Hawkesbury City Council

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Rural Lands Strategy

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Hawkesbury
Rural Lands Strategy









EDGE LAND PLANNING

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Hawkesbury Rural Lands Strategy

Prepared for Hawkesbury City Council
by

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Executive Summary

The rural lands of Hawkesbury LGA are an important part of the City and the wider region. They contain agricultural activities, scenic rural landscapes, native vegetation, biodiversity corridors and areas for rural living. Agriculture has been identified by the Council and the community as being an important component of the economy.

The LGA has significant agricultural land as well as riverine and mountainous rural landscapes. The Hawkesbury River provides a wide floodplain of rich alluvial soils which grow significant amounts of vegetables and turf. The river and the mountainous vegetated landscapes also provide for a significant tourism sector that is also linked to the agricultural produce. There is also a significant horse industry – including both thoroughbred and recreational horses.

The land within the LGA provides an important resource, both for the Hawkesbury LGA and the wider Sydney region, particularly for food and turf. This resource consists of a number of components:

- Productive agriculture
- Industry
- Community facilities and services
- Towns and villages
- Cultural heritage
- Rural landscapes
- Waterways and Native vegetation including National Parks and Nature Reserves

The Hawkesbury LGA is being affected by the trend to lifestyle living as people move away from the hustle and bustle of the city to a more rural lifestyle whilst still having the ability to go to the city for business and leisure. These people seek to live in rural and urban settings. There has been an increase in the number of rural residential rural living lots – 2, 10, 40 ha or more that people live on and do not gain the majority of their income from the productive capacity of the land. This trend is being noticed all around the fringe metropolitan areas of Australia's capital cities.

There are a variety of land uses within the rural parts of the LGA. They include intensive and extensive agriculture, native vegetation, rural residential, urban, extractive industries, commercial and light industrial uses. They all have an impact on each other as well as the environment. The main land uses which are of note are agriculture, and rural residential. The resultant rural land use conflict from the various uses is perhaps one of the most important issues to be addressed for the future of agricultural landscapes. Finding the balance between these often-competing desires for rural land is the key to planning for rural areas.

There are basically two forms of land use within the study area – ones based on agriculture and ones that do not have an agricultural base.

The uses based on agriculture include the following:

- Irrigated plants
  - ⇨ Vegetables grown in market gardens and protected cropping structures,
  - ⇨ Nurseries

    - ⇨ Turf
- Intensive Animals
    - ⇨ Poultry meat and egg production
- Grazing animals
    - ⇨ Cattle,
    - ⇨ Horse studs, agistment/boarding, and horses associated with rural residential use
- Rural Tourism uses
    - ⇨ Farm gate sales,
    - ⇨ Horse riding,
    - ⇨ Farm Stay Accommodation.

There are also a number of uses that are not based on agriculture which include the following:

- Rural residential uses
    - ⇨ Rural residential dwellings only,
    - ⇨ Home businesses, tradesman or truck depots,
    - ⇨ Horses (domestic / recreational)
    - ⇨ Bed & Breakfast / accommodation
- Commercial Uses
    - ⇨ Petrol stations, shops, medical practitioners, mechanical repairs, clubs, cafes and restaurants
- Extractive industries
    - ⇨ Quarries
- Public Uses
    - ⇨ Cemeteries, halls, churches, pony clubs
- Rural Tourism uses
    - ⇨ Caravan Parks,
- Village development
    - ⇨ Residential, commercial, industrial uses

A land use survey has been carried out and this found that 86.1% of the land uses are rural residential with 18.8% of these being in the rural fringe category which are estates with kerb and guttering and adjoining or near to urban centres (Pitt Town and Windsor Downs) and the remainder being rural living category which are scattered throughout the rural landscape. Most of the rural residential uses are just for living purposes but some also have other activities associated with the use including trucks, horses, home businesses and bed and breakfast accommodation. The next highest land use is irrigated plants which makes up 4.5% of the number of properties followed by extensive agriculture, commercial, public uses, vacant, intensive animals and extractive industries. The main types of irrigated plant uses are market gardens, turf farming, orchards and protected cropping, nurseries and mushroom farms. The intensive animal uses are made up of horse studs and poultry farms with some small dairies. A similar land use survey was conducted in 2003 and this survey found that the highest land use category was rural residential which was 83.1% and the number two land use was Irrigated Plants 5.8% and number three was extensive agriculture with 3.6%. It can be seen that rural residential development increased 3.0% and irrigated plants decreased by 1.3% of the total number in each year. The actual growth was 6.6% and this equates to 0.4% per annum. The LGA population grew at a

rate of 0.5% per annum which shows that the growth of rural residential development kept pace with the growth of the LGA.

The rural land in the LGA is highly fragmented with the average size being 6.2 ha and a median of 2.0 ha. The majority of holdings are in the less than 0.8 ha range and followed by 0.81 – 3.0 ha range and that there is not very many larger than 18ha. In fact, 62.3% of the holdings are less than 3 ha and 81.1% are less than 8 ha

The mixture of rural residential use amongst agricultural uses such as vegetables, fruit and poultry can cause land use conflict. The effect of the pollution laws is that a neighbour can complain about any pollution emanating from a farm such as noise from a tractor or pump, trucks taking produce from the packing shed, spray drift or odour. The Council must then investigate and can require the farmer not to farm part of the land, providing a "buffer area" to the rural residential use, or to conduct farming activities at restricted hours. This is because the farm is causing pollution to cross its boundaries and causing the neighbour a loss of amenity. The fact that the farm was there first and is carrying out normal agricultural activities is irrelevant in this case because it is causing pollution. These affected buffer areas between the dwellings and the agricultural uses can be referred to as the "contested land" which can be seen from map 5. The total area of contested land in the LGA has been calculated to be 21,230 ha of land, with much of this being agricultural land. This covers nearly all of the agricultural uses except for those on the Hawkesbury River floodplain where there are not many rural residential uses. The issue of land use conflict and its potential impact on agricultural and tourism land use is very significant for the future of the rural lands of the LGA.

Hawkesbury has a significant rural economy. Agriculture is a significant land use in the Hawkesbury LGA. In 2016 the Hawkesbury LGA produced a total of $158,670,281 value of production. This is equivalent to 19.7% of Peri-Urban Sydney, 1.2% of the NSW value of production and 0.3% of Australia's total value of agricultural production. It is number two in the Sydney Peri-Urban Area behind Central Coast which has $161,449,035. The main commodity in Central Coast is poultry and in Hawkesbury it is Vegetable production which is the most significant. Crops have a value of $118,853,279 which makes up 74.9% of the total LGA value of agricultural production. Vegetable production is $63,686,875 (40.1%), Turf has a value of $48,534,440 (30.6%). The top five commodities are vegetables, turf, poultry meat, eggs and nurseries. The significant agricultural commodities are as follows:

- Turf – number one producer in Sydney (82.5%), NSW (59.3%) and Australia (19.8%);
- Perishable Vegetables – Number one producer in the Sydney Peri-Urban area (32.6%) and NSW (16.3%) and the thirteenth highest in Australia (1.9%). It should be noted that the number LGA one in Australia is Lockyer Valley which has 11.9% of Australia's perishable vegetables;
- Other Poultry (ducks, turkeys, geese, etc) – Number four in Sydney (12.5%) and NSW (8.1%) and fifth highest in Australia (4.3%);
- Egg production – number two in Sydney (19.7%), number four in NSW (7.3%) and number eight in Australia (2.3%).

The Sydney Peri-Urban area is a significant producer of perishable vegetables, poultry and eggs as well as nurseries, flowers and turf. It has a total value of $806.4m which equates to 6.2% of NSW value of production from 1.5% of the land area. The significant commodities are as follows:

- Perishable Vegetable Production
  - ⇨ 49.8% of NSW – Number 1 region
  - ⇨ 5.8% of Australia Perishable Vegetables
- Poultry Production
  - ⇨ 35.6% NSW Meat Chickens – Number 1 region.
  - ⇨ 64.5% NSW Other Poultry – Number 1 region
  - ⇨ 36.8% NSW Egg Production – Number 1 region
  - ⇨ 11.9% of Australia's meat chickens
  - ⇨ 27.5% of Australia's Other Poultry
  - ⇨ 11.6% of Australia's Egg Production
- Nurseries, Flowers & Turf Area
  - ⇨ 39.2% of NSW Nurseries – Number 1 region
  - ⇨ 54.3% of NSW Flowers – Number 1 region
  - ⇨ 71.9% of NSW Turf – Number 1 region
  - ⇨ 8.6% of Australia's Nurseries
  - ⇨ 7.1% of Australia's Flowers
  - ⇨ 24.0% of Australia's Turf

The LGA has a number of environmental characteristics which influence the location and type of land uses. The topography can broadly be described as being steep to undulating land in the west and north with flat to undulating land on the footslopes and banks of the Hawkesbury, Colo and Macdonald Rivers. The topography is a key determinant of the location of agriculture in the LGA. The flat to undulating land to the south and east is associated with alluvial river flats and these are areas where the intensive plants are grown as well as the poultry farms and also there is also an area of fruit orchards on the ridgeline to the west of the LGA along the Bells Line of Road. There is a significant amount of native vegetation within the LGA and this too is a function of the topography and soil types. There are a number of areas of ecological corridors within the rural lands of the LGA.

Analysis has been carried to show the demographic make-up of the rural lands. This showed that is the urban-rural population split was 57.6% urban and 42.4 % live in the rural land. There are more people in the rural lands in the secondary school age (12-17) and more parents and homebuilders (35-39), older workers and pre-retirees (50-69) and seniors (70-84). There are considerably more couples with children over 15 and couples with no children at home in the rural areas and slightly more couples with children under 15 in the rural areas than the urban and LGA. The weekly family income is higher in the rural area for all families earning more than $1,000 per week and higher with considerably more in the $4,000 per week and higher. There are less people who own their house outright and also who own with a mortgage and more people who rent in the rural area. There are more people who lived at a different address one year ago but less who lived at a different address five years ago. The number one sector of employment is construction, followed by retail, education and training, health care and social assistance, manufacturing, public administration,

professional scientific and technical services, other services, accommodation and food services with agriculture coming in at number 10. This verifies the high number of rural residential uses in the rural landscape. There are more managers and technician and trade occupations in the rural areas and also slightly less people with degrees and certificates in the rural areas. There are 4.1 % of the rural workforce who work from home compared to 1.6% in the urban area.

The management and control of land uses within the Hawkesbury LGA are guided by a number of policy and legal processes. These are Acts of Parliament and Regulations as well as Plans and Policies prepared under the provisions of those Acts and Regulations. The key document for the future of the LGA include the strategies prepared by the Greater Sydney Commission titled The Metropolis of Three Cities and the Western City District Plan.

There are a number of development and planning issues that have an impact on the sustainability of agriculture. They can be categorised into environmental opportunities and constraints and social and economic factors. They are as follows:

Environmental Opportunities and Constraints

- Climate Change
- Water Catchments
- Groundwater
- Native Vegetation and Biodiversity
- Topography
- Soils
- Landscape Character
- Flood Prone Land
- Bushfire Hazard
- Weeds

Social and Economic Factors

- Land Use
- Rural Land-Use Conflicts
- Sustainable Agriculture
- Food Security
- Economic Development
- Extractive Industries
- Infrastructure
- Domestic Effluent Management
- Heritage

Consultation with the stakeholders is seen as an integral component of this strategy. Targeted consultations were held with key stakeholders from Government Agencies and the community including agricultural producers, and farmer groups. The key messages coming from these were the importance of agriculture and the need to preserve it.

The key issues facing the future of the rural lands are as follows:

- Maintaining food production;
- Pressure for rural residential and urban development;
- Farmers are price takers, not price makers;
- Land Use Conflict;
- Price of land for agriculture;
- Change of land use from agriculture to rural residential by sale of farms;
- Rural residential development;
- Biodiversity;
- Water quality;
- Natural hazard impact – bushfires and flooding;

There are a number of development opportunities to improve the economy of the rural land and they are as follows:

- Horticulture and Protected Cropping;
- Aquaculture;
- Poultry;
- Nurseries;
- Turf;
- Horse Sector;
- Tourist and commercial uses.

The links to Western Sydney Airport also create development opportunities for these sectors.

The competing demands on agricultural land are complex and the policy solution has traditionally been focused on planning policy and regulation. However, there is a need is to balance this with incentives, economic development initiatives and infrastructure as well as community engagement, communication and education.

A settlement hierarchy has been developed which is based on the services and facilities that are provided in each settlement which is a factor of its size. The hierarchy is based on the hierarchy in the Western District Plan prepared by the Greater Sydney Commission and further categorises the local centres into towns, villages and rural localities. The purpose of the hierarchy is to acknowledge that some settlements, because of their lack of services and facilities, are not able to grow by either infill or expanding the boundaries of its urban zoned land.

A number of landscape units have been identified for the LGA and they are based on land use, topography, vegetation and holding sizes. The landscape boundaries have been defined by the relationship between these elements and they also relate to the way that an area looks and feels. They have been identified to help the Council to provide planning for the future of the rural lands as well as the consideration of the requirement for place-based planning in the Western City Plan prepared by the Greater Sydney Commission. The landscapes will be used to identify different recommendations for land uses and zoning as well as other strategic priorities.

A key component is the designation of land for its best use. A methodology has been devised that identifies the various characteristics of the land from both the physical, social and economic sense and results in two land use designations that can be used to protect the land for its best use. These zones are RU1 Primary Production and RU2 Rural Landscape and reflect the future use and character of the land use within the LGA. The current zone boundaries are not in conjunction with the best use of the land. The land use survey has confirmed this by showing that the most intensive agricultural uses are in the rural landscape zone and the most rural residential uses are in the Primary Production zone – this does not reflect the intention of the zones nor the objectives. There is also a RU4 Primary Production Small Lot zone which has mostly rural residential use and a small number of intensive agricultures. A simplified zoning regime has been recommended which has the Primary Production zone

covering the most important agricultural land and the rest of the land being recommended for Rural Landscape zoning.

The zone review has revealed that there are a number of land use definitions in the LEP that need to be added and amended and they are as follows:

- Rural Tourist Cabins
- Roadside Sales
- Protected Cropping
- Rural Workers Dwellings

The recommendations can be categorised into the following categories:

Growth Management

Adopt the settlement hierarchy outlined in section 6.5

Urban expansion into the surrounding rural landscape can only occur in accordance with the settlement hierarchy and the recommendations of the Hawkesbury Housing Strategy.

Acknowledgement that the Western City District Plan identifies that rural areas contain large areas that serve as locations for people to live in a rural or bushland setting. Rural-residential development is not an economic value of the District's rural areas and further rural-residential development is generally not supported. Limited growth of rural-residential development could be considered where there are no adverse impacts on the amenity of the local area and the development provides incentives to maintain and enhance the environmental, social and economic values of the Metropolitan Rural Area. This could include the creation of protected biodiversity corridors, buffers to support investment in rural industries and protection of scenic landscapes.

Rural Lands Preservation

Adopt the landscape based strategic planning concept in section 6.6.

Encourage and promote the farmers of the Hawkesbury LGA

Adopt the let 'the farmers farm' land use conflict concept outlined in section 6.4.1 and discuss this with the relevant State Government Departments

Economic Development

Encourage farmers to join the farm gate trail and sell from the farm gate or to sell their produce to those farmers who already have a farm gate sales outlet.

Encourage farmers to sell local produce to local shops under the band of Hawkesbury Harvest

Council engage with the Protected Cropping sector and encourage and facilitate the establishment of protected cropping sector in the Hawkesbury LGA.

Encourage the retention and promotion of the existing agricultural sectors of vegetable and turf farming, nurseries, egg production and poultry meat production in the LGA

Encourage and promote the agricultural processing sector to expand in the LGA as well as attracting other processing industries to establish in the LGA

Encourage and promote the horse sector horse studs, polo clubs and the recreational horse riding

Promote agritourism as a key economic development component of the rural sector, focusing on the Bells Line of Road in Kurrajong Heights to Bilpin, Berambing and surrounding areas

Consider the incentive measures outlined in section 6.4.2 and discuss this with the relevant State Government Departments

Promote the existing farmers markets and encourage them to establish in other settlements.

Land Use Planning

Adopt the changes to the zones as outlined in section 6.7

Endorse the changes to the land use definitions and new provisions outlined in section 6.8

Amend the Hawkesbury DCP as discussed in section 6.4.1

Chapter 1: Introduction

1.1 Introduction

The Hawkesbury Local Government Area (LGA) is located in the outer north west of the Sydney metropolitan area and is located approximately 50 km from the Sydney CBD. It is part of the Sydney Peri-Urban area and has an area of 2,793 square kilometres and a population estimated to be 67,083 in 2018 (ABS, 2019a) with an annual average growth rate of 0.7% per annum for the past ten years and 0.6% for the 2017-18 year.

The LGA has significant agricultural land as well as riverine and mountainous rural landscapes. The Hawkesbury River provides a wide floodplain of rich alluvial soils which grow significant amounts of vegetables and turf. The river and the mountainous vegetated landscapes also provide for a significant tourism sector that is also linked to the agricultural produce. There is also a significant horse industry – including both thoroughbred and recreational horses.

The land within the LGA provides an important resource, both for the Hawkesbury LGA and the wider Sydney region, particularly for agricultural produce. This resource consists of a number of components:

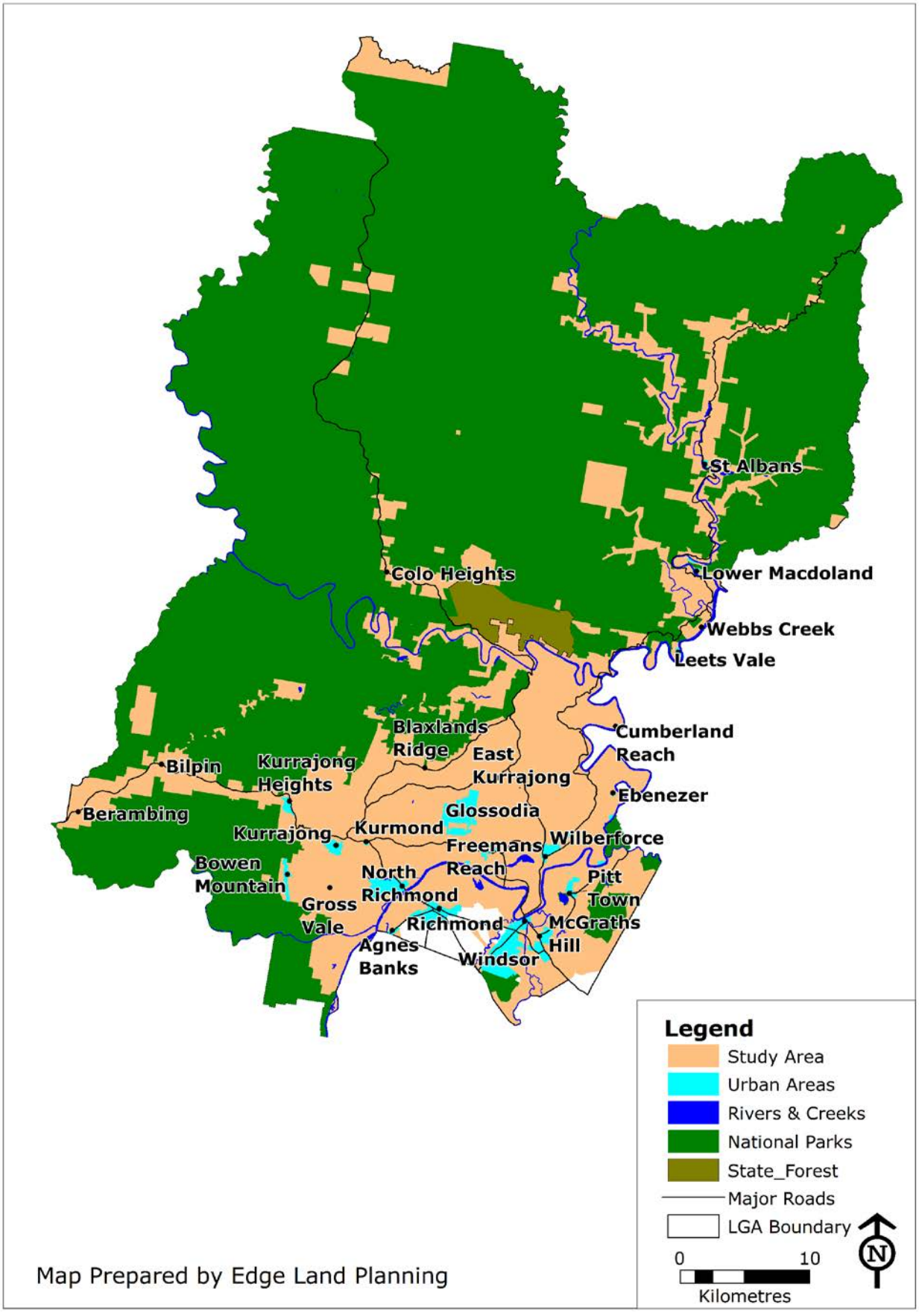
- Productive agriculture
- Industry
- Community facilities and services
- Towns and villages
- Cultural heritage
- Rural landscapes
- Waterways and Native vegetation including National Parks and Nature Reserves

It is a significant area for agricultural production in close proximity to markets in Sydney predominantly in industries including perishable vegetables, turf, nurseries, cut flowers, poultry meat and eggs. This study investigates the land uses and holding sizes in the rural areas of the LGA and provides a discussion of the key issues for the future of the rural landscapes.

The rural lands also contain areas for people to live. Some live on the farms but a very large proportion live within the rural landscape and do not have any productive use of the rural land. These people have a rural residential use of the land. So, this strategy considers not only the productive land but also the land that provides a living area for the residents.

1.2 Location and Study Area

The study area is the whole of the Hawkesbury LGA, which is zoned mostly rural with a fragment of the area zoned for urban residential and employment purposes as well as open space and other urban uses. It does not cover the urban areas or land contained within State Forests, National Parks or State Conservation areas. The study area is shown on map 1.1.



Map 1.1: Study Area

1.3 Methodology

This Rural Lands Strategy has been prepared in accordance with the brief issued by Hawkesbury City Council.

The document has been prepared by the Edge Land Planning based on discussions held with Council Officers, Government Departments and the Community.

Data was gathered based on secondary information except for a detailed land use survey and lot and holding size analysis, which was carried out by the consultant. The land use survey was carried out in2019 by Edge Land Planning . It entailed utilising aerial photography to gain an appreciation of the land use, which was then field checked by a survey of all roads and properties in the LGA. This information was then coded and entered into Councils property database, which enabled it to be mapped using a Geographical Information System (GIS). The holding sizes within the LGA were categorised and mapped. A detailed description of the methodology for the land use survey is contained in Appendix 1.

A detailed literature review has been carried out of studies and issues relevant to local and regional planning. Discussions were held with various Council officers covering the areas of planning, environmental science, engineering and social services.

Australian Bureau of Statistics census information was used to provide a population and demographic profile of the LGA.

Input has been given by the State Government Departments through formal and informal discussions.

1.4 Sydney Metropolitan Planning Policy

The planning policies that set the agenda for the future of planning for the Sydney Region have been prepared by the Greater Sydney Commission and are as follows:

- Greater Sydney Region Plan A Metropolis of Three Cities – Connecting People
- Our Greater Sydney 2056 Western City District Plan – Connecting Communities
- Our Greater Sydney 2056 Central City District Plan – Connecting Communities
- Our Greater Sydney 2056 Eastern City District Plan – Connecting Communities
- Our Greater Sydney 2056 North District Plan – Connecting Communities
- Our Greater Sydney 2056 South District Plan – Connecting Communities

The Western City District Plan is the most relevant to the Hawkesbury and it as well as the Metropolis of Three Cities Region Plan will be discussed in this Strategy as they relate to the rural lands of the Hawkesbury LGA.

1.4.1. Greater Sydney Region Plan

In the context of these plans, the Hawkesbury LGA is within the Metropolitan Rural Area (MRA).

The Structure Plan for the Metropolis of Three Cities states that one of the matters of critical importance to the plan is "… the retention of the integrity of the values of the Metropolitan Rural Area and the Protected Natural Area" p12 (Greater Sydney Commission, 2018)

The Plan lists ten directions for the metropolis of three cities and also 40 objectives. The relevant ones are as follows:

- *Objective 22: Investment and business activity centres* contains a centre hierarchy which lists metropolitan, strategic and local centres. It notes that the strategic centres vary in size, location and mix of activities and enable access to a wide range of goods, services and jobs. In the context of Hawkesbury LGA, Richmond-Windsor are listed as strategic centres and all of the other settlements "… function as local centres" (ibid p121) and would be local centres, however the document does not identify them per se. The local centres provide are important for access to a range of goods and services for the local and surrounding rural areas. This includes shopping, commercial, health and community services as well as recreational needs. The Region Plan notes that one of the distinguishing components of a centre is the presence of a supermarket and states that these are the centres which should be the focus of urban expansion. The Regional Plan does not identify the local centres and this is to be left to each Council. The hierarchy of settlements for the LGA is discussed in sections 4.2.6 and 6.5 and this provides the link between the Region Plan and the Rural Strategy.
- *Objective 24: Economic sectors are targeted for growth*. This lists tourism as well as agriculture and resources as key industry sectors of the rural areas that need to be supported and protected. The objective notes on page 140 that the

value of agriculture in the Sydney region in 2016 was $645 million which is 5% of the value of the State's agriculture output. It notes that the key commodities are poultry meat, eggs, vegetables, nurseries, flowers and turf. It also notes that extractive industries are important and include sand, clay and mining. It notes that the proximity of rural residential development to agriculture, mining and extractive industries that generate odour, noise and other pollutants can be a source of conflict. It states that there is a need to provide important rural industries with certainty so their operations can continue without encroachment from incompatible land uses. Strategy 24.2 lists a number of matters to be considered when preparing tourism plans which are applicable to agritourism and Strategy 24.3 is about protecting and supporting agricultural production and mineral resources by not allowing inappropriately dispersed urban activities in the MRA.

- *Objective 27: Biodiversity is protected, urban bushland and remnant vegetation is enhanced* details the protection of the significant biodiversity resource in the MRA and it is noted that a large part of the biodiversity in the LGA is in the Greater Blue Mountains World Heritage Area. It also is noted that there are incentive's for landowners in the MRA to protect and enhance the environmental values of their land by using biodiversity offsets. This only covers a small area of vegetated land between Kurrajong, Bowen Mountain and Grose Vale. It allows landowners to access the NSW Government's Biodiversity Investment Opportunity Mapping project which can provide funding to manage biodiversity. Strategy 27.1 deals with protecting and enhancing biodiversity.
- *Objective 28: Scenic and cultural landscapes are protected.* This deals with the scenic and cultural landscapes. It notes that cultural and scenic landscapes produce symbols of the Sydney area and connect the present-day urban environment with natural and historic urban landscapes. It goes on to state that it is important to protect the aesthetic, social and economic values and the character of the entire region. There are more opportunities to protect these landscapes with the demand for biodiversity offsets as well as continuing to support agriculture. Strategies 28.1 deals with identifying and protecting scenic and cultural landscapes and Strategy 28.2 relates to and enhancing and protecting views of scenic and cultural landscapes from the public realm. The Hawkesbury LGA has some significant scenic and cultural landscapes.
- *Objective 29: Environmental, social and economic values in rural areas are protected and enhanced* is focused on the MRA and it notes that this includes farms, rural towns and villages, rural residential developments, heritage, scenic and cultural landscapes as well as mineral resources and locations for recreation and tourism. It is perhaps the most important of the objectives for the Hawkesbury LGA. It also includes large areas where natural hazards like flooding and bushfires need to be managed. It notes that farming has been integral to the supply of fresh food for the residents of Greater Sydney for over 200 years and also that the agricultural production bolsters the resilience of the region as well as being supported by a growing interest in local food production. Valuable supplies of sand, stone, clay and other materials are sourced from

within Greater Sydney. Protection of these resources is important in supporting the construction industry.

The objective goes on to state that place-based approaches for landscape units within the MRA and these will help to manage the economic, environmental and social values as well as maximising the productive use of the land. It also notes that urban development is not consistent with the values of the MRA and there is sufficient land in the existing urban area and growth areas. It states that this "*… eliminates the need for the Urban area to expand into the Metropolitan Rural Area*". It notes that there are a number of rural towns and villages that offer people the opportunity to live and work in an attractive rural or bushland setting. Maintaining and enhancing the distinctive character of each rural and bushland town and village is noted as being a high priority. There is a section dealing with mineral resources and this states that mineral resources supply construction materials that are needed for the building of housing and infrastructure throughout Sydney. It is stated that there is a need to manage the development of other uses on land surrounding these uses to ensure that land use conflict will not impact on the future operations of extractive uses. It also has a section dealing with rural lands and states that place-based planning can be used to identify, maintain and enhance the economic, environmental and social values of rural lands. Rural residential development is not considered to be an economic value of the MRA and it is generally not supported.

There are two strategies to implement the objective which maintain or enhance the values of the MRA using place-based planning and to limit urban development to with the urban area except for specific urban investigation areas (which are not in the LGA). The place-based planning is discussed in more detail in section 6.6.

1.4.2. Western City District Plan

The Western City extends from the Hawkesbury LGA in the north, Penrith and Liverpool in the centre and Camden, Campbelltown and Wollondilly in the south. It includes the urban areas of Western Sydney as well as significant agricultural land, mineral resources, biodiversity and water as well as having a number of towns and villages that provide for the surrounding rural communities and which also provide a tourist destination.

The Western City is covers the LGAs of Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly. It also includes the Aerotropolis which is located around the Badgerys Creek Airport in the Liverpool and Penrith LGAs.

The Plan lists ten directions for the Metropolis of Three Cities and the Western City District and also 22 planning priorities and actions. The relevant ones are as follows in the order they are in the document:

Planning Priority W4: Fostering healthy, creative, culturally rich and socially connected communities. Is partially focused on healthy communities and it is noted that research has shown that three key aspects of the built environment that support healthy lifestyles and improved health outcomes are strong social connections, physical activity and access to fresh food. There are a number of actions listed under this planning priority and one discusses promoting local access to healthy fresh food and supporting local fresh food production.

Planning Priority W6: Creating and renewing great places and local centres, and respecting the District's heritage. This is similar to objective 22 in the Sydney Region Plan. This priority deals with the centres and the hierarchy of settlements. It notes that Richmond and Windsor are strategic centres and it also notes that heritage is a key aspect that needs to be conserved. It has a number of actions that acknowledge and provide for the future of the settlements. These actions deal with the design of the urban centres using a place-based approach and they are not directly relevant to the Rural Strategy.

Planning Priority W7: Establishing the land use and transport structure to deliver a liveable, productive and sustainable Western Parkland City.is related to the overall land use and transport issues associated with the entire region and it acknowledges that agriculture has a role to play in this, albeit a small one and it is acknowledged that it can be used to provide for food production and tourism related benefits. It is important that there is a good transport network so that the produce that is grown and processed in the Hawkesbury LGA can be taken out in the most efficient way possible.

Planning Priority W8: Leveraging industry opportunities from the Western Sydney Airport and Badgerys Creek Aerotropolis. This deals with the Western Sydney Airport and the Badgerys Creek Aerotropolis. The Airport is currently being constructed and will begin operations in 2026. The accompanying Badgerys Creek Aerotropolis will, with the airport, form the economic catalyst for the proposed Western Parkland City. This will provide positive employment options for the future. The protection and support for rural industries along with planning for tourism and visitation activities are noted as key industry sectors that are relevant to Hawkesbury's rural lands. This also includes the scenic landscapes which are made up in part of the agricultural uses (turf farming, market gardens and citrus orchards) along the Richmond Lowlands, Freemans Reach, Wilberforce and Pitt Town Bottoms areas. The planning priority also discusses agricultural processing and export and notes the potential for eggs, poultry, cut flowers, turf and mushroom farms to benefit from these, also not mentioned but also just as important is the perishable vegetable sector. It also notes the role of the Western Sydney University Hawkesbury Campus in the agriculture and food areas as well as natural science and animal science. The following statement is made which is very pertinent to the Hawkesbury LGA:

> *"Agricultural industries provide produce, employment and tourism opportunities and require long-term certainty to enable investment and growth, especially as the Western Sydney Airport may provide new international markets. The*

> *Western Sydney Employment Area will develop agribusiness and will also provide opportunities to establish high value intensive agricultural industries and will enhance export capacity for NSW Primary Industries to new international markets. Local agribusiness opportunities for processing and export can be leveraged through stronger links to rural areas in the district." (ibid p75)*

The actions for this planning priority that are relevant to the Hawkesbury LGA are as follows:

35. Protect and support agricultural production and mineral resources (in particular, construction materials) by preventing inappropriately dispersed urban activities in rural areas

38. Create capacity for tourist accommodation in appropriate locations through local environmental plans.

39. When preparing plans for tourism and visitation, consider:
    (a) encouraging the development of a range of well-designed and located facilities
    (b) enhancing the amenity, vibrancy and safety of centres and township precincts
    (c) supporting the development of places for artistic and cultural activities
    (d) improving public facilities and access
    (e) protecting heritage and biodiversity to enhance cultural and eco-tourism
    (f) supporting appropriate growth of the night-time economy
    (g) developing industry skills critical to growing the visitor economy

40. Consider opportunities to implement place-based initiatives to attract more visitors, improve visitor experiences and ensure connections to transport at key tourist attractions.

41. Consider opportunities to enhance the tourist and visitor economy in the District, including a coordinated approach to tourism activities, events and accommodation

It is noted that Council and other planning authorities have the responsibility to implement these actions. This will be discussed in more detail in chapter 6.

Planning Priority W11: Growing investment, business opportunities and jobs in strategic centres. This focuses on investment and business activity in centres. It notes the centres hierarchy adopted by the Region Plan and it details specific actions for the strategic centres which include Richmond-Windsor. It is noted that the role of Richmond-Windsor has traditionally been to provide accommodation and services to support the rural population and agricultural activity by providing agricultural supplies, professional services as well as mechanical and other similar trades services. The role and function of the centres has changed over time to include retail and commercial services, major health facilities as well as the aviation, defence, equine, Western Sydney University and TAFE cluster at Clarendon. There is also a significant employment area at South Windsor which has a number of large businesses in it.

Planning Priority W12: Protecting and improving the health and enjoyment of the District's waterways. This is about the waterways of Western Sydney and it is noted that they shape its landscape and character. They are natural assets, cultural resources and recreational destinations. The catchments of Western Sydney that are relevant to Hawkesbury LGA are the Hawkesbury-Nepean which also includes South Creek. The Hawkesbury-Nepean Catchment extends outside of the boundaries of the Western District Plan with the river system having its headwaters in Braidwood to the south and the Southern Highlands to Lithgow in the west. These rivers and creeks flow through natural areas, farming land as well as the urban parts. It is noted that these land uses have an impact on the quality of the river system. From an agricultural point of view, it is important that the health of the river system is protected because most of the intensive plant and animal industries pump water directly from the river system. There are a number of actions that deal with protecting and enhancing the waterways of the District. It is noted that the Western Parkland City is focused on the South Creek corridor and this enters the Hawkesbury River at Windsor. The strategy notes that with the urban growth as well as the development of the Western Sydney Airport and Badgerys Creek Aerotropolis there will be the opportunity to better manage the land so as to enhance and improve the health of South Creek and its tributaries. It is therefore important to the future of the agriculture sector in the LGA that this development does not lead to any impact on the waterways. There are some actions that can also be taken by the Councils which form the South Creek catchment which will be discussed in chapters four and six.

Planning Priority W14: Protecting and enhancing bushland and biodiversity. This planning priority provides for the protection of bushland and National Parks to preserve the significant biodiversity. There is also bushland and remnant vegetation throughout the urban and rural landscapes which also provide habitat It is estimated that bushland covers approximately 60% of the Western City District, the majority of which is in National Parks and Nature Reserves. A total of 70% of the Hawkesbury LGA is National Parks and Reserves. The protection of biodiversity has in impact on agriculture because it provides for clean waterways and also provide habitat for a number of beneficial organisms for agriculture.

Planning Priority W16: Protecting and enhancing scenic and cultural landscapes. This deals with protecting the scenic and cultural landscapes of the District. Scenic and cultural landscapes encourage an appreciation of the natural environment, protect heritage and culture, and create economic opportunities, particularly for recreation and tourism. Aboriginal culture is deeply entwined in the landscapes of Greater Sydney. The Greater Blue Mountains World Heritage Area and the national parks and nature reserves make up the natural landscape component of the scenic landscapes whilst the modified landscapes providing rural vistas and along the alluvial river flats and escarpments all combine to make the spectacular landscapes of the District and a setting for the urban areas. Ridgelines are also highly valued elements of the scenic landscapes and the document notes that development should not diminish this scenic quality. Hawkesbury LGA is represented in all of these aspects. It is also noted that the cultural landscapes are intertwined with the natural and modified landscapes. The

action that is relevant to Hawkesbury is to protect the ridgelines, scenic and cultural landscapes associated with the escarpments of the Blue Mountains and this includes the area around Kurrajong Heights. There is also an action to protect and enhance views of scenic landscapes from the public realm. This includes the lands in the Bilpin to Kurrajong Heights area as well as the slopes from Grose Vale to Blaxlands Ridge and the land along the Hawkesbury River.

Planning Priority W17 Better Managing Rural Areas deals with the rural lands and is s the most important planning priority for the rural lands of the Hawkesbury LGA. It is noted that the rural areas support productive agriculture, provide mineral and energy resources, contribute to habitat and biodiversity and sustain the local rural towns and villages. This include the Hawkesbury and Nepean River floodplains escarpment and hills and steep ridgelines and comprise 28% of the landmass. The agriculture includes poultry meat, egg production, dairies, irrigated horticulture such as vegetables and mushrooms, nurseries and cut flowers as well as turf farming. All of these are represented in the Hawkesbury LGA. The rural lands also contain extractive resources which are based on the construction material resources. There are major resources of construction sand in the Londonderry area as well as along the Hawkesbury River. It is this area that is within the LGA. The District Strategy states that by sourcing construction materials locally, it reduces the transportation, thus reducing costs and environmental footprint and the social impact of construction. It is noted that the future housing needs Sydney can be met within the existing urban areas and the Growth Areas identified in the Region Plan – the north west and south west Growth Areas, which includes the south eastern part of the LGA.

The rural towns and villages of the MRA contain some of the best examples of early colonial buildings and heritage. A number of these area also nestled in a bushland setting like Bowen Mountain, Kurrajong and Kurrajong Heights and the maintenance of the individual distinctive character of these towns and villages is a high priority. It is noted that the rural area also serves as locations for people to live in a rural or bushland setting. "Rural residential development is not an economic value of the District's rural areas and further rural residential development is generally not supported" (ibid p126).

The Western Sydney Airport will provide a catalyst for agricultural exports from the region and the District will retain its significant peri-urban agricultural production. It is noted the Western Sydney University Agri Park Research Centre at its Richmond Campus and this will help to promote the role of agriculture in the LGA. There are two actions for this planning priority which are as follows:

> *78. Maintain or enhance the values of the Metropolitan Rural Area using place-based planning to deliver targeted environmental, social and economic outcomes.*
>
> *79. Limit urban development to within the Urban Area, except for the investigation areas at Horsley Park, Orchard Hills, and east of The Northern Road, Luddenham.*

1.4.3. SEPP Exempt and Complying Development

The State Environmental Planning Policy (Exempt and Complying Development) 2008 (Codes SEPP) applies to the rural zones and village zones, but not to environmental zones. This SEPP lists a number of exempt and complying development types.

The Rural Housing Code applies to the RU1 Primary Production, RU2 Rural Landscape, RU4 Primary Production Small Lots and the R5 Large Lot Residential zones. It makes provision for all lots greater than 4.000 m^2 in these zones to be complying development as long as they meet the minimum lot size requirement. In the case of the RU1 and RU2 zones the minimum lot size for subdivision is 10 ha and for the RU4 zone it is 4 ha. This means that a new or replacement dwelling house or alterations and additions to a dwelling house can be built next to an intensive agriculture use and the farmer and the Council do not have any ability to ask or require it to be moved so it is further away from the agricultural use, to avoid land use conflict This is antipathetic to the objective to reduce land use conflict in the rural zones. Whilst it is not very likely for new dwellings on existing lots, it is very possible on farmland that has been sold and becomes rural residential development, a trend that will be discussed in chapter 4. In this case, the former farmhouse is normally replaced with a larger dwelling which may not be in the same location as the original farmhouse. It is noted that clause 3A.19 of the SEPP requires a dwelling house or outbuilding to be at least 250m from an intensive agricultural development or a rural industry. Whilst this may be seen as an attempt to ameliorate land use conflict, it is not considered that 250m is a suitable distance, nor is it known what the evidence for the 250m is based on. It is noted that setbacks are generally between 300 to 1,000m depending on whether it is an intensive plant or livestock agricultural use and that the NSW DPI Primefact titled *Buffer Zones to Reduce Land Use Conflict with Agriculture* dated 2018 states that intensive livestock agriculture should be 1,000m from sensitive receptors.

Farm buildings (which include packing sheds and machinery sheds), for example are only exempt development if they meet specific requirements If the farm building does not comply with these development standards, particularly in the case of the height, building footprint, setback, or distance from other buildings it becomes development that needs a Development Application (DA). For example, a holding of between 4 and 10 ha can only have 1,000 m^2 of buildings as exempt development. It is not uncommon for market gardens or turf farms to have buildings with a total area of more than 1,000 m^2 and this limit on the total size does not seem to be justified, particularly as the shed is needed for the use of the land as agriculture. There also is not any justification for the 1,000m^2 maximum size. It is also highly unlikely that the Council would refuse the DA as long as it can be justified that it is needed for the agricultural use.

There is potential therefore for land use conflict to be increased by new dwellings being built close to an intensive agricultural use and for the need for an unnecessary DA to be required for rural sheds that are required for the agricultural use merely because they cover an area of more than 1,000 m^2. These two anomalies with the

Codes SEPP can be overcome by an amendment to the SEPP to remove the RU1 Primary Production zone and this is discussed in more detail in section 6.4.1.

Chapter 2: Development Pattern

2.1 Introduction

The pattern of development in the rural area is dictated by the land use and the holding sizes. This chapter discusses this as well as the demography and economy of the rural area.

2.2 Rural Land Use

There are a variety of land uses within the rural parts of the LGA. They include intensive and extensive agriculture, native vegetation, rural residential, urban, extractive industries, commercial and light industrial uses. They all have an impact on each other as well as the environment. The main land uses which are of note are agriculture, and rural residential. The resultant rural land use conflict from the various uses is perhaps one of the most important issues to be addressed for the future of agricultural landscapes. Finding the balance between these often-competing desires for rural land is the key to planning for rural areas.

There are basically two forms of land use within the study area – ones based on agriculture and ones that do not have an agricultural base.

The uses based on agriculture include the following:

- Irrigated plants
  - ⇨ Vegetables grown in market gardens and protected cropping structures,
  - ⇨ Nurseries
  - ⇨ Turf
- Intensive Animals
  - ⇨ Poultry meat and egg production
- Grazing animals
  - ⇨ Cattle,
  - ⇨ Horse studs, agistment/boarding, and horses associated with rural residential use
- Rural Tourism uses
  - ⇨ Farm gate sales,
  - ⇨ Horse riding,
  - ⇨ Farm Stay Accommodation.

There are also a number of uses that are not based on agriculture which include the following:

- Rural residential uses
  - ⇨ Rural residential dwellings only,
  - ⇨ Home businesses, home industries, tradesman or truck depots,
  - ⇨ Horses (domestic / recreational)
- Commercial Uses
  - ⇨ Petrol stations, rural industries, rural produce stores, shops, medical practitioners, mechanical repairs, clubs, cafes and restaurants
- Extractive industries
  - ⇨ Quarries
- Public Uses
  - ⇨ Cemeteries, halls, churches, pony clubs

- Rural Tourism uses
  - ⇨ Caravan Parks, camping grounds
- Village development
  - ⇨ Residential, commercial, industrial uses

2.3 Land Use Survey

A detailed land use survey has been carried out of the study area to investigate and document a baseline state of these existing land uses. Its purpose is to give an understanding of the land use pattern so that appropriate decisions can be made having regard to the mixture of land uses throughout the area as well as to identify those localities that have a predominance of a particular land use in terms of the number of uses. It is based on the socio-economic characteristics rather than the land form characteristics because it's purpose is to identify agricultural land uses as well as non-agricultural ones like rural residential, commercial and others. It is based on the cadastral boundaries rather than topographic features. The survey counted the number of lots that were used and these were amalgamated into holdings which have been counted to provide the details below. This survey was carried out in April and May 2019. The methodology and details of the land uses – both primary and secondary can be found at Appendix 1.

The land uses were categorised into the following land use types

- Commercial
- Extensive Agriculture
- Extractive Industries
- Intensive Animals
- Irrigated Plants
- Native Vegetation
- Public Uses
- Rural Residential
- Vacant

Within each of these categories there are a number of sub categories relating to the specific use of the land. It should be pointed out that the land use survey categorised the primary use of the property and where a property had a number of uses, the dominant use was chosen. The native vegetation land use has been mapped but has not been counted in the analysis because of the extent of it as well as the fact that it is not a socio-economic based land use and is not within the purpose of the survey.

There are a total of 10,184 uses that were counted in the land use survey. The overall land uses are shown in Table 2.1, which lists the total number of uses as well as the land areas occupied by those uses, and analyses the relative percentages. The percentage of the total number of uses is shown graphically in Figure 2.1. Map 2.1 shows the land use in broad terms for the entire LGA. It can be seen that rural residential is by far the dominant land use representing 86.1% of the total. This is followed by irrigated plants with 4.5%, extensive agriculture (2.5%), commercial (1.9%), public uses and vacant (1.8%), then intensive animals (1.3%), and extractive industry with 0.05% of the number of uses.

Table 2.1: Number of Primary Land Uses

Uses	Total LGA			
	Count of Land Use	% of Total	Area of Land Use	% of Total
Commercial	191	1.9%	1,921	3.9%
Extensive Agriculture	259	2.5%	4,753	9.7%
Extractive Industry	5	0.05%	180	0.4%
Intensive Animals	128	1.3%	2,628	5.3%
Irrigated Plants	463	4.5%	4,483	9.1%
Public Uses	188	1.8%	2,756	5.6%
Rural Residential	8,768	86.1%	32,186	65.4%
Vacant	182	1.8%	278	0.6%
Total Uses	**10,184**	**100.0%**	**49,185.6**	**100.0%**

Source: Hawkesbury Rural Land Use Survey May, 2019

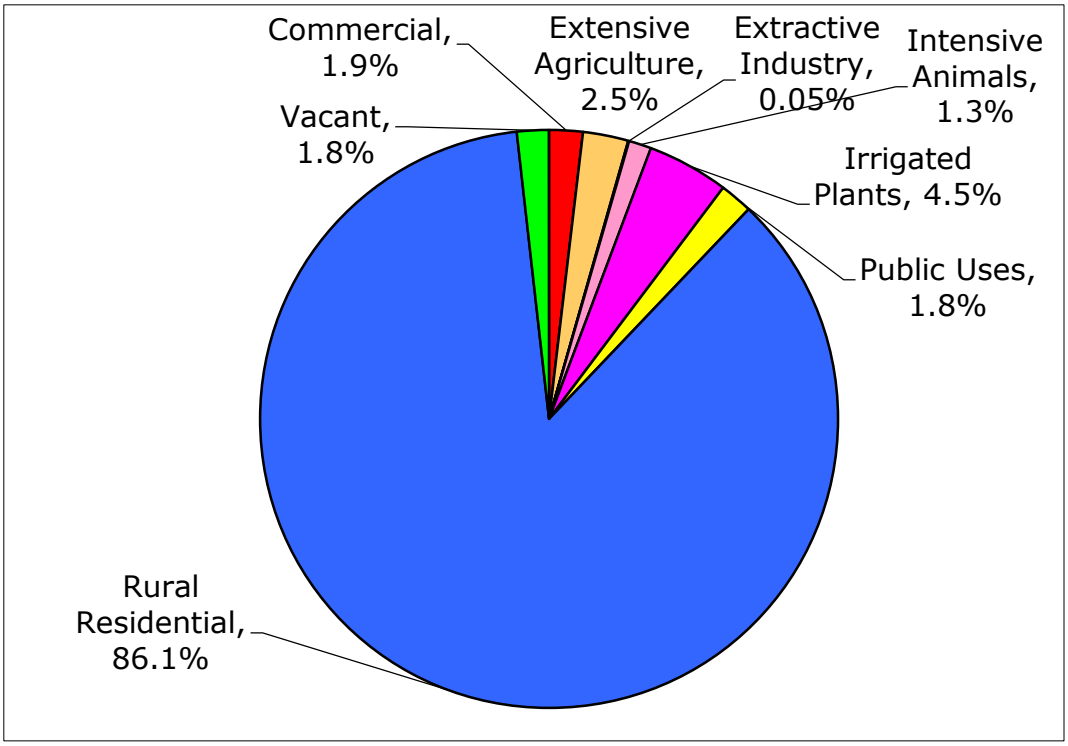
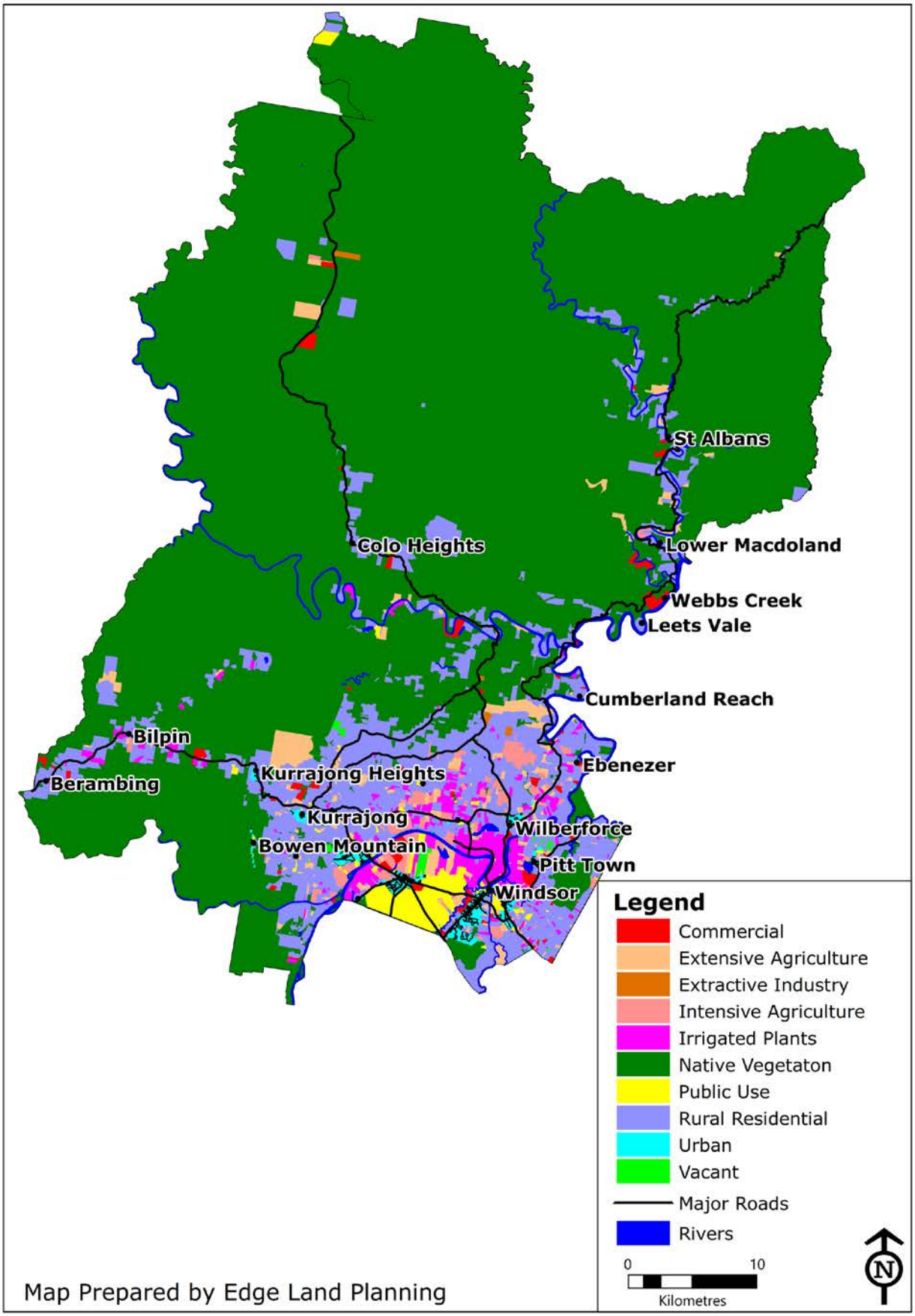


Figure 2.1: Land Use
Source: Hawkesbury Rural Land Use Survey May, 2019



Map 2.1: Land Use

A land use survey was carried out in 2003 for the Department of Planning by Edge Land Planning of Western Sydney and the data for Hawkesbury is shown in figure 2.2 and it can be seen that rural residential use has increased by 3% and irrigated plants has declined by 1.3% and intensive animals has increased by 1%. The decline in irrigated plants would be due to change of ownership which leads to the farm changing to rural residential land use. It is noted that the overall rural residential land use for Western Sydney was 78.3% in 2003 and so it can be seen that Hawkesbury had more rural residential development. Irrigated Plants were also higher at 6.8% of the total land use.

The actual growth in rural residential development was 6.6% and this equates to 0.4% per annum. The LGA population grew at a rate of 0.5% per annum (ABS, 2020a) which shows that the growth of rural residential development kept pace with the growth of the LGA.

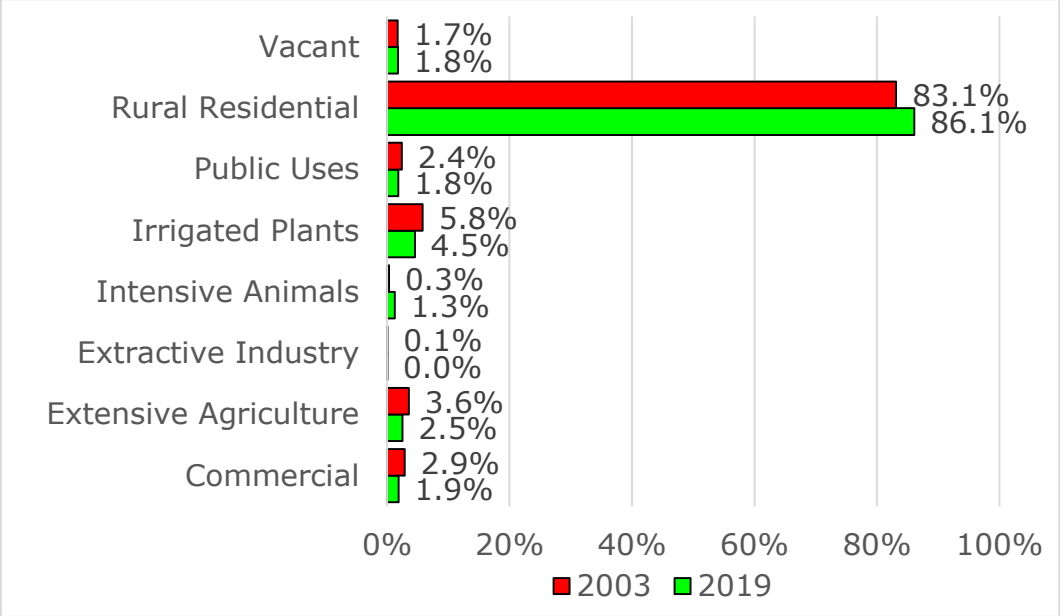


Figure 2.2: Land Use Change 2003-2019
Source: Hawkesbury Rural Land Use Survey

The area of each of the land uses has also been calculated and this is shown in Figure 2.3. It can be seen that rural residential makes up the highest area of land use with 65.4% followed by extensive agriculture (9.7%), irrigated plants (9.1%), public uses (5.6%), intensive animals (5.3%), commercial uses (3.9%) and extractive industry with 0.4%.

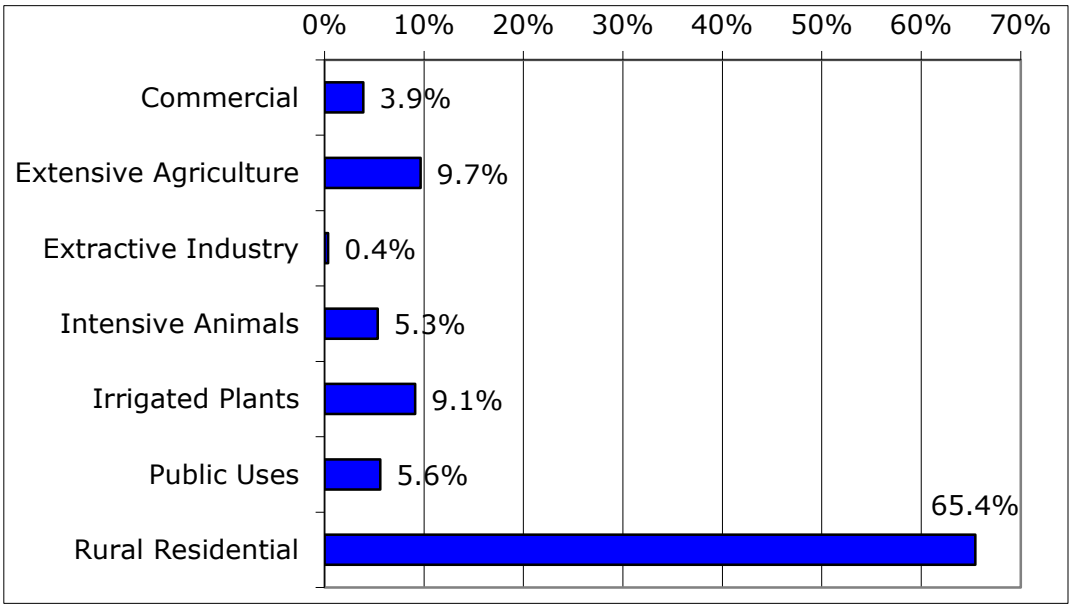
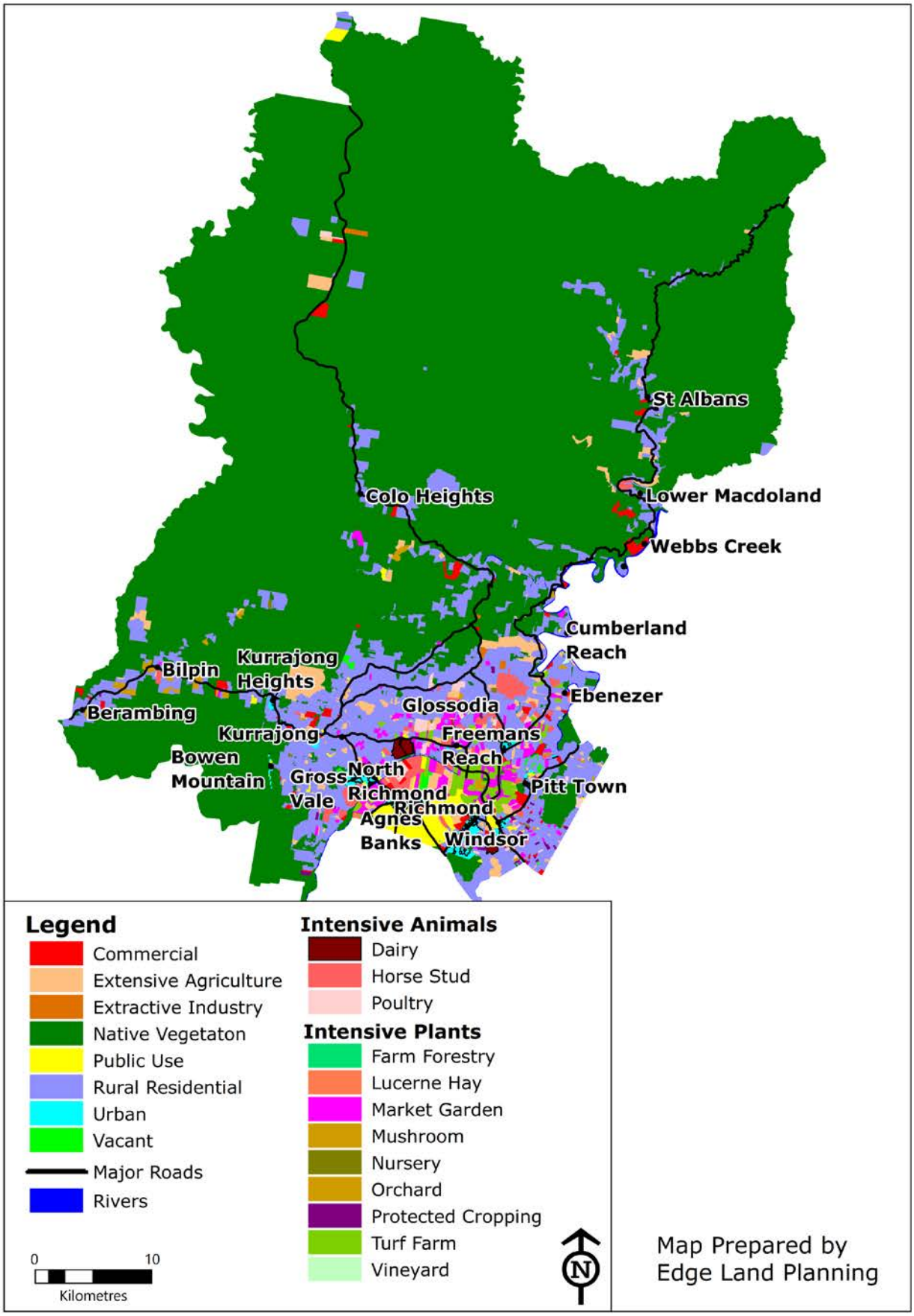


Figure 2.3: Area of Land Use
Source: Hawkesbury Rural Land Use Survey

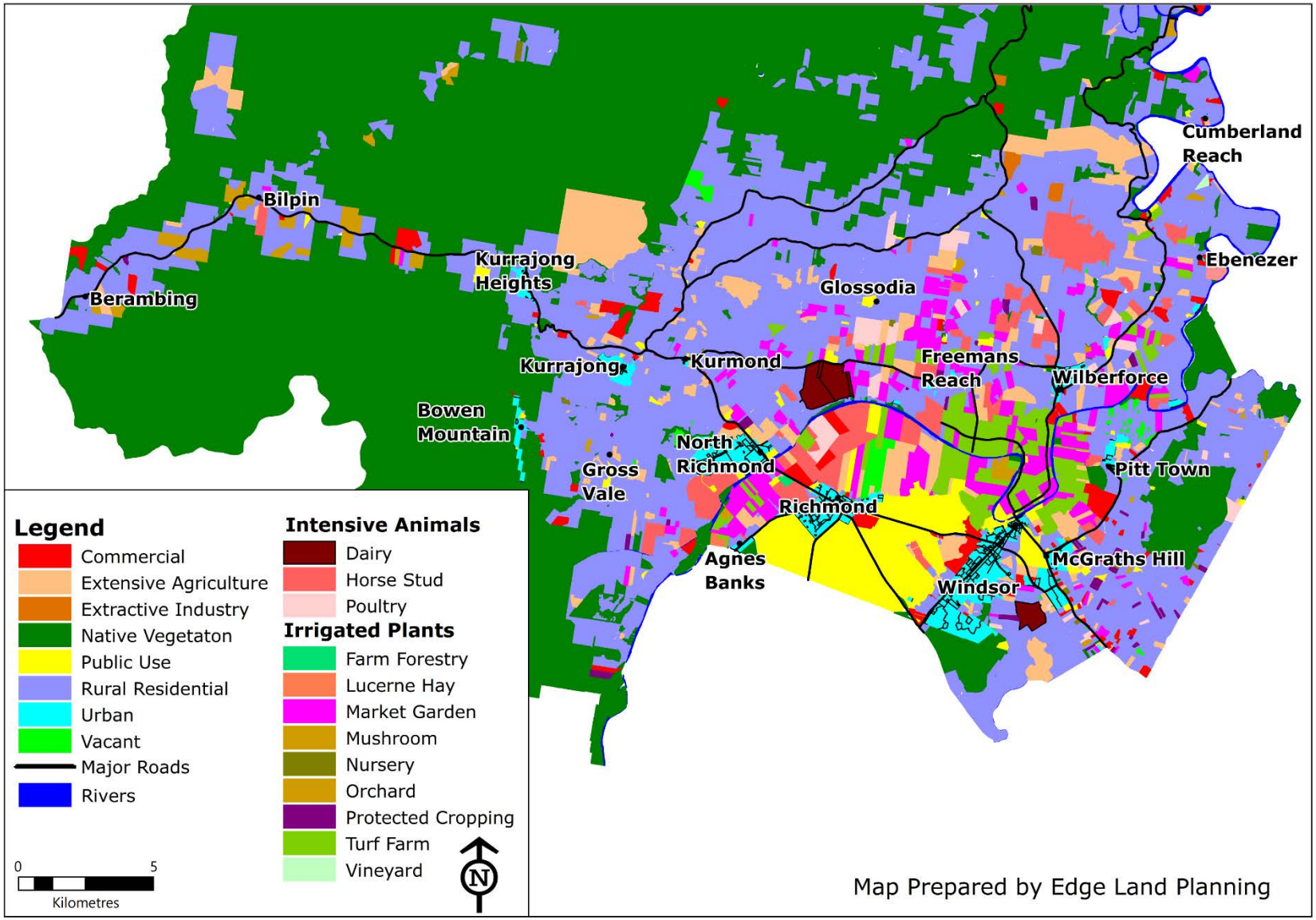
There are a number of intensive agricultural uses in the LGA which include irrigated plants such as market gardens, nurseries, orchards, protected cropping and turf farming, as well as intensive animal uses including poultry, horse studs and dairies. Their spatial distribution is shown on Map 3.2 for the LGA. Map 3.3 shows the land in the southern parts of the LGA.

There are eleven categories of irrigated plants which were observed during the land use survey and they are as follows:

- Farm Forestry
- Hay
- Market Garden
- Market Garden plus Protected Cropping
- Protected Cropping
- Mushrooms
- Nursery
- Orchard
- Orchard plus other
- Turf
- Vineyard



Map 2.2: Land Use Intensive Agriculture LGA



Map 2.3: Land Use Intensive Agriculture South

Figure 2.4 shows the proportion of these irrigated plant uses for the entire LGA. It can be seen that market gardens are the number one followed by turf farming, orchards and protected cropping which make up nearly all of the land uses. There are some small areas of nurseries, mushrooms and hay. There are also some diversified farms, such as market gardens which also have protected cropping, and orchards that have other uses like intensive animals and protected cropping.

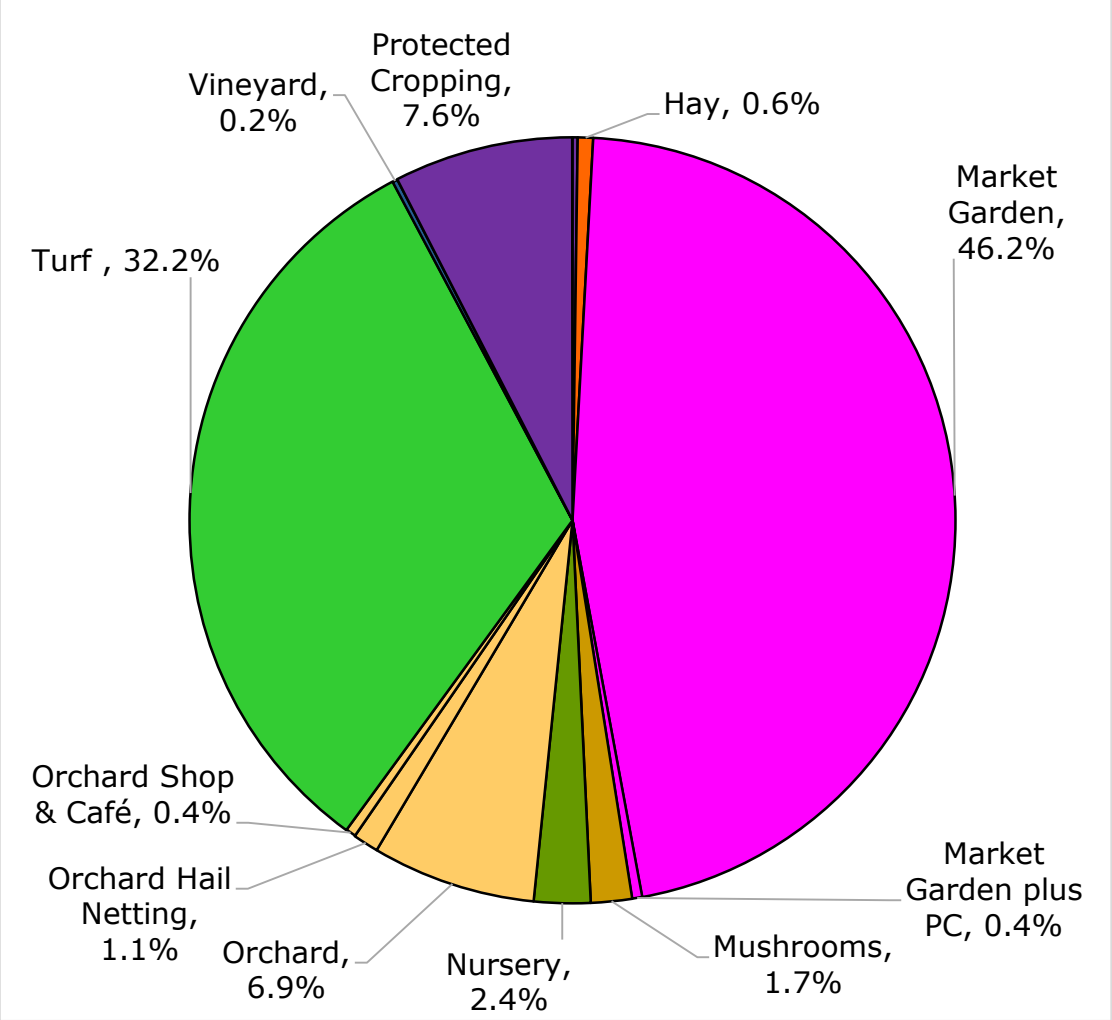


Figure 2.4: Irrigated Plant Land Use
Source: Hawkesbury Rural Land Use Survey May, 2019

The following photographs illustrate the Irrigated Plants category, with Photo 2.1 showing a market garden, photo 2.2 showing a mushroom farm Photo 2.3 showing a turf farm, Photo 2.4 showing an orchard and Photo 2.5 showing a nursey.

Photo 2.1: Market Garden
Date of Photo: May 2019

Photo 2.2: Mushroom Farm
Date of Photo: May 2019

Photo 2.3: Turf Farm
Date of Photo: May 2019

Photo 2.3: Orchard
Date of Photo: May 2019

Photo 2.5: Nursery
Date of Photo: May 2019

The protected cropping structure is utilised for improved protection from rain and hail, climate control, pest control, ease of harvesting as well as having a higher yield than growing food in market gardens. It has been broken into three categories as follows:

- Greenhouse
- Hydroponics and Orchards
- Igloos

Figure 2.5 shows the distribution of the protected cropping land use and it can be seen that greenhouses make up the highest proportion, followed by hydroponics and igloos. Photo 2.6 shows a Protected Cropping hydroponics and photo 2.7 shows a greenhouse. These structures are often utilised in conjunction with market gardens.

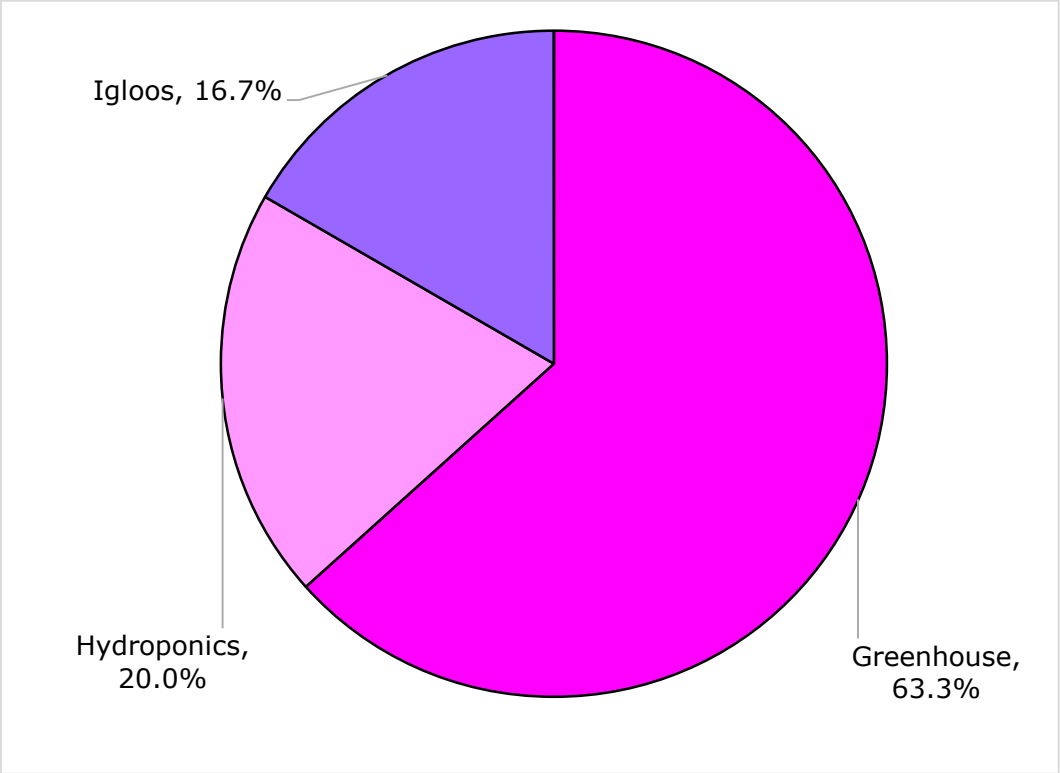


Figure 2.5: Protected Cropping Land Use
Source: Hawkesbury Rural Land Use Survey

Photo 2.6: Protected Cropping Hydroponics
Date of Photo: May 2019

Photo 2.7: Protected Cropping Greenhouse
Date of Photo: May 2019

The other significant agricultural land use in the LGA is intensive animals, which includes horse studs, and poultry farms growing eggs as well as chicken for meat as well as dairy farms. Figure 2.6 shows the distribution of the intensive animal uses. Photo 2.8 shows a poultry farm and photo 2.9 shows a horse stud. There are also a number of Polo uses in the Richmond Lowlands. Photo 2.10 shows these.

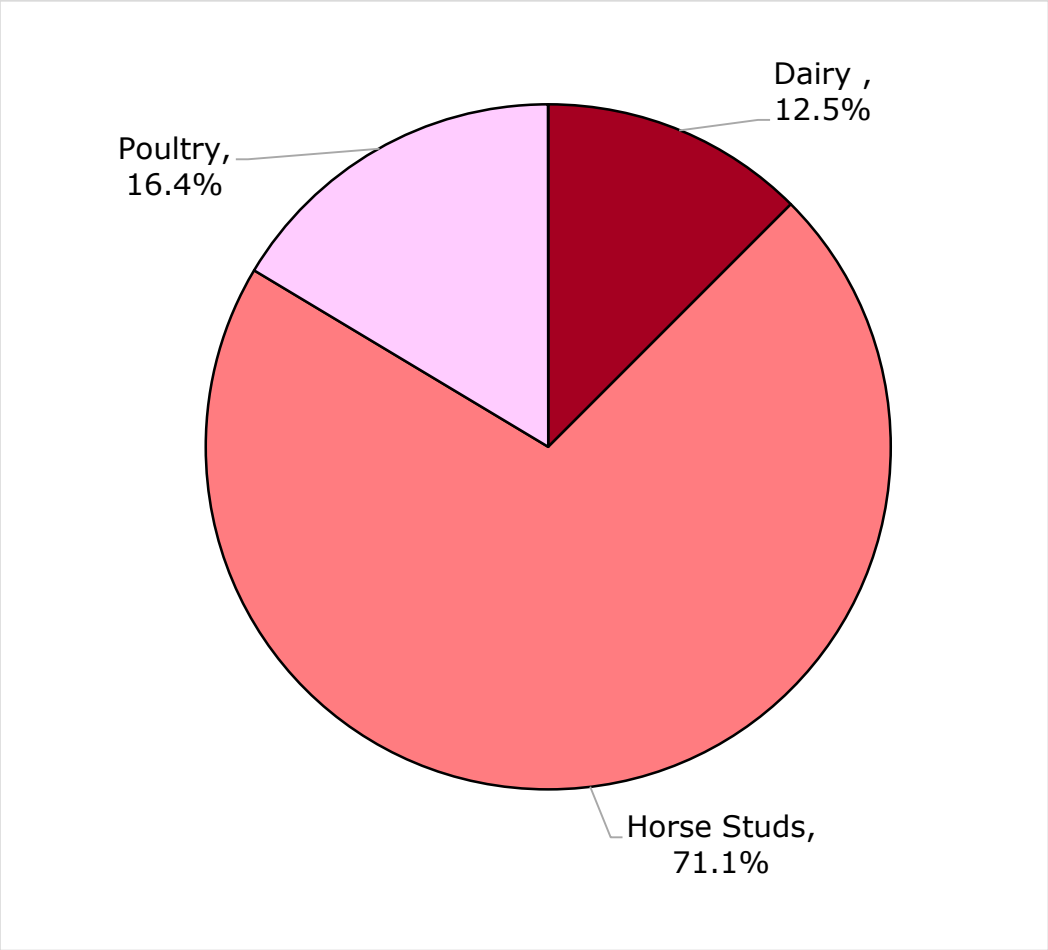


Figure 2.6: Intensive Animals Land Use
Source: Hawkesbury Rural Land Use Survey

Photo 2.8: Poultry
Date of Photo: May 2019

Photo 2.9.: Horse Stud
Date of Photo: May 2019

Photo 2.10.: Polo Fields
Date of Photo: May 2019

Extensive Agriculture is number three in the agricultural land use categories, and is mostly associated with cattle grazing. Photo 2.11 shows cattle grazing. There are also a range of commercial uses in the rural areas which range from spring water bottling plants, to conference centres and petrol stations. Photo 2.12 shows a commercial use, being a Produce Store. There are some existing urban uses in the area within the villages of St Albans, Lower Macdonald, Leets Vale, Cumberland Reach, Ebenezer, Freemans Reach and Bowen Mountain, which are zoned RU5 Village.

Photo 2.11: Cattle
Date of Photo: May 2019

Photo 2.12: Commercial Use
Date of Photo: May 2019

The LGA has been spatially divided a number of combined localities (which are detailed in chapter four) and the land use has been analysed for each of these areas. The analysis can be seen from figure 2.7 which shows the land use in each of the combined localities in the coloured bars and the LGA land use as the blue line. This shows that rural residential is the highest land use in each of the combined localities, all except the River Flats which are similar to the LGA total land use. The River Flats combined locality also has the highest number of irrigated plants as well as the lowest number of rural residential uses. It also has the most intensive animal land uses.

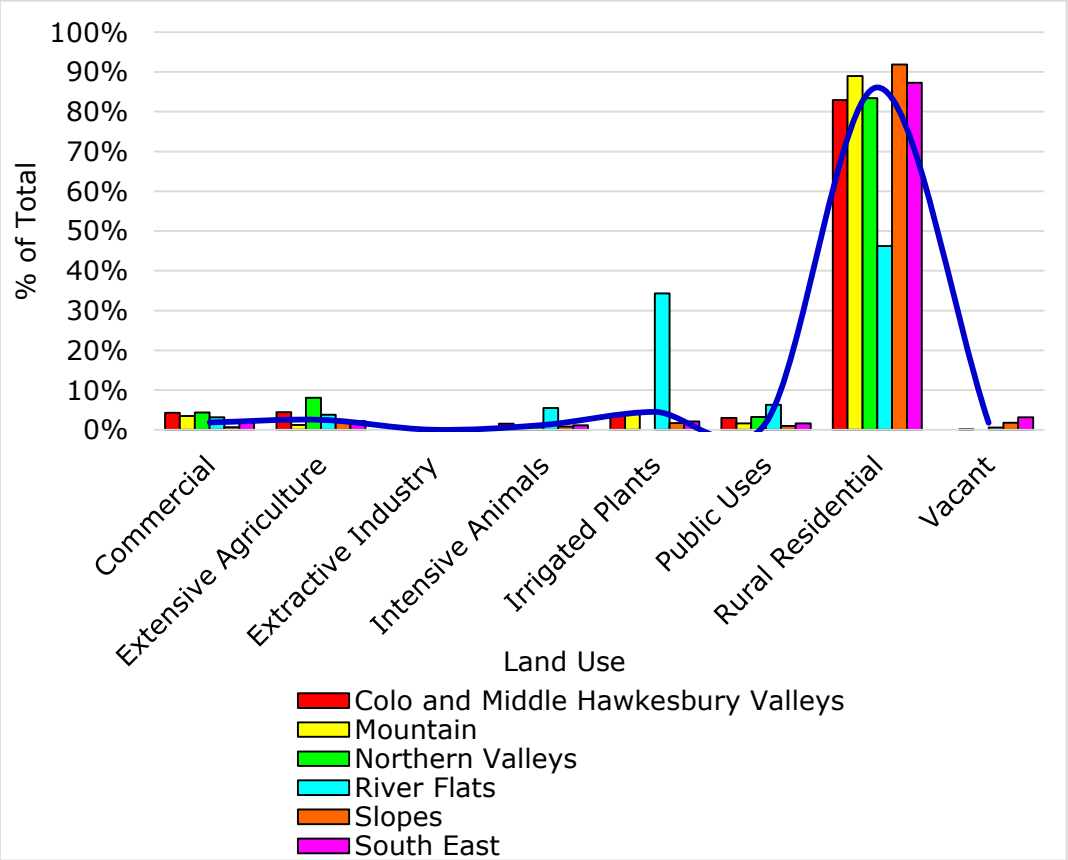


Figure 2.7: Land Use in Combined Localities
Source: Hawkesbury Rural Land Use Survey

2.4 Rural Residential

The term "rural residential" has a number of different meanings. It generally refers to estate type of living on lots between 0.4 Ha and 2 Ha where services may or may not be provided. This type of land use is found in areas such as Windsor Downs, Pitt Town and Yarramundi. However, the term is also used to cover rural living on larger lots (generally greater than 2 ha), that are scattered throughout the rural lands, where farming is not practiced on a full-time basis, or as the major source of income. These are generally referred to as hobby farms or lifestyle lots, where the residents merely seek a rural lifestyle.

The following definition is useful:

> *"The residential use of rural land is called rural residential development; that is, people live on rural lots, but use the land primarily for residential rather than agricultural purposes. Although some engage in 'hobby farming', most derive the principal source of their income from pursuits not carried out on the land. The main distinction between urban housing and rural residential housing is bigger lot size and larger distances between dwellings. This creates a sense of openness and of living in the landscape rather than in an urban area. Rural residential dwellings are often large (up to 1000 to 2000 square metres in floor area). They can be found in clusters of new houses and are often mixed with intensive plant and animal uses, which invariably leads to rural land-use conflict (Sinclair, Docking, Jarecki, Parker, & Saville, 2004). They can have varying*

degrees of native vegetation cover, from totally covered to totally cleared. This has been termed 'rural sprawl' (Daniels, 2014) because of its pervasiveness over the rural landscape, particularly adjoining the metropolitan areas as well as large cities and towns.

Rural residential development can be divided into two main categories: rural fringe and rural living. Rural fringe development is characterised by single detached houses and dual occupancies on lot sizes of approximately 4000 square metres to two hectares laid out in an estate. This estate usually joins or is in close proximity to an urban area.

Rural living, on the other hand, features single detached houses and dual occupancies on lot sizes between one hectare and 40 to 100 hectares and can adjoin farmland or vegetated areas (it should be noted that there are sometimes lots of less than one hectare). People living on these lots use the land primarily for residential purposes, although they may graze some cattle or have horses. This requires lot sizes of more than two hectares if land degradation is to be avoided. The lots do not adjoin townships or villages and are scattered throughout the rural landscape." (Sinclair & Bunker, 2012).

For the purposes of this study, the term rural residential development has been refined to identify both the "rural fringe" and "rural living" categories. Rural living has then categorised into holdings less than 3 ha and greater than 3 ha.

The land use survey has found that both rural fringe and rural living types of rural residential development exist in the study area. Photo 2.13 shows the land at Yarramundi which is a 2 ha rural fringe estate and Photo 2.14 shows a rural living house.

Photo 2.13: Rural Fringe Development
Date of Photo: June 2018

Photo 2.14: Rural Living Development
Date of Photo: June 2018

Rural residential development accounted for 8,768 holdings which accounted for 86.1% of the total LGA land use, of which 1,649 (18.8%) are Rural Fringe and 4,271 (60.0%) are Rural Living < 3 ha and 2,848 (40.0%) are Rural Living > 3 ha. Map 2.4 shows the spatial distribution of the rural residential development for the LGA and map 2.5 shows the southern part. It can be noted that Rural Fringe development is usually within an area that is zoned for rural fringe style subdivision, with a uniform minimum lot size and normally does not have intensive agriculture land uses in the zone. However, there are also small historic rural fringe style lots scattered throughout the Rural Living landscape, and are often the main contributor to rural land use conflict.

Observations of the use of land within the Rural Residential category show that these areas are dominated by lots with dwellings only, followed by trucks, horses and home businesses (Figure 2.8). This is considered to be a conservative count and there are probably more of these than are shown on the graph. Photo One aspect of rural living development is that it is also associated with. These are shown on Photos 2.15, 2.16 2.17 and 2.18 show horse, truck and home businesses as well as Bed and Breakfast uses respectively.

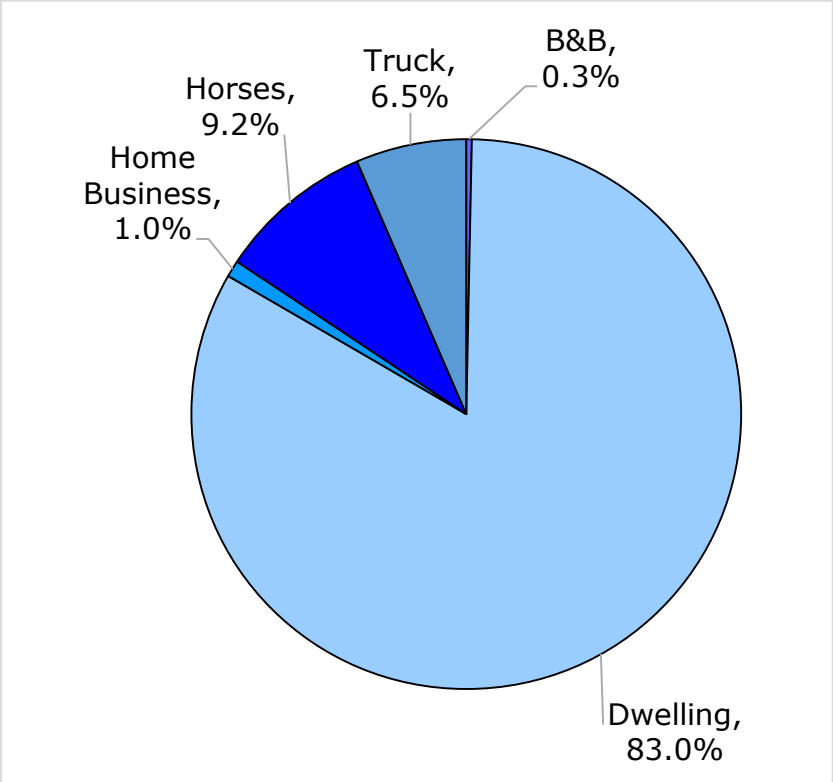


Figure 2.8: Rural Residential Land Use
Source: Hawkesbury Rural Land Use Survey

Photo 2.15: Rural Living Horse Development
Date of Photo: May 2019

Photo 2.16: Rural Living Truck Development
Date of Photo: May 2019

Photo 2.17: Rural Living Home Business Development
Date of Photo: May 2019

Photo 2.18: Rural Living Bed and Breakfast Development
Date of Photo: May 2019

The overall size of all of rural residential holdings within the LGA (rural fringe, rural living < 3 ha and rural living > 3ha) are shown in Figure 2.8, where it can be seen that 67.3% are holdings less than 3 ha with basically equal amounts of them in the less than 0.8 ha and 0.8 – 3.0 ha range.

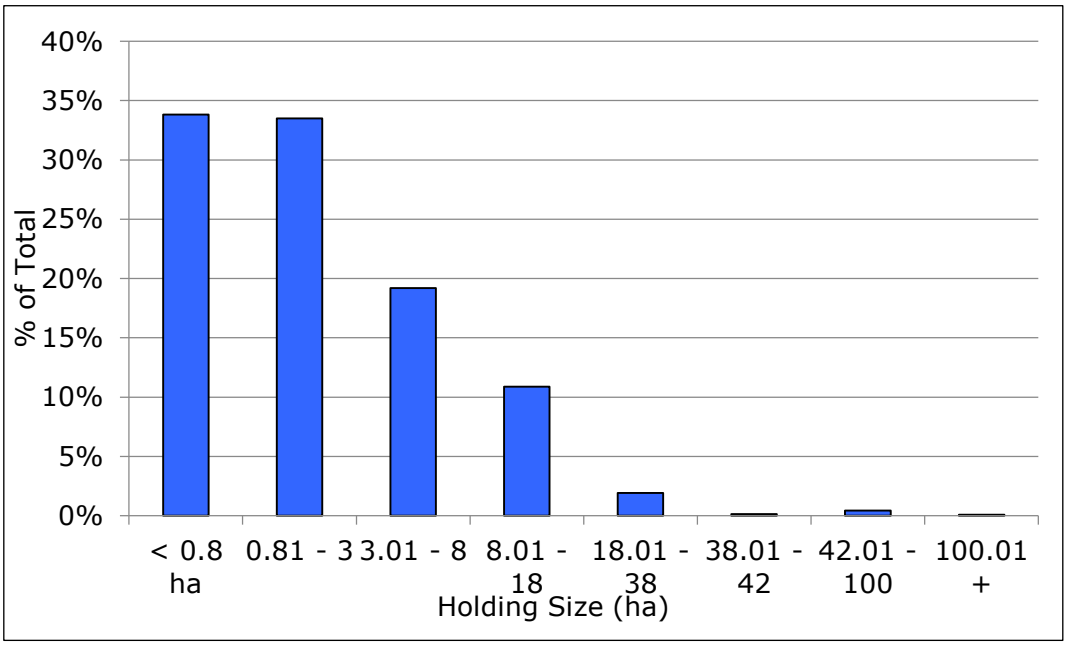
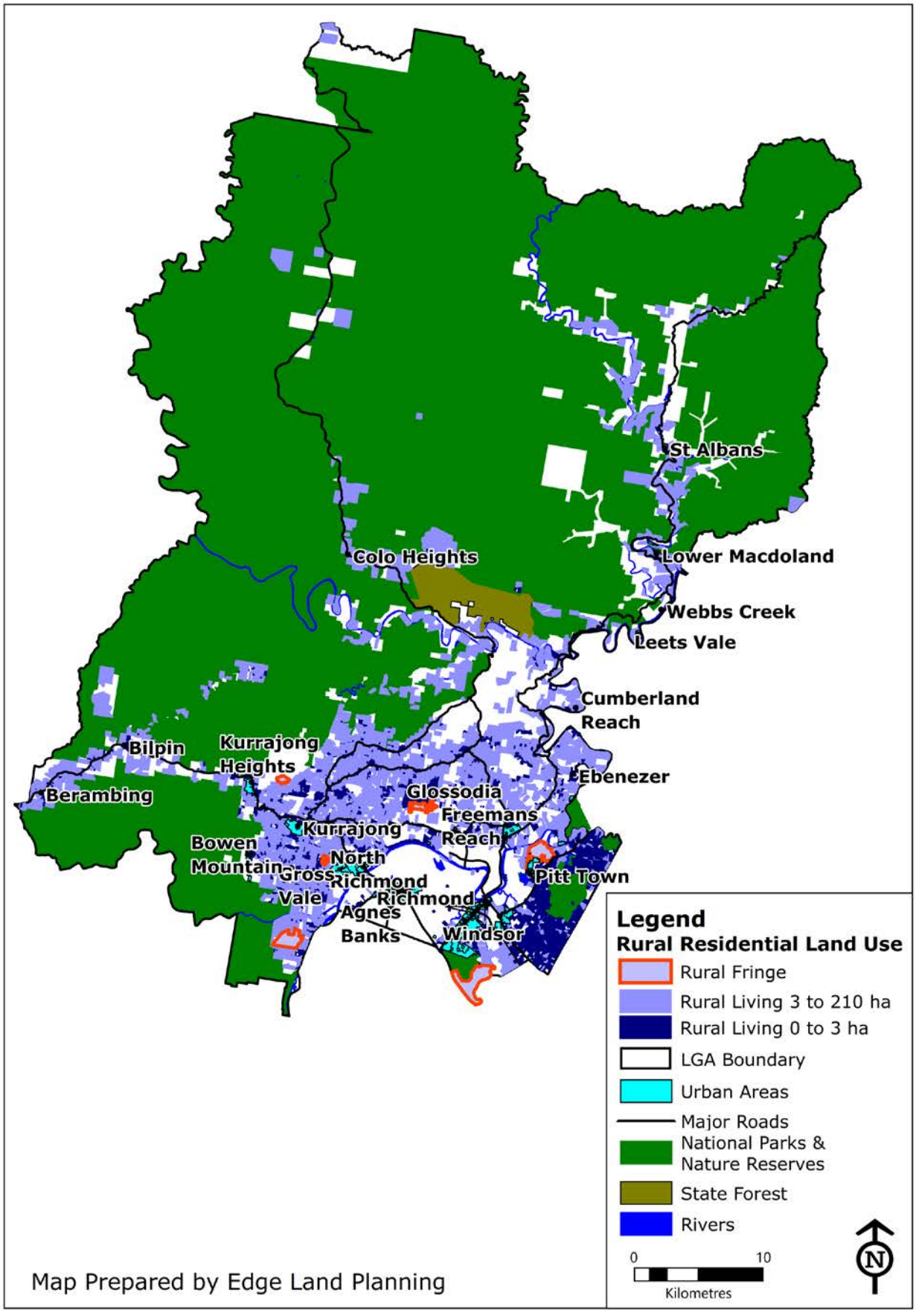
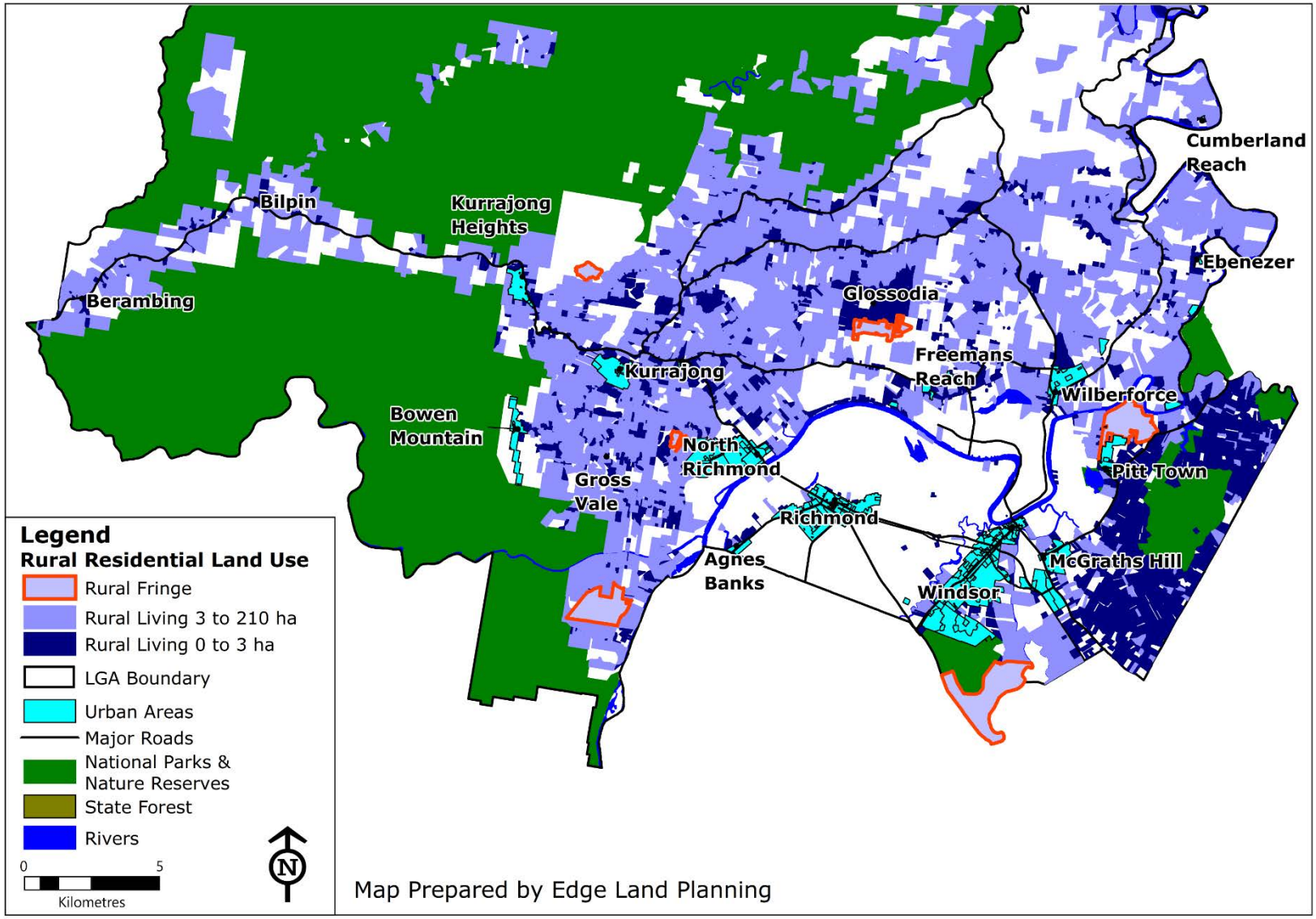


Figure 2.9: Rural Residential Holding Size - LGA
Source: Hawkesbury Rural Land Use Survey



Map 2.4: Rural Residential Land Use LGA



Map 2.5: Rural Residential Land Use South

The land that is zoned R5 Large Lot Residential as well as Glossodia comes under the category of Rural Fringe (discussed above) and the holdings analysis for this is shown in Figure 2.10. This shows that the majority of the holdings are in the < 0.8 ha range followed by the less than 0.81-3.0 ha range.

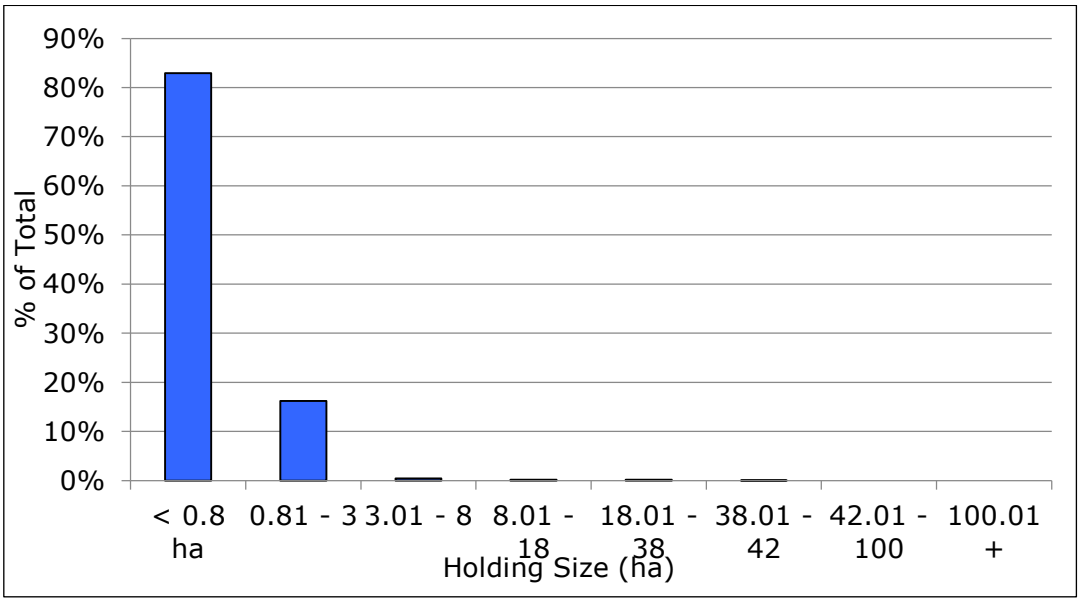


Figure 2.10: Rural Fringe Holding Size
Source: Hawkesbury Rural Land Use Survey

The holding size range for the Rural Living category is shown in Figure 2.10 and it can be seen that it is dominated by the < 0.8ha range 0.81 – 3 ha range, which is a total of 60.0% of holdings less than 3 ha in the rural living category and 40.0% of them are greater than 3 ha

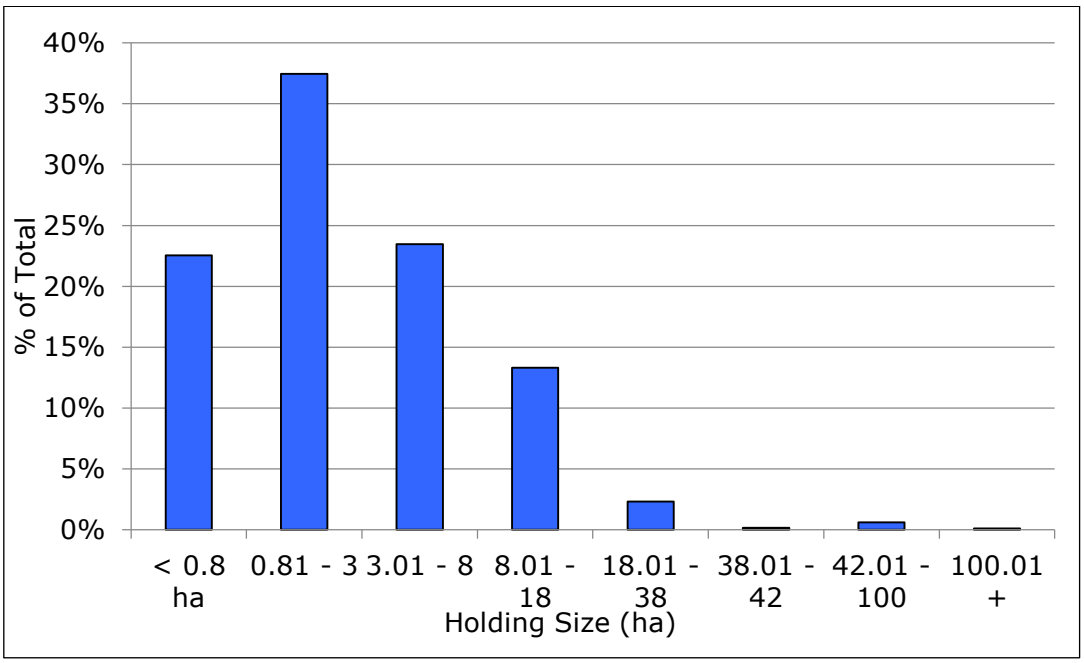


Figure 2.11: Rural Living Holding Size
Source: Hawkesbury Rural Land Use Survey

The holding size range for the horses is shown in figure 2.12 which shows that most of the horses are on holdings in the 0.81-3.0ha (42.6%), then 3.01-8 ha (35.1%) and 8.01 to 18 ha (18.1%).

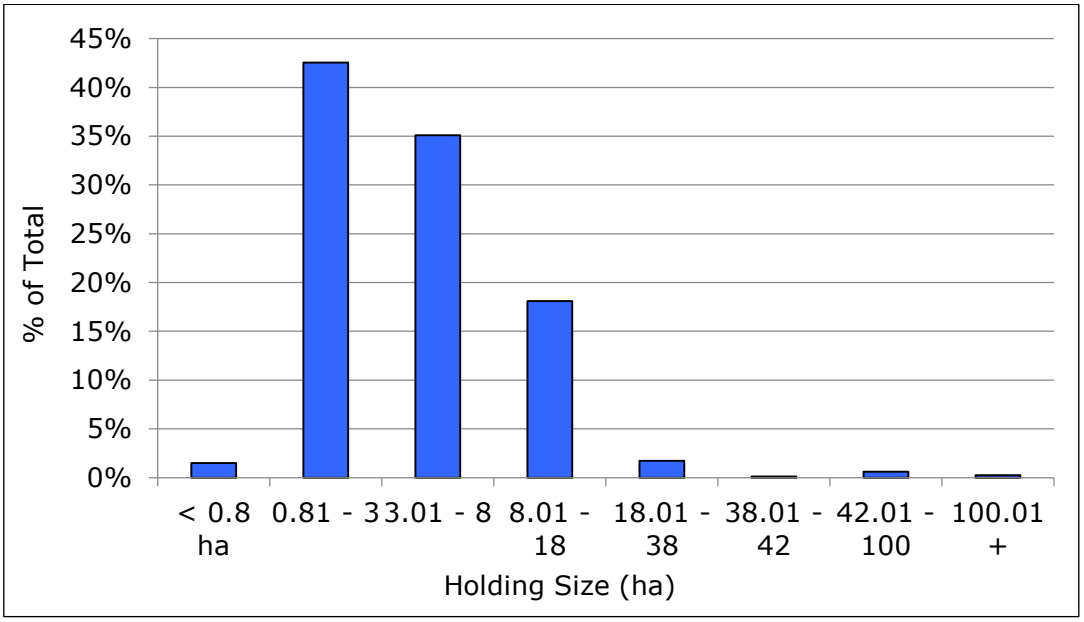


Figure 2.12: Rural Residential Horse Holding Size
Source: Hawkesbury Rural Land Use Survey

The holding size range for the rural residential truck uses can be seen from figure 2.13 which shows that nearly half of the trucks are on holdings in the 0.81-3.0 ha range (49.2%) followed by 3.01 – 8.0 ha (21.4%), 8.01 – 18 ha (15.8%) and < 0.8 ha with 12.3%.

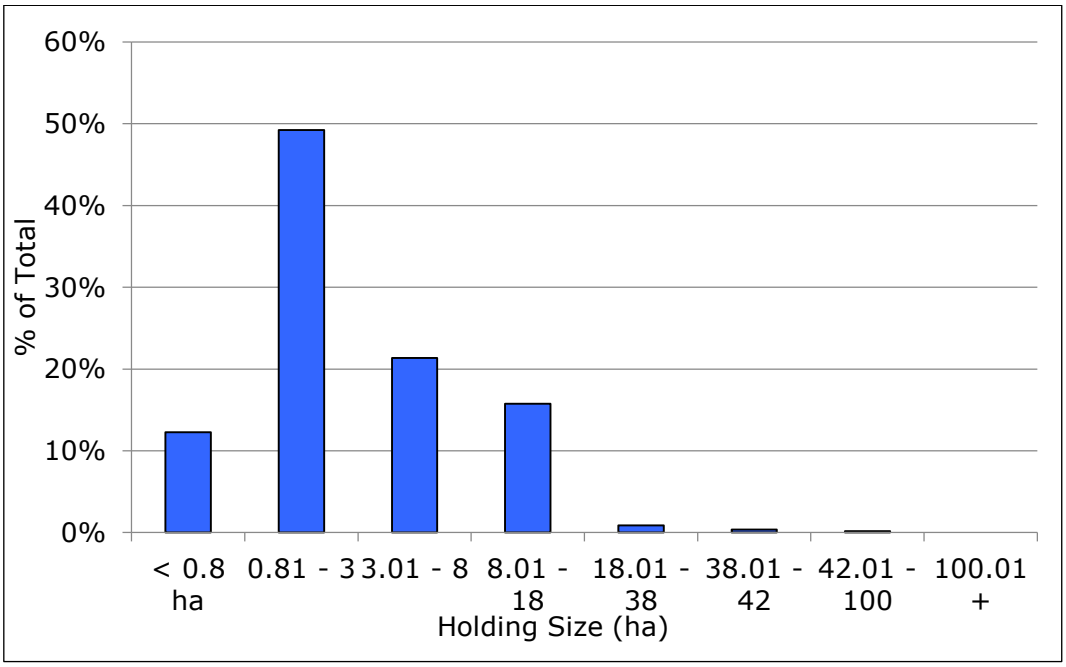


Figure 2.13: Rural Residential Truck Holding Size
Source: Hawkesbury Rural Land Use Survey

2.5 Holding Analysis

This section details the holdings within the study area and it includes all of the rural land uses including agricultural rural residential and does not include land not public use, commercial and extractive industries.

The rural land in the LGA is highly fragmented with the average size being 6.2 ha and a median of 2.0 ha. This can be seen from the holding analysis which is shown in Figure 2.14 and the spatial distribution can be seen from Map 2.6 for the LGA and Map 2.7 for the southern part of the LGA. It can be seen that the most holdings are in the less than 0.8 ha range and followed by 0.81 – 3.0 ha range and that there is not very many larger than 18ha. In fact, 62.3% of the holdings are less than 3 ha and 81.1% are less than 8 ha. In Western Sydney the number of holdings less than 3 ha was 76.6% so it can be seen that overall, Hawkesbury is not as fragmented as Western Sydney, although it does have more less than 0.8 ha holdings.

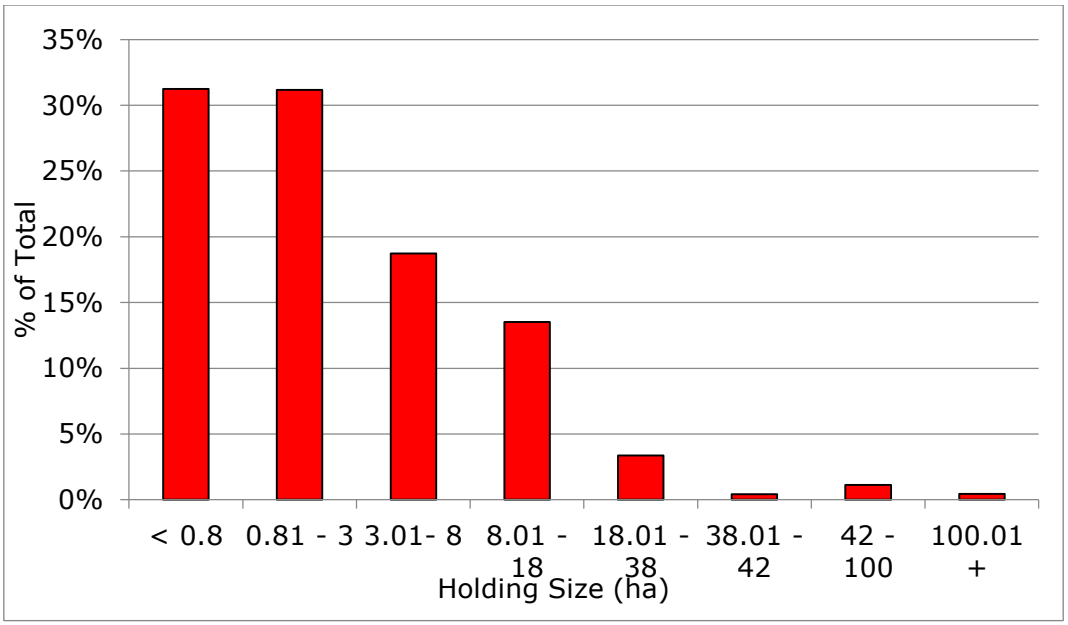


Figure 2.14: Holdings Analysis
Source: Hawkesbury Rural Land Use Survey

The holdings have been analysed using the combined localities and this is shown in figure 2.15 which shows the combined localities as coloured bars and the LGA total as the blue line. It can be seen that the South East which has the most of the 0.81 – 3 ha range.

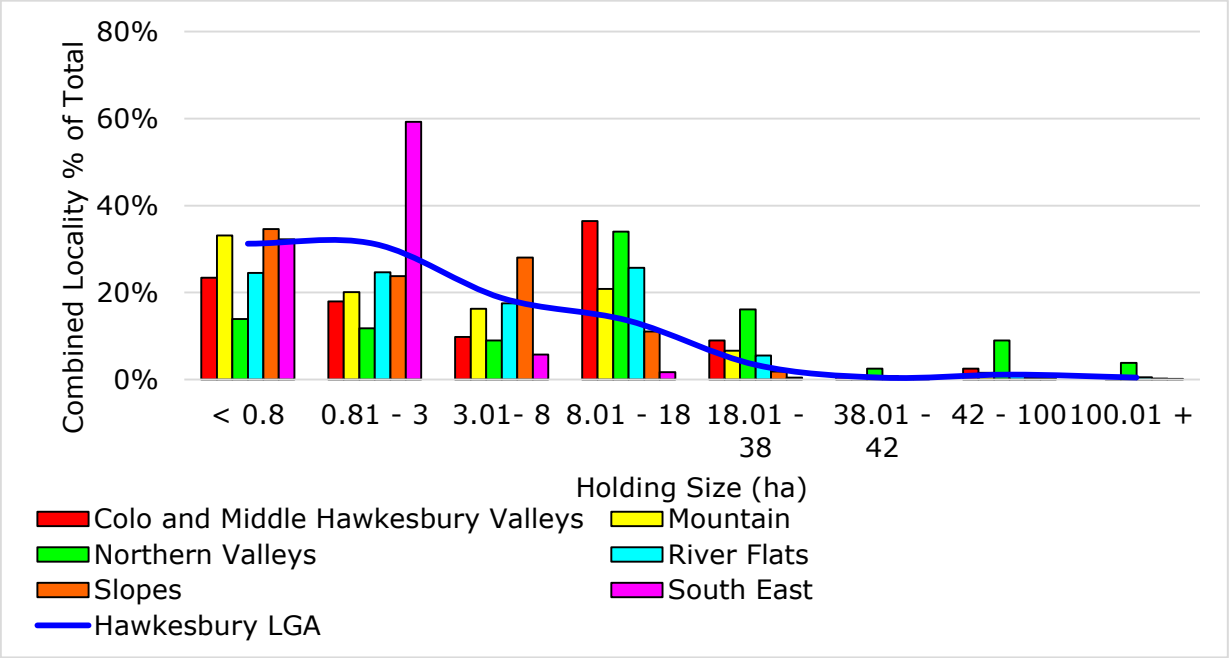
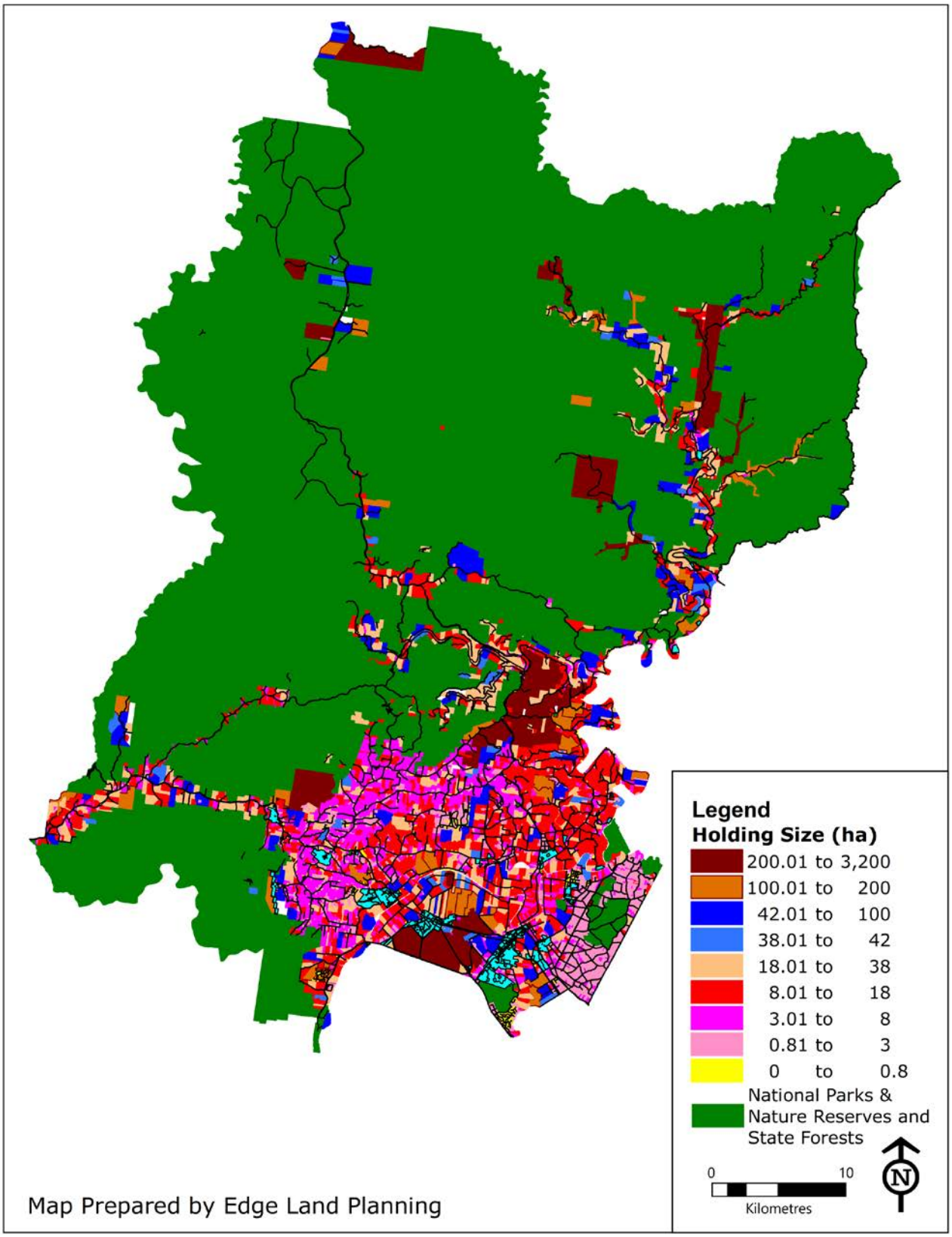
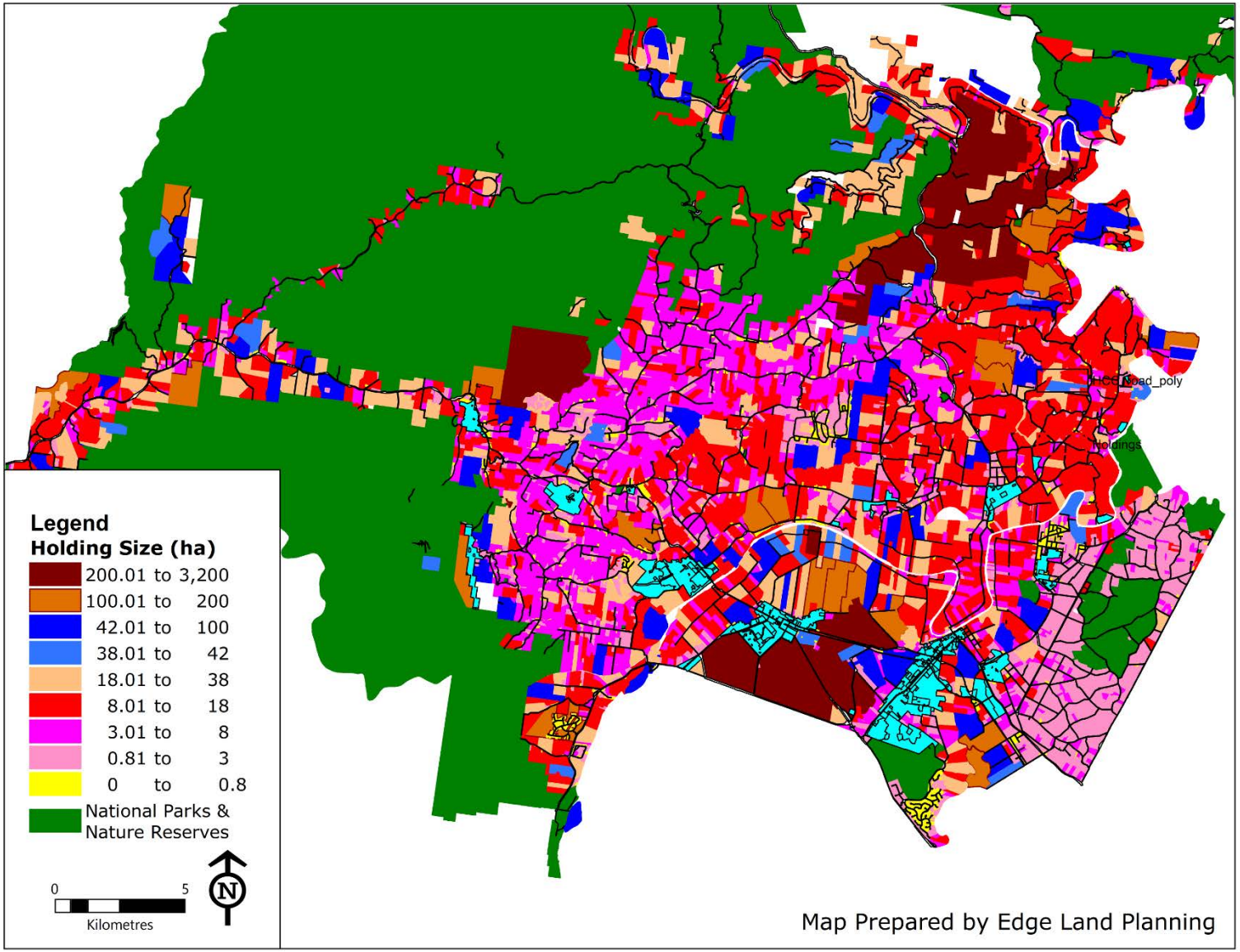


Figure 2.15: Holdings Analysis Combined Localities
Source: Hawkesbury Rural Land Use Survey



Map 2.6: Holding Size LGA



Map 2.7: Holding Size South

2.6 Land Use by Holding Size

The land use data has been cross referenced with the holding sizes to show the proportion of land uses that are in each of the holdings size ranges. The results of this analysis are shown in Figure 2.15. The major land use categories of rural residential, intensive animals, irrigated plants, extensive agriculture have been shown and the others have been grouped together (extractive industry, commercial, public uses and vacant land). It shows the

Figure 2.16 shows that, in the holding sizes below 3 ha the highest proportion of uses is vacant (which is mostly comprised of the newly subdivided area in Pitt Town), rural residential and public uses as opposed to agriculture-based activities. Irrigated plants and intensive animals are a low proportion of uses in these holding size ranges. Irrigated plants and intensive animals are high in the 8.01-18.0 ha range and rural residential is the lowest. In the holding sizes above 8 ha the irrigated plants and intensive animal uses dominate as do the extensive agricultural uses. However, it should also be noted that there are a number of rural residential uses on holdings of 8 ha and above, which is 13.5% or approximately 1,200 holdings. These are also scattered between productive agricultural uses, which can lead to some instances of rural land use conflict. It is also an indicator of the desire for rural lifestyle living.

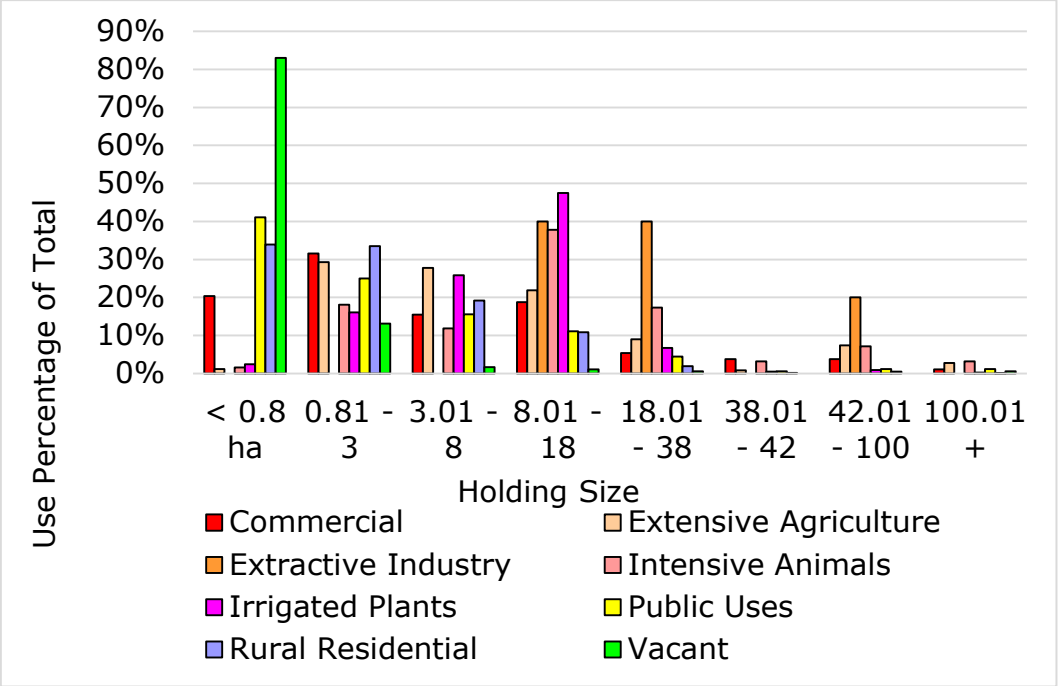


Figure 2.16: Land Use by Holding Size
Source: Hawkesbury Rural Land Use Survey

2.7 Contested Land

The mixture of rural residential use amongst agricultural uses such as vegetables, fruit and poultry can cause land use conflict. The effect of the pollution laws is that a neighbour can complain about any pollution emanating from a farm such as noise

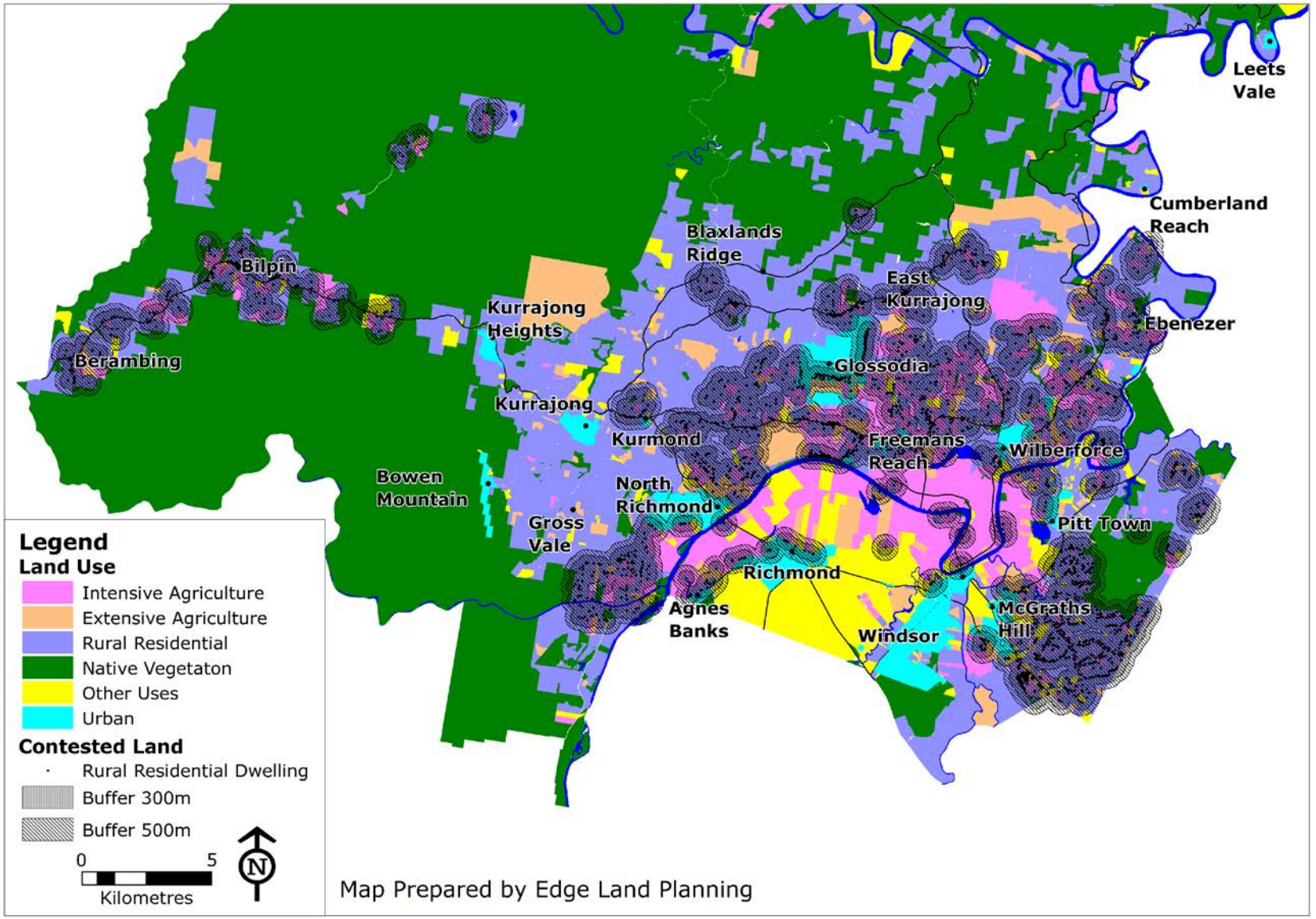
from a tractor or pump, trucks taking produce from the packing shed, spray drift or odour. The Council must then investigate and can require the farmer not to farm part of the land, providing a "buffer area" to the rural residential use, or to conduct farming activities at restricted hours. This is because the farm is causing pollution to cross its boundaries and causing the neighbour a loss of amenity. The fact that the farm was there first and is carrying out normal agricultural activities is irrelevant in this case because it is causing pollution. These affected buffer areas between the dwellings and the agricultural uses can be referred to as the "contested land".

Land use conflict will be discussed in detail in Chapter 4, however suffice to say that it is one of the most intractable issues associated with the future of farming. The principle of the buffer distance is for new agricultural uses locating near to existing residential uses (urban and rural residential) to be a specific distance from the residential use (this ranges from 200m to 1,000m based on the use). However, if this distance is reversed, and a buffer is applied to the rural residential house the amount of land that is potentially at risk of being lost to production can be estimated and this is called the "contested land".

This exercise has been completed for the southern part of the LGA, where there are the most rural residential and intensive agricultural uses. Each rural residential dwelling house has been identified and located on a GIS layer using the aerial photography. This has been shown as a black dot. A 300m and 500m buffer has been applied to each of these dots to represent the land that would be affected. The buffers are based on a number of sources which have been recently summarised in a recently released publication from the Department of Primary Industries titled Buffer Zones to Reduce Land Use Conflict with Agriculture (Wells, 2019). This document recommends between 200m for irrigated plants and 1,000m for poultry. It is noted that there is a mix of irrigated plants and intensive agriculture and so a buffer of 300m to 500m is considered appropriate. The result is two layers as follows:

- Rural residential dwelling
- 300m and the aggregate 500 m buffer for all of the land to indicate the combined affect

Map 2.8 shows the amount of contested land. The area of land that each rural residential dwelling house consumes as the contested land can be calculated. For the 500m buffer the area is 77 ha of land for 300m buffer it is 28 ha. It should be noted that most of the rural residential lots are less than 3 ha and so it can be seen that the buffer is mostly on the adjoining farmland. It can also be seen that a large amount of the intensive agricultural uses are either fully covered by contested land or partially covered. This indicates areas with the potential for land use conflicts



Map 2.8: Contested Land

2.8 Rural Economy

The Hawkesbury economy has a total value added estimated to be $4.130 billion (REMPLAN, 2019). The agriculture sector is estimated to have a value added of $266.6 million which is the number six behind Public Administration and Safety ($605.1m), Rental Hiring & Real Estate Services ($581.2m), Construction ($547.5m), Manufacturing ($416m) and Education & Training ($276.5m). It is significant to note that a number of these top five sectors have rural components to them. The Hawkesbury value added agriculture estimate is 28.0% of the Western City District and 20.8% of the Greater Western Sydney figure which makes it the number one in Greater Western Sydney for agriculture. In addition, the agriculture sector has an export value of $409.6m which is 11.2% of the total and number four behind Manufacturing ($1,421.2m), Public Administration & Safety ($771.8m) and Construction ($444.9m). This shows that the agriculture sector is a very significant component of the local economy, as well as the metropolitan area in total. (REMPLAN, 2019)

Agriculture is a significant land use in the Hawkesbury LGA. In 2016 the Hawkesbury LGA produced a total of $158,670,281 value of production (ABS, 2018a). This is equivalent to 19.7% of Peri-Urban Sydney, 1.2% of the NSW value of production and 0.3% of Australia's total value of agricultural production. It is number two in the Sydney Peri-Urban Area behind Central Coast which has $161,449,035. The main commodity in Central Coast is poultry and in Hawkesbury it is Vegetable production which is the most significant. The Sydney Peri-Urban Area is the rural land in the Sydney Greater Capital City region as defined by the ABS. The Councils that make up the peri-urban area are shown on map 2.9.

The details of the value of production can be seen from Table 2.2, and Figure 2.17 shows the percentage of the value of each commodity for the LGA. Crops have a value of $118,853,279 (ABS, 2018a).which makes up 74.9% of the total LGA value of agricultural production. Vegetable production is $63,686,875 (40.1%), Turf has a value of $48,534,440 (30.6%). The top five commodities are vegetables, turf, poultry meat, eggs and nurseries.

The top five LGAs for each of the main commodities grown in the Sydney region have been highlighted in the next section and it is noted that Hawkesbury is represented in each of them except Flowers where it is number 7 and Poultry meat (6). The commodities and the LGA ranking is as follows:

- Nurseries: Number 5
- Flowers: Number 7
- Turf: Number 1
- Vegetables: Number 1
- Eggs: Number 2
- Poultry Meat: 6

This makes it the second highest ranking behind the Central Coast when the rankings are combined.

Table 2.2: Value of Agriculture in the Hawkesbury LGA

Commodity	Hawkesbury	% of Hawkesbury	% of Sydney Peri-Urban	% of NSW	% of Australia
Total Crops	$118,853,279	74.9%	34.3%	1.7%	0.4%
Broadacre Crops	$18,132	0.0%	0.3%	0.0%	0.0%
Total Livestock	$39,817,002	25.1%	8.7%	0.6%	0.1%
Hay	$137,843	0.1%	2.4%	0.0%	0.0%
Nurseries	$3,720,048	2.3%	6.0%	2.5%	0.5%
Flowers	$1,680,436	1.1%	3.5%	2.4%	0.5%
Turf	$48,534,440	30.6%	82.5%	59.3%	19.5%
Total Nurseries, Flowers & Turf	$53,934,924	34.0%	31.9%	18.0%	4.2%
Fruit & Nuts	$1,075,505	0.7%	8.1%	0.1%	0.0%
Perishable Vegetables	$48,704,951	30.7%	48.9%	31.8%	3.8%
Total Vegetables	$63,686,875	40.1%	41.9%	15.2%	1.8%
Wool	$27,505	0.0%	2.7%	0.0%	0.0%
Milk	$473,995	0.3%	2.5%	0.1%	0.0%
Eggs	$18,728,663	11.8%	19.7%	7.3%	2.4%
Total Livestock Products	$19,230,163	12.1%	16.7%	1.1%	0.2%
Sheep	$4,060	0.0%	0.5%	0.0%	0.0%
Cattle	$1,103,970	0.7%	4.4%	0.0%	0.0%
Goats	$5,242	0.0%	36.1%	0.1%	0.0%
Pigs	$352,710	0.2%	21.7%	0.2%	0.0%
Poultry Meat	$19,120,857	12.1%	6.0%	2.2%	0.7%
Other	$0	0.0%	0%	0%	0.0%
Total Livestock Meat	$20,586,839	13.0%	6.0%	0.5%	0.1%
Total Agriculture	**$158,670,281**	**100%**	**19.7%**	**1.2%**	**0.3%**

Source:(ABS, 2018b)

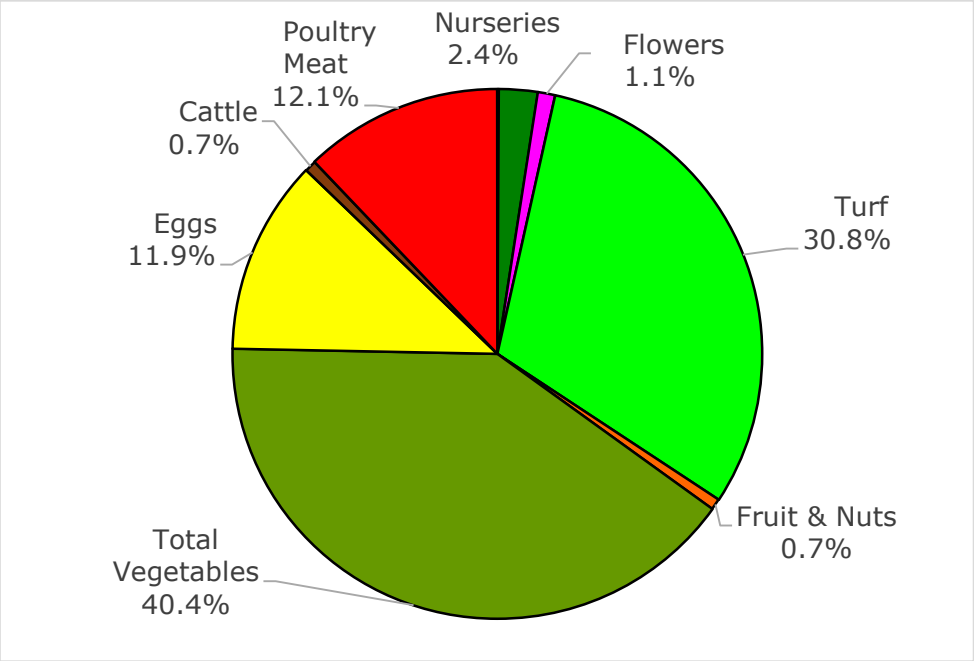
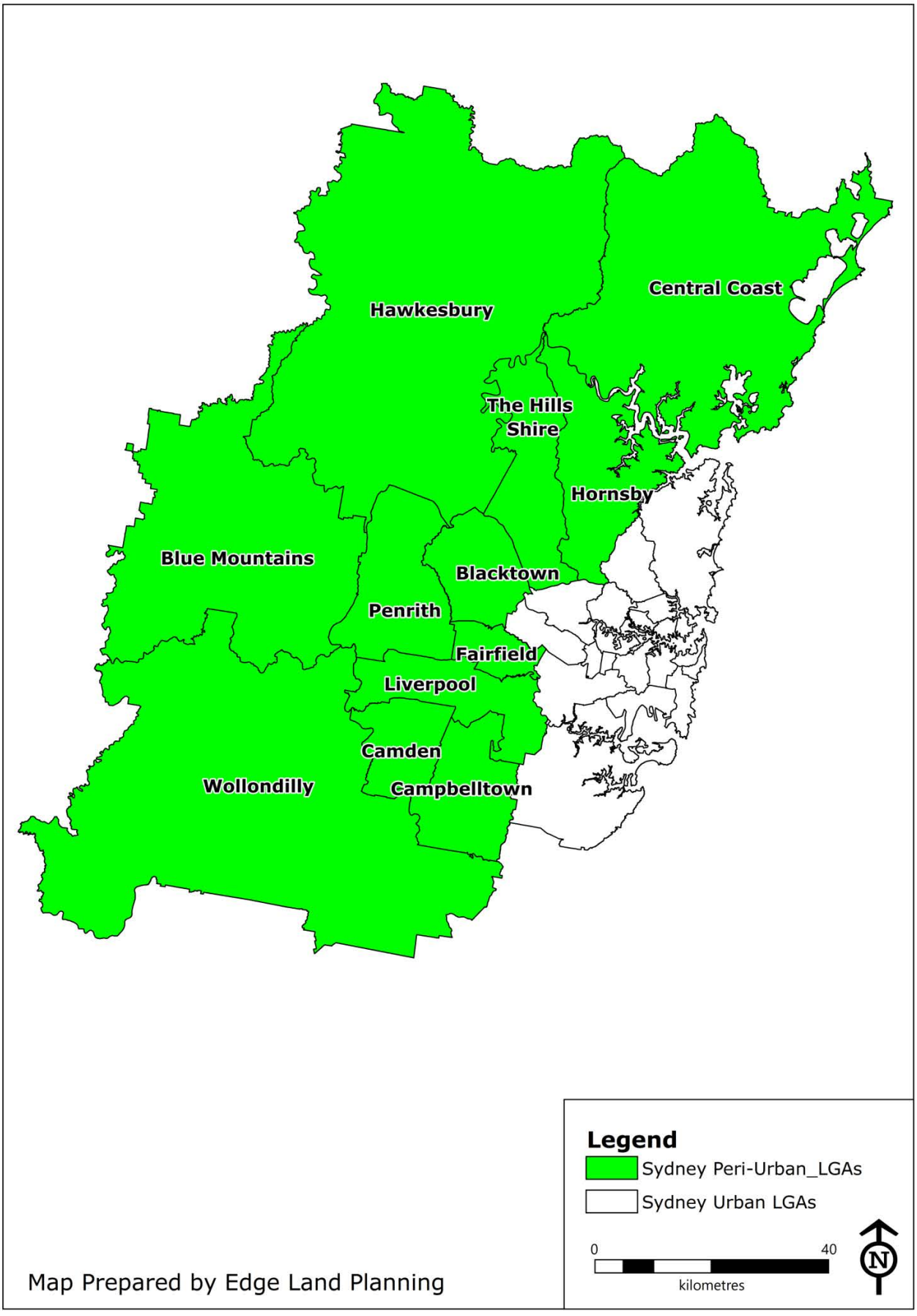


Figure 2.17: Hawkesbury Agricultural Commodities
Source: (ABS, 2018b)



Map 2.9: Sydney Peri-Urban Area

The agricultural commodity production data has also been analysed and will be discussed in more detail in the next section. It should be noted that this is the production data (area of cropping, kg of vegetables, number of chickens and number of dozen eggs) and is different from the value of production data in Table 2.1. It is significant to note that the Hawkesbury LGA contributes to the State and National production of the following commodities:

- Crops: 33.6% of Sydney Peri-Urban Area
- Turf: 82.5% of Sydney Peri-Urban Area, 59.3% of NSW and 19.8% of Australia's total area which makes it number one LGA in Australia;
- Perishable Vegetables: 32.6% of Sydney Peri-Urban Area, 16.3% of NSW and 1.9% of Australia's total production which makes it number one in Sydney and NSW as well as the 13th highest producer in Australia;
- Nurseries: 3.7% of Sydney, 1.5% of NSW and 0.3% of Australia's total area;
- Flowers: 9.3% of Sydney Peri-Urban Area, 5.1% of NSW and 0.3% of Australia's total area;
- Meat Chickens: 2.4% of Sydney Peri-Urban Area, 0.9% of NSW and 0.3% of Australia's total number of birds;
- Other Poultry:12.5% of Sydney Peri-Urban area, 8.1% of NSW and 4.3% of Australia's total number of birds, which is number four in Sydney and NSW and number five in Australia;
- Egg production: 19.7% of Sydney Peri-Urban Area, 7.3% of NSW and 2.3% of Australia's egg production, which makes it number two in Sydney, number four in NSW and number eight in Australia.

There are a number of parts of the LGA that the ABS has designated as SA2 level. This is the second level of data that the ABS uses for its databases. The ABS describe these as "…medium-sized general-purpose areas built up from whole Statistical Areas Level 1. Their purpose is to represent a community that interacts together socially and economically" (ABS, 2016). They have a population ranging from 3,000 to 25,000 people depending on whether they are rural or urban areas. A map of the SA2 level areas for the rural parts of the Hawkesbury is shown as Map 2.10. These cover the urban and rural areas, and the rural ones are as follows:

- Bilpin – Colo – St Albans
- Kurrajong Heights – Ebenezer
- Pitt Town – McGraths Hill
- Richmond - Clarendon
- Windsor – Bligh Park

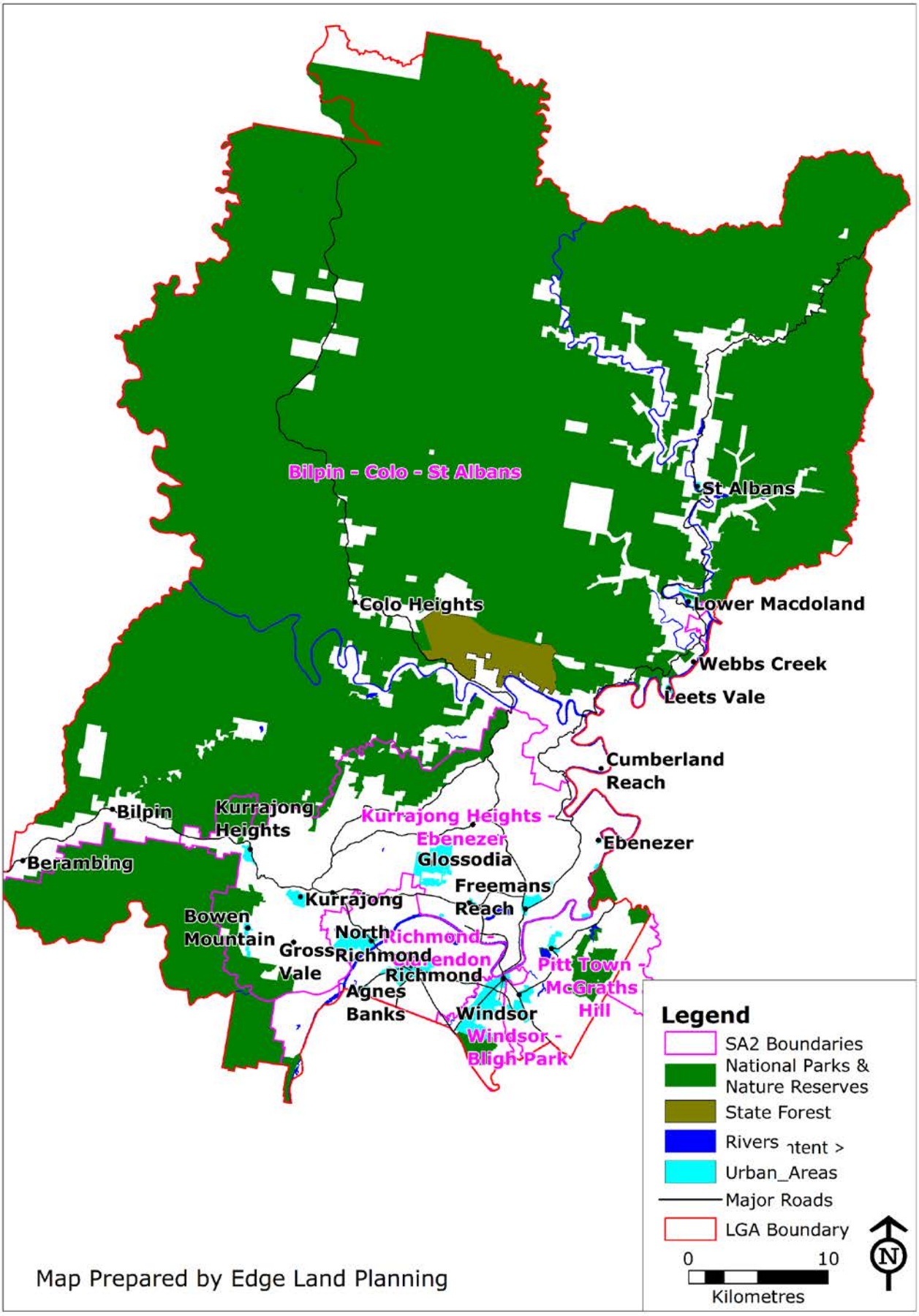
Table 2.3 shows the details of each SA2 area and how it contributes to the total value of production. It needs to be noted that the total of the value is more because the boundaries of the SA2 areas goes outside the LGA in Pitt Town – McGraths Hill. It can be seen that Kurrajong Heights - Ebenezer has by far the highest value of production with $$70,750,654 (Turf, Vegetables, Eggs and Poultry Meat), followed by Pitt Town – McGraths Hill (Vegetables, Turf, Eggs and Poultry Meat), Richmond Clarendon (Turf &

Vegetables), Windsor – Bligh Park (Poultry Meat, Turf and Vegetables), and Bilpin – Colo – St Albans (Poultry Meat and Nurseries).

Table 2.3: Value of Agriculture in the Hawkesbury SA2 Areas

Commodity	Bilpin – Colo – St Albans	Kurrajong Heights – Ebenezer	Pitt Town – McGraths Hill	Richmond - Clarendon	Windsor – Bligh Park
Broadacre Crops		$14,861	$3,833		
Hay	$13,113	$19,413	$22,557	$85,842	
Nurseries	$981,000	$2,374,599	$90,610		$132,569
Flowers	$96,248	$1,218,352	$149,537		
Turf		$19,384,951	$7,057,671	$20,635,057	$1,866,012
Nurseries Flowers & Turf Total	$1,077,248	$22,977,902	$7,297,818		$1,998,581
Citrus Fruit	$80,513	$1,105	$2,518	$10,422	$83,009
Pome Fruit	$271,457	$12,030			
Stone Fruit	$53,123	$8,343			
Berries	$1,082		$1,718		
Other Fruit	$32,383	$11,901	$86,604	$165,146	
Nuts	$102,883	$2,249		$144,277	
Perishable Vegetables	$145,127	$12,255,319	$37,502,504	$1,291,626	$421,474
Total Vegetables	$190,049	$20,453,778	$40,581,519	$4,695,037	$1,026,175
Wool	$25,542	$254	$1,757	$530	
Milk			$555,714		
Eggs		$16,999,404	$1,998,128	$132	$18
Total Livestock Products	$25,542	$16,999,658	$2,555,599	$662	$18
Sheep & Lambs	$1,916	$292	$1,421	$665	
Cattle & Calves	$179,270	$319,993	$182,195	$311,982	$5,071
Goats		$5,183	$69		
Pigs		$352,650			
Poultry Meat	$1,566,598	$9,571,295	$864,993	$68	$6,592,988
Total Livestock Slaughtered	$1,747,785	$10,249,414	$1,048,678	$312,715	
Total Agriculture	**$3,595,177**	**$70,750,654**	**$51,600,845**	**$26,049,159**	**$9,705,842**

Source: (ABS, 2017e)



Map 2.10: Hawkesbury SA2 Regions

Location quotient is an economic development tool that is a ratio used to compare the dominance or specialisation of a particular industry in the local economy. The ratio compares the importance or specialisation of the industry to the LGA relative to Australia. A Location Quotient of 1 indicates the same level of importance and generally, a ratio of greater than 1.5 indicates that there is a degree of specialisation in that particular industry within the LGA and the higher the ratio, the more important it is to the LGA.

The location quotient has been calculated for the Hawkesbury rural lands and the LGA compared to Australia and this can be seen from figure 2.18. It can be seen that Construction has the highest location quotient being 2.0 followed closely by agriculture with 1.9. When this is compared to Regional NSW it is significant because Regional NSW has a location quotient of 2.3 for agriculture. This shows the strength of the agriculture sector as an economic driver for the LGA.

It is noted that the draft Employment Lands Strategy (SGS Economics and Planning, 2020) has location quotients for the LGA which reference it to Sydney. However, the LGA is already significant in the Sydney region and so it is considered more appropriate to reference the location quotients for the rural land to Australia.

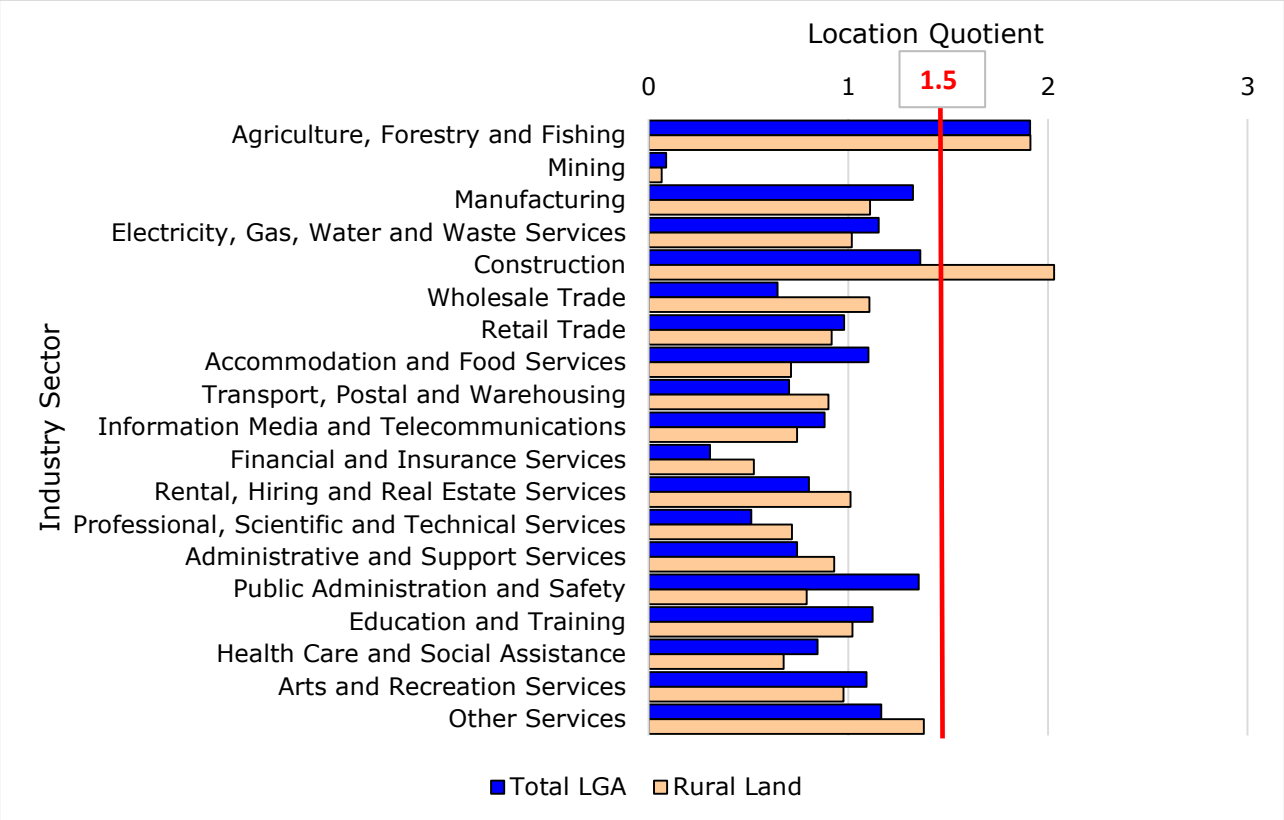


Figure 2.18: Location Quotient LGA and Rural Land
Source: (ABS, 2019c)

The growth of an industry sector can also be factored into the Location Quotient to see if the industry sectors are increasing or decreasing over the past 5 years. This can be seen from figure 2.19. This shows that agriculture is growing as well as having the second highest location quotient behind construction. This shows that the importance of agriculture has been increasing and having regard to the growth over the past four years since the census, it also shows a promising future.

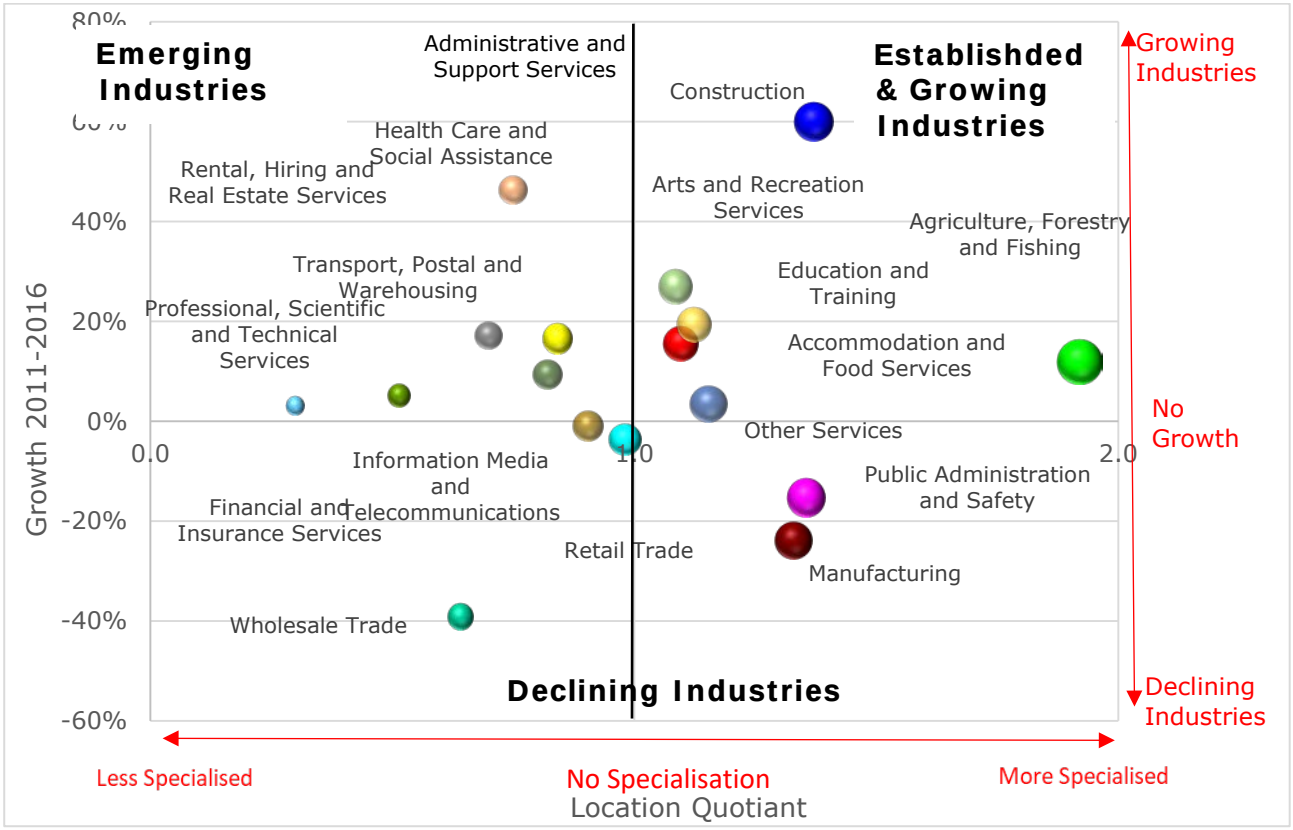


Figure 2.19: Location Quotient LGA
Source: (ABS, 2019c)

A more detailed picture can be painted of the significance of the agriculture sector by looking at the different commodities that contribute to the significance of the sector in the LGA. This is done by examining the 4-digit level of data as opposed to the 1 digit which is that used for figures 2.18 and 2.19. This shows the number of employees in each of the key commodities in table 2.3 and this can be converted to the location quotient. The results of this analysis is shown in figure 2.20. It can be seen that turf growing has a very large location quotient of 63 and that mushroom farming is also very significant with a quotient of 57. However, the large figure for these two commodities skews the results for the others. Vegetables have a location quotient of 12.8, total poultry (10.9), eggs (9.2) all being significant. It is also noted that flowers (3.3) and nurseries (2.2) are also important.

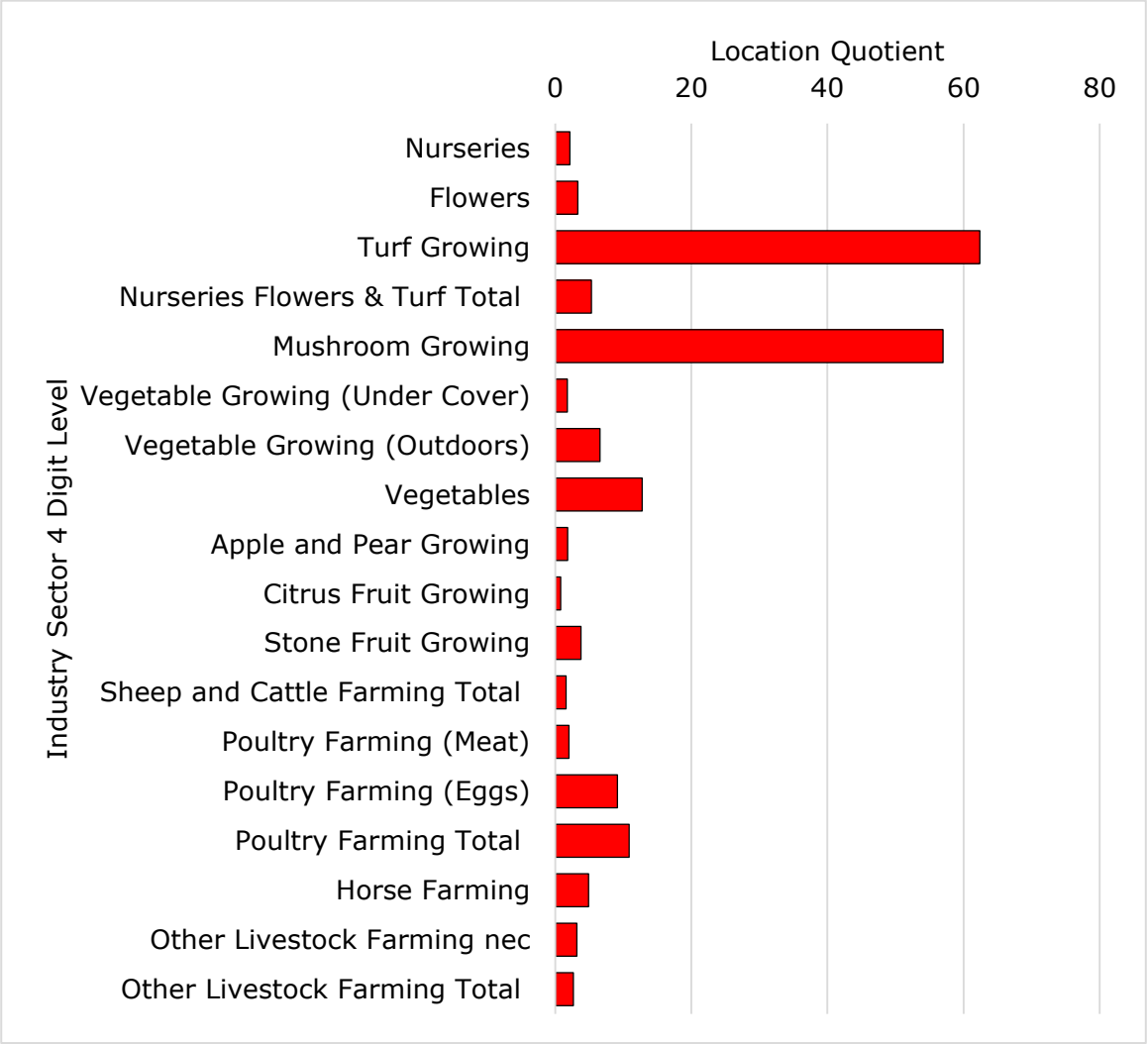


Figure 2.20: Location Quotient Hawkesbury Data
Source: (ABS, 2019c)

Analysis has also been carried out of the location quotients for the Central Coast LGA to provide some level of comparison and this shows that Hawkesbury is significant in turf and vegetables as well as apples and stone fruit but in the other commodities it is not as significant as the Central Coast relative to its economy. This can be seen from figure 2.21.

Another indicator of the strength of an economy is to look at the number of people who are employed growing each of the commodities shown in the location quotient data. This has been done for each of the top five LGAs in Sydney for the value of agriculture. These are as follows:

1. Central Coast ($161,449,035)
2. Hawkesbury ($158,670,281)
3. Penrith ($109,654,198)
4. Wollondilly ($97,256,959)
5. Liverpool ($86,066,555)

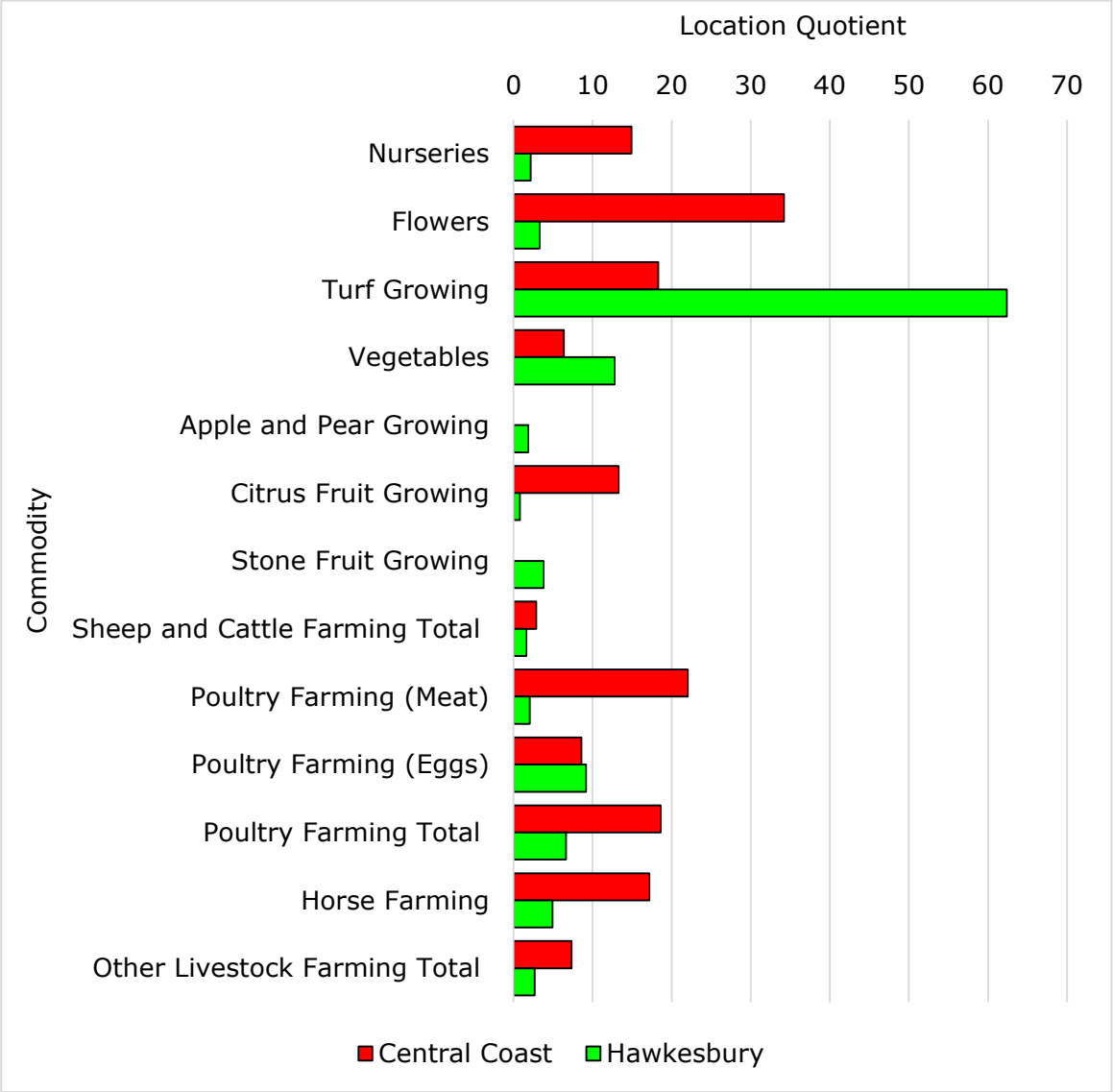


Figure 2.21: Location Quotient Hawkesbury and Central Coast
Source: (ABS, 2019c)

The data has been graphed for the total employed in growing each of the commodities and this is shown in figure 2.22. This shows that Hawkesbury has the most employees in vegetables and turf, Central Coast has the most employees in nurseries, flowers, and poultry meat, Penrith has the most employed in eggs ad total poultry and Wollondilly has the most employees in sheep and cattle farming. It should be noted that this is most likely to be in conjunction with a rural residential use of the land because there are not large enough properties to make a full-time income from cattle grazing. The high numbers in Liverpool should be noticed because the land that is growing vegetables in the Liverpool LGA is part of the South Creek West Growth Area and Aerotropolis Growth Areas and this will not be growing vegetables in the future. This is significant to Hawkesbury because this is 17.8% of the total vegetable employment in the Sydney Peri-Urban area and most of it is grown in protected cropping making up 18.4% of the total employment in protected cropping in Sydney.

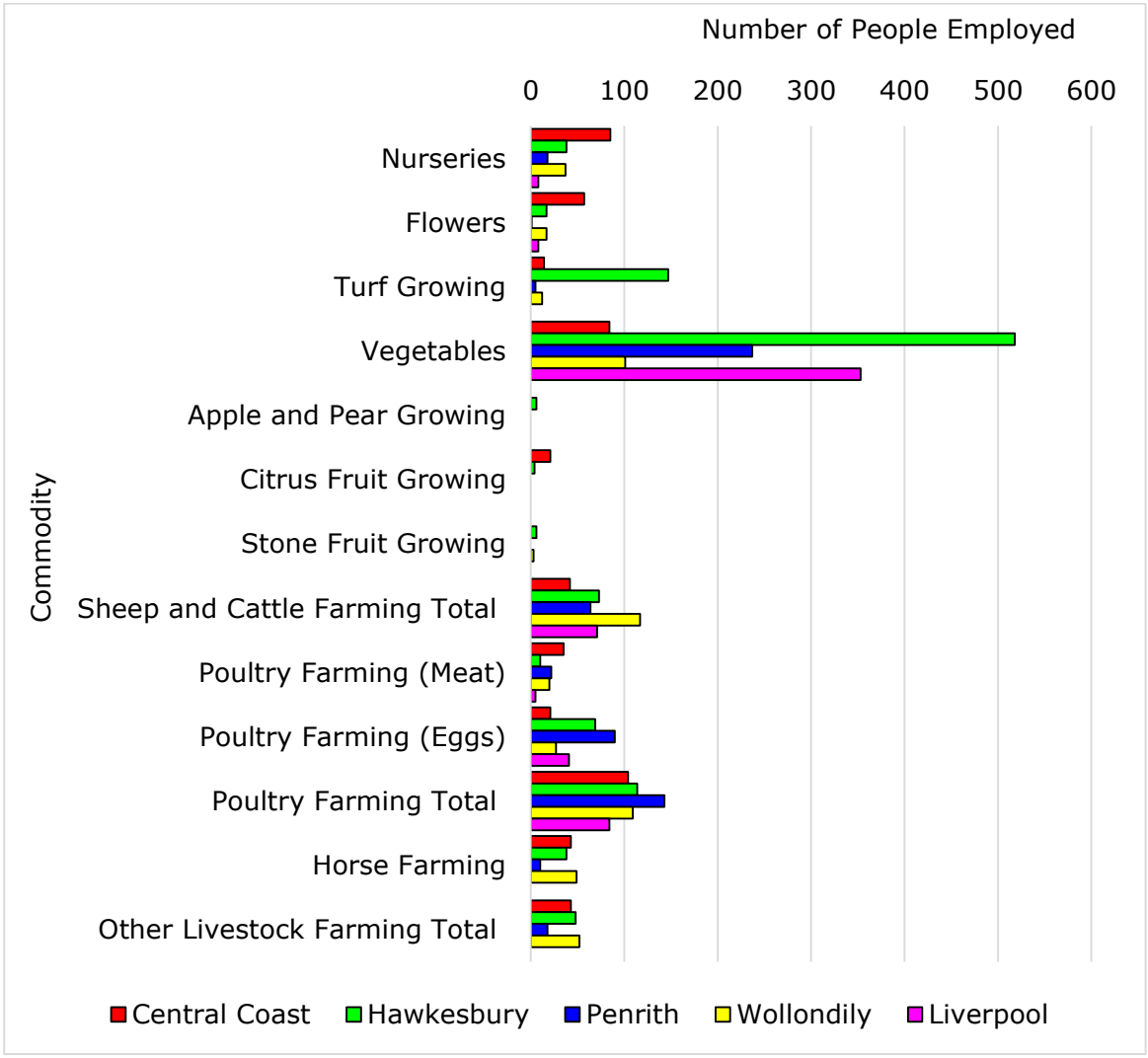


Figure 2.22: Number of People Employed Sydney Peri-Urban
Source: (ABS, 2019c)

The drivers of the rural economy can be ascertained from the same data base as the location quotients; however, they are grouped into the following industry sectors:

- *Industry* – Manufacturing; Electricity, Water & Gas; Wholesale Trade; Transport, Postal and Warehousing
- *Population Serving* – Construction; Retail Trade; Accommodation & Food Services (tourism); Arts & Recreation Services; Other Services
- *Knowledge Intensive* – Information, Media & Telecommunications; Financial & Insurance Services; Rental, Hiring & Real Estate Services; Professional, Scientific & Technical Services; Administrative & Support Services; Public Administration & Safety
- *Health and Education* – Health Care & Social Assistance; Education & Training
- *Agriculture* – Agriculture, Forestry & Fishing
- *Mining* – mining
- *Not Stated* – not stated

It can be seen from figure 2.19 that the drivers of the rural economy are very similar to the drivers of the LGA economy with some slight differences. There are less in the industrial, knowledge intensive and health and education sectors but more in the population serving and agriculture sectors.

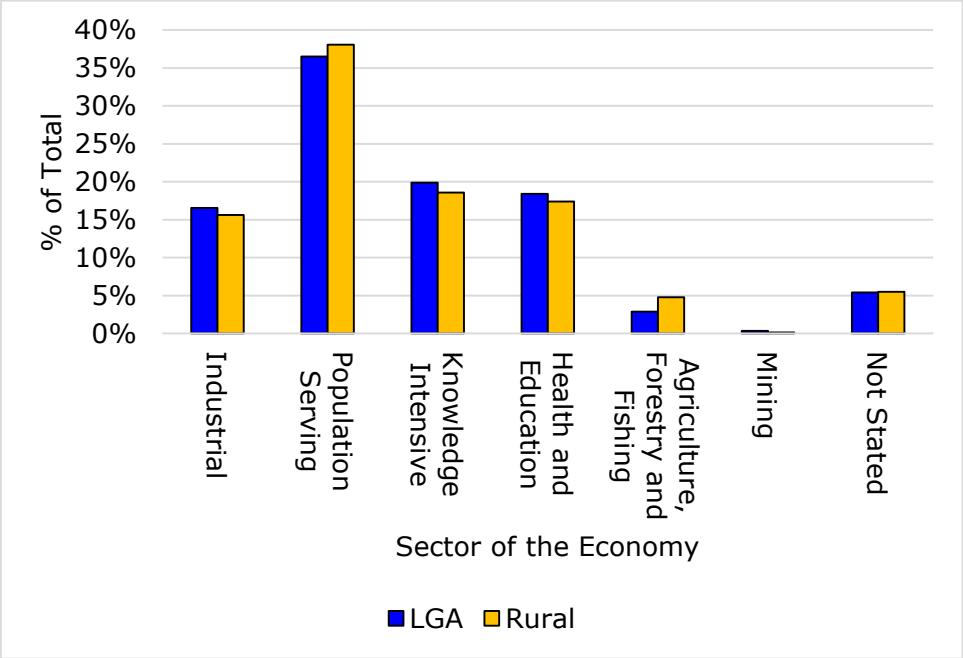


Figure 2.23: Location Quotient LGA and Rural Summary
Source: (ABS, 2019c)

2.9 Agriculture in the Peri-Urban Area

The Hawkesbury LGA is dominant in turf, perishable vegetables, and poultry. In order to gain an insight into the comparison with the other parts of the peri-urban area, this section provides data on the actual production of agriculture – number of animals, area of ornamental plants and kilograms of vegetables, and totals them for the entire peri-urban area. These are then compared to the rest of NSW to show the dominance of the peri-urban area, and then the SA4 regions within the peri-urban area are graphed to show how the Hawkesbury compares with the others.

The Statistical Level 4 (SA4) areas cover regions of the State and have been designed for the output of a variety of regional data. There are a number of SA4s in NSW and they are shown on Map 2.11. The boundaries are based on population and there are fourteen within the Sydney Region and a further fourteen in the rest of the State. For the purposes of this analysis, the SA4s within the Sydney Region have been agglomerated. The Central Coast SA4 and the Sydney Region SA4 combined make up the Sydney Peri-Urban Area for the purposes of this discussion. The Hawkesbury LGA is in the Hawkesbury and Baulkham Hills SA4 region and makes up the bulk of the production in the SA4.

Agriculture is a significant land use in the Sydney Peri-Urban Area and in 2016, it had a value of $806,400,574 which represents 6.2% of NSW value of production from 1.5% of the land area of the combined Sydney and Central Coast SA4 regions. Table 2.3 shows the total value for the main commodities and the percentage contribution to NSW. It can be seen that the significant commodities are turf (71.9% of NSW value), flowers (68.2%), perishable vegetables (65.0%), nurseries (42.1%), poultry eggs (36.8%), poultry meat (36.3%) and total vegetables (36.2%).

Map 2.11: NSW SA4 Regions

The value of agriculture shown in Table 2.4 is calculated from the Agricultural Census carried out every five years. Analysis of the actual production points to a similar outcome to that of the value of the key agriculture commodities. Analysis has been carried out using the 2015-16 Agricultural census to show the dominance of the Sydney Peri-Urban Area in the key commodities of vegetables (particularly perishable vegetables), nurseries, flowers, turf, eggs and poultry meat – all commodities that need to be close to the markets or the processors. Table 2.3 also shows the percentage of the value of production as a proportion of Australia. It can be seen that the Sydney Peri-Urban Area provides 23.6% of Australia's turf value, 15.3% of the flowers, 12.1% of Eggs, 11.5% of Poultry Meat, 8.5% of Nurseries, 7.7% of perishable vegetable value and 4.2% of the total value of Australia's vegetables. Table 2.1 showed the contribution of the Hawkesbury LGA to NSW and Australia's value of production, and it is noted that the Hawkesbury LGA produces 19.5% of Australia's area of turf, 3.8% of perishable vegetables, 2.4% of the value of Australia's total egg production, 1.8% of total vegetable production, 0.7% of poultry meat and 0.5% of the value of Australia's nurseries and cut flower production.

Table 2.4: Value of Agriculture in Sydney Peri-Urban Area

Commodity	Sydney Peri-Urban Area	% of NSW	% of Australia
Broadacre Crops	$5,798,758	0.1%	0.0%
Hay	$5,795,331	1.8%	0.4%
Nurseries, Flowers & Turf Total	$169,262,986	56.4%	13.1%
Nurseries	$61,792,623	42.1%	8.5%
Flowers	$48,619,655	68.2%	15.3%
Turf	$58,850,707	71.9%	23.6%
Fruit and Nuts	$13,341,763	2.2%	0.3%
Total Vegetables	$152,041,059	36.2%	4.2%
Perishable Vegetables	$99,634,410	65.0%	7.7%
Livestock Products	$114,932,059	6.4%	1.4%
Wool	$1,010,263	0.1%	0.0%
Milk	$18,914,267	3.2%	0.4%
Eggs	$95,007,529	36.8%	12.1%
Livestock Slaughtered	$345,215,951	7.9%	1.7%
Poultry Meat	$317,434,918	36.3%	11.5%
Sheep & Lambs	$899,682	0.1%	0.0%
Cattle & Calves	$25,240,673	1.0%	0.2%
Goats	$14,525	0.2%	0.0%
Pigs	$1,626,154	0.8%	0.1%
Total value of Agriculture	**$806,400,574**	**6.2%**	**1.4%**

Source: (ABS, 2017d)

Table 2.5 shows the value of agriculture for the top five Sydney Peri-Urban LGAs. This shows that the Central Coast is represented in all of the commodity areas and that Hawkesbury is the second most dominant when all of the rankings are combined. The dominance of Liverpool in vegetables is notable especially as the current vegetable growing area is in the South West and Aerotropolis Growth Areas and this will decline over the coming years as the urban development take over.

Table 2.5: Value of Agriculture in the Top 5 Sydney LGAs

Ranking	Total Agriculture		Nurseries		Flowers		Turf	
	LGA	Value	LGA	Value	LGA	Value	LGA	Value
1	Central Coast	$161,449,035	Central Coast	$17,935,549	The Hills	$15,131,355	Hawkesbury	$48,534,440
2	Hawkesbury	$158,670,281	The Hills	$13,574,797	Central Coast	$14,645,864	Central Coast	$3,477,356
3	Penrith	$109,654,198	Hornsby	$8,258,106	Hornsby	$5,440,030	Penrith	$2,733,118
4	Wollondilly	$97,256,959	Wollondilly	$5,670,429	Penrith	$2,951,133	The Hills	$1,770,948
5	Liverpool	$86,066,555	Hawkesbury	$3,720,048	Fairfield	$2,723,830	Camden	$1,579,976
6					Wollondilly	$2,691,764		
7					Hawkesbury	$1,680,436		

Ranking	Vegetables		Eggs		Poultry Meat	
	LGA	Value	LGA	Value	LGA	Value
1	Hawkesbury	$63,686,875	Penrith	$45,350,725	Central Coast	$102,354,094
2	Liverpool	$21,078,665	Hawkesbury	$18,728,663	Liverpool	$49,680,311
3	Wollondilly	$18,186,167	Camden	$6,694,855	Wollondilly	$49,469,070
4	Penrith	$16,135,725	Fairfield	$6,663,846	Penrith	$36,998,952
5	Central Coast	$10,318,398	Central Coast	$5,592,683	Camden	$26,303,846
6					Hawkesbury	$19,120,857

Source: (ABS, 2017d)

2.9.1. Vegetables

According to the Australian Horticulture Statistics Handbook 2017-18 for Vegetables, the Sydney Peri-Urban Area is one of Australia's major growing areas for broccoli (Hawkesbury), cabbages, egg plants, parsley, basil and other herbs, fresh head lettuce, leafy Asian vegetables, mushrooms and sweet corn (Horticulture Innovation Australia, 2019).

In 2015-16, the Sydney Peri-Urban Area produced 5.8% of Australia's perishable vegetables, which is significant when considering that vegetables are grown throughout the country and the number one LGA in Australia is Lockyer Valley in the Brisbane Peri-Urban Area with 11.9%, followed by Whitsunday 7.7% and Wyndham in the Melbourne Peri-Urban Area with 7.2% of Australia's perishable vegetables (ABS, 2018a). The Sydney Peri-Urban Area produced 50.2 % of NSW perishable vegetables (beans, broccoli, cabbages, capsicums, cauliflowers, lettuces, mushrooms and fresh tomatoes) and 15.2% of the total vegetable production (ABS, 2017b).

The data for irrigated agriculture also shows the importance of peri-urban vegetable production shows that 40.7% of Australia's irrigated vegetable production is grown in the peri-urban areas and if the high growth coastal areas of Queensland are included it takes it to 53.7% (these coastal areas have a similar land use mix as peri-urban areas as well as similar growth rates). In addition, 75% of the irrigated vegetable production is not grown in the Murray Darling Basin. In NSW, the Sydney peri-urban area grows 40.1% of the irrigated vegetables and is number one, followed by the Northern Tablelands (11.3%), the Riverina with 10.9%, Central West (7.6%) and Murray at number five with 7.3%.

The significance of the Sydney Peri-Urban Area for vegetable and perishable vegetable production can be seen from Figure 2.20 which shows it compared to the rest of NSW. It should be noted that the data in Table 2.2 refers to the value of agricultural produce whilst the data in Figure 2.2 refers to the actual production – kilograms of vegetables, area of nurseries, flowers and turf as well as the number of chickens and dozens of eggs. For this reason, the figures shown in Table 2.2 will be different to those shown in Figure 2.20.

Whilst the inland irrigation areas of the Murray, Riverina and Central west are significant in total vegetable production, the Sydney Peri-Urban Area, with its favourable climate and good soils, is significant in perishable vegetable production, that is, the commodities that have to be close to the market because of their short shelf life. It can be seen that the Sydney Peri-Urban Area is the number one perishable vegetable region in NSW and the number four total vegetable producing region. It is significant to note that the value of production for perishable vegetables in the Sydney Peri-Urban Area is 65.0% of the total NSW value of perishable vegetables (see Table 2.3) and also the total vegetable production in the peri-urban area is 36.2% of NSW. This makes it the number one region for total value of production with Riverina coming in second with 18.3% and Murray third at 13.1%. Whilst this seems to be at odds with the data shown in Figure 2.7, it is explained by

the higher value of the commodities produced as well as the larger number of kilograms of these commodities produced in the Sydney Peri-Urban Area compared to other regions of NSW. These two factors combined illustrate the significance of the peri-urban area as a producer of vegetables and particularly perishable vegetables.

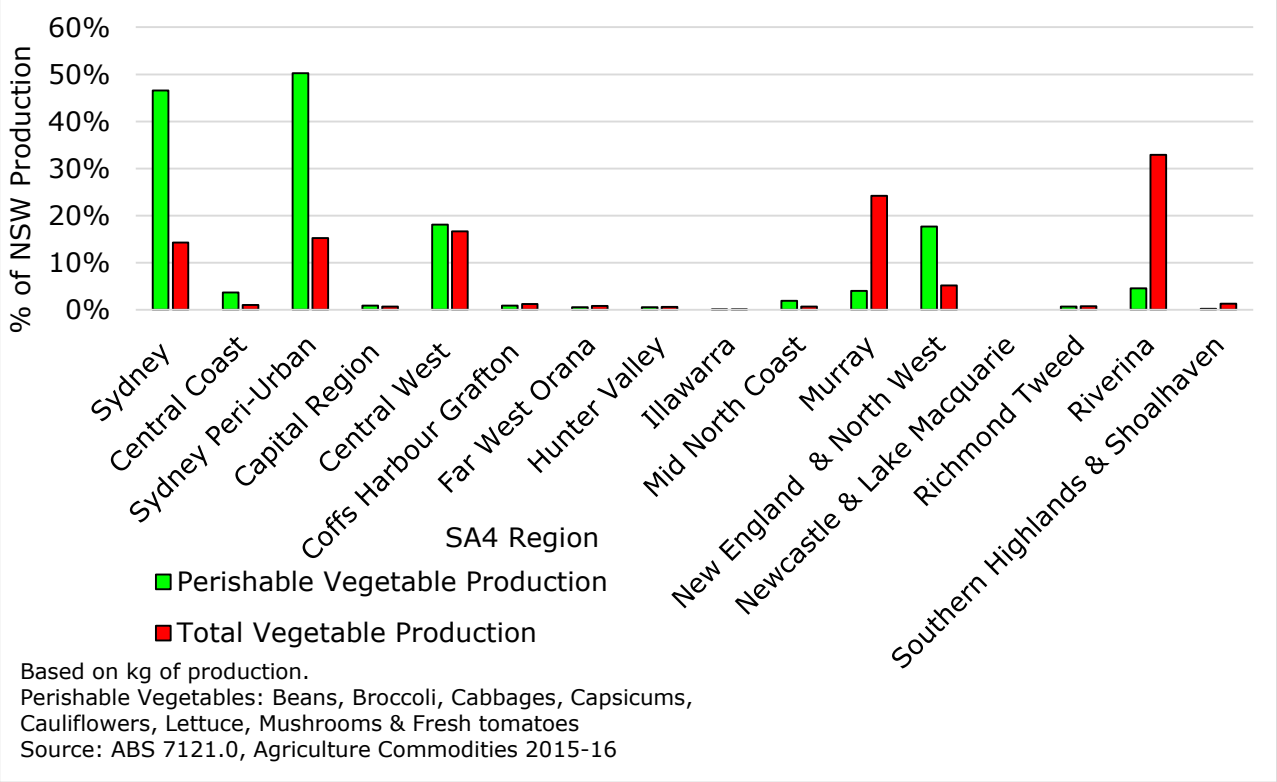


Figure 2.20: NSW Vegetable Production
Source: (ABS, 2017c)

The vegetable production in the Sydney Peri-Urban Area can be seen from Figure 2.21 which shows the vegetable and perishable vegetable production and it can be seen that the number one region is Baulkham Hills and Hawkesbury, followed by Outer South West, Outer West and Blue Mountains, the South West, the Central Coast and Blacktown.

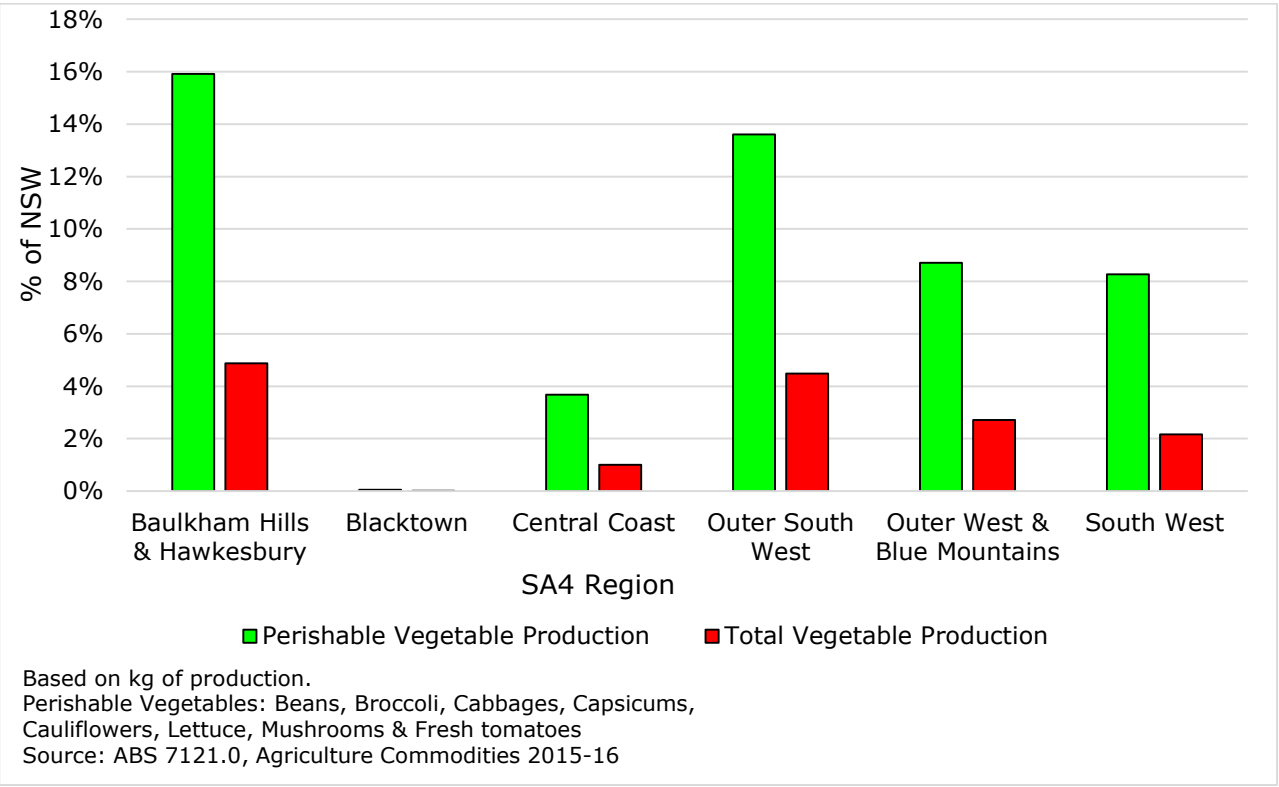


Figure 2.21: Sydney Vegetable Production
Source: (ABS, 2017c)

Data on the value of irrigated vegetables in NSW also paints a picture of the significance of the Sydney Peri-urban area. Figure 2.22 shows the dominance of the Sydney Peri-Urban area which is shown as the Hawkesbury Nepean Natural Resources Management Region. There is a lot of commentary about the Murray-Darling Basin being 'Australia's food bowl' (Murray-Darling Basin Authority, 2014) but this is not true for irrigated vegetables. The ABS data shows that the value of irrigated vegetables in the Murray Darling Basin is $884,407,672 and the value of irrigated vegetables grown outside the Murray-Darling Basin is $2,534,627,514 (ABS, 2019b) which means that 75% of irrigated vegetables are grown outside of the Murray-Darling Basin and in NSW that is predominately in the Sydney Peri-Urban Area and Hawkesbury LGA in particular.

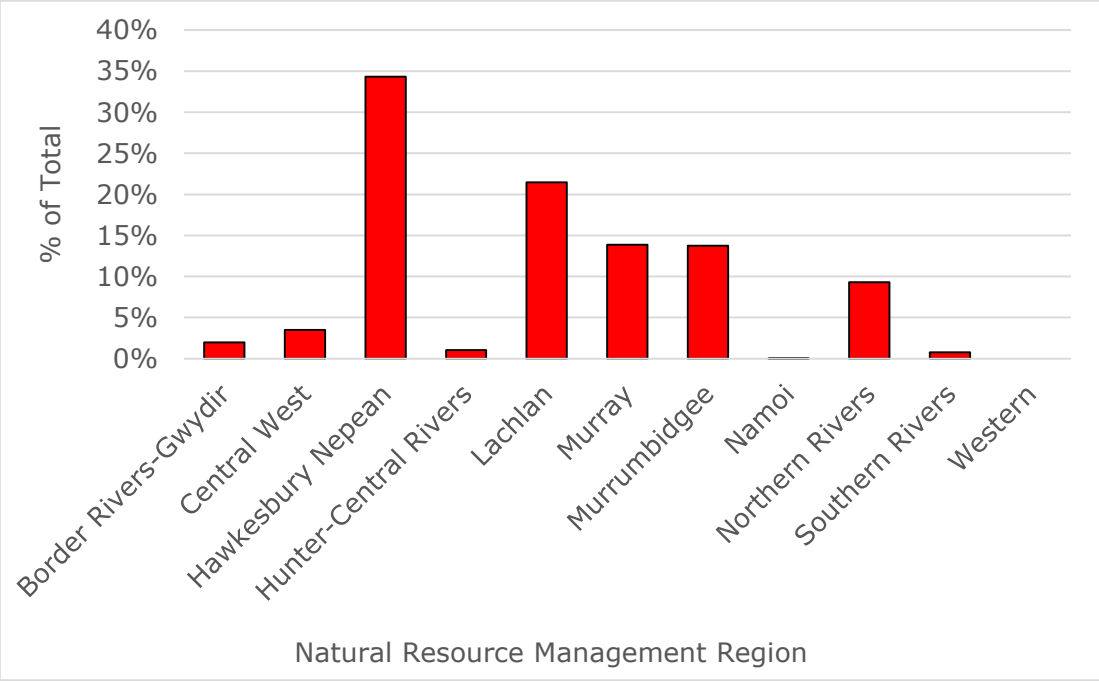


Figure 2.22: NSW Value of Irrigated Vegetables
Source: (ABS, 2019b)

2.9.2. Poultry

Poultry production in the Sydney Peri-Urban Area is significant for chicken meat, other poultry (ducks, turkeys, etc.) and eggs. In 2015-16 it produced 11.9% of Australia's meat chickens, 27.5% of other poultry and 11.6% of the eggs. It is the number two chicken meat producing region in Australia behind Melbourne's peri-urban area. It is also the number one region for other poultry in Australia and the number three egg producing region in Australia behind the Toowoomba in the Darling Downs and Melbourne's peri-urban area.

The figures for the NSW production are also significant with 35.6% of the meat chickens, 54.5% of the other poultry and 36.8% of the eggs being produced in the Sydney Peri-Urban Area. The distribution across NSW for poultry meat, number of birds and value can be seen from Figure 2.23 which shows the dominance of Sydney for both chicken meat and other poultry, where it is the number one region in NSW followed by Riverina and New England North West. Egg production follows the trend of the poultry meat and Figure 2.24 shows that the Sydney Peri-Urban Area is number one with 71% of the eggs produced in NSW, followed by Newcastle & Lake Macquarie and the Central West.

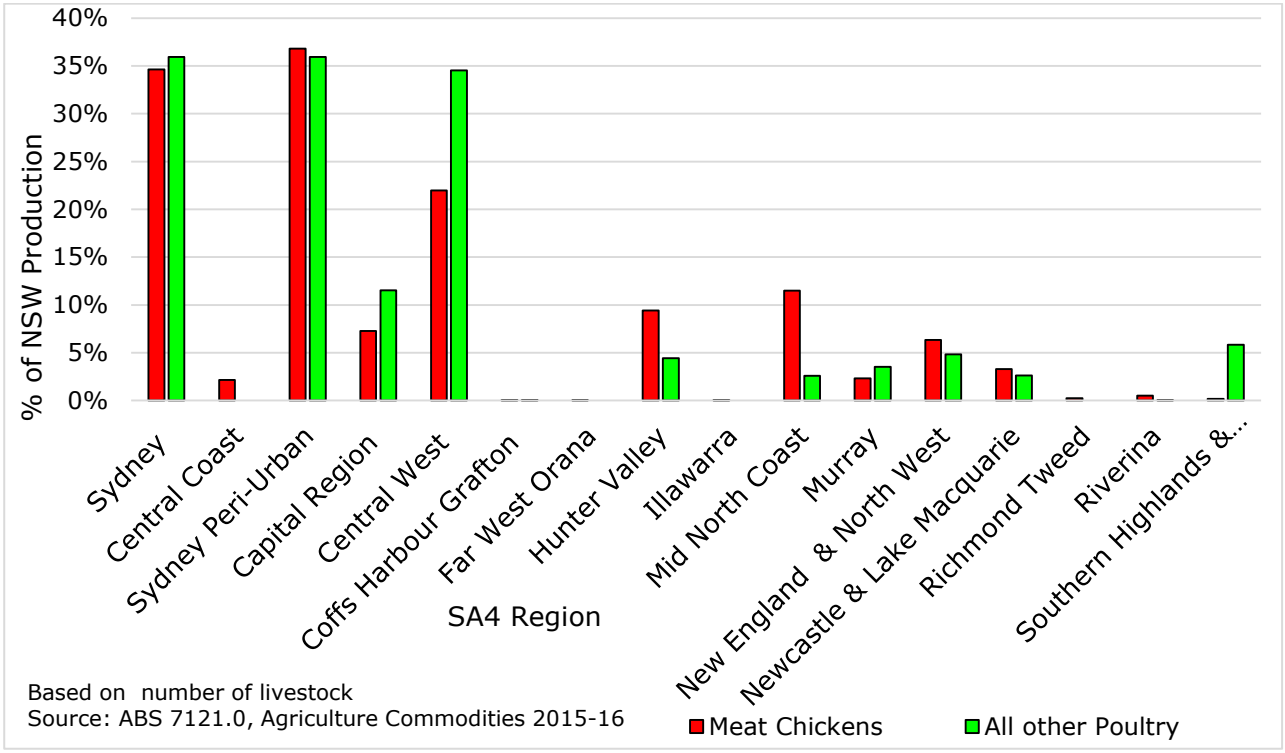


Figure 2.23: NSW Poultry Production
Source: (ABS, 2017c)

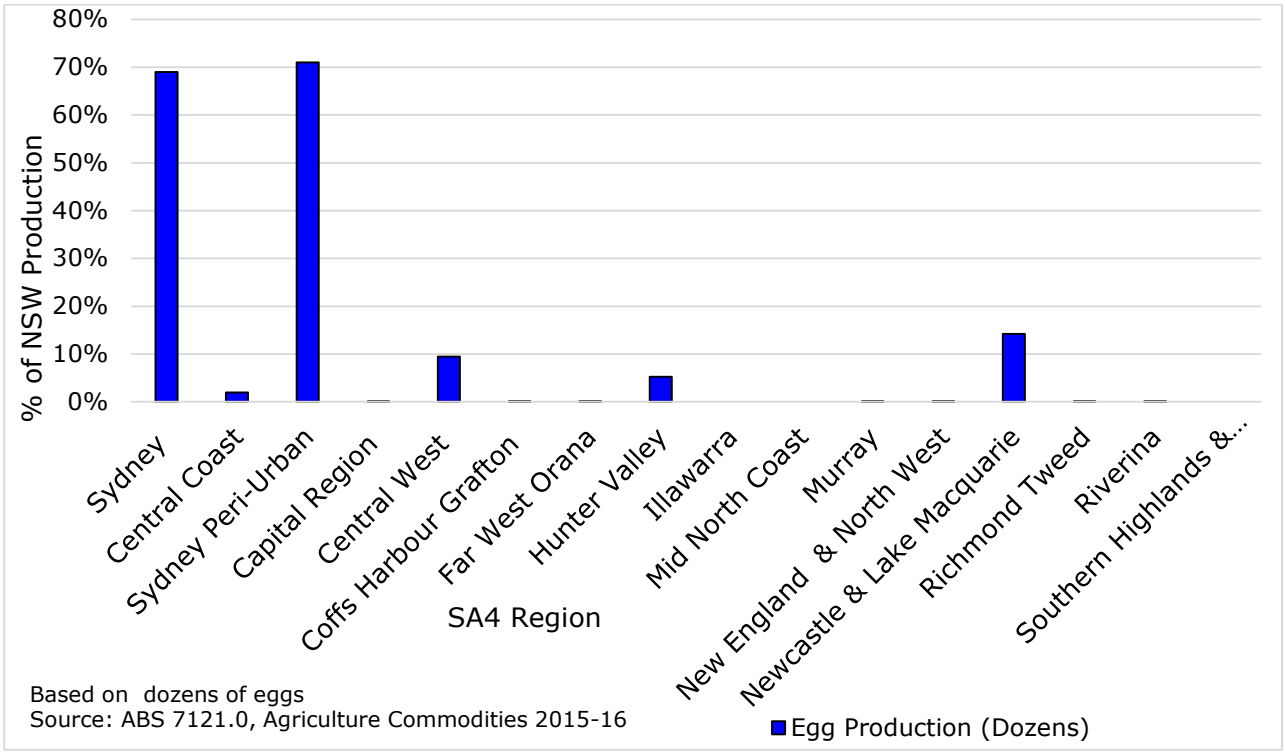


Figure 2.24: NSW Egg Production
Source: (ABS, 2017c)

The poultry meat and egg production for the Sydney peri-urban area can be seen from Figure 2.25. These show that the Central Coast has the highest number of Meat Chickens followed by the South West Sydney, Outer South West, Outer West and Blue Mountains, Blacktown, and Baulkham Hills and Hawkesbury. For Other Poultry it is the

Outer South West region that has the most, followed by the South West, Baulkham Hills and Hawkesbury, as well as the Outer West and Blue Mountains, then the Central Coast. No Other Poultry is recorded for Blacktown. Egg production is highest in the Outer West and Blue Mountains followed by the South West, Baulkham Hills and Hawkesbury, then the Central Coast, Outer South West and Blacktown.

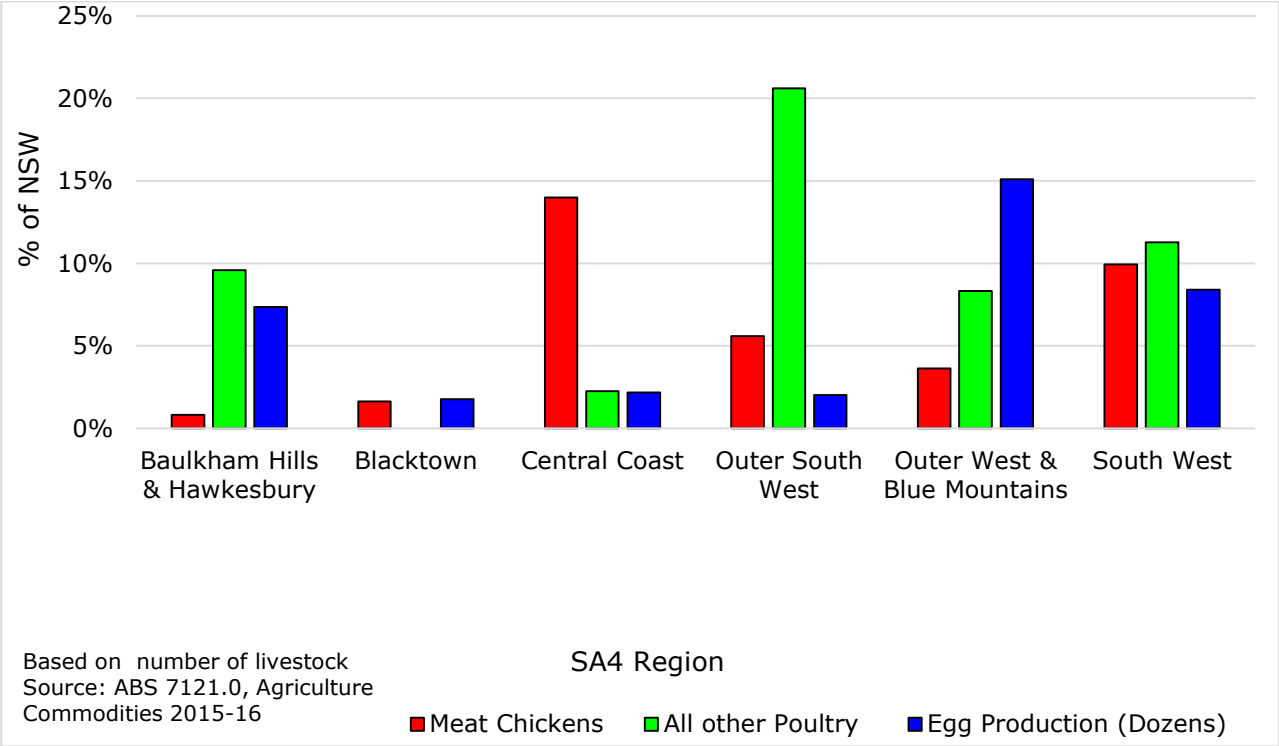


Figure 2.25: Sydney Poultry Production
Source: (ABS, 2017c)

2.9.3. Nurseries, Flowers and Turf

The Sydney Peri-Urban Area has 15.1% of Australia's total area of the category Nurseries, Flowers and Turf. This can be broken down to 8.8% of all nurseries in Australia (11.3% of Australia's undercover and 8.5% outdoor), 7.1% of all flowers (20.1% Australia's undercover and 6.1% outdoor) and 24.0% of the area of all turf farms Australia-wide (refer Table 2.4). It is the number two region in Australia for Nurseries, Flowers and Turf behind Melbourne's peri-urban area. It is also the number two region in Australia for nurseries behind Melbourne peri-urban area, and number three for cut flowers behind Victoria North West and Melbourne peri-urban. The Sydney Peri-Urban Area is the number one region in Australia for the area of turf farms.

The figures for NSW are also significant, where the Sydney Peri-Urban Area has 61.5% of Nurseries, Flowers and Turf combined, comprising 40.4% of NSW nurseries (46.6% of NSW undercover and 39.6% outdoor), 54.3% of NSW flowers (77.0% of NSW undercover and 50.4% outdoor) as well as 71.9% of the turf produced in NSW. Figure 2.26 shows the distribution of the nurseries, flowers and turf category across NSW regions, which shows that the Sydney Peri-Urban Area is the number one region.

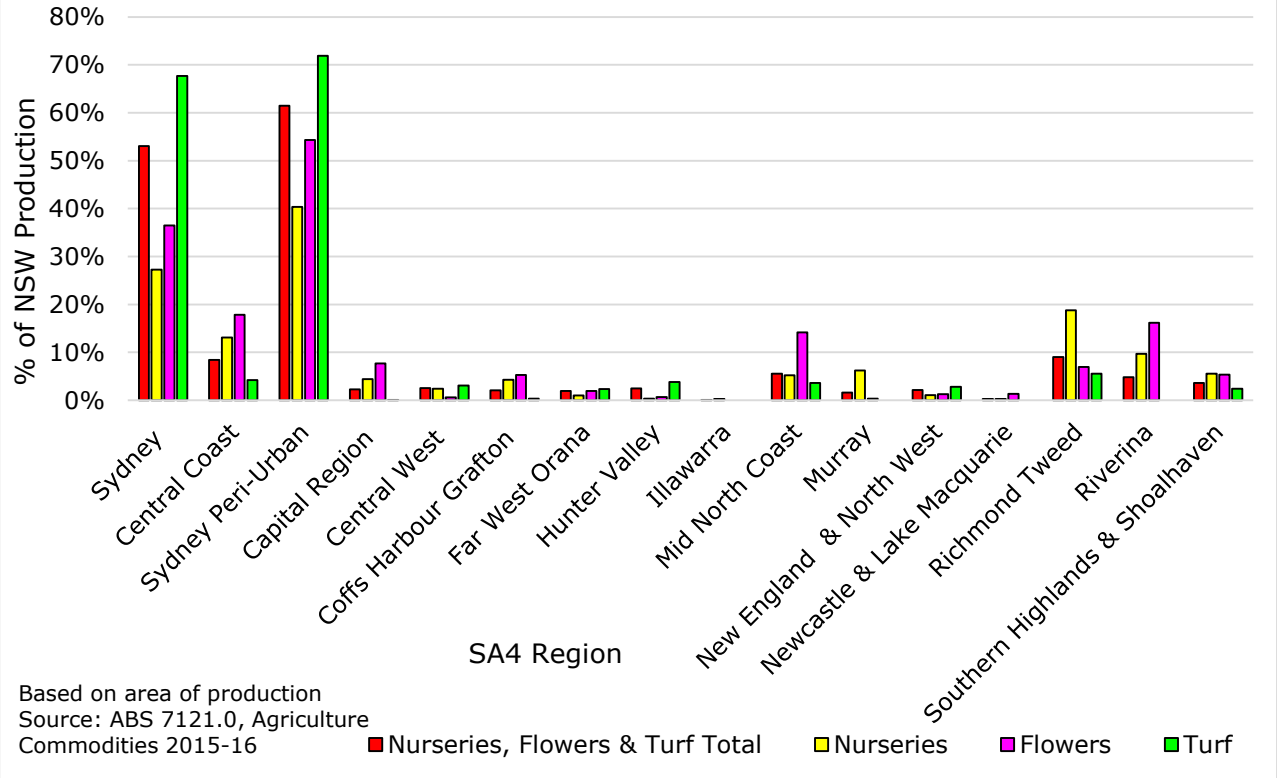


Figure 2.26: NSW Nurseries, Flowers and Turf Production
Source: (ABS, 2017c)

Figure 2.27 shows the distribution of the areas where nurseries, flowers and turf are grown in the Sydney Peri-Urban Area. This shows that nurseries, flowers and turf are significant in Baulkham Hills and Hawkesbury as well as the Central Coast and Outer West and Blue Mountains. The highest concentration of nurseries is in Baulkham Hills and Hawkesbury (14.7%), followed by the Central Coast (13.1%), South West (3.9%), Outer South West, Outer West and Blue Mountains, and then North Sydney and Hornsby, and Blacktown. Baulkham Hills and Hawkesbury also have the highest concentration of flower growers with 26.8% of NSW, followed by the Central Coast with 17.8%, then Outer South West region, South West, Outer West and Blue Mountains, and Blacktown. The largest area of Turf is grown in Baulkham Hills and Hawkesbury, closely followed by the Outer West and Blue Mountains, followed by the Central Coast and Outer South West region.

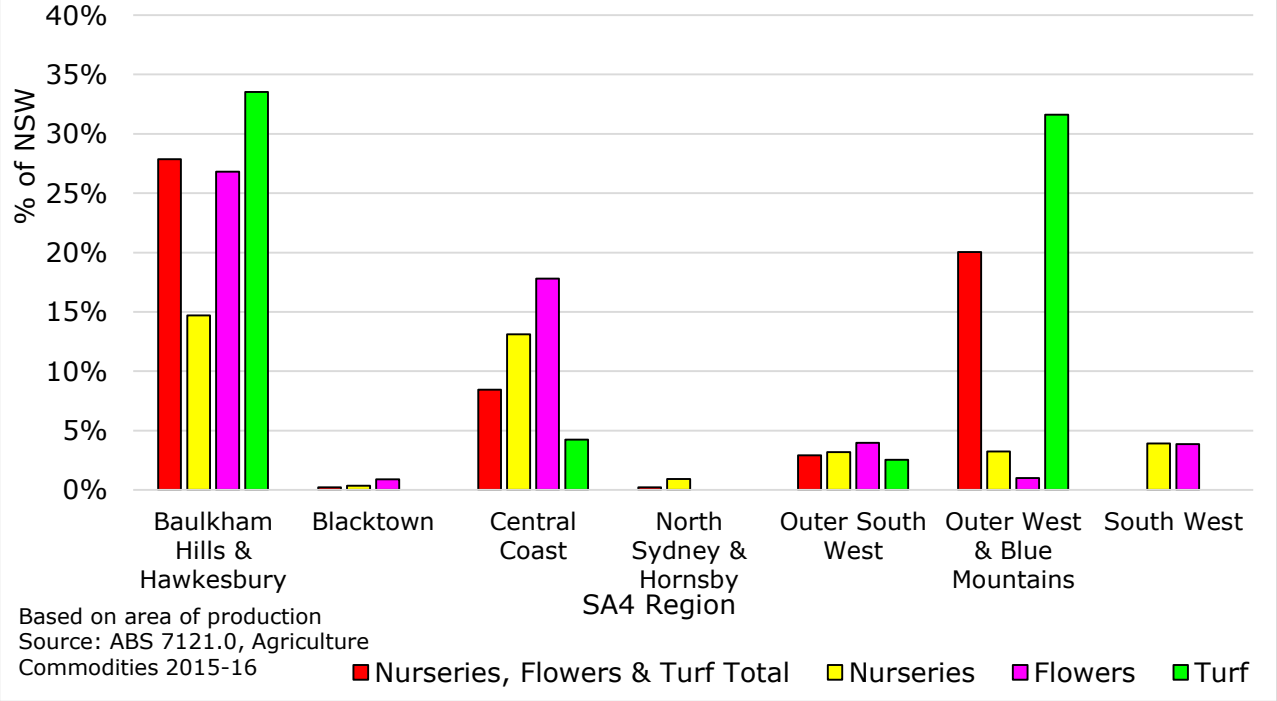


Figure 2.27: Sydney Nurseries, Flowers and Turf Production
Source: (ABS, 2017c)

2.9.4. Change in Agriculture Production

To gauge an indication of the growth or decline of these commodities, comparison can be made with the 2010-11 Agriculture Census data. However, a direct comparison cannot be made because of the change in the methodology for carrying out the Census. The value of farm gate production required to be included in the census has changed from $5,000 in 2010-11 to $40,000 in 2015-16. This had the result of changing the number of farms surveyed Australia-wide from 145,200 (ABS, 2012b) to 87,890 farms (ABS, 2017c) respectively. It was done by the ABS to provide more accurate data on commercial farms as opposed to part-time farmers (whose main use is rural residential).

The value of production actually rose in the period from $749.2.9m in 2010-11 (ABS, 2008) to $806.4m in 2015-16 (ABS, 2017d). Whilst this cannot be directly compared because of the change in collection methodology, it is significant that the value increased when the number of farms decreased, when it would have been expected that the value might have gone down.

The commodities that Sydney is significant for are shown in Table 2.6 where it can be seen that there was a modest rise in all commodities except for nurseries, meat chickens and total vegetables, which saw a modest decrease in the proportion of NSW and Australia. This too cannot be directly compared, however it can be said that agriculture did not decrease during the period and could have in fact increased in both value and production.

Table 2.6: Change in Agricultural Production 2010-11 to 2015-16

Commodity	2010-11		2015-16		Change 2010-11 to 2015-16	
	% of NSW	% of Australia	% of NSW	% of Australia	% of NSW	% of Australia
Nurseries, Flowers & Turf Total	56.5	14.8	61.5	15.1	5.0	0.3
Nurseries	41.0	10.3	40.4	8.8	-0.6	-1.5
Flowers	45.6	6.4	54.3	7.1	8.7	0.7
Turf	67.4	23.3	71.9	24.0	4.5	0.7
Perishable Vegetables	45.8	5.2	50.2	5.9	4.4	0.7
Total Vegetables	14.1	1.8	15.2	1.7	1.1	-0.1
Meat Chickens	46.1	17.6	35.6	11.9	-10.5	-5.7
Other Poultry Meat	34.6	16.5	52.0	27.5	17.4	11.0
Eggs (Dozens)	31.2	9.9	36.8	11.6	5.6	1.7
Number of Businesses Surveyed Australia wide		145,200		87,890		-57,310

Source: (ABS, 2012b, 2017c)

In 1993 Wollondilly Shire Council published its Agricultural Lands Study which also analysed these commodities and found a similar pattern of the dominance of the Sydney Region in the NSW production of perishable vegetables, poultry, and nurseries, flowers and turf for the 1990-91 year (Wollondilly Shire Council, 1993). In 2001, the Penrith Rural Lands Study reported a similar trend for the 1997 agricultural census (Edge Land Planning, 2001). So, it can be seen that the Sydney peri-urban area has been a significant contributor to the production of a number of key agricultural commodities.

Another indicator of the significance of agriculture in Sydney compared to the rest of NSW is to look at the Farm Management and Demography data collected as part of the ABS Agriculture Census. This shows that the average age of the farm owner in the Hawkesbury LGA is 54, compared to 55 for Sydney's peri-urban area, 57 for NSW and 56 for Australia (ABS, 2017a). The SA2 data for Hawkesbury shows that the age varied from 49 in Richmond Clarendon (which has a lot of agricultural land use) to 61 in Bilpin – Colo – St Albans (which has a significant proportion of rural residential land use). The census data shows that in the Hawkesbury LGA has 71.8% of the farm workers less than 55 compared to Greater Sydney (including both urban and peri-urban areas) there were 70.9% of the farm workers less than 55, which is much more than regional NSW, NSW and Australia. The LGA has the largest proportion of farmers under 55 in Sydney – Central Coast has 67.4% and Wollondilly has 69.0% of farmers aged younger (ABS, 2017a). This can be seen from Figure 2.28. This was 69.7% for Sydney peri-urban and 69.9% for the Hawkesbury LGA in 2011 (ABS, 2012a). Therefore, the Hawkesbury LGA and the Sydney Region has the youngest farmers in NSW and Australia.

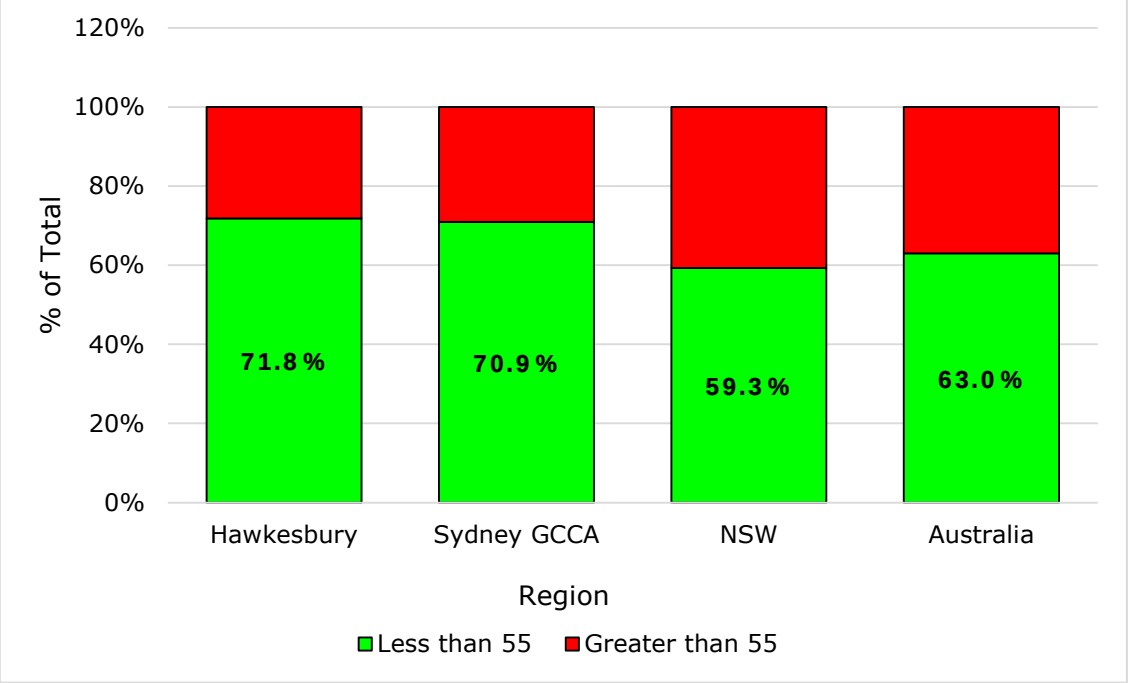


Figure 2.28: Proportion of Farm Workers less than 55
Source: (ABS, 2017a)

Another indicator is the percentage of income generated by agriculture on the farm and the percentage of off-farm income. Farm owners in the Hawkesbury LGA generate 77.2% of their income from on-farm (ranging from 87.5% in Pitt Town – McGraths Hill to 67.2% in Bilpin – Colo – St Albans), which is less than the Sydney Region compared to 82.3% for NSW and 83.6% for Australia (ABS, 2017a). Hawkesbury farm owners rely on off-farm income for 16.3% (ranging from 7.6% in Pitt Town – McGraths Hill to 26.9% in Bilpin – Colo – St Albans), compared 11.0% for Sydney, 13.1% for NSW, and 12.1% for Australia (ABS, 2017a). It should be noted that there are other sources of income from grants, Government transfers, relief funding and other funding sources that have not been included in these figures by the ABS, hence the reason the figures presented don't add up to 100%. This illustrates the strong productive capacity of agricultural businesses in the Hawkesbury LGA and shows that farm owners on the Hawkesbury LGA and the Sydney Peri-Urban area generate more of their income from farming than for other areas of NSW and Australia, and conversely rely less on off-farm income.

The Census of population and housing is also an indicator of the performance of agriculture in the Sydney peri-urban area. Data from recent censes shows that employment in agriculture has fluctuated since 1991, and in 2016 it was higher (9,919 people) than it was in 1991 (9,849 people). In between it increased to 11,151 in 2001 and then dropped to 7,796 in 2011. It is significant to note that employment in agriculture increased by 2,123 from 2011 to 2016. It is a similar pattern in Hawkesbury LGA where it was 1,317 in 1996 then dropped in 2001 (1,174) and continued in 2006 (938) to reach a low in 2011 of 847 and has rebounded to 936 in 2016.

2.10 Rural Demography

The 2016 Census of Population and Housing provides details of the population and housing characteristics.

Detailed analysis has included the Statistical Area 1 (SA1) level of data being aggregated to identify the demographic profile of the rural areas. SA1 is the smallest unit for data collection and processing at the 2016 Census and contain an average of 200 dwellings. At previous censes, the smallest area was called a Collector District. They have been changed and are now called SA1. This has been subtracted from the LGA total to gain a picture of the urban area. This has allowed for comparison between the rural and urban parts of the LGA. The SA1 the former Collector District boundaries and are not the same spatial area which means that direct correlation between the 2006, 2011 and 2016 areas is not possible, however, it is possible when the SA1s and CDs are aggregated to form a rural area dataset.

Analyses have been carried out of the 2006, 2011 and 2016 census at the CD / SA1 level to allow for the demography of the rural lands to be examined.

The following points can be observed for the 2016 Census year:

- The urban – rural split is 57.6% urban and 42.4 % live in the rural land. This has changed from 62% and 38% respectively in 2006.
- The rural population has grown from 23,120 in 2006 to 27,372 in 2016.

Population Pyramids have been produced and the differences can be seen between the rural lands and Hawkesbury LGA in figures 2.29 and 2.30. The pyramids show the differences between the rural area and the LGA particularly in the 15-19 year ages and 45 to 49 years. The rural pyramid resembles one that is more akin to the pyramids for Peri-Urban LGAs like Wollondilly and Wingecarribee that don’t join the metropolitan area.

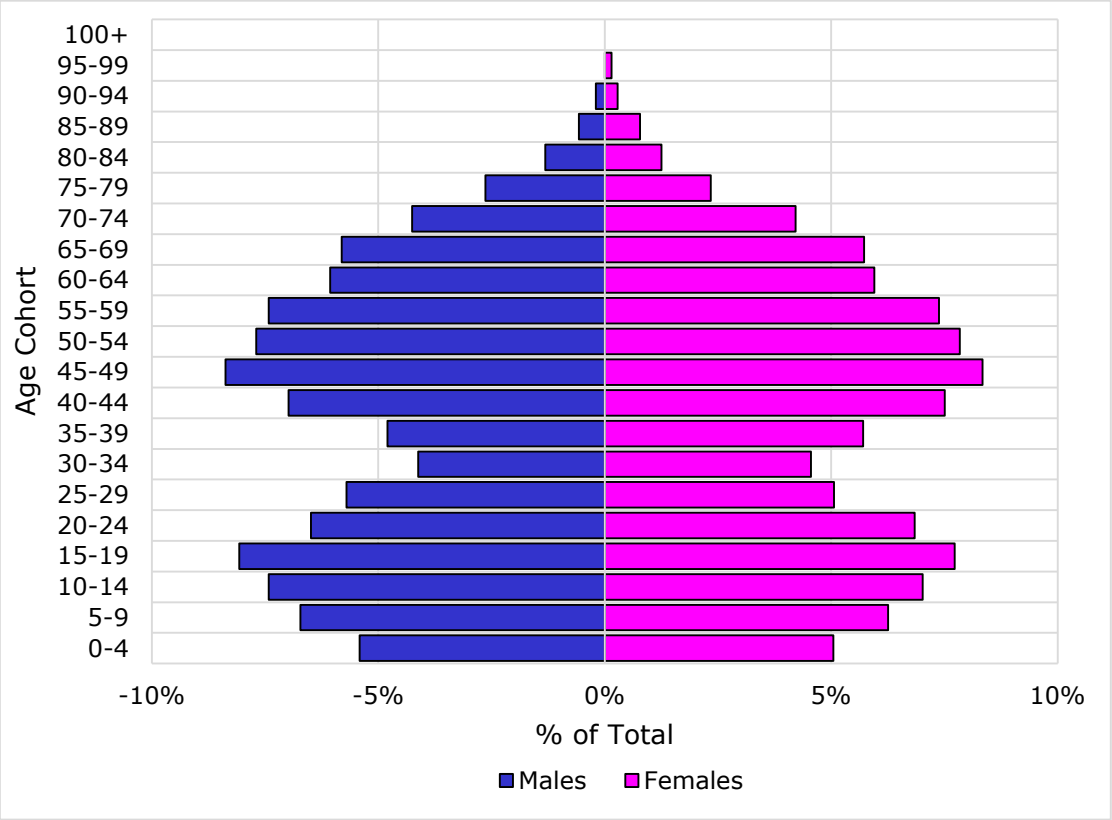


Figure 2.29: Rural Land Population Pyramid
Source: ABS Census of Population and Housing

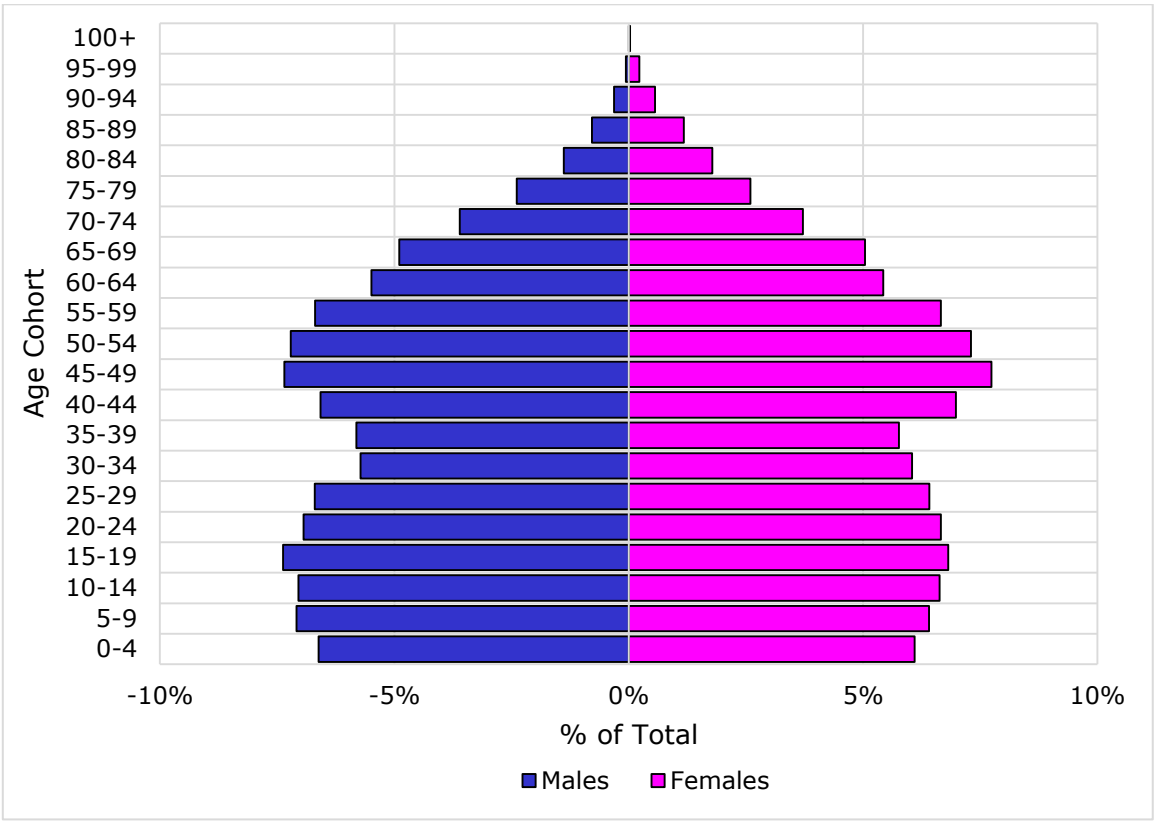


Figure 2.30: Hawkesbury Population Pyramid
Source: (ABS, 2019c)

Figure 2.31 shows the age comparison between the rural, urban and LGA. It shows that the rural area has more people in all age groups from 5 to 19 and 40 to 74. This is reinforced in figure 2.32 which shows that there are more secondary school students in the rural area than the urban are and LGA as well as there being more parents and homebuilders, older workers and pre-retirees, empty nesters and retirees as well as seniors but less elderly aged than the urban area and LGA.

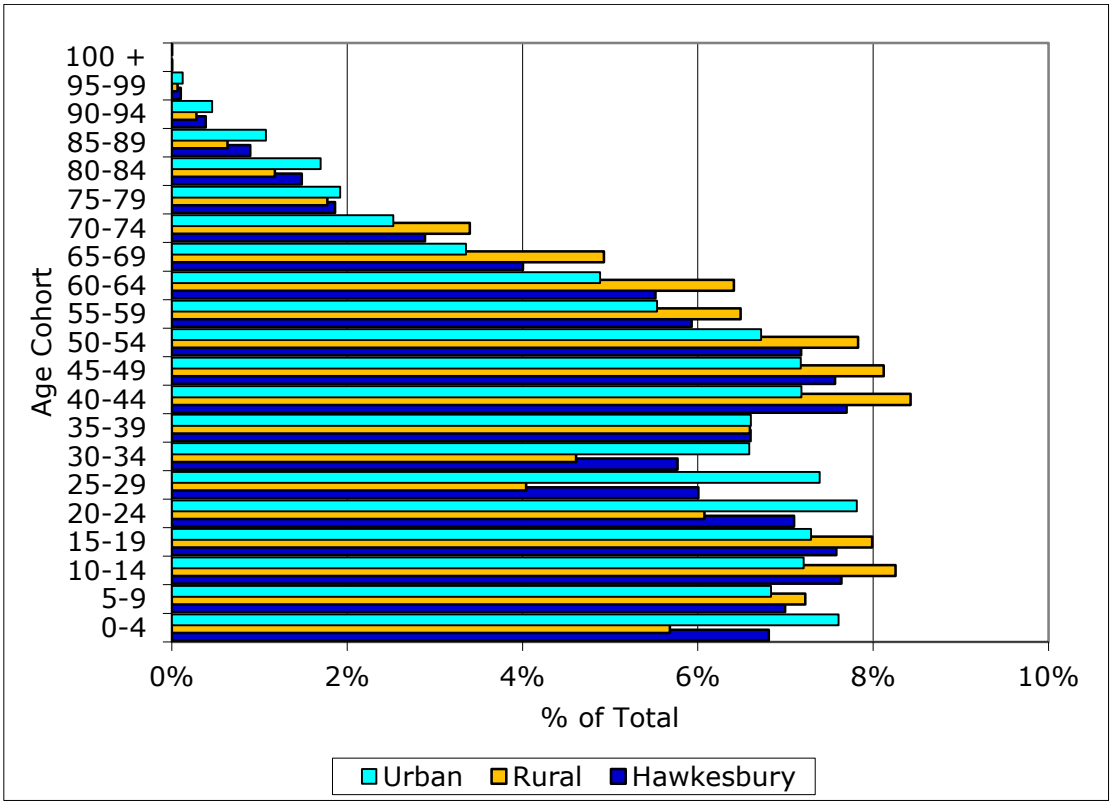


Figure 2.31: Age Cohort Comparison

Source: ABS Census of Population and Housing

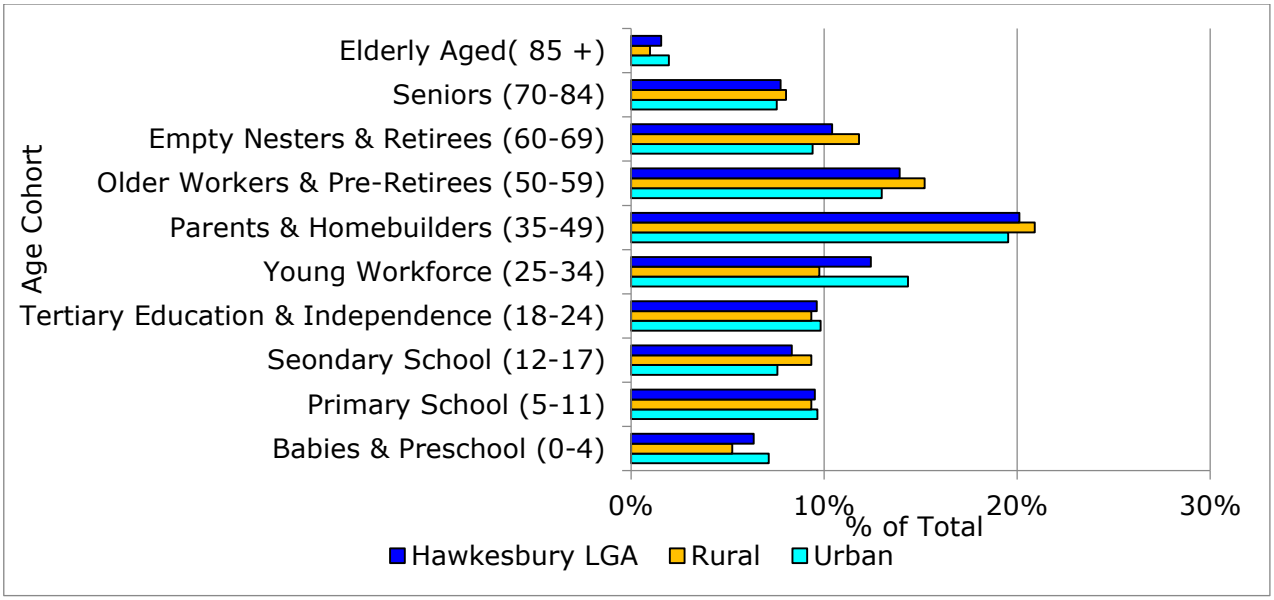


Figure 2.32: Specific Age Cohort Comparison

Source: ABS Census of Population and Housing

More of the rural residents are married and less separated, divorced, widowed and never married as can be seen in figure 2.33.

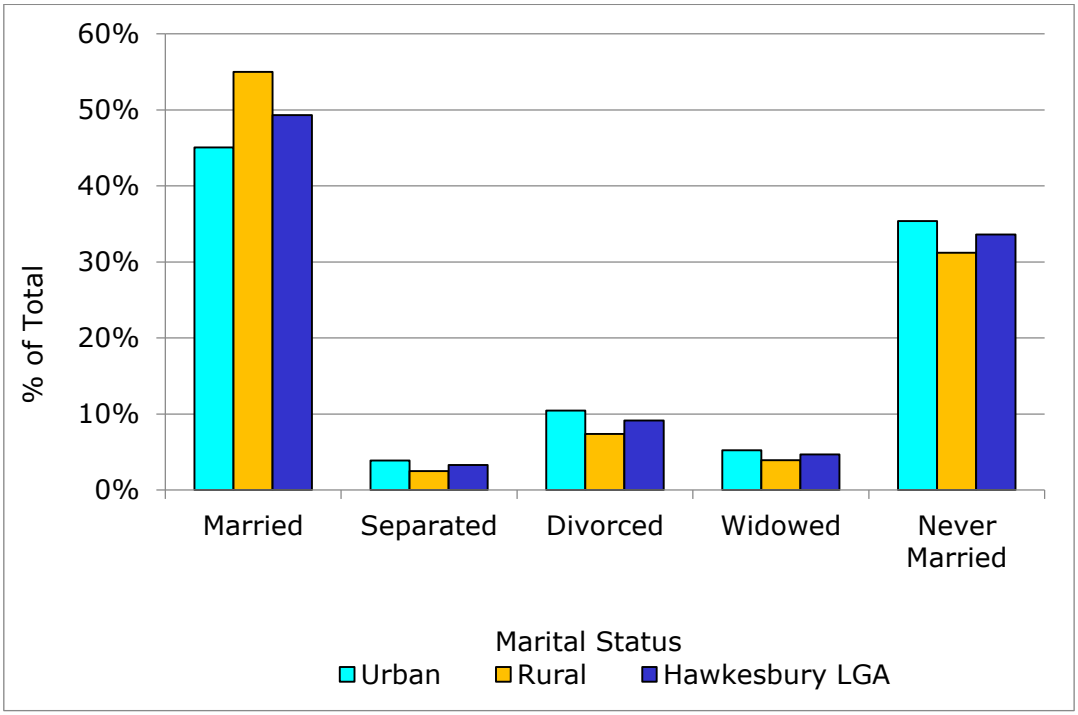


Figure 2.33: Registered Marital Status
Source: ABS Census of Population and Housing

There more people from a Non-English Speaking Background in the rural areas than the urban parts and LGA. This is shown in figure 2.34.

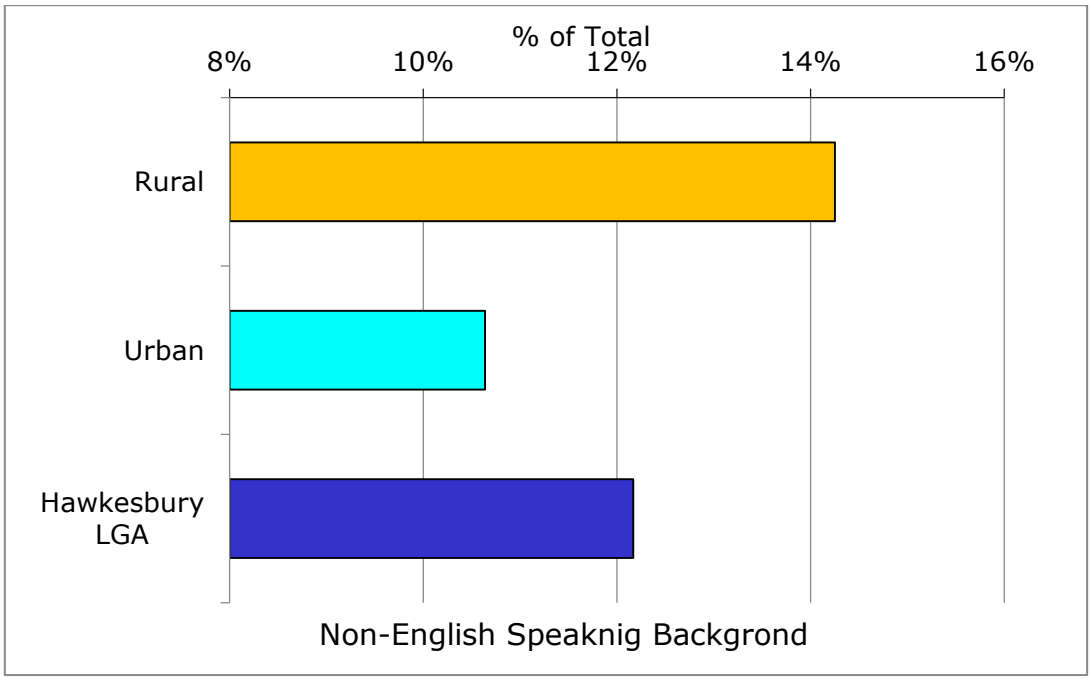


Figure 2.34: Non-English Speaking Background
Source: ABS Census of Population and Housing

There are slightly less pre-schoolers and infants / primary and but more secondary school students in the rural, than the urban and Hawkesbury LGA There are also less TAFE and the same proportion of university students in the rural areas and LGA, as can be seen in figure 2.35.

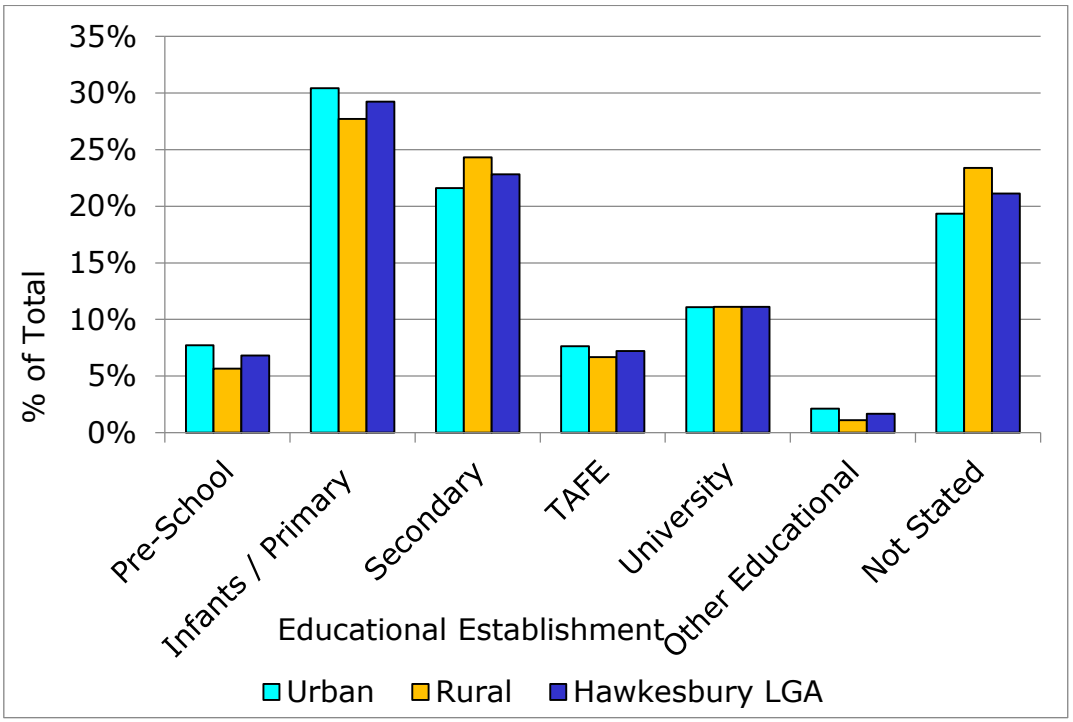


Figure 2.35: Educational Establishment Attending
Source: ABS Census of Population and Housing

There are slightly less people in the rural area who completed school after year 12, but slightly more in year 11 and slightly less in year 10 and more in years 9 and 8 than the urban area and LGA as can be seen in figure 2.36.

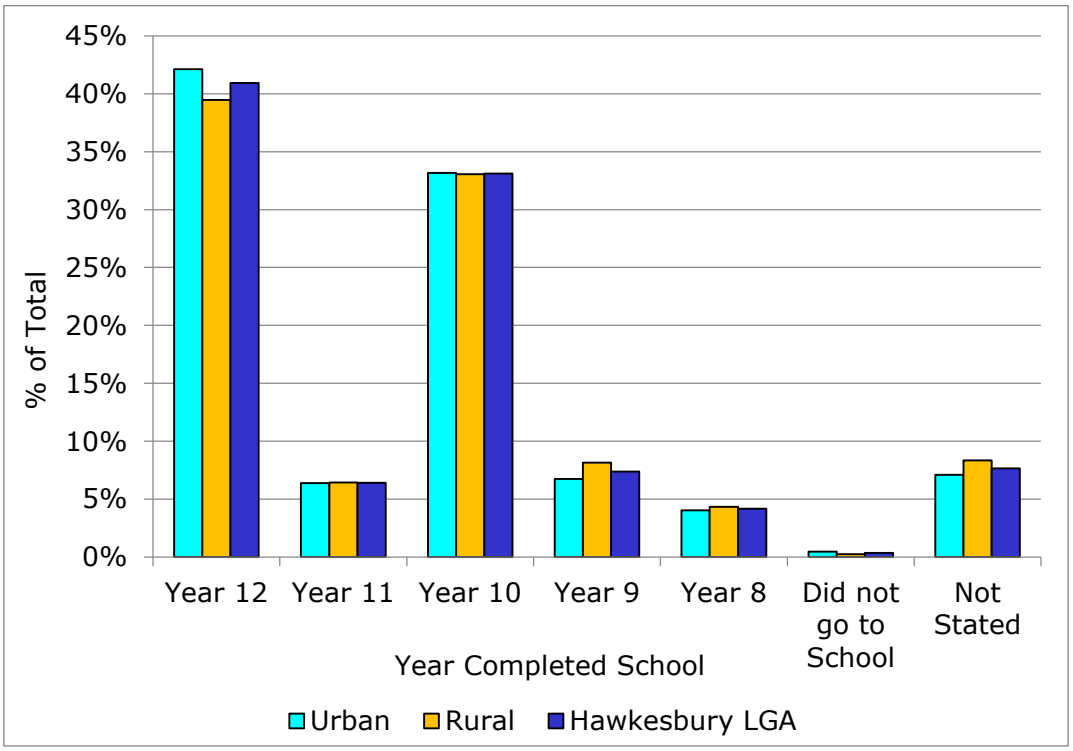


Figure 2.36: Year Completed School
Source: ABS Census of Population and Housing

Figure 2.37 shows that there are more people who volunteer in the rural areas.

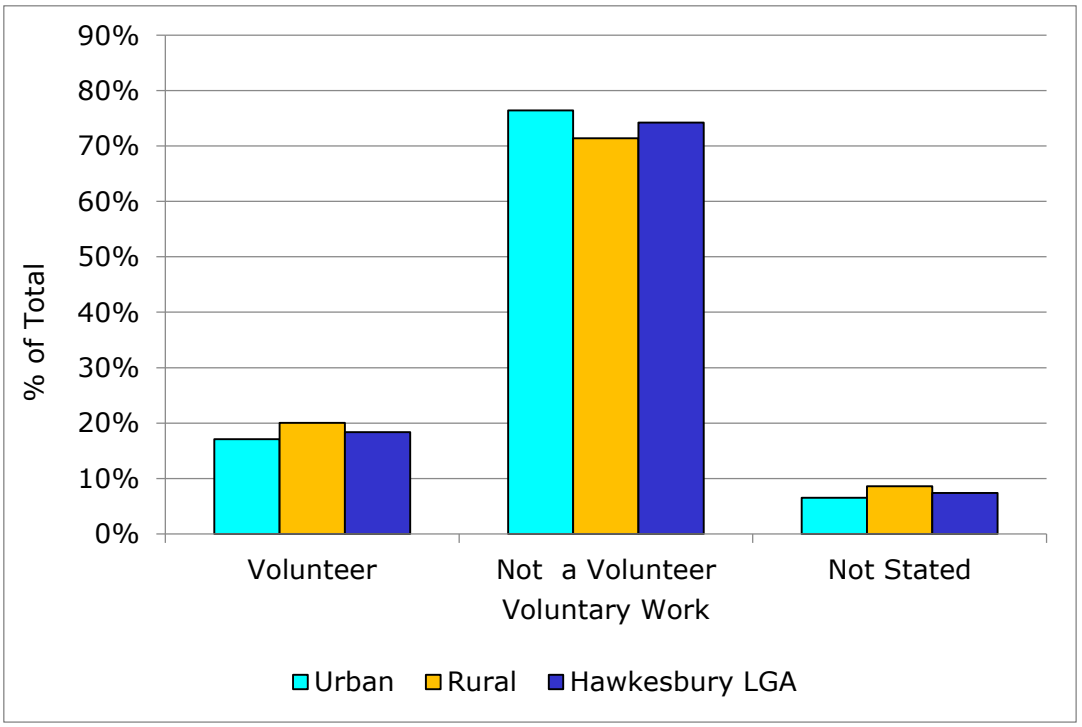


Figure 2.37: Voluntary Work
Source: ABS Census of Population and Housing

There are more two parent families with no children as well as more with children under 15 and no children under 15 (older children living at home) in the rural areas

but much less single parent families in the rural areas than the urban and Hawkesbury LGA as can be seen from figure 2.34.

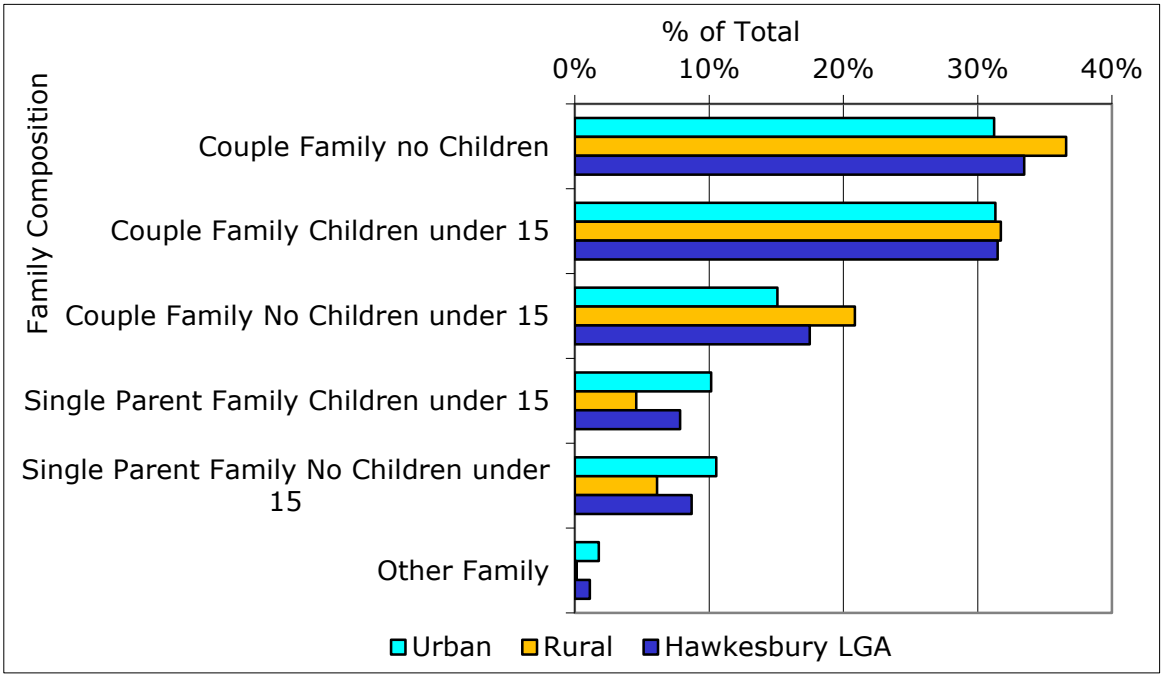


Figure 2.38: Family Composition
Source: ABS Census of Population and Housing

Figure 2.39 shows that there are less people earning less than $800 per week in the rural area and considerably more earning more than $1,000 per week than the urban areas and the LGA.

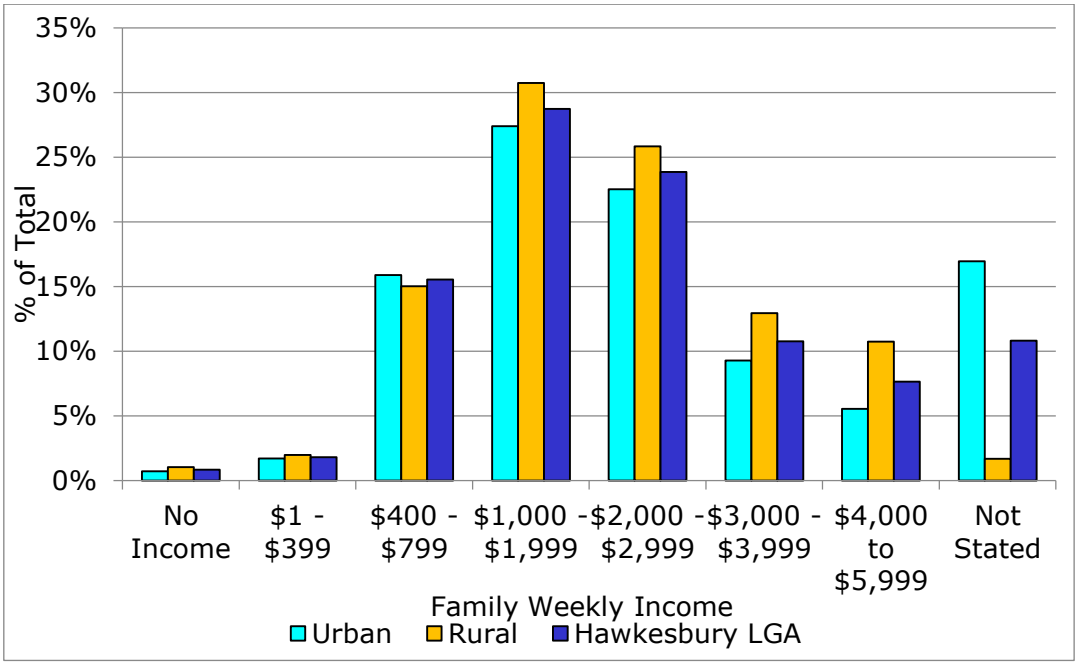


Figure 2.39: Family Income
Source: ABS Census of Population and Housing

There are more dwellings with one and two motor vehicles in the rural area than the Hawkesbury LGA and less dwellings with two, three and four motor vehicles as can be

seen in figure 2.40. The number of motor vehicles per dwelling is 1.11 in the rural areas, 0.8 in the urban areas and 0.93 in the LGA.

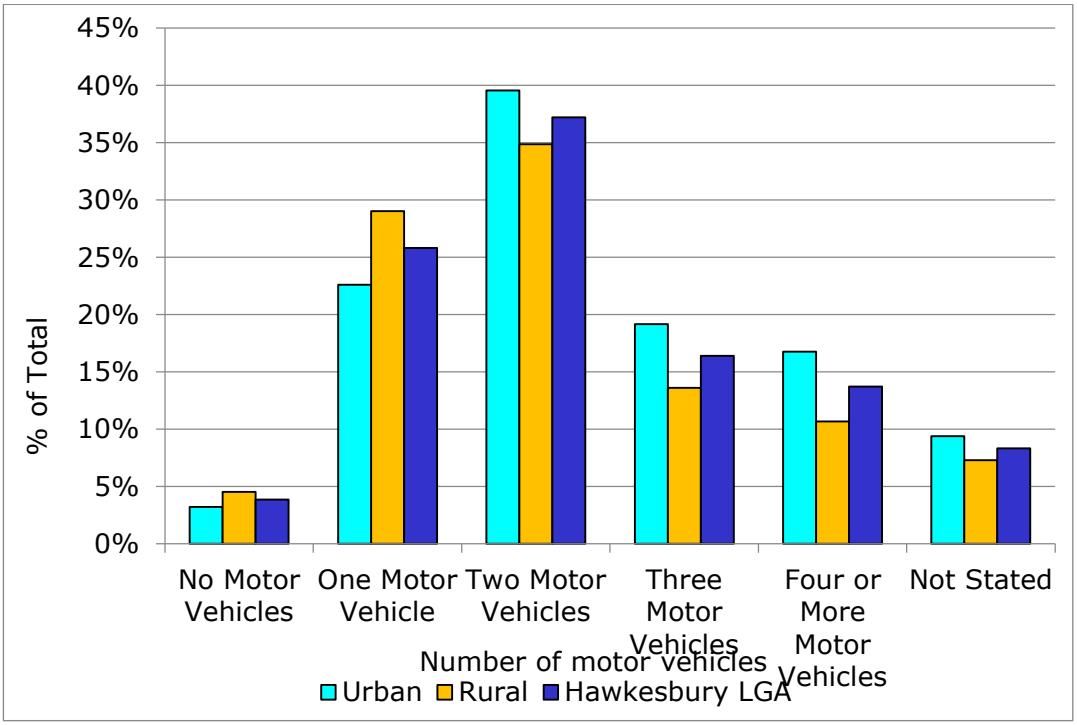


Figure 2.40: Number of Motor Vehicles
Source: ABS Census of Population and Housing

There are considerably less single person households in the rural area and more two, less three, and more four, five and six or more person households than the urban areas and Hawkesbury LGA, as can be seen from Figure 2.41.

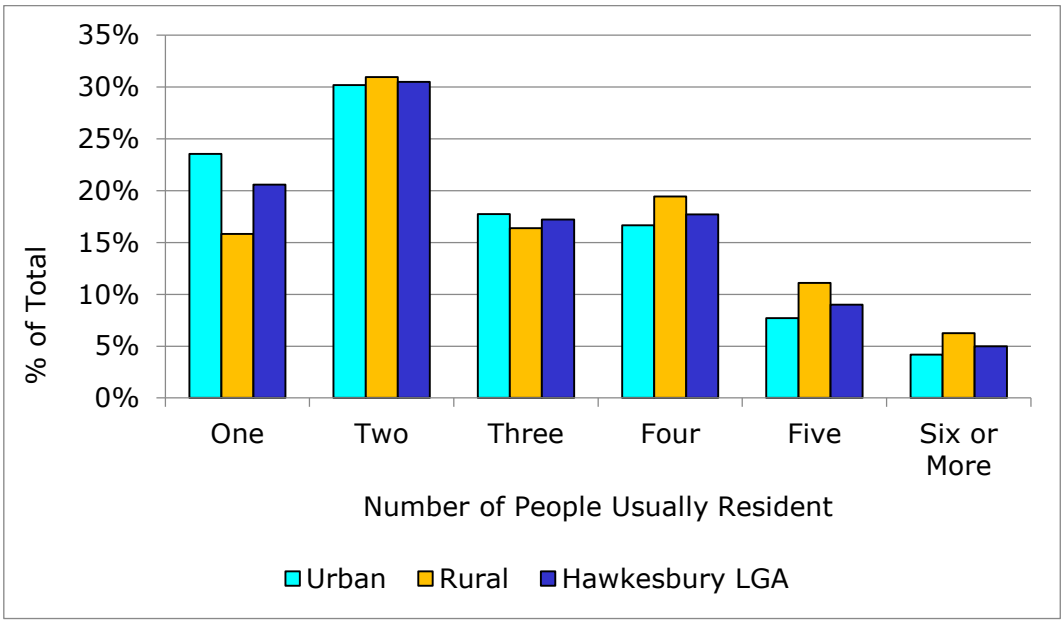


Figure 2.41: Number of People Usually Resident
Source: ABS Census of Population and Housing

Figure 2.42 shows that there are more separate houses and unoccupied dwellings in the rural area than the urban area.

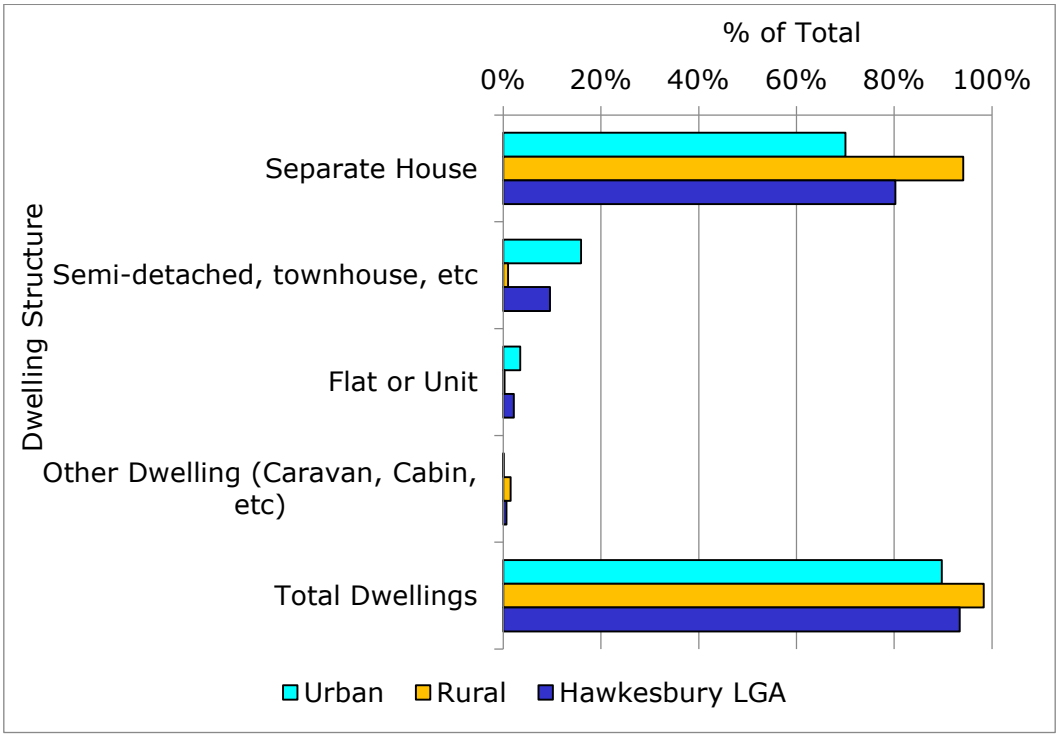


Figure 2.42: Dwelling Structure
Source: ABS Census of Population and Housing

There are less houses owned outright and with a holders in the rural area than the urban area and Hawkesbury LGA as can be seen in figure 2.43. It also shows that there are more rented houses in the rural area than the urban area and Hawkesbury LGA.

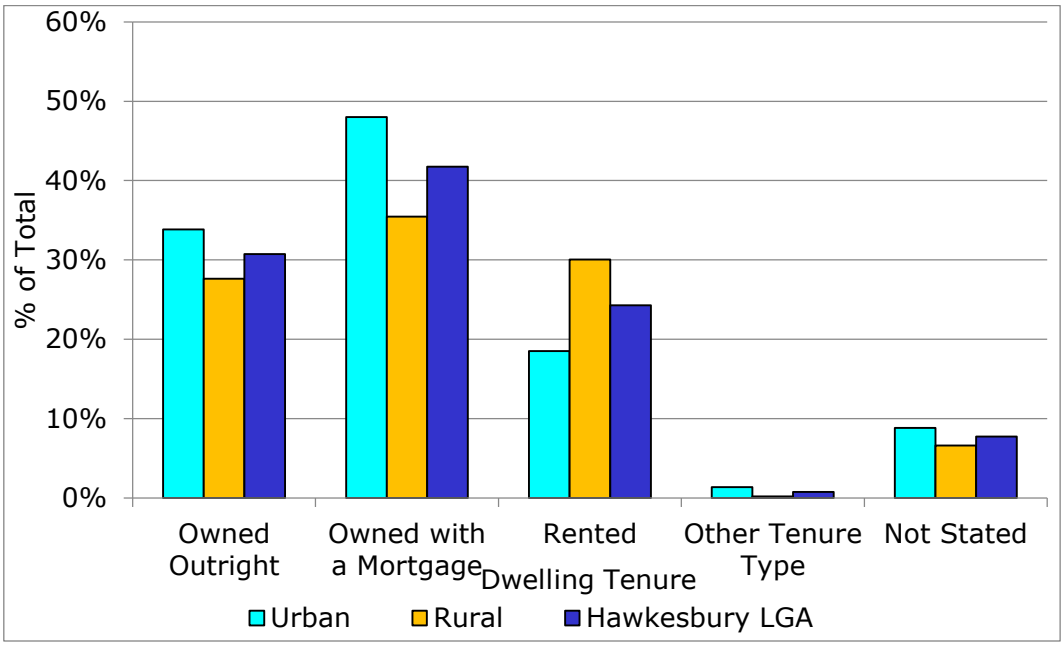


Figure 2.43: Dwelling Tenure
Source: ABS Census of Population and Housing

There are less dwellings with a mortgage repayment of less than $999 per month in the rural area and more people with a repayment of between $1,000 and $2,400 per week as can be seen in figure 2.44. It can also be seen that there are less slightly more with repayments of $2,400 to $2,999, and less dwellings in the rural areas with repayments of greater than $3,000 than the urban area of Hawkesbury LGA.

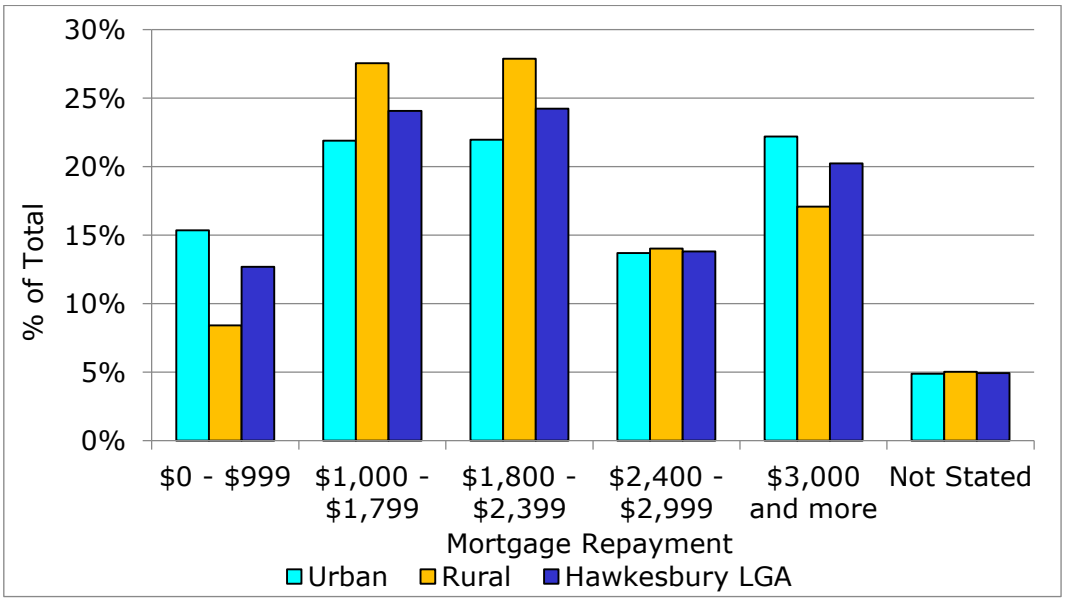


Figure 2.44: Mortgage Repayment
Source: ABS Census of Population and Housing

Figure 2.45 shows that there are more dwellings with a weekly rent in the rural areas of between $0 and $149 and slightly less with a rent of between $150 and $224 but more with a weekly rent of greater than $225 to $649 but less over $650 per week.

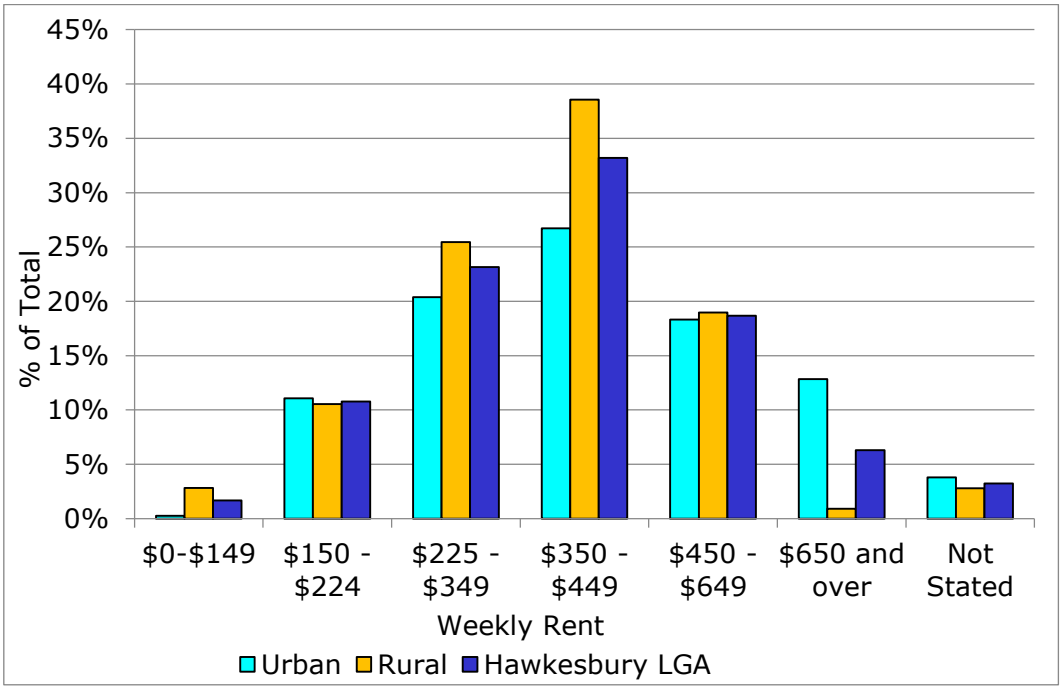


Figure 2.45: Weekly Rent
Source: ABS Census of Population and Housing

There are the slightly more one bedroom dwellings in the rural area but less two and three bedroom houses with more four, five and six bedroom dwellings as can be seen from figure 2.46.

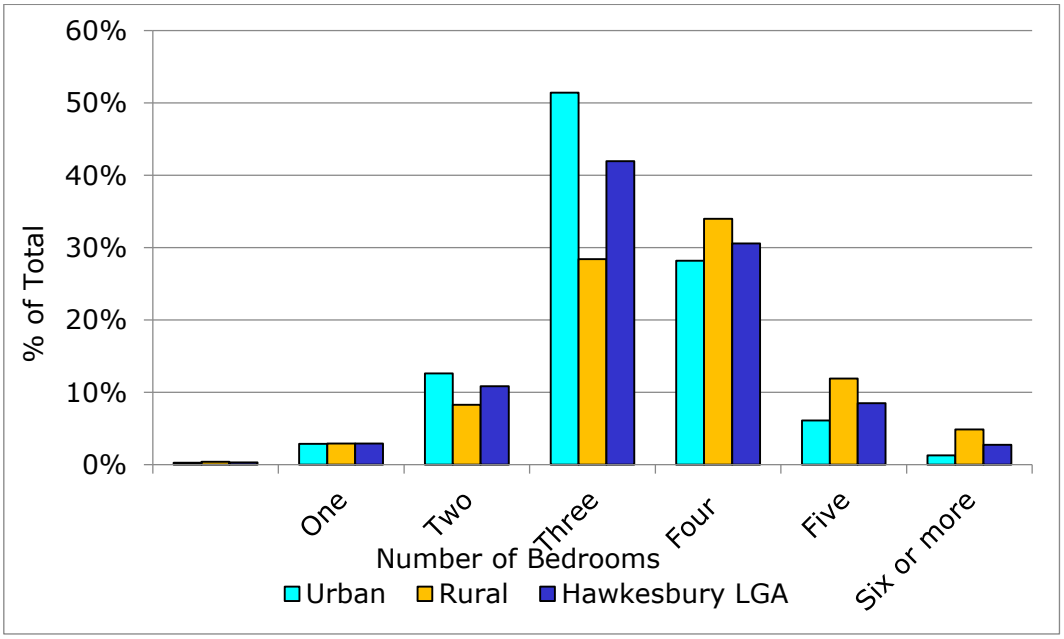


Figure 2.46: Number of Bedrooms
Source: ABS Census of Population and Housing

People in the rural area are less mobile than people in the urban area and the Hawkesbury LGA five or more years ago but slightly more mobile one year ago. This can be seen from figure 2.47 which shows that there are slightly more people who lived at a different address 1 year ago than five years ago in the rural area than the urban area and Hawkesbury LGA.

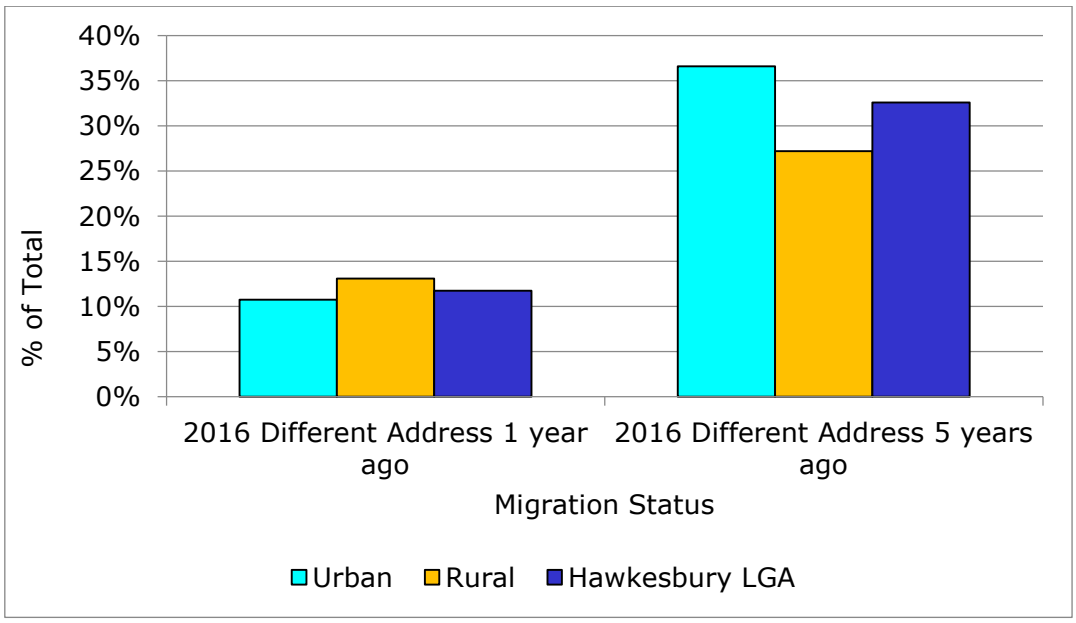


Figure 2.47: Migration Status
Source: ABS Census of Population and Housing

There are slightly less people with professional qualifications in the rural area than the urban area and Hawkesbury LGA as can be seen from figure 2.48, which shows that there are less people with a Bachelor, Graduate Diploma / Graduate Certificate and Post Graduate degree. There are also less with a certificate qualification in the urban area.

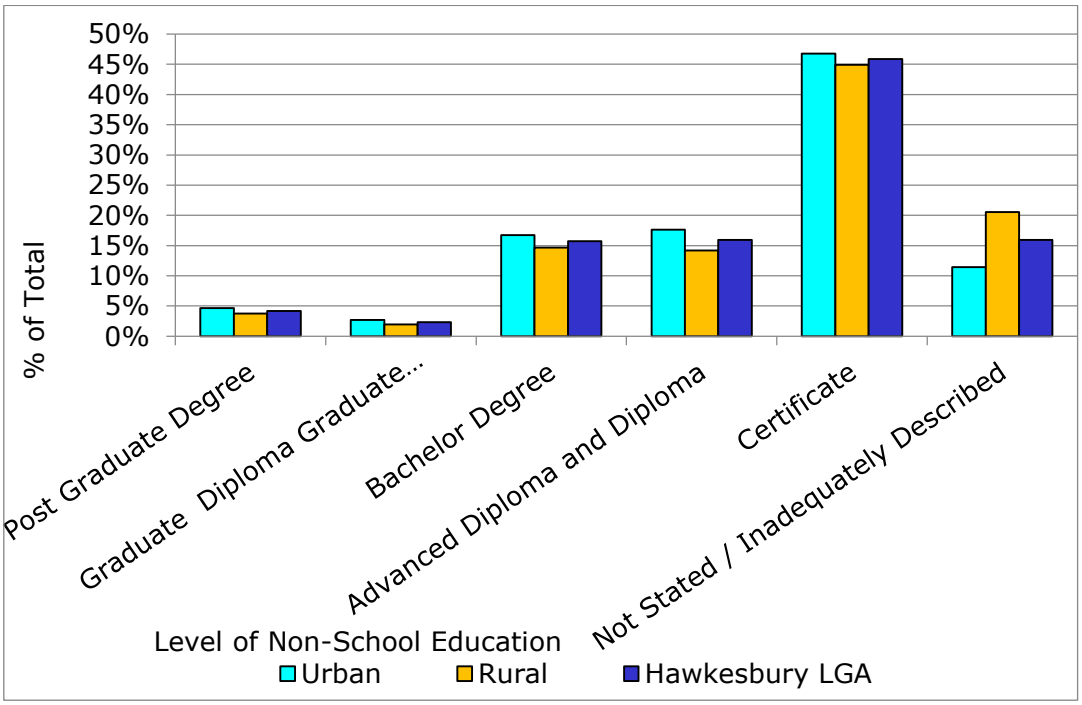


Figure 2.48: Level of Non-School Education
Source: ABS Census of Population and Housing

There are slightly less people employed full time and slightly more part time workers and employed and away from work in the rural area than the urban area and Hawkesbury LGA, as can be seen from figure 2.49. It can also be seen that there are less people unemployed and looking for work.

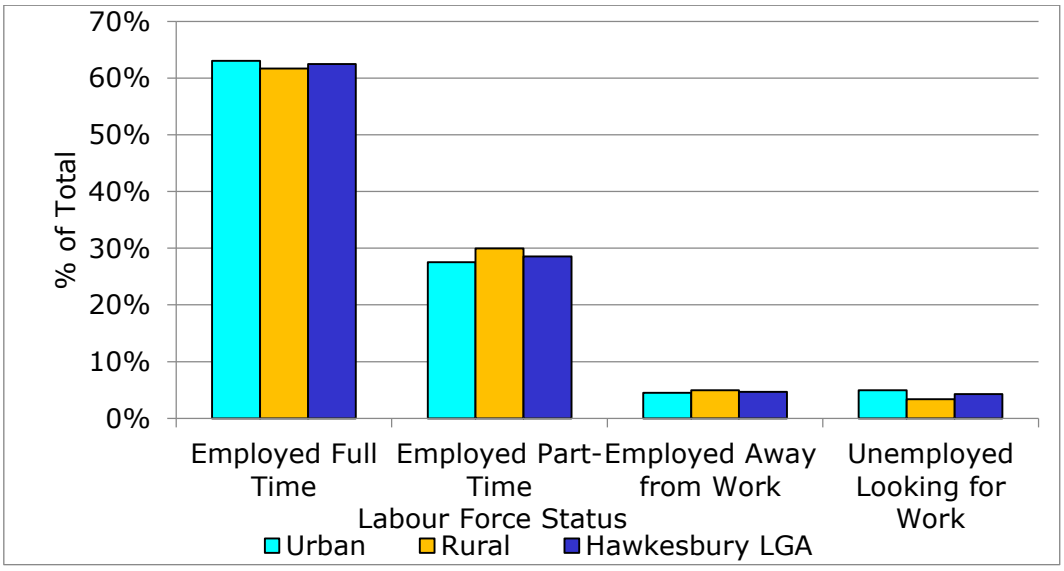


Figure 2.49: Labour Force Status

Source: ABS Census of Population and Housing

Figure 2.50 shows that the workforce participation rate is slightly lower in the rural area than the urban area.

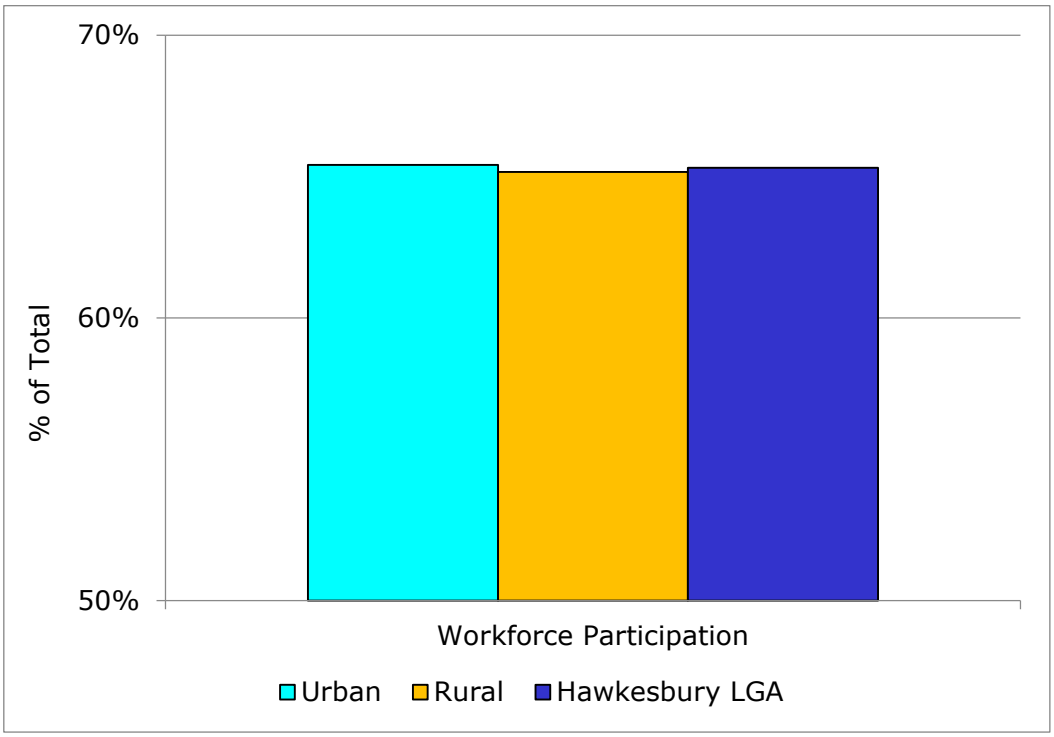


Figure 2.50: Workforce Participation
Source: ABS Census of Population and Housing

The industry sector of the rural workforce is shown in figure 2.51 It is significant to note that the number one industry sector is construction followed by retail trade then education and training; health care and social assistance; manufacturing; public administration and safety; professional, scientific and technical services; other services; accommodation and food services; agriculture, forestry and fishing; transport, postal and warehousing; wholesale trade; administrative and support services; financial and insurance services arts and recreation services; rental hiring and real estate services information , media and telecommunications; electricity, gas, water and waste services; and mining. It is significant to note that agriculture is number ten when it would be expected to be number one in a rural area and also that it is only 4.7% when it would be expected to be much higher.

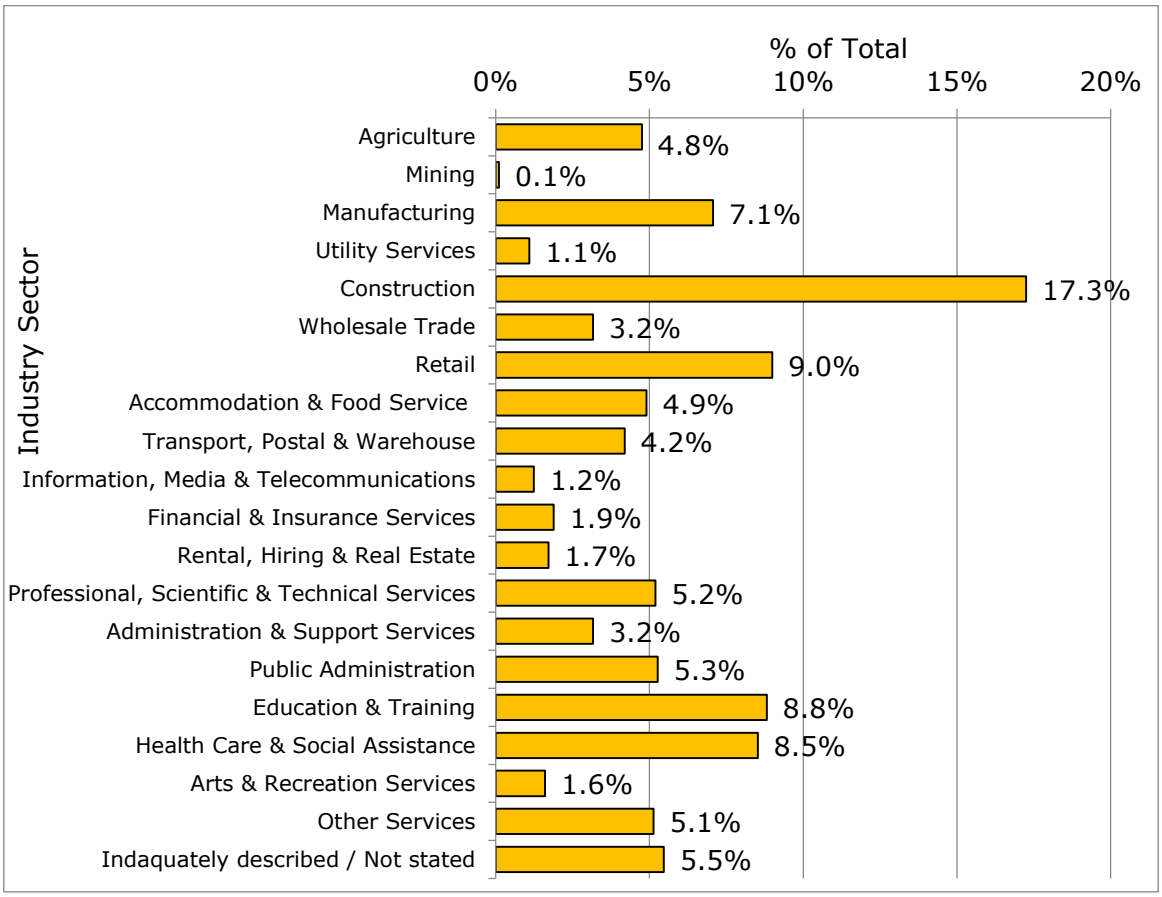


Figure 2.51: Industry Sector of Rural Workforce
Source: ABS Census of Population and Housing

The industry sector of the workforce for the rural, urban and Hawkesbury LGA are shown in figure 2.52. This shows that comparatively, the rural area has more people employed in agriculture (which would be expected) and also more in construction; professional, scientific and technical services; administrative and support services; education and training and other services.

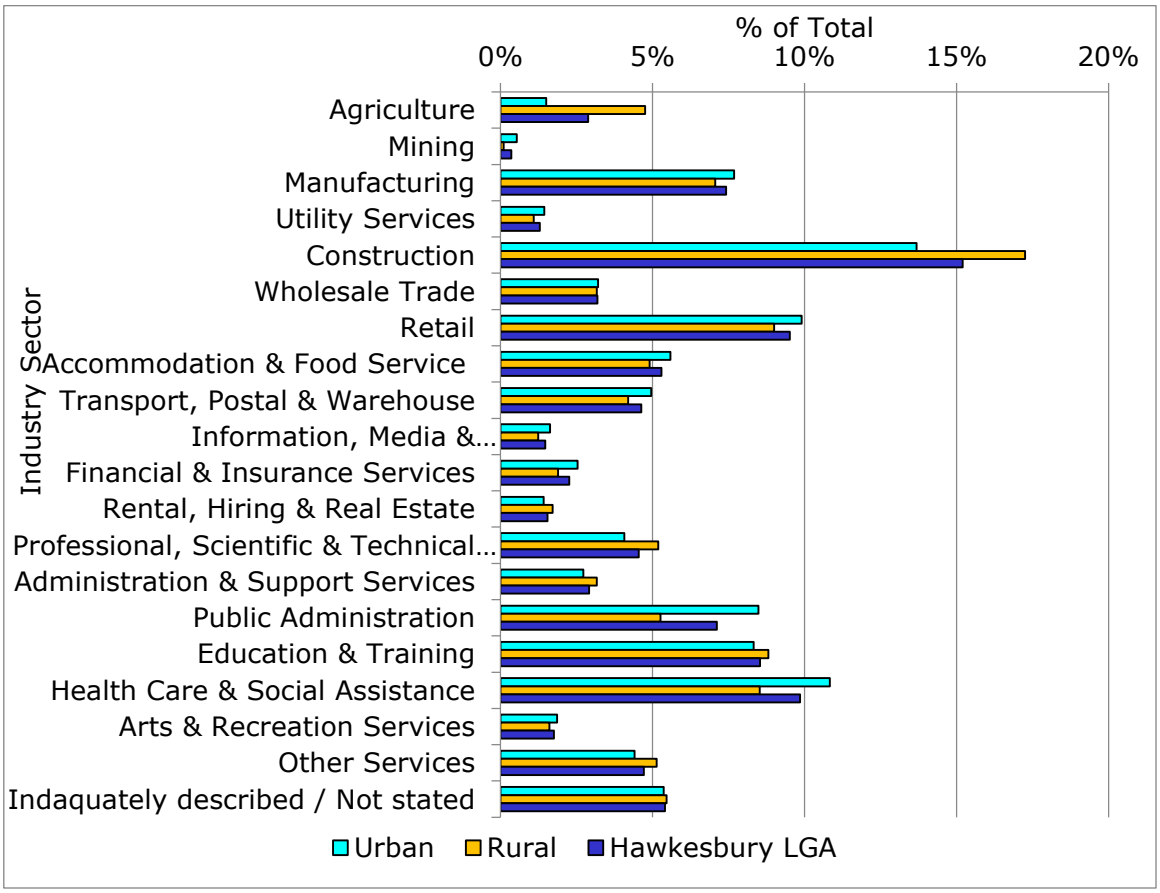
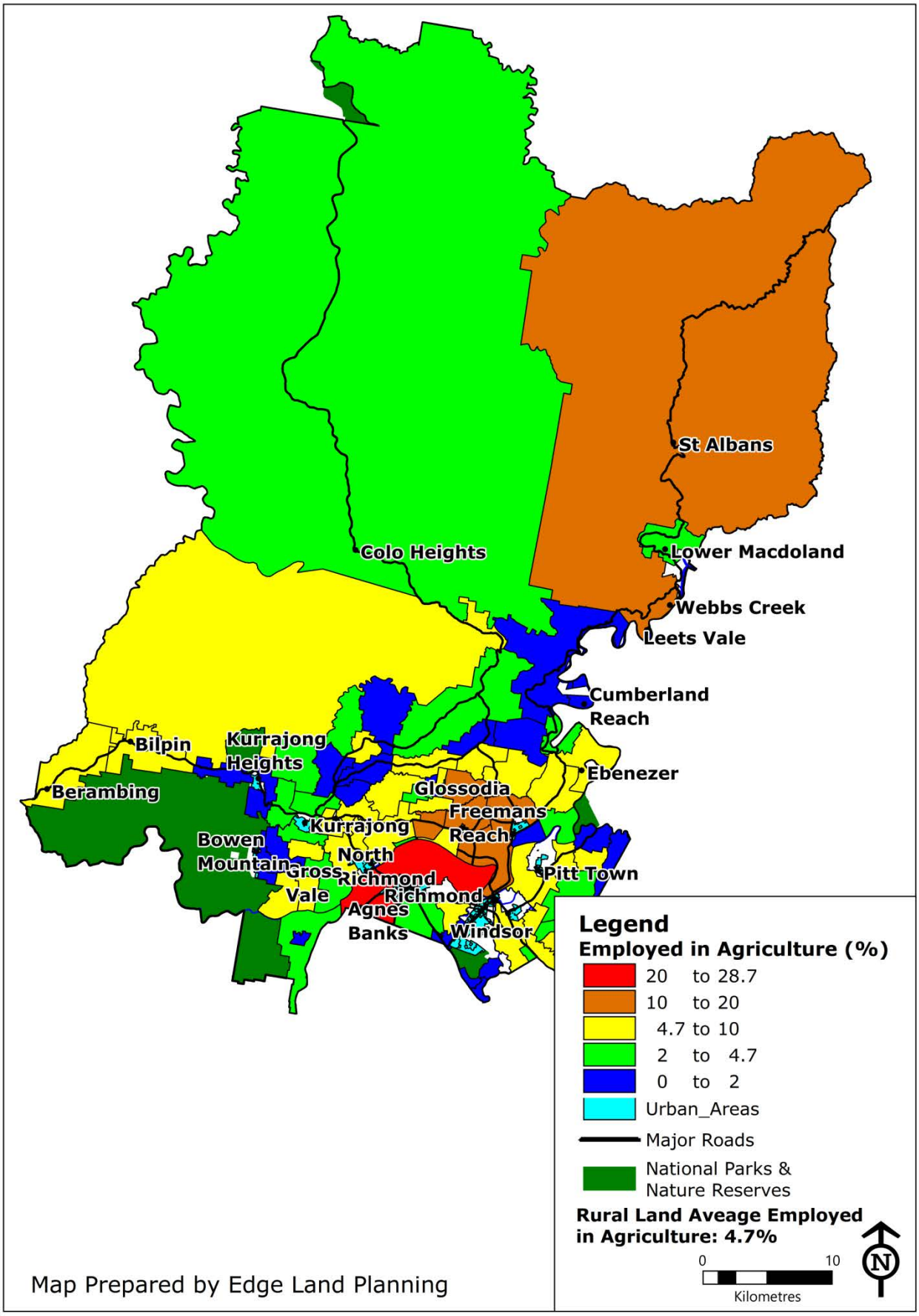
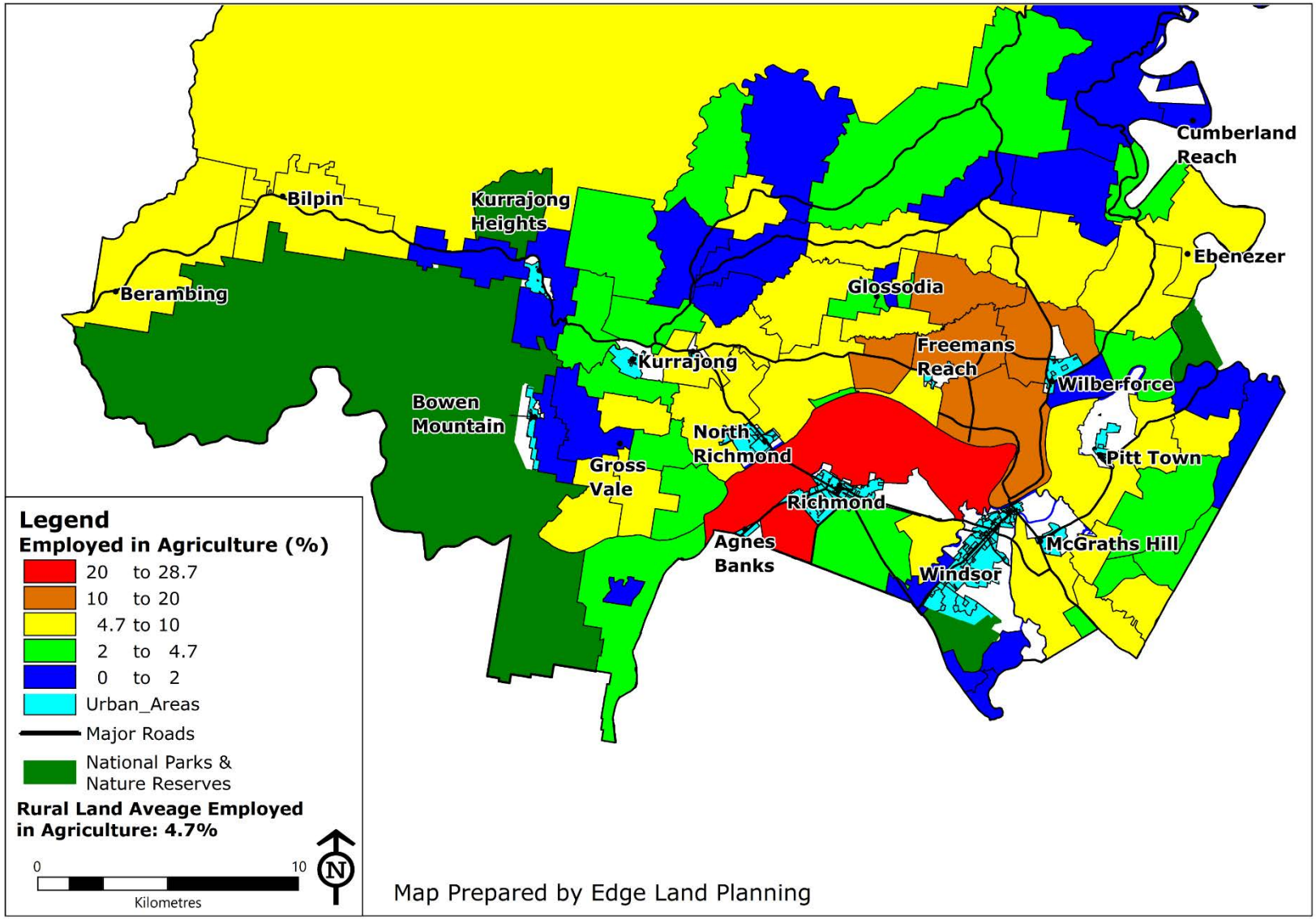


Figure 2.52: Industry Sector of Workforce
Source: ABS Census of Population and Housing

Maps 2.12 and 2.13 shows the spatial distribution of the people employed in agriculture. The average of the rural land is 4.7% employed in agriculture. However, this data needs to be used with caution as it is possible that a number of people living in these areas of high agricultural employment are retired and operating the farm on a part-time basis. It is noted that the question asks what employment did was the person in on the week before of the Census night.



Map 2.12: Employed in Agriculture LGA



Map 2.13: Employed in Agriculture South

The employment data provided above is the aggregated data for the main industry of employment sectors for the LGA, which is known as the two-digit data. The ABS also provide the detailed breakdown of this for each of the industry sectors and this is known as the four-digit data. The Agriculture, Forestry and Fishing data shows that agriculture makes up 91.1% of the total employment in this industry sector followed by agriculture support services with 8.5%, forestry support services (1.6%), forestry (1.2%) and fishing (0.3%) as well as hunting and trapping (0.3%). The detailed breakdown of the agriculture employment can be seen from figure 2.53, where it can be seen that the most people are employed in vegetables, followed by turf, mushrooms, nurseries, general agriculture, poultry eggs, agriculture support, cattle grazing, horses, general poultry, fruit and poultry meat.

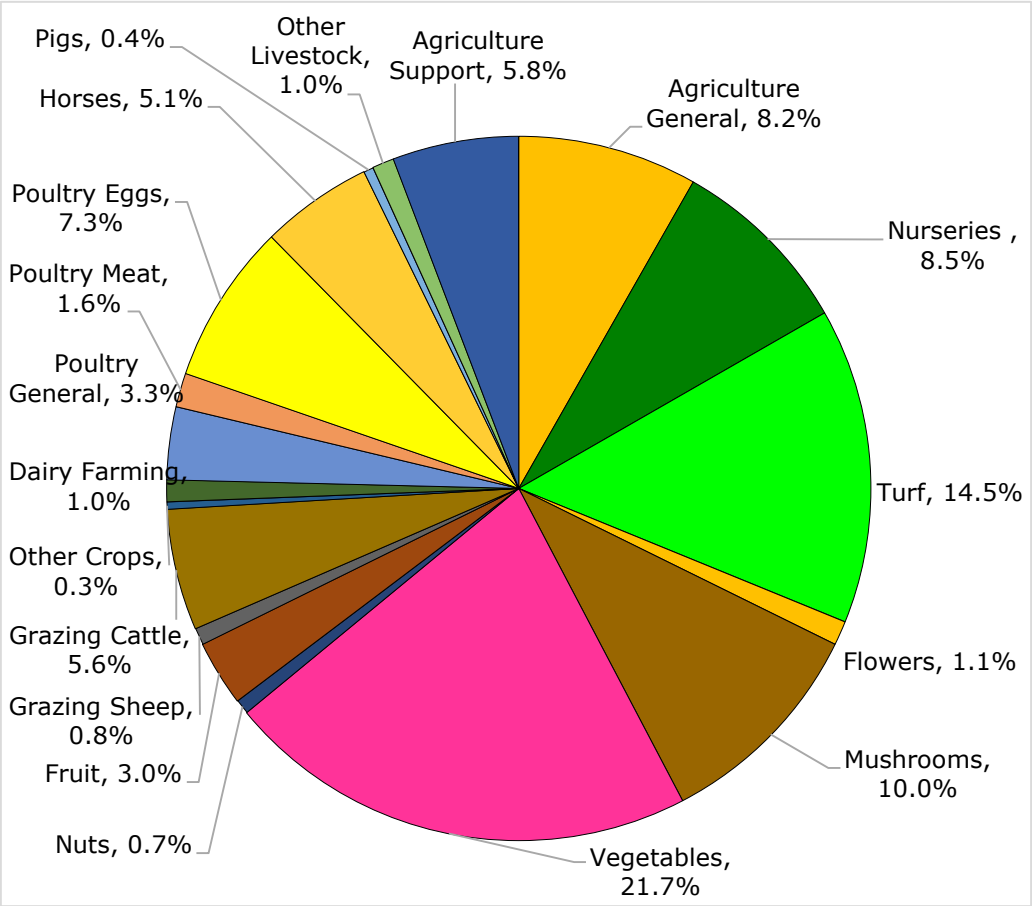


Figure 2.53: Agriculture Workforce Detail
Source: (ABS, 2020c)

The other sectors which have components associated with agriculture are manufacturing and food and agriculture-based manufacturing employment makes up 16.2% and 13.6% of the wholesale employment.

The ABS produce data on the working population of the LGA as well as the resident population. The data presented in this section is the resident population. When the working population is subtracted from the resident population it shows the industry sectors which import workers and those which export workers from the LGA. This is

shown in figure 2.54. it can be seen that only the agriculture sector (215 workers) and the Accommodation & Food Services sector (123 workers) are the only sectors which import workers and the construction sector is the sector that exports the most workers. When this data is read in conjunction with figure 2.52 which showed the industry sectors of the urban, rural and LGA resident workers, it shows that the highest percentage of jobs in the rural area is the construction sector. This also quantifies the large number of rural residential truck uses observed during the land use survey.

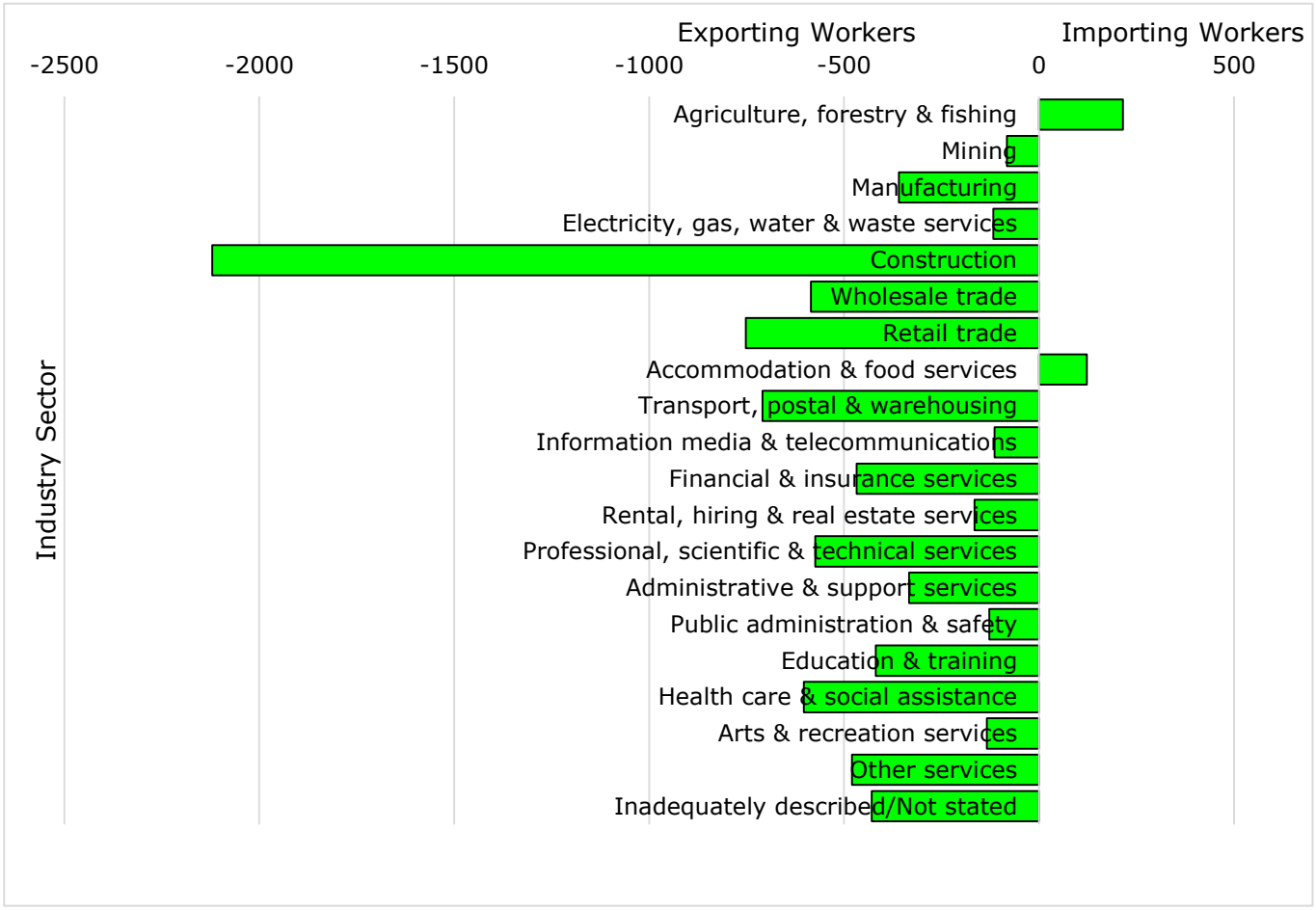


Figure 2.54: Location of Industry Sector of Workforce
Source: ABS Census of Population and Housing

There are more managers, but slightly less professionals and slightly more technicians and trades people in the rural areas and less community and personal services, clerical and administration, sales, machinery operators, and labourers occupations in the urban areas as can be seen from figure 2.55.

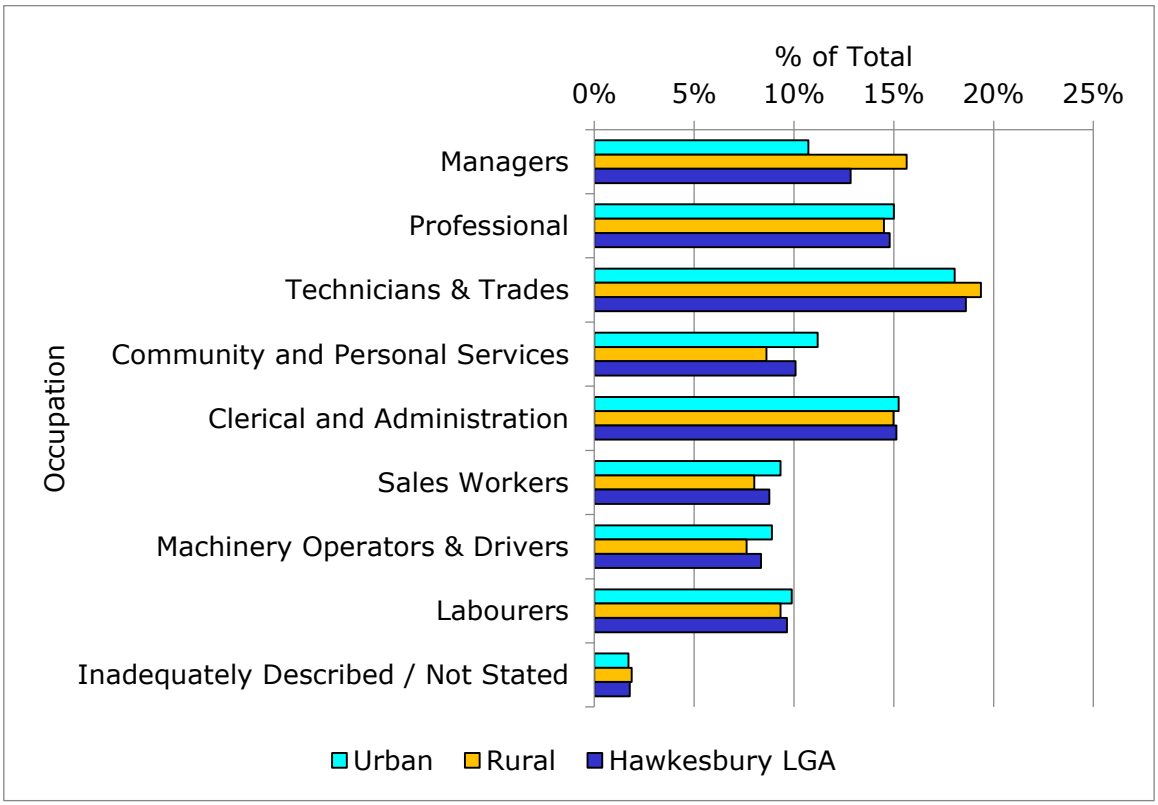


Figure 2.55: Occupation of Workforce
Source: ABS Census of Population and Housing

The majority of people drove to work as a driver in the rural and urban areas as can be seen from figure 2.56, which shows that the proportions are basically the same. There are some differences in some of the modes with more people living in the rural area using trains, trucks and other forms of transport than the urban area and the Hawkesbury LGA.

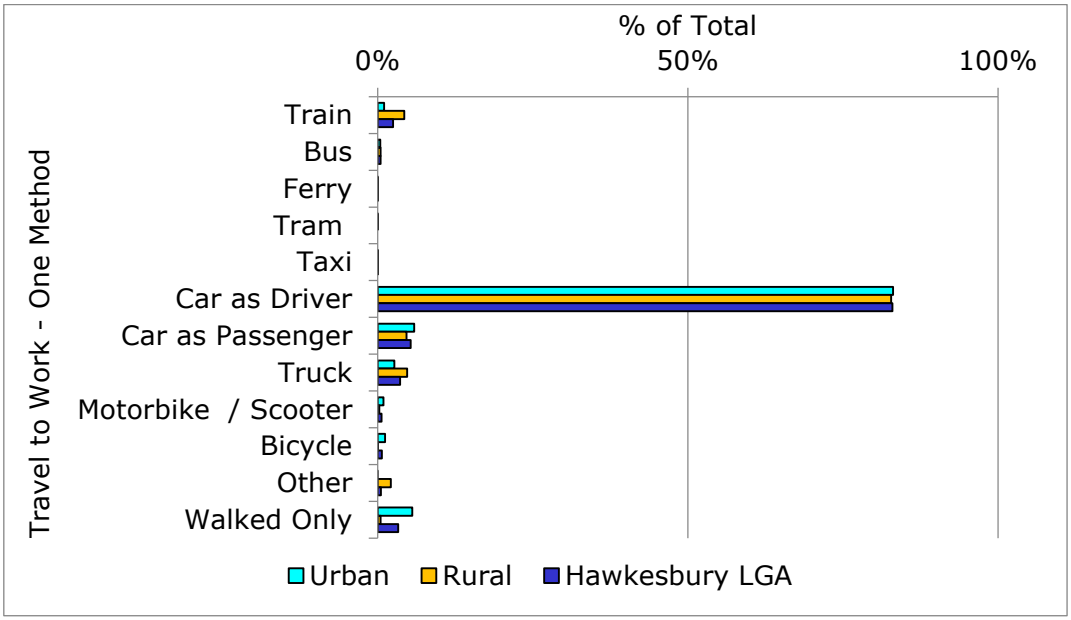


Figure 2.56: Method of traveling to work
Source: ABS Census of Population and Housing

Two and one half times more people in the rural areas worked at home than the urban areas and nearly twice as much as the Hawkesbury LGA as can be seen from figure 2.57

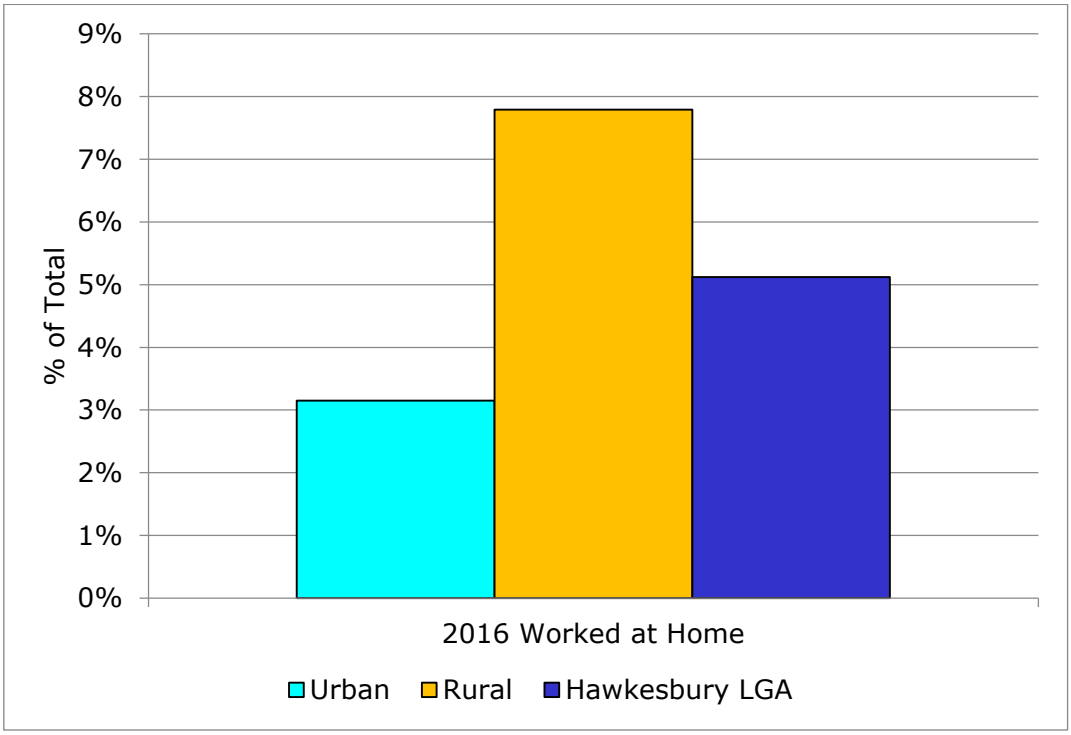


Figure 2.57: Worked at home
Source: ABS Census of Population and Housing

2.11 Summary of Key Messages

- Rural residential makes up 86.1% of the total rural land use and irrigated plants is the second most common with 4.5% of the land use.
- Rural residential land use is the dominant use in all parts of the LGA with the irrigated plants uses clustered around the Hawkesbury River Flats as well as some intensive animals in this area. The River Flats are also the lowest proportion of rural residential land use.
- Market gardening of vegetables make up 46.2% of the irrigated plants followed by turf farms with 32.2% and then protected cropping makes up 7.6%
- The rural residential land use is comprised of mostly just a dwelling (83%), however there are also horses (9.2%), trucks (6.5%), home businesses (1%) and Bed and Breakfasts (0.3%).
- Rural residential takes up 65.4% of the area of all private land use which demonstrates that it is on large lots of greater than 10 ha as well as lots less than that.
- In 2003, rural residential land use was 83.1% of the total land use. The actual growth was 6.6% over the period from 2003 to 2016 and this represents 0.4% per annum. This kept pace with the LGA population growth which was 0.5% per annum.
- The size of rural holdings analysis shows that 62.3% of all land ownership is on holdings of less than 3 ha and 81.1% is holdings of less than 8 ha. Most of the

small lots less than 3 ha are in the South East part of the LGA and the larger holdings are in the northern parts of the LGA.

- Agricultural production in the LGA is valued at $158.6 million. The major components of this are from vegetables ($63.7m) turf ($48.5 m), poultry meat ($19.1 m) and eggs ($18.7 m).
- Hawkesbury is the number one turf producing LGA in Australia, number one perishable vegetable producer in Sydney and NSW as well as number 13 in Australia. It is the number two egg producer in Sydney, number four in NSW and number eight in Australia.
- The Sydney Peri-Urban area (which is the Sydney region and the Central Coast) has a value of production of $806.4 m which is 6.2% of NSW total value of production. The Sydney Peri-Urban area is the number one producer of perishable vegetables and number four for total vegetables. It is the number one poultry producer and number one egg production area. It is also the number one producer of nurseries, flowers and turf.
- The average age of farmers in Hawkesbury LGA is 54 which is younger than the age of farmers in Sydney, NSW and Australia. In the Hawkesbury, 71.8% of all farmers are younger than 55 which is more than the Sydney Peri-Urban area, NSW and Australia.
- Analysis has been carried to show the demographic make-up of the rural lands. This showed that is the urban-rural population split was 57.6% urban and 42.4 % live in the rural land. There are more people in the rural lands in the secondary school age (12-17) and more parents and homebuilders (35-39), older workers and pre-retirees (50-69) and seniors (70-84).
- There are considerably more couples with children over 15 and couples with no children at home in the rural areas and slightly more couples with children under 15 in the rural areas than the urban and LGA.
- The weekly family income is higher in the rural area for all families earning more than $1,000 per week and higher with considerably more in the $4,000 per week and higher. There are less people who own their house outright and also who own with a mortgage and more people who rent in the rural area.
- There are more people who lived at a different address one year ago but less who lived at a different address five years ago.
- The number one sector of employment is construction, followed by retail, education and training, health care and social assistance, manufacturing, public administration, professional scientific and technical services, other services, accommodation and food services with agriculture coming in at number ten. This verifies the high number of rural residential uses in the rural landscape.
- There are more managers and technician and trade occupations in the rural areas and also slightly less people with degrees and certificates in the rural areas. There are 4.1 % of the rural workforce who work from home compared to 1.6% in the urban area

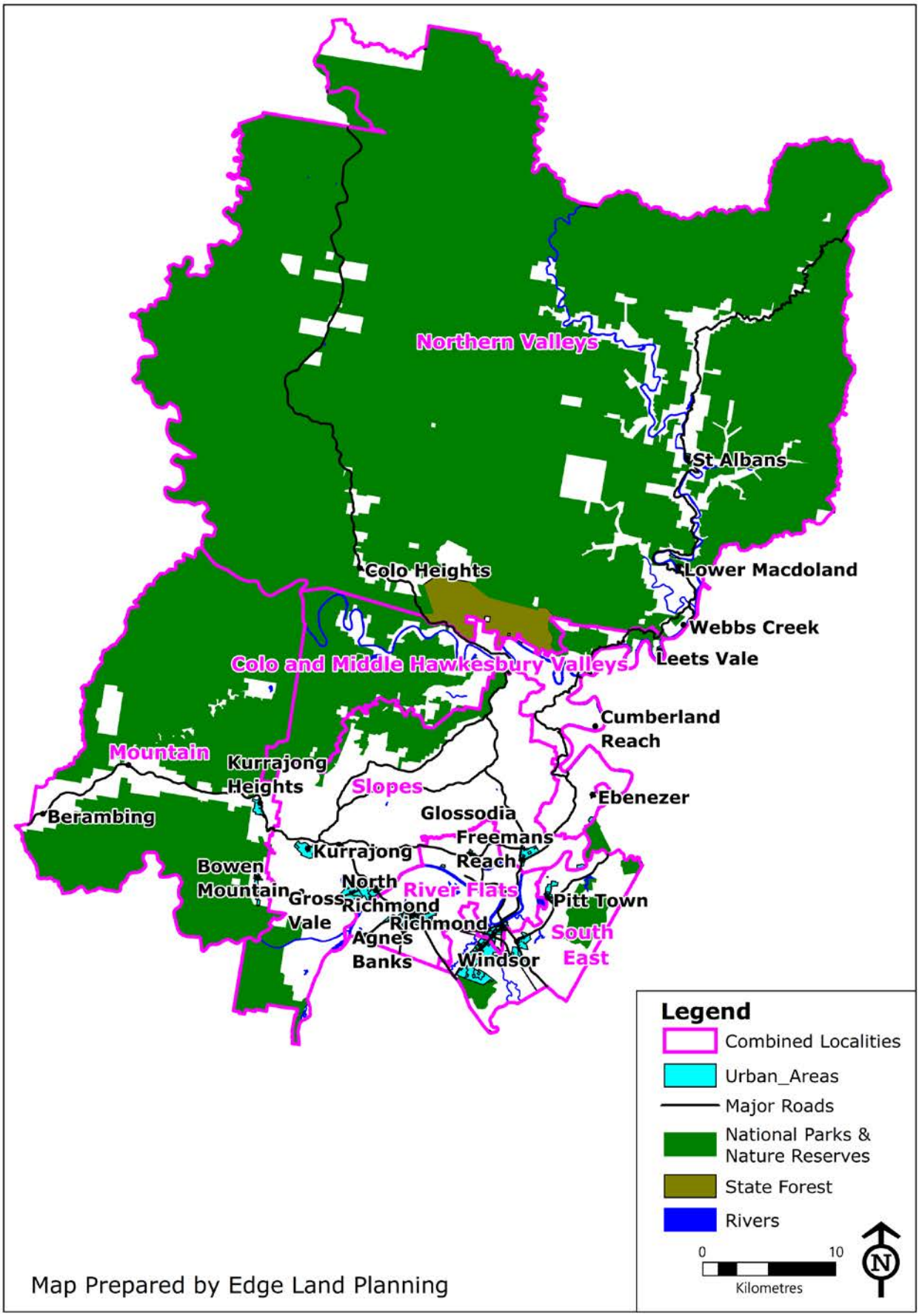
Chapter 3: Existing Development Pattern

This Chapter presents selected data and characteristics of the combined localities of the LGA as well as individual maps of the localities. To make the understanding of the data more manageable, the localities have been combined into areas of similar topographic features and land use. Table 3.1 shows the combined localities, which are identified on Map 3.11.

Table 3.1: Combined Localities

Combined Name	Localities Included
1. Northern Valleys	Central Macdonald, Colo Heights, Fernances, Higher Macdonald, Lower Macdonald, Lower Portland, Mellong, Mogo Creek, Perrys Crossing, Putty, St Albans, Upper Macdonald, Webbs Creek, Wisemans Ferry, Wrights Creek
2. Colo and Middle Hawkesbury Valleys	Central Colo, Colo, Cumberland Reach, Ebenezer, Leets Vale, Lower Portland, Sackville, Upper Colo, Wheeny Creek
3. Mountain	Berambing, Bilpin, Bowen Mountain, Kurrajong Heights, Mountain Lagoon
4. Slopes	Blaxlands Ridge, East Kurrajong, Glossodia, Grose Vale, Grose Wold, Kurmond, Kurrajong, Kurrajong Hills, North Richmond, Tennyson, The Slopes, Wilberforce, Yarramundi
5. River Flats	Agnes Banks, Cornwallis, Freemans Reach, Pitt Town Bottoms, Richmond, Richmond Lowlands, Wilberforce, Windsor
6. South East	Cattai, Clarendon, Maraylya, McGraths Hill, Mulgrave, Oakville, Pitt Town, Scheyville, South Windsor, Vineyard, Windsor Downs

Map 4.1 Shows the combined localities, as well as the primary localities which make up the combined ones.



Map 3.1: Combined Localities

The following describes the data presented in the next pages.

1. Details presented for each locality below include the following:

    - Total number of rural land uses
    - Number of agricultural uses
    - Number of rural residential uses
    - Land use by holding size graphs
    - General comments

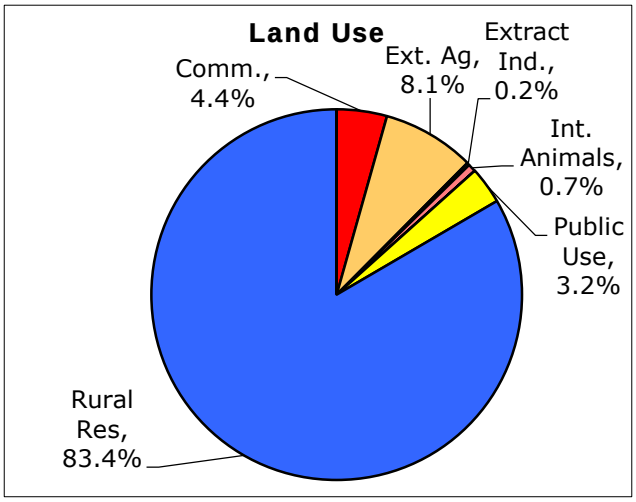
2. The number of rural uses does not include the land within the villages, and includes extensive agriculture, native vegetation, intensive plants and intensive animals.
3. The land use details come from the land use survey carried out as part of this study and the lot size graph data is based on Council's property system (Esri Arc GIS Platform).
4. The number of primary uses in each locality are provided.
5. Land use and holding size graphs are provided to give an indication of the land uses in each locality as well as the holding size range.

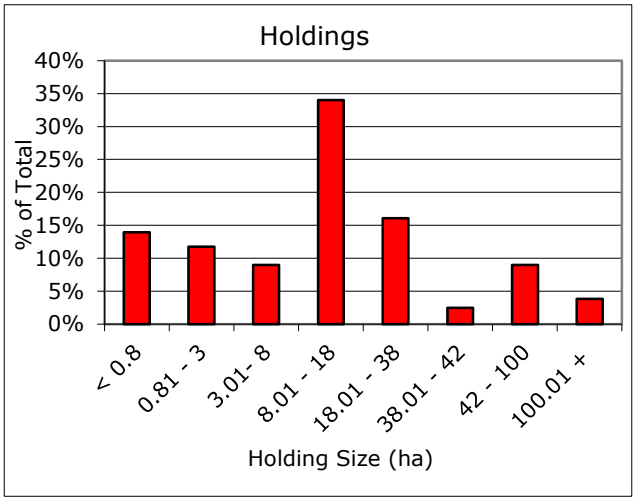
3.1. Northern Valleys

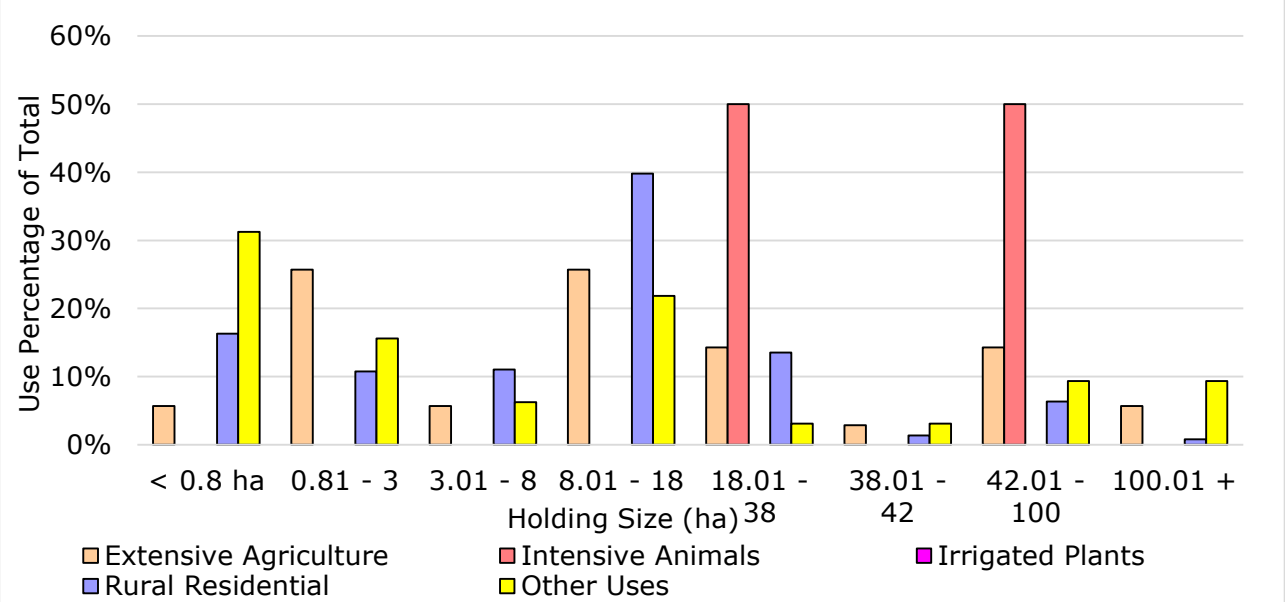
General Characteristics

Total Number of Rural Uses	434
Number of Agricultural Uses	38
Number of Rural Residential Uses	362

Land Use and Holding Size

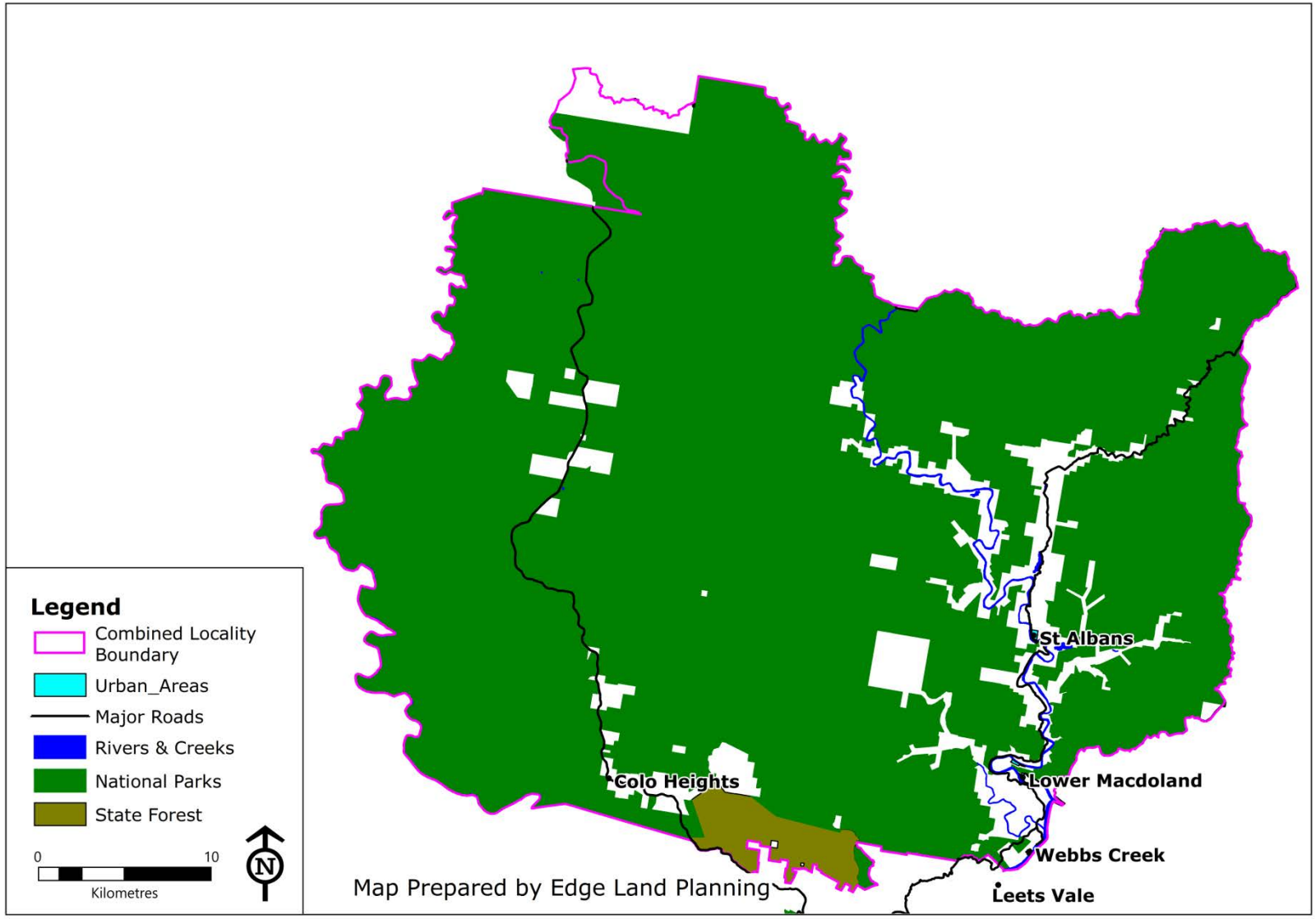






General Comments

- Floodprone land adjacent to rivers and extensive areas of bushfire prone land.
- High proportion of rural residential, agriculture is mostly extensive agriculture. Intensive animals are predominantly horse studs
- Commercial uses are mostly tourist based accommodation and caravan parks associated with water skiing.
- High proportion of holdings in 8-18Ha range, and low in less than 0.8ha, and above 40Ha.
- High proportion of rural residential in 8-18ha range, intensive animals are horse studs on holdings greater than 18 ha.



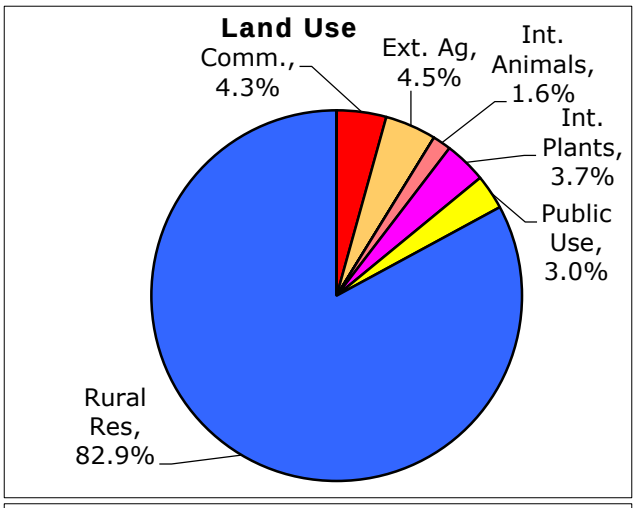
Map 3.2: Northern Valleys

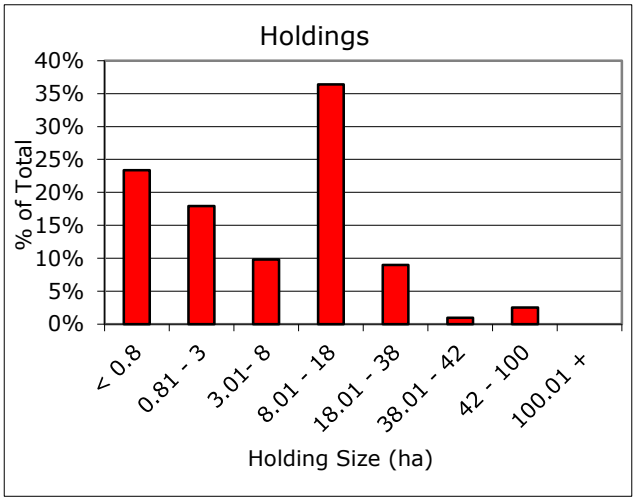
3.2. Colo and Middle Hawkesbury Valleys

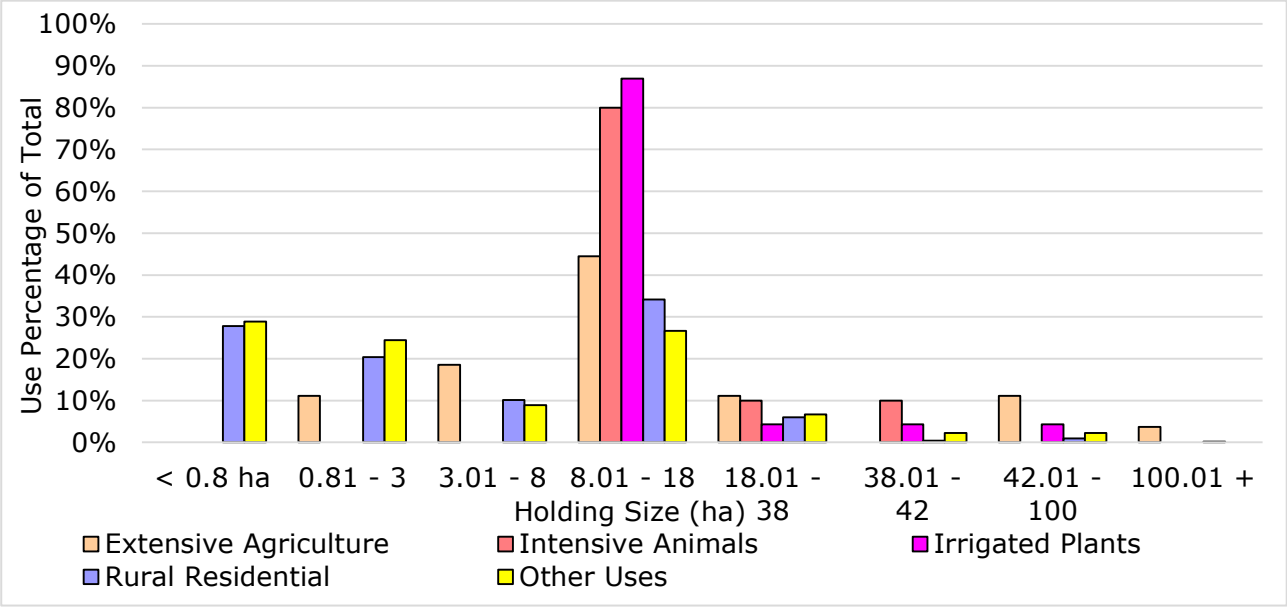
General Characteristics

Total Number of Rural Uses	626
Number of Agricultural Uses	61
Number of Rural Residential Uses	519

Land Use and Holding Size

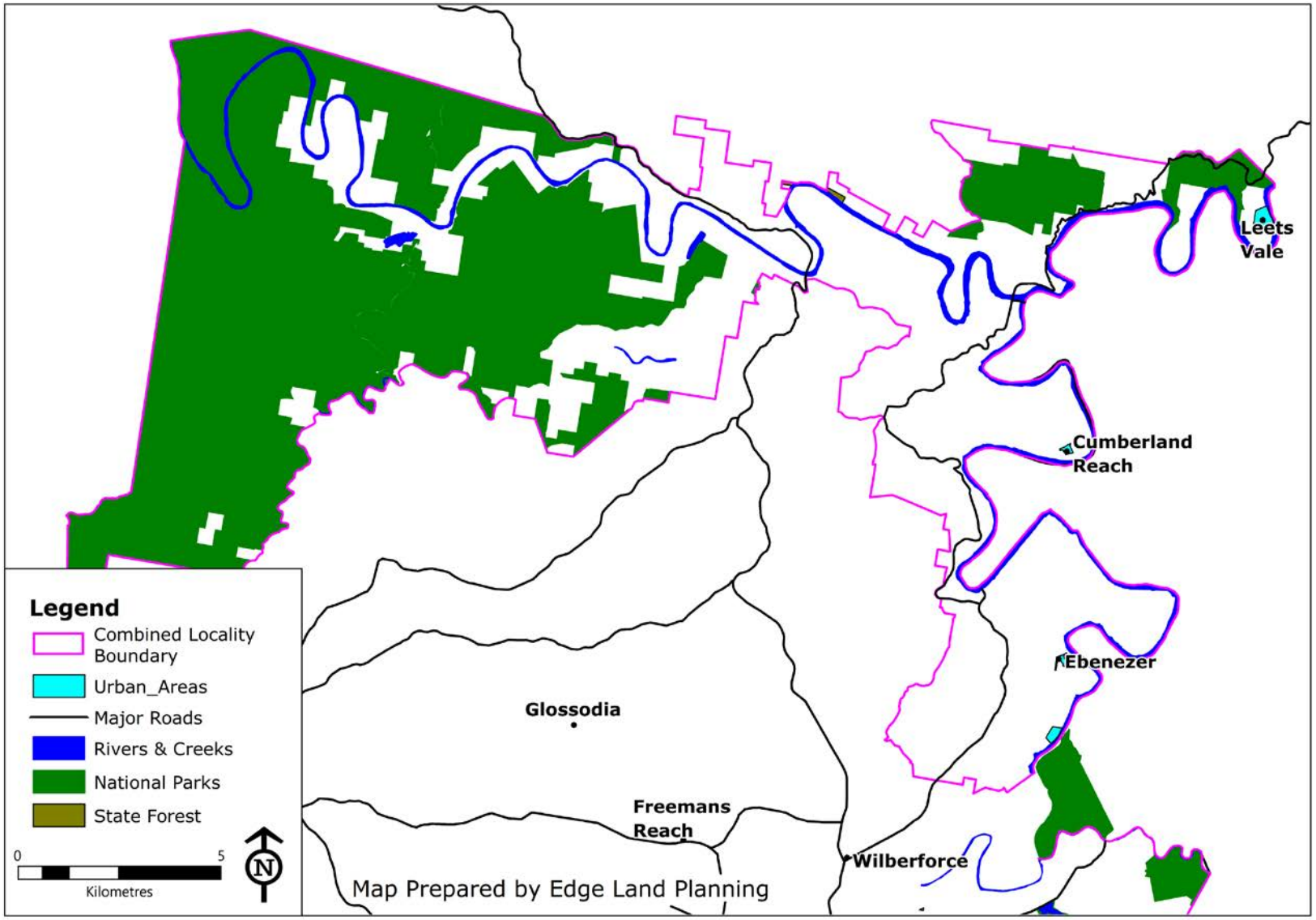






General Comments

- Floodprone land adjacent to rivers
- High proportion of rural residential, extensive agriculture and irrigated plants
- Intensive animals are horse studs
- High proportion of holdings in 8- 18 ha and less than 0.8ha.
- High proportion of irrigated plants, intensive animals and rural residential in 3.01-18 ha range, intensive animals 8.01 - 18ha range



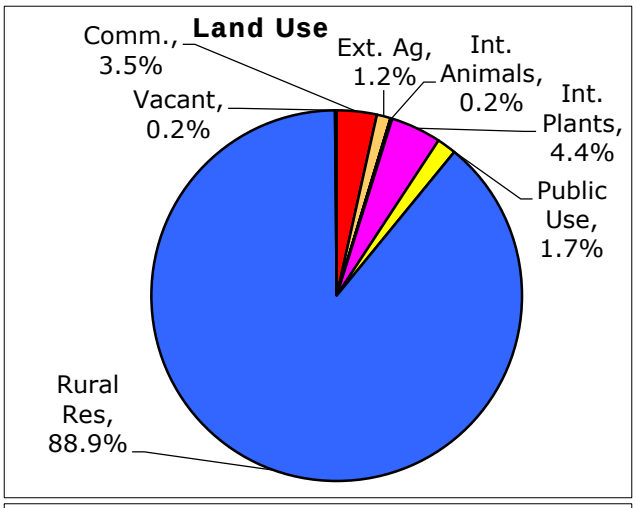
Map 3.3: Colo and Middle Hawkesbury Valleys

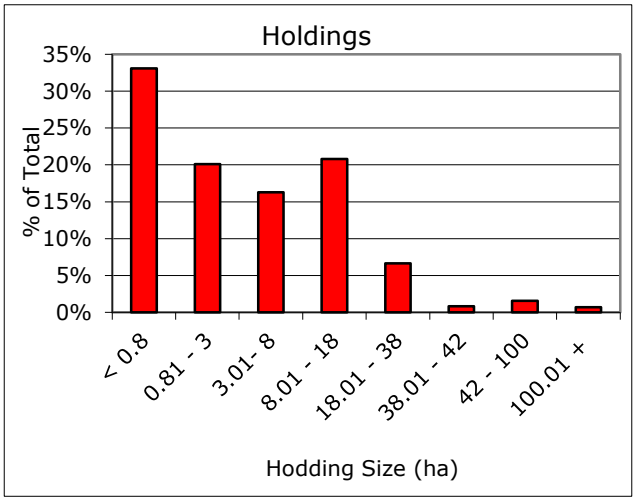
3.3. Mountain

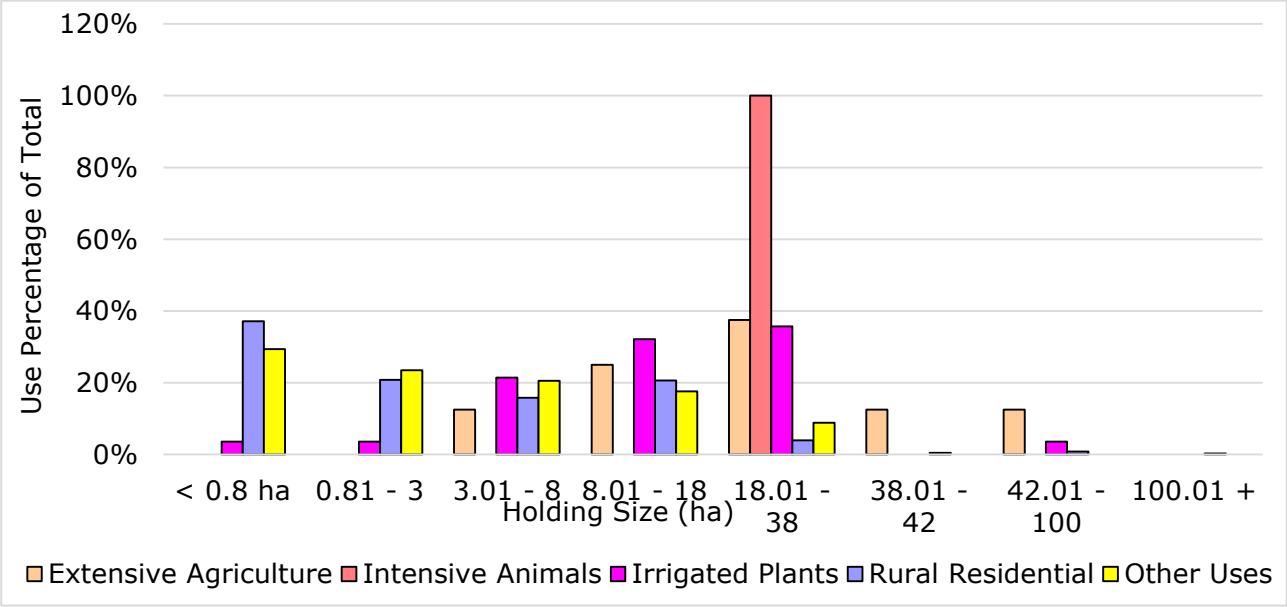
General Characteristics

Total Number of Rural Uses	660
Number of Agricultural Uses	38
Number of Rural Residential Uses	587

Land Use and Holding Size







General Comments

- High proportion of bushfire prone land associated with National Parks
- High proportion of rural residential, irrigated plants and commercial
- Irrigated plants are orchards and commercial is a mixture of food and accommodation uses associated with the tourist industry
- High proportion of holdings less than 0.8 and 8.01-18 ha range
- High proportion of rural residential in less than 0.8 and 0.81-3 ha range. Intensive Animals is one horse stud

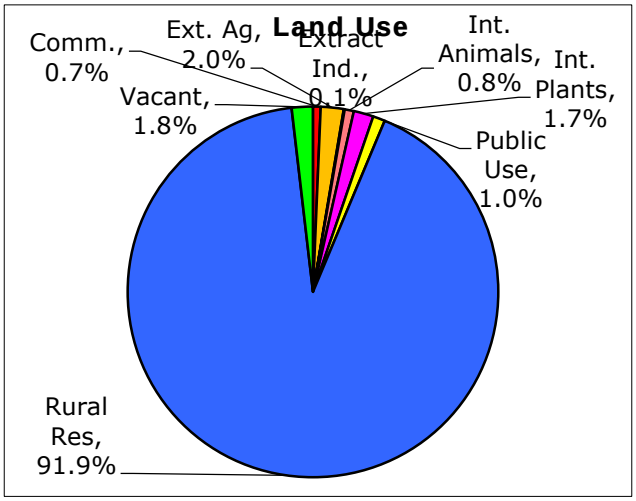
Map 3.4: Mountain

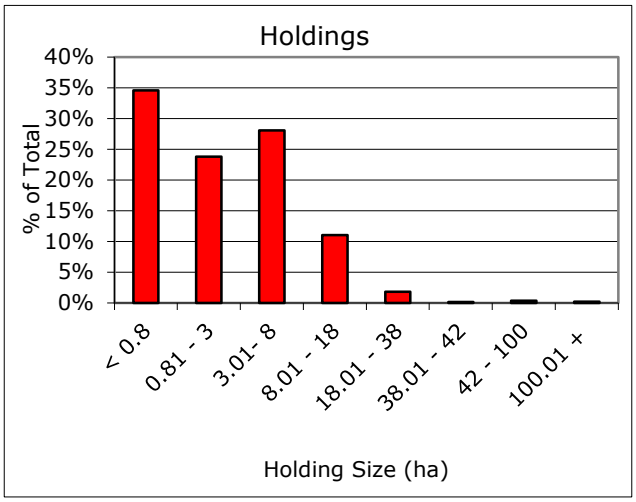
3.4. Slopes

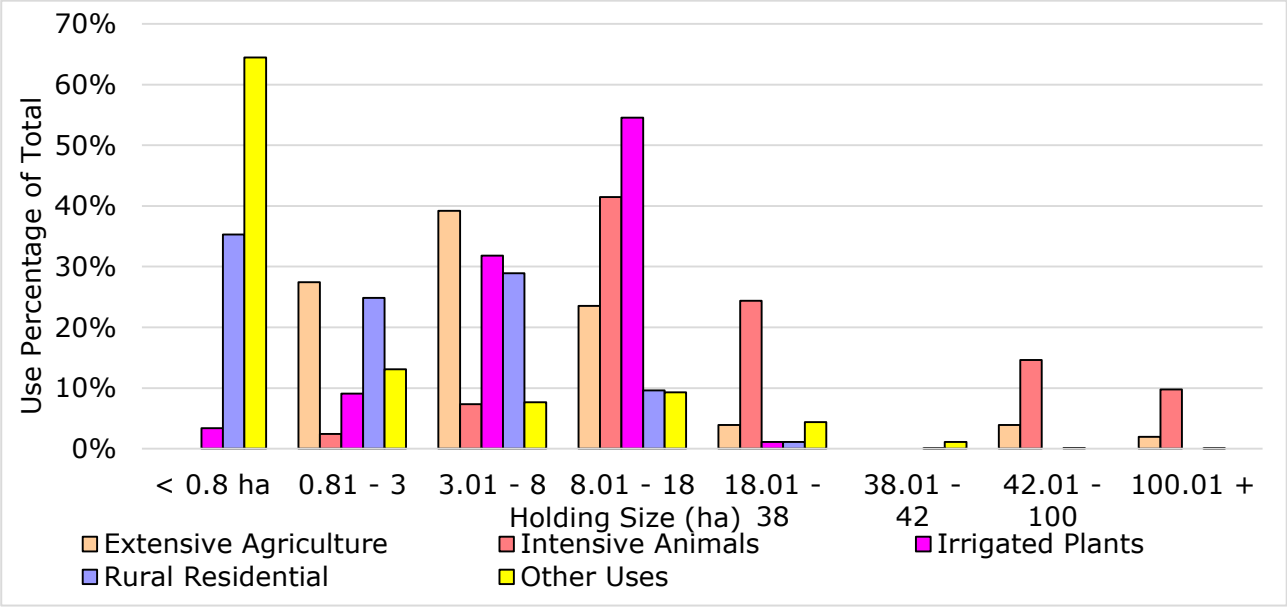
General Characteristics

Total Number of Rural Uses	5,105
Number of Agricultural Uses	231
Number of Rural Residential Uses	4,689

Land Use and Holding Size

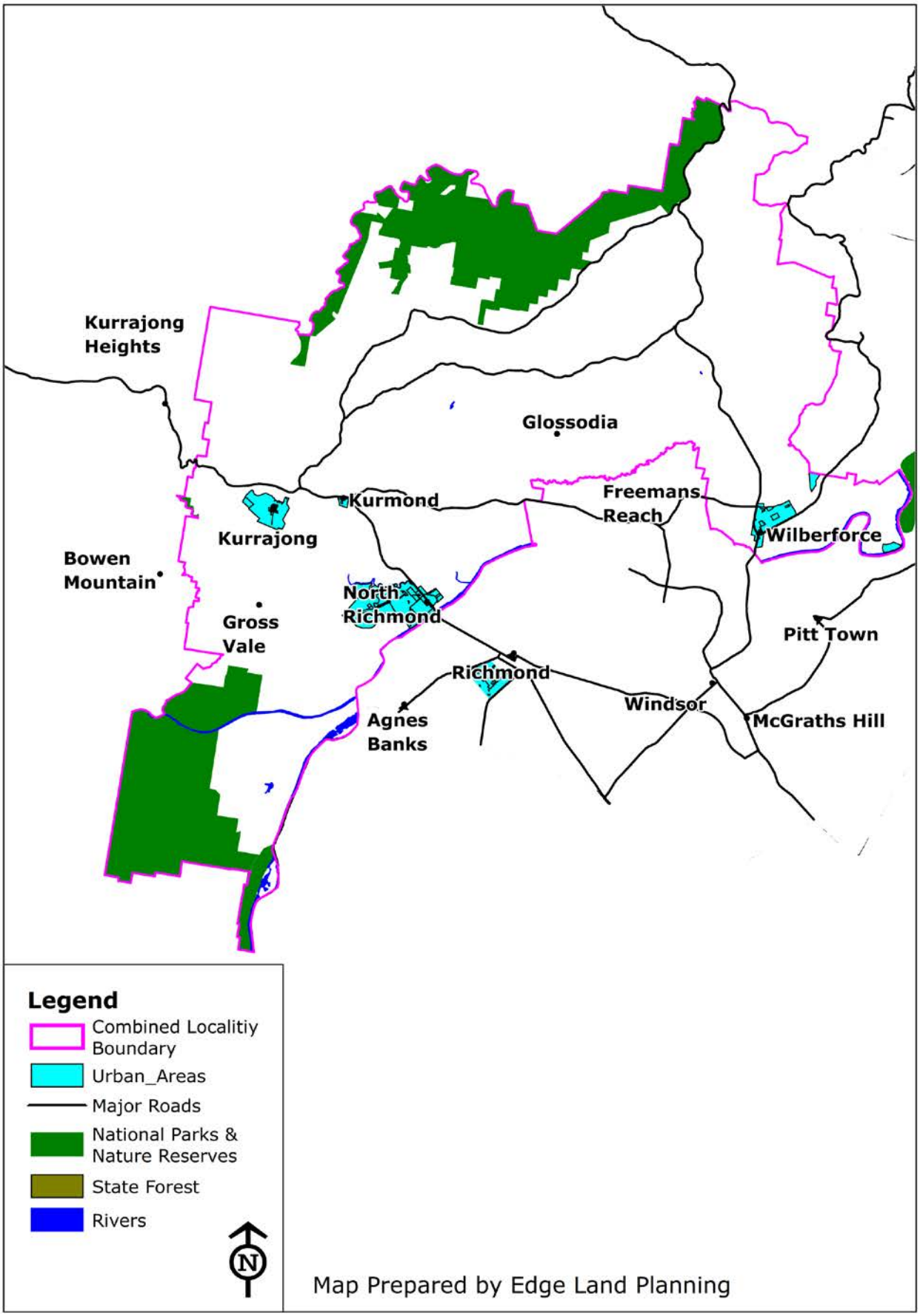






General Comments

- Very high proportion of rural residential, most of the agriculture is irrigated plants and intensive animals (poultry and horse studs).
- High proportion of horses and truck use associated with rural residential
- Agriculture low proportion
- High proportion of holdings in less than 0.8 ha, 3.01-8 ha as well as 0.81-3 ha r
- High proportion of rural residential on less than 8 ha Irrigated Plants mostly 8-18 ha and 3.01-8 ha. Intensive Animals mostly horse studs on holdings greater than 8 ha.



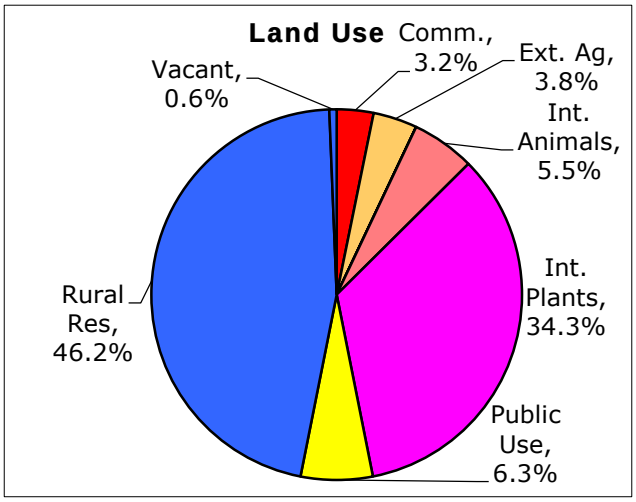
Map 3.5: Slopes

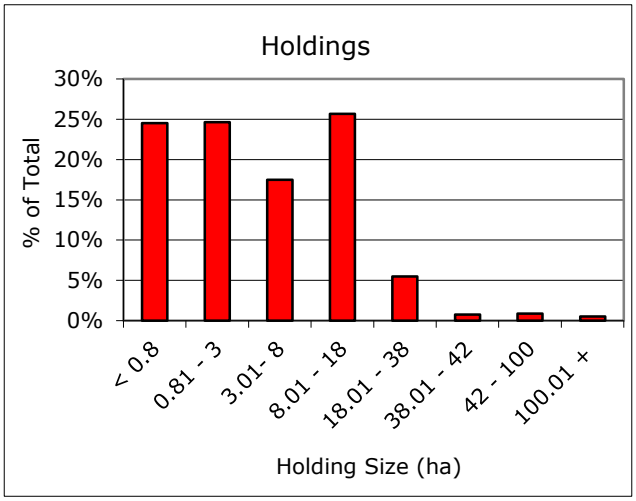
3.5. River Flats

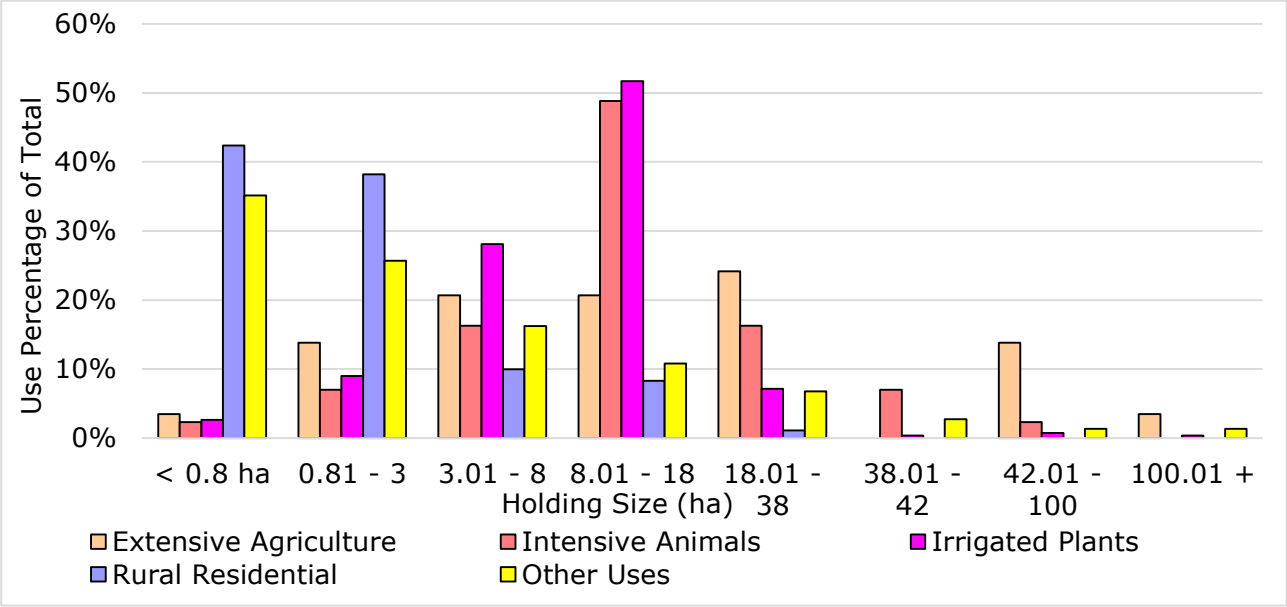
General Characteristics

Total Number of Rural Uses	781
Number of Agricultural Uses	341
Number of Rural Residential Uses	361

Land Use and Holding Size







General Comments

- Flood prone land along Hawkesbury River
- High proportion of intensive agriculture and relatively low rural residential.
- Agriculture highest proportion in LGA. Intensive plants mixture of turf farms and market gardens. animals mostly poultry and some horse studs
- High proportion of holdings in 8-18 ha range and in 18-38 ha range.
- High proportion of rural residential in 8- 18 and 18-38 ha range. Intensive Animals and Irrigated Plants most in 8- 18 and 18-38 ha ranges

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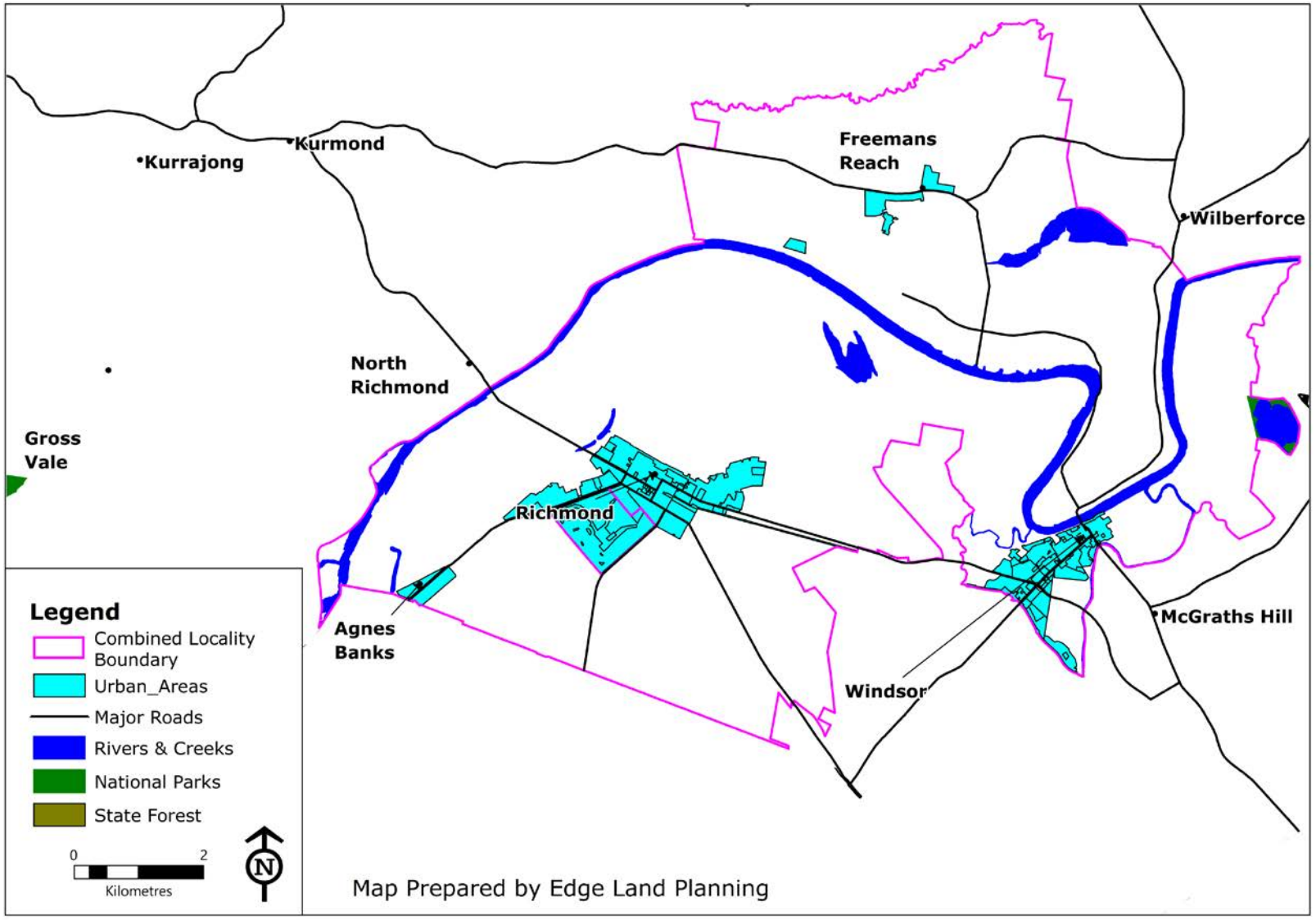


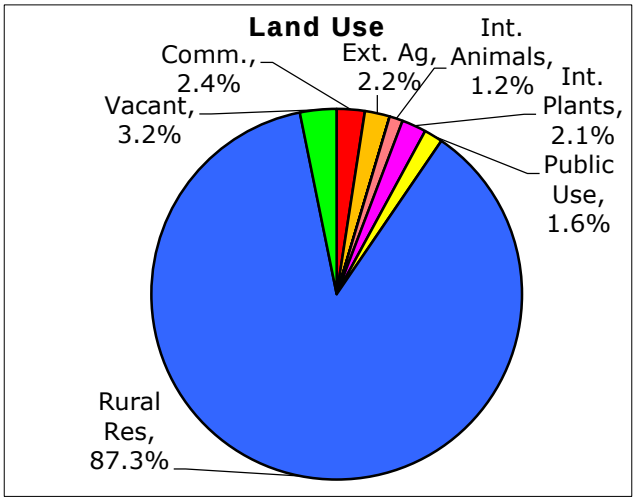
Map 3.6: River Flats

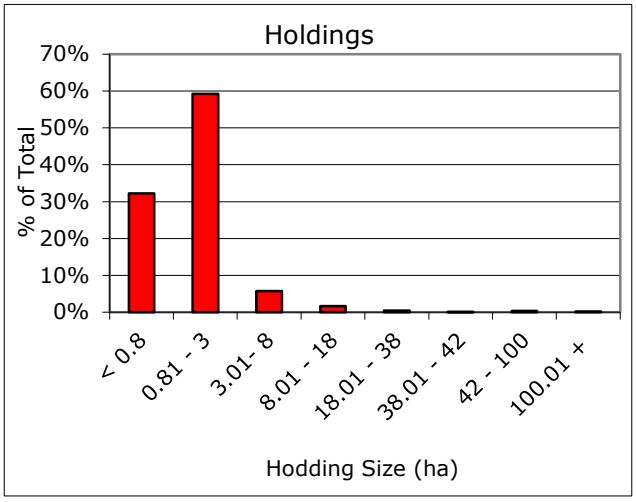
3.6. South East

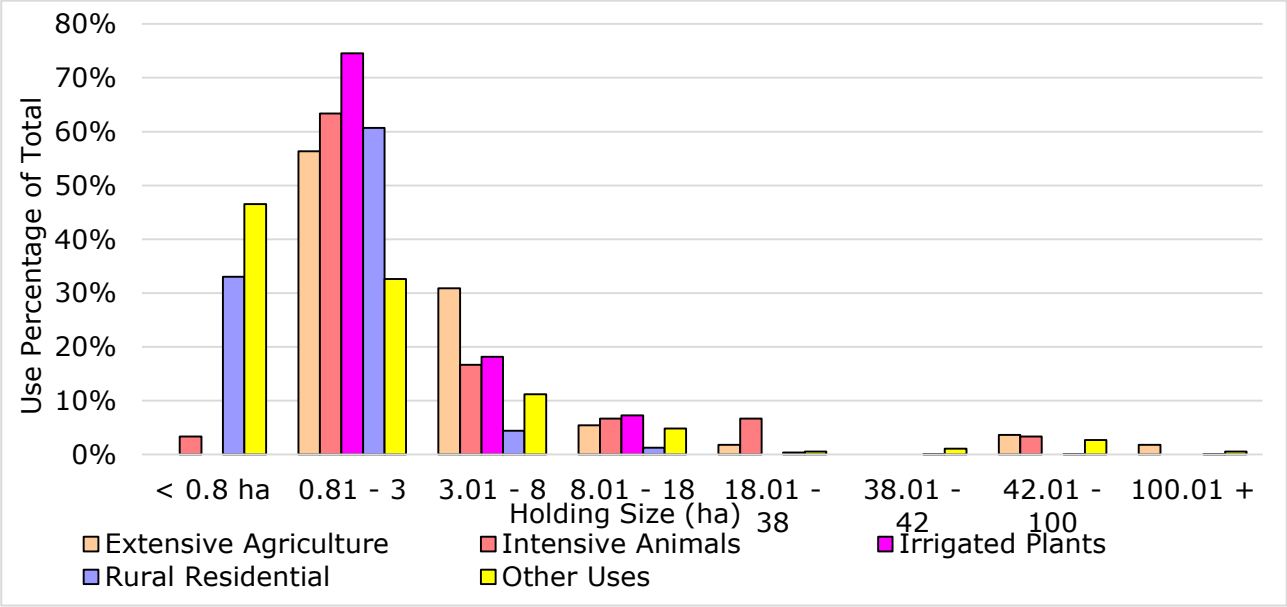
General Characteristics

Total Number of Rural Uses	2,578
Number of Agricultural Uses	141
Number of Rural Residential Uses	2,250

Land Use and Holding Size

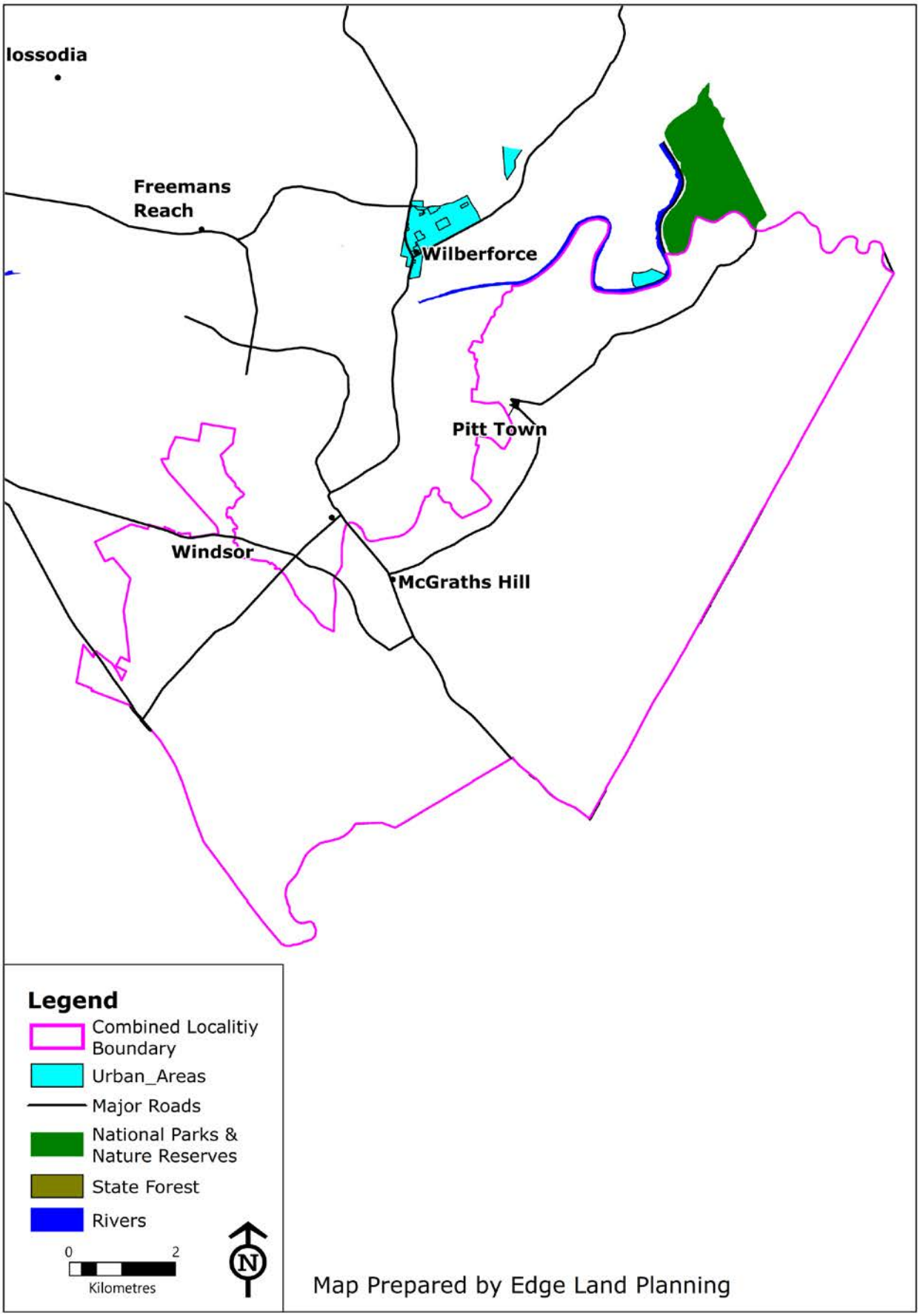






General Comments

- Very high proportion of rural residential
- High proportion of horses and trucks associated with rural residential use
- Agriculture low proportion
- Very high proportion of holdings less than 0.8 ha
- High proportion of rural residential in less than 0.8ha mostly small lots along river frontages. Intensive Animals are horse studs.



Map 3.7: South East

3.7. Summary of Key Messages

The Slopes Combined Locality has the highest proportion of rural residential land use with 91.9% followed by the Mountain with 88.9% then the South East with 87.2%.

The River Flats Combined Locality has the highest proportion of irrigated plants with 34.3%, followed by Mountain with 4.4% and then Colo and Middle Hawkesbury Valleys.

The Northern Valleys has the highest proportion of extensive agriculture land use followed by the River Flats with 3.8% and then the Slopes with 2.0%.

The Northern Valleys have the greatest proportion of commercial land uses

Chapter 4: Development and Environmental Issues

4.1. Introduction

The issues, which have to be considered when we discuss the future of Hawkesbury LGA rural lands, can be grouped into two broad headings of:

- Social and Economic Factors
- Environmental Opportunities and Constraints

There are a number of uses and issues which influence the settlement pattern of Hawkesbury LGA. The resources necessary to use the land are finite and need to be conserved. There are a number of constraints to the use of the land and the resource.

Underlying all of the issues are the philosophies of Ecologically Sustainable Development (ESD) and Catchment Management (CM). It is shown graphically in figure 2.1. The figure illustrates the interconnectedness of the issues and the fact they all must be considered in relation to each other and cannot be considered in isolation.

Ecologically Sustainable Development embodies the three concepts of:

- Social equity
- Economic prosperity
- Environmental conservation

All three are interrelated and have to be considered as such. The environment in which we live has to be treated carefully so we can ensure it is left in a good state for the future generations. However, for there to be future generations, we must have settlements in which to live – be they urban areas or rural residential use or in houses scattered throughout the countryside. If we are going to live in an area, there also must be a market economy. There is a need to find the balance between these three so we can have a sustainable future and can leave an intact environment to the future generations.

Catchment Management should underlie all planning for rural land and settlements. As such, it is an issue which is very important to this project.

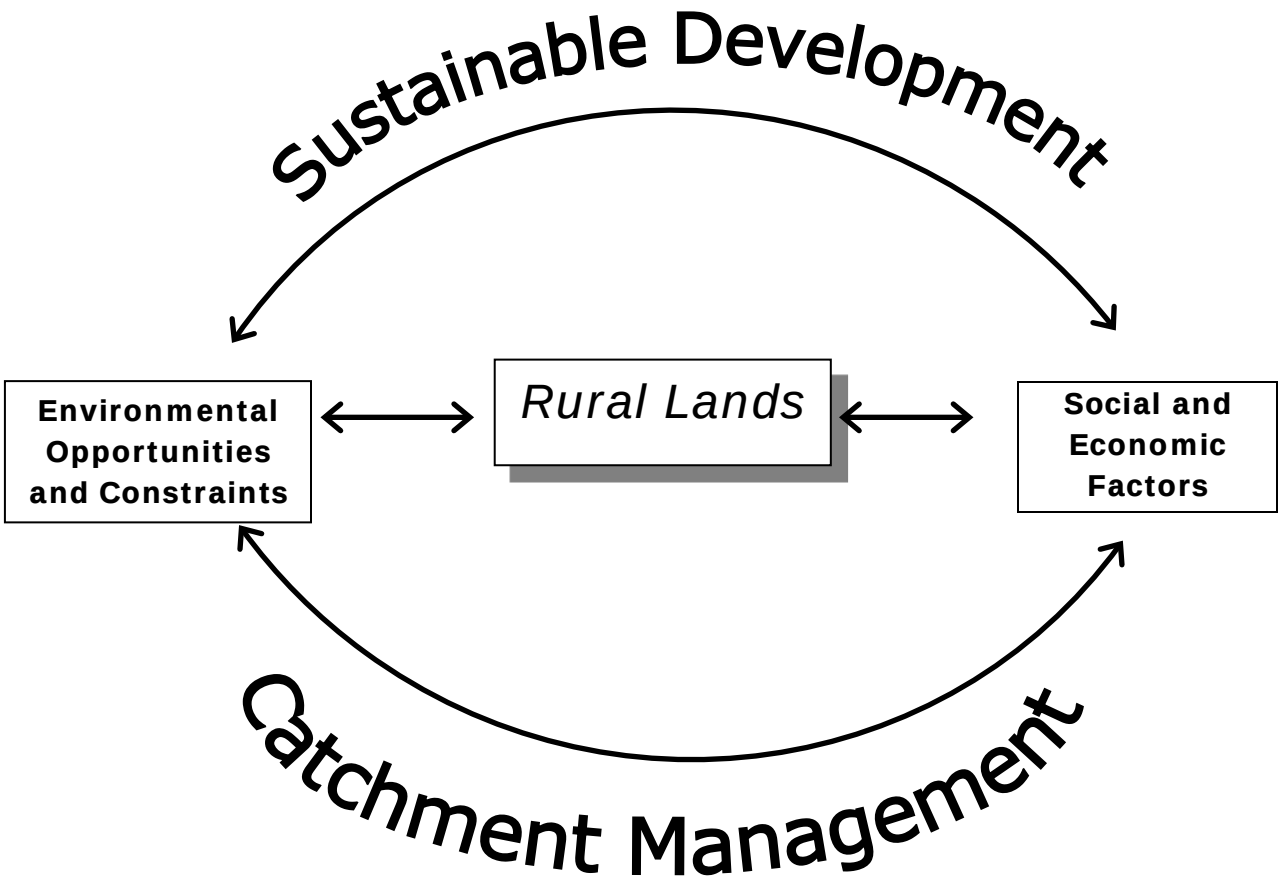


Figure 4.1: Issues and Themes for the Rural Strategy
Source: Sinclair 2002a

4.2. Social and Economic Factors

The interaction of humans with the environment is an important component of any strategy dealing with the future of the Hawkesbury rural lands.

4.2.1. Land Use

There are a variety of land uses in the LGA. The major land use shown in figure 2.1 is rural residential followed by agriculture which comprises market gardens, turf farms, protected cropping, horse studs and poultry farms as well as some lucerne hay and wineries. It should also be pointed out that a lot of the rural residential uses, particularly the ones on larger holdings, have alpacas, horses and some cattle, sheep and goats. Other uses include some extractive industry, forestry, tourism related uses, National Parks, commercial and public uses such the RAAF Base and Western Sydney University. Photo 4.1 shows the variety of plant-based uses in the Agnes Banks area with orchards, vegetables and turf growing. Photo 4.2 shows poultry egg farm and cattle grazing operations with some rural residential development at North Richmond.

One aspect of the agriculture in the Hawkesbury is that it has become more intensive over the past twenty years or so as the farmers have seen their yields increase due to better farm management as well as the use of more high technology farming systems.

Photo 4.1: Variety of Rural Land Use at Agnes Banks
Date of Photo: August 2019

Photo 4.2: Variety of Rural Land Use at North Richmond
Date of Photo: August 2019

All of these uses have an impact on each other and the environment. This is an important issue and the resultant rural land use conflict, particularly from rural residential and agricultural uses is perhaps one of the most important issues to be addressed by this strategy. The causes of this conflict will be discussed in detail later

in this chapter. Finding the balance between these often-competing desires for rural land is the key to planning for rural areas. Land use conflict is discussed in detail later in this chapter.

4.2.2. Rural residential development

Rural residential development has been defined in chapter 2 and it is noted that both of the categories of rural fringe and rural living development are found within the LGA. The current rural Large Lot Residential R5 zone contains rural fringe development and the rural living development is scattered throughout the LGA.

Hawkesbury LGA is within the peri-urban area of Sydney and this area has been the subject of increasing population growth since the 'turnaround' in population patterns of the 1970s when the population growth in capital cities began to decline and adjoining rural areas began to increase in population (Burnley & Murphy, 1995) The Hawkesbury LGA has generally reflected the experience of the Sydney peri-urban area.

The demography data shown in chapter 2 also confirmed that the rural residential dwellers have an urban demography and not many are farmers. There is also a noticeable trend in Home businesses and work from home opportunities. This is evidenced by the data presented in figure 2.51 which showed 7.8% of people (two and one half times the amount of people in the urban) area worked from home. This is similar to the data for the Sydney Peri-Urban area in 2011 which showed 9.7% rural to 4.3% urban (2.25 times) (Edge Land Planning, 2015) and Western Sydney in 2001 which showed that 8.6% were rural dwellers and 3.8% urban (2.26 times) .(Sinclair & Bunker, 2012).

Rural residential development has both positive and negative impacts. It has to be said that the negative impacts outweigh the positive ones. However, it provides a choice of housing therefore should be developed on land classed as less desirable or not fit for farming as well as areas of high biodiversity value.

On the positive side it provides for a lifestyle choice for a number of people. It also provides for a place of business for residents who run home offices and for tradespeople who need land to store plant and equipment as well as supplies. It can also contribute to the local economy. Anecdotal evidence is also that the newer purchasers of rural residential lots have a higher income and more time to devote to the local schools and community groups.

The negative impacts can be broken into financial, community and environmental. These impacts become more problematical as the lots get smaller.

There have not been any recent studies into the costs of providing rural residential development in Australia. However, a study in the United Kingdom compared clustered and dispersed growth. This found that overall, the annual costs would be one third higher for the dispersed settlement pattern than a concentrated one. The study also found that, in terms of public costs, a scattered settlement pattern is 395% more expensive for capital and 236% for ongoing costs than a concentrated one.

There are community costs associated with rural residential development. They include the provision of services and facilities to the areas that are normally located some distance from towns and villages.

The environmental costs associated with rural residential development are related to the initial development and ongoing use of the land. During construction of a rural residential area, especially rural urban fringe development, there can be soil erosion and land degradation.

The ongoing impacts of rural residential development stem from the onsite effluent disposal, soil and water management and domestic pets. Most rural residential development has onsite effluent disposal and this can be a concern if there is not a large enough area of land available for disposal. There is also a concern about the cumulative impact of having a large number of onsite systems in one area as can occur with rural urban fringe. There can be impacts on adjoining bushland from the nutrients coming off the site as well as from weeds and groundwater pollution. Native wildlife can be eaten by domestic pets.

The building of houses and associated structures in the rural area can have an impact on the landscape, especially when the land is hilly. The introduction of a number of new buildings can detract from the landscape quality of an area.

Rural residential development can also cause rural land use conflict if it is located in close proximity to intensive agricultural, mines and quarry uses. Siting the house too close to the agricultural uses can cause this.

In a majority of cases, the people who buy a lot used for rural residential are not aware of the issues associated with it as outlined above. Issues such as the need to service the onsite effluent disposal system and the impact of pets on wildlife and weed eradication are common ones where the people don't fully understand.

4.2.3. Rural Land Use Conflicts

The presence of agriculture and non-rural land use in the one location can often generate conflict due to their potential incompatibility. This is particularly evident with intensive agriculture such as market gardening (vegetables), orchards (fruit) and poultry as well as non-agricultural uses like extractive industries. Agriculture and other uses can affect adjoining non-rural uses, such as rural residential uses via pollution from the agriculture activities. Photo 4.3 shows rural residential land uses which are adjacent to intensive plant uses which can lead to land use conflict – it should be noted that this is a generalisation and the photo has been used to illustrate the point and it might not show land use conflict. Similarly, the presence of rural residential uses creates an adverse influence on the continued operation of the agricultural enterprise and other non-rural uses such extractive industries.

The main cause of land use conflict is the pollution from the use but it is also caused by lack of understanding and lack of communication between both the resident and the polluting use. Not only this, there is a lack of awareness of the zones and its objectives when the new dweller moves in with no knowledge or regard for rural land. They are expecting a lifestyle amongst the productive agricultural land and land uses. These people are the main causes of land use conflict.

Photo 4.3: Potential Land Use Conflict
Date of Photo: August 2019

The basic concept of pollution regulation is to ensure that the pollution does not impact on uses outside the property boundaries. Any person can make a complaint about a land use that is causing noise, odour or other pollution to cross its boundaries and lead to a loss of amenity to the surrounding land uses. It is not always residential uses and in some cases, it can be commercial and other types of industrial uses. The polluting use has to take steps to ensure that the pollution does not occur. This can lead to an amendment to the operation or physical structures being built to enclose the pollution and treat it at the source poses. "It could be said that the legislation benefits the complainant and not the producer because its target levels have been set for an urban situation, not a rural one." (Sinclair & Bunker, 2012) p190

The issue of land use conflict can arise when there is no separation between incompatible uses, let alone the misunderstanding, which may exist about the purpose and character of a district. Land use conflicts may arise in such situations through noise, odour, farm chemicals, access, land degradation due to mining and extractive industries, light, visual amenity, dogs, and stock damage and weed infestation, to name just a few. The buffer distance depends on a number of aspects of the use such as noise intensity, odour or spray drift. Living and Working in a Rural Area (Learmonth, Whitehead, Boyd, & Fletcher, 2007) has been prepared for the North Coast but the issues are just as pertinent to Western Sydney and it has a number of recommended buffer distances depending on whether it is noise, odour, spray drift or dust. They range from 60 m to 1,000 m. A conservative approach to buffers for all intensive agriculture in Hawkesbury would be 500 m. This has already been discussed in section 2.7 which showed the contested land for the Hawkesbury LGA.

One issue that has to be addressed is the basic planning principle of the new use blending in with the current one. This has not happened in the past with dwelling houses being permitted to locate in areas close to the property boundary with the

adjoining property with little or no consideration of the impact it may have on the agricultural use on the next-door property. This leads to rural land use conflict and experience in other areas has led to the agricultural use having to move, which was the case with mushroom composting in the 1990s in the Hawkesbury LGA.

One way of trying to assess the potential for land use conflict is to require a Land Use Conflict Risk Assessment (LUCRA) to accompany a DA for a non-agricultural land use. The LUCRA is a system that has been developed by the NSW DPI and it is aimed at identifying and assessing the potential for land use conflict to occur between neighbouring land uses. "It helps land managers and consent authorities to assess the possibility for and potential level of future land use conflict" (NSW Department of Primary Industries, 2011)

4.2.4. Peri-Urban Agriculture

The Sydney Peri-urban area region is a significant producer of poultry, perishable vegetables, nurseries, flowers and turf and this has been the case since at least 1991 when these figures were first analysed (Wollondilly Shire Council, 1993). The significance of the Sydney region for agriculture has been outlined in section 2.9. When the high percentages of vegetables, poultry, nurseries, flowers and turf are viewed through the lens of climate change this makes the region even more important for Sydney's supply of these products. The importance of Hawkesbury as the number one perishable vegetable producer on Sydney and NSW and thirteenth in Australia makes it the most significant peri urban LGAs in NSW for vegetable production. It is also the most significant turf producer in Australia as well as being a significant egg and other poultry producer.

The peri-urban landscapes around the world will be sources of food supply into the future. Olivier de Schutter, the United Nations Special Rapporteur on the Right to Food sums the issue up well in his report titled "The transformative potential of the right to food" when he says:

> *"As the competition increases between putting land to urban or to industrial use in the urban and peri-urban perimeter, and as increased food supplies create unprecedented logistical challenges for food distribution and transport systems, it is vital that cities assess their food dependencies, identify weaknesses and potential pressure points and, where possible, develop a variety of channels through which they can procure their food. Urban and peri-urban agriculture, as well as the development of short food chains connecting cities to their local food-shed, will therefore play an increasingly important role" (Special Rapporteur on the Right to Food, 2014).*

The current Sydney Metropolitan Strategy is called *"The Greater Sydney Region Plan – A Metropolis of Three Cities"* and as discussed in section 1.4.1, it has identified the Metropolitan Rural Area (which includes the Hawkesbury LGA) and has identified the area as being an area for the growing of fresh food close to the growing population of Sydney. This includes protecting the existing farms and by providing for new opportunities. The accompanying strategy for the Western Sydney has been discussed

in section 1.4.2 and this also notes that there are a number of planning priorities that protect and enhance the agricultural production in the Peri-Urban area which includes Hawkesbury.

The Sydney Agricultural Strategic Approaches Working Group in 2017, issued a Discussion Paper titled "*The Future of Agriculture and Food Production in Sydney*" which addresses the issues around the future of agriculture in Sydney. It highlights that urban development continues to encroach on the peri-urban food landscapes causing land use conflict leading to an adverse impact on the city's broader food system. It states that this is becoming a pressing challenge for decision making at the Regional, Council and farm levels. It makes a series of recommendations dealing with the following:

- Land use conflict
- Promoting agriculture in peri-urban areas
- Empowering current and future agricultural enterprises

Sydney's South West and North West Growth Areas had 560 vegetable farms or 52% of the Sydney total in 2009 (Malcolm & Fahd, 2009). These are currently undergoing urbanisation whilst some remain as the land has not yet been rezoned. However, over the following ten to fifteen years, they will be gone. This places more emphasis on the remaining land in the peri-urban area to grow food, including the Hawkesbury LGA.

So, it can be seen that peri-urban agriculture is significant in food production as well as ornamental plants that are grown and consumed in Sydney. It is also a significant food producing area on a world-wide basis and the current The Greater Sydney Region Plan (which has been discussed in section 1.4.1) has objectives and strategies aimed at protecting it into the future Including objective 24, strategy 24.3, objective 29 and strategy 29.1. The Western City District Plan (which has been discussed in section 1.4.2) also has planning priorities and actions which protect peri-urban agriculture including Planning Priority W4 and Action 11(d), Planning Priority W7, Planning Priority W8 and Action 35, Planning Priority W11, Planning Priority W12, Planning Priority W14, Planning Priority W16, Planning Priority W17 and Actions 78 and 97.

One aspect associated with vegetable production in the peri-urban areas (as well as other parts of the country) is that the farmers who sell their produce at the central markets are price takers not price makers. This is an issue with the central market system where the produce is taken to the Flemington Markets and is sold at a price that is reflected by the market conditions of that day. The local growers are competing for price with other producers who have grown the same crop, some from interstate. The large number of buyers and sellers means that the farmers are not able to influence the price and so have to take the price that is offered. It is sometimes the case where the local grower will take a crop to the market where there is the same product from many other farmers (some from interstate) and thus the supply is large and the price that they get is lower and this has an impact on their margin, sometimes it is so low that they don't make much or any money at all. To overcome this, some farmers sell from their farmgate, some sell direct to fruit and vegetable

shops in the surrounding areas or to the major supermarkets and some are selling produce online. It must be pointed out, however, that the central market is the place that the majority of farmers sell their produce, however the alternative markets are becoming more popular.

The construction of the Western Sydney Airport at Badgerys Creek presents a good export opportunity for agricultural products grown in the peri-urban area in general and Hawkesbury. The types of produce that would benefit from being close to the airport is the high value time critical commodity such as leafy vegetables and mushrooms as well as some ornamental flowers and poultry – eggs and ducks.

The impact of the COVID-19 pandemic also has implications for peri-urban agriculture. The Food and Agriculture Organisation of the United Nations has recently released a document that highlights what can be done by Local Government to respond to the emergency. (FAO, 2020) It notes that the promotion of short supply chains by buying food closer from where it is grown is one of the medium- and long-term actions that can strengthen the resilience of urban food systems. It also notes that the existence of peri-urban and urban agriculture helps to ensure this resilience. Hawkesbury is the number one producer of vegetables in the peri-urban area and the continuation of this will help to aid in the resilience of Sydney's food system.

4.2.5. Protected Cropping

There are a number of protected cropping structures (also referred to as greenhouse horticulture) that have been constructed in the LGA. It has been defined by the Department of Primary Industries as

> *"… the production of horticultural crops within, under or sheltered by structures to provide modified growing conditions and/or protection from pests, diseases and adverse weather. In its broadest definition, protected cropping includes the use of greenhouses and glasshouses, shade houses, screen houses and crop top structures." (NSW Department of Primary Industries, 2020)*

The land use survey showed that protected cropping made up 7.6% of the irrigated plants land use, which is the third highest behind market gardens and turf farms. It is anticipated that this type of land use will increase as with market gardens and turf farming. In a number of cases, a market garden has a protected cropping structure which is part of the horticulture system and they grow in association with each other.

There is also the potential for some market gardens to convert to protected cropping uses. In addition, the urbanisation of the South West growth area will see the need to relocate a number of the horticulture uses (with a high proportion of protected cropping uses) and there is potential for them to relocate to the Hawkesbury LGA. This will be discussed in more detail in section 6.3.

Protected Cropping Structures can be categorised into three types and are based on the technology (Osborn Consulting & RMCG, 2017) as follows:

- *Low technology*: These greenhouses are less than 3 metres in total height. Tunnel houses, or "igloos", are the most common type. They do not have vertical walls. They have poor ventilation. This type of structure is relatively inexpensive and easy to erect. Little or no automation is used.
- *Medium technology:* Medium level greenhouses are typically characterised by vertical walls more than 2m but less than 4 metres tall and a total height usually less than 5.5 metres. They may have roof or side wall ventilation or both. Medium level greenhouses are usually clad with either single or double skin plastic film or glass and use varying degrees of automation.
- *High technology:* High level greenhouses have a wall height of at least 4 metres, with the roof peak being up to 8 metres above ground level. These structures offer superior crop and environmental performance. High technology structures will have roof ventilation and may also have side wall vents. Cladding may be plastic film (single or double), polycarbonate sheeting or glass. Environmental controls are almost always automated.

The NSW Department of Primary Industries has recently published a report titled Protected Cropping and the NSW Planning & Approvals Process – A Review. This report states that the protected cropping sector is expanding rapidly across the World, in Australia as well as in NSW. It is estimated that the national farm gate value of protected cropping is $1.3 billion and it represents 20% of the Australian value of vegetable and flower production and is expanding at a rate of 4%-6% annually.

The typical crops that are grown in Protected Cropping Structures include tomatoes, cucumbers, capsicum, lettuce, strawberries, herbs and micro-herbs, Asian greens and mini-vegetables. They are grown in all three types of greenhouses detailed above and the yield improves as the technology gets higher due to the ability to control the climate and other growing aspects.

This definition does not strictly cover hail netting which is used for orchards, berry crops and hydroponic growing on benches. However, for the purposes of this Strategy it is considered appropriate to include them as a protected cropping structure. There is a large hydroponics farm at North Richmond which has a large area of hail netting covering the benches.

All three types of greenhouse are in existence in the Hawkesbury LGA. However, most are medium technology and low technology greenhouses and there is potential for more of the high technology greenhouses to be constructed, especially as development of the South West Growth Sector of Sydney continues to consume the high number of these greenhouses that are located in this part of Sydney's peri-urban area. The Western Sydney University has some high tech greenhouses at is Richmond Campus which are used to grow crops for research purposes and they are then passed on to food charities such as Foodbank.

The cost of protected cropping structures is expensive and depending on the amount of site preparation costs, it can be $2.5 to $3 million per hectare for the high technology greenhouses. The medium and low tech greenhouses cost considerably less but also have less yield.

The employment generation from protected cropping systems is significant and depending on the type of crop being grown can be as much as twenty to forty people per hectare of the amount of protected cropping structure. For example, a greenhouse operation which produces vegetables and herbs for the restaurant sector, with 4,000 m^2 of greenhouse in another LGA employs fifteen to twenty people. This makes the potential of protected cropping structures appealing from an economic development as well as agricultural systems point of view.

One aspect of the protected cropping sector is that the size of the high technology greenhouses is between two and five hectares with some demand for ten hectare ones. This requires considerable investment up to $10 to $15 million and also large land sizes. The price of land in the Peri-Urban area is becoming high and this reduces the ability to purchase land at a reasonable cost for agriculture as its value is often seen for rural residential use. One option is to lease land for ten years with a ten year option so that the protected cropping structure can remain in place for twenty years which is its average lifespan.

A review of the protected cropping sector and the NSW Planning and Approvals Process (NSW Department of Primary Industries, 2018b) was carried out by the Department of Primary Industries and this found that one of the significant issues for the assessment of DAs was that Council staff had limited knowledge of protected cropping sector and particularly the design and operation of protected cropping structures. It also found that the proponents of protected cropping DAs also did not fully understand the information required by Councils. On the whole, the survey results did not show that the planning and assessment process discouraged new projects. One of the recommendations of the review was to work with industry to improve the level of understanding about the information required to be submitted to Councils. It would also be opportune for the industry to provide Council officers with details about the operation and design protected cropping structures as well as conduct tours of existing operations.

4.2.6. Rural Towns and Villages

The Hawkesbury LGA consist of a number of Towns, Villages and rural settlements, which can be seen on map 1.1 which shows the study area and the other maps throughout this Strategy. There are also a number of community halls and bushfire sheds scattered throughout the rural area which play a vital role as a focal point for the community to be used for community meetings, community services and in times of natural disasters.

To set a relationship and strategic context to these settlements, a hierarchy is being adopted. The hierarchy is based on the facilities provided in the settlement and the role that it plays, rather than purely population. The hierarchy for this strategy is based on two factors: retail shopping and educational facilities. Retail facilities are classed on three basic shopping trips:

- *Convenience shopping* relates to the daily shopping needs of bread and milk as well as newspapers and emergency purchases not done at other times. This is usually done in a general store / convenience store or petrol station. These are standalone facilities.

- *Weekly shopping* is for the basic food and household shopping needs and is usually done in a chain supermarket. This is usually in a small strip shopping centre.
- *Comparison shopping* is the shopping trips done for larger items of household and personal items such as whitegoods, furniture and clothing. This type of shopping is usually done in large shopping centres.

Hierarchies can also be based on infants, primary and high schools.. Small settlements have a primary school and when the catchment area gets larger it attracts a high school as well as primary schools. In the case of Hawkesbury, there are high schools in Richmond and Windsor. There are also two high schools located in the rural area – Colo High School is located to the west of North Richmond and Hawkesbury High School is located at Freemans Reach. The location of these schools indicates that they also serve the surrounding rural residential development as well as the local urban centres of North Richmond and Freemans Reach.

The Greater Sydney Region Plan (Greater Sydney Commission, 2018) establishes a settlement hierarchy for the entire Sydney Region, however, as discussed in section 1.4.2, it does not identify any of the local centres in the LGA, but it does state that "… most rural towns and villages function as local centres." (ibid p121) which infers that all of the settlements in the LGA would be classed as local centres. However, it does not make any distinction between them as to their relative importance and function – this is the role of a settlement strategy. The Greater Sydney Region Plan can be used as the basis for the hierarchy for the Hawkesbury LGA and this Rural Lands Strategy can outline the relationship of each of the settlements to each other based on the criteria discussed above. The settlement strategy for Hawkesbury should take the following form:

- *Metropolitan Centre* This is the economic focus of Greater Sydney and is fundamental to growing its global competitiveness and where Government actions and investment will be focused. It also provides a wide range of employment, entertainment and recreational opportunities, a full range of local services and higher order services such as Major Hospital, TAFE College as well as a infants, primary and high schools as well major indoor recreation facility and often has a University campus. It also has regional offices of State Government Departments. It has a large mixed commercial area providing service, retail and office uses with a large chain supermarket and a discount department store. It caters for convenience, weekly and comparison shopping. It draws its catchment from the surrounding Local Government Areas and may not be in the LGA.
- *Strategic Centre.* This provides access to a wide a range of employment, entertainment and recreational opportunities, a full range of local services and some higher order services such as high school (as well as infants and primary schools) and sometimes University and TAFE Colleges and health care as well as a major indoor recreation facility. It has a large mixed commercial area providing service, retail and office uses with a large supermarket. It would cater for convenience, weekly and limited comparison shopping.
- *Local Centre – Town.* This provides a range of local services and variety of employment opportunities in tourism and retail but relies on the Strategic Centre for other opportunities. It has shopping for weekly and convenience shopping and also infants, primary and high schools.

- *Local Centre – Village*. This provides only for convenience needs and typically has only a general store / post office as well as maybe an infants and primary school.
- *Rural Centre*. This is a focal point for the surrounding community and usually has a community hall, silo or bushfire shed. There are generally no shopping facilities or other services in this area.

It should be pointed out that the hierarchy works both upwards and downwards. The higher order settlements rely on the lower order settlements for catchment population and the lower order settlements rely on the higher order centres for goods and services. The details of the hierarchy for Hawkesbury is discussed in section 6.5.

4.2.7. Economic Development

The economic base of rural LGAs such as Hawkesbury is a very important component of its future viability and sustainability.

Economic development and a need for the area to have a vibrant and diverse economy sets a robust strategy for its survival. It is also important protect the existing rural businesses as well as attracting new ones. The potential for some of the existing vegetable farmers in South West Sydney to relocate to the Hawkesbury is a good example of new businesses and this is something that can be included in Council's economic development strategy.

The indicators of the economic output discussed in section 2.8 have shown that the value-added component of the Hawkesbury rural economy is $266.6m for the agriculture sector. In addition, the manufacturing, retail and accommodation and food services sectors all have components related to the rural economy. This showed that the rural economy is number five or six, depending on the component of the other sectors. The value of exports from agriculture is $409.6m, which is number four for the Hawkesbury LGA. All of this shows that the rural economy is a key contributor to the economic development of the Hawkesbury LGA. Added to this is the potential to gain increased employment via more protected cropping structures as has been discussed in the protected cropping section of this chapter.

Tourism is becoming a significant contributor to the economy, with agriculture-based tourism being a key component of this. This can be increased with the introduction of more agriculture-based tourism such as the Hawkesbury Farm Gate Trail, experiential dining, pick your own, cellar door tastings and other similar enterprises.

There is a need to ensure that work is carried out to promote all of these sectors as they combine to contribute to the economy of the LGA. It is also necessary to ensure that the future sustainability of these sectors is not compromised by the development of one sector which might impact on the other. An example of this would be accommodation uses next to an orchard and the potential for the guests at the accommodation use complaining about the noise from the orchard. There is a need to consider this when thinking about the development of both sectors. Similarly, the use of good quality agricultural land for development that does not need the high quality

soils such as the equine sector on the Richmond Lowlands taking good quality agricultural land out of food production.

4.2.8. Extractive Industry

Extractive industries in the Hawkesbury LGA are for sandstone and construction sand. They are shown on map 4.1. Currently, there are only three operational quarries in the Hawkesbury LGA as follows:

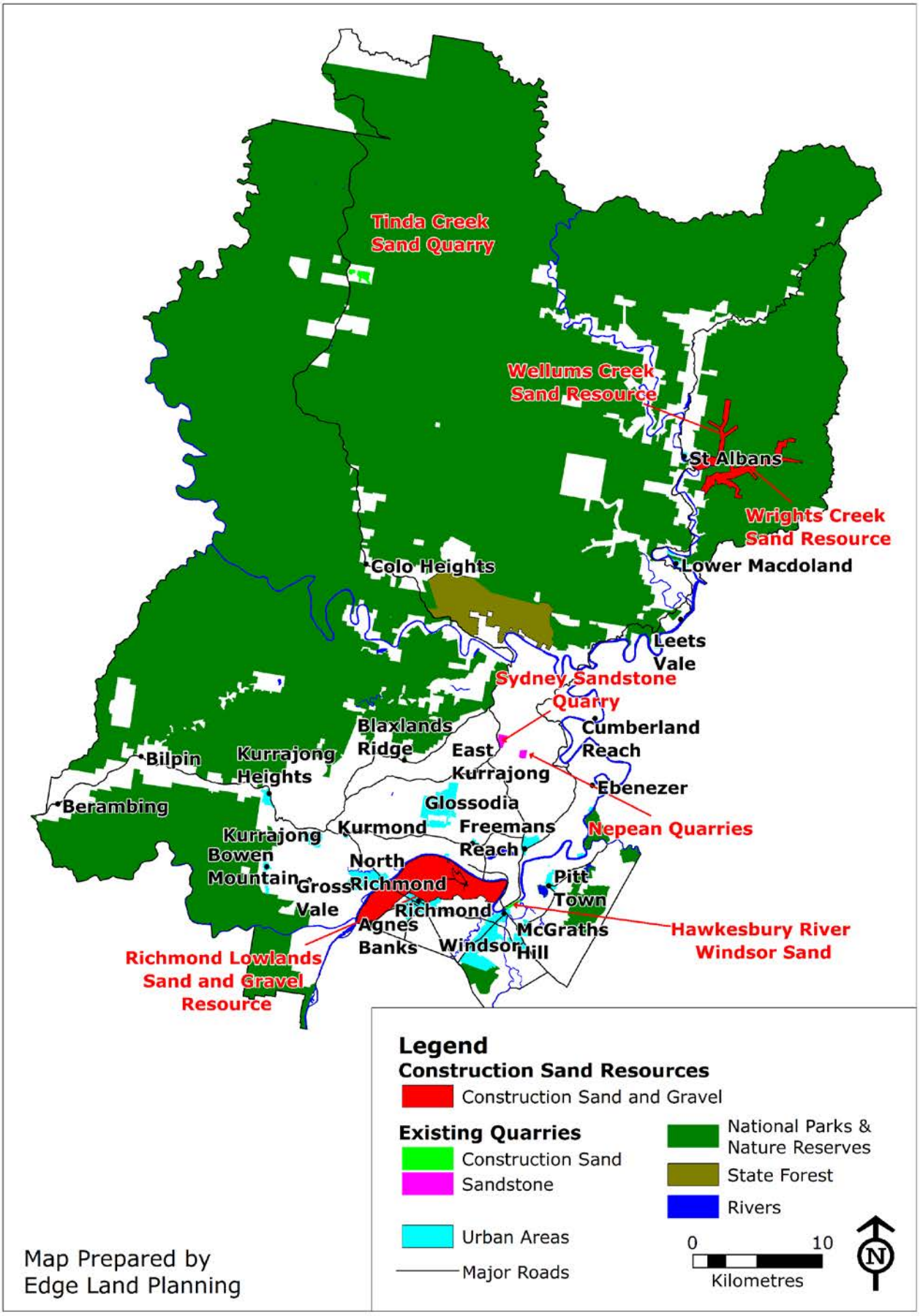
- Tinda Creek Sand Quarry
- Sydney Sandstone East Kurrajong
- Nepean Quarries East Kurrajong Sandstone

There are three resources that have not yet been developed in the LGA which have been identified by NSW Resources and Geosciences. Two are for construction sand and one is for construction sand and gravel and they have been identified in the Sydney Regional Environmental Plan (REP) Number 9 as significant extractive resources as follows:

- Wellums Creek Sand Resource
- Wrights Creek Sand Resource
- Richmond Lowlands Sand and Gravel Resource

The effect of the identification of these resources by the REP is to ensure that they are protected into the future for extraction as needed for Sydney's construction sand.

The Penrith Lakes Scheme has been Sydney's major source of construction sand since the 1980s and this has now ceased and the sand is now being sourced from other locations. The Richmond Lowlands were seen as the next area for extraction when the Penrith Lakes Scheme was established in the 1980s. It is noted there are many other land uses in the Richmond Lowlands including turf farming, vegetable farms, orchards, horse studs, polo fields and others. This mix of land uses as well as the multiple ownerships, the future needs of agriculture, the scenic values of the land, riparian land impact, flooding, water quality issues of the Hawkesbury River would all have to be taken into consideration with any application to carry out a major sand extraction of the scale of Penrith Lakes. This makes any such large-scale sand extraction unlikely. However, there may be some small-scale sand extraction applications and these will have to be dealt with by the Council as part of the DA process. This has the effect of ensuring that the land can be used for agriculture in the future because it is very unlikely that the agricultural resource will be taken away as was the case with the Penrith Lakes Scheme which was class one and two agricultural land before the sand was extracted. It is noted that the resource in the Richmond Lowlands covers 2,275 ha of class one and two agricultural land and this equates to 25% of the total area of class one and two agricultural land in the Hawkesbury LGA. This is a very significant resource for agricultural land and it should be kept as for growing food and plants, rather than becoming a sand quarry like Penrith Lakes was for thirty years. This is discussed in chapter six.



Map 4.1: Extractive Resources

The land at Wellums and Wrights Creeks is to the south of St Albans to the east of Settlers Road Fernances Run and Wrights Creek Rd. This land has a fragmented land ownership , and its land use is mostly rural living with some extensive agriculture. It also has riparian vegetation along the creeks as well as a number of wetlands which have significant environmental values. This would also need to be considered in any application for sand extraction in the future. For this reason, it makes any large-scale sand extraction from this area unlikely.

Council currently has an application for a sand extraction on one property in the Freemans Reach area. This has the potential to have a significant impact on the agriculture sector – both turf farming and market gardens. The application is to take sand from a small area of an existing turf farm and if it is established, it may then seek extensions of the area to encompass more of the agricultural land. This as well as impact on the Hawkesbury River and its environmental values would have to be addressed by the Council. For this reason, it is considered that no sand extraction should be considered in this area. This will be discussed in more detail in chapter 6.

4.2.9. Infrastructure

Infrastructure such as roads, water, electricity, telephone is necessary for the provision of human settlement areas as well as for transporting farm produce. The Hawkesbury LGA is well served by electricity and telephone.

An emerging issue is the amount of traffic generated by rural residential development, especially rural living because of the lack of public transport and resultant high car dependency, as discussed in section 2.10. The large number of rural residential development in the Slopes area, for example, can generate the same number of traffic movements as urban areas because the people leave the house each day to work in urban centres and other LGAs. The data presented in Chapter 3 showed that there are 4,609 rural residential uses which is nearly the same as Richmond and Windsor combined which has approximately 5,000 dwellings.

Another issue associated with infrastructure is the impact of natural hazards on infrastructure. Flooding and Bushfires are discussed in section 4.3 and these have a major impact on road and bridge closures. In December, 2019 there were major bushfires which burnt a considerable amount of the Wollemi National Park in the north and western parts of the LGA. The fire caused a number of roads to be closed for long periods of time. These roads are:

- Bells Line of Road from Kurrajong Heights to Berambing
- Putty Road between Colo and Colo Heights
- St Albans Road between Webbs Creek and St Albans
- Wollombi Road between St Albans and Bucketty
- Settlers Road between St Albans and Webbs Creek

In February 2020 after a heavy rainfall in the Hawkesbury River catchment, there was minor flooding in the Hawkesbury River and its tributaries which saw the following roads closed:

- Sackville Road at the Sackville Ferry
- Bridge Street at Windsor Bridge and Windsor Bridge
- Windsor Road at McGraths Hill
- Bells Line of Road at Richmond and Richmond Bridge
- Springwood Road at Yarramundi and Yarramundi Bridge

The bushfire and flooding issues are discussed in section 4.3.7 and 4.3.8 and combination of these events within 2 months is unusual but the projections about climate change suggest that these will become more frequent. This has an impact on the amount of new development that should be permitted on the western side of the LGA. This will be discussed in chapter 6.

4.2.10. Domestic Effluent Management

This is perhaps the most important impact of human settlement on the water quality of the surrounding streams and the general environment.

Only Agnes Banks, Freemans Reach, Glossodia, McGraths Hill, North Richmond, Pitt Town, Richmond, Windsor, and Wilberforce have reticulated sewerage and so all of the other settlements and rural properties have onsite effluent disposal. The onsite disposal systems are a mixture of traditional septic tanks, and pump out of effluent. The effluent is disposed of either by direct absorption into the land via a septic tank, irrigated onto the land via an aerated wastewater treatment systems (AWTS)or directed to a holding tank to be collected by a tanker, which is also known as a pump out system.

The ability for land to dispose of effluent on site is dependent on the size of the irrigation area which is a function of, soil type, underlying geology and slope of the land. A large lot size will generally be able to cope with onsite disposal. If the soil is not porous and has a clay base, or has rock near the surface, it will take longer to transpire, and require a larger irrigation area. In addition, if the land is steep, it may transport the nutrients off site and into surrounding waterways. To ensure that the land is capable of disposing of effluent adequately, there is a need to submit an application and adhere to the requirements of the Council's Development Control Plan. If the land is not able to dispose of effluent onsite, it normally needs to be pumped out and transferred to a sewerage treatment plant. This solution is a costly one for the landowner and is usually only done after the onsite disposal system has failed and should not be used for new systems.

4.2.11. Community Services and Facilities

Community services provided in the Hawkesbury LGA cover the following groups:

- Aged
- Children
- Youth
- Families
- Disabled persons

- Multicultural groups

The Hawkesbury Council does not provide many services itself, rather it is a facilitator of a number of services that are run by the State Government. This provides some problems with the ability of some members of the community being able to access the full range of services available in the more urban parts of the Sydney region. It also set up Peppercorn Community Services to manage and operate Council's externally funded community service. It focuses on disadvantaged, vulnerable or geographically and socially isolated groups within the community. However, is does not provide a comprehensive list of services.

The dispersed nature of settlement in the Hawkesbury and the distance between these settlements makes it difficult to provide essential services equally. There are many black holes where service providers will not go to because of the distance between the office location and the people needing the services. This is especially true for those services which originate from outside the LGA such as aged, disability and family support. This makes the cost of service delivery very high and this is also a reason for the poor provision of services, particularly to the rural areas and especially those further away from Richmond, Windsor, Penrith and Blacktown where most of them are based. The only way to mitigate this is to provide more services which is a budgetary issue for the State Government Department concerned and is beyond the control of Council

Disabled people find it difficult to obtain support services within the LGA and have to travel outside it to Blacktown and Penrith LGAs which makes it difficult to access, particularly if they do not have access to transport. Community Transport services are also very expensive and find it difficult to get to all people and the lack of public transport is also a problem with people travelling out of the LGA to seek support services.

As a result of the lack of services and the lack of transport to get to services, there is a lot of social isolation in the LGA and the rural areas in particular.

The Council has a number of halls and community facilities throughout the LGA and many of these are in the rural areas. Of the eighteen halls and facilities, ten of them are in the rural area or in villages. They provide a focal point for the community and are used for meetings, children's playgroups, mobile pre-schools, exercise classes, markets and other community services. Photo 4.4 shows the East Kurrajong Hall, which is used for a range of uses including exercise classes, markets, art classes, lending library and as a place for the community to meet each month at its open days. This is an example of the types of facility and the services provided throughout the rural parts of the Hawkesbury LGA.

Photo 4.4: East Kurrajong Hall
Date of Photo: August 2019

4.2.12. Heritage

It is important to consider the heritage of the area when looking at the future of the LGA. This includes both European and Aboriginal heritage values. There is a substantial number of listed sites of European heritage as well as some knowledge of the Aboriginal heritage.

Whist most of the European Settlement is evidenced in the urban areas, there is some significant items in the rural landscape. This includes old houses, buildings and former sawmills and other evidence of local industrial history as well as many slab barns. Many heritage items are listed in the Local Environmental Plan. This ensures that they are considered when any development is proposed on the land.

Photo 4.5 shows the Settlers Arms Hotel at St Albans which is a significant heritage item and is listed in the Heritage Schedule of the Hawkesbury LEP 2014. It is an example of the rich heritage resources that are located in the rural villages as well as the rural lands of the LGA.

Photo 4.5: Heritage Item at St Albans
Date of Photo: August 2019

4.3. Environmental Opportunities and Constraints

4.3.1. Climate Change

The climate of an area is very important and has a direct impact on the economic, social and environmental aspects of that area. "The landscape, and the plants and animals in it, are all determined to a large extent by climate acting over long intervals of time" (Pittock, 2009) p1 This is relevant to the rural lands of Hawkesbury because climate change has an impact on growing of plants and raising of animals. Hawkesbury is the most significant grower of vegetables and turf in NSW and also is a significant producer of eggs and poultry meat. These are impacted by hot and dry conditions, both of which are predicted to continue into the future. The hot and dry conditions also have an impact on the many rural residential uses because many of them rely on rainwater tanks and these often run dry during long periods of dry conditions. This then puts a strain on the potable water supply because they purchase water which is sourced from the metropolitan water supply.

The Intergovernmental Panel on Climate Change (IPCC) produced the fifth report on the assessment of the causes, impacts and possible response strategies to climate change worldwide in 2013. This is the most recent assessment report and the IPCC are currently working on the sixth assessment report. The fifth assessment report has found that "*Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions*" (IPCC, 2013) p17

The IPCC are currently in the process of preparing the sixth assessment report and in 2016 decided to prepare three special reports as follows:

- Global Warming of 1.5°C prepared in 2018
- Climate Change and Land prepared in 2019
- The Ocean and Cryosphere in a Changing Climate prepared in 2019

Each of these reports has built on the work of the previous IPCC assessment reports and with new research and analysis, they have all concluded that the climate is changing at a faster rate than before. This has also been confirmed by the World Meteorological Organisation's latest report on global climate titled *WMO Statement on the State of the Global Climate in 2019* which found that the year 2019 was the second warmest year on record and that the years 2015 to 2019 were the top five warmest years in the global temperature record and the last decade (2010-2019) is also the warmest on record. The report also says that "climate-related events have already posed risks to society through impacts on health, food and water security as well as human security, livelihoods, economies, infrastructure and biodiversity" p27 (World Meteorological Organization, 2020) The IPCC report on the impacts of global warming mentioned above states that the average global temperature for the ten years from 2006 to 2015 was 0.86°C above the pre-industrial baseline (IPCC, 2018).

The report on Climate Change and Land has revealed that global land use (ice-free) is made up of the following components (IPCC, 2019a) :

- Infrastructure: 1%
- Cropland 12% (Irrigated 2% non-irrigated 10%)
- Pasture for grazing 37% (intensive 2%, used savannahs and shrublands 16% extensive pastures 19%)
- Forests 22 % (plantation 2%, timber and other uses 20%)
- Other land uses 28% (unforested ecosystems with minimal human use 7%, forests with minimal human use 9%, other land including bare or rocky 12%)

> *"Land provides the principal basis for human livelihoods and well-being including the supply of food, freshwater and multiple other ecosystem services, as well as biodiversity. Human use directly affects more than 70% of the global ice-free land surface. Land also plays an important role in the climate system."* (IPCC, 2019a) p2

The report discussed the important role that land plays in the climate system and found that land use change and speedy intensification of land use have allowed for increasing production of food, feed and fibre. It notes that about one quarter of the global ice-free land area is subject to human induced land degradation and that climate change exacerbates land degradation. It notes that the mean land surface air temperature has increased 1.53°C over the pre-industrial period (1850 -1900). This warming has resulted in increased frequency, intensity and duration of heat related events, the frequency and intensity of droughts has been observed as has the increase in the intensity of heavy rainfall events. Climate change has already affected food production because of warming of the atmosphere, changing rainfall patterns and greater frequency of some extreme events. The report also found that climate change creates added stresses on land which aggravates the existing risks to livelihoods,

biodiversity, human and ecosystem health, infrastructure and food systems. The report has found that urban expansion is projected to lead to conversion of cropland which will lead to losses in food production which can result in additional risks to the food system. Section 4.2.4 of this Strategy has revealed that food growing land in Sydney is being redeveloped for urban expansion. It is noted that the global amount of cropland is 12%, and irrigated cropland makes up 2% of the total land surface, vegetables form part of the irrigated cropland, and the importance of the Sydney Peri-Urban area and Hawkesbury as an irrigated vegetable growing area has been highlighted in section 2.9.1. The report makes the comment that strategies that could be aimed at reducing the impacts can include encouraging urban and peri-urban agriculture and the management of urban expansion as well as potentially urban green infrastructure can all help to reduce climate risks in cities. It is noted that the Hawkesbury LGA is the number one perishable vegetable producing LGA in NSW and that this is one of the strategies in the Greater Sydney Region Plan. The role that Hawkesbury Council can play in preserving agricultural land is discussed in Chapter Six.

The Climate Change and Land report has a section dealing with the impacts of urbanisation and makes particular note of its impact on food. The United Nations World Urbanisation Prospects 2018 Revision reports that 55.3% of the World's population was urbanised and this is projected to reach 60.4% by 2030 and 68.4% by 2050. Australia's urban population was 86% in 2018 and is projected to reach 87.6% by 2030 and 91% by 2050 (United Nations Department of Economic and Social Affairs Population Division, 2018). Urban areas are also expected to absorb nearly all of the World's future population growth (United Nations Department of Economic and Social Affairs Population Division, 2019) Following are key messages about the impact of urbanisation on climate change(IPCC, 2019a):

- Currently urban areas cover between 0.4 and 0.9% of the global land surface;
- Urban areas generate about three-quarters of the global total carbon emissions from energy use;
- Urban food consumption is a large source of these anthropogenic greenhouse gas emissions;
- Climate change is expected to increase the energy demand of people living in urban areas;
- Urbanisation also contributes to forest degradation, converts neighbouring agricultural, forested and otherwise undeveloped land to urban use which alters the natural and semi-natural ecosystems both within and outside urban areas;
- Urbanisation is a major driver of land degradation;
- Highly productive lands are experiencing the highest rates of conversion to urbanised landscapes, thereby affecting food security;
- Loss of agricultural land and increased pollution and waste are some of the key challenges arising from urban growth;
- Urban sprawl is projected to consume between 1.8 and 2.4% of the current amount of cultivated land by 2030 and 5% by 2050.

The Food and Agriculture Organisation (FAO) of the United Nations estimates that the world's arable land is 10.8% of the total land mass (FAO, 2019) and for Australia it is 4.0% of the total land mass.

The third report (IPCC, 2019b) recently released has shown that over the last decades, the impact of global warming has led to widespread shrinking of the cryosphere with a loss of ice sheets and glaciers, reductions in snow cover and Arctic sea ice extent and thickness as well as increases in the temperature of permafrost. The report has also found that the global ocean temperature has warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system and since 1993 the rate of ocean warming has more than doubled. The impact of absorbing more carbon dioxide is that the ocean has undergone increasing surface acidification and there has been a loss of oxygen from the surface to 1,000 metres below the surface. This has in turn led to a rise in global mean sea level and this has accelerated in recent decades due to increasing rates of ice loss from Greenland and Antarctic ice sheets as well as a continuation of the loss of glacier mass and ocean thermal expansion. The increases in tropical cyclone winds and rainfall along with increases in extreme waves when combined with relative sea level rise exacerbate sea level events and coastal hazards. The report notes the importance of the ocean and cryosphere for people by emphasising that all people on earth depend indirectly or directly on the ocean and the cryosphere.

The CSIRO and the Bureau of Meteorology have released a report dealing with the impacts of climate change on the Australian continent. The document titled *State of the Climate 2018* (Bureau of Meteorology & CSIRO, 2018) provides the most up to date summary of long term climate trends in Australia The Report discusses the concept called 'compound events'. It is noted that *" … historically significant weather and climate events are often the result of the combined influence of extremes in multiple variables occurring simultaneously* (Bureau of Meteorology & CSIRO, 2018) p8. It notes that climate change can have a significant effect on the frequency, size and impact of some types of compound events.

In its most recent Climate Statement for 2019, the Bureau of Meteorology (Bureau of Meteorology, 2020) found the following for 2019:

- The warmest year on record for NSW and Australia
- Australia's driest year on record
- Both mean annual maximum and minimum temperatures above average for all States and the Northern Territory
- Annual national mean maximum temperature warmest on record (2.09 C above average)
- Widespread warmth throughout the year; January, February, March, April, July, October, and December all amongst the ten warmest on record for Australian mean temperature for their respective months
- Significant heatwaves in January and in December
- Nationally-averaged rainfall 40% below average for the year at 277.6 mm
- Rainfall below average for most of Australia

- Much of Australia affected by drought, which was especially severe in New South Wales and southern Queensland
- Widespread severe fire weather throughout the year; national annual accumulated Forest Fire Danger Index highest since 1950, when national records began

The Climate Council has recently published its latest report on the Australian climate and its causes. The Angriest Summer report (Steffen, Dean, Rice, & Mullins, 2019) has found the following:

- The summer of 2018 – 19 was characterised by prolonged, nation-wide heatwaves and record hot days, bushfires all over the continent as well as heavy rainfall and flooding in northern Queensland.
- The record-breaking heat was driven by greenhouse gas pollution from the burning of fossil fuels like coal, oil and gas as well as land clearing and this is a long-term warming trend.
- NSW had the hottest summer on record (3.41^{o}C above average)

The Climate Council has also recently published a report on the costs of climate change. This report is titled *Compound Costs: How Climate Change is Damaging Australia's Economy* (Steffen, Mallon, Kompras, Dean, & Rice, 2019) and it makes the following key findings:

- Climate change is a major threat to Australia's financial stability, and poses substantial systemic economic risks.
- The economic damage to Australia's property and agricultural sectors will be very significant.
- The property market is expected to lose $571 billion in value by 2030 due to climate change and extreme weather, and will continue to lose value in the coming decades if emissions remain high.
- Extreme events like droughts, heatwaves, cyclones and floods have an impact on agriculture and food production; this is already affecting Australia's economy and will cost us much more in the future.

The report has a section detailing the costs of climate change on the food system and it makes for following comments:

- Australia is one of the most vulnerable developed countries in the world to the impacts of climate change.
- Extreme events like drought, heatwaves, cyclones and floods affect both production and value chains.
- The food sector is also vulnerable to the more chronic effects of ongoing climate change, like rising temperatures, changing rainfall patterns, and the persistent damage caused by repeated extreme events.
- Rural exports declined by 23% ($2 billion) during the 2002-3 drought, whilst overall food prices rose by 4.4%, twice the rate of the Consumer Price Index.
- The current drought has already reduced farm output by 6% and total GDP by about 0.25%.

- *By* 2050, without mitigation, we are projected to lose half the irrigated agricultural output of the Murray-Darling Basin, which is currently worth about $7 billion per year and accounts for roughly half of Australia's irrigated agricultural production.

This will put even more pressure on the peri-urban areas to produce vegetables, which as has been noted in section 2.9.1, are not a significant commodity in the Murray Darling Basin (25%) This has implications for Hawkesbury as the number one vegetable producing LGA in NSW..

The NSW Office of Environment and Heritage have published a document on climate change in the Sydney Metropolitan Area titled Metropolitan Sydney Climate Change Snapshot which was published in 2014. This report has projected the following for temperature:

- Maximum temperatures increasing by 0.7^{o}C by 2030;
- Maximum temperatures increasing by 1.9^{o}C by 2070;
- Minimum temperatures increasing by 0.6^{o}C by 2030;
- Minimum temperatures increasing by 2.0^{o}C by 2070;

Overall, there is projected to be more hot days and fewer cold nights. There will also be more days with temperatures over 35^{o}C. "The greatest increase is projected for Western Sydney and the Hawkesbury, with an additional 5-10 days in the near future (2030), increasing to 10-20 additional hot days per year by 2070." (NSW Office of Environment and Heritage, 2014) p10.

The Snapshot makes the following comments about rainfall:

- Rainfall is projected to decrease in spring and winter;
- Rainfall is projected to increase in summer and autumn;

"Rainfall changes are also associated with changes in the extremes, such as floods and droughts …" (NSW Office of Environment and Heritage, 2014) p12.

The data presented above shows that impacts of climate change on agriculture in the Hawkesbury will vary. The rise in temperatures, especially the number of hot days will have an impact on vegetables with the potential of burning of the leaves as well as needing to put more irrigation water on the plants. This will also be the same for turf growing and fruit. The increase in summer rainfall has the potential to affect the market gardens, especially with the increase in flooding and heavy rainfall because it can have an impact on the ability to harvest the vegetables because of vehicles not being able to access the saturated paddocks. Turf farming is expected to have less impact. The orchard industry will be affected, particularly apples which need cold weather. This will lead to the need to adapt by planting different varieties.

4.3.2. Topography

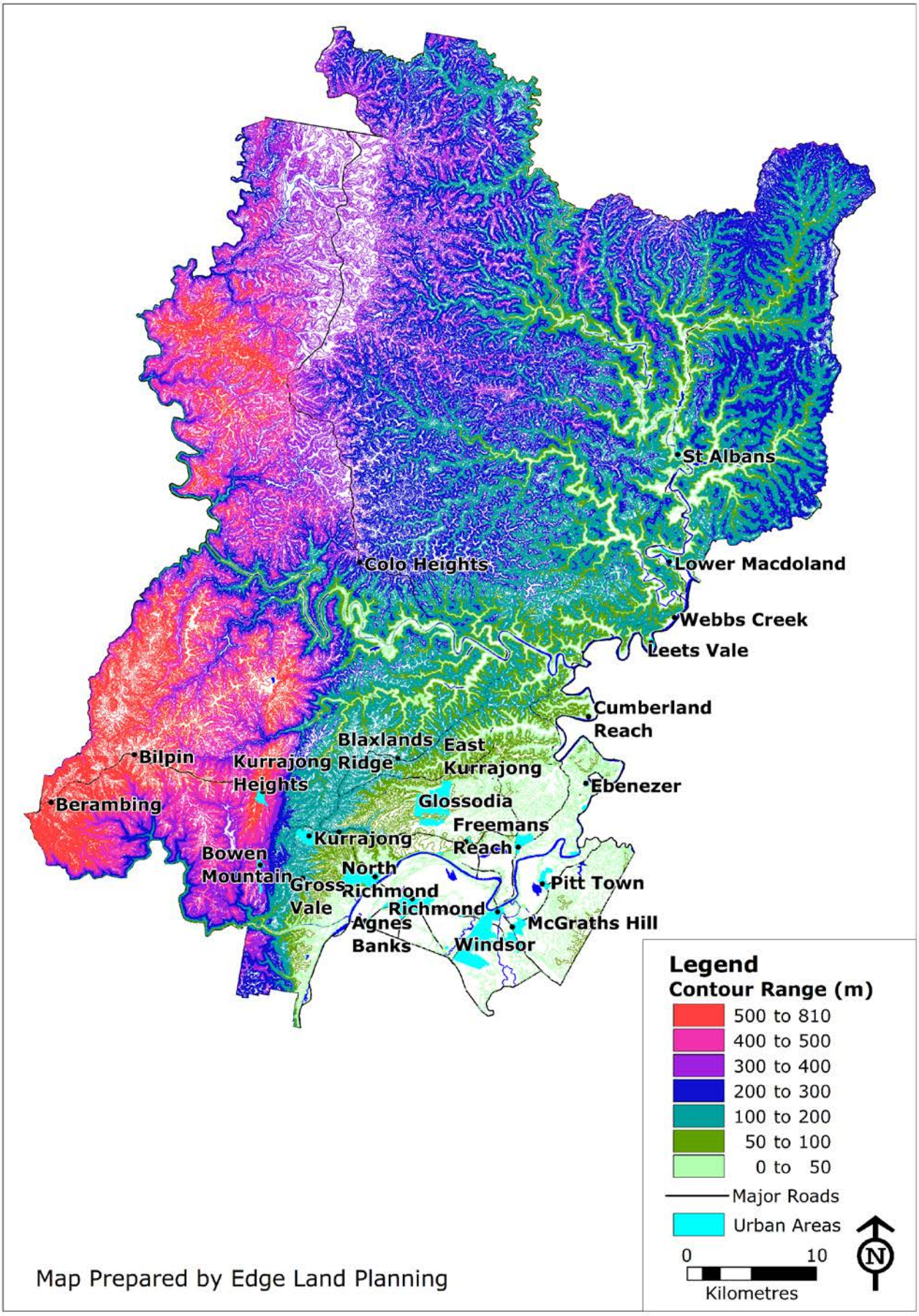
The topography of the Hawkesbury LGA can be described as mostly hilly in the north and west with some steep valley sides of the creeks and rivers to flat to undulating

land in the south. The topography can be seen from maps 4.2 for the LGA and map 4.3 for the southern part which shows the contour lines and the topography can be seen by the different colours of the lines which range from high land in red to low land in grey. When the lines are close together, it is steep land and when they get further apart, it flattens out. Photos 4.6, 4.7, 4.8 and 4.9 show the varied topography.

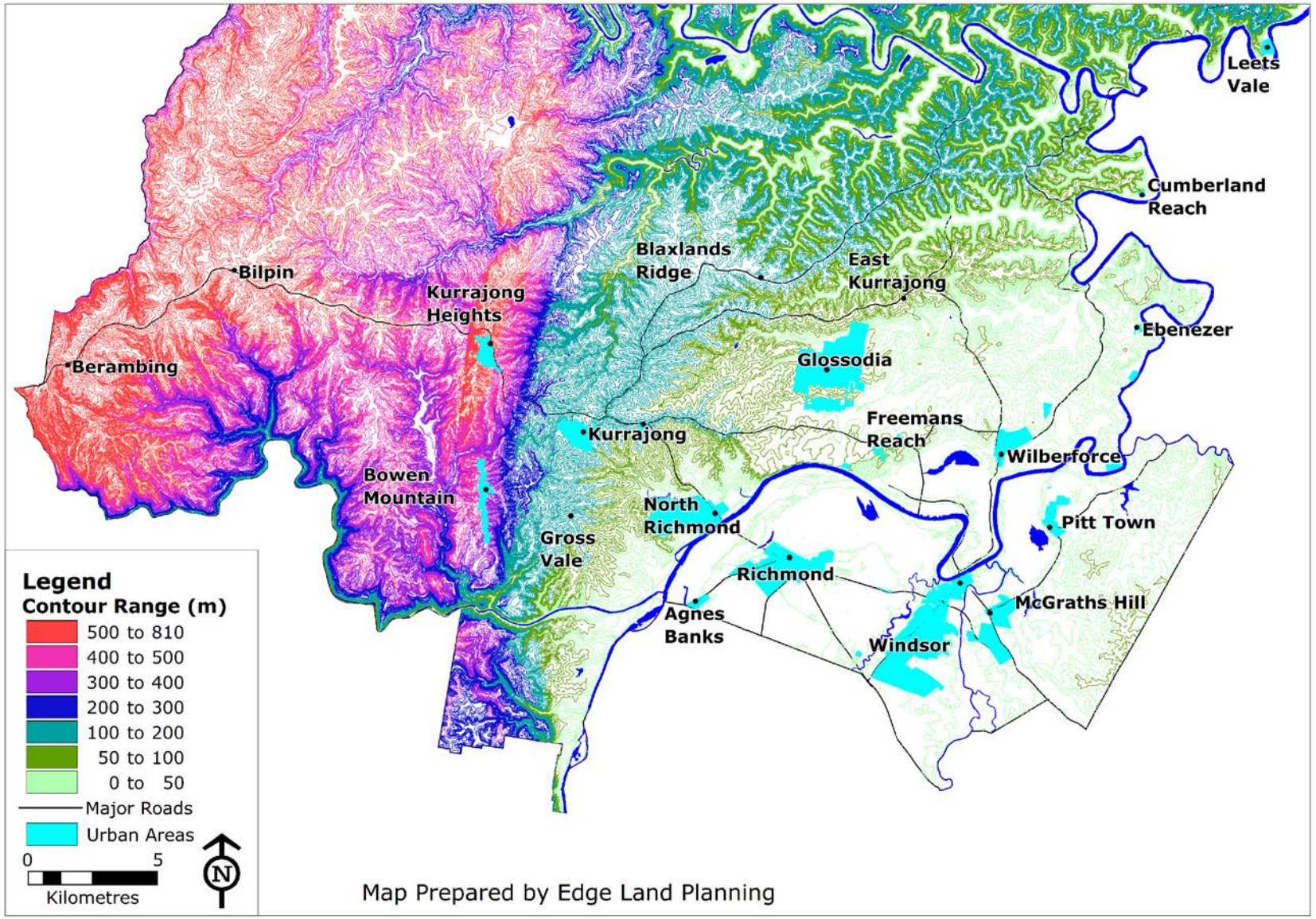
The topography of an area is important because land with a slope can become unstable and when the soil is disturbed, can lead to erosion. A lot of sloping land is also heavily vegetated and so this has to be considered.

The variety of landforms within an area can contribute to the rural landscape character and provide a setting for the settlement areas.

The topography of an area has an impact on the ability to grow agriculture. Flat land is suitable for crops and in the case of Hawkesbury, this includes the alluvial floodplain of the Hawkesbury River. Flat land is also more suited to intensive animal keeping such as poultry and horse studs. Orchards are grown on both flat land along the rivers (citrus) and land in the Bilpin area because of the higher altitude which is more conducive to growing apples and stone fruit. Grazing of livestock is carried out on both flat and hilly land with a lot of livestock being grazed on hilly land in association with rural residential development.



Map 4.2: Topography LGA



Map 4.3: Topography South

Photo 4.6: Topography in the Northern Valleys
Date of Photo: August 2019

Photo 4.7: Topography in the South West slopes
Date of Photo: August 2019

Photo 4.8: Topography in the Bilpin area
Date of Photo: August 2019

Photo 4.9: Topography along the Hawkesbury River
Date of Photo: August 2019

4.3.3. Rivers and Creeks

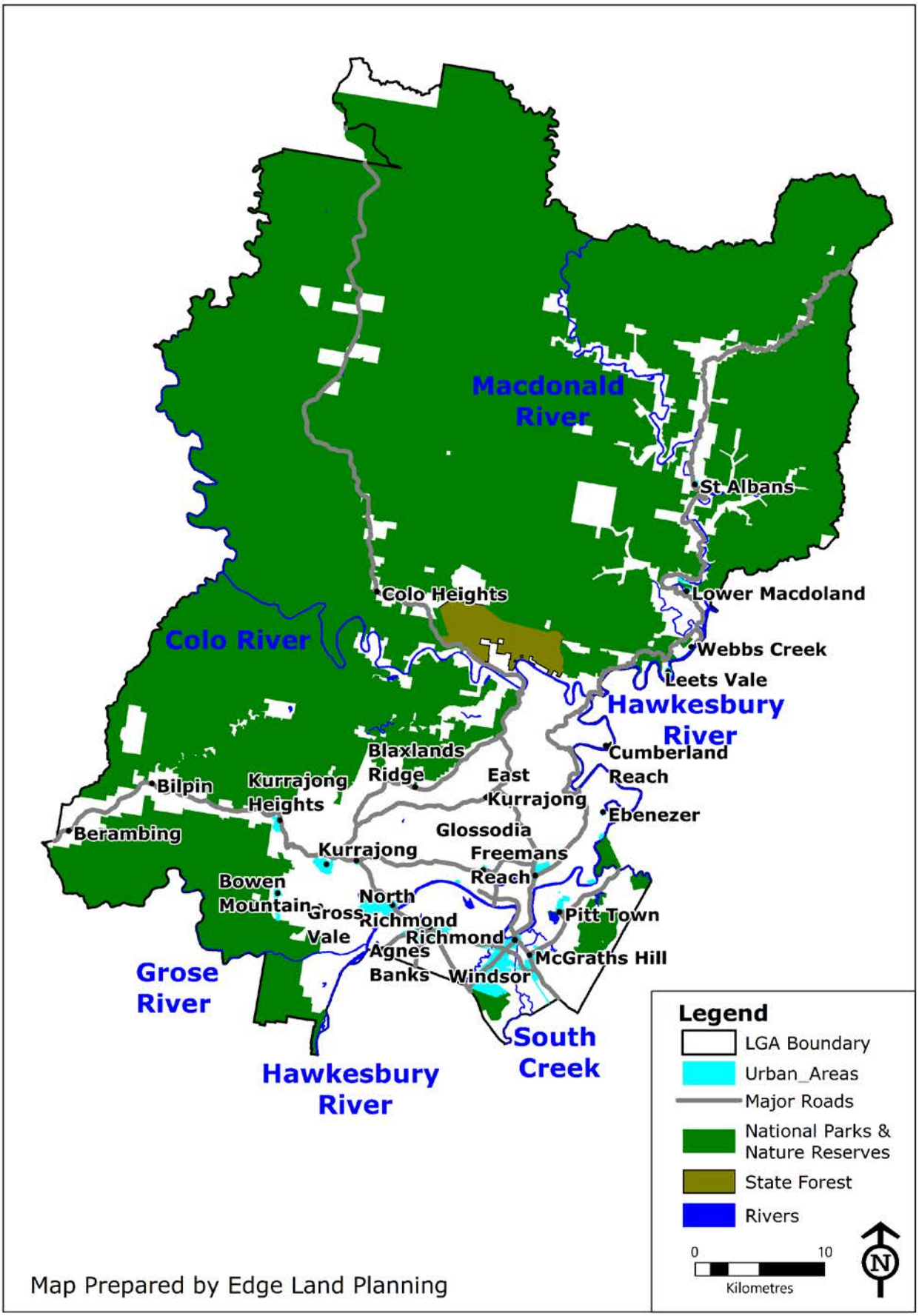
The Hawkesbury LGA is in the Hawkesbury Nepean Catchment. There are five major waterways that flow through the LGA as follows:

- Hawkesbury River
- Macdonald River
- Colo River
- Grose River
- South Creek

There are also a number of creeks that form tributaries to these main five waterways. Map 4.4 shows the rivers within the LGA and photo 4.10 shows the Colo River

The provision and conservation of water is a major issue for the future of the Hawkesbury LGA. There is a need to ensure that the integrity of the waterways are protected from inappropriate land uses. This is important because of the amount of irrigation water that is taken out of the river as well as the drinking water for North Richmond which is extracted from the Hawkesbury River. The remainder of the LGA is supplied from Prospect Reservoir via Warragamba Dam and the Upper Nepean water supply system.

Photo 4.10: Colo River
Date of Photo: July 2019



Map 4.4: Rivers

There are many things that can cause the waterways to become stressed. Some are as follows:

- Nutrients from urban areas, rural residential, waste disposal and intensive agriculture;
- Dams and water diversions;
- Extraction from rivers and streams – both licensed and unlicensed;
- Flooding and drainage associated with the differing topography;
- Turbidity caused by soil erosion;
- Filling of land;
- Inappropriate development controls on existing uses; and
- Loss of indigenous riparian vegetation.

These are all relevant to the Hawkesbury because rivers and creeks are used for irrigation of crops not only in this LGA but also in downstream LGAs. In addition, there is a need to ensure that the quality of the water in the rivers is kept high because of the large amount of recreational use of the Rivers for swimming and water skiing.

4.3.4. Native Vegetation and Biodiversity

The native vegetation of the LGA is an important resource that is essential to ecological and land management as well as contributing to the visual landscape of the LGA. It is an important component of the LGA because it provides habitat for native flora and fauna as well as being a landscape and visual feature.

The rural lands are covered with as significant amount of native vegetation which is on a mixture of private and public land – both in dense and scattered patches. The total area of National Parks, Nature Reserves and State Forests comprises 72.5% of the total area of the LGA.

Of this, it is identified that the Greater Blue Mountains Area within the Hawkesbury LGA contains over 161,000 Ha of World Heritage listed national parks, which is over 58% of the LGA. The Greater Blue Mountains World Heritage Area Strategic Plan provides broad principles for the integrated management, protection, interpretation and monitoring of the World Heritage property. The Greater Blue Mountains World Heritage Area Strategic Plan identifies that management of the adjacent areas needs to be consistent with the protection of the World Heritage values. The Greater Blue Mountains World Heritage Area Strategic Plan identifies that Councils of the local government areas adjoining the Greater Blue Mountains World Heritage Area will play a key role in implementing the Greater Blue Mountains World Heritage Area Strategic Plan.

The ten key management principles outlined in the Greater Blue Mountains World Heritage Area Strategic Plan include Integrity and Major impacts related to urban and industrial development. The potential for impacts on the integrity of the Greater Blue Mountains World Heritage Area arise largely from its long and complex boundary and large number of adjoining landholders and land uses.

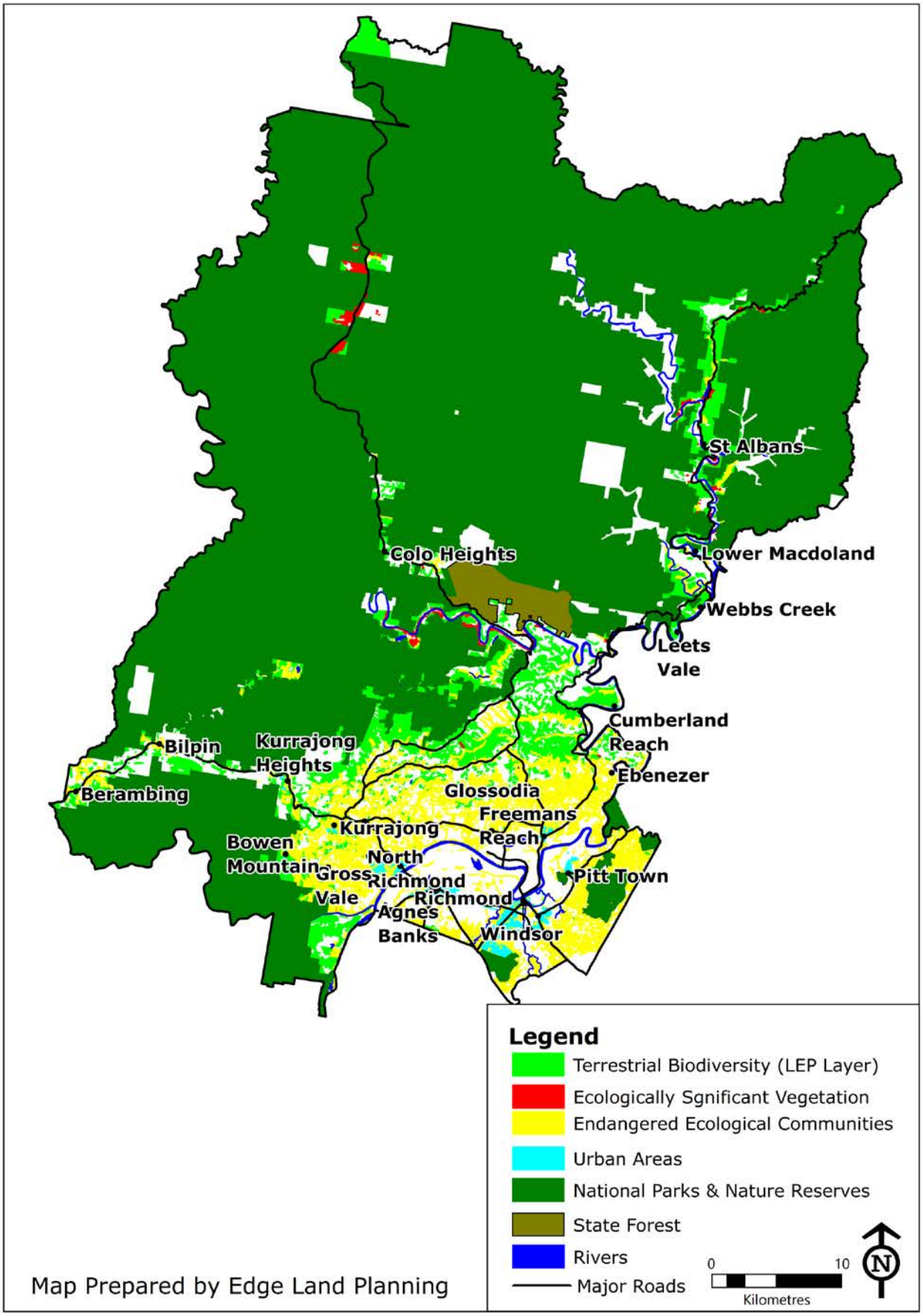
Therefore, the Greater Blue Mountains World Heritage Area Strategic Plan confirms that complementary management of adjoining land by both private landholders and government agencies is critical to maintenance of the area's integrity. The Greater Blue Mountains World Heritage Area Strategic Plan also recognises the importance of ensuring that adjoining land uses are compatible with the conservation and presentation of World Heritage values.

Based on this, relevant planning provisions and controls should be developed for planning adjacent to the Greater Blue Mountains World Heritage Area, including:

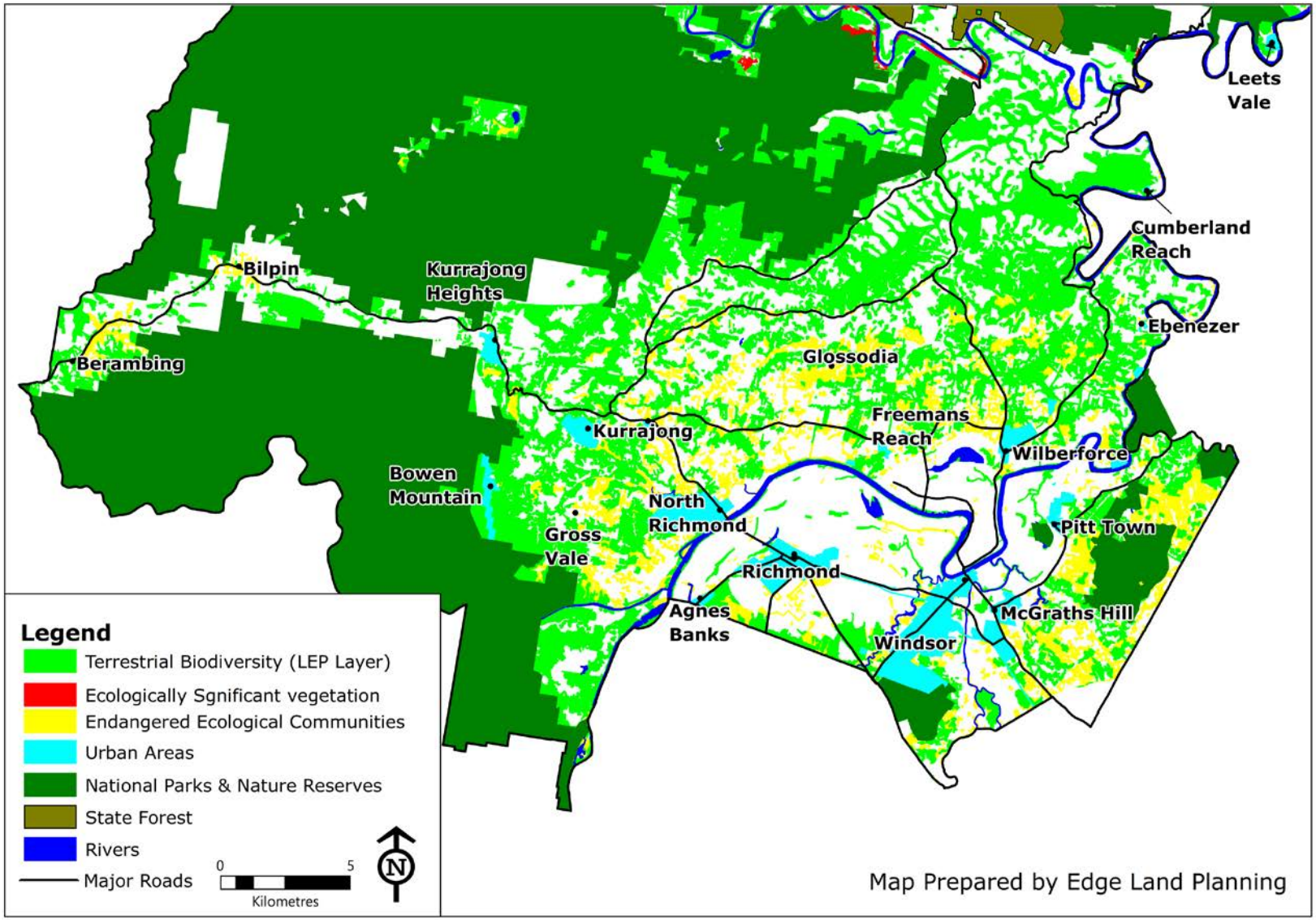
- prevention of intensification of land subdivision
- recognition of bush fire hazards, development within catchments flowing into the area, and potential for weeds and feral animals to be introduced into the area from private land
- Aboriginal cultural heritage, which is a key attribute of the Greater Blue Mountains World Heritage Area and of the rural landscapes of the LGA.

The Biodiversity of the LGA can be seen from map 4.5 for the LGA and 4.6 for the southern part which shows the National Parks, Nature Reserves and State Forests plus the Terrestrial Biodiversity Layer from the LEP as well as Ecologically Significant Vegetation and areas of Endangered Ecological Communities.

Photo 4.11 shows the scattered nature of this vegetation in The Slopes and photo 4.12 shows the dense vegetation in the Colo area which also includes the Whatleys Creek Wetland.



Map 4.5: Biodiversity LGA



Map 4.6: Biodiversity South

Photo 4.11: Scattered Native Vegetation in The Slopes
Date of Photo: August 2019

Photo 4.12: Dense Vegetation and Whatleys Creek Wetland
Date of Photo: August 2019

In the context of Hawkesbury rural lands, it is important to recognise that all land use decisions will have an impact on the biodiversity of the area. It is important therefore to take into consideration the impact on biodiversity when thinking about changing the use of the land.

The biodiversity of Hawkesbury's rural lands needs to be protected when carrying out any planning exercise. This includes clearing of land for agricultural development as well as rural residential and urban development. There are also implications for the conservation and expansion of existing wildlife corridors or linkages. There is

significant vegetation and biodiversity habitat in road reserves which should be conserved as they can form wildlife linkages. It is important to note that although large parts of the LGA are conserved as National Parks, there are also large areas of bushland remain on private land.

Ecosystem services are important to the functioning of rural areas. It has been defined in a recent report prepared for the Commonwealth Department of Agriculture, Fisheries and Forestry titled *Ecosystem Services Report* as follows:

> *"The term 'ecosystem services' has been used to denote the transformations of resources that can be turned into benefits by humans. A typical definition is the direct and indirect contributions of ecosystems to human well-being"*. (Australia 21, 2012 pvi)

The use of land for rural residential development, particularly on sloping land has the potential to impact on the biodiversity values and the ecosystem services they bring. Agriculture also has the potential to impact on biodiversity and so there is a need to consider this when doing any development of land.

4.3.5. Agricultural Land Classification

Mapping of land for its suitability for agricultural land has been carried out by the Department of Primary Industries and the Department of Planning and Environment. This has been done in two ways – Agricultural Land Suitability Mapping and Biophysical Strategic Agricultural Land (BSAL). In addition, the Office of Environment and Heritage has mapped NSW to prepare a set of Land and Soil Capability maps.

The agricultural land classification mapping prepared by the DPI shows five classes of land ranging from one being the highest to five being the lowest. The description of the classes are as follows (Hulme, Grosskopf, & Hindle, 2002):

- *Class 1:* Arable land suited to continuous cultivation1 for uses such as intensive horticulture and field crops. Constraints to sustained high levels of production are absent or minor.
- *Class 2:* Arable land suitable for regular cultivation for crops but not suited to continuous cultivation. It has a moderate to high suitability for agriculture but edaphic (soil factors) or environmental constraints reduce the overall level of production and may limit the cropping phase to a rotation with sown pastures.
- *Class 3:* Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with sown pasture. The overall production level is moderate because of edaphic factors or environmental constraints. Erosion hazard, soil structural breakdown or other factors including climate may limit the capacity for cultivation, and soil conservation or drainage works may be required.
- *Class 4:* Land suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high, but the overall production level is low as a result of major environmental constraints.

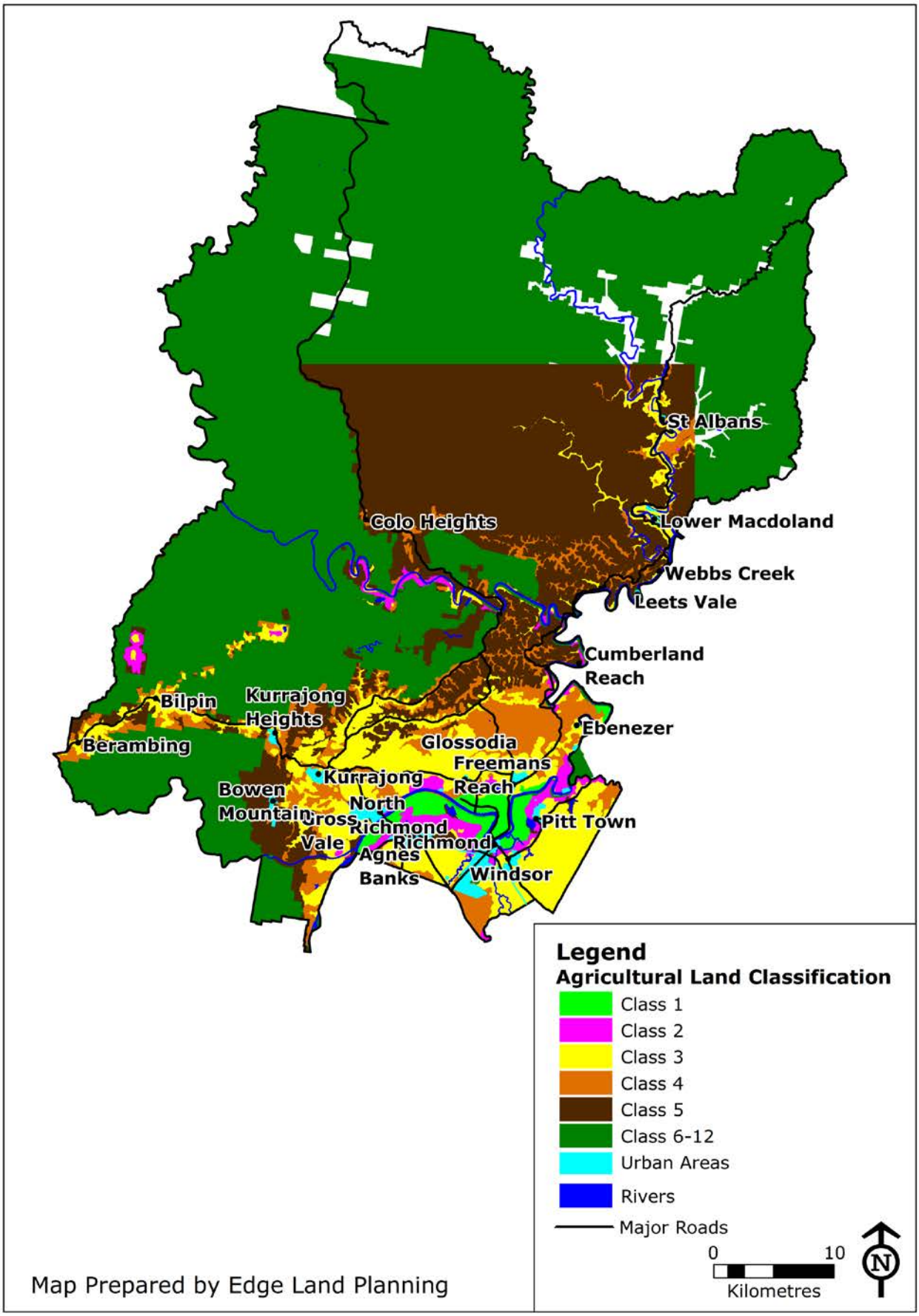
- *Class 5:* Land unsuitable for agriculture or at best suited only to light grazing. Agricultural production is very low or zero as a result of severe constraints, including economic factors which preclude land improvement.
- *Classes 6 – 12:* This is land that is not suitable for agriculture and includes urban areas, waterways, National Parks and Nature Reserves, State Forests and Crown Land.

The Classes one to three are regarded as being high class agricultural land that is suitable for cropping. The main difference between class one and two from class three is that class one and two land is normally land on alluvial floodplains and is the more fertile. Class three land is capable of growing horticulture which is the case in the LGA.

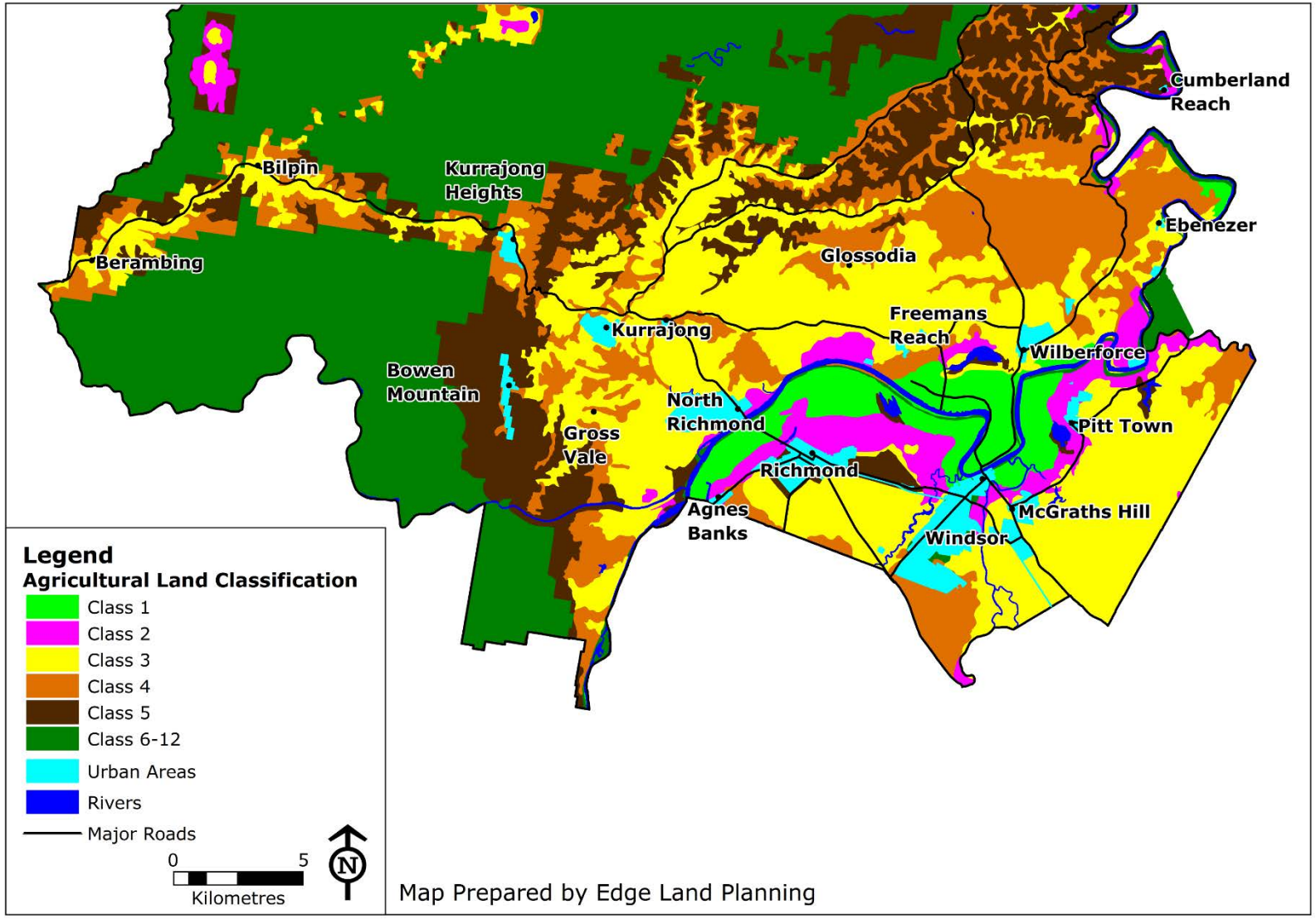
Table 4.1 shows the area of land in each of the land classes, the location and the most suited types of agriculture. Map 4.7 shows the Agricultural Land Classification for the LGA and map 4.8 shows it for the southern part of the LGA.

Table 4.1: Agricultural Land Classification

Agricultural Land Class	Area (ha)	% of Total	Location	Farming Practices
1	3,934	1.8%	Alluvial river flats of Hawkesbury River	Market Gardening, Turf Farming, Orchards
2	5,664	2.6%	Alluvial river flats of Colo and Hawkesbury Rivers, Mountain Lagoon and Mt Tootie	Market Gardening, Turf Farming, Orchards
3	102,238	46.3%	Slopes from Yarramundi to Grose Vale, Glossodia and Wilberforce. South Eastern part of the LGA	Limited market gardening and orchards, grazing of cattle, horses and other livestock
4	27,877	12.6%	Hilly to steep land to the west of class three land as well as land with sandstone geology north and east of Blaxlands Ridge	Grazing of cattle, horses and other livestock
5	81,298	36.8%	Heavily vegetated land and steep land	None
Total	**221,012**	**100%**		



Map 4.7: Agricultural Land Classification LGA



Map 4.8: Agricultural Land Classification South

4.3.6. Soils

The maintenance of soil is a major consideration and there is a need to consider the impacts of land degradation, especially soil erosion and salinity. It is both a management issue as well as being associated with the future development of the land.

Soil erosion and sedimentation is an issue which becomes worse, as the uses become more intensive and where inappropriate land management occurs. Soil erosion can occur in conjunction with market gardening on sloping land. It is also an issue for the more steeply sloping land and the construction of dwellings, particularly rural residential uses which tend to be on smaller lot sizes.

Soil erosion becomes more of a problem in areas where the soil is of a poor quality and any disturbance of them often leads to more rapid land degradation.

Land capability is an important aspect of development and its impact on soils. Development should only be done on land that is capable of supporting it. For this reason, land that is steep or prone to erosion should be avoided. In addition, land on the banks of rivers and creeks should only be developed if there has been adequate ameliorative measures put in place to ensure that it does not have any impact on the quality of the water in the waterways. Farming will be the use that has the most impact on land capability. For this reason, it is important to encourage the use of best practice in farming. This will ensure that the health of the soils is improved.

This is an issue for the environment as well as the human impact of development.

4.3.7. Bushfire Hazard

The protection of the identified community assets is a key issue as is the preservation of biodiversity when considering the issue of bushfires. The impact of bushfires on the rural land in Hawkesbury is related to the topography and soil types / geology. It is also a function of the climatic conditions over the preceding years and the current fire season which in turn are impacted by climate change.

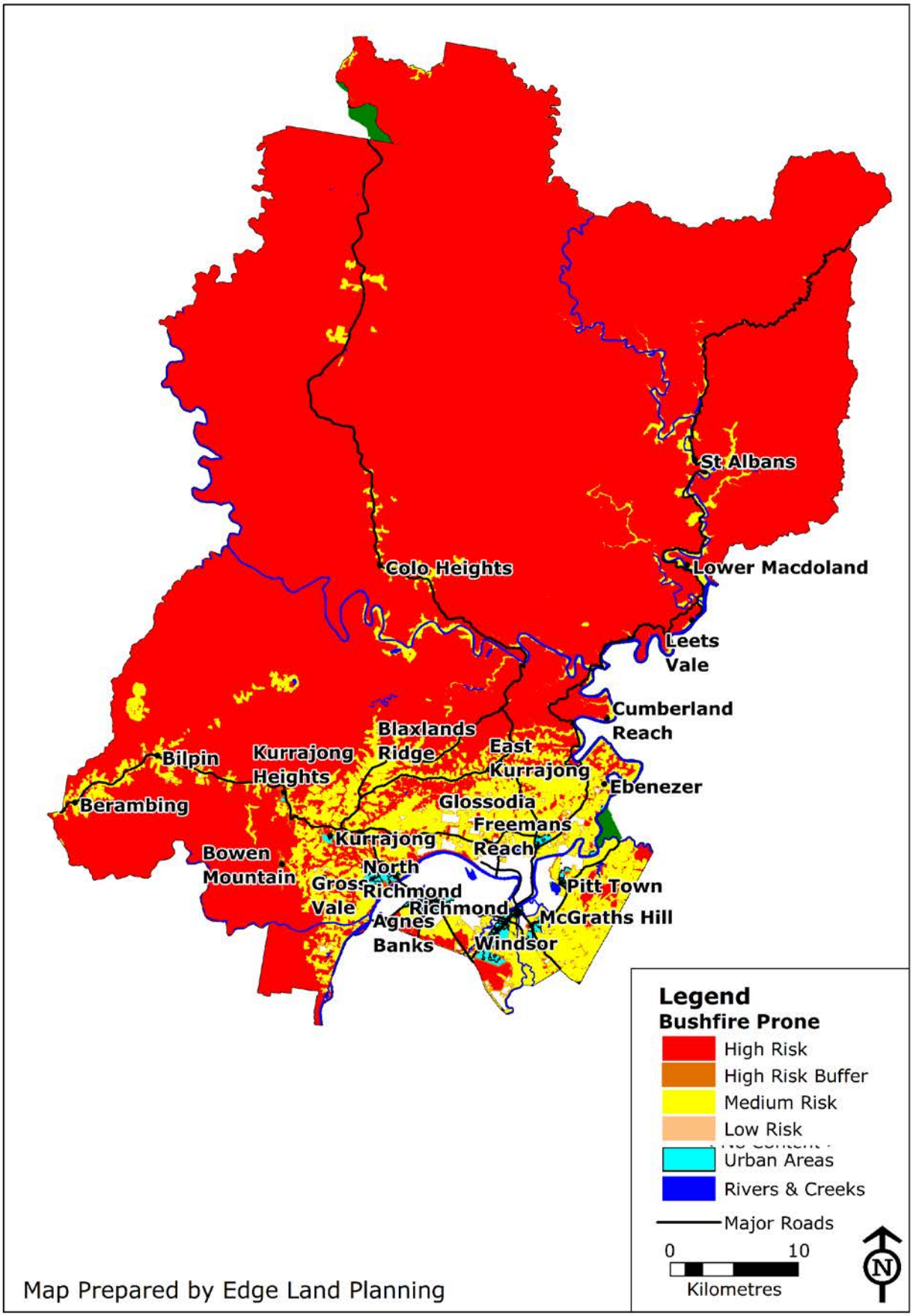
The Rural Fire Service have a 'statutory' bushfire danger period which is from 1 October to 31 March each year and basically corresponds to the warmer months of the year. However, in recent years this has been extended at both ends of the period due to local conditions being dry and hot. The bushfire hazard is also increased in times of drought. When this is combined with periods of very hot and windy weather, it can lead to extremely high bushfire hazard which, can cause fires to ignite or become larger in size.

Bushfires can be ignited by dry lightning strikes, ember attack from an existing bushfire as well as human related causes – deliberate and accidental – including use of equipment, discarded cigarettes, arson and burning off of debris.

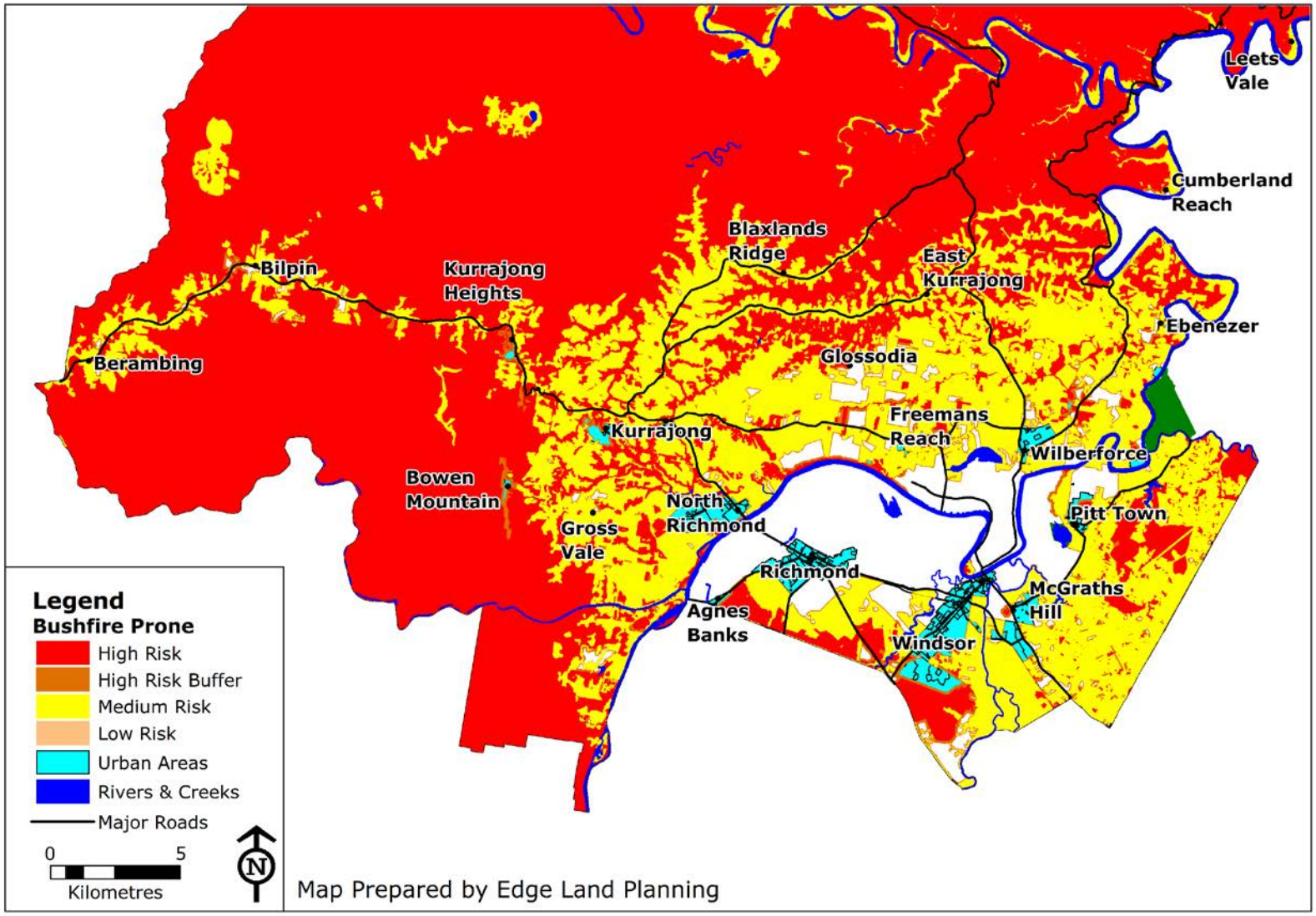
Map 4.9 shows the bushfire prone land in the LGA and map 4.10 shows the southern part. It can be seen that the majority of the rural lands are bushfire prone, with the exception of the cleared land to the south of the LGA.

The RFS have defined the categories of bushfire prone land as follows:

> *"Vegetation Category 1 is considered to be the highest risk for bush fire. It is represented as red on the bush fire prone land map and will be given a 100m buffer. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production. Vegetation Category 1 consists of Areas of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations.*
>
> *Vegetation Category 2 is considered to be a lower bush fire risk than Category 1 and Category 3 but higher than the excluded areas. It is represented as light orange on a bush fire prone land map and will be given a 30-metre buffer. This vegetation category has lower combustibility and/or limited potential fire size due to the vegetation area shape and size, land geography and management practices.*



Map 4.9: Bushfire Prone Land



Map 4.10: Bushfire Prone Land South

Vegetation Category 3 is considered to be medium bush fire risk vegetation. It is higher in bush fire risk than category 2 (and the excluded areas) but lower than Category 1. It is represented as dark orange on a Bush Fire Prone Land map and will be given a 30-metre buffer. This category consists of grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands." (NSW Rural Fire Service, 2015)

Analysis of the map has been done to illustrate the percentage of the LGA that is in each of the categories and this is provided in figure 4.2 which shows that a total of 96.8% is bushfire prone with the majority of that being high risk. However, it is noted that a large majority of this is National Parks, Nature Reserves and State Forests and these make up 45% of the area of the entire LGA.

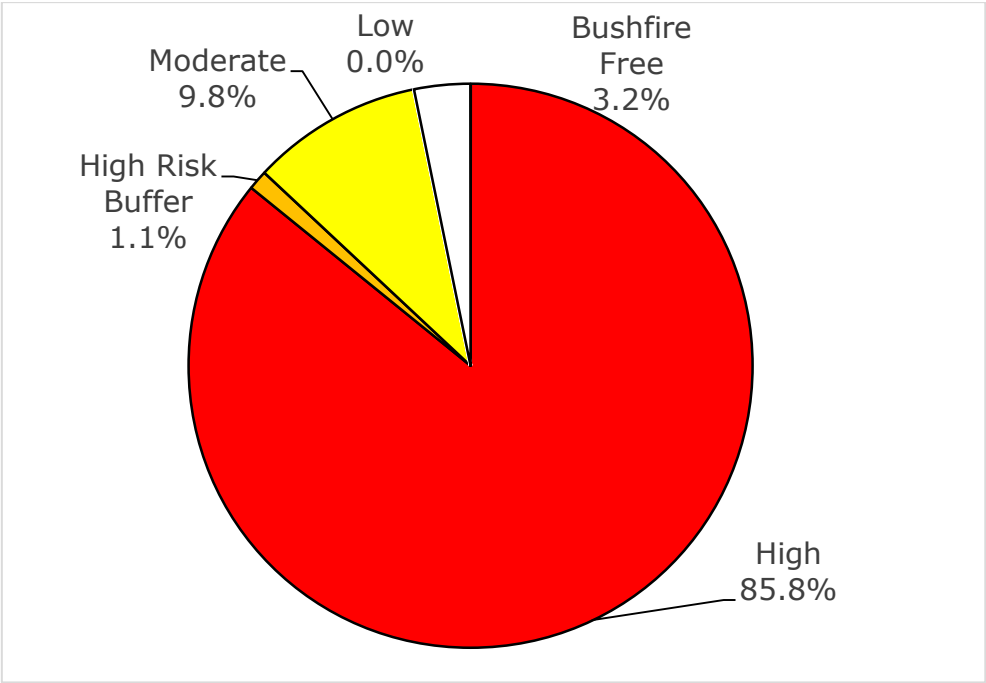


Figure 4.2: Bushfire Prone Land

Managing the bushfire risk is noted as the key factor in dealing with the bushfire hazard. One of the management options is risk avoidance and therefore, land that is prone to bushfires should not be rezoned and subdivided where an adequate fire protection zone cannot be established.

The NSW Rural Fire Service has published a set of guidelines titled Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities and Developers in 2018. (NSW Rural Fire Service, 2018). It provides development standards for designing and building on Bushfire Prone Land. It provides details and recommendations for the for the following aspects of building in bushfire prone land:

- Strategic land use planning to ensure that new development is not exposed to high bush fire risk;
- Specific provisions for creating new residential and rural residential subdivision allotments;

- Specific provisions for special fire protection purpose (SFPP) development taking account of occupant vulnerability;
- Bushfire protection measures (BPMs) for new buildings;
- Guidance in upgrading and maintaining existing development.

The general principles underlying the document are as follows: .

- Bushfire Protection Measures are required to reduce the impact of a bush fire;
- Protection measures are governed by the degree of threat posed to a development and the vulnerability of occupants;
- reducing the interface of a development to the hazard reduces the bush fire risk to the development;
- good practice in planning, building and management reduces the risk to developments and their occupants, and increases their resilience.

The protection of the identified community assets is a key issue as is the preservation of biodiversity when considering the issue of bushfires.

Bushfire Risk Management includes the identification of the level of risk posed by bushfires to the assets and establishing strategies to protect those assets from the adverse effects of the fires. The purpose of bushfire risk management is to protect the community and its values from the adverse effects of wildfire. One key element of bushfire management is to achieve better integration of community preparedness and prevention strategies.

The recent fires in the LGA in December 2019 and January 2020 were the result of the Gospers Mountain and Grose Valley fires and impacted an area from St Albans and Mellong in the North to Colo Heights and Bilpin in the west and Kurrajong Heights in the south. A report by the RFS Building Impact Assessment team prepared for the Council has shown the following impact:

- 24 homes destroyed
- 13 homes damaged
- 1 facility destroyed
- 4 facilities damaged
- 65 outbuildings destroyed
- 30 outbuildings damaged
- 540 rural landholders impacted

There was also the loss of businesses and damage to orchards in Bilpin. It also closed the following roads, some for a number of weeks:

- Bells Line of Road from Kurrajong Heights to Berambing
- Putty Road between Colo and Colo Heights
- St Albans Road between Webbs Creek and St Albans
- Wollombi Road between St Albans and Bucketty
- Settlers Road between St Albans and Webbs Creek

It has been noted that there is a very high proportion of the land use that is rural residential and a very high number of these are in bushfire prone areas. Maps 4.11 and 4.12 show the amount of rural residential development that is bushfire prone. It can be seen that it is a mixture of high and moderate bushfire prone land. Analysis of the data has been carried out for the rural residential and agricultural uses and this can be seen from figure 4.3 which shows that there is a total of 84.9% of all rural residential development in the LGA is bushfire prone and this comprises 20.3% high risk, 12.3% high risk buffer and 52.3% moderate risk.

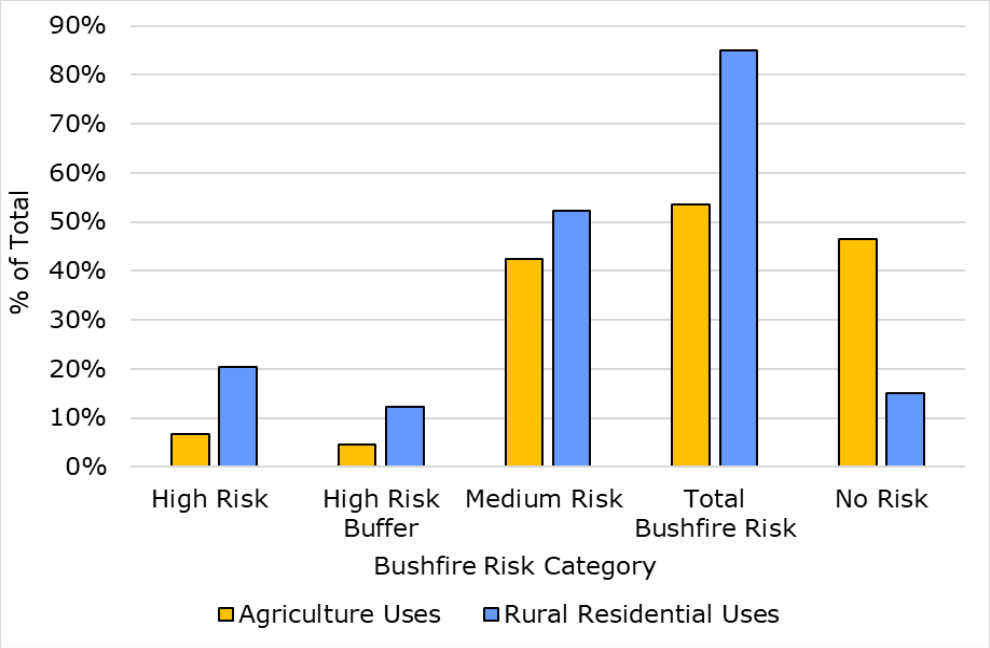
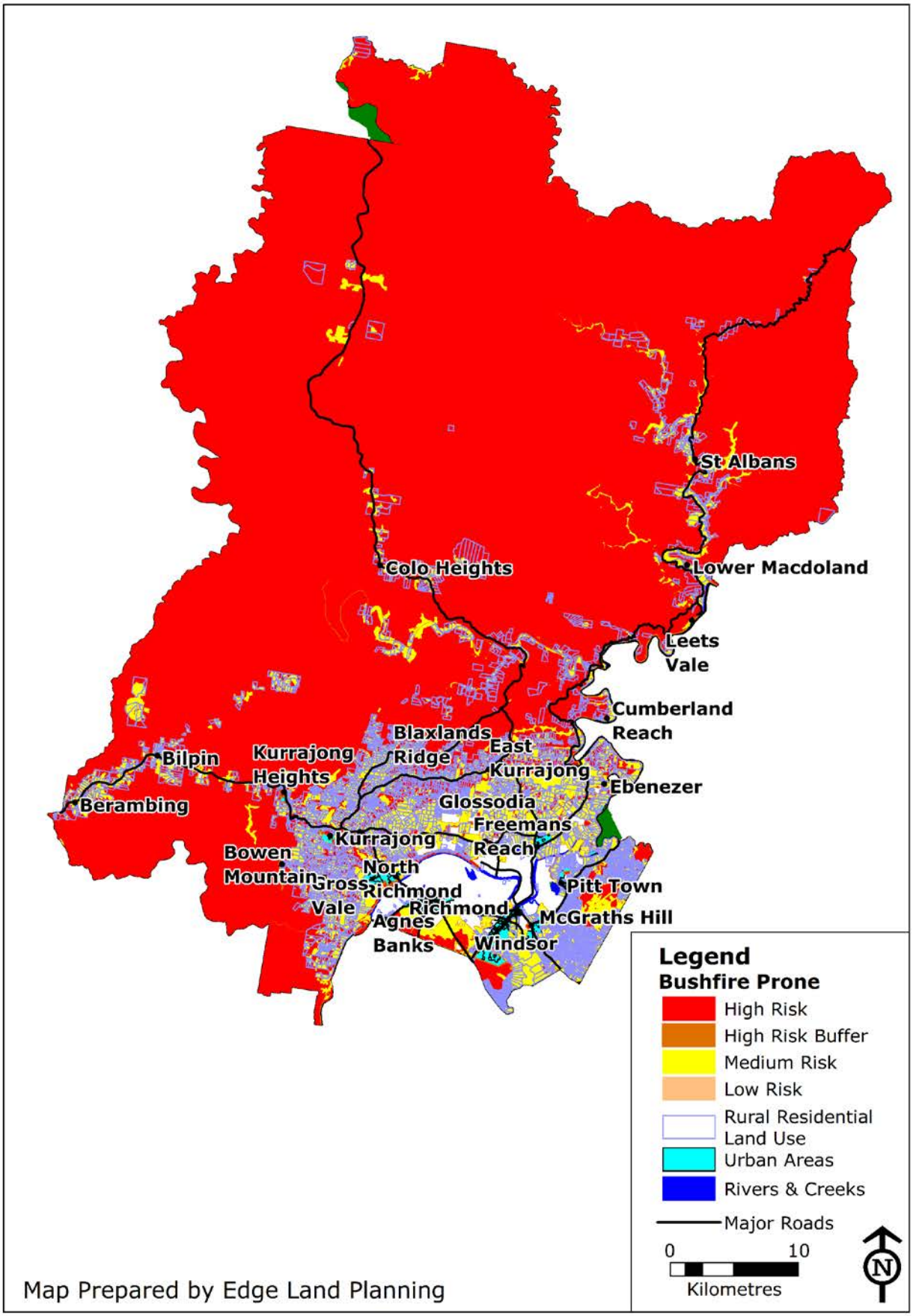
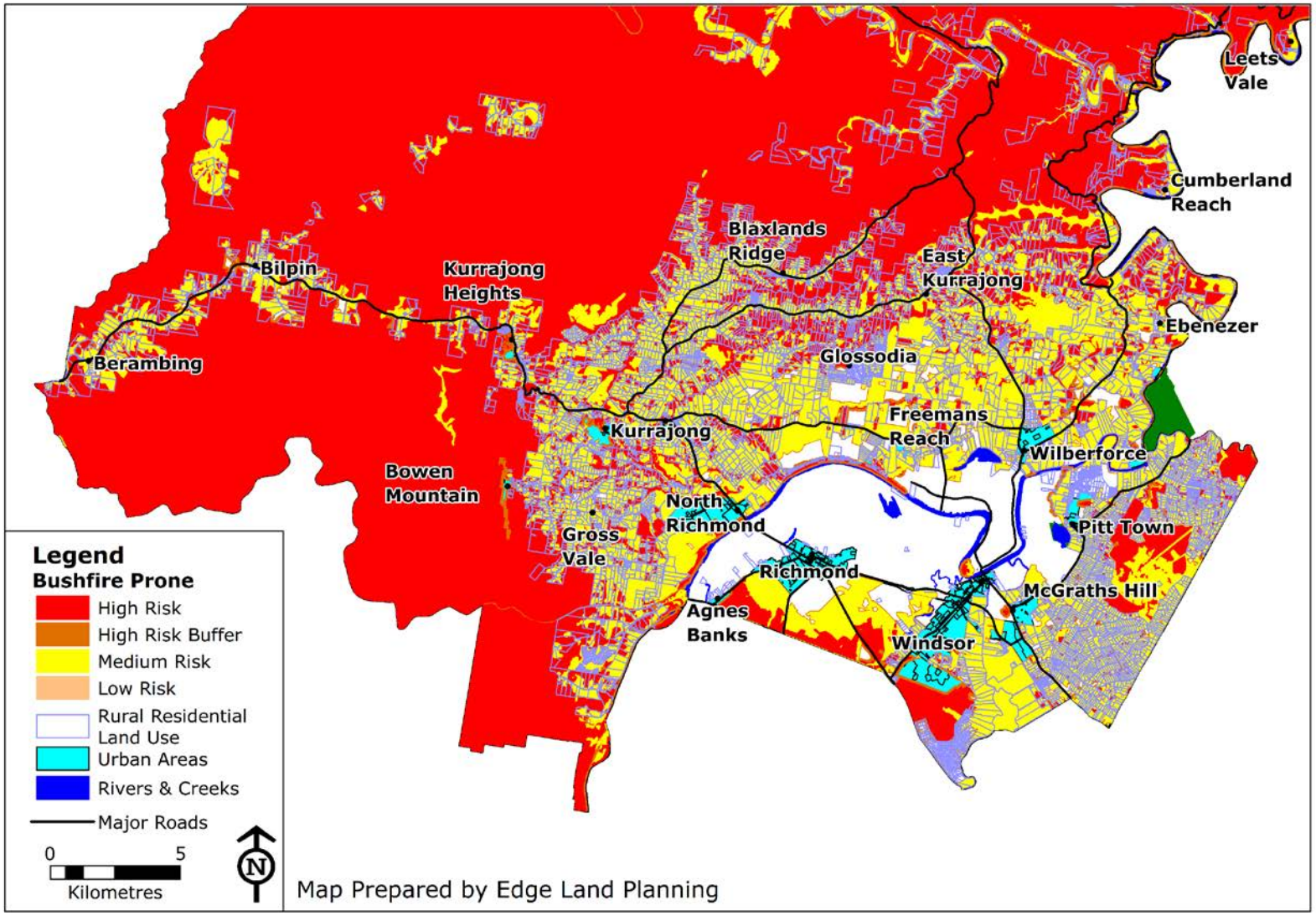


Figure 4.2: Bushfire Prone Land Use



Map 4.11: Bushfire Prone Land and Rural Residential LGA



Map 4.12: Bushfire Prone Land and Rural Residential South

Photo 4.13 shows the Kurrajong area which is mostly rural residential development and all of the land in the photo is bushfire prone – both medium risk (the cleared grassland) and high (the vegetated land). This has severe implications for the land should a bushfire ignite in the area. It would put many houses and potentially lives at risk. The recent bushfires in 2019 and 2020 reached near to this area getting as close as Kurrajong Heights. Embers from a fire in the Kurrajong Heights area can be blown into this area if the wind is from the north west.

Photo 4.13: Bushfire Prone land at Kurrajong
Date of Photo: August 2019

The implications for this on the future development of the rural land is discussed in chapter 6.

4.3.8. Flooding

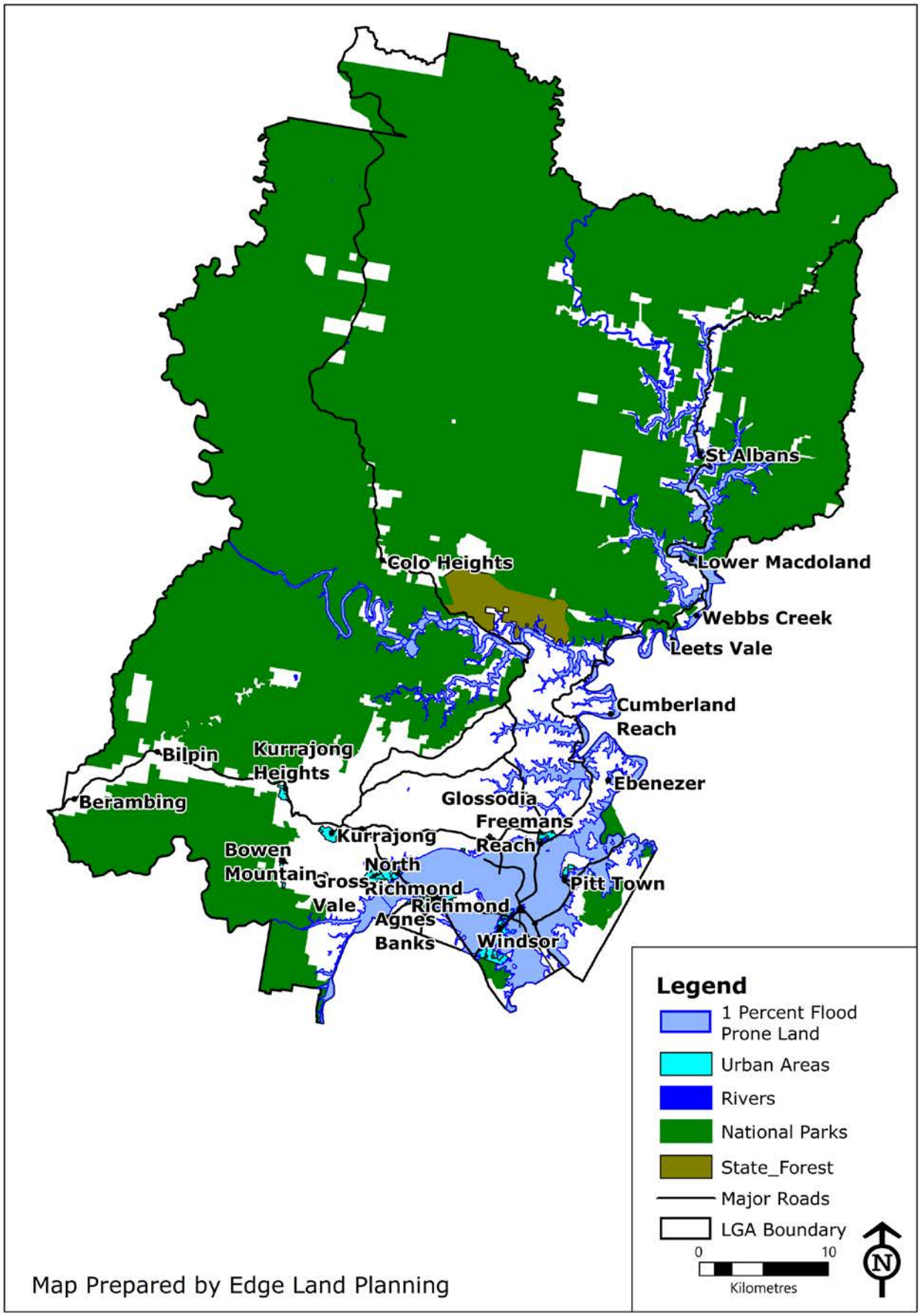
Flooding is a significant issue in the Hawkesbury LGA and the Hawkesbury Floodplain Risk Management Plan and Study has stated that the Hawkesbury Nepean Valley " … has one of the most significant flood risk exposures within Australia." (Bewsher Consulting, 2012). The highest flood ever recorded was in June 1867 and this is referred to as having a probability of 1: 280 in any one year. (Hawkesbury City Council, 2016). To put this in context, the generally accepted flooding standard that is normally used for planning purposes is the 1% Annual Exceedance Probability (AEP) flood which has a probability of 1: 100. In addition, the Probable Maximum Flood (PMF) is now having to be considered by planners when planning for new development.

The land that is flooded to the 1% flood is shown as map 4.13 and it can be seen that it covers the land alongside the Hawkesbury, Colo, Grose and Macdonald Rivers and Webbs Creek as well as other tributaries. It covers the low-lying alluvial land and it is not very wide in the northern parts of the LGA but it extends out to cover an

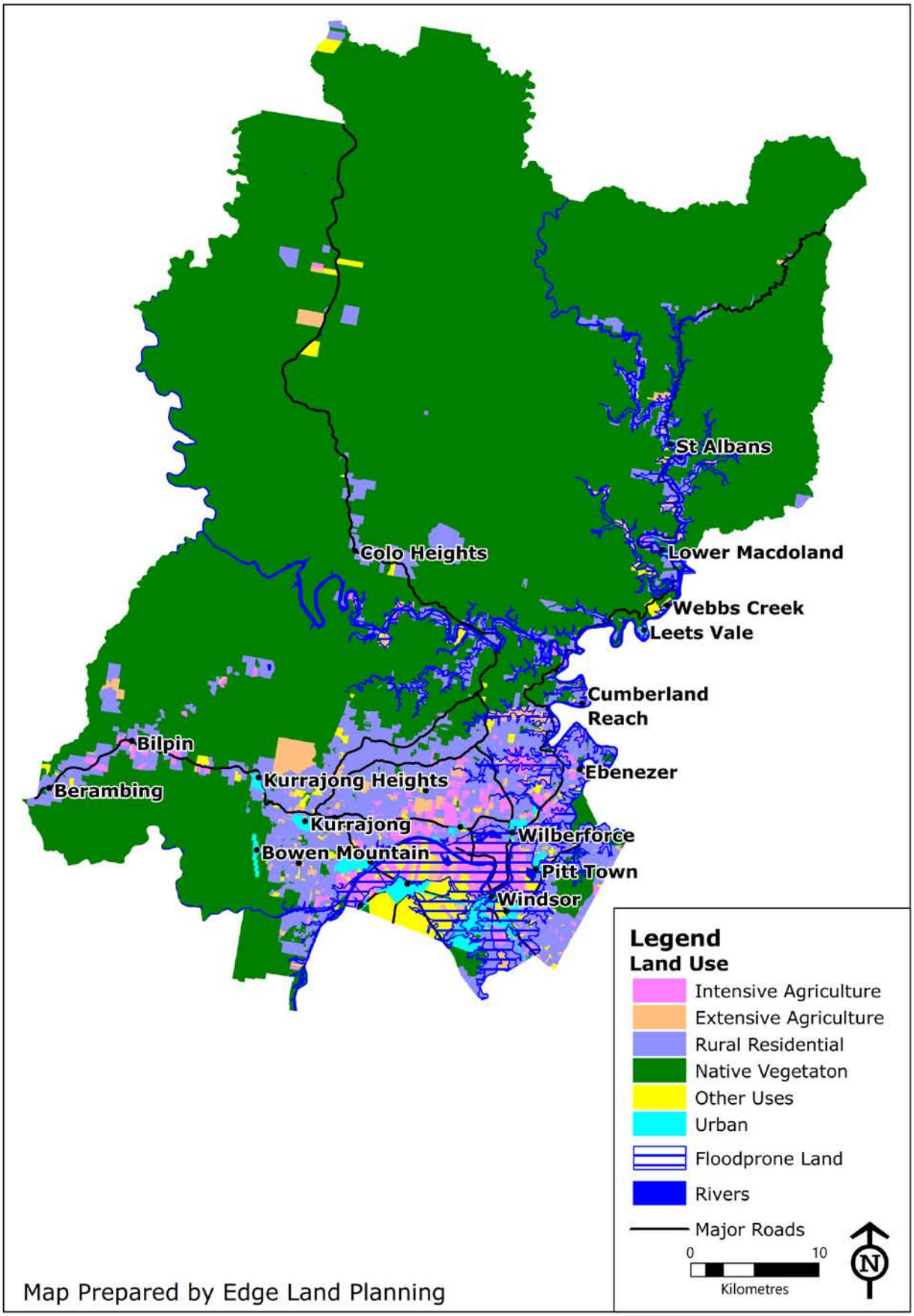
extensive part of the land that is approximately 9.5km wide, in the Freemans Reach – Wilberforce – Pitt Town – Cornwallis – Richmond Lowlands – Agnes Banks areas. It should be noted that this is the 1% flood extent and the Probable Maximum Flood covers a larger area.

The most affected land is the rural land and maps 4.14 and 4.15 show the land use with the flood layer overlaid to show which of the land use are affected. These maps show that in the northern part of the LGA, the most affected land use is rural residential with most of the dwellings located above the flood prone land but there are also a number which are located in the flood prone land. The narrow valleys and steep sides help to ensure that most of the dwellings are located on flood free land. In the south as the floodplain widens out with the flatter valley floors, more land is floodprone. The land use that is most affected in this area is the irrigated plant uses (market gardens and turf farms). However, it is important to note that in the Richmond Lowlands, there are a number of horse studs and polo uses that are also flood prone. It is significant to note, however that there are a number of these plant uses as well as intensive animal uses that are not flood prone, including market gardens, turf farms, protected cropping structures, poultry farms and horse studs.

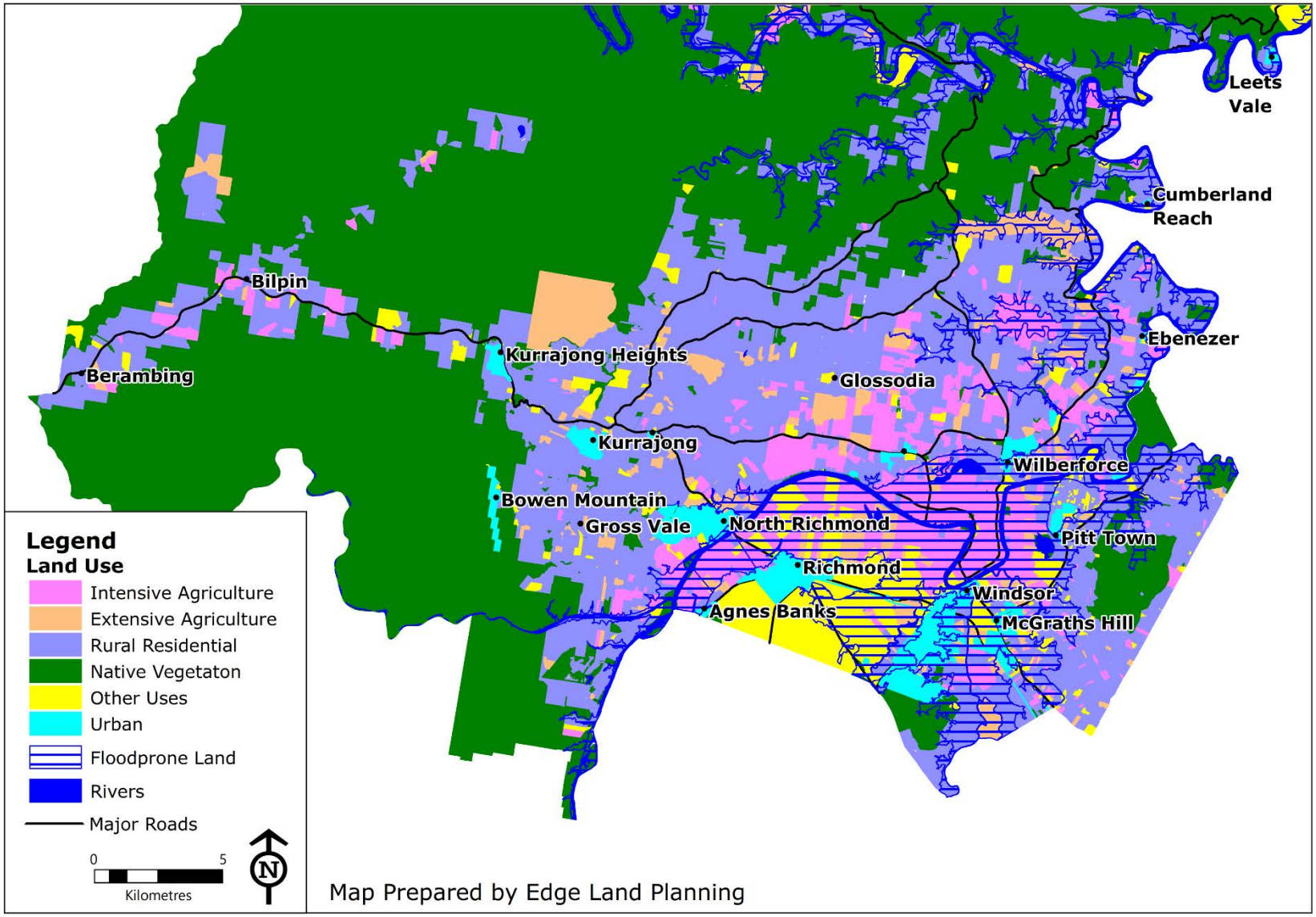
The NSW Government has published a floodplain management manual titled *Floodplain Management Manual April 2005: the Management of Flood Liable Land* (DIPNR, 2005).. This manual outlines a procedure that Councils must follow to prepare a Floodplain Risk Management Plan and introduce appropriate controls within planning instruments. The resulting Floodplain Risk Management Plans are to address existing, future and continuing flood risk for flood prone land. It also requires an assessment of the probable maximum flood and the decision to address it recognises that these rare events should not preclude or unnecessarily hamper development within these areas.



Map 4.13: Flood Prone Land



Map 4.14: Land Use and Flood Prone Land LGA



Map 4.15: Land Use and Flood Prone Land LGA

Land uses considered appropriate for flood prone land depends on the level and velocity of flood waters. If the water is flowing too fast, it can damage buildings or structures as well as having the potential for debris to be caught by the building or structure and cause a damming effect, which can cause damage to the structure or cause flood waters to back up and inundate other land in the vicinity or downstream. The most appropriate land uses for floodprone land include cropping (market gardens and turf farming) and grazing of animals. As a general rule, buildings and structures should only be constructed in floodprone land if it can be proved that there will not be any impact on other land as well as a risk assessment to identify if there is potential for the building or structure to be damaged by floodwaters.

The most recent floods in the Hawkesbury River in February 2020 caused moderate flooding with some inundation of the low-lying land at Wilberforce, Pitt Town, Freemans Reach, Cornwallis and Richmond Lowlands. It also saw the following roads closed:

- Sackville Road at the Sackville Ferry;
- Bridge Street at Windsor Bridge and Windsor Bridge;
- Windsor Road at McGraths Hill;
- Bells Line of Road at North Richmond and Richmond Bridge;
- Springwood Road at Yarramundi and Yarramundi Bridge;

The Hawkesbury River peaked on 9 February, 2020 at a height of 11.4m at North Richmond and at Windsor at 9.2m (NSW SES Hawkesbury Unit, 2020). This flood is estimated to be less than a 1:5 (20% probability) year flood (Bewsher Consulting, 2012) It is noted that the Windsor Bridge is being replaced with a new bridge which is higher than the existing one. According to the Environmental Impact Statement for the Bridge Replacement, the existing bridge is overtopped in a one in two-year (50%) probability flood event and the replacement bridge is predicted to be overtopped in an event just smaller than the 1:3 (33%) probability event. The new bridge is not higher because height of the access road on the northern side of the Hawkesbury River (Wilberforce and Freemans Reach Roads) which are also inundated in these flood events. (Sinclair Knight Merz, 2012)

The Richmond, Windsor and Yarramundi bridges were closed for a number of days which caused some disruption to the people who live on the western side of the river and this is estimated by the ABS to be approximately 31,000 residents which is approximately 46% of the LGA population. There are also a total of approximately 260 (ABS, 2020b) agricultural businesses that are cut off and this is approximately 58% of all of the agricultural businesses in the LGA. This means that not only can residents not get to work but also that more than half of the agricultural businesses cannot get their produce to the markets. The implications for this on the future development of the rural land is discussed in chapter 6.

4.3.9. Landscape Character

The predominant rural character of Hawkesbury LGA is created by the topography, numerous rural activities, and range of holding sizes, vegetation and expansive views.

The landscape changes with the varying topography and views of the river. Apart from this, the history (Aboriginal and European), the settlement patterns and the built environment also adds to the local character.

The term 'landscape' and 'character' have been defined by the Australian Institute of Landscape Architects in its Guidance Note for Landscape and Visual Landscape Assessment as follows:

> *"Landscape: Landscape is an all-encompassing term that refers to areas of the earth's surface at various scales. It includes those landscapes that are: urban, peri-urban, rural, and natural; combining bio-physical elements with the cultural overlay of human use and values.*
>
> *Character: A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, and often conveys a distinctive 'sense of place'. This term does not imply a level of value or importance." (Australian Institute of Landscape Architects, 2018)*

The unique landscape character of the Hawkesbury LGA is a visual resource as it generates tourism, development and environmental management. The visual resource also plays an important role in promoting environmental awareness and wellbeing for residents and visitors. This varies from the steep vegetated areas to the simplicity of grazing lands and formal patterns of agricultural crops and river views. It is important to recognise the visual amenity of open paddocks, post and rail fencing, distant views, heritage items and rural activities. This all adds to the scenic amenity of the area. However, it is also important to note that the main contributor to the scenic amenity is the natural landscape as well as the productive agricultural landscapes. There is a need therefore to ensure that these landscapes are preserved into the future because of the large impact that they have on the landscape character of the Hawkesbury LGA.

It can be seen therefore that the preservation of the landscape character is of importance.

4.3.10. Weeds

Weeds have an impact on agricultural production, the environment as well as public and private infrastructure. Weeds can be terrestrial and aquatic. They are one of the most serious threats to Australia's natural environment and primary production. They can destroy the native species, contribute significantly to land degradation and reduce farm and forest productivity. The annual costs of weeds is estimated to be $5 billion across the nation (McLeod 2018). The majority of this cost is made up from chemical control of broadacre cropping and production losses in the grain, beef and wool sectors. The document titled *Annual Costs of Weeds in Australia* estimates that the overall cost of weeds has increased by more than 20% over the past 14 years.

The management of weeds forms part of the wider biosecurity along with pests and diseases. The Greater Sydney Regional Strategic Weed Management Plan has been

prepared to manage the weed issues in the Greater Sydney region. It notes the following about the weed issues in the Sydney region:

> *"The Region's large urban population, major industries and complex city infrastructure combined with man peri-urban land owners and associated businesses, and with the outstanding natural resources with which the region is endowed (including Sydney Harbour, the Blue Mountains and iconic national parks) is both a major challenge and a great opportunity to achieve effective weed control."* (Local Land Services Greater Sydney, 2019).

The NSW Invasive Species Plan assigns week responses into four categories as follows:

- Prevention of new weeds establishing;
- Eradication of small and localised infestations where feasible;
- Containment of larger infestation to stop wider spread; and
- Protection of key assets to prevent their damage or degradation by weed invasion (e.g. threatened plants and farmlands)

The control of weeds in the Hawkesbury LGA is the responsibility of the Hawkesbury River County Council which is comprised of Blacktown, Hawkesbury, Penrith and The Hills Councils. The weeds are managed under the auspices of the Sydney Weeds Action Plan which provides funds to control weeds by weed surveillance, control and education activities.

The Hawkesbury River County Council has categorised weds into two types as follows:

- Priority weeds.
- Environmental weeds

Priority weeds are plants that have the potential to pose a biosecurity risk. They can pose an impact on human health, the economy, the liveability of our cities and the environment. Impacts can include allergies and other health issues, costs of control, loss of tourism value, degradation of natural landscapes, parks and recreation facilities, reduction of useful agricultural land and loss of primary production, loss of biodiversity and water quality. Lantana is on the list of priority weeds and is prevalent in the rural lands and along the roadsides as can be seen from photo 4.13.

Environmental Weeds are plants that are not listed as priority weeds but still pose a threat to the environmental health of the local area as well as the agricultural productivity. They pose a particular threat to natural bushland areas and along rivers and creeks. Balloon vine is one of the environmental weeds that are prevalent in the rural areas and photo 4.14 shows an infestation along a waterway.

There is a need therefore to consider the preparation of Weed Management Plans for developments that have the potential to cause the spread of weeds by clearing large tracts of land or that generate effluent in sufficient quantities that may kill native vegetation which then allows for the weeds to invade the bushland.

Rural residential landowners are normally not aware of these weeds and so can unknowingly aid in their spread by not controlling them.

Weeds are often found along the roadsides and near creeks. Photo 4.14 shows lantana on the roadside and photo 4.15 shows balloon vine al0ng a waterway.

Photo 4.14: Lantana – a Priority Weed
Date of Photo: May 2019

Photo 4.15: Balloon Vine – a Priority Weed
Date of Photo: May 2019

4.4. Summary of Key Messages

A high proportion of the rural residential people work from home compared to the urban areas.

Rural residential development has positive and negative impacts.

The mixture of rural residential development and intensive agriculture leads to land use conflict which has a major impact on the sustainability of farming.

The pollution legislation benefits the complainant because of the noise and odours associated with intensive agricultural development lead to a loss of amenity to the rural residential use, despite the fact that the farmer might have been farming the land for many years.

Peri-Urban Agriculture is significant for the fresh food supply of the adjoining metropolitan areas and this is expected to become more important by the Food and Agriculture Organisation of the United Nations in the future.

Protected cropping has great potential for the future of vegetable growing in the LGA.

Importance and value of Greater Blue Mountains World Heritage Area, and planning adjacent to the area.

Agri-tourism is strengthening in the LGA and has accommodation, food and experiential components.

During natural disasters like flooding or bushfires, key roads are closed including the Bells Line of Road during bushfires and the roads over the Hawkesbury River during floods.

Climate change is impacting on the land that is available to grow food. It has already affected food security because of warming of the atmosphere, changing rainfall patterns and greater frequency of some extreme events. The IPCC also noted that highly productive lands are experiencing the highest rates of conversion to urbanised landscapes, thereby affecting food security. The report found that urban expansion is projected to lead to conversion of cropland which will, in turn lead to loss of food production. Strategies that can be aimed at reducing these impacts include urban and peri-urban agriculture. It is noted that the Hawkesbury LGA is a key food producing LGA, especially for perishable vegetables.

The 2019 year was the hottest and driest year on record. Both mean annual maximum and minimum temperatures were above average.

The Climate Council has projected that by 2050, half of the irrigated agricultural output from the Murray Darling Basin will be lost, without any climate change mitigation This will put pressure on peri-urban agriculture, particularly vegetables which are grown in the Murray Darling Basin.

Climate change in the Hawkesbury LGA will see more hot days and fewer cold nights. Rainfall is expected to decrease in spring and winter and increase in summer and autumn and also there are to be more severe flooding and also droughts.

The LGA has a very high proportion of bushfire prone land with only 3.2% being bushfire free. There is 85.8% in the high-risk category (most of this is National Parks) and 9.8% moderately at risk. There are also 84.9% of all rural residential land uses are bushfire prone – 20.3% high risk, 12.3% high risk buffer and 52.3% moderate risk.

Flooding affects a significant amount of the LGA and flooding in the wider Hawkesbury Nepean Valley has one of the most significant flood risk exposures in Australia. Flooding has a direct impact on the key agricultural are of the Hawkesbury River flats. It also leads to the closure of all of the bridges over the Hawkesbury River and effectively cuts off the western part of the LGA which approximately 31,000 residents or 46% of the LGA population.

Chapter 5: Consultation

5.1. Introduction

The rural lands of Hawkesbury are an important part of the City and the wider region. They contain agricultural activities, scenic rural landscapes, native vegetation, biodiversity corridors and areas for rural living. Agriculture has been identified by the Council and the community as being an important component of the economy.

The purpose of the consultation was to find out from the key stakeholders what the major issues are for the future of the rural land. Consultation with stakeholders is an essential component of preparing a strategy for the future of the rural lands. Stakeholders include the community as well as Government Agencies and Council officers.

> *"Tell me and I'll forget,*
> *Show me and I may remember,*
> *Involve me and I'll understand"*

A targeted consultation strategy was used for this document and a more comprehensive consultation is due to occur when the document is exhibited. A series of phone interviews were conducted with NSW Government Agencies, NSW Farmers Association, Hawkesbury Harvest and farmers representing the vegetable, turf and orchard industries. In addition, interviews were also conducted with accommodation and tourism operators.

The key messages that came out of the interviews were as follows:

- Intensifying of production for irrigated plants
- Climate changing and the need for more water to be applied
- Agritourism
- The need for agriculture to continue in the LGA as well as Sydney peri-urban area

These have been discussed in chapter four and options for them are discussed in chapter six.

5.2. Consultation Interviews

A number of farmers and tourism operators have been interviewed to gauge some indication about the issues that face them.

The types of crops grown includes vegetables (Asian vegetables, broccoli cabbages, garlic, lettuce, mushrooms, parsley, zucchini) water melons, rock melons, apples, pears, stone fruit, figs and quinces as well as turf and lucerne. There are also ducks, chickens and eggs grown in the LGA.

Water was a major issue for the farmers. A number of them irrigate from the Hawkesbury River and bores and some farmers also use the potable water supply from Sydney Water. There are many farms who use rainfed dams. The climate change impact on the agriculture is the need to use more water and this is not so much of an issue with the irrigation from the river and bores but is an issue with the rainfed dams.

The farm yields have increased over the past ten to twenty years and this has been the result of moving to more intensive systems such as hydroponics or an increase in the density of orchard tree planting. The use of new technology and growing techniques has also led to the increase in farm yields.

Employment on the farm ranges from owner operated small scale operations (farmer only or husband and wife) to large scale ones employing more than 150 people (mushroom farms). The use of casual labour is also key for the picking and harvesting. The poultry industry is also a large employer, especially Pepe's Ducks who employ around 200 people at their processing plant, hatchery and breeder farm.

The large-scale farmers take their vegetables to the Flemington Markets but there are a number of the growers who sell direct to the public or to shops and restaurants. This is a more reliable source of income rather than having to accept the variety of prices that are offered at the markets because the farmers are price takers not price makers. The farmers who sell to the local shops and restaurants transport their produce to the markets themselves in light trucks. There also a number of farms that supply restaurants in the Sydney Region with fresh vegetables via providores. The pick your own operations are geared to the orchards in the Bilpin area and they also have sale of the fruit from the packing shed or farm gate sales. This is seasonal and is also mostly on the weekends. Some of the vegetable growers sell to green grocers in surrounding areas. White Prince mushroom sell directly to the supermarkets as well as delivering to the pizza restaurant chains. Turf is sold both to residential customers as well as corporate and Government customers for playing fields, parks, etc. Egg production and poultry are taken from the farms to be further processed and packed. In the case of egg production, this occurs in the Blacktown LGA and chicken meat is processed in the Cumberland LGA whilst the duck processing occurs in south Windsor.

Agritourism is seen by all of the farmers as important – some more so than others. Hawkesbury Harvest is the key agri-tourism operator in the LGA and they have a farm gate trail which has many members mostly in the Agnes Banks-Richmond Lowlands-Wilberforce area and the Bilpin area where vegetables and fruit are sold from the farm gate. In a number of cases, the farm gate sales and pick your own methods are the major component of the income from the farmers. This allows the farmers to build a relationship with the customers and the customers come back regularly – in some cases, three generations of one family have been visiting one orchard. However, not all farmers participate in the Hawkesbury Harvest program and it has been reported that some farms have been visited by people wanting to buy the produce. This causes some problems as these farms do not sell to the public. One solution that has been suggested is that there could be more information about the fact that not all farm sell

their produce to the public and there is a need to make this information clear to the wider community.

Accommodation was seen as a part of the tourism sector that has potential to expand. This includes small farm and bed and breakfast style as well as larger businesses. The café and restaurant sector was also seen as something that has potential to provide food and drinks to the tourists who travel through the LGA.

When asked what could be done to make the farms more profitable the farmers gave a wide range of answers. They ranged from using agritourism and cutting out the middle man to increasing the area of cropping or number of trees. Energy rebates were also mentioned as the increasing temperature means more pumping and cooling which uses energy. Other costs included fuel and fertiliser.

The cost of infrastructure for farming is relatively high and for the more intensive uses, it is higher. The cost of infrastructure ranged from $100,000-$150,000 for small orchards or market gardens to $1-5million for orchards, vegetable farms and turf farms more than $15m for the larger farms.

All of the farmers interviewed indicated that there was a need for farming in both the Hawkesbury LGA and the wider Sydney Peri-Urban area.

The Western Sydney Airport is seen as a potential benefit for the farmers in the LGA, but not many saw much benefit for them. The food grown in the LGA is not export orientated and supplies the local market. The survey was a small sample size and this should not be seen as an impediment to future use of the airport by growers.

Chapter 6: Options for the Future

6.1. Introduction

This chapter summarises the key issues as well as providing a discussion of the options for the future of the rural lands.

6.2. Summary of Key Issues

The main issues affecting peri-urban areas like the Hawkesbury are the retention of agriculture (food and ornamental plants), the need to preserve the environment, the pressure for subdivision of agricultural land or the resubdivision of existing rural residential land for more lifestyle living uses. Added to this is rural land use conflict between agriculture and rural residential uses.

Key issues associated with this include the following:

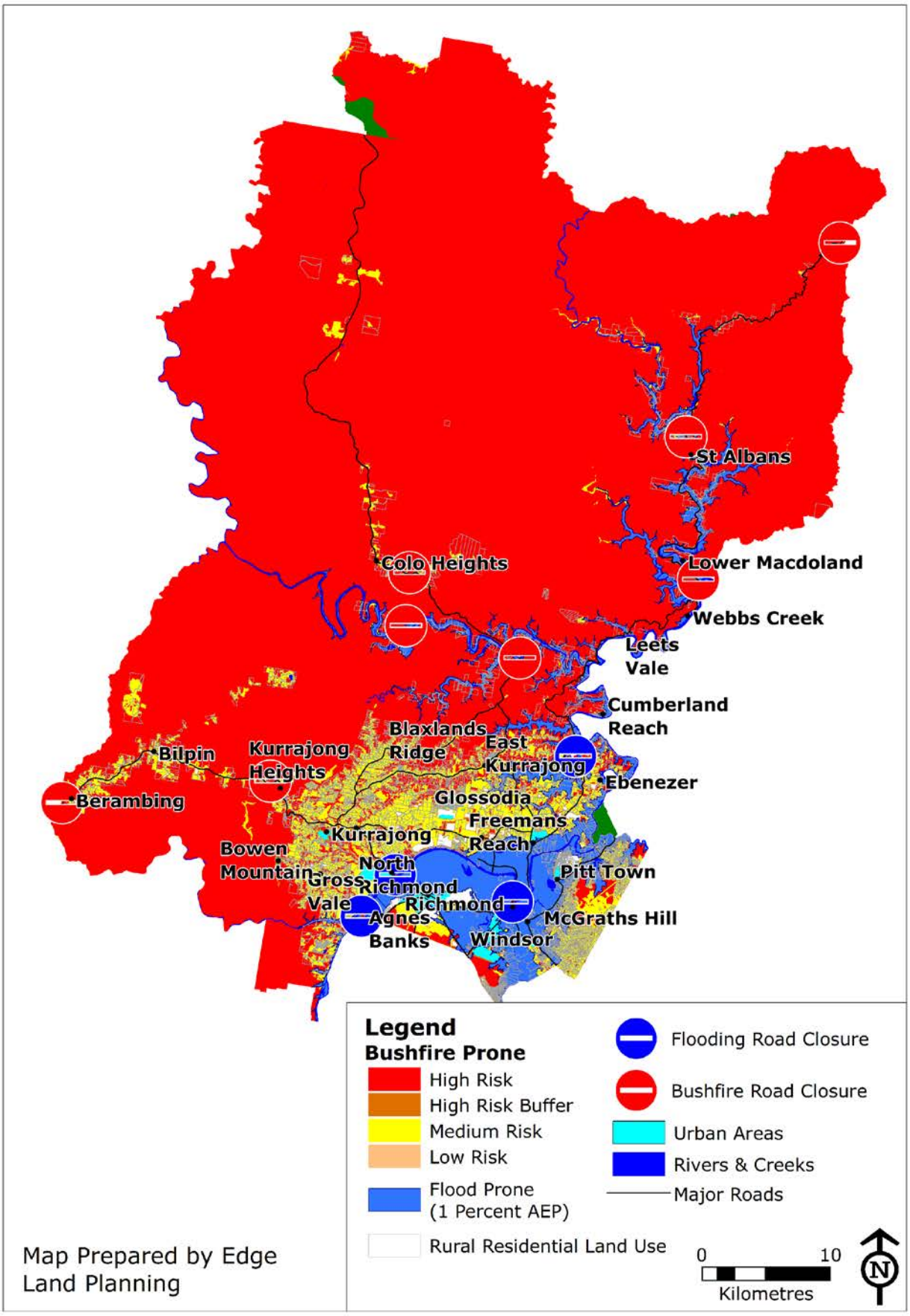
- *Maintain food production*. The amount of perishable vegetable production in the LGA is significant for the food supply for Sydney, particularly in the peak growing seasons of summer and spring. There is a need to encourage more protected cropping uses in the LGA.
- *Pressure for rural residential and urban development*. The proximity to Sydney and the north west growth centre creates a demand for land use change. There are a lot of people who want to have a rural lifestyle and so they seek to buy land. There is also the demand for new urban development and landowners want to have their land rezoned to residential. The location of the LGA in the Metropolitan Rural Area creates a halt on residential rezoning but the pressure for rural residential rural living cannot be altered by traditional land use policy.
- *Farmers are price takers and not price makers*. The farmers who sell their vegetables via the central markets at Flemington are not able to have an impact on the price that they get and therefore have to take the price offered on the day. In an effort to overcome this, some farmers are selling from the farmgate, to nearby fruit and vegetable shops or direct to the large supermarkets. Some are also selling online.
- *Land use conflict*. This is not so much an issue in the areas where there are many similar uses such as the Hawkesbury river flats areas. However, in other areas there may be land use conflict between agricultural uses and adjoining or nearby rural residential uses.
- *Price of land for agriculture*. The value of land that is available for farming is increasing and causing problems with the establishment of new farms.
- *Change of land use by the sale of farms.* The desire for rural living has caused the price of land to increase significantly over the past 15-20 years. When a farmer wants to retire and sell the farm, it is often bought by people who seek a lifestyle rather than carrying on the agricultural use. This results in a change of use to rural residential with the potential for conflict with the surrounding agricultural uses. This is evident in the Mountain and Slopes Combined Localities. where former orchards and vegetable farms are being purchased as

lifestyle blocks and the orchards removed to be replaced by grazing of cattle or a horse use.

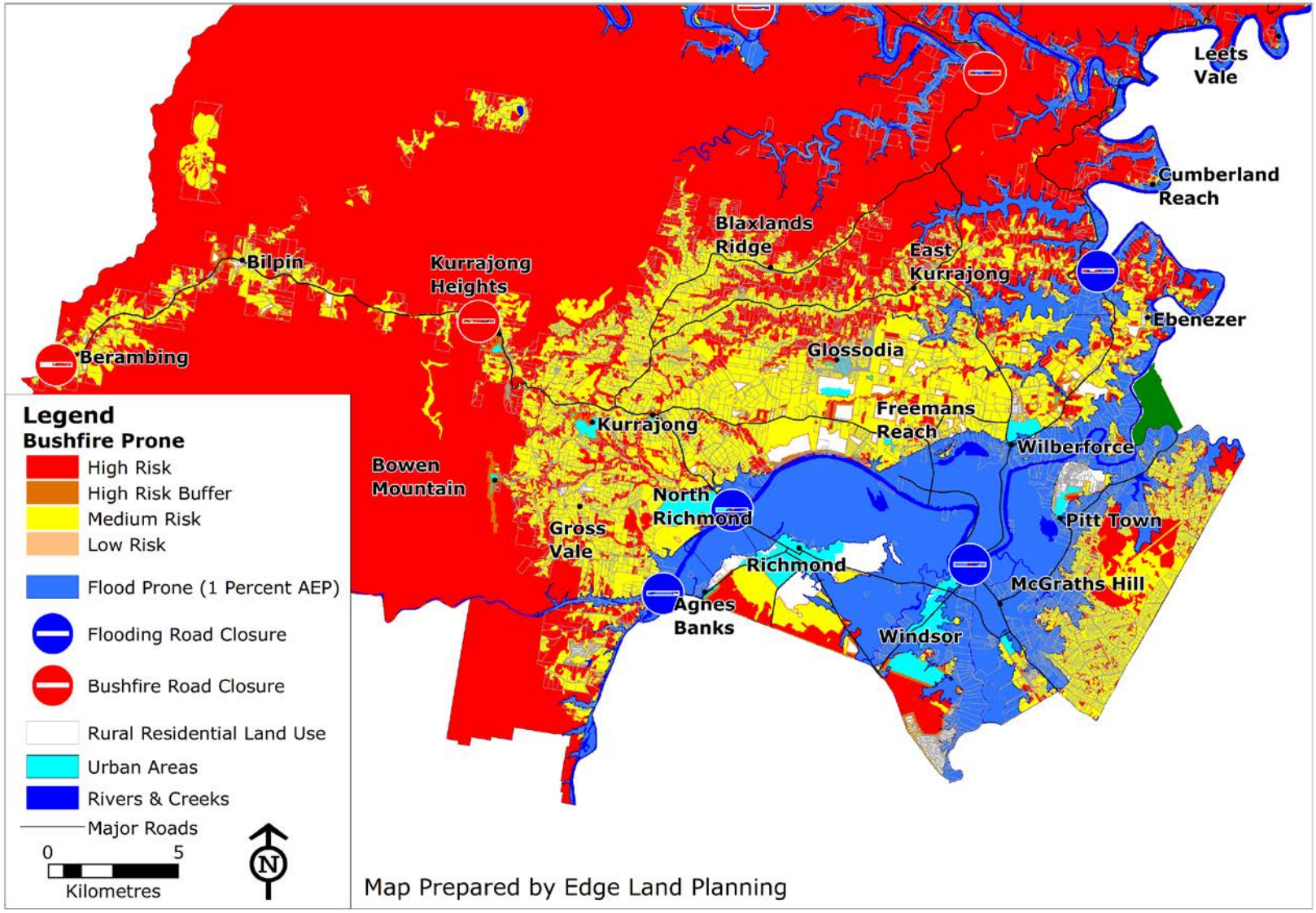
- *Rural Residential.* The large amount of people living in the rural landscape produces similar demands on services and facilities as the urban area. There are 27,252 people living in the rural area which is 42.4% of the total population. Many of these people are also spatially distant from the main centres of Richmond and Windsor. It has been noted that the level of community services and facilities provided for these people is poor. If this population was not so dispersed, it would have a good level of service and this causes an imbalance between the rural and urban people for access to these services and facilities.
- *Biodiversity.* There is significant biodiversity in the LGA that should be protected.
- *Water Quality.* The water quality of the Hawkesbury, Grose, Colo rivers as well as the many creeks and wetlands is significant and has an impact on the natural systems that rely on these. There is the potential for land use to have an impact on the water quality of these rivers, creeks and wetlands. This can include rural residential development, agriculture and other land uses. Rural residential development can have an impact via effluent disposal systems not having sufficient land to dispose of the effluent which can then affect water quality. Agriculture can have an impact on water quality. Market gardens can have an impact on waterways via pesticide and fertiliser and soil erosion. It is important to ensure that appropriate buffers are maintained between agriculture and waterways.
- *Natural Hazards Impact*. The recent bushfires and flooding events have shown the impact on the land uses on the western side of the Hawkesbury River and the problems associated with the road closures and impact on properties and risk to life of the residents in such areas. This is particularly true for the large areas of rural residential development. The fact that there are approximately 45% of the entire LGA population living on the western side of the river highlights this fact. The climate change scenarios point to an increase in bushfire and floods and this in turn leads to the need to contain any expansion of settlement on the western side of the River. Maps 6.1 and 6.2 show the bushfire and flood prone land and the main roads which were cut during the recent bushfires and floods. Photo 6.1 shows the Windsor Bridge which was cut off by the recent floods on 11 February and was taken by the State Emergency Services (SES) Hawkesbury Unit. Photo 6.2 shows the Bells Line of Road, Bilpin which was cut off by bushfires in December 2019 which was taken by the Sydney Morning Herald photographer Nick Moir.

Photo 6.1: Hawkesbury River Floods
Date of Photo: February 2020.
Source: SES Hawkesbury Unit

Photo 6.2: Bushfire Bells Line of Road
Date of Photo: December, 2019.
Source: Nick Moir, Sydney Morning Herald



Map 6.1: Roads cut during recent Floods and Bushfires LGA



Map 6.2: Roads cut during recent Floods and Bushfires LGA

6.3. Development Opportunities

6.3.1. Horticulture & Protected Cropping

The existing areas of vegetable production have the potential to expand, however there is a need for them to diversify into more specialised varieties to ensure that they are not as reliant on the price for the vegetables at the central markets. This was a major issue raised during the consultations. Some farmers have been able to reduce this by selling to local fruit and vegetable shops. There is an opportunity for this to be expanded.

The use of farmgate sales is another way for this to increase. The consultations carried out during this project highlighted the potential of the farmgate sales (vegetables) or pick you own (fruit) to be a good source of income.

Protected cropping is one form of horticulture that is not as prolific in the LGA at the present and one that has the potential to generate good income as well as being a key employment generator. In a report on the economic assessment of industry sectors prepared for the Western Sydney Airport by Agrology, it was found that protected cropping was the production method for tomatoes, cucumber, capsicums and leafy greens (lettuce and herbs). Blueberries were also considered to be a crop that could be grown. There is the potential for these to locate in the LGA, however the size of the protected cropping structure will be limited by the size of the land and its affordability. The employment figures for protected cropping are significant with an employment to size of shed ratio of approximately 10-30 employees per ha of structure depending on the type of crop grown. The high number of protected cropping uses in the Liverpool LGA and the need to relocate these provides an opportunity for the Council to encourage more of these protected cropping land uses.

One option available to the protected cropping sector is to lease land. The lifespan of a high-tech greenhouse is approximately twenty years and this allows sufficient time to make a return on investment. This can also be used for parts of a large property which is used for another type of agricultural use. This can be used for protected cropping structures ranging in size from 4,000 m^2 to two to 10 ha in size and this is dependent on the size of the land parcel in question.

An analysis of the land available for protected cropping has been carried out using the following constraints:

- *Size of parcel*. A greenhouse will require sufficient land to enable a sufficient buffer from the boundary for screen planting, packing sheds, vehicular manoeuvring and other infrastructure. A greenhouse of 4,000 m^2 will require a lot size of approximately 1.5 to 2 ha of land.
- *Proximity to rural residential development*. The potential for land use conflict from noise emanating from the business means that it would be necessary to be 500m from the nearest rural residential development.

- *Slope of the land*. Ideally, there is a need to have flat land with a slope of between one and five percent. Whilst it is possible to build on land with a greater gradient, it requires cut and fill which can also add to the cost and make it less financially sustainable.
- *Floodprone land*. It is not appropriate to build in flood prone land because of the potential to increase flooding downstream as a result of such a large structure as well as the potential to damage the structure and the infrastructure from floodwater and debris.
- *Vegetated land*. The presence of vegetation on a property is a constraint due to the potential for this not to be permitted. The Hawkesbury LEP maps significant vegetation and this can be uses as a guide to land to be avoided. Vegetation in the Hawkesbury LGA is usually also associated with sloping land or land that is close to creeks and drainage lines.

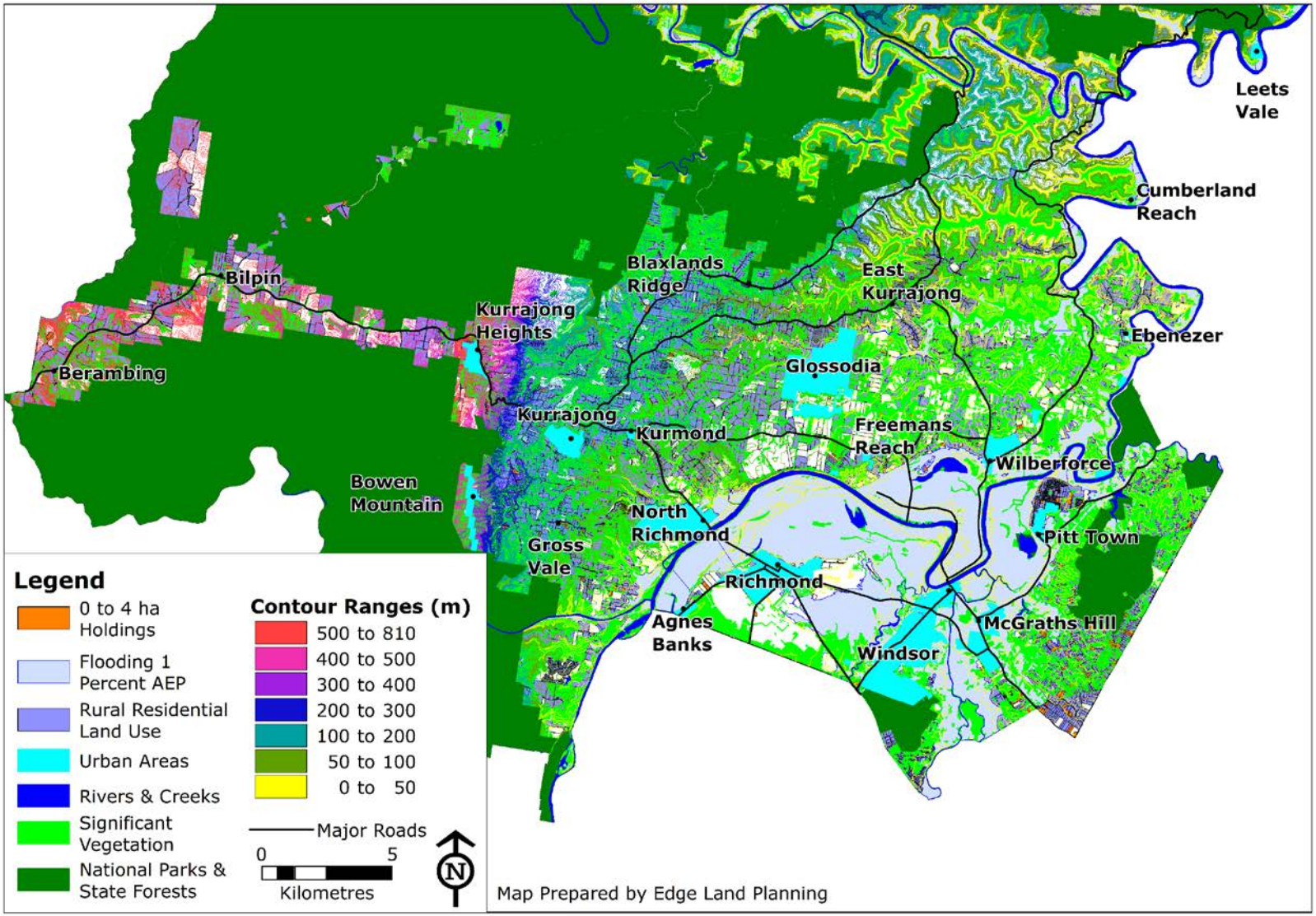
Using the discussion above, a conservative approach can be taken to assess land suitability for protected cropping. The following criteria has been used to map the land that is available:

- Size of parcel: 4 ha and above.
- Proximity to rural residential development: 500 m
- Slope of land: flat
- Floodprone land: non 1% AEP
- Vegetated land: not vegetated with significant vegetation.

These constraints have been applied to the land in the Hawkesbury and have been mapped as can be seen from map 6.3. The map shows the land that is suitable as white on the map being the land from North Richmond to Glossodia to Wilberforce to Freemans Reach and back to North Richmond that is not floodprone suitable for protected cropping. Some of this land is also within 500m of rural residential development and this is also a potential constraint, although as long as the site is large enough, land use conflict may not be a major constraint. Not all of this land would be suitable because of site specific constraints but it shows how much of the land in the LGA is constrained. The other land is not suitable for the following reasons:

- Steep land – Berambing, Bilpin and Kurrajong Heights area would be too steep as would the land to the north of the Colo River.
- Rural residential development and vegetation – Yarramundi to Grose Vale, North Richmond, Kurmond, Glossodia, East Kurrajong to Blaxlands Ridge to Kurrajong Heights and Bowen Mountain.
- Floodprone land from Agnes Banks to Richmond Lowlands, Freemans Reach, Wilberforce and Pitt Town Bottoms is not suitable.

There is the opportunity for Council's economic development strategy to include the promotion of protected cropping sector. To do this, discussions could take place with the protected cropping sector to discuss the potential of the sector expanding in the LGA to take some of the existing farms that are being forced to relocate from the north west and south west growth areas.



Map 6.3: Land Suitable for Protected Cropping

6.3.2. Aquaculture

The use of rural land for the farming of fish and crustaceans occurs in other parts of the peri-urban area and there is the opportunity for this type of development to establish in the rural lands.

There are three stages of Aquaculture operations as follows:

- a hatchery operation which produces fertilised eggs, larvae or fingerlings
- a nursery operation which nurses small larvae to fingerlings or juveniles
- a grow-out operation which farms fingerlings or juveniles to marketable sizes

Depending on the species being farmed, aquaculture can be carried out in freshwater, brackish water or salt water. There are a number of different systems that could be used in the LGA including outdoor ponds or tanks which can be either indoors or outdoors.

Aquaculture can be extensive, semi-intensive or intensive, depending on the level of input (food and water aeration) and output per farming area and the stocking density.

Aquaculture can be used to produce a variety of species including fish, molluscs, crustaceans and aquatic plants for human consumption, or for producing ornamental species.

Aquaculture can also be operated with other agriculture activities forming an integrated aquaculture–agriculture system. This can include aquaponics which is the growing of fish or crustacea in tanks in conjunction with hydroponics in a symbiotic environment. Such a system is operated in the Camden LGA where Barramundi is grown on conjunction with tomatoes and leafy greens.

There is an opportunity for the Council to investigate the potential of establishing some aquaculture operations in the LGA, potentially in association with a protected cropping operation or as a stand-alone operation.

6.3.3. Poultry

The LGA is a key poultry egg producer as well as being the location of Pepe's Ducks breeding farms. There are not many poultry meat farms in the LGA.

The LGA is the number two egg producing LGA in Sydney and number four in NSW as well as being the eighth largest in Australia. The egg production is taken to the Pace Farm packing facility in Minchinbury. The Hawkesbury LGA would be the largest supplier of that packing facility because the Penrith LGA, which is the number one in Sydney has a significant number of eggs produced by Pirovic Farms which is not allied to Pace Farms. There are opportunities to consolidate

egg production and to ensure that it survives in the LGA. This could include new farms however; the cost of new sheds is expensive (up to $1 million per shed) as well as the cost of land is seen as a considerable constraint to the establishment of new farms.

The LGA is not known as a location for poultry meat production with not many farms. The potential for new farms to start are low having regard to the cost of the sheds and the cost of the land as well as potential land use conflict issues.

Pepe's Ducks has its processing plant in South Windsor and this has the potential to expand as the demand for duck meat has increased. Currently they process 100,000 ducks per week and this has grown from 28,000 in 1995. They also have their hatchery at Mulgrave which is a world leader in the process of hatching ducks and have a zero-carbon footprint system using both wind and solar energy. This makes Pepe's ducks world leaders in duck hatching and processing. There is also a breeder farm at Glossodia which supplies the eggs to the hatchery. However, the ability to grow ducks in the Sydney region is diminishing because of the cost of the land as well as potential land use conflict. Whilst some of the ducks are still sourced from farms in the Sydney region, Pepe's have invested in new farms in Harden and Young and transport the ducks from these areas to the processing plant. There is an opportunity for Pepe's Ducks to expand its operation to keep up with the demand for ducks and this is a good local employment generator. There are also export opportunities which can make use of the Western Sydney Airport.

The Council should protect and maintain the existing poultry sector in the LGA, especially the egg production and duck sectors and this should be reflected in the economic development strategy.

6.3.4. Nurseries

There are not many nurseries in the LGA and this sector has traditionally been focused on the Hills and Hornsby LGAs. The potential for this sector to relocate into the LGA will rely on the ability to be able to purchase land in a similar fashion to the protected cropping sector. However, the Council should encourage the relocation of this sector by holding discussions with the nursery industry to ascertain the willingness of the sector to relocate into the LGA. This also can be addressed in the economic development strategy.

6.3.5. Turf

Turf is a sector that is growing and has a good future in the LGA. The Hawkesbury is the number one turf growing LGA in Australia and there is a mixture of turf suppliers to the residential part as well as the Council and parks and gardens part of the industry. The alluvial river flats of the Hawkesbury River make it ideal for the growing of turf. This sector has the potential to expand,

however this is at the cost of a reduction in vegetable farms, which has been occurring over the recent years.

6.3.6. Horse Sector

The horse sector in the LGA can be broken into three categories as follows:

- Recreational horses
- Horse Studs
- Polo Clubs and associated horse studs

The recreational house sector is comprised of dressage, show jumping, pony clubs and those people who just want to ride for recreation. There are five pony clubs in the LGA which is an indicator of a strong ridership. In addition, the number horses associated with rural residential uses and dressage arenas observed during the land use survey shows that this is a strong sector. There are also horse agistment uses that will be used by people who live in urban areas that don't have room to keep a horse and they board them at rural properties. There are opportunities for this sector to be encouraged to continue and expand in the LGA. This expansion could include the establishment a major indoor eventing arena to be constructed to cater for the recreational and eventing horse sector. Discussions can be held between the sector and Council to detail the potential expansion and what is needed.

Horse studs can be small ones that breed standard bred and performance horses to larger ones that are based around the horse racing industry. The land use survey showed that the majority of horse studs were smaller ones that are focused on the performance and recreational horses. The horse studs should be encouraged to expand and this also can be the subject of discussions with the sector.

There are a number of Polo Clubs in the Richmond Lowlands area which have increased in number from three in 2002 to eleven now. Having regard to the floodprone nature of the land on which they have been constructed and to the number of buildings, fences and structures there is not considered to be any opportunities for the expansion of this sector in its current location. However, there is potential for it to expand in other flood free land in the LGA.

6.3.7. Tourist and Commercial Uses

Tourism and commercial uses are clustered around the Hawkesbury River as well as in along the Bells Line of Road, mostly in the Kurrajong – Bilpin areas.

They range from agritourism to restaurants and water-based uses. Most of the water-based uses are associated with caravan parks or ski parks and have basic accommodation with some having more substantial accommodation. There are also a number of bed and breakfast type uses scattered throughout the LGA with

a cluster of them in the Kurrajong – Bilpin area. Specific accommodation and function uses are also prevalent in the Kurrajong – Bilpin area. There is also an emerging apple cider industry with cellar-door style tasting rooms that is proving successful and using locally grown apples.

There is potential for this to increase, particularly in the agritourism component of the sector. This can be done by encouraging them via Council's economic development strategy as well as having detailed discussions with the sector.

6.4. Rural Land Preservation

Rural land has three productive components. It is a source of food, fibre and resources (like water and minerals), a biodiversity resource and a place for people to live. These relate to the three components of ESD in the following manner:

Source of Food, Fibre & Resources	➔ Economic
Biodiversity Resource	➔ Environment
Place to live	➔ Social Equity

They combine to form rural landscapes that are a mixture of flat productive land, hilly land and land covered by native vegetation. There is a need to find the balance between all three of these components to ensure that the overall rural landscape is sustainable.

Agricultural land is a resource, it is not a commodity. It is a resource that is dwindling in Australia and around the world as productive land is converted to residential and rural residential use and other non-agricultural uses. As highlighted in section 4.3.1, he latest estimate of the amount of arable land in Australia by the United Nations Food and Agriculture Organisation is 4.0% of the total land mass and the World total is 10.8% arable land (FAO, 2019). There is, therefore a need to allow farms to continue producing food and fibre by ensuring their sustainability into the future by not hindering their continued operation or by unnecessary fragmentation. The importance of peri-urban land for the production of perishable vegetables, as well as poultry meat and eggs has also been discussed and this is part of the small area of Australia's arable land mass outlined above.

> *" An omnibus protection of all farmland is difficult to defend; but protection of the best soils in a metropolitan area would appear not only be sensible, but clearly desirable." p60 (McHarg, 1992)*

There is increasing competition for this land from non-agriculture uses such as rural residential development, resource extraction, industrial and urban expansion.

One major issue with planning for the preservation of agricultural land is the size of the holdings that currently exist. The smaller the lot the more likely it is to be used for a residential use and when there is a mixture of rural residential (this can range from 1 – 2 ha to 40 ha) and agriculture – both extensive and intensive – this can lead to rural land use conflict. In an area like Hawkesbury, where there is a lot of fragmentation, there is more potential for land use conflict. In areas where there is less fragmentation, the potential for land use conflict is less because of the ability to locate any new rural residential dwelling away from the boundary and any agriculture on adjoining land. There is also a higher probability that the land will be used for agriculture rather than rural residential if it is a larger size.

It should be recognised that this desire to subdivide is often based on the farmers' belief that the land is effectively their Superannuation investment, and they should be permitted to subdivide the land to fund their retirement elsewhere. Also, that they have a 'right' to subdivide to disperse parts of the holding to their children. At no time has there been any indication from the Council or State Government that they would be able to subdivide sometime in the future. It is a resource that can be utilised in the future if it is not subdivided. Experience has shown that once land is subdivided, even into rural residential lots of 10 to 20 ha to 40 ha and even up to 100 ha, the ability for it to be used for agricultural use is severely compromised and sometimes lost. An example of this is the Richmond Rise subdivision in Cornwallis Rd, which is a subdivision of high-class agricultural land on the Richmond Lowlands into lots ranging in size from 3.7 ha to 10.1 ha and which are being marketed for rural lifestyle and not for agricultural land. It is surrounded by a number of turf farms and market gardens. There is potential for the use of these lots to cause land use conflict if they are to be used for rural residential use, which is the likely outcome The details of how this subdivision occurred are not apparent however it is noted that the land is floodprone and has a minimum lot size of 10 ha for any subdivided lot. One way that this can be prevented from happening in future is limit the number of subdivisions on floodprone land. There is also the potential to require a Land Use Conflict Risk Assessment for all non-agricultural development in the Primary Production zone. This is discussed in more detail in section 6.4.1.

The fact that the Hawkesbury region has the largest proportion of farmers less than 55 in Sydney and Sydney has more farmers under 55 in NSW is also a good pointer for the fact that agriculture is significant in Sydney and Hawkesbury.

Figure 6.1 shows the "Cycle of Farmland Conversion" which is taken from a book titled *Holding Our Ground: Protecting America's Farms and Farmland*. It shows how land use change occurs and the drivers and impacts of it. It is significant to note that the cycle is as relevant to the Australian situation as it is in America, signifying that it is an international problem. This cycle of farmland conversion is

evident in the Hawkesbury LGA. This is very evident with the change of land use by sale of land. Many farms have been sold and have not been kept as a farm, but have changed to a rural residential use of the land.

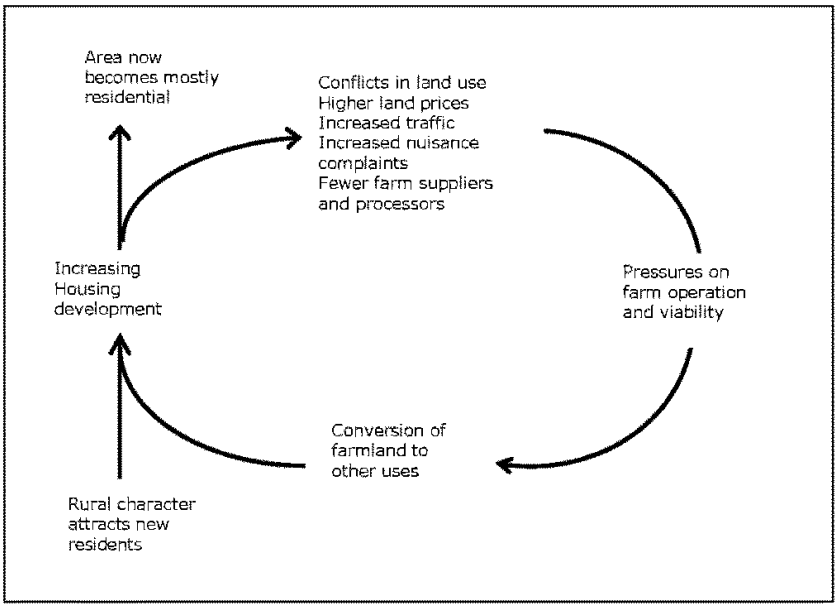


Figure 6.1: The Cycle of Farmland Conversion
Source: (Daniels & Bowers, 1997)

There is a perception in the community that rural land is land that is in a holding pattern awaiting subdivision for urban or rural residential development or converted to some other use. This is not correct. Western Sydney has a vibrant and prosperous rural economy with a diverse community. Agriculture in the Sydney region is an important commodity and contributor to the regional economy as well as providing a landscape that creates its own unique character. It has been noted in section 1.4 that the Greater Sydney Region Plan and Western District Plan both designate the land in Hawkesbury as being in the Metropolitan Rural Area which is not to be subdivided for urban or rural residential development.

Farming, like any business has significant investment in buildings, machinery, crops and livestock. It is not uncommon for this investment to be many millions of dollars for the horticulture, poultry farms and horse studs. Famers want certainty of investment so that they can continue to operate into the future. The soils on the alluvial river flats are good quality for horticulture and there is also land that is flat and therefore good for poultry farming and horse studs on other land in the LGA. However, the large amount of rural residential development as well as the price of the land as discussed in section 6.2 and 6.3, make it difficult for any new poultry farms or horse studs to establish in the LGA. There is a need therefore to protect this investment from development that may cause it to lose productivity. This includes rural residential uses and urban expansion.

The agricultural landscapes in the Hawkesbury LGA are not dissimilar to those of the other peri-urban areas of Sydney. The mixture of high value agriculture production, high quality soils, good climate, transport linkages and competing land uses – urban expansion, rural residential development and other non-agricultural uses create what has been described as a 'contested landscape' where there are a number of competing and often overlapping land uses which creates tensions and land use conflict.

As planners seek to balance the needs of agricultural producers with those of rural residential dwellers and biodiversity habitat, they must also bear in mind the importance of preserving the productive agricultural landscape. In Australia, planning policy and regulation are the main mechanisms for doing this, but overseas research (Daniels, 2014; Daniels & Daniels, 2003; Sinclair & Bunker, 2012) shows that there is a need to balance these mechanisms with incentives, economic development initiatives and farming infrastructure while encouraging community engagement, communication and education. There is also a need to understand and take advantage of the linkages between these three components. An effective policy regime for preserving important rural landscapes requires the application of all these elements, as outlined in Figure 6.2.

It is not intended to discuss these aspects in detail here, but to be effective, there is a need to address each of them, where there has traditionally only been an emphasis on zoning and regulation. The linkages to incentives, economic development and the need for farming infrastructure as well as techniques to engage the community, communicating with the community and educating the community of the benefits of preserving farmland are all key to ensuring the future of agriculture in the Hawkesbury LGA and will be discussed in detail next. It is acknowledged that Local Government can play a role in promoting agriculture, for example, or publishing information about the issues surrounding rural land use conflict, however, they are mostly State Government responsibility.

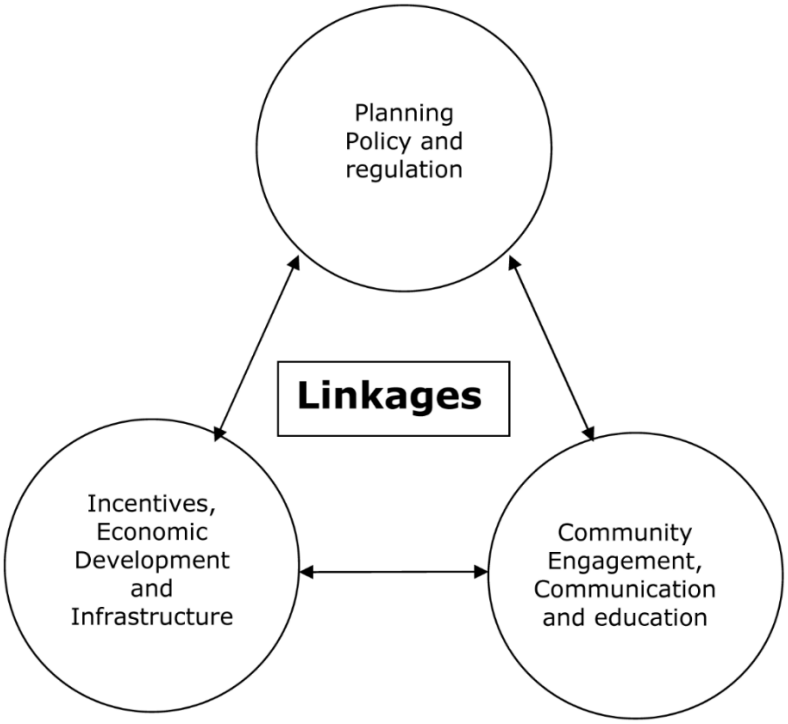


Figure 6.2: Policy responses to preserving rural landscapes
Source: (Sinclair & Bunker, 2012)

The main aspects of the rural lands that this study focuses on fall into two categories:

- Zoning and management of rural land
- Sustainability of Agriculture in the Region

The basic thing that needs to be done is to identify and protect the best land for its use in the future for agriculture. To do this there is a need to understand not only the capability of the land for agriculture but also to understand the land uses – particularly the rural residential and agricultural uses, different types of agricultural systems being carried out on the rural land, the holding size and fragmentation, as well as the impact of each use on the adjoining land – especially rural residential on farmland. There is also a need to accept that rural land use conflict needs to be minimised and the best way to do this is by a strategic approach to the rural land and the management of land uses into the future. It is important to distinguish between the capability of the land and its actual use (Land Use Survey). If there is good quality land but it is fragmented and used for rural residential use and other non-agricultural uses, its capability of being high quality land has been lost because of the rural land use conflict as well as the rise in land value to one of residential use as opposed to agriculture.

6.4.1. Planning Policy and Regulation

The land use zoning system can be used to provide the delineation of the best agricultural land as well as other land that is used for a number of uses. This is

based on land capability and existing areas of production and is discussed in detail in section 6.7

Another aspect of the policy and regulation is land use conflict. Land use conflict occurs when one land user is perceived to infringe upon the rights, values or amenity of amenity of another (NSW Department of Primary Industries, 2011). In most cases it occurs when people move into a dwelling or build a dwelling on land (small and large lots) which is either adjacent to or near to an operating farm - these can be intensive and extensive agricultural operations. The resident alleges a perceived loss of amenity due to noise, odour, dust, night time activities, spray drift, etc. In most cases they expect the amenity to be one of quiet, peaceful and nice smelling countryside because they don't understand farming or the noise, odours and other impacts. However, as discussed in section 4.2.3, this is often not the case when they move next to an operating farm. The environmental legislation (Protection of the Environment Operations Act, 1997, and relevant regulations) governing pollution is based on an urban situation and one that assumes that all pollution can be contained within the boundaries of the land. This can be done in an urban situation but it is very difficult in a rural one. Noise pollution is a case in point. The noise pollution legislation says that if the noise being emitted is a specific level greater than the ambient noise level, the operation is in breach of the noise pollution legislation. If the neighbour complains, the Council can require the farmer to bring the noise down to the required level, or confine the noise generating activity to a maximum number of days per year. This can often force farming operations to be restricted to certain hours, thus reducing the intensity and duration of the nuisance. But such restrictions can affect the economic viability of the farming business and in turn force farmers either to move or to cease farming, which accelerates the conversion of land to rural residential purposes. It could be said that the legislation benefits the complainant and not the producer.

The NSW Government has introduced a right to farm policy which has as its main focus "… a desire by farmers to undertake lawful agricultural practices without conflict or interference arising from complaints from neighbours and other land users." (NSW Department of Primary Industries, 2015) It has also introduced a Right to Farm Act, which in the Explanatory Note to the to the Right to Farm Bill 2019 has a number of objects but the most relevant are as follows:

(a) to prevent an action for the tort of nuisance being brought in relation to a commercial agricultural activity where it is occurring lawfully on agricultural land,
(b) to require a court to consider alternative orders to remedy a commercial agricultural activity that is found to constitute a nuisance rather than order the activity to cease

It is significant to note that the Act relates to the 'tort of nuisance' and states that commercial agricultural activities do not constitute a nuisance. It goes on to

state that if a court finds that a commercial agricultural activity constitutes a nuisance, then the court must not order the complete cessation of the activity, if it could make an order to allow it to continue in a manner:

(a). that is managed, modified, or reduced, and
(b). is consistent with an efficient and commercially viable operation, and
(c). unlikely to significantly disturb the other party to the proceedings

However, for a farmer to be protected by this legislation, a complainant must bring an action in the Local Court in a tort of nuisance. This is a costly exercise and one that is unlikely to occur. The current practice in land use conflict issue is that the neighbour complains to the Council and it is up to the Council to investigate it. The Council can then take any necessary action under the Protection of the Environment Operations Act to make the farmer modify the operations to stop the loss of amenity of the neighbour. It is noted that the Right to Farm Act does not override the Protection of the Environment Operations Act.

Agriculture causes off-site impacts which are generally accepted by people who farm the land, but this causes conflict when the neighbour is using the land for amenity and not production. One option to deal with this is to consider the dominant use having priority over other uses when complaints are made – the "right to farm". In this case the dominant use would be agriculture and other non-agricultural uses would include rural residential dwellings as well as accommodation and commercial uses. The zoning system can be used to classify the land that is identified for its productive potential for agriculture as well as land for other uses (this is discussed in detail in the next section). When a complaint is made against an agricultural practice by a neighbour, the first point of the investigation would be to determine if the land is within the agriculture production zone. If this is the case, the investigation determines if the farmer is carrying out best practice (which can be determined and documented in by Councils and Government Agencies in conjunction with the relevant farming organisation) and if they are, the complainant is advised of this and the farmer is left to farm the land. It is important to note, however, that if the farmer is causing a breach of the Protection of the Environment Operations Act, this should be investigated and if there is a breach, appropriate action should be taken. This approach is called 'let the farmers farm' and is a collaborative and consultative approach that tries to resolve the issues in favour of the farmers over the residential uses. This would require some alteration to the pollution legislation but it is considered to be worthy of investigation by the Department of Primary Industry and Department of Planning, Industry and Environment via the Intensive Agriculture Consultative Committee. The Hawkesbury LEP can only be used to alleviate land use conflict by the assessment of applications for the use of the land and cannot be used for existing land use conflict issues.

Council's Development Control Plan (DCP) is used to provide a guide to the assessment of DAs. It is noted that the Council's current DCP includes Chapter 8 which deals with Farm Buildings and Outbuildings in association with rural residential development. It does not include any guidelines on intensive plant or intensive livestock agriculture, animal boarding and training establishments or aquaculture. Having regard to the discussion about promoting agriculture and the opportunities to encourage agriculture, it would be appropriate for the Council to incorporate the following sections into its DCP:

- Intensive Plant Agriculture
- Intensive Livestock Agriculture
- Animal Training and Boarding Establishments
- Aquaculture
- Farm buildings
- Non-Agricultural development

The use of Land Use Conflict Risk Assessment as a way of dealing with land use conflict has been discussed in section 4.2.3. This can be a requirement for all non-agricultural development in the Primary Production Zone to require a risk assessment to be submitted to assess the potential for the use to cause land use conflict. This can be incorporated into the DCP requirements for non-agricultural development.

The SEPP Exempt and Complying Development has been discussed in section 1.4.3 where it was noted that there is potential the for land use conflict to be increased by new dwellings being built close to an intensive agricultural use and for the need for an unnecessary DA to be required for rural sheds that are required for the agricultural use merely because they cover an area of more than 1,000 m^2. The potential land use conflict can be dealt with by requiring the dwelling house to be moved away from the adjoining agricultural development or other ways of reducing the conflict as was the case before the introduction of Codes SEPP via the DA assessment process. There would also be the ability to require a Land Use Conflict Risk Assessment with a DA as part of the DCP, as this is not possible under the SEPP at present. The ability to require a DA to address land use conflict which is perhaps one of the most significant aspects of preserving agriculture is not available with the current application of the Codes SEPP. In addition, the unnecessary requirement for a DA for sheds with a total area of over 1,000 m^2 is considered to be redundant because it is highly likely that the DA would be approved if it is in conjunction with an intensive agricultural use of the land. There is the opportunity to resolve these two anomalies by amending the SEPP Exempt and Complying Development so that it does not apply to the RU1 Primary Production zone in Hawkesbury LGA.

It is noted that both the Hawkesbury LEP has some statements about protecting agricultural land but it is not very specific. It is considered appropriate that more

specific statements should be put into the LEP by amending the objectives of the relevant zones.

Agriculture contributes to a number of aspects of the Hawkesbury LGA which are as follows:

- Economy
- Rural Landscape
- Tourism
- Settlement pattern
- Environmental conservation

In order to recognise this from an overall corporate viewpoint, the issues raised above can be incorporated into the Council's corporate and governance documents such as the Corporate Plan and Community Plan where appropriate.

6.4.2. Incentives, Economic Development and Infrastructure

The incentives, economic development and infrastructure aspect can cover the following:

- Incentives in rate rebates for Agricultural Production
- Economic development strategies to help farming, such as a regional brand, websites and linking local produce to local restaurants
- Infrastructure such as roads, telecommunications, and electricity to be provided

Council rates are one of the largest single outlays for an agricultural producer, and rate remission can help keep land in farming. Rate charges are based on land value, and can range from $2,000 to $60,000 or more, depending on a farm's size and location. As rural land becomes more desirable for rural residential use, land values increase, with a corresponding impact on rates. The farming community has borne this cost, often without a commensurate increase in the value of production, and this is more problematic where intensive farming – for example, irrigated and intensive cropping and intensive animals – is already common. This creates a fundamental inequity between urban and rural areas where residents of urban areas adjoining rural land pay much less (in the order of $500 to $1,000) and have many more services than people living in adjacent rural areas. This can be structured to correspond to the rural land designations (discussed in the next section) with those farmers who are in the Primary Production designation receiving a larger rebate than the Rural Landscape designation because the Agriculture Production zone is more important for its agriculture output because it has more agricultural land uses. The Rural Landscape zone has more rural residential land uses and has less agricultural output. The scheme would be based on an annual inspection and proof of net farm profit. This is a matter for Council's rating policy and should be investigated to identify the amount of rate revenue generated from the

agricultural land uses, rural residential, and residential land uses. The rates paid by a selection of these land uses can then be compared and some analysis done of the relative impact of reducing the agricultural land use on the rates for the other land uses.

Economic development initiatives are also used to ensure that farming can continue, thereby providing for food security. These initiatives include allowing and encouraging roadside stalls, whereby farmers are permitted to sell produce from their farm. Others include allowing and encouraging agritourism, farmers' markets like the current ones in Richmond and Windsor, local branding and encouraging farmers to deal directly with restaurateurs, which give the restaurateur access to fresh reliable produce and the farmer access to a secure and reliable market. Hawkesbury Council can have a direct and indirect influence on these initiatives. The Council's economic development strategy can be amended to address some of these initiatives, and the Council can support and encourage other organisations to carry out other initiatives.

The assessment of Development Applications under the provisions of the LEP is one area where the Council can have a direct influence. Currently, the LEP permits the range of uses listed above and this is positive for the economic development of the region's agriculture.

Agritourism is becoming an increasingly popular form of development. Agritourism can be defined as follows *" … the act of going to a region for the purpose of visiting a working farm, winery or other food or fibre related operation (including restaurants, markets, produce outlets and natural attractions) for enjoyment, education or active participation in activities and events"* (Ecker et al., 2010). In the case of the Hawkesbury rural lands this includes farm-gate sales of produce and rural accommodation. The continued support of the Farmgate Trail is something that Council can do to help and promote agritourism. Council can have an indirect influence on other initiatives such as local branding and agritourism by supporting them to develop and prosper. The establishment of a local brand such as 'Hawkesbury Fresh' or 'Hawkesbury Grown' would help raise the local profile. It is noted that the Hawkesbury Harvest emblem is used by a number of farms but it could also be used by local businesses that use local produce.

There is a need to ensure that there is sufficient infrastructure to allow agriculture to continue. This includes water as well as access to produce stores, farm machinery dealership, mechanics, metal fabrication uses, transport (road, rail and air), access to consultants and other professionals as well as a workforce. Hawkesbury Council can directly influence the achievement of appropriate infrastructure by ensuring that roads are kept to a standard that allows the farmers to move their produce as easily as possible. The other issues outlined above can be indirectly influenced by the Council supporting their location and development.

6.4.3. Community Engagement, Communication and Education

There is also a need to engage with the community to make them aware of the importance and benefits of farmland, particularly where their produce is grown. The Council can promote the role of agriculture in the Region by preparing brochures on the role, value and importance of the LGA in the food supply of Sydney's peri-urban area. The information in the land use survey can provide the basis for such a brochure. This is also linked to the economic development issue mentioned above – the agriculture in the LGA has both economic and community benefits.

The community can be encouraged to participate in urban agriculture such as community gardens, edible streetscapes / road verge gardens and farmers markets. This is also linked to the health of the local community and other community development goals. Community gardens are usually planted on Council owned land and they can be a way to encourage people to grow fresh food as well as gaining a sense of community wellbeing. "Community gardens are places where people come together to grow fresh food, to learn, relax and make new friends" (Australian City Farms & Community Gardens Network) There is a growing move to planting the road verges with vegetables – although this is more prevalent in higher density neighbourhoods.

Hawkesbury Council can support the establishment of Community Gardens by gaining knowledge about it as well as encouraging it to be carried out on public land with easy access to the surrounding community. The Council can also have a role with community gardens and road verge gardens by requiring developers of new subdivisions to set aside land and provide appropriate infrastructure (water and electricity) as well as planting edible street trees. In a number of existing subdivisions, land is set aside for small parks and is mostly unused and these can also potentially be reused for community gardens. In multi-unit developments, the landscaping plan can be required to make provision for a vegetable patch to encourage people to plant fresh vegetables, thus providing them with healthy food. Farmers Markets allow local farmers to sell the food they produce to the local people. They are usually run on a fortnightly or monthly basis. They are also run in parks, showgrounds, car parks and other public spaces.

It is important to communicate with the various stakeholders to ensure that they are all involved and know what is happening in other areas and fields of expertise, thereby creating an environment for collaboration. Education is useful in overcoming misconceptions about the idyllic rural lifestyle sought by those moving to the country from urban areas as well as providing information about the food and where it is grown. The restaurant and catering industry can play an educative role by promoting fresh food from nearby sources. Events can be designed to draw attention to the importance and characteristics of rural

production, in promoting community awareness of local agricultural production. The Council can promote the role of farming and its role in the Hawkesbury LGA.

Council staff can also be trained in the planning aspects of agricultural production. This was discussed in conjunction with the protected cropping sector in section 4.2.5. This would include discussion about the different types of agriculture and the impacts that can occur both onsite and offsite. It would cover intensive and extensive agriculture and the different operational and design aspects of the buildings and structures associated with each farming system. This would include staff from the development assessment, strategic planning and compliance sections.

This section has pointed out that to ensure the sustainability of agriculture in the Hawkesbury LGA there is a need to address all three of the matters outlined in Figure 6.2. A number of actions have been outlined above that can be introduced by the Council to help to facilitate the sustainability of agriculture in the LGA. They can also be done in a coordinated and linked program. The best land can be identified and zoned for agriculture production and incentives can be applied to that land to ensure that it can be retained in the long term. Also, economic development initiatives can include links being made between these farms and the local restaurant industry and farmers markets. There could also be a farm gate trail set up to promote this. A locally grown scheme could be set up and be promoted by local cafes and restaurants to promote the local farming. In new residential estates, land could be set aside for community gardens like it is done for parks.

6.5. Settlement Hierarchy

The Settlement hierarchy was discussed in section 4.2.6. A five-order hierarchy is recommended for Hawkesbury LGA. It is necessary to recognise that the regional centre is outside the LGA and also that other surrounding centres also have a bearing on the settlements. It is based on the criteria discussed in section 4.2.6 and is as follows:

Metropolitan Centre	➡	Penrith
↕		
Strategic Centre	➡	Blacktown, Marsden Park, Rouse Hill, Richmond - Windsor
↕		
Local Centre – Town.	➡	Glossodia, North Richmond, Pitt Town, Wilberforce,
↕		

Local Centre – Village. ➡ Agnes Banks, Bilpin, Bowen Mountain, Freemans Reach, Kurmond, Kurrajong, Kurrajong Heights, McGraths Hill, St Albans

Rural Locality. ➡ Berambing, Blaxlands Ridge, Colo Heights, Cumberland Reach, East Kurrajong, Ebenezer, Grose Vale, Leets Vale, Lower McDonald, Webbs Creek

The purpose of the hierarchy is to acknowledge that some settlements, because of their lack of services and facilities, are not able to grow by either infill or expanding the boundaries of its urban zoned land. For a settlement to be able to grow, there is a need for basic services and facilities including weekly shopping (supermarket) and a school (at least primary) as well as water, sewer, retail, cafes and medical services. The strategic centre and local centre - towns are usually able to grow subject to constraints and the villages and rural centres, don't have the potential to expand their current urban boundaries. Table 6.1 provides a list of all of the urban settlements in the LGA with the corresponding services noted by a tick. It can be seen that the settlements designated as strategic centres and local centres – town have the most facilities and services and that the ones that are local centres – village don't have as many

Table 6.1: Services and Facilities in Settlements

Service and Facility	Richmond	Windsor	Glossodia	North Richmond	Pitt Town	Wilberforce	Agnes Banks	Bilpin	Bowen Mountain	Freemans Reach	Kurmond	Kurrajong	Kurrajong Heights	McGraths Hill	St Albans
Government Offices	✓	✓													
Hospital	✓	✓													
Council Offices		✓													
Primary School	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓		
High School	✓	✓		✓						✓					
Shopping Centre	✓	✓	✓	✓	✓	✓						✓			
Supermarket	✓	✓	✓	✓	✓	✓						✓			
General Store									✓	✓	✓			✓	✓
Post Office	✓	✓	✓	✓	✓	✓		✓		✓					

Service and Facility	Richmond	Windsor	Glossodia	North Richmond	Pitt Town	Wilberforce	Agnes Banks	Bilpin	Bowen Mountain	Freemans Reach	Kurmond	Kurrajong	Kurrajong Heights	McGraths Hill	St Albans
Oval	✓	✓	✓	✓	✓	✓		✓							
Community Centre / Hall	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clubs / Hotel	✓	✓		✓	✓	✓					✓		✓	✓	✓
Bushfire Brigade	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water Reticulation	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Sewer Reticulation	✓	✓	✓	✓	✓	✓				✓					
Waste Collection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

In order to ensure that a settlement is sustainable and does not create any adverse social, economic or environmental impacts a set of criteria can be developed to ensure that any future development is as sustainable as possible.

The criteria can be categorised into exclusionary and management criteria. Exclusionary criteria cover those issues considered to be of such magnitude that it should be used to exclude land from future urban or rural residential development. Management criteria, however, covers issues that can be dealt with on a site by site basis.

Exclusionary criteria and the reasons for it being listed as such are as follows:

- *Natural Hazards (Bushfire and Flooding)*. Bushfire prone land has been mapped and Planning for Bushfire Protection 2019 states that it should not be rezoned for urban or rural residential development. Land that is flood prone (inundated by the 1% AEP flood event), poorly drained or close to a drainage line or creek should, as a general rule not be rezoned because of potential impact on any existing or new dwellings as well as putting the lives of the people who live there and those who may be asked to rescue them at risk. Land that has its access over floodprone land or a stream that is susceptible to flooding should also not be rezoned. It should be noted that some flood prone land may be developed, subject to the hazard category of the land in question.
- *Flood road closures impact.* During flooding of the Hawkesbury River all of the bridges over the river were closed during the flooding in February 2020 as well as the Sackville Ferry. It is noted that the new Windsor Bridge will still be accessible when the other two bridges (Richmond and Yarramundi) as well as the Sackville Ferry are cut but this has the potential to cause traffic congestion on this river crossing. The

replacement Windsor Bridge will still be overtopped in times of minor flooding (1:3 probability event as discussed in section 4.3.8), which will mean that 45% of the LGA population who live on the western side of the bridge, the bulk of who travel to work will be cut off. This and the flood evacuation issues limit the potential for any major new development on the western side of the Hawkesbury River.

- *Prime Agricultural Lands*. Prime agricultural lands (classes 1 – 2) are needed for the growing of plants and animals and as such should not be used for urban or rural residential development. This land is located along the Hawkesbury River from Ebenezer in the north, Pitt Town, McGraths Hill and Windsor in the East, Richmond and Agnes Banks in the South and Freemans Reach in the west.
- *Proximity to agricultural development*. The proximity to agricultural development, particularly intensive agriculture like horse studs, poultry farms, turf farms, market garden and nurseries can cause land use conflict. The land use constraints mapping has identified the contested lands and therefore, an appropriate buffer of 500 m from these uses agricultural land uses should be observed, when considering if the land should be rezoned to urban.
- *Utility servicing*. This includes water, sewer, electricity and telephone.
- *Road surface*. All roads to be accessed should be sealed.
- *Community Services and Facilities*. This includes community halls, child care, home care services, medical, dental and other similar services.
- *Shopping facilities*: this includes supermarkets, newsagents, chemists, cafes, and similar shopping facilities.
- *Slope of land – greater than 20%*. Land with steep slopes is not considered appropriate for rural residential development because of erosion potential and scenic impact on the landscape. This includes land that has to access over 20 % slope.
- *Native Vegetation*. Native vegetation provides a biodiversity and habitat resource and areas that are heavily vegetated should not be developed because of the potential impact on the biodiversity and habitat from the clearing of that land.

Management Criteria and the matters that have to be addressed are as follows:

- *Domestic Effluent Disposal*. The method of domestic effluent disposal has a major bearing on the size of the lot to be subdivided. A soil and water test will be necessary to ascertain the minimum area for effluent disposal which in turn will impact on the size of the lot.
- *Road Alignment and access.* The road alignment and access should have adequate sight lines so that any potential impact with other vehicles travelling on the road are minimised.
- *Traffic Generation.* Traffic generation for rural residential development is the same as urban development which is 6 – 10 movements per day. This can add up to a number of traffic movements which can overload existing roads and intersections. This may cause a need for road widening and or intersection treatment.

The Hawkesbury LGA, except for the Vineyard Urban Release Area is classed as the Metropolitan Rural Area (MRA) and this does not allow for any major expansion of the urban area of Sydney into the MRA. It is noted that when the exclusionary criteria are applied to the settlements, none of the Local Centre – Villages can be expanded because of a mixture of slope, floodprone, bushfire prone and infrastructure issues. This provides some certainty for the settlements but could have the impact of increasing the price of land in the settlements. However, it may be possible to allow for some 'organic' growth of some of the settlements by providing for a small amount of growth along the lines of the current population growth of the LGA which is 0.7% per annum over the past 10 years according to the ABS Regional Population Growth database. This would require detailed investigations of each of the settlements in question and should also be done in association with an assessment of the services and facilities available in each settlement. The Hawkesbury Housing Strategy identifies the accommodation of continued incremental growth in rural villages, whilst maintaining the local character and respecting environmental constraints which is supported.

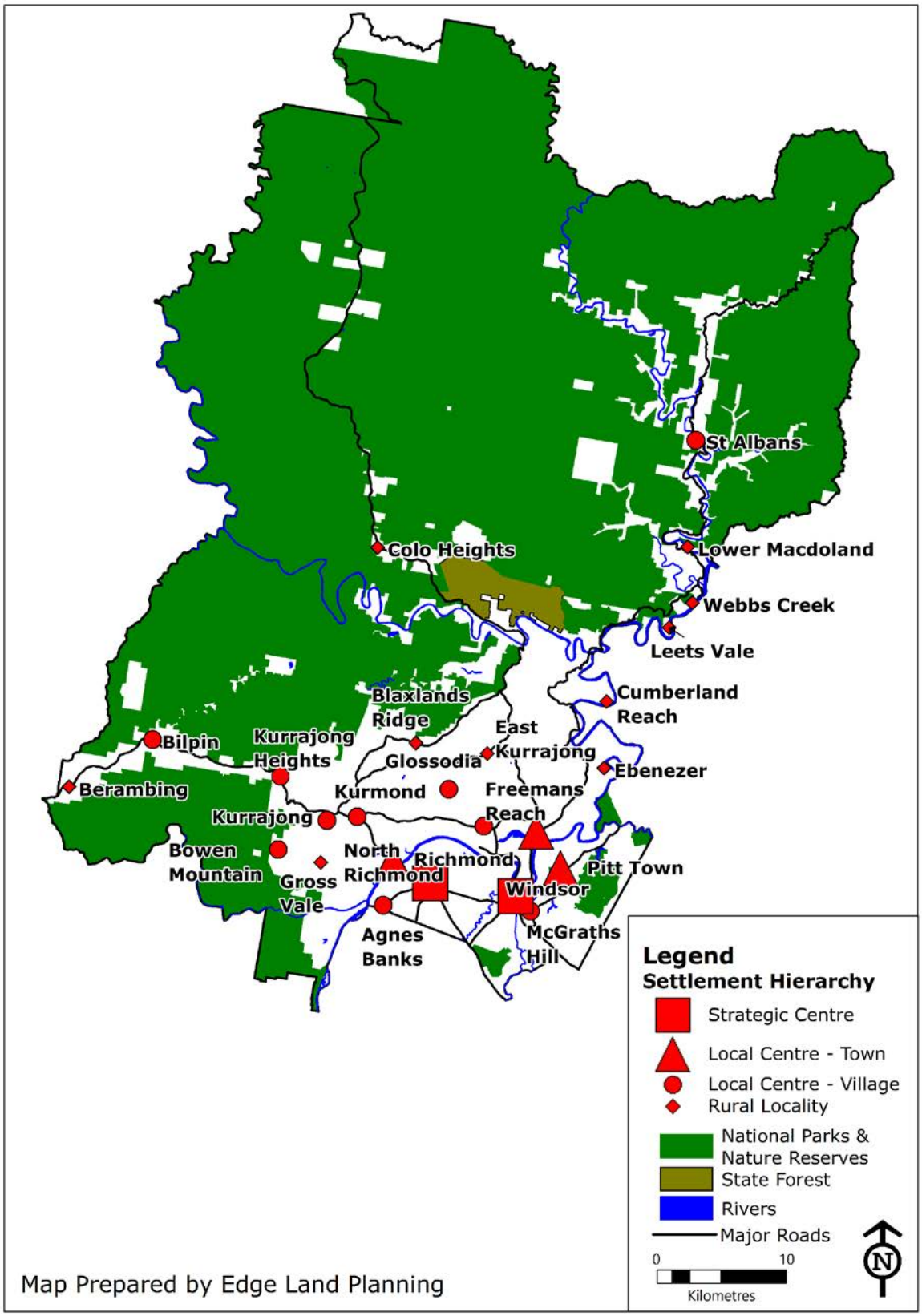
It is also noted that the Hawkesbury Housing Strategy has identified that Richmond and Windsor have sufficient land to accommodate future residential development by increases in residential density as well as utilising other housing options. The Vineyard Urban Release Area is to accommodate new housing (this is part of the North West Growth Area and not considered in this strategy). There is zoned land that is yet to be subdivided at Glossodia and North Richmond.

The Western City District Plan identifies that rural areas contain large areas that serve as locations for people to live in a rural or bushland setting. Rural-residential development is not an economic value of the District's rural areas and further rural-residential development is generally not supported. Limited growth of rural-residential development could be considered where there are no adverse impacts on the amenity of the local area and the development provides incentives to maintain and enhance the environmental, social and economic values of the Metropolitan Rural Area. This could include the creation of protected biodiversity corridors, buffers to support investment in rural industries and protection of scenic landscapes.

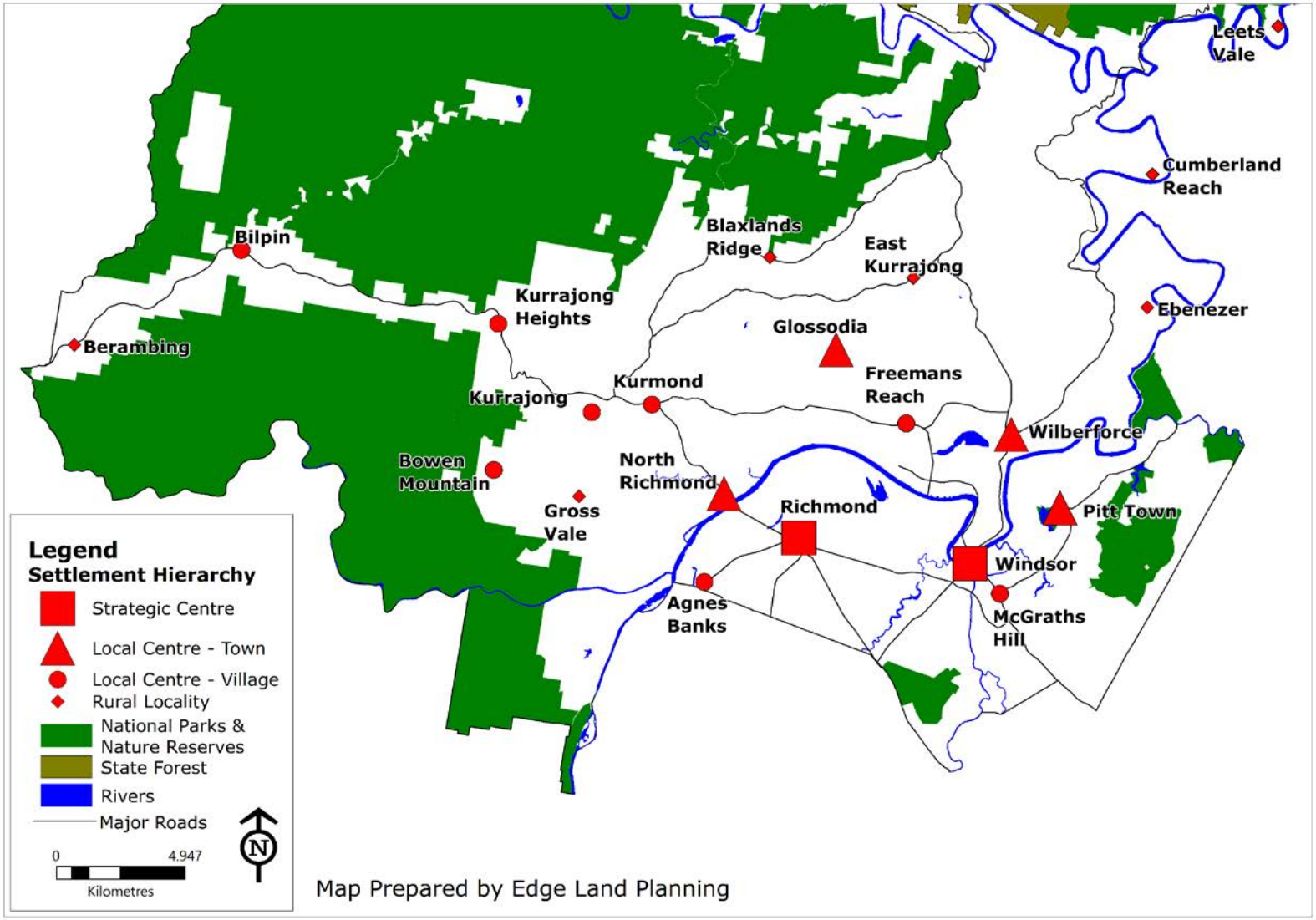
For the reasons noted, the following settlements are not recommended for expansion other than natural or organic growth:

- Agnes Banks (agricultural land, floodprone land and lack of service and facilities);
- Bilpin (agricultural land, bushfire prone, native vegetation, slope and lack of service and facilities);
- Bowen Mountain (bushfire prone, native vegetation, slope and lack of service and facilities);

- Freemans Reach (agricultural land, floodprone land and lack of service and facilities);
- Kurmond (bushfire prone, slope and lack of service and facilities);
- Kurrajong (bushfire prone and slope),
- Kurrajong Heights (bushfire prone, native vegetation, slope and lack of service and facilities);
- McGraths Hill, (floodprone land)
- Oakville/Maraylya (infrastructure and timing - link to Housing Strategy)
- Pitt Town (agriculture and floodprone land)
- St Albans (bushfire prone land and lack of service and facilities)



Map 6.1: Settlement Hierarchy LGA



Map 6.2: Settlement Hierarchy South

6.6. Landscape Based Strategic Planning

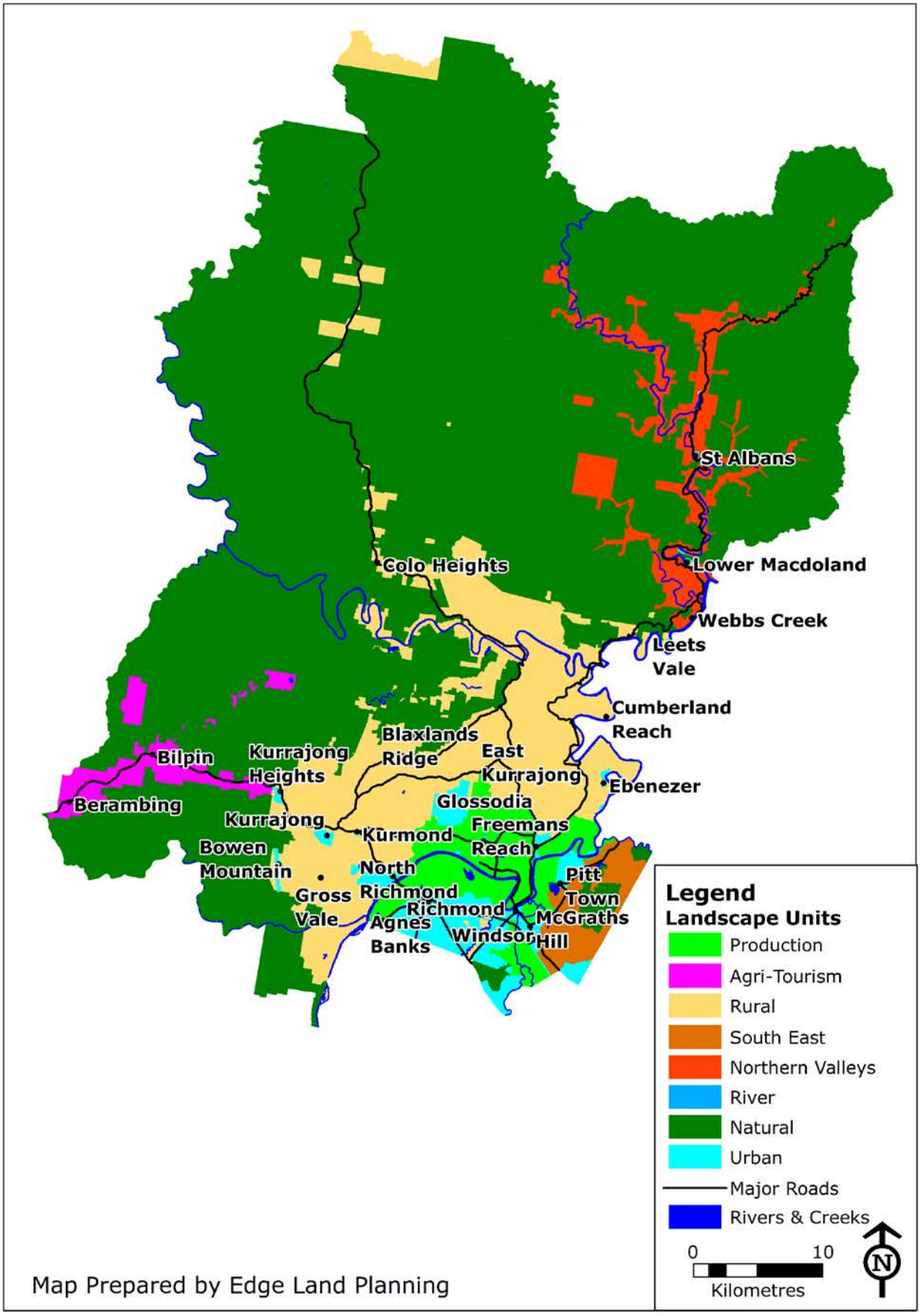
A number of landscape units have been identified for the LGA and they are based on land use, topography, vegetation and holding sizes. The landscape boundaries have been defined by the relationship between these elements and they also relate to the way that an area looks and feels. They have been identified to help the Council to provide planning for the future of the rural lands as well as the consideration of the requirement for place-based planning in the Western City Plan prepared by the Greater Sydney Commission. The landscapes will be used to identify different recommendations for land uses and zoning as well as other strategic priorities.

The landscape units are as follows:

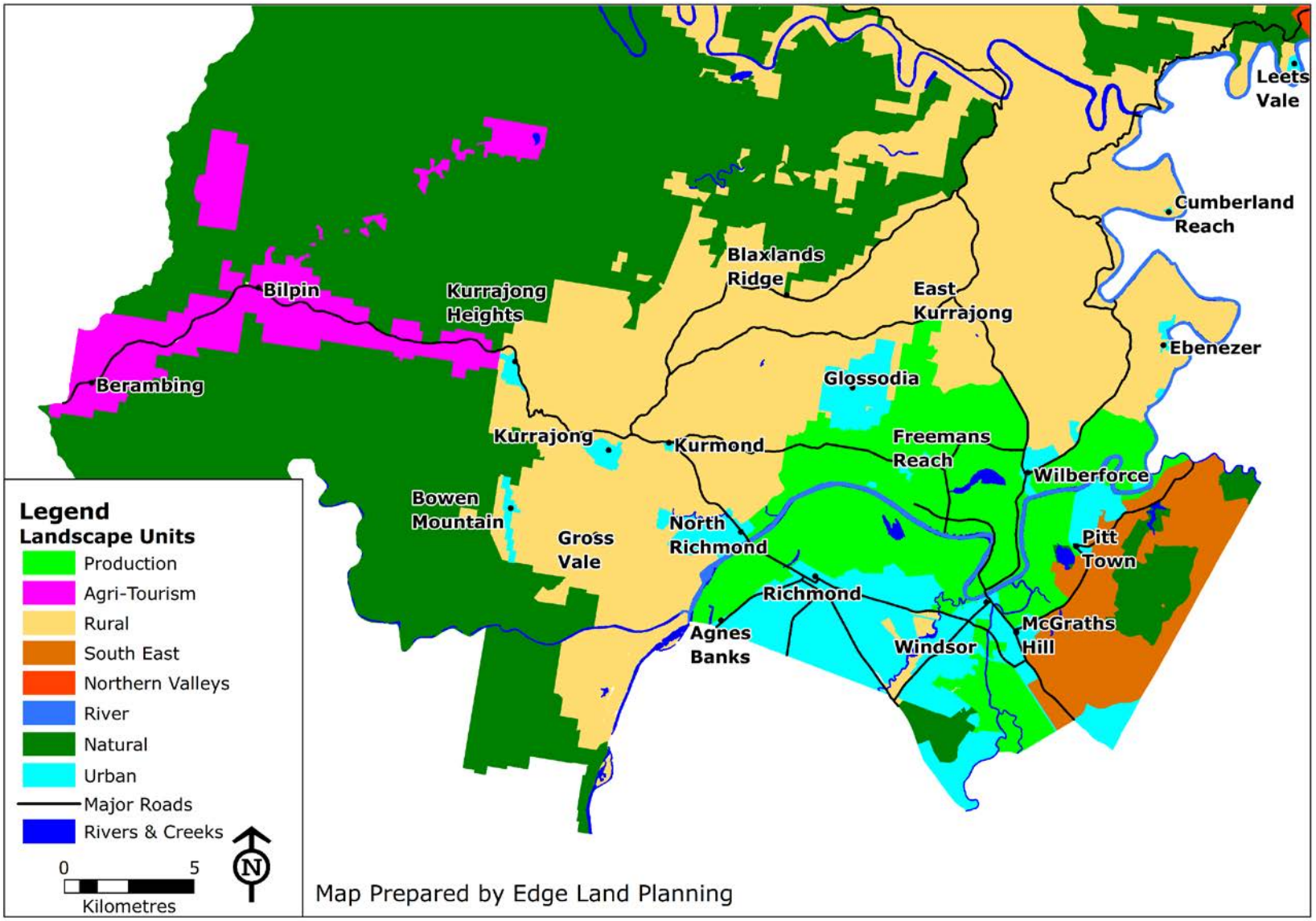
- Production
- Agri-Tourism
- Rural
- South East
- Northern Valleys
- River
- Urban

Their spatial distribution can be seen from maps 6.3 and 6.4.

A place-based approach to the strategic planning of the rural landscapes can be applied and this is best called 'landscape-based' strategic planning. It is noted that place-based strategic planning is normally applied to urban areas and precincts. Each of the landscape units outlined above has specific components that set it apart from the other landscapes of the LGA although in some circumstances, the land use zoning outcomes may be the same. However, other strategic directions will be different and these will be discussed in each of the landscape units.



Map 6.3: Landscape Units LGA



Map 6.4: Landscape Units South

6.6.1. Production Landscape

The production land unit is based around the productive land of the Hawkesbury River alluvial and surrounding land.

It extends from Agnes Banks to North Richmond and Glossodia, Freemans Reach, Wilberforce and Gronos Point, Pitt Town, McGraths Hill and the South Creek Valley from Windsor to Mulgrave, South Windsor and Vineyard.

The land is mostly flat with some undulating land away from the river flats.

The land use is dominated by intensive agriculture, mostly market gardens and turf farming with some poultry, horse studs and polo clubs. There is some rural residential land use but it is not significant. Holding sizes are mostly less than 8 ha (66.7%) and an average size of 9 ha.

Photo 6.3 shows the land at Freemans Reach and Richmond Lowlands.

Photo 6.3: Production Landscape
Date of Photo: August 2019

Strategic Direction

Zoning of the land is recommended to be RU1 Primary Production.

Promote the area as the main production area for agriculture and specifically food production and turf growing.

Discourage sand and gravel extraction

Minimise the impact of other land uses which are not associated with food production or turf growing.

Apply a rural rating rebate to all farmers and also consider applying a rebate of 90% in this landscape unit.

Apply the 'let the farmers farm' approach to use conflict in section 6.4.1.

Require a Land Use Conflict Risk Assessment for all non-agricultural development applications.

6.6.2. Agri-tourism Landscape

This landscape is focused on the Mountainous lands that have a mixture of productive agriculture as well as tourism related businesses such as food and accommodation.

It extends along the Bells Line of Road and side roads from Kurrajong Heights to Bilpin and Berambing as well as Mountain Lagoon.

The land is hilly to steep with the Bells Line of Road running along a ridge line.

The land use is a mixture of rural residential rural living, orchards, cafes, accommodation, cider cellar door and other commercial uses.

Holding sizes are mostly less than 8 ha (69.4%) and an average size of 8 ha.

Photo 6.4 shows orchards at Bilpin.

Photo 6.4: Agri-Tourism Landscape
Date of Photo: August 2019

Strategic Direction

Zoning of the land is recommended to be RU2 Rural Landscape.

Promote the area as being the major agritourism place in the LGA. The types of businesses to be promoted include farm gate sales, pick your own, accommodation,

cafes and restaurants in conjunction with agricultural uses, cellar door sales of locally produced beverages like cider and other similar uses.

Encourage Bed and Breakfast accommodation and rural tourist cabins in association with agricultural and tourist uses.

Apply a rural rating rebate to all farmers and also consider applying a rebate of 90% in this landscape unit.

Apply the 'let the farmers farm' approach to use conflict in section 6.4.1.

6.6.3. Rural Landscape

The landscape unit is based around the broad rural area of the slopes and undulating land.

It extends from Yarramundi, Grose Vale and Kurrajong Heights to North Richmond, The Slopes, Glossodia, Blaxlands Ridge and East Kurrajong as well as Ebenezer, Sackville North, Leets Vale, Cumberland Reach and Colo Heights.

The land use is mostly rural residential with some intensive plants and animals.

Holding sizes are mostly less than 8 ha (68.8%) and an average size of 6 ha.

Photo 6.5 shows the land at North Richmond, Kurrajong, Kurmond and The Slopes

Photo 6.5: Rural Landscape
Date of Photo: August 2019

Strategic Direction

Zoning of the land is recommended to be RU2 Rural Landscape.

Promote the area as part of a tourist drive along the river to promote tourism associated with the river.

Encourage rural accommodation such as Bed and Breakfast in existing dwellings.

Apply a rural rating rebate to all farmers and also consider applying a rebate of 75% in this landscape unit.

Apply the 'let the farmers farm' approach to use conflict in section 6.4.1.

6.6.4. South East Landscape

The landscape unit is based around the south east part of the LGA.

It extends from Cattai to Pitt Town, McGraths Hill, Vineyard, Oakville and Maraylya.

The land use is mostly rural residential (87.2%) with some intensive plants and animals (5.5% in total).

Holding sizes are mostly less than 8 ha (97.2%) and an average size of 2 ha.

Photo 6.6 shows the land at Oakville.

Photo 6.6: South East Landscape
Date of Photo: August 2019

Strategic Direction

Zoning of the land is recommended to be RU2 Rural Landscape.

Apply a rural rating rebate to all farmers and also consider applying a rebate of 75% in this landscape unit.

Apply the 'let the farmers farm' approach to use conflict in section 6.4.1.

Oakville – Maraylya

It is noted that land in the Oakville – Maraylya localities has been the subject of a number of submissions to the Draft Housing Strategy exhibition requesting that the land be rezoned to allow urban development to be the same as the land on the eastern side of Boundary Road in The Hills LGA.

It is also noted that the Housing Strategy has identified that there is not an identified need for additional investigation areas given the fact that existing residential zonings are sufficient to meet the target / population projections provided by the Greater Sydney Commission and Department of Planning, Industry and Environment.

It has been noted above that the land is recommended to be zoned as Rural Landscape with 5.5% of the total land being agriculture and 87.2% of its land use as rural residential. This indicates that it is not a significant area for agriculture. It does not have as many physical constraints for urban development not being flood prone and not having high bushfire prone land.

Infrastructure is a key consideration for any investigation area, including roads, services and community infrastructure, the planning for which is long term. A key consideration in this respect is the Outer Sydney Orbital. At this stage, the Outer Sydney Orbital Road corridor does not extend beyond Richmond Road and its route to the north of this has not yet been determined. Transport for NSW have indicated that the extension of the Outer Sydney Orbital is subject to Future Investigations for connections to the Central Coast. Corridor locations will need to be known before any future investigations can occur into the future land uses of the land.

6.6.5. Northern Valleys Landscape

The landscape unit is based around the valleys in the north of the LGA which include the Hawkesbury and Macdonald Rivers and Webbs Creek and other smaller creeks.

It extends from Webs Creek to Lower Macdonald, Upper Macdonald and St Albans.

The land use is mostly rural residential rural living with some extensive agriculture and commercial uses which are mostly tourism related.

Holding sizes are mostly greater than 8 ha (65.3%) and an average size of 26 ha.

Photo 6.5 shows the land at Central Macdonald.

Photo 6.7: Northern Valleys Landscape
Date of Photo: August 2019

Strategic Direction

Zoning of the land is recommended to be RU2 Rural Landscape.

Promote the are as part of a tourist drive along the river to promote tourism associated with the river.

Promote bed and breakfast and rural cabins in association with rural and ecological uses as well as camps and educational establishments and river based tourist uses such as water skiing.

Apply a rural rating rebate to all farmers and also consider applying a rebate of 75% in this landscape unit.

Apply the 'let the farmers farm' approach to use conflict in section 6.4.1.

6.6.6. River Landscape

The landscape unit is based around the Hawkesbury River and the activities that take place on it.

It extends from Webbs Creek in the north to Yarramundi in the South.

Photo 6.8 shows the Hawkesbury River showing a tourist use on the shoreline.

Photo 6.8: River Landscape
Date of Photo: August 2019

Strategic Direction

Zone the Hawkesbury River as W1 Natural Waterways between Yarramundi Bridge and Windsor Bridge and W2 Recreational Waterways between Windsor Bridge and Webbs Creek

Promote the area to be used for recreational uses such as water skiing and recreational boating and fishing.

6.6.7. Urban Landscape

The landscape unit is based around the urban areas of the LGA. They range in size from small settlements like Cumberland Reach and St Albans to medium sized ones like Kurrajong to large ones such as Richmond and Windsor.

Photo 6.9 shows the land at Cumberland Reach.

Photo 6.9: Urban Landscape
Date of Photo: August 2019

6.7. Land Use Zoning

Land use zoning is perhaps one of the major impacts on the land use character and what is permitted where in the LGA.

6.7.1. Assessment of Current Rural Land Zoning

An assessment has been carried out of the current zoning regime. This has been overlaid with the land use map and analysis has been carried out of the land uses within each zone to provide data on the applicability of each zone.

The spatial extent of the zone overlaid with the land use survey can be seen from map 5 and the land uses within eac of the three rural zones are shown on figure 3.

It is noted that the RU1 Primary Production zone is the primary zone for the preservaton of farmland and farming. THe following is an excerpt from the Department of Planning and Environment Circular on the application of the zones:

> ***Primary Production**: This zone is generally intended to cover land used for most kinds of primary industry production, including extensive agriculture, horticulture (market gardening, protected cropping, intensive livestock agriculture, mining, forestry and extractive industries. The zone is aimed at maintaining and enhancing the natural resource base.*
>
> ***Rural Landscape**: This zone is generally intended for rural land with landscape values or land that has reduced agricultural capability due to gradient, soil type, vegetation, rock outcrops, salinity etc. but which is suitable for grazing and other forms of extensive agriculture.*

It can be seen from figure 6.3 that the Primary Production zone has 4.9% irrigated plants, 2.1% intensive animals and 5.3% extensive agriculture. The Rural Landscape zone has 20.8% irrigated plants and 0.9% intensive animals and 6.6% extensive agriculture. The small lot agriculture zone has 1.8% irrigated plants, 0.3% intensive animals and 3.2% extensive agriculture. The Primary Production zone has 84% rural residential, the Rural Landscape zone has 65.8% rural residential and the Primary Production Small Lots Zone has 91.7% rural residential land use. The zone that is the most productive from an agricultural perspective is not the Primary Production zone as would be expected but this is the rural landscape zone and the zone that has the least amount of rural residential development is also the rural landscape zone. The Primary Production Small Lot zone is made up mostly of rural residential development and not agriculture.

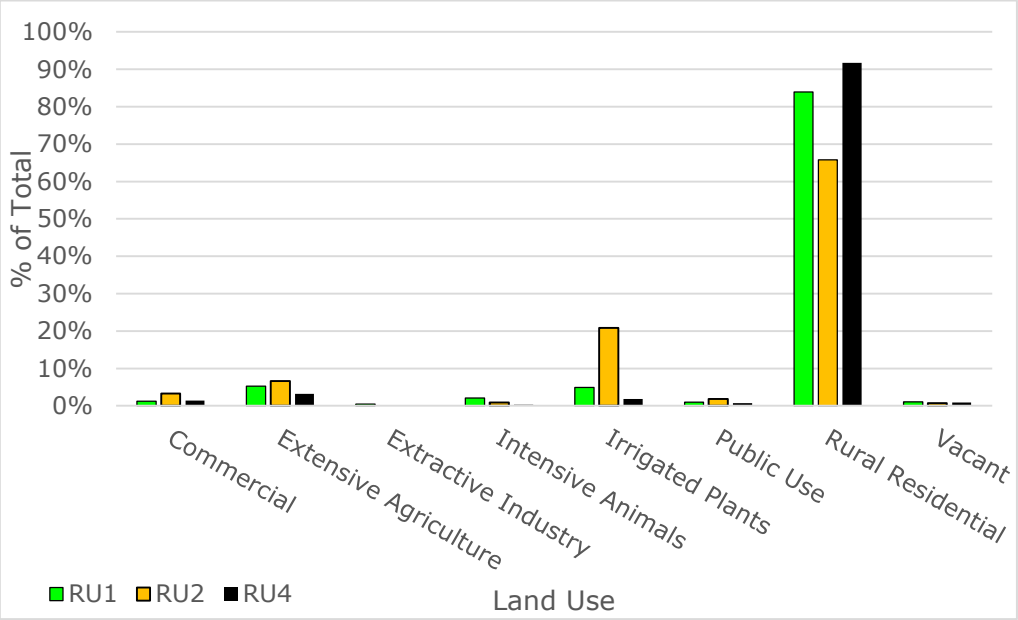
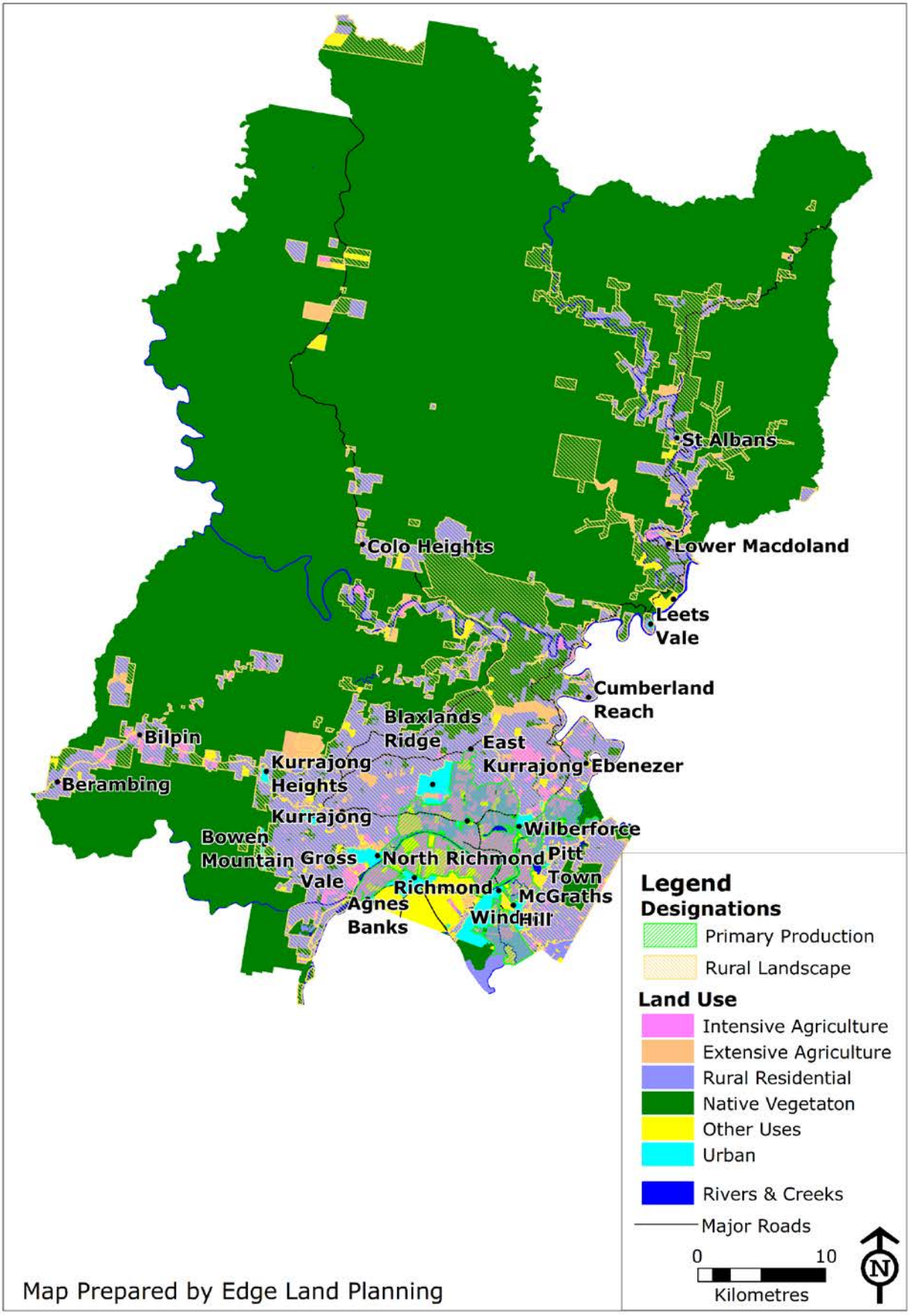


Figure 6.3: Land Use in Existing Rural Zones

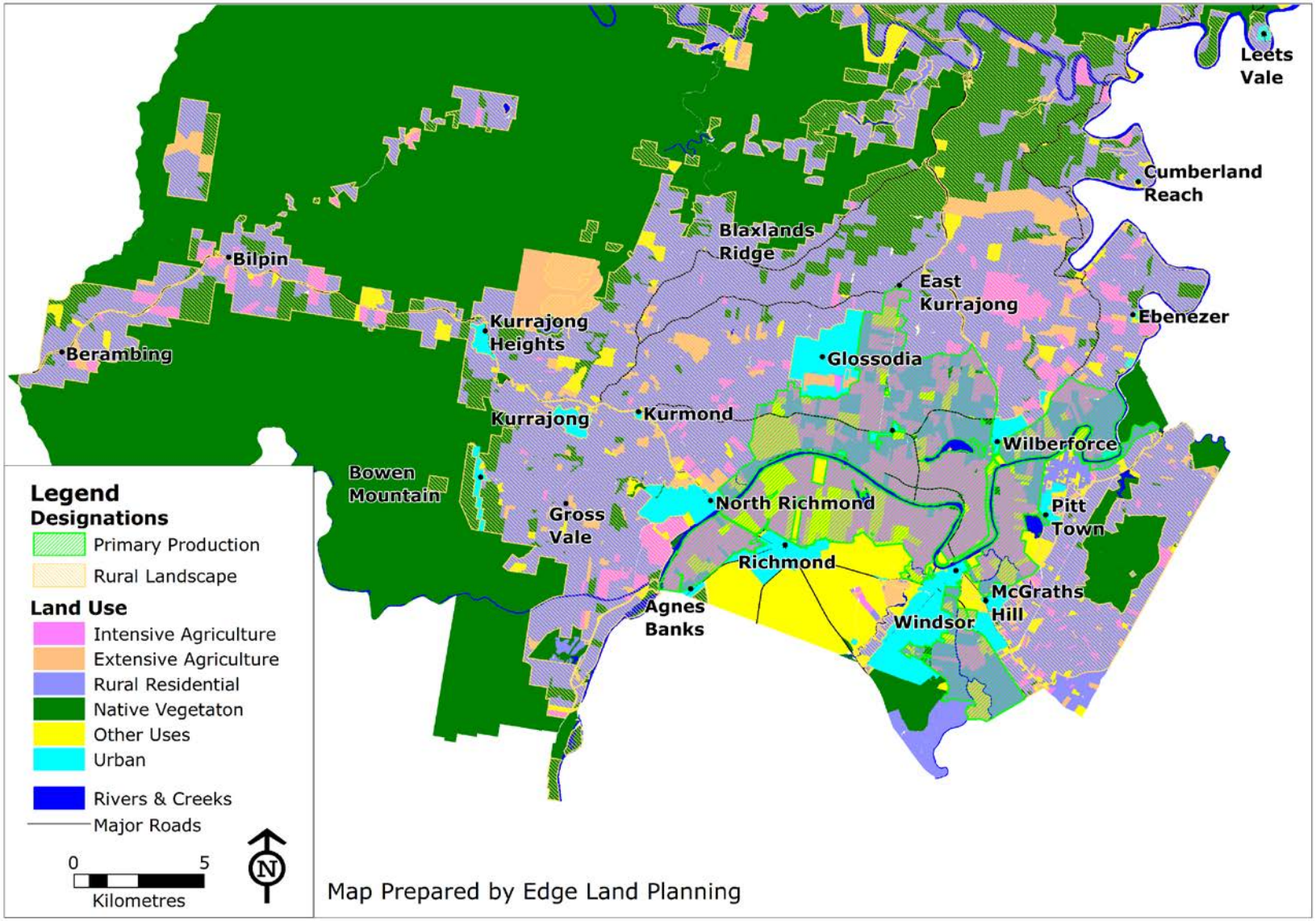
THe implications of this is that the zones don't apply to the correct land. As can be seen from map 3, the land that is the flatest is zoned as rural landscape which is supposed to be for land that has reduced agricultuural capabaibliy when it is the land that has the best agricultural capabability.

There needs to be a realighment of the zones with the Primary Production zone following the river and the land basically that is zoned as rural landscape and the land zoned as primary production needs to be zoned as rural landscape. The issue of the Primary Producton Small Lots zone needs to be considered. It certainly does not have much primary prodction and consideration shold be given to zoning it as Rural Landscape.

The analysis of the existing rural zones has been carried out in chapter two and it can be seen that the zone boundaries are in need of review.



Map 6.1: Land Use and Existing Zones LGA



Map 6.2: Land Use and Existing Zones South

6.7.2. Rural Zoning Methodology

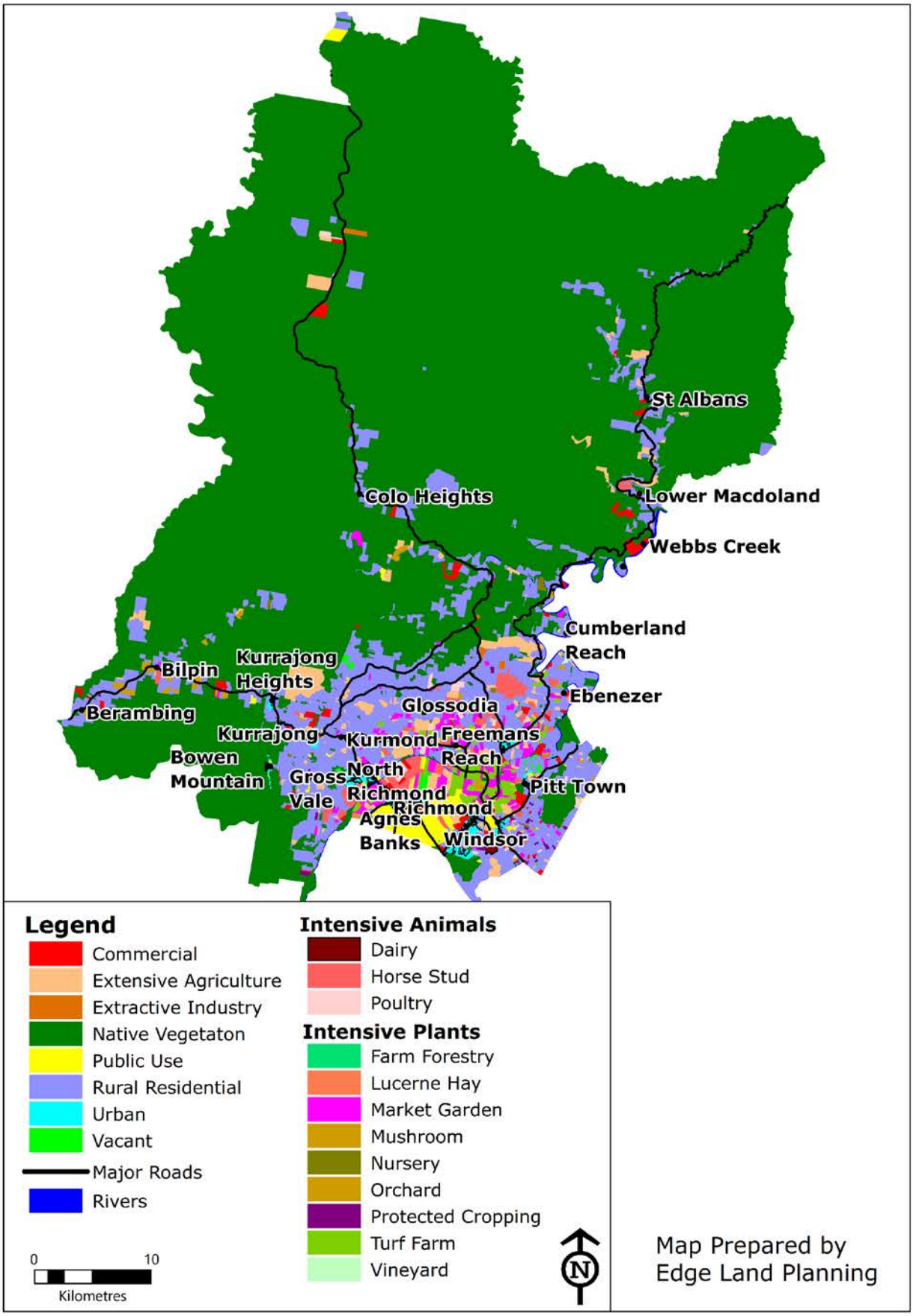
A methodology has been developed which uses a combination of the land use and holding size as well as potential for land use conflict to determine the best land to be zoned for the following zones:

- Primary Production
- Rural Landscape

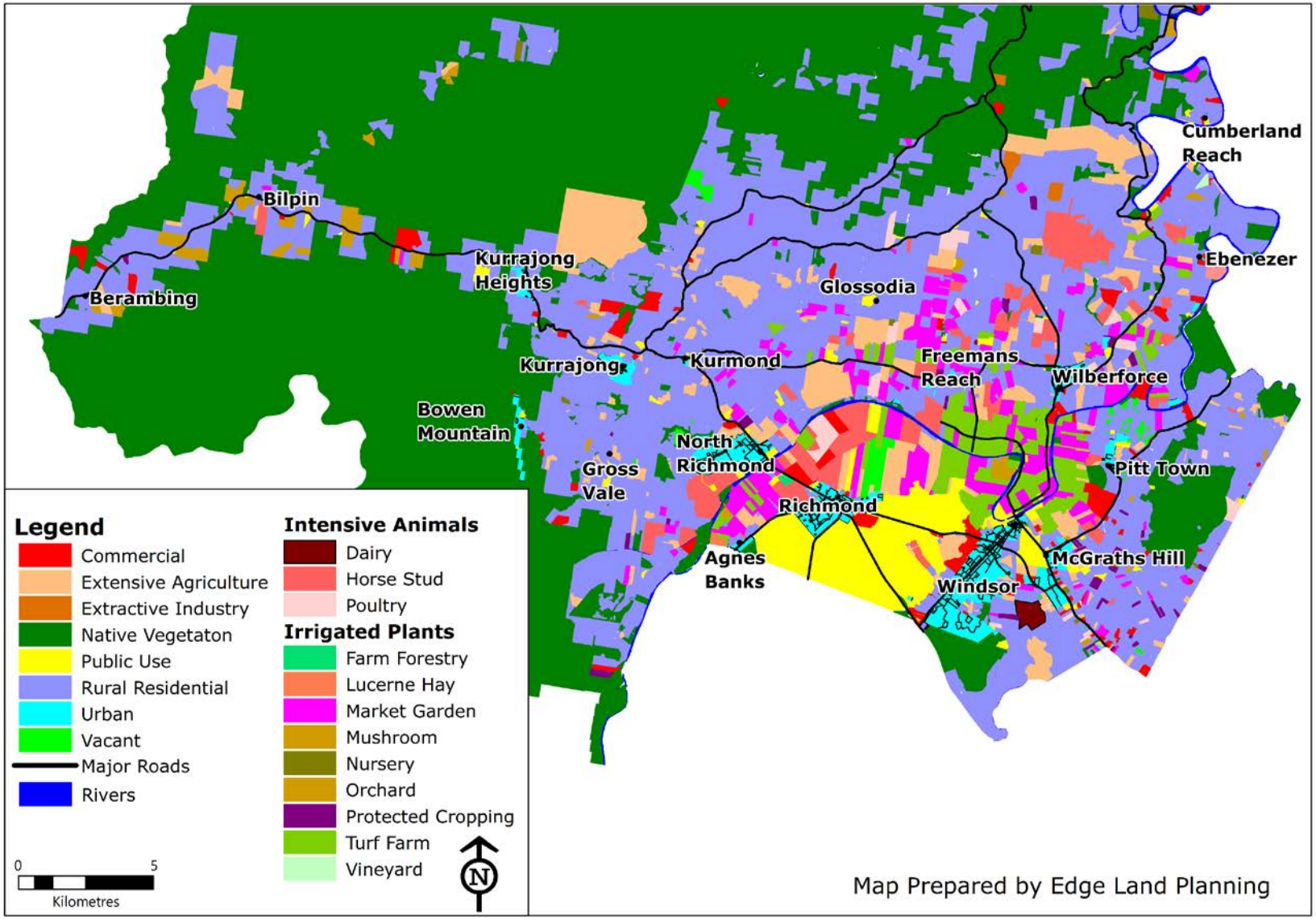
A land use survey has been carried out and has been discussed in section 2.5. This survey identified a number of land uses as well as the holding size range for the rural lands of the LGA. It has formed the basis for this recasting of the zone boundaries. The land use map and the holdings map can be seen from maps 6.3 to 6.6.

Land use surveys and lot size analyses such as the one discussed above have utility for use in identifying land with common features as a foundation for future zoning. The land use survey is used because it provides an overview of the existing land use pattern within an area and therefore gives an indication of the predominant land uses which should be conserved. It is important to consider the size of the lots and holdings within an area because the existing fragmented lot patterns contribute to rural land use conflicts and the ability of the area to be protected from such rural land use conflicts.

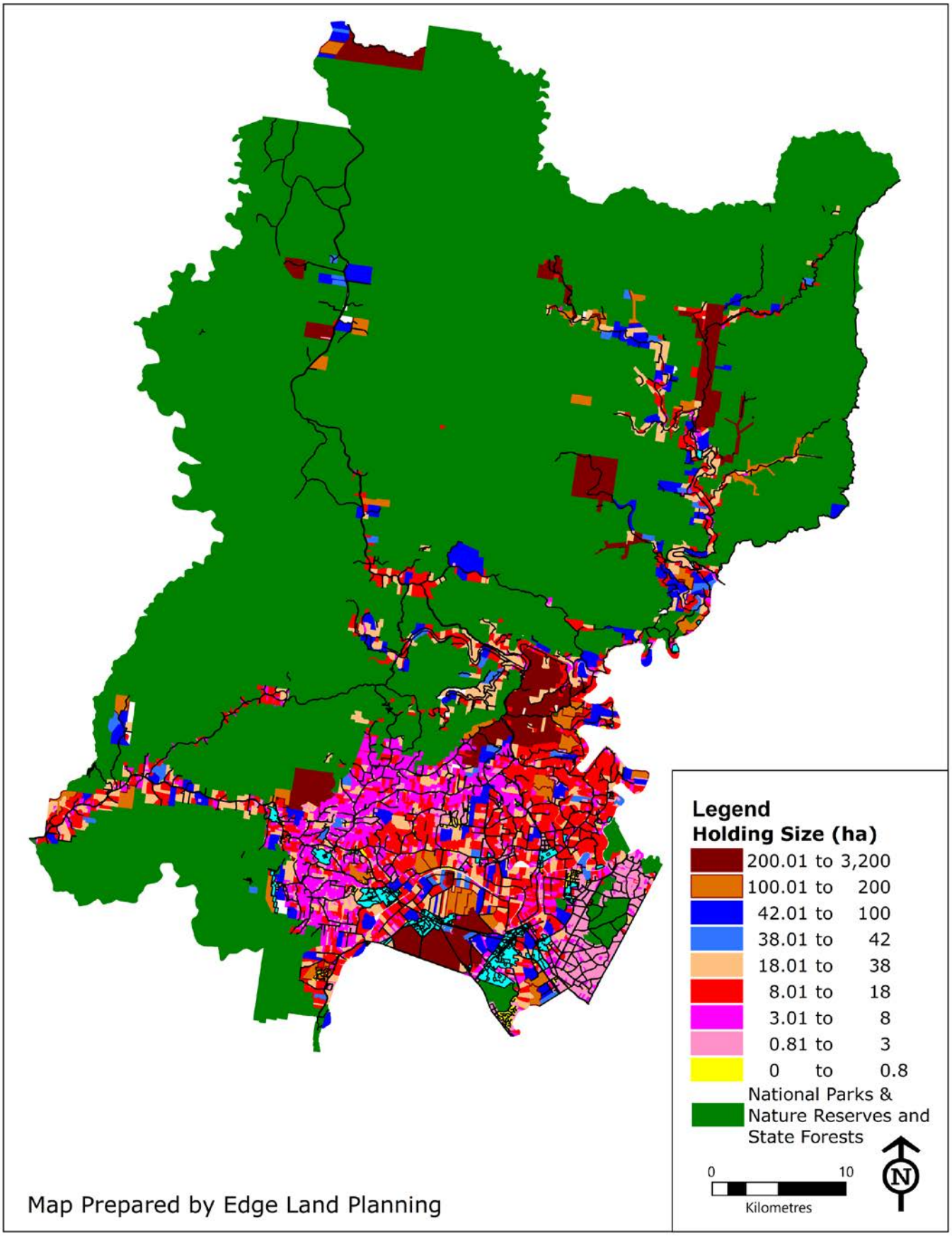
A methodology has been developed to identify the best land for growing food by zoning the land for its dominant use - agriculture production as well as a second zone for landscape character rather than just having one rural zone. It uses data on what is happening on the land (land use, holding size and soil types) as well as what the land is capable for (agricultural land classification, soil types and slope). The data sets used are land use (based on cadastre), holding size, native vegetation coverage, natural resources capability and other secondary sources of data. They are used as a series of sieves to identify the different characteristics of the land. The methodology comprises 5 steps which are outlined below.



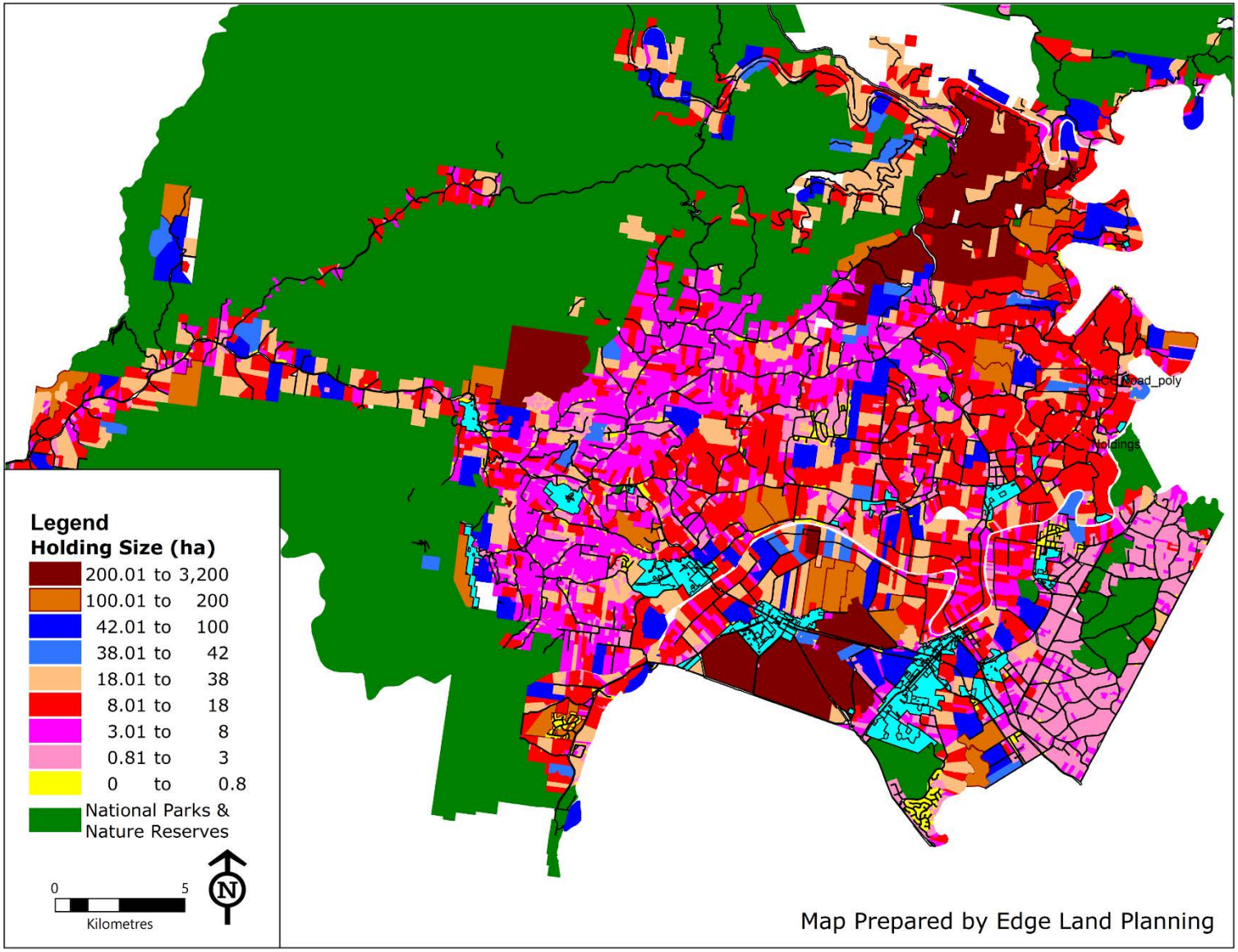
Map 6.3: Land Use LGA



Map 6.4: Land Use South



Map 6.5: Holding Size LGA



Map 6.6: Holding Size South

- *Step 1: Data Gathering*. This is done using a GIS. The following layers / maps are used: cadastre, land use, holding size, slope, drainage, soil type (prime agricultural land classification) and so on, as appropriate.

- *Step 2: Identify the constraints for agriculture.* The data gathering is used to identify the constraints of the land for its continued use for agriculture. The following are identified: urban expansion areas, clusters of rural residential land uses, slope and other physical constraints. This is done by reference to the land use survey mapping to identify the clusters of rural residential development and slope mapping, drainage and native vegetation mapping. Council documents on the future strategic intent of land such as urban expansion, future industrial uses, etc. are also a source of this information.

- *Step 3: Identify land for agriculture*. The maps are used to identify the constraints. The first constraint is slope and soil types. This will provide an analysis of the land capability. The land use and holdings analysis is the next constraint. The land use survey will show where there are clusters of agricultural uses as well as the location of urban and rural residential uses. The holdings map will show where there are large and small lots / holdings. Larger holdings are preferred because they are less likely to be in demand for rural residential development and other non-agricultural development. This is done by reference to the land use and holdings GIS mapping.

- *Step 4: Identify Land Units*. Land units are areas that have similar land uses, soil types, topographic and other physical features like vegetation. This is done by reference to the relevant GIS databases. There are 5 land units:

    - ⇨ *Agriculture Production*. The land that is good for agriculture will be that land that has good soils, is relatively flat, has an existing number of agriculture (mostly intensive) uses as well as having a number of larger lots and not a proliferation of small ones. This is the area that should be preserved for future food production.

    - ⇨ *Rural Landscape*. This land is hilly and not the best class of soils but can still be used to grow orchards and vineyards as well as grazing cattle and sheep. The land use would be mostly extensive agriculture and rural residential rural living uses. It will also have areas of native vegetation which has biodiversity value.

    - ⇨ *Native Vegetation*. This is land that is mostly covered in native vegetation and is mostly steep and inaccessible. It might be in private ownership but a large proportion of it is owned by the government as National Parks and other land.

    - ⇨ *Rural Residential*. This has a residential use and is located within the rural landscape and mostly small lots of between 4,000 m^2 (0.4 ha) and up to 10 ha and above.

    - ⇨ *Urban*. This is land that is zoned for urban uses like Residential, Commercial, Industrial, and Recreation and so on.

- *Step 5: Prepare Land Use Designations*. The land units are then mapped

into designations which have the same titles and which can be converted to zones. This is done as a GIS layer.

By utilising this methodology, the best land can be identified and protected for growing food. The land use survey has shown that there are a number of different rural landscapes in the LGA and that they have different land uses.

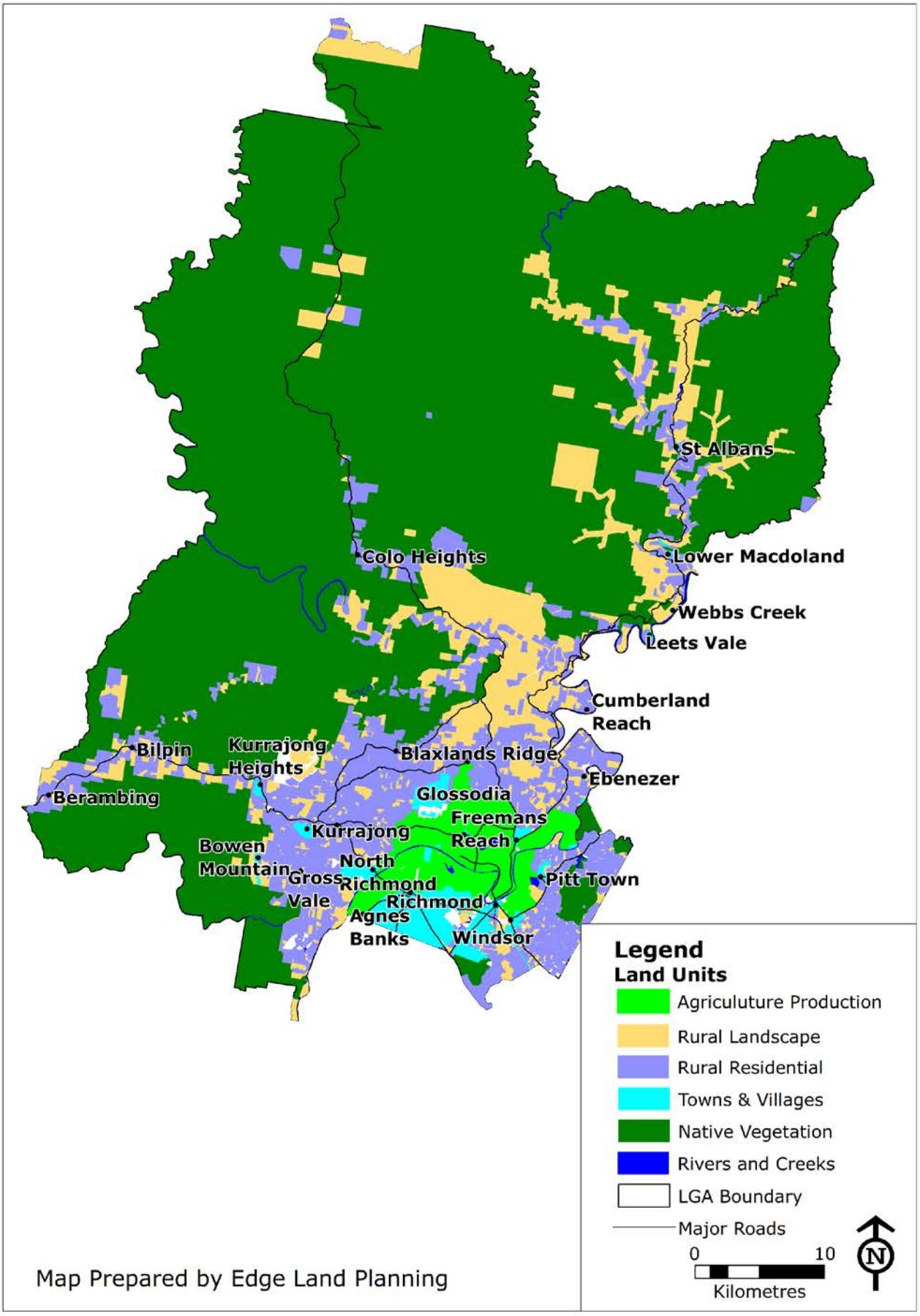
6.7.3. Rural Land Units

Based on this methodology, there are five broad land units within the LGA. The land units are outlined on Maps 6.7 and 6.8 and are as follows:

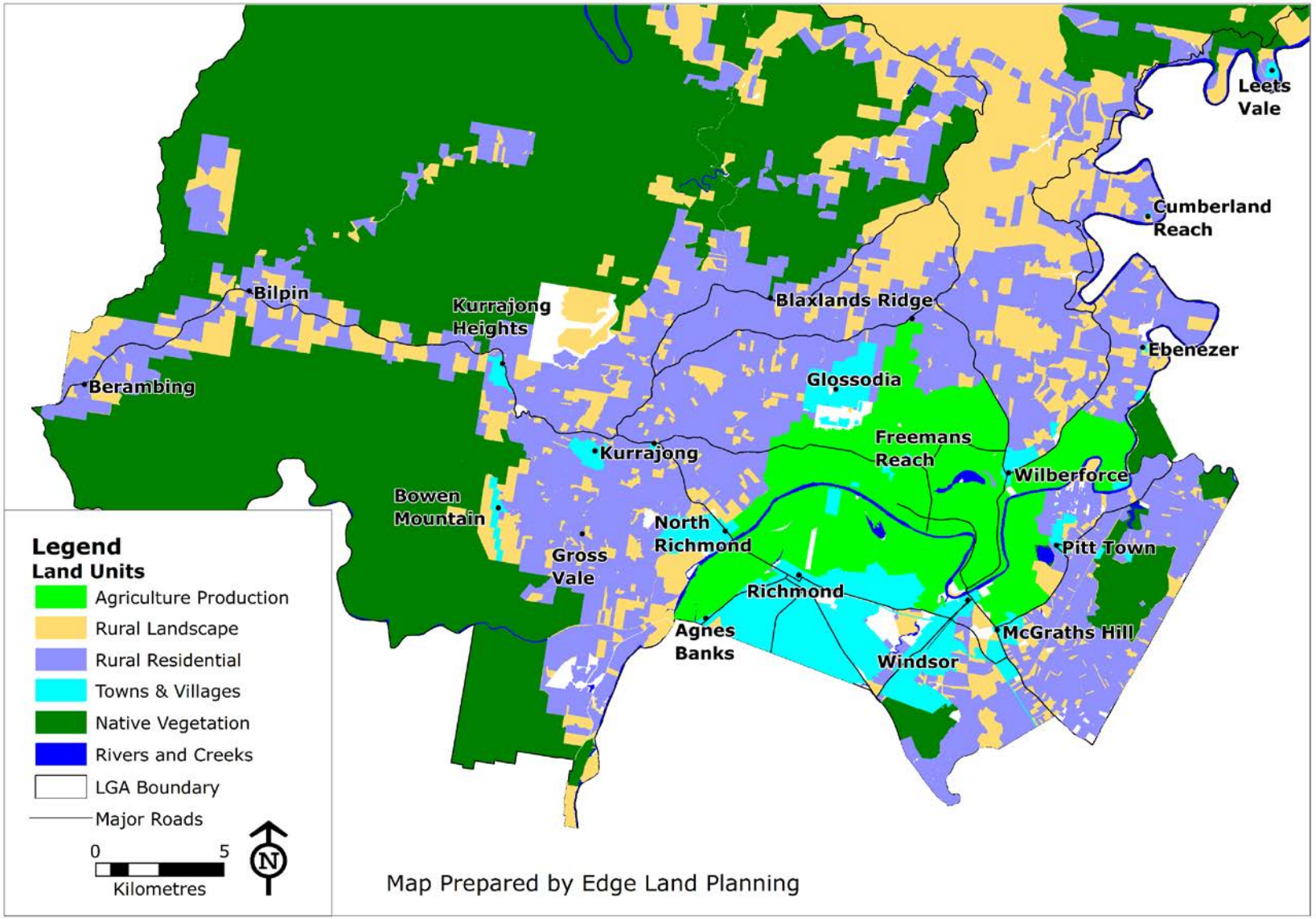
- Agriculture Production
- Rural Landscape
- Native Vegetation
- Rural Residential
- Towns & Villages

The *Agriculture Production* land unit is based on the horticulture land uses along the Richmond Lowlands, Pitt Town Bottoms and other alluvial river flats. Photo 6.10 shows the Wilberforce area which is an example of this land unit.

Photo 6.10: Agriculture Production Land Unit
Date of Photo:



Map 6.7: Land Units LGA



Map 6.6: Land Units South

The *Rural Landscape* land unit is based on the steep to hilly land on the mountain area from Bilpin to Kurrajong Heights, East Kurrajong to Colo Heights and in the Webbs Creek and Macdonald River Valleys which is not rural residential uses and it has some horse studs and irrigated plant uses but not as much as the river flat areas. Photo 6.11 shows the Wrights Creek area.

Photo 6.11: Rural Landscape Land Unit
Date of Photo: August 2019

The *Native Vegetation* land unit consists of the land that is covered by a significant amount of native vegetation. The land is mostly steep land or land that is poor in soil quality which makes it unsuitable for agriculture. It provides a rich source of biodiversity. Photo 6.12 shows the Wollemi National Park north of Bilpin.

Photo 6.21: Native Vegetation Land Unit
Date of Photo: August 2019

The *Rural Residential* land unit covers the existing rural residential subdivisions throughout the LGA. It also covers the extensive area of Rural Residential Rural Living land use that stretches from Yarramundi in the South west to East Kurrajong in the North to Oakville in the South East as well as the areas on the Plateau area and along the northern valleys. The land is not all subdivided and has a diversity of topography and areas of native vegetation. Photo 6.4 shows land at Kurmond and Kurrajong.

Photo 6.13: Rural Residential Land Unit
Date of Photo: August 2019

The *Town and Village* land unit is the current urban areas throughout the LGA.

6.7.4. Rural Land Designations

The land units can be translated into future zones. However, as this is a strategy and does not zone the land, the term land use designation has been used to describe how the land units can be transformed into policy, to avoid confusion. In determining the boundaries of the land designations, the potential for the expansion of existing agricultural activities, such as horticulture, animal growing, as well as urban and rural residential areas has been taken into consideration. It is important to consider the future needs of these activities as well as the traditional agricultural uses of cropping and grazing.

The utilisation of landuse zoning to segregate landuses is a commonly used practice in NSW. The Standard Instrument LEP makes provision for a number of rural character zones, with three most relevant being as follows:

- RU1 Primary Production
- RU2 Rural Landscape
- RU4 Primary Production Small Lots

It also makes provision for rural residential and rural village zones which are as follows:

- RU5 Village
- R5 Large Lot Residential
- E4 Environmental Living

Zoning can also be used to identify the major objective for any future as well as existing development in an area for example, if an area is of high conservation status then a zone name outlining this is also appropriate.

A sieve methodology (as outlined above) has been used to determine the land units and these can be translated into land use designations. The recommended designations are as follows:

- Agriculture Production
- Rural Landscape

It was decided to not use the RU4 Primary Production Small Lots zone. The RU4 Primary Production Small Lots was not considered necessary because its objectives are not as robust as the RU1 Primary Production zone and it would duplicate a zone for no apparent purpose.

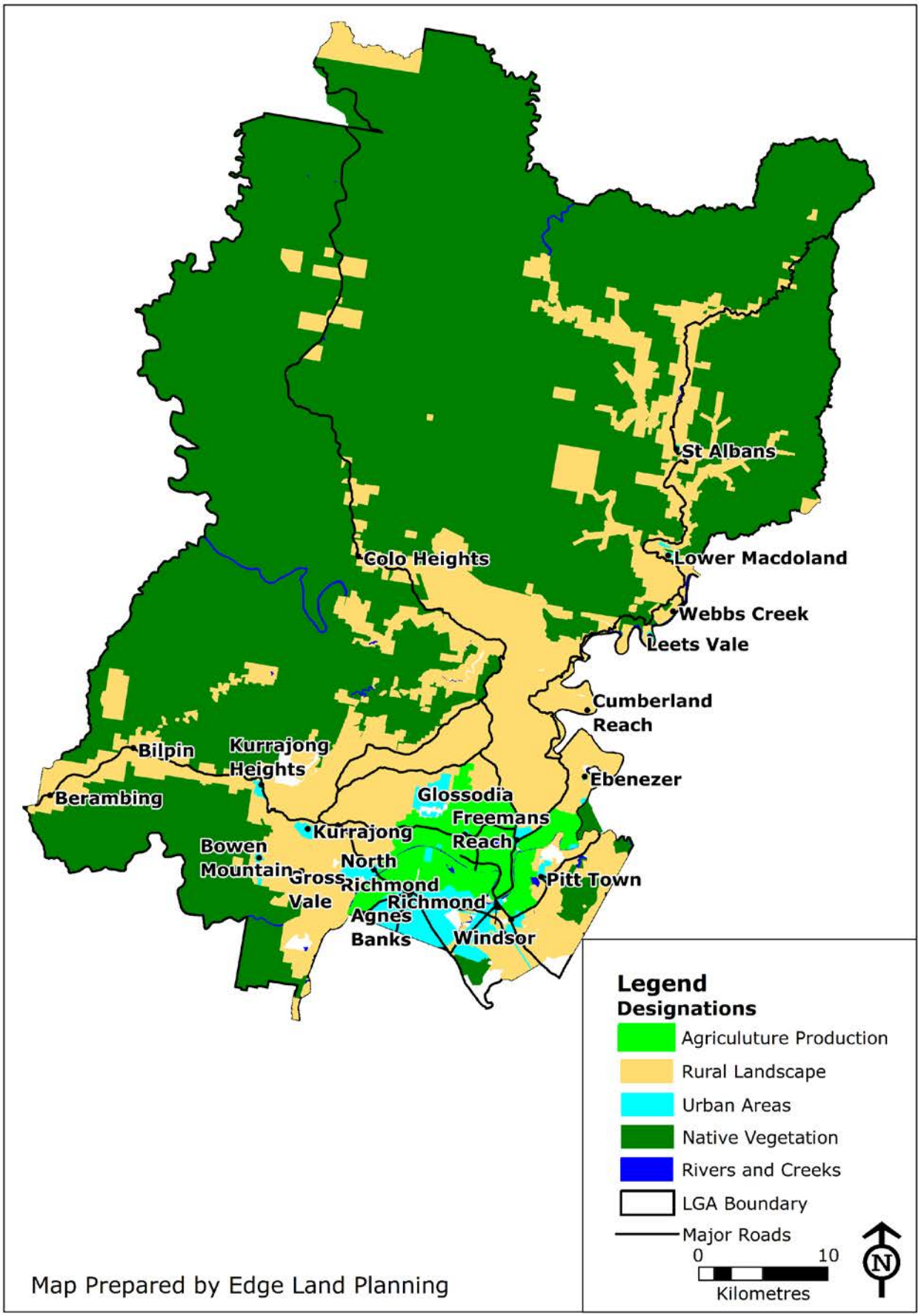
The Agriculture Production designation is the same as the Agricultural Production land unit and the Rural Landscape designation covers the land identified as the Rural Landscape land unit. The main distinction between the two areas is the soils and slope which make the agriculture production designation more suited to horticulture and intensive animals and some grazing whereas the rural landscape designation is most suited to grazing and rural residential rural living.

Whilst it is acknowledged that there is a significant area of native vegetation, its status is not fully known and so it is not considered appropriate to recommend designations at this stage. Once the status of it is known, it may be considered appropriate to create a specific zone more suited to its future use.

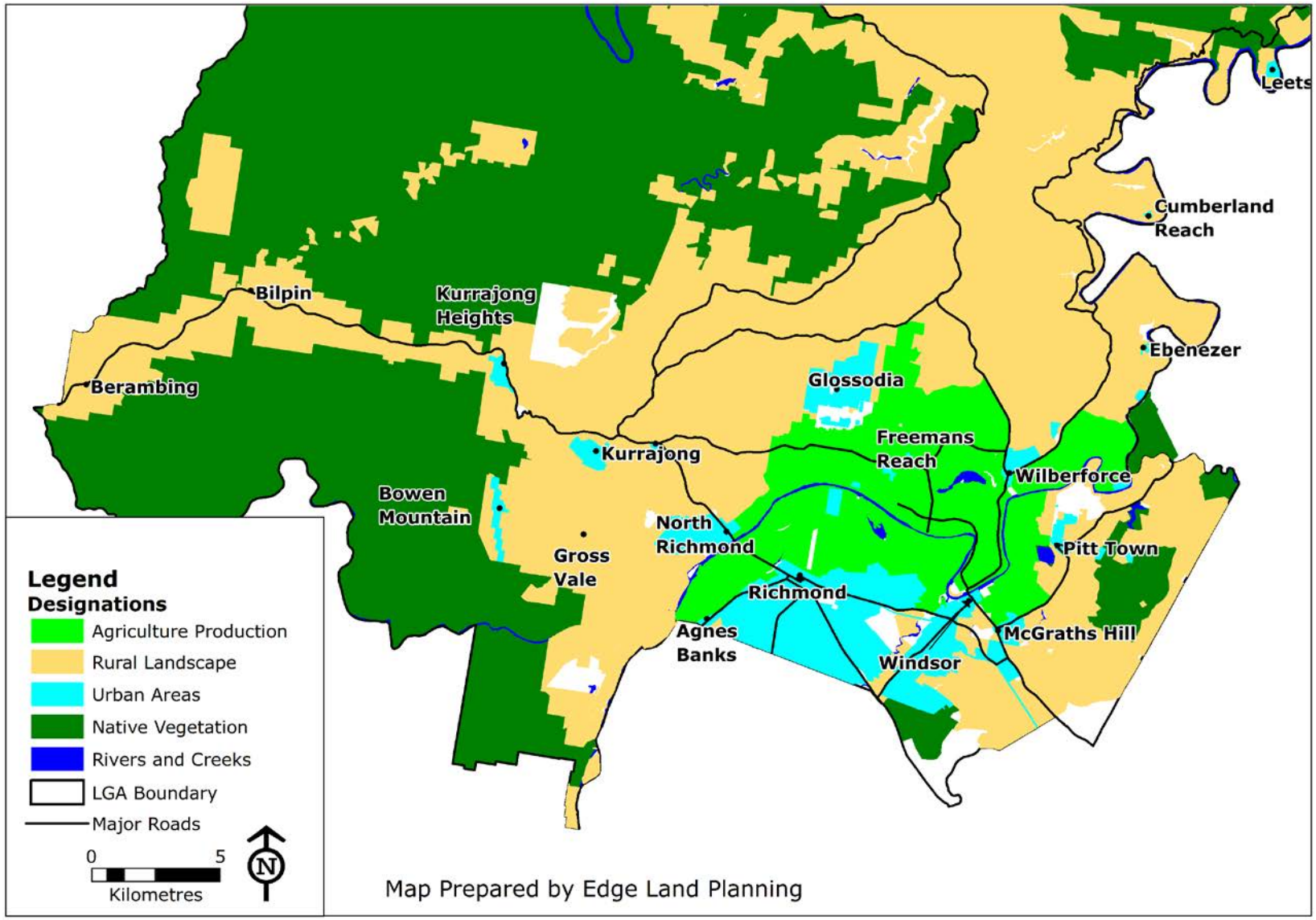
It has been noted that in some areas there is a significant amount of native vegetation. For simplicity, they have been given a rural zoning, however, further investigation should be undertaken as an environmental zone may be considered to be more appropriate.

The rural designations are outlined on Map 6.7 and 6.8

A review has also been carried out of the existing zone objectives of the Hawkesbury LEP 2012 and they have been found to be suitable.



Map 6.8: Rural Land Designations LGA



Map 6.9: Land Units South

6.7.5. Rural Villages

There are a number of the rural villages which are zoned as village but some which are simply clusters of small residential lots varying from 10 to 30 lots. These areas don't resemble a traditional village which has some commercial uses as well as a small number of residential uses. Most are focused on the Hawkesbury River in the northern part of the LGA as well as at one area at Freemans Reach. Consideration of the Village zoning for these areas should occur, and whether or not they should be zoned the same as the surrounding lands, which in all cases is proposed to be rural landscape.

The village zones are

- Gormley Street, Freemans Reach
- Gronos Farm Road, Wilberforce
- Coromandel Road, Ebenezer
- Port Erringhi Road, Ebenezer
- Ski Lodge Road, Cumberland Reach
- Chaseling Road South, Leets Vale
- Pioneer Road, Webbs Creek
- Settlers Road, Lower Macdonald
- Walmsley and Settlers Rd, Lower Macdonald

It is recommended that an assessment should be undertaken of these village zones, and whether the land should be rezoned to rural landscape.

6.8. Land Uses and Definitions

As a result of the zone review, there are some definitions that need to be amended and they are discussed below for the following uses:

- Rural Tourist Cabins
- Roadside Sales
- Protected Cropping
- Rural Workers Dwellings

6.8.1. Rural Tourist Cabins

It is noted that there is a need for more agri-tourism related uses to be promoted in the LGA. To facilitate this there is a need to make some changes to the definitions in the current Standard LEP in relation to rural tourist cabins.

Currently there are some tourist cabin developments in the rural areas that provide tourist accommodation in a rural environment at a low scale. These are considered to be an appropriate form of development that is compatible with the rural landscape. Under the current LEP provisions which were introduced with the Standard Instrument LEP these types of development would not be permitted, thus not allowing this type of tourism product to be increased.

There is no definition that covers cabins to be constructed in a rural area to cater for tourist accommodation.

The current definitions covering tourist accommodation are as follows:

- Bed and Breakfast accommodation
- Eco-tourist facility
- Farm stay accommodation
- Hotel or motel accommodation
- Serviced apartment.

Bed and Breakfast accommodation utilises an existing dwelling and farm stay accommodation has to be in association with a working farm as secondary to the use of the land for primary production. Eco-tourism facilities have to be on land or adjacent to land with special ecological or cultural features. Hotel and Motel accommodation and serviced apartments are more akin to an urban area than rural land. In addition the definition of serviced mentions a building or part of a building. Cabins are scattered throughout the property. It can be seen that none of these allows for tourist cabins to be developed.

There is a need for a new definition that takes into account the need to provide cabin development in a rural setting. There was a difficulty with using the previous definition of tourist facility to apply to cabins because it was very broad and did not specify a minimum number of cabins and this allowed it to be used as a loophole to gain dwelling approvals on land that was smaller than the minimum lot size for a dwelling. People would gain approval for a tourist facility but only have one cabin and use it as a dwelling house. There are two ways to avoid this problem. One is to link the tourist cabin to the minimum lot size for dwellings which means that they can only be built on properties that have a dwelling on them or are large enough to have a dwelling house built. The second way is to ensure that they are built in addition to a dwelling house and that there is more than one cabin on the property to ensure that it will be a profitable and therefore viable enterprise. It is considered that a minimum of five cabins would alleviate the potential for applicants to abuse the provision because the construction of five cabins requires a considerable outlay of money. It is also appropriate to allow for the re-use of former rural buildings to be used for this style of tourist accommodation. Examples from other parts of rural NSW have included former dairy buildings and woolsheds. One such is the Black Sheep Inn at Orange which includes a former shearing shed being converted with five bedrooms and a second two bedroom former shearers quarters.

A definition for rural tourist facilities existed in Hawkesbury LGA under its previous LEP 1989 and is as follows:

> *"rural tourist facilities means a building or place in a rural area that is used to provide low scale holiday accommodation, recreation or education for the travelling or holidaying public, and may consist of holiday cabins, horse riding facilities, refreshment rooms or the like."* (Hawkesbury LEP 1989 clause 5)

There were also definitions former Wyong LEP 1991 and the Gosford Interim Development Order which are as follows:

Wyong LEP 1991 defined as tourist accommodation as follows:

> *"tourist accommodation means a building or buildings substantially used for the temporary accommodation of tourists, visitors and travellers which may have facilities for the convenience of patrons such as restaurants, convention areas and the like but does not include a building or place elsewhere specifically defined in this clause or a building or place used for a purpose elsewhere specifically defined in this clause." (*Wyong LEP 1991 clause 4*.)*

Gosford Interim Development Order No 122 contained a definition of rural tourist unit which is as follows:

> *"Rural tourist unit means a building separate from a dwelling house used for the temporary accommodation of tourists, that is incidental and ancillary to existing agricultural production, or intensive agriculture or horse establishments on the same allotment of land, and includes farm stay holiday accommodation, bunk houses and the like, at a rate of not more than one bedspace per two hectares of the allotment on which it is located."* (Gosford Interim Development Order No. 122 clause 3)

It is considered that the former Hawkesbury LEP definition as well as the two in the former Gosford and Wyong EPIs can be used as the basis for a new definition to be called 'rural tourist cabins' and that it be defined as follows:

> *"Rural tourist cabins means the use of a minimum of five new or existing buildings in which temporary or short-term accommodation is provided on a commercial basis and which are to be used in conjunction with an existing dwelling house."*

Hawkesbury LEP 1989 also had a clause that listed specific performance criteria as follows:

"(2) The Council may consent to development to which this clause applies only if the Council is satisfied that:

(a) the proposed development will have no significant adverse effect on the present and potential agricultural use of the land and of the lands in the vicinity, and
(b) the proposed development will be compatible with the rural environment and of minimal environmental impact, and
(c) adequate separation distances will be incorporated to minimise the potential for land use conflict between the proposed development and existing or potentially conflicting land uses, such as intensive agriculture on adjoining land, and

(d) the proposal incorporates adequate landscaping and screen planting for visual amenity as viewed from a public road or dwelling-house on other land in the locality, and

(e) all proposed buildings and other uses are clustered so as to reduce impact on the rural amenity, and

(f) there will be no significant adverse visual impact of the proposed development on the scenic quality of the area." (Hawkesbury LEP 1989 clause 43)

It is considered appropriate to use this clause as the basis for a new clause to be inserted as an additional local provision in part 7 of the LEP with the addition of a criteria dealing with adequate water supply as well as effluent disposal.

6.8.2. Roadside Stalls

The definition of roadside stall is restrictive because it only allows for the sale of goods produced from the property on which the stall is located or an adjacent property. This prevents one farmer from selling produce that is grown on other farms in the local area. It is often the case that not every farmer wants to sell produce from their farm gate, but there are some that do and the current definition restricts this by requiring them to source produce from the farm on which the stall is proposed or the adjacent property. It may also have the potential to have a proliferation of roadside stalls if a number of farmers want to sell their produce locally. This could lead to traffic conflict. The size of the stall is regulated to prevent it expanding to become a shop, by Clause 5.4 (8) of the relevant LEPs. A maximum floor area of 75 m^2 is permissible under the Hawkesbury LEP 2012. The current definition is reproduced below:

> *"roadside stall means a place or temporary structure used for the retail sale of agricultural produce or hand crafted goods (or both) produced from the property on which the stall is situated or from an adjacent property."* Hawkesbury LEP 2012.

It is considered that the definition could be changed to allow for sale of agricultural produce or hand crafted goods to be sourced from properties in the area. The term area has been chosen because to use the word 'locality' may be restrictive and the use of the word area allows for the sourcing of agricultural produce or hand crafted goods to be from the entire LGA. It has to be noted that the size of the stall is restricted so this will not allow for the stall to become a shop and also the stall must only sell agricultural produce grown on the property or in the LGA. It is therefore recommended that the definition be amended to be as follows:

> *roadside stall means a place or temporary structure used for the retail sale of agricultural produce or hand crafted goods (or both) produced from the property on which the stall is situated or from a property in the area."*

6.8.3. Protected Cropping Structure

There are a number of protected cropping structures that have been constructed in the LGA over the past few years and it is considered to be one sector that has the potential to grow.

In a number of cases, a market garden has a protected cropping structure which is part of the horticulture system and they grow in association with each other.

Protected cropping structures have been defined as follows:

> *"Greenhouses or grow structures are intensive horticultural structures for growing or propagation of plants, flowers and vegetables and excludes retail and wholesale nurseries and conservatories."* (Osborn Consulting & RMCG, 2017)

They can be categorised into three types and are based on the technology (Osborn Consulting & RMCG, 2017) as follows:

- *Low technology*: These greenhouses are less than 3 metres in total height. Tunnel houses, or "igloos", are the most common type. They do not have vertical walls. They have poor ventilation. This type of structure is relatively inexpensive and easy to erect. Little or no automation is used.
- *Medium technology:* Medium level greenhouses are typically characterised by vertical walls more than 2m but less than 4 metres tall and a total height usually less than 5.5 metres. They may have roof or side wall ventilation or both. Medium level greenhouses are usually clad with either single or double skin plastic film or glass and use varying degrees of automation.
- *High technology:* High level greenhouses have a wall height of at least 4 metres, with the roof peak being up to 8 metres above ground level. These structures offer superior crop and environmental performance. High technology structures will have roof ventilation and may also have side wall vents. Cladding may be plastic film (single or double), polycarbonate sheeting or glass. Environmental controls are almost always automated.

This definition does not cover hail netting which is used for orchards, berry crops and hydroponic growing on benches.

The low technology and medium technology greenhouses are in existence in the LGA and the high technology ones are expected to become popular.

From a land use definition point of view, protected cropping structures could fall under the definition of horticulture, which in turn is part of the definition of intensive plant agriculture if the plants that are being grown are considered. The definitions are as follows:

> ***intensive plant agriculture*** *means any of the following:*
>
> *(a) the cultivation of irrigated crops for commercial purposes (other than irrigated pasture or fodder crops),*
>
> *(b) horticulture,*

(c) turf farming,
(d) viticulture.

***Horticulture** means the cultivation of fruits, vegetables, mushrooms, nuts, cut flowers and foliage and nursery products for commercial purposes, but does not include a plant nursery, turf farming or viticulture*

However, these definitions were developed to cover the type of farming system based on the plants that are grown. This does not cover the issue of the structure at all. There are two definitions that cover rural buildings used to grow plants which are as follows:

***farm building** means a structure the use of which is ancillary to an agricultural use of the landholding on which it is situated and includes a hay shed, stock holding yard, machinery shed, shearing shed, silo, storage tank, outbuilding or the like, but does not include a dwelling.*

***plant nursery** means a building or place the principal purpose of which is the retail sale of plants that are grown or propagated on site or on an adjacent site. It may include the on-site sale of any such plants by wholesale and, if ancillary to the principal purpose for which the building or place is used, the sale of landscape and gardening supplies and equipment and the storage of these items.*

Neither of these definitions cover the issues associated with crop protection structures. The farm building definition is too broad, and states that the structure is 'ancillary to the agricultural use' and they are not ancillary, but essential to the agricultural use and actually form part of the use. The farm building definition applies to farm sheds, and other general types of structures. However, Councils are using the definition to require development consent but it is not clear and is open to interpretation. The plant nursery definition, whilst covering a number of the key aspects of the protected cropping structures, is too specific for plant nurseries. So it can be seen that there is confusion and ambiguity with the requirement for development consent for protected cropping structures.

The key issues with protected cropping structures relate to the size of the structure, its setback from boundaries, its reflective capacity as well as runoff and managing traffic generation, particularly for staff as it is estimated that employment can range from 10 – 20 people per hectare of greenhouse, depending on the crops grown. Another issue that arises is the one of changing from growing crops in the open to migrating to a crop protection structure. Under the current definitions, there would be no requirement for development consent, because the use would already have consent or have a deemed consent because it was already in operation when the Planning Instrument that required the consent came into force – which is the case with a lot of market gardens and orchards in the LGA. The potential for land use conflict exists if a farmer changes from a market garden to construct a protected cropping structure on the land, particularly if the land next door is used for rural residential use. There is a need to provide some controls on the setbacks from

boundaries, potential reflective issues as well as noise and traffic generation for staff and deliveries.

Hail netting and bird netting are not considered to have a sufficient impact to require development consent. The only issue that is raised by residents is that they have a negative visual impact, however this is not a universal view. Weighing up this issue, it is not considered appropriate to require development consent for this type of ancillary component to horticulture. It is noted that horticulture already require development consent in the LGA and it would be adding to the 'red tape' to require a further DA for this component. In some cases, the objections can be overcome by altering the colour of the netting from white to black, however this may be an issue with light getting to the crop, especially for orchard fruit but may not be such an issue for berries under hail netting.

A suitable definition based on the above discussion would be as follows:

> **Protected cropping structure** means a structure used for the protection of horticulture, which may be open or completely enclosed, and be constructed of rigid or non-rigid materials, and utilises climate control equipment to assist the production of high quality and consistent produce., but which does not include hail or bird netting.

There would also need to be provisions placed in the DCP to provide guidelines on the issues referred to above.

6.8.4. Rural Workers Dwellings

Rural workers dwellings are used to house people who work on a farm. They are usually provided on more intensive agricultural operations and large grazing and cropping properties when there is a need to have people on the farm at all hours to look after animals or cropping operations as well as security and emergency.

A rural workers dwelling is defined by the SI LEP

> *"rural worker's dwelling" means a building or place that is additional to a dwelling house on the same lot and that is used predominantly as a place of residence by persons employed, whether on a long-term or short-term basis, for the purpose of agriculture or a rural industry on that land.*

Currently they are permitted in the RU1 Primary Production zone, however there are no performance criteria for them and without this there may be the potential for them not to be used for rural workers. They should only be permitted where there is a genuine need for them, which would be on large rural holdings or in conjunction with intensive plant or animal uses. There would need to be a justified need for there to be more than one dwelling to be constructed on the property to ensure that the dwelling will be used by bona fide rural workers. They should be on the same lot as the primary residence. Access to the rural workers dwelling should be from the same access road that serves the main dwelling on the property. It is considered that a plan and statement from a suitably qualified person should be required to justify the need

for the rural workers dwelling house. It is also not considered necessary for the rural workers dwelling requirement to be tied to the minimum size for a dwelling house – the report and plan from the suitably qualified person should be able to justify this.

One other way of dealing with rural workers dwellings is for them to be approved as detached dual occupancies. However, this would not allow for a genuine dual occupancy to be created for the dwelling house associated with the intensive agricultural use.

An appropriate clause can be found in Moree Plains LEP 2011 to provide some performance criteria and is as follows:

> *7.2 Erection of rural workers' dwellings*
>
> *(1) The objective of this clause is to ensure the provision of adequate accommodation for employees of existing agricultural or rural industries.*
>
> *(2) This clause applies to land in Zone RU1 Primary Production.*
>
> *(3) Development consent must not be granted for the erection of a rural worker's dwelling unless the consent authority is satisfied that:*
>
> > *(a) the development will not impair the use of the land for agricultural and rural industries, and*
> >
> > *(b) there is a demonstrated economic capacity of the agricultural or rural industry being carried out on the land to support the ongoing employment of rural workers, and*
> >
> > *(c) the development is necessary considering the nature of the agricultural or rural industry land use lawfully occurring on the land or as a result of the remote or isolated location of the land, and*
> >
> > *(d) the development will be on the same lot as an existing lawfully erected dwelling house.*

6.9. Living in the rural landscape

The high number of people living in the rural landscape is equivalent to a large country town the size of Ballina, Lismore or Taree. These towns have a high level of service for their residents. However, the density of population is much higher in Taree than in the rural areas of Hawkesbury. It has been estimated that it is approximately 35 times denser. The community, however is very similar to an urban one and this has been shown in section 2.10 which showed that the rural area has an urban demography. The paradox is however, that because of the distance from the dwellings to the centres and the low population density, the people have a much lower level of service.

There are some opportunities to address this by lobbying the Government for more services to be provided to these rural areas.

One potential option is for the Council to provide one or two centrally located facilities in the rural lands to act as a hub for these services and also allow for more services to travel to the dwellings in the rural areas.

A third option is to provide more community-based transport services to take people to the services in the surrounding areas such as Penrith and Blacktown.

6.10. Environmental Conservation

The Greater Sydney Region Plan and Western City District Plan identifies that The District's extensive rural areas include farmland and mineral resources which supply fresh local produce and construction materials. Its bushland provides habitat for local wildlife and offset sites for biodiversity. Collectively the District's rural areas and Protected Natural Areas provide significant green space for Greater Sydney, particularly in the Wollondilly, Blue Mountains and Hawkesbury local government areas. Relevant to Environmental Conservation and this Rural Lands Strategy, the Western City District Plan includes the following priorities:

Planning Priority W12

Protecting and improving the health and enjoyment of the District's waterways

Planning Priority W13

Creating a Parkland City urban structure and identity, with South Creek as a defining spatial element

Planning Priority W14

Protecting and enhancing bushland and biodiversity

Planning Priority W15

Increasing urban tree canopy cover and delivering Green Grid connections

Planning Priority W16

Protecting and enhancing scenic and cultural landscapes

Planning Priority W17

Better managing rural areas

In response to this, and to inform amendments to the Hawkesbury Local Environmental Plan, Council is either undertaking the following work and considering existing work prepared by other organisations:

Biodiversity Strategic Planning Framework

Council has commissioned Ecological Australia to undertake a strategic biodiversity framework.

Biological diversity, or biodiversity, is the variety of life forms in all terrestrial (land) and aquatic (water) environments on Earth. There are three levels of biodiversity:

- genetic diversity—the variety of genetic information contained in individual plants, animals and micro-organisms
- species diversity—the variety of species
- ecosystem diversity—the variety of habitats, ecological communities and ecological processes.

The biodiversity value of an area is determined by the integrity of the vegetation based on its composition, structure and function, and the suitability of habitat.

Biodiversity supports ecosystem services that are essential for human survival. Ecosystem services include clean air and water, pollination and temperature control. Ongoing threats to biodiversity in the Hawkesbury Local Government Area include climate change, vegetation clearing, introduction and spread of weed species, fauna hunting by pest animals, and diseases.

Council is undertaking a strategic biodiversity framework to support biodiversity functions of local ecosystem health, including species and their genetic diversity, survive in their natural habitat. This will ensure that the social, economic, environmental and health services provided by healthy ecosystems can continue to provide their benefits for current and future generations.

As part of the strategic biodiversity framework, a mapping framework to prioritise biodiversity within Hawkesbury Local Government Area is being developed in response to updated NSW biodiversity legislation, biodiversity conservation guidelines, and planning documents and policies. The framework will support Council to consider biodiversity priorities in its provision of regulatory requirements and operational management, improve and inform Council decision making, and support strategic planning.

The purpose of the prioritisation framework is to co-ordinate the delivery of key biodiversity outcomes within the LGA in line with the overarching objectives of relevant regional plans and to identify key sensitive areas that require urgent conservation action.

The biodiversity prioritisation mapping incorporates key biodiversity criteria and provides the strategic tool to identify areas of high biodiversity lands across the LGA.

High biodiversity value lands were refined from the initial biodiversity prioritisation layer prepared for Hawkesbury Council in 2018. The resultant refinement provides support and guidance for:

- Conservation investment – identifies comparative biodiversity values to rank lands that may be candidate for ongoing conservation. as:

  - biodiversity stewardship sites under the Biodiversity Offsets Scheme framework for potential financial return;
  - candidate areas to enhance biodiversity through further investment (Bushcare and Hawkesbury Council Works)
  - voluntary planning agreements and biodiversity certification assessments
- Council policies – identifies key areas of consolidated biodiversity values that support regional biodiversity connectivity and opportunities for biodiversity conservation and enhancement across the LGA to inform land use and management (open space and recreation, urban forest, street tree planting, residential planting guidance)
- LEP update – identified high priority lands can be used as a basis to update the current terrestrial biodiversity overlay boundaries over both public and private lands
- Biodiversity Values Map – identified high priority lands can be proposed to support a nomination to update the DPIE biodiversity values mapping across the LGA.
- Assessment of land - a number of identified key Council lands were assessed against the biodiversity priority mapping and ranked in order of biodiversity value to identify potential future opportunities.

Greater Blue Mountains World Heritage Area Strategic Plan

The rural lands are covered with as significant amount of native vegetation which is on a mixture of private and public land – both in dense and scattered patches. The total area of National Parks, Nature Reserves and State Forests comprises 72.5% of the total area of the LGA.

Of this, it is identified that the Greater Blue Mountains Area within the Hawkesbury LGA contains over 161,000 Ha of World Heritage listed national parks, which is over 58% of the LGA. The Greater Blue Mountains World Heritage Area Strategic Plan provides broad principles for the integrated management, protection, interpretation and monitoring of the World Heritage property. The Greater Blue Mountains World Heritage Area Strategic Plan identifies that management of the adjacent areas needs to be consistent with the protection of the World Heritage values. The Greater Blue Mountains World Heritage Area Strategic Plan identifies that Councils of the local government areas adjoining the Greater Blue Mountains World Heritage Area will play a key role in implementing the Greater Blue Mountains World Heritage Area Strategic Plan.

The ten key management principles outlined in the Greater Blue Mountains World Heritage Area Strategic Plan include Integrity and Major impacts related to urban and industrial development. The potential for impacts on the integrity of the Greater Blue Mountains World Heritage Area arise largely from its long and complex boundary and large number of adjoining landholders and land uses.

Therefore, the Greater Blue Mountains World Heritage Area Strategic Plan confirms that complementary management of adjoining land by both private landholders and

government agencies is critical to maintenance of the area's integrity. The Greater Blue Mountains World Heritage Area Strategic Plan also recognises the importance of ensuring that adjoining land uses are compatible with the conservation and presentation of World Heritage values.

Based on this, relevant planning provisions and controls should be developed for planning adjacent to the Greater Blue Mountains World Heritage Area, including:

- prevention of intensification of land subdivision
- recognition of bush fire hazards, development within catchments flowing into the area, and potential for weeds and feral animals to be introduced into the area from private land
- Aboriginal cultural heritage, which is a key attribute of the Greater Blue Mountains World Heritage Area and of the rural landscapes of the LGA.

Upper Hawkesbury River Water Quality Monitoring Program

Council has contracted the Estuaries and Catchments Team of the NSW Department of Planning, Industry and Environment, formerly known as NSW Office of Environment and Heritage to assist Council staff to assess the water quality in part of the Upper Hawkesbury River that falls within the Hawkesbury City Council Local Government Area.

This is a long term monitoring programs to track the ecological health of the river and to identify potential areas requiring management.

The NSW Natural Resources Monitoring, Evaluation and Reporting Program outlines standard sampling, data analysis and reporting protocols, to assess estuary ecological health (Office of Environment & Heritage, 2016).

The Upper Hawkesbury River monitoring program was designed to adhere to these protocols and to also address locally relevant issues.

The aims of the monitoring program are to assess the ecological health of the Upper Hawkesbury River using methods that are scientifically valid and standardised, and to report the information generated in an accessible way to a number of potential users in a report card style format.

With the Hawkesbury being such a large system that runs through several Council LGA's, this program also falls within the larger overall aim of establishing a standardised report card and grades that other Councils can adopt. Provision of the monitoring program is a key recommendation of Councils existing certified Upper Hawkesbury Coastal Zone Management Plan.

Whole of Hawkesbury Coastal Management Plan

Six councils, including Hawkesbury City Council have partnered on a project to improve the management of the river through collaboration, in order to maintain and enhance the social, environmental and economic values of this iconic system.

Collaborating on such a project brings numerous benefits to partner Councils, government agencies, all stakeholders and the health of the river system, including:

- enabling a consistent, sustainable and strategic approach to management of the Hawkesbury estuary (i.e. ensure everyone's priority objectives are considered)
- the opportunity to address catchment scale issues independently of jurisdictional boundaries
- efficiency savings (economies of scale in projects with common goals across councils, reducing duplication of studies, monitoring and community engagement)
- the ability to develop a framework for interagency co-ordination (local and state government agencies)
- development of a platform to access funding assistance to address catchment-related issues impacting on the social, economic and environmental values of the Hawkesbury and
- improved capacity and provide support when resources are limited.

The Coastal Management Plan will provide the necessary guidance to enable the system to be managed in a holistic, strategic and coordinated fashion, in particular:

- The Coastal Management Plan will provide a robust and defensible platform to secure funding from the NSW Government's Coastal and Estuary Grants Program and any other potential investors;
- The structure and mandatory requirements of a Coastal Management Plan process are specifically designed to address the objectives of the Coastal Management Act by directly addressing issues across the four coastal management areas defined in the Act;
- The Coastal Management Plan process provides significant pathways for community and stakeholder engagement, and can establish strong working relationships with community networks and stakeholders which are built on mutual trust and respect
- The risk-management process outlined in a Coastal Management Plan promotes the identification of current and future risks across a range of planning horizons – allowing Partner Councils to adequately prepare for emerging threats;
- The preparation of a Coastal Management Plan will enable the funding and implementation of a number of projects that will provide benefits to the local community by improving and maintaining safe and sustainable access to the estuary system, and protecting public assets in areas subjected to current and future coastal hazards; and,

- There are significant opportunities for a project of this magnitude to leverage its large scope in order to gain funding, media attention and community buy-in.

Chapter 7: Implementation

This chapter provides the implementation details for the strategy and summarises the recommendations made during the document. They can be categorised into the following categories:

Growth Management

Adopt the settlement hierarchy outlined in section 6.5

Urban expansion into the surrounding rural landscape can only occur in accordance with the settlement hierarchy and the recommendations of the Hawkesbury Housing Strategy

Rural Lands Preservation

Adopt the landscape based strategic planning concept in section 6.6.

Encourage and promote the farmers of the Hawkesbury LGA

Adopt the let 'the farmers farm' land use conflict concept outlined in section 6.4.1 and discuss this with the relevant State Government Departments

Economic Development

Encourage farmers to join the farm gate trail and sell from the farm gate or to sell their produce to those farmers who already have a farm gate sales outlet.

Encourage farmers to sell local produce to local shops under the band of Hawkesbury Harvest

Council engage with the Protected Cropping sector and encourage and facilitate the establishment of protected cropping sector in the Hawkesbury LGA.

Encourage the retention and promotion of the existing agricultural sectors of vegetable and turf farming, nurseries, egg production and poultry meat production in the LGA

Encourage and promote the agricultural processing sector to expand in the LGA as well as attracting other processing industries to establish in the LGA.

Encourage and promote the horse sector horse studs, polo clubs and the recreational horse riding.

Promote agritourism as a key economic development component of the rural sector, focusing on the Bells Line of Road in Kurrajong Heights to Bilpin, Berambing and surrounding areas.

Consider the incentive measures outlined in section 6.4.2 and discuss this with the relevant State Government Departments.

Promote the existing farmers markets and encourage them to establish in other settlements.

Land Use Planning

Adopt the changes to the zones as outlined in section 6.7

Endorse the changes to the land use definitions and new provisions outlined in section 6.8

Amend the Hawkesbury DCP as discussed in section 6.4.1

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Appendix 1: Land Use Methodology

The Land Use Survey:

A major component of this study has been a land use survey of all of the land within the study area. The purpose of the land use survey is to provide a baseline of information regarding the current use of rural and environmental lands.

The preparation of a land use survey is one of the most important components when zoning rural land. Each parcel of land has been inspected and given a land use description. This has been entered into Council's Property Information database and mapped using a GIS.

The first step is to identify the categorisation of the land uses to be surveyed. The land use has been categorised into primary and secondary land use categories. The primary land use categories are as follows:

- Commercial
- Extensive Agriculture
- Extractive industries
- Irrigated Plants
- Intensive Animals
- Native Vegetation
- Public Use
- Rural Fringe
- Rural Living
- Vacant

Definitions of each use which were used for the purpose of identifying the land uses are as follows:

- *Commercial* uses are uses that are used for a commercial or industrial type of use and which do not have any dwellings associated with them.
- *Extensive Agriculture* means the growing of plants using natural rainfall or the rearing of animals using grazing as a feeding method. It also includes the growing of fodder crops and irrigated pasture.
- *Extractive Industry* means a use that extracts material from the land and includes mining, sand and clay mining and quarrying of sandstone and other stones.
- *Irrigated plants* means the growing of vegetables and ornamental plants for commercial gain using the application of irrigated water and includes market gardening, protected cropping structures, orchards, vineyards, and other similar uses.
- *Intensive Animals* means the rearing of animals using a feeding method other than natural grazing and includes poultry and piggeries mainly.
- *Native Vegetation* means a lot that has no dwellings or structures on it and which has the majority of the land covered in native vegetation.
- *Public Uses* mean a use that is commonly used and or operated by a public authority or associated body. It includes community facilities, golf courses and Government owned uses of the land.

- *Rural Residential* means a house on a lot that is greater than 1 ha generally, and is in a rural environment where the main source of income is from other sources than agricultural use of the land. Rural-residential is further divided into three categories, being:
  - *Rural Fringe* (generally up to 3.0 Ha);
  - *Rural Living less than 3.0 Ha;* and
  - *Rural Living* greater than 3.0 Ha
- *Vacant* land is land that is mostly cleared of native vegetation and which does not have any dwellings or other structures on it.

The sub-categorisation of rural residential was done after the land use was coded. The rural fringe sub-category was determined by reference to the R5 Large Lot Residential zone. The rural living category is determined by subtracting the rural fringe category from the rural residential data and the further sub-categorisation was determined by reference to the holding size of each parcel and the ranges of less than 3 ha and greater than 3 ha.

The detailed categorisation is presented in the following table:

LAND USE SURVEY CODES

PRIMARY		SECONDARY	
Description	**Code**	**Description**	**Code**
Commercial	CO	Abattoir	AB
		Accommodation	AC
		Child Care Centre	CC
		Cellar Door	CD
		Conference Centre	CF
		Camp Grounds	CG
		Club	CL
		Caravan Park	CP
		Bus Depot	BD
		Education	ED
		Golf Course	GC
		Manufacturing	MF
		Mechanical Repairs	MR
		Paintball	PB
		Pool	PL
		Petrol Station	PS
		Rifle Range	RR
		Restaurant & Cafe	RS
		Shop	SH
		Sawmill	SM
		Sand and Soil Supplies	SS
		Springwater	SW

PRIMARY		SECONDARY	
		Truck Depot	TD
		Tourist	TO
		Veterinary Surgeon	VS
Extensive Agriculture	EA	Grazing	GR
Extractive Industry	EI	Sand Extraction	SA
		Sandstone Quarry	ST
Intensive Animals	IA	Dairy	DA
		Horse Stud	HS
		Pigs	PG
		Poultry	PO
Irrigated Plants	IP	Forestry	FO
		Lucerne	LU
		Market Garden	MG
		Market Garden Protected Cropping	MG PC
		Mushrooms	MU
		Nursery	NU
		Orchard	OR
		Protected Cropping	PC
		Protected Cropping Greenhouse	GH
		Protected Cropping Hydroponics	HY
		Protected Cropping Igloos	IG
		Turf Farm	TF
		Igloos	IG
Native Vegetation	NV	Native Vegetation	
Public Use	PU	Royal Australian Airforce	AF
		Bushfire Brigade	BF
		Cemetery	CE
		Community Facilities	CF
		Church	CH
		Crown Land	CR
		Electricity	EL
		Hall	HL
		Hospital	HO
		Open Space	OS
		Pony Club	PY
		Race Club	RC
		Showground	SG
		School	SL
		Telstra	TL
		University	UN
		Waste Disposal	WD
		Water & Sewer	WS

PRIMARY		SECONDARY	
Rural Residential	RR	Bed & Breakfast	BB
		Dwelling	DW
		Home Business	HB
		Horse	HO
		Truck	TR
Rural Fringe Vacant	VA	Cleared Land	CL

Methodology:

There are 3 components to the carrying out of the land use survey as follows:

- Preliminary identification of land use.
- Study area inspection.
- Data entry and mapping.

Preliminary identification of land use occurred in the office prior to the field inspection. Aerial photography was used to identify the land use. The major things to be picked out are extensive agriculture, intensive animals (horse studs and poultry), irrigated plants (particularly market gardens and turf farms), , dwellings on small lots, vacant land, lots which are totally covered with native vegetation, and extractive industries. Only one major land use was identified for each site. An assumption was made that lots less than 40 ha which did not have an intensive agricultural, commercial, industry, public or government use and were in a separate ownership to the surrounding land, were rural residential. Where there is just a dwelling, it was coded in the second use as dwelling, if there was a horse, horse and if there was a truck use it was coded as a truck use. If the land is cleared and has a dwelling house located on it and is either greater than 40 ha, or was owned in association with the surrounding land and was greater than 40 ha, it was coded as extensive agriculture.

This information was entered into the database using the coding that has been identified for the primary and secondary land uses.

The study area inspection was carried out by windscreen survey of all of the roads within the rural parts of the LGA. This was done to check the primary land use categories and also to enter secondary ones that could not be identified from the aerial photos. As each road is driven on the land use is clarified against the preliminary identification. Signage, which gives an indication that the property may be used for a secondary use such as a home business or a commercial use, was also noted. Many photos were taken of the land use and general landscape of the rural lands.