Bungendore Health Impact Assessment






A Rapid Health Impact Assessment of Two Development Scenarios in Bungendore, New South Wales

May 2006

PALERANG COUNCIL

GREATER SOUTHERN AREA HEALTH SERVICE NSW HEALTH

CHETRE UNSW THE UNIVERSITY OF NEW SOUTH WALES CENTRE FOR HEALTH EQUITY TRAINING, RESEARCH & EVALUATION

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Acknowledgments

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The valuable input of all members of the steering group is also acknowledged.

Abbreviations and Terms

ACT	Australian Capital Territory
CHETRE	Centre for Health Equity Training, Research and Evaluation
Council	Palerang Council
DCP	Development Control Plan
EIA	Environmental Impact Assessment
GSAHS	Greater Southern Area Health Service
HIA	Health Impact Assessment
LEP	Local Environmental Plan
NSW	New South Wales
SEPP	State Environmental Planning Policy
YLEP	Yarrowlumla Local Environmental Plan 2002
Walkability	Is a term used to describe whether a town or neighbourhood is amenable for walking. It considers factors such as there being destinations within walking distance, the quality of footpaths, access to road crossings and the behaviour of drivers, a sense of safety and aesthetics and topography.

Executive Summary

The village of Bungendore is located in the Southern Tablelands of NSW within the Palerang Council local government area. It is estimated that approximately 2000 people now live in the village.

Recent population growth in Bungendore has highlighted the need for the provision of services for current and future residents. Planning for Bungendore's future is especially important and planning processes are currently underway. Feasible and sustainable development outcomes will be examined in this process.

In this report, two growth scenarios have been evaluated that investigate the implications of future growth on the health of its residents. The first scenario examines development occurring within the existing boundaries of the village with development on existing vacant land over the next 15 years. This is known as 'infill development' and it would likely accommodate an additional 2350 people resulting in a total population of approximately 4350 people.

The second scenario investigates the re-zoning of some agricultural land on the perimeter of Bungendore for residential and other urban purposes. This is known as 'greenfield development". This second scenario would not occur to the exclusion of 'infill development' but simultaneously with it. The second scenario is likely to accommodate an additional 7150 people and would bring the total population of Bungendore to approximately 9150 people.

Future population growth in Bungendore is likely to have a number of significant impacts on the people, service provision, local economy and on the environment of Bungendore. Some of these effects may be predictable, others will be unexpected; some may be positive others will be negative. Early identification of the possible consequences of either development scenario allow decision makers and service providers to avoid, or at least mitigate, negative impacts and promote positive ones.

The method of rapid health impact assessment was employed to try and identify some of the issues that may affect the health of people living in Bungendore that arise from either of the proposed development scenarios. The health impact assessment focused on three health-related areas: physical activity, water and neighbourliness.

The following elements have been identified as important in promoting physical activity in Bungendore:

- Mixed land use.
- Housing density.
- Footpaths, cycleways and facilities for physical activity.
- High street connectivity.
- Street design that is attractive and safe.
- Transport infrastructure and systems linking residential commercial and business areas as well as other destinations.

The following elements have been identified as important in the provision of water for Bungendore:

- Quantity of water available for residential, recreational and commercial uses.
- Quality of water (fluoridation).

The following elements have been identified as important in promoting neighbourliness in Bungendore:

- Opportunities for incidental contact.
- Conflict management.
- Participation in decision making by the community.
- A shared sense of local identity.
- Local community groups and volunteering.
- Cultural and personal diversity.
- Civic spaces.
- Local businesses and local employment.

Introduction

The Health Impact Assessment (HIA) of Bungendore was part of the NSW Health Impact Assessment Project. The NSW Department of Health has funded the Centre for Health Equity Training, Research and Evaluation (CHETRE) at the University of NSW to implement the NSW Health Impact Assessment Project. The overall project comprised three phases:

- Phase 1 (2002-03) - awareness raising and exploration.
- Phase 2 (2003-04) - expanded awareness and early adoption.
- Phase 3 (2005-08) - broader implementation of HIA and working with other sectors.

The Bungendore HIA was a component of phase 3 of the NSW HIA Project, whereby six developmental sites were selected to undertake an HIA with the training and support of CHETRE. In addition to the Bungendore project, other developmental sites for 2005 were:

- Lower Hunter (focus on urban and industrial renewal).
- Greater Western Sydney (focus on urban development).
- Northern Sydney (focus on early childhood home visiting program).
- Granville (focus on urban regeneration).
- North Coast (focus on Indigenous Environmental Health Workers proposal).

Project Purpose

Bungendore was suggested as a developmental site following discussions between the Greater Southern Area Health Service (GSAHS) and Palerang Council (Council). GSAHS was interested in testing the HIA methodology, particularly as a structured approach for assessing the links between health and urban development.

The methodology adopted for the HIA is a rapid assessment methodology. The person hours required to complete the assessment was equivalent to that of a 12 week full time position. The assessment does not look at all potential impacts on the health of future populations from growth, nor is it a needs assessment for these populations. The three areas of investigation undertaken in this report (physical activity, water supply and neighbourliness) were considered relevant to Bungendore and were agreed to by consensus by the steering committee. Although other health issues could also have been examined such as aged accommodation, child care, or youth facilities and activities, these would need to have been examined under the methodologies of a comprehensive health impact assessment.

Palerang Council had commenced a major strategic planning project. Part of this process involves the preparation of an urban development strategy to guide the future development of the area, including Bungendore, taking into account population growth pressures and infrastructural constraints. Applying the HIA methodology to two urban development scenarios for population growth in Bungendore was seen as an opportunity to obtain different information on the potential impacts.

Project Management

The Bungendore HIA was jointly managed by Palerang Council and Greater Southern Area Health Service, with support from CHETRE. A project team was created to undertake the HIA, comprising Matthew Lynch (Palerang Council), James Allwood (GSAHS), Andrew Marich (GSAHS) and Andrew Gow (GSAHS), together with participant observers Jenny Sheehan and Carlie Naylor (both from the NSW Department of Health) and Janet Chapman (GSAHS).

The project team referred to a Steering Group for support and guidance (Appendix 6).

Development Scenarios

The HIA focused on two urban development growth scenarios in and around Bungendore. In its examination of these, this report does not form an opinion as to whether or not the future growth of Bungendore is positive or negative. It simply identifies possible health impacts likely to be generated from the growth scenarios and recommends mitigation measures to minimise these impacts.

The current situation

Bungendore is zoned 2(V) Village under the Yarrowlumla Local Environmental Plan 2002 (YLEP 2002). Separate Residential, Commercial, Light Industrial and Open Space zones that control development do not exist in Bungendore. Village zones are often used in local environmental plans for smaller settlements where the demand for specialised zones has not been established. To supplement the 2(V) Village zone, the Development Control Plan that applies to Bungendore identifies preferred land uses for each precinct across the village (Appendix 3).

All land surrounding Bungendore is zoned 1(a) General Rural under the YLEP 2002.

A profile of Bungendore is at Appendix 1.

Bungendore's residential land stock is summarised in Table 1.

	< 1000 m^2	1000 - 2000 m^2	> 2000 m^2	Total Allotments
Allotments with dwellings	172	246	221	639
Vacant Allotments	30	286	80	396
Total Allotments	202	532	301	1035

Table 1: Residential Landstock (as at April 2005)

With future population growth almost certainly to occur in and around Bungendore, Council is now considering ways in which this growth can be appropriately accommodated. The health impacts of two growth scenarios have been examined:

Scenario One - Infill Development

Scenario one considers the growth of Bungendore within the existing village boundaries only.

The number of dwelling - houses approved has increased significantly since 2002 (Figure 1). Assuming that the rate of approvals continues at about 60 dwellings per year (ie, the same rate as in 2005), existing available residential land would not be fully developed until 2020.

This estimate had been based on the assumption that average residential allotment sizes will continue to be approved with areas at about 1000sqm (as is generally the case now) and that average household occupancy rates of 2.9 people per occupied dwelling[1] remain constant. This would correspond to an increase in Bungendore's population from approximately 2000 people in 2005 to 4350 people in the year 2020.

[1] ABS Census' 1996 and 2001.

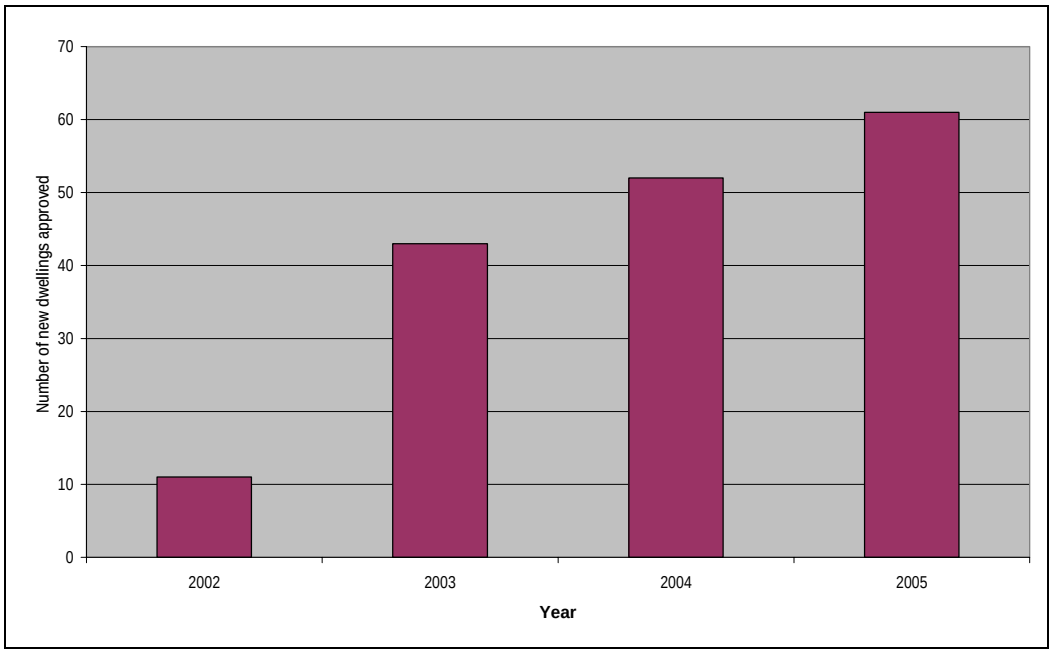

Figure 1: Dwelling-Houses approved in Bungendore 2002-2005

Scenario Two - Infill Development and Greenfield Development

Several representations have been made to Council to rezone rural land immediately adjoining the existing Village boundary for urban purposes. If all these requests for greenfield development were to eventuate, they would result in the creation of about 1550 residential allotments and 160 townhouses translating into an additional population of about 4800 people.

These representations have also included requests to establish additional commercial land and if supported, this would result in the existing commercial precinct being extended and the establishment of a new, physically separated commercial precinct.

Scenario two considers infill development as described in Scenario one to occur in addition to the requests from Developers to rezone land that adjoins the existing village boundaries. Legislative restrictions prevent Council from prohibiting further development within the existing village boundaries in lieu of supporting Greenfield development sites. Accordingly, if Greenfield development were to occur, the provisions that currently enable infill development would have to remain under any new planning provisions for Bungendore. This scenario would also mean that the geographical area of Bungendore would substantially increase.

Under Scenario two, the population of Bungendore could grow to approximately 9150 people.

Estimated time frames for the completion of Scenario Two have been based on a low population growth rate (2% per annum), a medium growth rate (3%) and a high growth rate (4%):

- 2% annual growth rate 77 years.
- 3% annual growth rate 52 years.
- 4% annual growth rate 39 years.

Methods - Overview of the Health Impact Assessment Process

Screening

Screening determines whether a health impact assessment is the most appropriate methodology for assessing the impact of an urban growth scenario on health, in this case the impact of future urban development on the health of the people of Bungendore.

The screening identified a wide range of potential health impacts that could arise from future urban development. These were categorised broadly as relating to public infrastructure, services and facilities, the environment and the community.

The Bungendore HIA Steering Group agreed that an HIA be undertaken to more fully identify:

- the anticipated health impacts of the development scenarios and any differentials amongst different groups within Bungendore; and
- opportunities to change the scenarios to enhance any anticipated health benefits and minimise any health hazards.

The rationale for recommending a HIA of the proposal includes:

- the importance of ensuring that major proposals do not unintentionally impact adversely on people's health;
- the need to further investigate some of the potential impacts identified in the screening; and
- the opportunity for the findings to inform the development of Council's strategic planning documents, such as the new LEP and social plan.

Agreement to proceed with the HIA was not without considerable discussion about the merits of the HIA process and potential for real outcomes to be achieved for the people of Bungendore.

The Steering Group acknowledged that there are many tools for assessing the need for or impact of proposals. These include community needs assessments, environmental impact assessments and social impact assessments. It was noted that some of these processes may be undertaken at other stages: for example, when specific development applications are lodged, environmental impact assessments are undertaken. Likewise, a needs assessment should be undertaken when new services are being considered. However, as the purpose of this project was to focus specifically on potential health impacts of potential development scenarios, it was agreed to trial the HIA methodology.

Scoping

The purpose of scoping is to determine the scope and nature of the HIA. This includes consideration of whether the HIA should be short/rapid, intermediate or comprehensive and the extent of health impacts to be considered.

The Steering Committee agreed that the Bungendore HIA would focus on the anticipated impacts of two development scenarios.

It had initially been agreed that this would be a rapid HIA, which should involve a total time period of approximately three months of full time work. However, that timeframe had already been exceeded by the time the scoping was completed. In finalising the scope of the project, it became necessary to take steps to ensure that the project does not move too far from the initial

intention of a rapid project. This has resulted in a considerable refinement of the health issues to be investigated and the methodology to be used.

The project team and steering committee were initially interested in considering the question of, what characteristics of future urban development will maximise health benefits and minimise health risks for the residents of Bungendore. However, following consultation with CHETRE, it became apparent that this level of investigation was well beyond the scope of a rapid health impact assessment. Indeed, it may be that this question is beyond the scope of the health impact assessment methodology alone and would draw on a range of other techniques.

To enable the Bungendore HIA to make some clear recommendations in a timely manner on issues that are within the sphere of influence of Council, it was agreed to focus on the potential health issues outlined below. There was considerable discussion as to the appropriateness of these potential health issues and the method by which they were selected.

These issues have been drawn from the potential issues identified in the screening report and represent issues from environmental health, physical health and mental/emotional health.

Potential health issue	Rationale for selection
Physical activity	Overweight and obesity are enormous threats to the health of Australians. This is true also in communities in South Eastern NSW, where approximately 1 in 2 adults are overweight or obese. There is an emerging body of knowledge relating to the links between urban form, physical activity and overweight and obesity. The current structure of the urban environment and society is considered to be 'obesogenic' by many commentators. Examining this emerging literature and development recommendations appropriate to a rural environment will provide the opportunity to make long-lasting change that will maintain and/or improve health into the future.
Water supply	The availability of water imposes some absolute limits on the growth and future of a town. The relationship of water to health is more complex. At one level it is fundamental: without an adequate supply of clean water, health is seriously compromised. The complexity occurs when attempts are made to restrict water use to maintain a drinking supply. For example, can sporting fields and parks be maintained? Will the swimming pool be filled? Can home fruit and vegetable gardens be grown? What would this mean for the morale, economy and self-image of a town? This is a topical issue for communities in South Eastern NSW, following a major drought and in anticipation of the impacts of changing climate. Investigating which development scenarios will provide the optimal balance of growth and water management to maintain and/or improve health is important.

Neighbourliness	Much has been made of the concepts of social cohesion and connectedness. It is sometimes contended that an influx of new residents into an existing area threatens cohesion and connectedness. Existing residents may seek the economic growth promised by urban development but then find the ways and beliefs of new residents' conflict with existing social norms. These are topical issues in Bungendore, however they are also emotive and fraught. As a somewhat more objective indicator of cohesion and connectedness, it is proposed to assess the impact of urban development on neighbourliness and to develop recommendations that will allow neighbourliness to be maintained, based on the premise that trusting, connected communities experience better emotional/mental health.

Findings

Issue 1: Possible health impacts of the two development scenarios on physical activity

Analysis

Examining the potential impacts of urban development on physical activity levels in Bungendore was timely. The NSW Centre for Overweight and Obesity, at the University of Sydney, had just completed a comprehensive literature review entitled Creating Healthy Environments: A review of links between the physical environment, physical activity and obesity (Gebel, King et al, 2005).

The key findings of the literature review are summarised below.

Overweight and Obesity

- Over half of the Australian and NSW adult population are overweight or obese.
- Approximately one in four school age children are overweight or obese.
- If current trends continue, overweight and obesity will soon overtake tobacco smoking as the leading cause of chronic disease.
- Lifestyle changes in the last 25 years, including increased food consumption, a shift to more sedentary work and leisure activities, increased car use and reduced or continuing low level of physical activity are major reasons for this serious, new health problem.

Physical Activity

- There now is a broad base of evidence that an active lifestyle reduces the risk of coronary heart disease, stroke and some cancers, improves mental health and lipid profiles, lowers blood pressure, facilitates weight loss and prevents falls in the elderly. Therefore, physical activity has been called today's best buy in public health because of its manifold benefits.
- Physical activity includes both structured activities (e.g. organised sport) and unstructured activities (e.g. walking, cycling, gardening).

Physical Environment

- To the extent that environmental factors are associated with physical activity and weight status, they offer enormous potential to promote health. Environmental changes can reach and influence large numbers of people and are likely to achieve a sustainable outcome.

Links Between the Physical Environment and Physical Activity

- There is consistent evidence that high urban density, mixed land use and high street connectivity are associated with increased walkability.
- People walk more if they perceive that streets are safe and are aesthetically pleasing.
- There is an increasing volume of research showing that better footpaths, and perceptions about good footpaths, increase walking.
- A review of six studies found that improved walking and cycling infrastructure (such as providing cyclepaths) results in reduced car use and change towards more active transport.
- Infrastructure interventions can have an impact, although the impact will be mediated by other psychological and social factors, and thus not always reproducible.
- The studies in footpaths and walking also underline the role of both actual and perceived infrastructure.

- Other facilities, such as parks and open space, are also associated with increased activity, where they are perceived as safe, attractive and accessible.
- Destination and distance to destinations makes a difference to people's travel mode and to their activity levels. Locating route destinations (including retail and other types of activity facilities such as parks) near homes encourages activity and active transport.
- Route-related variables that impact on physical activity levels include: footpaths, bike lanes, signage, lighting, and tamed traffic.
- Area-related variables that impact on physical activity include: land use mix, density, street types, as well as aesthetic and visual features.
- Walking is the preferred form of activity and neighbourhood streets the preferred place for active living. There is also potential to convert this interest in walking, and to a lesser degree, cycling, into travel behaviour.

Feedback from key informants (appendix 4)

- there is support for Council ensuring that developers provide footpaths and open space or playing fields in new developments.
- there is concern that mixed land use must be handled carefully, so that commercial activities do not impinge on residential amenity.
- street connectivity (e.g. grid street design) is supported if the evidence suggests this will improve incidental physical activity, although there is concern that traffic must be managed so that streets remain safe for children.

Conclusions

Key environmental features that contribute to increased physical activity and prevention of weight gain include:

- mixed land use.
- high housing density.
- footpaths and cycleways and facilities for physical activity.
- high street connectivity.
- street design that is attractive and safe.
- transport infrastructure and systems linking residential, commercial and business areas.

Impacts and recommendations relating to physical activity

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
1. Mixed land use	• Land use is likely to follow existing (primarily residential) pattern and this has been linked to reduced physical activity.	• Council to discuss non-conflicting mixed use zoning in the preparation of the Bungendore Discussion Paper as part of the LEP review, e.g. residential development in association with commercial properties, corner shops etc.	• Greenfield development likely to result in residential areas being physically separated from the non-residential areas in the village, leading to reduced opportunities for physical activity	• Council to discuss the establishment of greenfield sites, additional commercial precincts and non-conflicting mixed use zoning in the preparation of the Bungendore Discussion Paper as part of the LEP review, e.g. residential development in association with commercial properties, corner shops etc.
2. Housing density	• Increase in housing density arising from new buildings on vacant land and/or from subdivision of larger land blocks is likely to promote physical activity.	• Council to discuss medium and higher density residential development in the preparation of the Bungendore Discussion Paper as part of the LEP review.	• Housing density is likely to increase in parts of Bungendore that are already zoned residential but is likely to remain low in greenfield development sites resulting in lower walkability in the latter.	• As for scenario one.
3. Footpaths, cycleways and facilities for physical activity	• Infill development will reduce vacant land in Bungendore that may currently be used for physical activity. • New residential development may help to fund infrastructure for physical activity such as footpaths and cycleways.	• Council to discuss footpath and cycleway networks in the preparation of the Bungendore Discussion Paper as part of the LEP review with guidelines for contributions from developers. • Council, in the preparation of their Assets Register and	• Greenfield development likely to result in residential areas being physically separated from the non-residential areas in the village, leading to reduced rates of physical activity	• The support for any Greenfield Development Sites to include an assessment of the provision and funding for footpaths, cycleways and other facilities for physical activity, in accordance with the footpath and cycleway plan

Impacts and recommendations relating to physical activity

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
		Social Plan, to investigate the establishment and maintenance of recreational facilities and to build and maintain at least one footpath on every street. • GSAHS to investigate health promotion programs that increase participation in physical activity amongst the residents of Bungendore, eg, walking		
4. High street connectivity	• Grid design of Bungendore generally provides good connectivity within the town and this promotes physical activity. The railway line and Turallo Creek restrict connectivity between 'old' Bungendore, Bungendore North, Elmslea and East and West Bungendore. Access to Bungendore North is restricted to one road and one pedestrian crossing across Turallo Creek. An additional road/pedestrian link at Majara St is also approved.	• The grid pattern of Bungendore should be maintained. • Council to investigate opportunities for increasing the physical connections between older and newer precincts (e.g. footpaths, bridges, etc)	• Greenfield development likely to result in residential areas being physically separated from the non-residential areas in the village, leading to reduced rates of physical activity	• New greenfield development should follow a grid-type pattern and have multiple connections to adjoining parts of the town (e.g. roads, pathways)

Impacts and recommendations relating to physical activity

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
5. Street design that is attractive and safe	• People are more likely to be active outside if the landscape is visually appealing and if people perceive that they're safe. • Inappropriate infill development is likely to reduce numbers of trees.	• Council to discuss new developments addressing the streetscape and the implementation of landscaping requirements (including tree planting) for all new development in the preparation of the Bungendore Discussion Paper as part of the LEP review. • Street lighting should be adequate to allow people to feel safe walking at night.	• New greenfield development concentrates many new houses in the one location and is usually accompanied by removal of existing vegetation. Unattractive landscapes make it less likely that people will be physically active outdoors.	• Council to consider ways to preserve significant trees and natural features on greenfield sites and should ensure that streetscape and landscape trees are established rapidly. • Streets and verges should be wide enough to allow pedestrian movement and playing. • Street lighting should be adequate to allow people to feel safe walking at night. • New homes should be in-keeping with streetscapes. High fences fronting streets to be avoided.

Issue 2: Possible health impacts of the two development scenarios on water for domestic, recreational and industrial uses

Analysis

The availability of a water supply for Bungendore imposes some absolute limits on the growth and future of the town. The relationship of water to health is of known importance, however this relationship does raise some complexities. At one level it is fundamental: without an adequate supply of clean water, health is seriously compromised. The complexity occurs when attempts are made to restrict water use to maintain a drinking supply. It is envisaged investigating which development scenarios will provide the optimal balance of growth and water management to maintain and/or improve health will be a valuable exercise.

Water contributes much to health. Water is the most important commodity humans consume. An adequate public water supply is a basic need for any community to avoid the spread of water-borne disease and to provide the foundation for a satisfactory standard of living.

According to WHO (2000), safe water supply and adequate sanitation to protect health are among the basic human rights, and ensuring their availability would contribute immeasurably to health and productivity for development. Wahlqvist (2003) suggests human settlement has always required an adequate, dependable and safe water supply.

However water's protective role is largely unseen and taken for granted in the wealthier countries. More attention is paid to its role in disease transmission than health protection.

In a population health approach, water contributes to health directly within households through food and nutrition, and indirectly as a means of maintaining a healthy, diverse environment. (WHO 2000).

Providing water to a community is a recognised function of Local Government in most countries. Local Government constructs and manages the water supply system as a corporate function.

The WHO (2000) suggests improving water management is a powerful tool that can be used by individuals, communities and households to protect their own health.

Communities need water for recreation, irrigation, industry and domestic use. The population increases, industry expands and other water uses multiply, yet the quantity of water remains fixed. Most sanitary infrastructures were built primarily for durability and lack the elasticity to meet changing needs.

The challenge now is to adapt sanitary systems for flexibility and simultaneously move from unchecked material consumption toward resource-based thinking (Knowlton 2001).

Water for Bungendore is sourced via a groundwater bore, and treated by aeration and chlorination. The quality of water is monitored on a weekly basis and is considered to be within appropriate guidelines. Results from the NSW Health Drinking Water Quality Program (1 January 2001 – 1 April 2006) for Bungendore indicate no significant water quality issues with regard to chemical, microbiological and physical parameters in the Australian Drinking Water Guidelines (appendix 5). Water quality was not raised as an issue in the key informant

interviews. The quality of the groundwater could be an issue in the future with the increased demand on supply. This could place increased treatment implications on infrastructure, which should be considered by Council.

Bungendore is changing and growing through rapid urban development, placing increased demands on public infrastructure including water. Palerang Council recognised this and commissioned the Lake George Aquifer Sustainability Study to gather more detail about the groundwater from which Bungendore draws its water, with particular interest in its sustainable yield. The study was prepared by consultants Hydrollex Pty. Ltd. The findings and implications of the study include:

- It is necessary to gain approval from Department of Natural Resources for an appropriate increase in the current Water Entitlement of 322 ML/year to cater for future residents.
- There is no guarantee that an increase in the Water Entitlement will be approved, especially without a developed case.
- Current usage for existing 2000 population is about 280ML/year.

The DNR (1997) suggests the effective environmental management of water supply systems requires a planning approach which aims primarily for sustainable management of the water resource.

Where environmental planning makes provision for new, intensified or expanded developments, there should be a clear understanding that this will make demands on the natural and managed water cycle, including water supply. Local environment studies should determine how this will be accommodated before the plan is finalised.

Maantay (2001) suggests zoning determines where various categories of land use may go, thereby influencing the location of resulting environmental and health impacts.

When preparing a LEP, Councils should provide for aspects of water supply such as protection zones around water supply catchments, limitations/restrictions on certain developments within water supply catchments and control of development across natural drainage lines.

Councils may consider preparing Development Control Plans which include development standards aimed at the protection and enhancement of the environment. They may also include standards which relate to activities that could impact on the environmental performance of water supply services. For example, a DCP could include requirements relating to stormwater management in new subdivisions.

Feedback from Key Informants (appendix 4)

- rain water tanks were seen as positive.
- there was a strong sense that the community accepts water restrictions during times of drought, but that restrictions would be resented if they were imposed outside of drought years to allow further development.
- facilities such as sporting fields and the swimming pool were seen as worthy uses of water.

Conclusions

In additions to the findings and implication of the Hydrollex Study, the following additional findings made:

- The future growth of Bungendore is threatened by lack of water.
- To obtain an increase in the license, Council will need to justify that any increase won't compromise the sustainability of the aquifer.
- The remaining 42ML available obviously will not support the natural growth of the village to 4000-5000 people in 15-20 years.
- Based on current dwelling approvals (having regard for State Environmental Planning Policy Building sustainability index BASIX – that requires a 40% reduction in the consumption of household water usage) there is sufficient water available to supply between 2 – 4 years worth of additional growth.

The following implications for Council are drawn:

- Restrict future development to the approved subdivided allotments until further water is found.
- Prove up the capacity of the existing aquifer.
- Acquire other existing bore licenses.
- Find and develop extra source(s) e.g. Butmaroo Creek Aquifer.
- Request DNR to place moratorium on further bores that are not for the Bungendore Village water supply – in combination with other options.

Impacts and recommendations relating to water

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impact	Recommendation	Impact	Recommendation
1. Quantity of water available for residential, recreational and commercial uses	• Bungendore will require more water as the population grows and the supply is finite. Rapid population growth may quickly outstrip water supplies and this will be a critical rate-limiting factor for further population growth and viability.	• Council to investigate water saving measures and alternate water supplies. • Council to consider water sustainability in the review of planning instruments i.e. DCPs & LEPs, support the use of rainwater tanks, greywater treatment systems and stormwater harvesting. • Community feedback should be sought on the possible actions and options in relation to water sources, water consumption (or restrictions) and development options.	• The magnitude of total population growth represented by greenfield development is more than double that of infill development and therefore the water supply issue is paramount.	• As for scenario one.
2. Quality of water available for residential and recreational uses.	• Fluoridation is an effective and safe intervention that allows all residents to benefit equally.	• Council should assess the possibility of fluoridating the water supply as a way of improving dental health and reducing health inequities. • GSAHS to work with Council should fluoridation of the water be acceptable to the community. • Council becomes the leader in promoting the benefits of fluoridation.	• An influx of middle-income residents is expected with greenfield development and inequities between the health of different socioeconomic groups may grow. Fluoridation is an effective and safe intervention that allows all residents to benefit equally.	• As for scenario one.

Issue 3: Possible health impacts of the two development scenarios on neighbourliness

Neighbourliness is difficult to define as it means different things to different people. The Oxford English Dictionary defines a neighbour as "someone who lives next door or near another, and a person regarded as having the duties or claims of friendliness and consideration."

It seems, though, that good neighbourliness involves more than simply living in a locality and being friendly and considerate to others. Some of the features of neighbourliness may include:

- People living in proximity to others in a community.
- People forming relationships with others in a community.
- People being trustworthy and having trust in others.
- People having a sense of responsibility for their community.
- People participating in community events.
- People respecting others in their community.
- People helping others in the community, especially in times of hardship.
- People taking pride in the local environment.

Neighbourliness implies that a community is cohesive, resilient, resourceful, and inclusive and is a pleasant place for all to live.

Analysis

Various researchers have derived measures of neighbourliness that commonly assess two main aspects: social interaction (including the extent of casual interaction, social support and social networks) and affective bonds (including sense of mutual aid, sense of community and degree of attachment to place) Cattell & Evans, 1999)).

Social capital

We found only very limited relevant formal research regarding “neighbourliness” *per se* although we determined that neighbourliness can broadly be conceptualised in terms of social capital. Social capital is variously defined as "features of social organisation such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit" and “Features of social organisation such as civic participation, norms of reciprocity and trust in others that facilitate co-operation for mutual benefit” (Kawachi 1996). Three key elements of social capital are social trust (the degree to which individuals have confidence in the actions of others); social networks (the degree and strength of relationships between individuals and groups); and social norms (formal and informal “rules” that govern the manners of social interaction) (Baum & Ziersch, 2003).

Types of social capital

Sociologists commonly describe three forms of social capital:

- Bonding social capital describes relationships between individuals or groups that share similar demographic characteristics.
- Bridging social capital describes the connections that form between different groups or individuals.
- Linking social capital describes connections that occur between different social strata.

Some characteristics and features of social capital

Social networks refer to some of the "structural" aspects of social capital. Formal networks are those relationships that are formed within formal organisations and voluntary associations. Informal social networks are those such as those relationships that form spontaneously within families and between friends and acquaintances. Informal social networks are important for the delivery of social support to individuals. Social networks can be further described in terms of their size (e.g.. the number of individuals in a group), their density (i.e., the strength of the relationships between members) and whether they are open (e.g., groups where newcomers to a group are welcomed) or closed (i.e., "cliques" where newcomers to the group are not easily incorporated (Baum & Ziersch, 2003; Burndine & Felix, 1999)).

Trust and reciprocity form some of the cognitive and subjective aspects of social capital and are more difficult to define. Social capital theorists define trust as "a standing decision to give most people the benefit of the doubt". Trust exists on a personal level within established relationships, based on an individual's prior experiences. It also exists as "social trust", the extent to which people have confidence in others, they don't know (Baum & Ziersch, 2003).

Reciprocity identifies the characteristic of cooperation that is intimately involved with social capital. In essence reciprocity describes the "doing of good turns" for other people in the expectation that these would be done by others in other circumstances (Baum & Ziersch, 2003).

A "sense of community" is somewhat subjective but has been defined by as "a feeling that [community] members have of belonging, that members matter to one another and a shared faith that members' needs will be met through their commitment to be together" (McMillan & Charvis, 1986).

Civil society is used to describe groups of people that act cooperatively for the good of the community, yet work independent of formal political or commercial systems. Social capital theorists disagree about the role governments play in fostering strong civil society. Civil society often influences government policymaking and may influence a community's values. Volunteering describes the donation of time and effort by community members, with no or little remuneration and usually occurs in the context of some form of community organisation and is often a component of civil society (Baum & Ziersch, 2003).

The extent to which an individual or a group can participate in decision-making processes is also thought to be an important aspect of social capital. The extent of participation can range from notional forms of "community consultation" to "grass-roots" decision making processes in which the individuals themselves are actively and intimately involved in the process.

The effects of social capital on health

Social capital is clearly associated with good health status. Communities with high measures of social capital have lower morbidity and mortality rates (Berkman L, Syme, 1979). Specifically, high social capital is associated with lower cardiovascular and cancer-related mortality and lower injury mortality, including both accidental injury death and suicide. (Kawachi, 1996). Communities with high social capital score better on measures of quality of life (Kawachi & Kennedy, 1999). The mechanism of the relationship between social capital and health is unclear but is possibly mediated through better social support, lower levels of stress, development of self-esteem and interpersonal skills. It is also possible that communities with high social capital have better health literacy (Baum, Palmer et al, 2000).

Social capital also has a number of benefits for communities that relate to the determinants of health. For example, communities with high social capital tend to have better levels of education, perform better economically, have lower rates of crime and have more government efficacy. It is likely that these effects themselves indirectly improve the health of these communities.

Some forms of social capital can also have negative effects on a community. For example, where "bonding" social capital is high within a group and "bridging" social capital is low between different groups, these groups may clash, sometimes violently.

While social inclusion is a feature of social capital, social exclusion describes those processes that marginalise and isolate individuals, creating division and inequity. Groups or individuals are commonly marginalised and excluded on the basis of gender, race or socioeconomic status. Social networks that are closed to others (commonly called "cliques") can marginalise and isolate people who don't identify with a group or who chose not to participate (Veenstra, 2000).

Some determinants of social capital

Determinants of social capital are complex and inter-related. It is clear that historical and cultural factors are the major determinants of a community's social capital and many theorists believe that social capital is therefore very difficult to modify (Stansfield, 1999; Productivity Commission, 2003).

Communities with high levels of education and employment tend to have higher levels of social capital than those with poor levels of education and employment. Communities with widely disparate socioeconomic groups are typically ones with low social capital compared with more equitable communities (Veenstra, 2000).

Individuals that have low rates of social participation are more likely to be older, to be from a culturally or linguistically diverse group, to have low levels of education. They are also more likely to be unskilled workers or be unemployed, to live alone or to be sick or disabled (Lindström, et al 2002).

The connection between urban design and social capital

The progressive suburbanisation of our cities and towns has been cited as a key factor contributing to declining social capital. Freeman (2001) suggests that this may be due to lower density housing associated with urban sprawl that inhibits casual social interaction between residents. Mixed land use and higher-density living appear to be associated with increased levels of social capital. Interestingly, very high housing density levels and crowding are associated with low social capital as people retreat into their homes seeking privacy and solitude and relief from sensory overload rather than interacting with neighbours.

Freeman also suggests that the increased commuting times that are often associated with suburban living leave working people less time to interact with their neighbours. Urban planning trends that separate different land uses together with increased reliance on the car mean that people are less likely to walk in their neighbourhood and interact with each other.

Leyden (2002) found that urban places that are walkable and have "mixed use" development are more likely to have residents that know their neighbours, participate politically, trust other people and interact socially compared with people who live in places that are highly dependent on cars.

Feedback from Key Informants

Some aspects of living in Bungendore that were highly valued and there was a perception that these were threatened by population growth.

One respondent valued "knowing people in the street and shops, community spirit that does things like plant street trees".

Levels of participation in community activities by long-time residents versus new residents:

- Longer term residents notice that some new residents who live here don't participate (in community activities).

Respondents perceived that population increase may change the socioeconomic profile of the community and there was a perception that the socioeconomic profile was more middle class than it was ten years ago with fewer "battlers". There is a sense that there are no concentrated areas of disadvantage in the town and that this is a quality worth preserving.

There was a perception that further population growth may threaten some of the pleasant aspects of living in Bungendore:

- One respondent reported that there was some controversy with the Elmslea development and that this development remains controversial in the community.
- Another expressed that new developments have been done well, included footpaths and bike paths, and these will look good when trees grow (i.e. visual amenity is important to people).
- There was a feeling that development should be allowed but there is a limit to the amount of development that can be supported and the infrastructure needed for this.
- There was a perception that further development would cause debate but that if development was well planned, moderate and that sufficient infrastructure were provided that it would be tolerated by the community.
- There was concern that the high number of residents who commute for work could present a risk for social cohesion.

Conclusions

- Rapid growth of Bungendore's population may have a negative impact on social capital within the community. People who have lived in Bungendore may perceive new residents as threatening the way of life and the essential character of the village. Population growth may also have positive consequences for social capital in Bungendore such as increased local employment opportunities.
- It is difficult to know if measures to mitigate negative aspects of population growth will be effective as the determinants of social capital are very complex immutable. However, it appears possible for local government to facilitate the development of a cohesive and vibrant community.

Impacts and recommendations relating to neighbourliness

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
1. Create opportunities for incidental contact	• Increasing the density of housing may be associated with improved social capital because people are more likely to interact with one another. Maintaining new development within existing town boundaries would assist new residents get to know older residents. • Walking in the neighbourhood increases the opportunities for social interaction. People are more likely to walk if the streets are well maintained, safe and are visually attractive.	• Council to discuss medium and higher density residential development in the preparation of the Bungendore Discussion Paper as part of the LEP review. • Ensuring that planning designs optimise street connectivity, that footpaths have a safe surface and well maintained, that footpaths are well lit and the visual appeal of Bungendore is maintained. • Support and publicise local walking groups. • Develop new local nature walks, cycleways and horse trails in the preparation of the LEP. • Connect off-leash dog walking areas with footpaths.	• Greenfield development will increase the footprint of Bungendore as well as increasing the total population. Connectivity between new and old areas may be restricted and therefore there may be fewer opportunities for social interaction.	• Limit the degree of urban sprawl that is created by new land releases by maintaining housing density and by siting new residential land close to the original village. • Maximise connectivity between old and new parts of Bungendore by providing several roads and pathways between the two. • Ensure that planning designs optimise street connectivity, that footpaths have a safe surface and well maintained and are clear of rubbish, that footpaths are well lit and that people feel secure walking, and the visual appeal of Bungendore is maintained. • Support and publicise local walking groups. • Develop new local nature walks, cycleways and horse trails in the preparation of the LEP. • Connect off-leash dog areas with footpaths.

Impacts and recommendations relating to neighbourliness

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
2. Manage conflict	• There may be a potential for neighbourhood conflict. Building noise, clashes in housing styles, increasing housing density and differing expectations of neighbours may cause some conflict. • There is potential for conflict resulting from perceived gentrification of a neighbourhood. • Note that there is likely to be a tradeoff between the degree of housing density and the potential for conflict.	• Ensure that council legislation pertaining to development is freely accessible and well understood by everyone. • Ensure that mechanisms for resolving conflict in the community are accessible, fair and transparent. • Encourage the resolution of neighbourhood conflict by mediation rather than by legal means.	• Some new residents that move to Bungendore into newly constructed housing that is concentrated in new development areas may be identified as essentially different to those living within the original village and this may make it difficult for some new residents to integrate socially within the community, particularly if new residents are perceived as different in terms of income or life expectations.	• Actively encourage new residents to get involved in existing community organisations and activities as a way of developing relationships between old and new residents. (e.g. encourage parents to participate in tuckshop duties).
3. Encourage participation in decision making by the community	• Participation in decision making processes around community issues has an important role in the development of social capital. • New residents to an area may feel excluded from established networks that actively lobby Council.	• Maintain a highly consultative approach with the community around Bungendore's future development. • Conduct community consultation activities as part of the LEP review process. • Send new residents a letter welcoming them to Bungendore that contains details of council services and community facilities and outlines how residents can	• New residents are likely to be disconnected from established local decision-making processes, especially if they have little interaction with long-standing residents.	• As for scenario one.

Impacts and recommendations relating to neighbourliness

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
		become involved in community decision making processes. • Encourage new residents to get involved in local community organisations. • GSAHS to encourage Bungendore residents to participate in the local Health Service Advisory Committee.		
4. Create a shared sense of local identity	• Population growth is likely to change the "look and feel" of Bungendore as a small village. Long-standing residents are likely to feel strongly about the change in the environment, especially if it occurs very rapidly.	• Identify and promote sources of community pride that are unique to Bungendore (e.g. create interest in Bungendore's rich history).	• Population growth is likely to change the "look and feel" of Bungendore as a small village. Long-standing residents are likely to feel strongly about the change in the surrounding environment, especially if this change occurs very rapidly. Greenfield development is likely to have a greater impact in this regard: the population growth will be greater and the look and feel of the Bungendore surrounds will change.	• As for scenario one.

Impacts and recommendations relating to neighbourliness

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
5. Support local community groups and volunteering	• Development of formal social networks may be challenging for new residents, especially if these people are perceived as different from long-standing residents.	• Identify and celebrate residents that do voluntary work for the benefit of the whole community. • Encourage the school to feature voluntary activities in the curriculum (e.g. participating in Clean Up Australia Day, tree planting days, or painting a mural in a public space.) • Support volunteer based services (e.g. Meals on Wheels, learn-to-read groups, Rotary). • Promote corporate social responsibility by encouraging partnerships between volunteer groups and local businesses (e.g. sponsorship of local sporting teams). • Support existing community groups and encourage the formation of new community groups where these are inclusive to and encourage new residents. • Encourage the development of new networks in the	• As for scenario one.	• As for scenario one.

Impacts and recommendations relating to neighbourliness

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
		community (e.g. develop and publicise a car-pooling system). • Council should distribute the *Bungendore Community Directory* to new residents.		
6. Celebrate cultural and personal diversity	• New residents to Bungendore may be different in terms of cultural and ethnic background and find it more difficult to integrate into the community.	• Invite different community and cultural groups to participate in local festivals. • Ensure that public places are accessible to people with a disability. • Investigate opportunities for providing suitable accommodation for elderly residents (e.g. establish a retirement village in Bungendore).	• As for scenario one.	• As for scenario one.
7. Provide and improve civic spaces	• Increasing population is likely to result in increased demand for civic spaces that allow people to interact socially and allow community groups to meet.	• Council to investigate options for increasing the number and quality of parks, sporting facilities, community halls etc. • Ensure that these are provided at minimal cost to users and are accessible to all. Maintain public services and facilities such as the library and historic sites. • Council should consider	• Greenfield development sites may not contain sufficient civic spaces such as parks or community buildings and new residents are less likely to use civic spaces if they are not physically close.	• Council should stipulate the requirement for any new greenfield development to include new civic spaces in or around the development site or contribution of money towards this.

Impacts and recommendations relating to neighbourliness

Element	Scenario one: Infill development only		Scenario two: Infill + greenfield development	
	Impacts	Recommendations	Impacts	Recommendations
		creating a focus point in the town for community activities (e.g. create a town square that could be used for weekend craft and growers' markets and local festivals).		
8. Support local businesses and create local employment	• Increasing population is likely to result in greater demand for local goods and services - this is likely to make local businesses more viable and create opportunities for local jobs. Residents who work in Bungendore (rather than in ACT) are likely to develop relationships with other local residents.	• Council should work with the Chamber of Commerce to support local businesses, to attract new industries and investigate job creation options, especially for the 20-29 age-groups.	• As for scenario one.	• As for scenario one.

Monitoring and evaluation

The following evaluation strategies have either been implemented or are proposed:

Evaluation Type	Evaluation Strategy	Responsibility
Formative (i.e. is the project appropriate to the identified need?).	Screening and Scoping.	Completed by the Project Team.
Process (i.e. was the project implemented as intended?).	Comparison between initial project plan, screening report, scoping report and actual project progress. Reflections from project team and steering committee members and consideration of lessons learnt (questionnaire or interview).	Program Coordinator, Evaluation, Health Development Team (GSAHS).
Impact (i.e. what are the immediate effects of the project?).	Monitor uptake of recommendations from the Final Report at two years following completion of the project.	Program Coordinator, Evaluation, Health Development Team (GSAHS).
Outcome (i.e. what are the longer term effects of the project?).	As this HIA is examining scenarios for urban development in Bungendore that are hypothetical and may not eventuate, it is not intended to conduct an outcome evaluation.	

In addition a case study report will be written and provided to CHETRE for lodgment on their website.

Conclusions

This HIA undertook to assess some of the possible impacts on three aspects of health that could arise from population growth in Bungendore. It examined two proposals for patterns of development that accommodate new residents, focusing on opportunities for increasing people's physical activity, ensuring that the town continues to have an adequate supply of high quality water and encouraging people to act in a neighbourly fashion.

Neither development scenario clearly stands out as being "healthier" for the community and there are many other health impacts that may also have been evaluated in this exercise. However, the HIA has highlighted that there are certainly opportunities for Palerang Council to influence these aspects of health, particularly during the early planning stages for the town's future population growth.

A sustainable source of water will be essential for continued population growth in Bungendore. This issue should be addressed urgently.

Some of the impacts identified are speculative. In particular, the evidence around the determinants of social capital is based largely in sociological theory and the determinants are undeniably extremely complex and inter-related.

An interesting synergy exists between the areas of physical activity and neighbourliness; street connectivity, housing density and urban walk-ability feature prominently in both and there certainly seem to be several opportunities to modify Bungendore's design to address these important issues simultaneously.

In making many of the recommendations in this report, the working group was aware that these should be reasonably practical and achievable in scope and should be cost-effective. 'Retro-fitting' some of the design elements such as footpaths to the existing village may be more difficult and expensive than building these into any greenfield sites.

It is hoped that this HIA will inform the development of the Social Plan and the Local Environmental Plan. Community consultation will form an important part of this process. A challenge will be to present the findings of the HIA in a way that makes trade-offs between urban form and population growth and their effect on health clear. Some recommendations such as mixed land use and housing density may be contentious to this community.

The HIA process has been valuable in developing and consolidating relationships between Palerang Council and Greater Southern Area Health Service and has involved considerable capacity building though the "learning by doing" process. It is hoped that, as a result of this work, planning decisions for Bungendore will better address the health needs of Bungendore's future residents and that future partnerships between health and local government will continue.

Limitations of the HIA process

It must be acknowledged that a limitation of this Health Impact Assessment is that it was conducted using rapid HIA methodology. As a result, a limited number of potential health issues were assessed and these were chosen by the project team (with steering committee endorsement) rather than through any consultative process. It may be that community members would identify a different set of issues to have investigated, likewise if the decision had been made by a panel of experts. Nonetheless, the issues selected were topical, were

represented in the literature and have allowed for an examination of issues that would not ordinarily be considered in a local government strategic planning process.

Community participation was also restricted to a set of key informant interviews. This is consistent with the rapid HIA methodology, but was not fully understood by the project team or steering committee when the project commenced. Initially, the expectation was for a full consultative process, which in fact is only suited to a comprehensive HIA. However, some community ideas were fed into the process, having been obtained by tools such as the Palerang Council telephone survey of residents undertaken in 2005 and the consultative process surrounding Council's discussion paper, Bungendore: It's Your Future.

A final note on limitations is that the project team was learning the health impact assessment methodology while doing the HIA. This meant that progress was at times slow and occasionally involved stepping back from initial plans. However, the 'learning by doing' process is an intrinsic part of the NSW Health Impact Assessment Project and it did provide the project team with expert support from the team at CHETRE.

Despite these limitations, the project team feels that the analysis and consequent recommendations arising from the project will allow Palerang Council and other agencies to consider a set of health issues that may otherwise be overlooked in a traditional planning process.

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Appendix 1: A profile of Bungendore

Bungendore is a rural village located about 26 kilometres north-east of Queanbeyan on the Kings Highway (Map 1).

The town of Bungendore was first proclaimed in 1837, although the first European settlers arrived in the region around 1825. The population grew steadily throughout the 1800s and grew more quickly following the introduction of the railway in 1885. Sheep and cattle stations were established on the surrounding land and local crops included wheat, oats, barley and potatoes. In the late 1800s, Queanbeyan emerged as the area's major commercial centre.

Today, businesses in Bungendore include rural suppliers, a supermarket, tourist-orientated businesses such as antique and art-and-craft shops, light industries, a range of accommodation and several plant nurseries. Wineries, hobby farms and turf farming are also well established in the vicinity of Bungendore.

Map 1: Bungendore in relation to the ACT and the NSW South Coast

In recent years the population of Bungendore has grown significantly. This growth has been primarily concentrated on the northern side of Turallo Creek where approximately 400 residential allotments were approved under separate subdivision applications in 1993, 2001 and 2002 and these subdivisions have now substantially been approved. Three allotments providing land for 46 Units have also been approved. People moving to Bungendore are attracted by a village lifestyle that is not available in either Queanbeyan or Canberra and because Bungendore is within easy commuting distance of these employment centres.

Despite Bungendore's proximity to Queanbeyan and Canberra, it still provides convenient services such as shops and a primary school that are easily accessible to Bungendore's residents and people who live in the surrounding areas.

In recent times, a number of developers have expressed interest in rezoning land that adjoins the existing Village zone for urban purposes. Despite a recent ease in the NSW housing market, the demand to live in Bungendore remains high.

Palerang Council local government area

Bungendore is located within the Palerang Council local government area. Palerang Council was proclaimed on 11 February 2004 following the amalgamation of Tallaganda Council with parts of Yarrowlumla, Gunning and Mulwaree. Palerang Council extends to Lake George in the north, the Tallaganda State Forest in the south, Queanbeyan City to the west and the Morton and Budawang National Parks to the east and has an area of 5144 square kilometres. Palerang's residents enjoy a rural lifestyle, with principal industries being beef and sheep production, stone fruit orchards, vineyards and emerging new ventures such as alpacas, lavender and berries. There is also a large and thriving artistic community comprising writers, poets, film-makers, musicians and specialty craftspeople.

Demographic Characteristics of Bungendore

Between 1996 and 2001 the population of Bungendore increased from 1353 to 1681 people. This net increase of 328 people represents an average annual growth rate of 3.9%. By comparison, the annual average growth rate for NSW in the same period was 0.7%. It is expected that the 2006 census will continue to show a high annual growth rate for Bungendore.

The median age of Bungendore has increased from 33 years of age in 1996 to 35 years of age in 2001.

Despite the increase in Bungendore's population, there was a significant decline in the numbers of residents aged between 20 and 29 years between 1996 and 2001. In 1996 this age group represented 11.3% of the population and in 2001 this fell to 6.6%, a decline of 4.7%.

The proportion of the population over the age of 60 increased from 8.4% to 9.5%. In absolute terms, this just represents an additional 45 people, however, it is expected that this will be a continuing trend and will eventually have implications for the provision of services for older residents.

It should be noted that the most recent available Census figures provided in this report are now 5 years old. The next Census will be conducted on 8 August 2006 and preliminary figures will not be available for at least another 12 months.

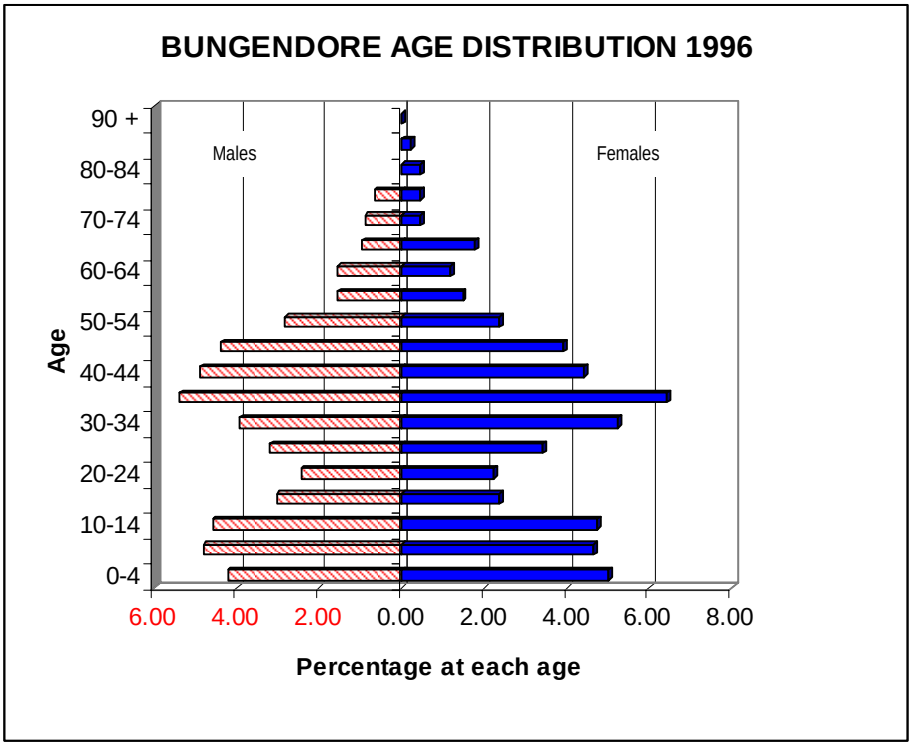


Figure 2: Age distribution of males and females living in Bungendore in 1996

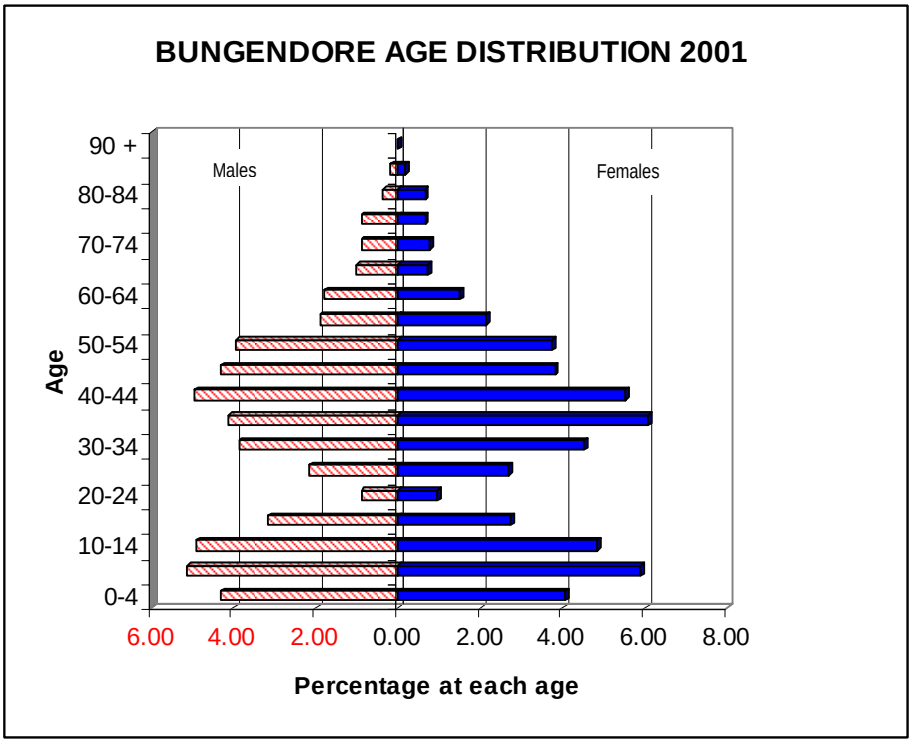


Figure 3: Age distribution of males and females living in Bungendore in 2001

Types of Families that live in Bungendore

Couple Families with Children declined by 6.5% between 1996 and 2001. This change may be partially explained by the increase of 3.6% in Couple Families without Children where new couples have moved to Bungendore prior to having their children and with dependants in existing families leaving home as evidenced by the 4.7% decline in the 20-29 year age group.

There was a 2.2% increase in One Parent Families between 1996 and 2001.

	1996		2001	
	No of Families	%	No of Families	%
Couple family with children	202	54.7	200	48.2
Couple family without children	128	34.7	159	38.3
One parent family	39	10.6	53	12.8
Other family	0	0.0	3	0.7
Total	369	100.0	415	100.0

Table 2: Types of Families Living in Bungendore in 1996 and 2001

Dwelling Structure in Bungendore

Almost all Bungendore's residents reside in separate houses and this characteristic has not changed in the 1996-2001 inter-censusal period.

The mean household size has also remained unchanged between 1996 and 2001 at 2.9 persons per occupied dwelling.

	1996		2001	
	No of People	%	No of People	%
Separate House	1287	97.4	1639	97.5
Town house	7	0.5	8	0.5
Flats/Units	0	0.0	3	0.2
Other	27	2.0	30	1.8
Total	1321	99.9	1680	100.0

Table 3: Number of People that lived in different types of Dwellings in 1996 and 2001

Bungendore's Workforce

The significant employment sectors for Bungendore residents are manufacturing with 11.9% of the workforce in 1996 and 11.4% in 2001; construction (14.2% in 1996 and 20.1% in 2001); retail trade (23.6% in 1996 and 26.2% in 2001); property and business services (19.6% in 1996 and 25.1% in 2001); government administration and defence (27.0% in 1996 and 27.8% in 2001); education (15.8% in 1996 and 13.4% in 2001) and health and community services (17.3% in 1996 and 16.0% in 2001).

The majority of these occupations are not located in Bungendore and many people commute to either Queanbeyan or Canberra for work.

Travel to Work

Many residents of Bungendore work in either Queanbeyan or Canberra. About two thirds of the employees living in Bungendore commuted to their place of employment by car (as driver or passenger). There have been no significant changes in the modes of travel to work over the 5 year inter-censal period (table 4).

Volumes of traffic are expected to increase along the Kings Highway as people continue to build and move into the recently approved subdivisions in Bungendore and when the National Defence Headquarters is completed in 2008 that will employ upwards of 900 people daily.

	1996		2001	
	No	%	No	%
Car as Driver	430	65.3	544	67.3
as Passenger	41	6.3	38	4.7
Walked	22	3.3	33	4.1
Worked at Home	40	6.1	53	6.6
Did not go to Work	94	14.3	82	10.1
Other	31	4.7	58	7.2
Total	658	100.0	808	100.0

Table 4: Method of Travelling to work by Bungendore Residents in 1996 and 2001.

Appendix 2: Strategy for Literature Search

The intervention

The general issue of interest was the potential health effects (health in the broadest sense, and both positive and negative effects) of residential development in the setting of a town in rural NSW.

More specifically, the HIA was interested in the combination of infill and greenfield development versus infill development only. (Infill development is residential development within the existing town's boundaries and greenfield development is development around the existing perimeter of the town on land that is currently vacant). In other words the health effects of an increasing population with and without increasing population density of the town.

Search terms

- greenfield development
- infill development
- residential development
- urban development
- built environment
- urban design
- urban environment
- population growth
- increasing population density

The population of interest

In terms of the population, we're especially interested in rural settings rather than metropolitan settings. I guess we're focusing on the health of the residents as opposed to others (but others such as workers, visitors etc should also be considered too I would think).

The most relevant literature for our needs would be about rural tows or villages (especially Australian ones). I think we'd also be interested in people living in outer metropolitan areas but probably not so much on literature focusing only on inner city residents.

Three outcomes

1. Water supply

Effects on the water supply in terms of water quality and water quantity/supply. We're interested in potable water, water for recreation and water for industry/agriculture.

2. Opportunities for physical activity

e.g., physical activity, exercise, walking, bicycling, active transport (? others)

3. Opportunities for social interaction

The ability of people to feel connected to and involved with their local community and their ability to form and build relationships with others, e.g., neighbourliness, social relationships, community connectedness, social capital, social interaction.

Appendix 3: Preferred Land Uses in Bungendore's Precincts

The Yarrowlumla Development Control Plan 2(V) Village Zone identifies six precincts in Bungendore which provide different opportunities for development which will be replaced by a new Development Control Plan as part of the current strategic planning project (Map 1). These are:

- Precinct 1 – Commercial.
- Precinct 2 – Residential.
- Precinct 3 – Industrial (Light).
- Precinct 4 – Special Uses (Bungendore).
- Precinct 5 – Residential (Bungendore North).
- Precinct 6 – Residential (Elmslea).

Precinct 1 – Commercial

This precinct encompasses both the traditional commercial and social centre of the village. This area provides sites for future commercial development in the village.

Objectives:

(a) to encourage the location of retailing, office space, and other commercial enterprises which service local and regional needs,
(b) to cater for tourist orientated uses but limit their extent in order to prevent ribbon development,
(c) to preserve the historical character of the precinct's townscape,
(d) to ensure development in the vicinity of buildings with historical importance is in harmony with the form and scale of those buildings,
(e) to provide for adequate car parking facilities, and
(f) to provide for adequate loading and unloading facilities.

Land Uses:

- Preferred land uses: shops, offices, and hotels.
- Other possible land uses: dwellings and multi-unit housing (whether attached or not) associated with a preferred use, and motels.

Precinct 2 - Residential

This precinct comprises the existing residential area of the village and allows for the conservation of historically significant items.

Objectives:

(a) To preserve and enhance the residential amenity and character of the precinct,
(b) To provide for a range of housing types,
(c) To permit uses other than residential uses only where such uses are compatible with and incidental to the residential use,
(d) To conserve any historically significant items of the precinct's townscape, and
(e) To ensure that development in the vicinity of buildings with historical importance is in harmony with the form and scale of those buildings.

Land uses:

- Preferred land uses: dwelling houses, dual occupancies, and multi-unit housing.
- Other possible uses: cottage enterprises, and general stores not having frontage to an arterial road.

Precinct 3 – Industrial

This precinct comprises the existing light industrial area of the village together with additional vacant land to accommodate light industrial growth.

Objectives:

(a) to provide for light industrial uses,
(b) to ensure that the amenity of the village is not jeopardised by incompatible industrial uses particularly those which pollute the environment,
(c) to encourage attractive industrial building design and site landscaping, and
(d) to facilitate economic development of the village.

Land uses:

- Preferred land use: light industries.
- Other possible uses: dwellings associated with the light industry use, showrooms for the display and sale of goods manufactured on the premises, and shops for the sale of bulky goods.

Precinct 4 - Special Uses (Bungendore)

This is the administrative and civic centre of the village area and includes Bungendore Park, adjacent government buildings in Gibraltar Street, the Post Office, Police Station, Court House and in Majara Street and former railway land.

Objectives:

(a) to recognise the existing central area where public and community facilities are located as distinct from the commercial precinct, and
(b) provide a consolidated area for future requirements for public and government agencies close to the centre of Bungendore.

Land uses:

- Preferred land use: community facilities and buildings, and state and local government facilities and buildings.

Precinct 5 - Residential (Bungendore North)

Bungendore North is bordered by the Tarago Road, the Goulburn/Bungendore Railway line and Turallo Creek. Subdivisions creating about 450 residential allotments are under construction and this precinct has now been substantially developed.

Objectives:

(a) to encourage good urban design at an appropriate density for a rural based village,
(b) to promote residential development which is sympathetic to the scale and character of the existing village,

(c) to ensure that the built form is not visually obtrusive as viewed from outside the Bungendore North area,
(d) to ensure that there is minimal disturbance to the existing landscape, having regard to "Days Hill",
(e) to provide for the development of a landscaping program for open space area,
(f) provide controls for allowable height, scale and colour of structures,
(g) to set aside an area for multi-unit development and medium density living in Bungendore,
(h) to provide for a range of living environments and opportunities to cater for the diverse community needs, and
(i) to provide for an area of small lot subdivisions through utilising Community Strata Titles Legislation.

Land uses:

- Preferred land uses: dwelling-houses, dual occupancies, and a total of 100 "multi-unit development" units.
- Other possible uses are: cottage enterprises, and one convenience store of not more than 400 metres of floor space to be located in the central area as part of a community activities centre.

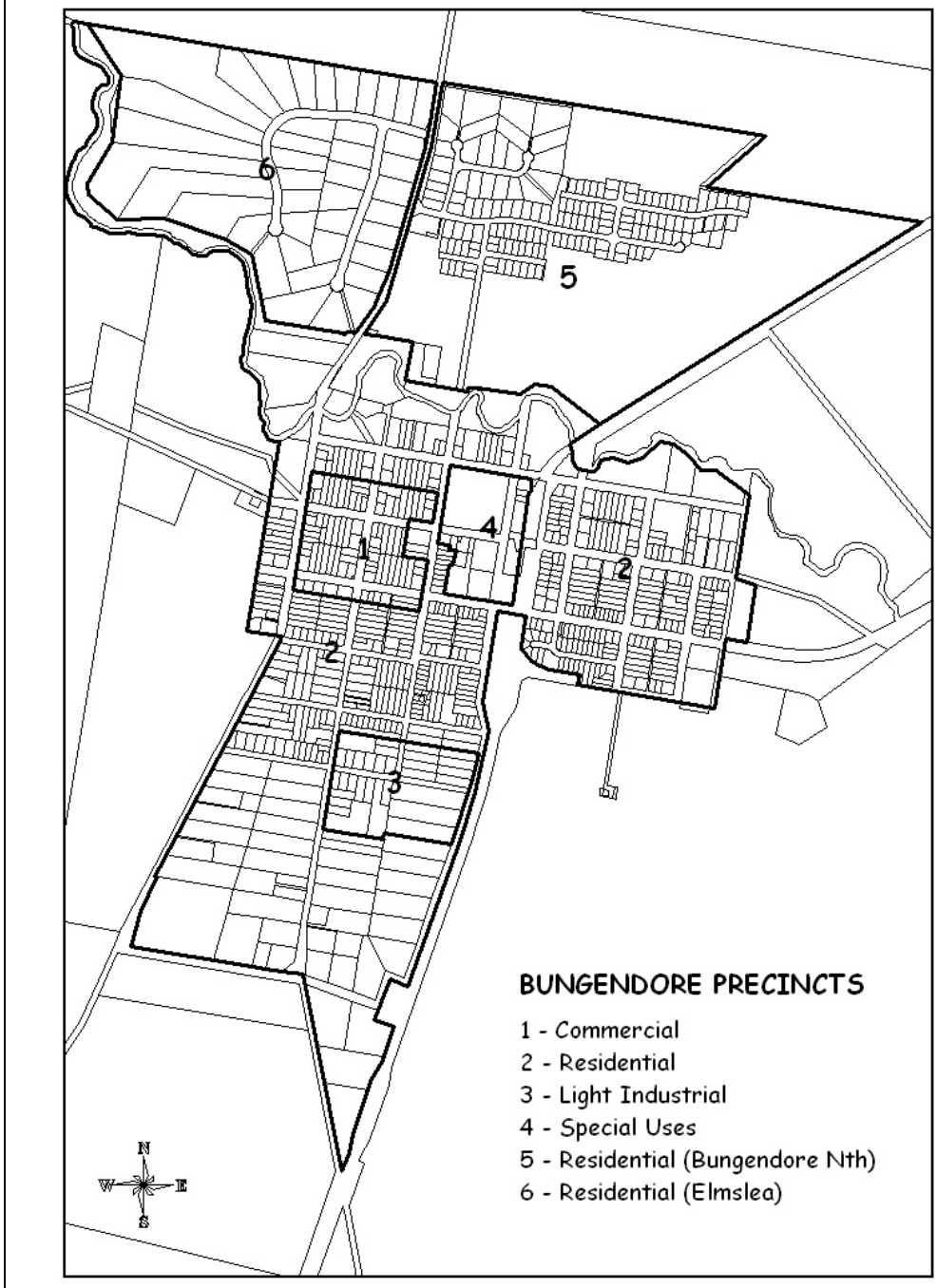
Precinct 6 - Residential (Elmslea)

This precinct was zoned 1(g) Rural Small Holdings under the former Yarrowlumla Local Environmental Plan 1993 (YLEP 1993) and the land was rezoned to 2(v) Village when the Yarrowlumla Local Environmental Plan 2002 (YLEP 2002) came into effect. Further subdivision of land within this precinct was not possible under YLEP 1993 due to the allotments having insufficient area of land. Clause 22(4) of YLEP 2002 continues to prohibit the subdivision of this land.

Objectives:

(a) to preserve and enhance the residential amenity and character of the precinct, and
(b) to permit uses other than residential uses only where such uses are compatible with and incidental to the residential use.

No preferred landuses have been identified for this precinct in the Development Control Plan.



Map 2: Preferred Landuses in Bungendore

Appendix 4: Questions for the key informant interviews

Physical Activity and Urban Development

1. What do you think helps people in Bungendore to be physically active?
2. What stops people being physically active locally?
3. Current evidence suggests that higher urban density, footpaths and mixed land use (i.e. a mixture of commercial, residential and other activities) is linked with increased physical activity. Do you think these factors would be appropriate to Bungendore? Would the community support these?
4. Current evidence also suggests that multiple connections between homes and destinations are linked with increased physical activity. Would this be appropriate in Bungendore? Do you think the community would support a grid layout or would they prefer other layouts, such as cul-de-sacs?

Water

5. What are some of the local water supply issues you're aware of?
6. If demand for water exceeds supply, Council may be forced to introduce some form or combination of water restrictions. In some communities, this has meant that sporting fields and swimming pools are not able to be used and that private gardening is restricted. How do you think this would this impact on you personally? How do you think it would impact on the community at large?
7. Some communities have encouraged rain water tanks as a way of supplementing the supply of water to residents. However, rain water tanks are not fluoridated and children drinking this water exclusively may experience a higher rate of tooth decay. Do you think this would be a concern to the Bungendore community? Do you have any ideas about what could be done to overcome the problem?

Neighbourliness

8. What changes (if any) have you noticed in the Bungendore community over the past five years?
9. Do you have any suggestions about how community spirit in Bungendore could be enhanced?

Other

10. Do you feel there are any other health issues associated with urban development in Bungendore that we haven't discussed?

Appendix 5: Summary of water testing results for Bungendore 2001-06

Parameter	Guideline Value	Mean	Median	Standard deviation	Min.	Max.	Number of samples	Number of exceptions	95th percentile	5th percentile	% meeting guideline values
Total Coliforms	0.0000 cfu/100 mL	2.1415	0	19.9628	0	202	205	5	34.8805	10.1	98
Thermotolerant Coliforms	0.0000 cfu/100 mL	0	0	0	0	0	71	0	0	0	100
E. coli	0.0000 cfu/100 mL	0	0	0	0	0	206	0	0	0	100
pH	6.5 - 8.5	8.0571	8	0.0787	8	8.2	7	0	8.1862	8.01	100
Turbidity	5.0000 NTU	0.1994	0.099	0.1829	0.099	0.6	7	0	0.4994	0.1241	100
Total Dissolved Solids	500.0000 mg/L	317.2857	307	22.0432	302	359	7	0	353.4366	304.85	100
Aluminium	0.2000 mg/L	0.0179	0.0099	0.0179	0.0099	0.05	5	0	0.0473	0.0119	100
Antimony	0.0030 mg/L	0.001	0.001	0	0.001	0.001	7	0	0.001	0.001	100
Arsenic	0.0070 mg/L	0.001	0.001	0	0.001	0.001	7	0	0.001	0.001	100
Barium	0.7000 mg/L	0.0201	0.012	0.0153	0.01	0.043	7	0	0.0453	0.0117	100
Boron	4.0000 mg/L	0.099	0.099	0	0.099	0.099	7	0	0.099	0.099	100
Cadmium	0.0020 mg/L	0.0005	0.0005	0	0.0005	0.0005	7	0	0.0005	0.0005	100
Calcium	9999.0000 mg/L	22.322	22.65	0.9788	20.67	23.04	5	0	23.9272	20.7885	100
Chloride	250.0000 mg/L	102	91.3	17.5231	85.7	123.3	5	0	130.7379	87.58	100
Chromium	0.0500 mg/L	0.0059	0.005	0.0012	0.005	0.008	7	0	0.0078	0.0052	100
Copper	2.0000 mg/L	0.006	0.005	0.0013	0.005	0.008	7	0	0.0081	0.0052	100
Cyanide	0.0800 mg/L	0.0099	0.0099	0	0.0099	0.0099	4	0	0.0099	0.0099	100
Fluoride	1.5000 mg/L	0.447	0.54	0.1684	0.099	0.57	7	0	0.7232	0.1226	100
Iodine	0.1000 mg/L	0.0588	0.066	0.0194	0.0198	0.07	6	0	0.0906	0.0223	100
Iron	0.3000 mg/L	0.0119	0.0099	0.0045	0.0099	0.02	5	0	0.0193	0.0104	100
Lead	0.0100 mg/L	0.002	0.002	0	0.002	0.002	7	0	0.002	0.002	100
Magnesium	9999.0000 mg/L	22.17	22.12	1.2446	20.76	24.05	5	0	24.2112	20.9245	100
Manganese	0.5000 mg/L	0.005	0.005	0	0.005	0.005	7	0	0.005	0.005	100
Mercury	0.0010 mg/L	0.0002	0.0001	0.0002	0.0001	0.0005	7	0	0.0004	0.0001	100
Molybdenum	0.0500 mg/L	0.0109	0.005	0.0155	0.005	0.046	7	0	0.0363	0.0071	100
Nickel	0.0200 mg/L	0.0099	0.0099	0	0.0099	0.0099	7	0	0.0099	0.0099	100
Nitrate	50.0000 mg/L	6.7	6	2.8059	4.4	12.9	7	0	11.3018	4.825	100
Nitrite	3.0000 mg/L	0.099	0.099	0	0.099	0.099	7	0	0.099	0.099	100
Selenium	0.0100 mg/L	0.002	0.002	0	0.002	0.002	7	0	0.002	0.002	100
Silver	0.1000 mg/L	0.002	0.002	0	0.002	0.002	6	0	0.002	0.002	100
Sodium	180.0000 mg/L	75.4571	72.5	8.5293	66	88.6	7	0	89.4452	67.13	100
Sulfate	500.0000 mg/L	27.9	27.6	2.9794	22.1	30.7	7	0	32.7862	22.53	100
Total Hardness (CaCO3)	200.0000 mg/L	147.02	148.6	7.1859	137.1	156.5	5	0	158.8049	138.07	100
True Colour	15.0000 Hazen U	0.99	0.99	0	0.99	0.99	4	0	0.99	0.99	100
Zinc	3.0000 mg/L	0.026	0.02	0.0207	0.01	0.06	5	0	0.06	0.0125	100

Appendix 6: Steering committee members

Cr Matt Gardiner, Councillor, Palerang Council (Chair)
Dr Marjorie Cross, General Practitioner, Bungendore
Mr John Wright, Manager Strategic Planning, Palerang Council
Mr Matthew Lynch, Senior Strategic Planner, Palerang Council
Ms Philippa Moss, Social Planner
Ms Lisa Kennedy, Community Health Manager, Monaro Cluster, GSAHS
Ms Jenny Sheehan, A/Manager Rural Health Services & Capital Planning Unit, NSW Department of Health
Ms Carlie Naylor, Public Health Officer, NSW Department of Health
Ms Janet Chapman, Manager Service and Corporate Planning, GSAHS
Mr James Allwood, Senior Environmental Health Officer, GSAHS
Mr Andrew Gow, Manager Health Development, GSAHS