.0	Grazing native vegetation	3.2.0	Grazing modified pastures	70	0.03	0.82
5.8.0	Mining	1.3.0	Other minimal use	51	0.03	0.60
1.3.0	Other minimal use	1.1.0	Nature conservation	51	0.02	0.59
4.2.0	Irrigated modified pastures	3.1.0	Plantation forestry	48	0.02	0.57
2.1.0	Grazing native vegetation	4.4.0	Irrigated perennial horticulture	46	0.02	0.54
2.1.0	Grazing native vegetation	6.2.0	Reservoir/dam	40	0.02	0.47
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	33	0.02	0.39
1.3.0	Other minimal use	5.8.0	Mining	25	0.01	0.29
4.5.0	Irrigated seasonal horticulture	2.1.0	Grazing native vegetation	24	0.01	0.28
4.5.0	Irrigated seasonal horticulture	3.2.0	Grazing modified pastures	22	0.01	0.26
5.8.0	Mining	6.2.0	Reservoir/dam	22	0.01	0.25
Total				**8,523**	**4.20**	**100.00**

Table 5: Summary statistics for land use change at secondary level for 2006–2012 in the Bremer River sub-catchment (showing only the land use changes > 24ha)

Land use code 2006	Land use class 2006	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	2,948	1.45	30.69
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	1,027	0.51	10.70
4.2.0	Irrigated modified pastures	2.1.0	Grazing native vegetation	666	0.33	6.94
3.6.0	Land in transition	2.1.0	Grazing native vegetation	439	0.22	4.57
3.1.0	Plantation forestry	2.1.0	Grazing native vegetation	350	0.17	3.65
3.2.0	Grazing modified pastures	2.1.0	Grazing native vegetation	322	0.16	3.35
4.3.0	Irrigated cropping	4.2.0	Irrigated modified pastures	287	0.14	2.99
4.3.0	Irrigated cropping	3.2.0	Grazing modified pastures	267	0.13	2.78
4.2.0	Irrigated modified pastures	3.2.0	Grazing modified pastures	257	0.13	2.68
2.1.0	Grazing native vegetation	4.3.0	Irrigated cropping	243	0.12	2.53
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	240	0.12	2.50
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	234	0.12	2.44
4.2.0	Irrigated modified pastures	4.3.0	Irrigated cropping	205	0.10	2.14
2.1.0	Grazing native vegetation	4.2.0	Irrigated modified pastures	187	0.09	1.94
2.1.0	Grazing native vegetation	3.2.0	Grazing modified pastures	177	0.09	1.84
3.3.0	Cropping	2.1.0	Grazing native vegetation	163	0.08	1.70
5.8.0	Mining	3.6.0	Land in transition	161	0.08	1.68
5.8.0	Mining	2.1.0	Grazing native vegetation	161	0.08	1.68
2.1.0	Grazing native vegetation	2.2.0	Production forestry	141	0.07	1.47
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	119	0.06	1.24
2.1.0	Grazing native vegetation	5.8.0	Mining	97	0.05	1.01
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	84	0.04	0.88
2.1.0	Grazing native vegetation	5.5.0	Services	84	0.04	0.87
2.1.0	Grazing native vegetation	3.6.0	Land in transition	76	0.04	0.79
1.3.0	Other minimal use	5.8.0	Mining	56	0.03	0.59
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	39	0.02	0.41
3.2.0	Grazing modified pastures	4.3.0	Irrigated cropping	35	0.02	0.37
2.1.0	Grazing native vegetation	6.2.0	Reservoir/dam	33	0.02	0.35
5.3.0	Manufacturing and industrial	2.1.0	Grazing native vegetation	32	0.02	0.33
2.1.0	Grazing native vegetation	3.1.0	Plantation forestry	29	0.01	0.30
2.1.0	Grazing native vegetation	3.3.0	Cropping	26	0.01	0.27
3.3.0	Cropping	4.2.0	Irrigated modified pastures	25	0.01	0.26
Total				**9,604**	**4.73**	**100.00**

Data format and availability

Download land use datasets

To access land use datasets it is recommended that the Queensland Government Information Service (QGIS) be used. Search for **"land use mapping"** in the type of data search after restricting your search to **"cadastral and land planning"** in the topic category field. Metadata is also available from QGIS.

The dataset comprises an ESRI vector geodatabase at a nominal scale of 1:50,000. Within this are six feature classes: 1999 improved land use, 2006 improved land use, 2012 updated land use, 1999–2006 land use change layer, 2006–2012 land use change layer and 1999–2012 land use change layer. The feature classes are polygon datasets with attributes describing land use. Land use is classified according to the Australian Land Use and Management Classification (ALUMC) Version 7, May 2010. Note that a representation showing land use at secondary level is available when working within a geodatabase.

Digital Data is supplied with a licence and by using the data you confirm that you have read the licence conditions included with the data and that you agree to be bound by its terms.

Request a land use map

Available from the QLUMP website, it is possible to request a land use map based upon a specific location (Lot on Plan, Street address or Central latitude/longitude coordinates) in Queensland. The land use maps are emailed upon request in portable document format (PDF).The maps present the most recent land use information available at the secondary level of the Australian Land Use and Management (ALUM) Classification.

View land use on the Queensland Globe

The most recent land use information available state-wide in Queensland is available for viewing on the Queensland Globe. This application allows browsing of Queensland spatial data including land use, maps and up-to-date satellite imagery.

Land use is available for viewing within the Planning and Cadastre category globe.

Appendix A 1999–2012 Land Use Change

For 1999–2012, the largest land use changes were observed from *grazing native vegetation* to *managed resource protection* (2,981ha or 19%), *irrigated cropping* to *grazing native vegetation* (2,110ha or 14%) and *grazing native vegetation* to *plantation forestry* (2,090ha or 14%). Collectively, for 1999–2012 the land use change to *residential and farm infrastructure* accounts for 959ha or 6% of the total.

Table 6: Summary statistics for land use change at secondary level for 1999–2012 in the Bremer River sub-catchment (showing only the land use changes > 60ha)

Land use code 1999	Land use class 1999	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	2,981	1.47	19.30
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	2,110	1.04	13.66
2.1.0	Grazing native vegetation	3.1.0	Plantation forestry	2,090	1.03	13.53
4.2.0	Irrigated modified pastures	2.1.0	Grazing native vegetation	1,084	0.53	7.02
4.3.0	Irrigated cropping	3.2.0	Grazing modified pastures	508	0.25	3.29
5.8.0	Mining	2.1.0	Grazing native vegetation	500	0.25	3.23
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	487	0.24	3.15
4.3.0	Irrigated cropping	4.2.0	Irrigated modified pastures	422	0.21	2.73
2.1.0	Grazing native vegetation	4.3.0	Irrigated cropping	356	0.18	2.31
4.2.0	Irrigated modified pastures	4.3.0	Irrigated cropping	354	0.17	2.29
2.1.0	Grazing native vegetation	4.2.0	Irrigated modified pastures	315	0.16	2.04
3.2.0	Grazing modified pastures	2.1.0	Grazing native vegetation	312	0.15	2.02
4.2.0	Irrigated modified pastures	3.2.0	Grazing modified pastures	302	0.15	1.95
2.1.0	Grazing native vegetation	3.2.0	Grazing modified pastures	281	0.14	1.82
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	256	0.13	1.66
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	186	0.09	1.21
2.1.0	Grazing native vegetation	5.8.0	Mining	175	0.09	1.13
3.2.0	Grazing modified pastures	4.2.0	Irrigated modified pastures	152	0.07	0.99
2.1.0	Grazing native vegetation	2.2.0	Production forestry	141	0.07	0.91
3.6.0	Land in transition	2.1.0	Grazing native vegetation	125	0.06	0.81
2.1.0	Grazing native vegetation	3.6.0	Land in transition	123	0.06	0.80
3.2.0	Grazing modified pastures	4.3.0	Irrigated cropping	117	0.06	0.76
2.1.0	Grazing native vegetation	3.3.0	Cropping	99	0.05	0.64
2.1.0	Grazing native vegetation	5.5.0	Services	96	0.05	0.62
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	85	0.04	0.55
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	80	0.04	0.52
1.3.0	Other minimal use	5.8.0	Mining	79	0.04	0.51
5.8.0	Mining	3.6.0	Land in transition	72	0.04	0.47
4.3.0	Irrigated cropping	3.1.0	Plantation forestry	71	0.04	0.46
2.1.0	Grazing native vegetation	6.2.0	Reservoir/dam	69	0.03	0.45
2.1.0	Grazing native vegetation	5.5.0	Services	68	0.03	0.44
2.1.0	Grazing native vegetation	5.8.0	Mining	67	0.03	0.44
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	67	0.03	0.43
Total				**15,445**	**7.61**	**100.00**

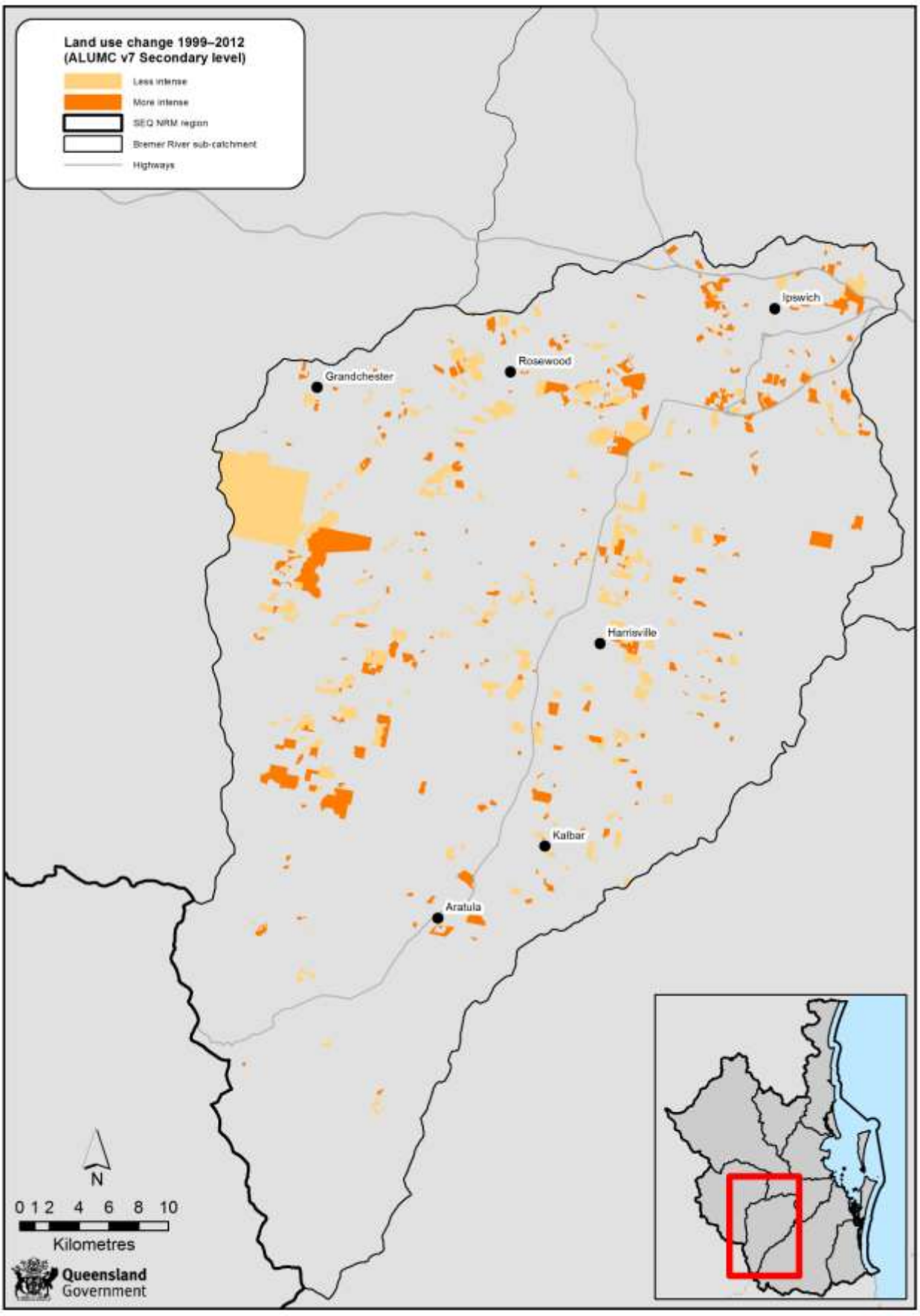

Figure 7: 1999–2012 land use change map at secondary level for the Bremer River sub-catchment

Appendix B Accuracy assessment

The accuracy assessment provided reference data suitable for assessing the 2012 land use map. For each of the sample points, the true land use class was independently determined (this provided the reference data) based on desktop interpretation of the same imagery and ancillary datasets available to the mapper. These points were then compared to the mapped class (map data) and the information summarised in the error matrix. The accuracy is summarised in terms of total accuracy, Kappa and user's and producer's accuracies. Each accuracy parameter is reported using a point estimate and a 95% posterior interval. Accuracy figures are provided as probabilities between 0 and 1.

Total accuracy provides an estimate of the overall accuracy of the map, and can be expressed as the probability that a point is mapped correctly. However, it should be kept in mind that total accuracy can be misleading, particularly when a dominant class exists. The Kappa statistic attempts to overcome this problem by adjusting for chance agreement. A common rule of thumb suggests a value of Kappa between 0.6 and 0.8 represents moderate agreement between the map and the ground truth, a value greater than 0.8 suggests strong agreement. Values less than 0.2 suggest the map is only marginally improved compared to a map produced by random allocation.

The user's and producer's accuracies summarise the map's accuracy on a per-class basis. User's accuracy for class A is the probability that a point mapped as A is truly in class A. If the user's accuracy of class A is estimated to be 0.84, then from a random sample of 100 points chosen from areas on the map in this class, approximately 84 would be found to be correct when checked in the field. Producer's accuracy for class B is the conditional probability that the map will show a site as class B given its true state is class B. If the producer's accuracy for class B were 0.84, then from a random sample of 100 points known to be in class B, approximately 84 would also be in class B according to the map. An accurate map should have both high user's and producer's accuracies.

The per-class estimates of accuracy are often not precise, since only part of the total sample points are used to estimate them. As a guide, if the upper bound of the interval for either user's or producer's accuracy is less than 0.5, this can indicate a true misclassification problem, rather than one due to inadequacies in sample size.

Points that differ between the map and the reference data may be due to positional or spatial errors. Inaccurate registration of datasets is an example of spatial error. Thematic errors are the incorrect labelling of an area due to difficulties in determining the true land use in that area, or by oversight or other operational errors. Spatial errors influence thematic accuracy. The purpose here is to assess the thematic accuracy of land use data. However, as described above, the separation of spatial and thematic errors can be difficult and was not undertaken. As a result, the accuracy assessment reflects properties of the land use data as a whole.

Note that the revised 1999 and 2006 land use and the land use change datasets were not accuracy assessed.

2012 land use dataset

The 2012 land use dataset was accuracy assessed with 362 points based on a random sampling strategy, using the map classes (area and frequency) as the strata. The stratified estimate of total accuracy is 0.95 (0.88, 0.98) and Kappa is 0.92 (0.80, 0.96). As the lower bound of the confidence interval for total accuracy is greater than 0.8, the mapping meets the ACLUMP specification.

Table 7 (page 25) shows the error matrix for the accuracy assessment of the 2012 land use data. For the majority of classes, the reference data agreed with the map data. For example, *irrigated cropping* had 70 sample points identified. For 68 of those points, the map data was also *irrigated cropping* and therefore correct. For two points the map data was incorrect, as the area was found to be *grazing native vegetation*. The misclassification in this case is likely to be related to image interpretation. Areas of grazing land may at times appear to be cropped, and confusion may also occur if rotations are used between *cropping, irrigated cropping* and *grazing native vegetation*.

The column 'proportion' in Table 7 is the relative proportion in area of the classes that were assessed, not of the catchment as a whole. The areas of other classes that are not amenable to assessment, for example, *grazing modified pastures*, are removed from the total area before the proportions are calculated. This column will thus sum to 100%.

Table 8 (page 26) provides the user's and producer's accuracy for the 2012 land use dataset. This demonstrates that the majority of land use classes in the catchment have been mapped accurately. The largest assessable land use class in this catchment is *grazing native vegetation* which has been mapped with very high user's and producer's accuracies of 0.967 and 0.993 respectively. The next largest class by area is *irrigated cropping* which also returned a high user's and producer's accuracy. The error matrix (Table 7, page 25) provides more detail on the misclassifications.

Accuracy estimates based on samples with fewer than two points are not considered sufficiently reliable, and are presented as NA (not available) in the table. Examples of this are *perennial horticulture*, *utilities* and *river*.

The user's and producer's accuracy results should be interpreted individually for their respective classes. It should be noted that the classes with a small area in proportion to the total area assessed, and also a small sample size, will return a wide confidence interval. The overall accuracy shows a much tighter confidence interval as it effectively summarises the accuracy results for all the assessable classes.

Some classes with low accuracies have insufficient sample points to provide precise estimates. For example, the producer's accuracy for *irrigated seasonal horticulture* is 0.958, however, from the 95% interval (0.248, 1.00) it can be seen that more sample points would be required to confidently determine class accuracy.

Table 7: Error matrix for the Bremer River sub-catchment 2012 land use dataset

		Reference data																									
	2012 land use class	Nature conservation	Other conserved area	Managed resources protection	Other minimal use	Grazing native vegetation	Production forestry	Plantation forestry	Cropping	Perennial horticulture	Land in transition	Irrigated cropping	Irrigated perennial horticulture	Irrigated seasonal horticulture	Intensive horticulture	Intensive animal husbandry	Manufacturing and industrial	Residential & farm infrastructure	Services	Utilities	Transport & communications	Mining	Waste treatment & disposal	Reservoir/dam	River	Marsh/wetland	**Total**	**Proportion (%)**
Map data	Nature conservation	**14**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0.43
	Other conserved area	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.32
	Managed resource	0	0	**15**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.25
	Other minimal use	0	0	0	**30**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	6.98
	Grazing native vegetation	0	0	0	0	**20**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	62.24
	Production forestry	0	0	0	0	0	**0**	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.0
	Plantation forestry	0	0	0	0	0	0	**15**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.69
	Cropping	0	0	0	0	4	0	0	**6**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.02
	Perennial horticulture	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.00
	Land in transition	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.03
	Irrigated cropping	0	0	0	0	2	0	0	0	0	0	**68**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	15.40
	Irrigated perennial horticulture	0	0	0	0	0	0	0	0	1	0	0	**8**	0	0	0	0	1	0	0	0	0	0	0	0	0	10	0.01
	Irrigated seasonal horticulture	0	0	0	0	0	0	0	0	0	0	1	0	**14**	0	0	0	0	0	0	0	0	0	0	0	0	15	0.60
	Intensive horticulture	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	1	0.00
	Intensive animal husbandry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	10	0.02
	Manufacturing and industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**	0	0	0	0	0	0	0	0	0	15	0.10
	Residential & farm infrastructure	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	**27**	0	0	0	0	0	0	0	0	30	7.04
	Services	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	**27**	0	0	0	0	0	0	0	30	2.27
	Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	1	0.00
	Transport and communications	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	1	0.01
	Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**	0	0	0	0	15	0.17
	Waste treatment and disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0.00
	Reservoir/dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**30**	0	0	30	3.29
	River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	1	0.00
	Marsh/wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**	15	0.12
	Total	14	1	15	35	26	0	16	6	2	11	69	8	14	1	10	15	28	27	1	1	15	1	30	1	15	**362**	**100**

Table 8: User's and producer's accuracy for the Bremer River sub-catchment 2012 land use dataset

Class	User's			Producer's		
	Estimate	95% interval		Estimate	95% interval	
Nature conservation	0.955	0.778	0.999	0.947	0.229	0.999
Other conserved area	NA	NA	NA	NA	NA	NA
Managed resource protection	0.958	0.781	0.998	0.909	0.128	0.999
Other minimal use	0.979	0.882	0.999	0.889	0.729	0.958
Grazing native vegetation	0.967	0.843	0.999	0.993	0.979	0.999
Production forestry	NA	NA	NA	NA	NA	NA
Plantation forestry	0.958	0.786	0.999	0.965	0.344	0.999
Cropping	0.552	0.257	0.817	0.274	0.005	0.971
Perennial horticulture	NA	NA	NA	NA	NA	NA
Land in transition	0.938	0.696	0.998	0.214	0.019	0.770
Irrigated cropping	0.963	0.901	0.991	0.996	0.915	1.000
Irrigated perennial horticulture	0.746	0.434	0.938	0.152	0.002	0.937
Irrigated seasonal horticulture	0.893	0.687	0.985	0.958	0.248	1.000
Intensive horticulture	NA	NA	NA	NA	NA	NA
Intensive Animal Husbandry	0.937	0.701	0.998	0.474	0.015	0.987
Manufacturing and industrial	0.958	0.794	0.999	0.796	0.072	0.997
Residential & farm infrastructure	0.882	0.739	0.962	0.997	0.801	1.000
Services	0.880	0.739	0.964	0.989	0.593	1.000
Utilities	NA	NA	NA	NA	NA	NA
Transport and communications	NA	NA	NA	NA	NA	NA
Mining	0.956	0.702	0.998	0.867	0.093	0.999
Waste treatment and disposal	NA	NA	NA	NA	NA	NA
Reservoir/dam	0.978	0.885	0.999	0.994	0.657	1.000
River	NA	NA	NA	NA	NA	NA
Marsh/wetland	0.955	0.788	0.999	0.824	0.077	0.998