Malanda North

Concepts Report
The benefits of a different approach
September 2009

MALANDA NORTH

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MALANDA NORTH

Dear *Fellow Tablelanders*,

I knew I had come home when I first set foot on the Atherton Tablelands back in 1970. I fell instantly in love with the lifestyle and environment, the people and the place. Four decades later, our Tablelands and the world are changing rapidly.

In the Malanda North project, we have a unique opportunity to take charge of change and work together as a community to manage and direct development on the Tablelands. We want to prosper yet protect the way of life we hold dear.

The goal for Malanda North is simple: to establish a more sustainable model for development to allow us to take charge of change and actively shape our future.

The *Malanda North Concept Report* proposes ideas for an innovative approach to development for 49ha of land I own at Malanda. These ideas have been formulated with the help of a dedicated team with a full range of knowledge, experience and skills in building, designing, engineering, farming, caring for country, caring for people, planning and providing services, and doing business.

I want the *Malanda North Concept Report* to stimulate and focus debate, and provide talking points in the community's ongoing conversation about our future. Note that the ideas in this report are not final solutions, rather options for a more future-friendly way for developers to do business on the Tablelands, a way which values people and place, and careful, economical, sustainable progress.

Let's be creative and courageous in our efforts to ensure that the Tablelands of the future remains our Tablelands.

Best wishes,

Christine Doan

Christine Doan

Do you:

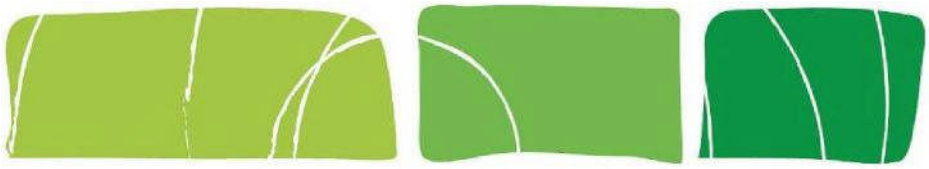
- have something new to contribute to the Malanda North concepts?
- have a comment to make, some questions to ask?
- just want to think out loud?

If so, please contact us:

→ Phone: 4091 4782
→ Email: info@malandanorth.com
→ Log on to: www.malandanorth.com
→ Have a cuppa with me at venues and dates to be advised soon
→ Attend one of our community events later in 2009

Keep your eye on the local papers and our website for information about what we are up to in the coming months.

CONTENTS



Executive Summary

Malanda North is a proposed mixed use development on a 49ha site located immediately to the north of Malanda. The project will create a dynamic new neighbourhood that is a showcase of best practice sustainable development and secures the future of the existing town of Malanda. The project is intended to demonstrate that sustainable development principles are economically viable, attractive to the market and can be integrated into a successful project in Far North Queensland.

Malanda North is distinct from other sustainable developments and masterplanned communities due to a focus on social and economic sustainability. The intention is to create a neighbourhood that combines the social and economic benefits of city life with the environment and lifestyle benefits of a rural town. The development will offer residents a high quality living and working environment within a more self-sufficient community that is less vulnerable to changing economic, social and climatic conditions. The project will also secure the future of Malanda as a viable service centre in the Southern Tablelands by diversifying the economic base and increasing the population.

A Concepts Report has been prepared to communicate the Malanda North concept to stakeholders and the community. The report describes the underlying rationale for the project and proposes aims, objectives, strategies and targets. The report also defines the benefits that the project can deliver for the region. This Executive Summary provides an overview of information presented in that report, including a Concept Plan, a summary of key strategies and benefits for the project and descriptions of the concept.

The vision for Malanda North is to:-

Foster the growth of a vibrant, thriving and creative neighbourhood that integrates with, and adds value to, the Tablelands region and is a highly desirable place to live because of its affordable lifestyle, culture of learning, creativity and innovation, opportunities to work and learn, commitment to sustainability and attractive natural setting.
Malanda North will be acknowledged as a model development because of its sustainability achievements, economic viability and the integration of a community building approach in the development process.

This Concepts Report is just the first step in communicating the Malanda North concept to the Malanda community and other stakeholders. The Report will be followed by market research, feasibility analysis and consultation. It is important that the Malanda community has a say in this major project. A project review will give community members, stakeholders and the project team a chance to explore, debate and refine the ideas described in this report. It is expected that the review process will result in a revised concept including community input. The project team will then prepare an application for Preliminary Approval to Council. This application will involve further community consultation.

Projected Benefits

The Malanda North Concepts Report describes a model of development that can deliver social, economic and environmental benefits for Malanda in comparison to a standard residential development on the site. Key strategies and anticipated benefits are summarised below.

Community Development

A resilient and socially rich community is sustained at Malanda and Malanda North.

Residents have fewer lifestyle-related health problems.

Malanda North will become a neighbourhood of Malanda. Investment in shared services and social infrastructure will benefit the entire community. The development will include a range of housing types and accessible social and recreational infrastructure to meet existing need, and to attract a new, diverse population.

Existing and intending residents will influence development of the site through participation in consultation and planning processes throughout the project.

Economic Development

The project provides local jobs in the construction sector during construction.

The development diversifies the local economy and provides new opportunities for existing businesses.

Malanda North will have an internal economy that integrates with existing businesses and industries, rather than competing with them. The additional population will enable Malanda to cement its position as a major service centre in the south-east Tablelands.

The development will provide high quality infrastructure and technologies that attracts participants in local to global enterprises and supports the development of new activities. This includes site-wide high-speed broadband and innovative approaches to office accommodation.

Urban Design and Built Form

The project will meet local growth targets, thus protecting other agricultural land from future development.

A distinct character and identity adds to the appeal of the Malanda area.

Malanda North will be planned to use land efficiently by reducing overall road area and providing communal gardens and open space instead of large individual lots. Controls on building footprints and heights will minimise the potential impacts of overshadowing and overlooking.

Building covenants based on sustainable passive design and low carbon development will define the appearance of buildings. Local materials will be investigated for use where possible, further influencing aesthetics.

Energy

Less demand on existing networks and carbon intensive energy sources.

Approximately 60% reduction in greenhouse gas emissions from stationary energy, thereby contributing to carbon abatement targets.

All buildings will meet energy efficient targets and at least 50% of power will be generated on site from renewable resources. This power will be distributed on site via a micro grid and exported at times of peak production.

A carbon footprint and carbon reduction target will be prepared for the project. The combined effect of energy efficient design and solar power will contribute to this target by reducing energy related emissions by at least 60%.

Water and Wastewater

Approximately 80% reduction in demand for Malanda's water sources.

Substantially reduced wastewater output from site, resulting in less energy use and less discharge to the environment.

Demand reduction measures will reduce per-capita consumption to less than 220 litres/day. Rainwater will be collected and treated on site and reticulated for potable uses, and greywater will be treated in small household clusters and reticulated for non-potable uses. Together these measures will reduce per capita consumption of mains water by 80%.

Greywater recycling and stormwater management measures will also reduce the quantity of wastewater emissions from the site.

Access, Transport and Circulation

Reduce potential additional traffic on existing roads.

Reduced transport related greenhouse gas emissions, thereby contributing to carbon abatement targets.

Reduced impact on fauna.

Transport to and from the site, and related greenhouse gas emissions, will be reduced through the coordination of deliveries, use of web for accessing services, car-pooling and provision of jobs and services on site.

Malanda North will be a walkable community, resulting in less use of cars within the neighbourhood. The design includes speed-controlled shared streets, limited car-parking and an extensive network of walking paths to connect activities across the site.

Land Use and Ecology

Protection and expansion of available habitat will benefit regional bio-diversity.

Health of waterways and associated eco-systems is maintained.

The ecological values of waterways and conservation areas adjoining Malanda North will be protected through replanting, buffer zones and preservation of floodways as open space.

A network of green corridors will be a defining feature of the site. They will provide stormwater management, climate control, food growing areas, circulation paths and define clusters of housing. Incorporation of best practice Water Sensitive Urban Design measures, in the design of streets and green corridors, will improve the quality of stormwater leaving the site.

Cadastre

Image sourced from Google Earth Pro
Cadastre supplied by DNRW

Issue	Date	By	Chkd	Appd
D1	16-05-08	GK	SG	SG

Metres
0 2.5 5 10 15

ARUP

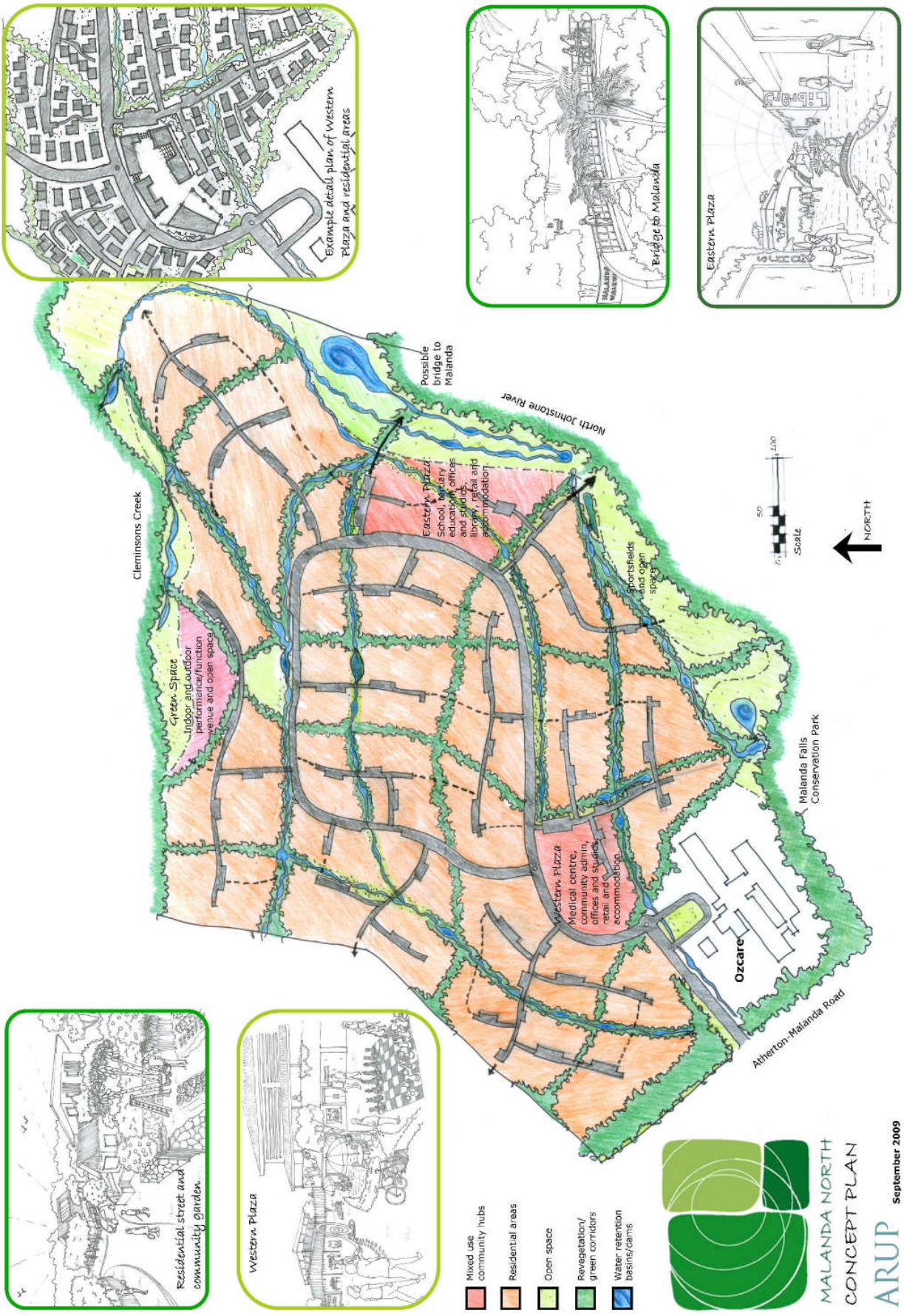
Level 4, Minerva Central
130 Ann Street Brisbane 4000
Tel +61 (7)3023 6000 Fax +61 (7)3023 6023
www.arup.com

Client

Job Title
Malanda Site Master Plan

Drawing Title
Study Area

Scale at A1	Co-ordinate System	
1:2,500	MGA94, zone 55	
Drawing Status	Horizontal Datum	
Draft	GDA94	
Job No	Drawing No	Date	Vertical Datum	Map Units	Issue
205273-00	001	16/05/2008	AHD	Metres	D1


Example detail plan of Western Plaza and residential areas
Bridge to Malanda
Eastern Plaza
Possible bridge to Malanda
North Johnstone River
Clemmsons Creek
Green Space
Indoor and outdoor performance/function venue and open space
Eastern Plaza
School, tertiary education, offices and studios, library, retail and accommodation
Sportsfields and open space
Western Plaza
Medical centre, community admin, offices and studios, retail and accommodation
Ozcare
Malanda Falls Conservation Park
Atherton-Malanda Road
Scale
NORTH
Residential street and community garden
Western Plaza
Mixed use community hubs
Residential areas
Open space
Revegetation/ green corridors
Water retention basins/dams
MALANDA NORTH
CONCEPT PLAN
ARUP
September 2009

Voices from the future…

Annie's Story

Hi. I'm Annie, I'm 38, and I've lived in Malanda for 12 years. For the last 3 years I've worked in the medical centre over the river at Malanda North and my daughter goes to an independent primary school there. We ride over every morning through the forest and across the little bridge. It is such a great way to commute. We seem to use the car a lot less since Malanda North was developed.

Amber's school is built of rammed earth and timber – it's really beautiful. Every classroom gets plenty of natural light and solar panels generate power for the school. There are gardens that the kids look after and Amber often brings home fresh veggies. Although the school is small they use community facilities – like the dance studio, community library, community arts centre and the sports fields by the river – so the kids don't miss out on anything.

The ride from Amber's school to the medical centre is along a tree-lined path. I really like it when it has been raining and the stream beside the path trickles with water. I run a physio practice from a room in the medical centre. I just pay rent for the days I use it and this includes costs for reception. I'm much busier than when I worked from home and really like working with medical colleagues again.

The days when I'm not at work I like to make silver jewellery. Our arts community has blossomed since the development of Malanda North and I belong to a cooperative of about twenty artists from all over the area. We share a lovely, light, airy studio at Malanda North and sell our work in a shop in one of the plazas. I am working on pieces for an exhibition in the community gallery next month.

After school Amber often goes to dance or drama classes in the green space. This is probably my favourite part of Malanda North – there is a stunning timber building overlooking a landscaped park and Cleminsons Creek. I always try to get there before the class is finished so I can take some quiet time to enjoy the forest.

Tony's story

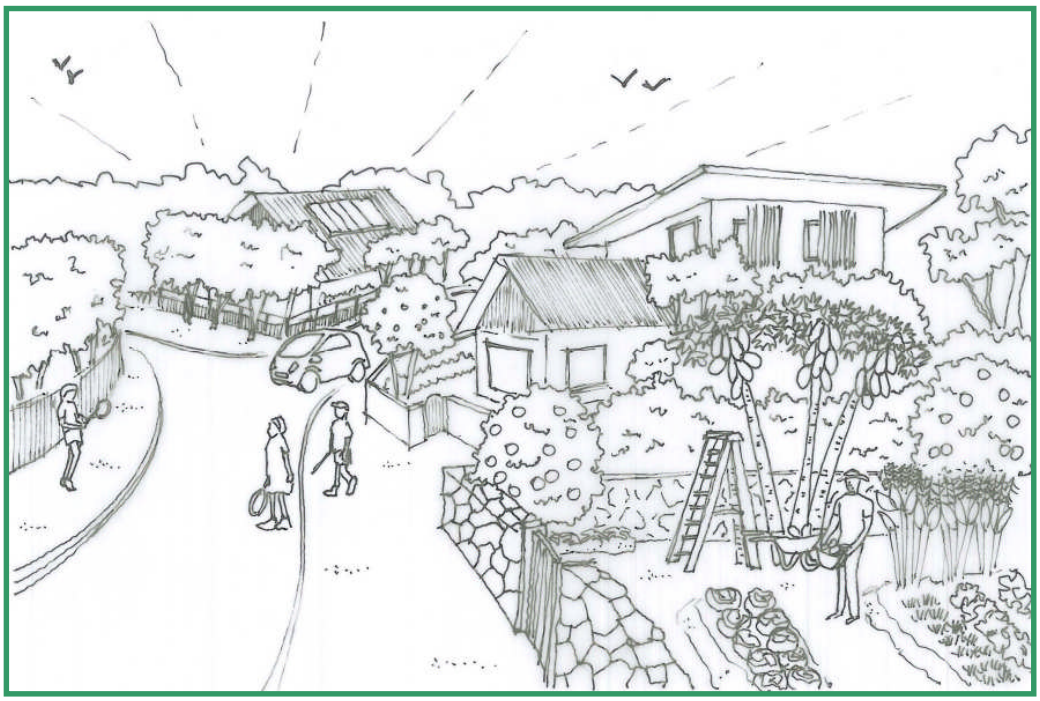
My name is Tony and my family was one of the first 100 residents of Malanda North. My wife and I decided to move here from Sydney because we wanted to bring up our boys in a pristine part of the world and in a strong, safe community. Malanda North was one of the few places that offered all of that. It is the daily lifestyle benefits I enjoy the most. While my friends in Sydney are sitting in traffic I am walking by the river or doing an RPM class in the Green Space. We have breakfast together in our sunny courtyard and then my wife and I walk to work and the boys ride to Malanda high school.

Although it felt like a long way away when we moved, we actually feel very connected to the world. My wife still works for a Sydney firm and can do most of her work and meetings over the web. When she does need to travel, the international airport is only an hour and a half away. My small business consultancy is still doing well. My clients in Sydney still use me and refer new business to me, and I have found plenty of new clients in the Tablelands and Cairns and even in New Guinea and the Pacific. So the move has increased my market, not decreased it.

My wife and I rent space in a couple of shared offices in the community plazas. I am enjoying this much more than working on my own in the spare room like I was before we left Sydney. I like the camaraderie of the office and find I am actually more productive working. We also seem to share some business with each other so it makes good economic sense.

We live in one of the first houses built here. Although it is much smaller than our Sydney house, it has never felt too small. It is very well designed so that we have all the room we need without any wasted space. The living rooms are filled with sun in winter but stay cool in summer. Our power bill dropped by more than half when we moved. We have views of the green spaces and hills so even though our yard is small we don't feel crowded. We certainly don't miss the time and money that we used to spend on maintaining a big house and garden.

Maybe it is my Italian heritage but since we moved up here I have spent a lot of time in the communal garden and get a real kick out of growing food for my family and neighbours. I have also found time to work in the communal shed, which is shared by the neighbours in our street, and one of the older men in the street is showing me how to make furniture.



Fran's Story

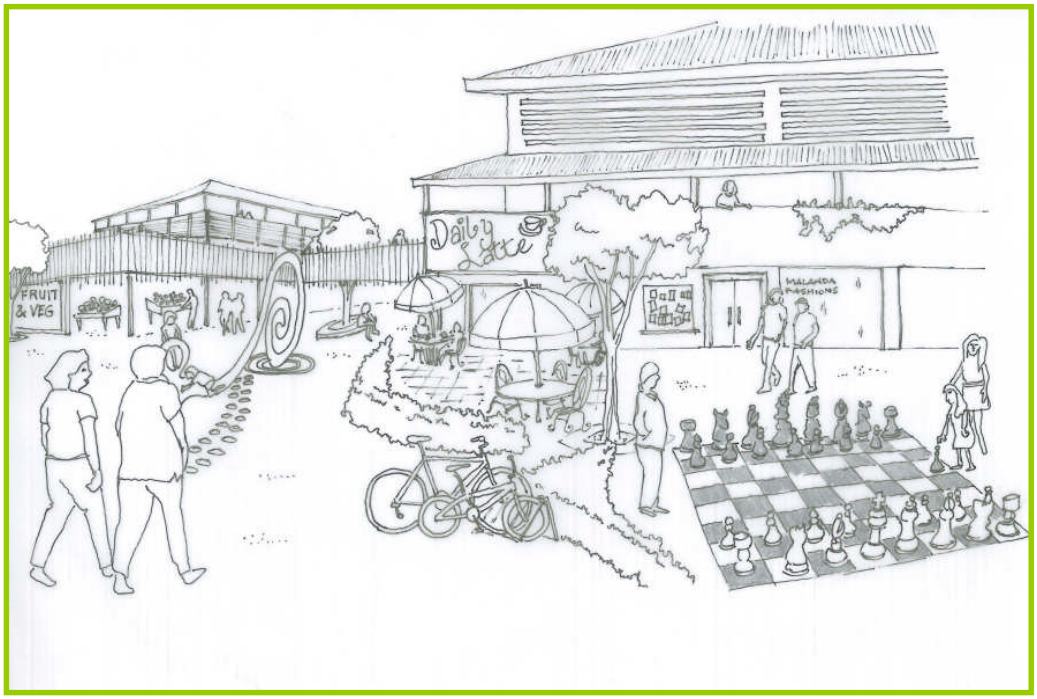
My name is Francis. My husband and I moved to Malanda North from northern Victoria after visiting my son and his family who live here. We fell in love with the place AND it was affordable – a great place for our retirement. I've never regretted the decision. My husband had a stroke not long after we moved here and now has to live at the OzCare centre because I could not look after him. Luckily this is only a short walk from my house and I can pop in to visit him two or three times a day which I couldn't have done in the small town we were in before.

I rent a little unit from a community cooperative and it is the most comfortable place I've ever lived in. Although I've got arthritis in my knees, I can walk to most things I need, including the doctors, a coffee shop and the art studio. The Home Care people help us with the housework.

One of the greatest pleasures of being here is spending more time with our grandkids. They have such a great life here – no need for playstations like their cousins in the city. Last night I was walking to their house and saw the kids playing hand tennis on the street. When cars came past the kids just moved aside, which is easy because the cars drive slowly. The kids couldn't do that in the city.

At least once a week I take my husband out to Malanda or Atherton on the community bus. It has a lovely main street and we look at the shops and have lunch at the pub. If I buy anything that is too much to carry, they deliver it to our house. I also order my fresh vegetables through a community supplier who buys it direct from local farmers.

Some days I volunteer in the community centre and then meet my friends for lunch at the café. There is so much life and activity there but it is the kids who entertain us the most. There are the little ones who skip to and from the child care centre; the bigger kids who climb on the public art and try to beat us at chess; and the teenagers trying to be nonchalant with their skateboards and bikes. There are some upper level units with balconies that overlook the plaza and I often look up at them and think it would be great to live in one of those. I could people watch all day! If only my knees could get me up the steps.



Shihab's Story

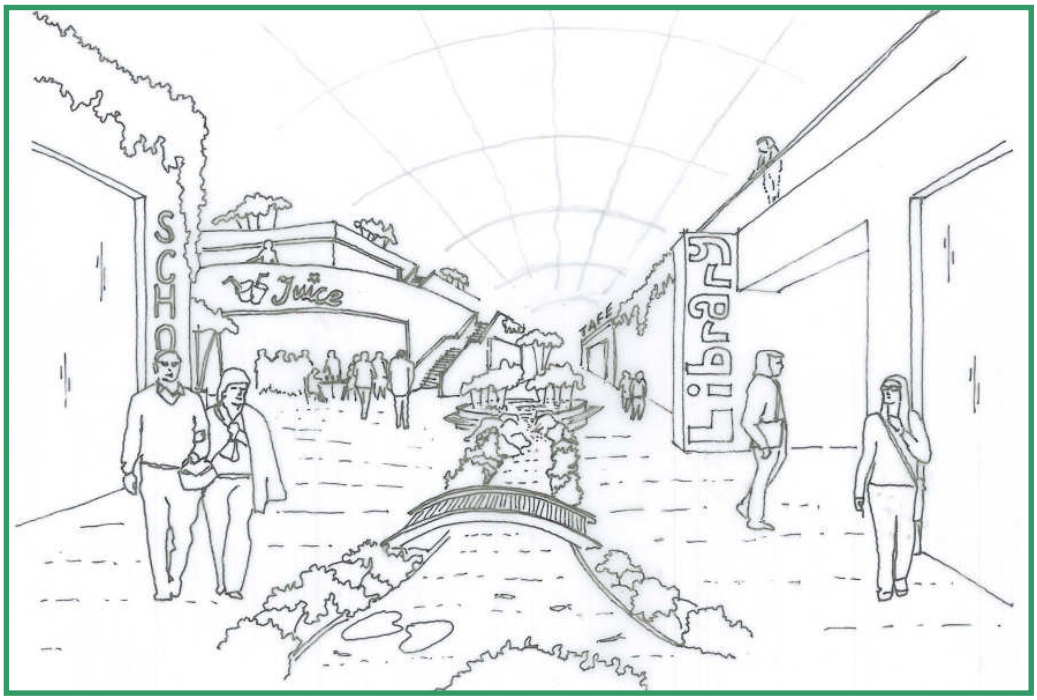
My name is Shihab. I am 22 years old. I have lived in Cairns since I was 13 and now I go to University in Townsville where I am studying a Masters of Bio-Chemistry, researching tropical crops. This semester I am living at Malanda North so I can undertake field research. I was not looking forward to living in a small town, but Malanda North feels like living in a city, without the traffic, noise and crime. I hope I can come back one day.

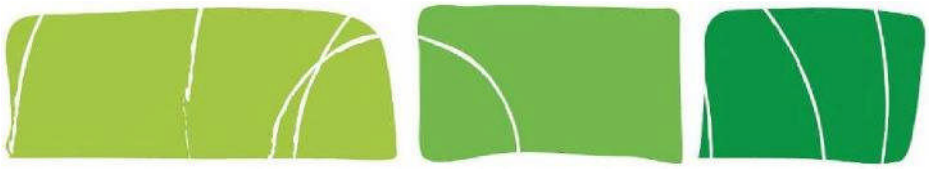
The university shares classroom and labs here with other universities and the TAFE in a plaza where there is also a school and library and lots of offices and studios. I spend lots of time out visiting farms in the area which have become a major food bowl and spend lots of time in the research lab which is very high quality. I am still doing a couple of subjects from Townsville and I do the lectures and tutorials for these by video-link. I'm also doing some art classes at one of the studios in the plaza because I want to be able to draw the plants I study better.

I live in a shared unit on top of the plaza with four other students. It has been specially designed for students like me - we each have our own bedroom and share a big living area. The unit has a big terrace and from there we can see right over the plaza to the hills and creek. There are lots of other students staying in units here, and people who come to visit the community for a little while often stay here too. I have met lots of interesting people and there is always something funny happening.

When I am finished studying each day I like to go to the sports fields with my friends. Sometimes we play touch football with the other people there, but mostly we play soccer and practice for the community soccer competition which my team, Bio-Spectacular, is winning.

There is a juice bar and a wine bar in the plaza and we keep them busy night and day. On Thursday night we have a jam session at the wine bar. There are lots of good musicians in the community and the music seems to get better each week. I have also been to two concerts in the big building they call the Green Space. People came from all over the Tablelands for those nights.





PART A:
PROJECT BACKGROUND AND OVERVIEW

1 Introduction

This Concepts Report describes a proposed development on a 49ha privately owned site, located near to Malanda on the Atherton Tablelands in Far North Queensland. The project has been named Malanda North. The owner of Malanda North wants to apply best practice sustainable methods to foster a vibrant, thriving, creative neighbourhood. The project will strive to improve self-reliance for the Malanda area in terms of natural resources, infrastructure and economy. It is envisaged Malanda North will include medical/wellness facilities, businesses, a mix of housing types, gardens, educational enterprises with future research capacity, community and recreation facilities, residential services, and conservation areas.

The purpose of this report is:

- to set out the vision, aims and objectives for Malanda North;
- to identify strategies that can achieve these;
- to describe the anticipated benefits that will flow from this model; and
- to provide a platform for the further evolution of the proposal following consultation with a wide range of stakeholders.

The ideas documented in this report are not a final proposal and in the coming months a consultation and review program will give community members and stakeholders opportunities to engage in debate about the Malanda North concept.

The report is divided into two parts. Part A provides an overview of the project context and outlines an overarching strategic framework for the project. Part B includes more detailed information about the proposed development, organised into seven technical themes:

- community development,
- economic development,
- urban design and built form,
- energy,
- water and wastewater,
- access, transport and circulation, and
- landscape and ecology.

Strategies, targets and benefits are presented for each of these themes.

Arup was commissioned to prepare this report for Christine Doan. The report brings together design and modelling work undertaken by Arup with inputs from Anita Eggington, the 20/20 Group, Cummings Economics, Michael Lawrence, Jo Doecke and Christine Doan.

2 Context

2.1 The Site

Physical Description

'Malanda North' is a 49ha freehold site located on the Atherton Tablelands in Far North Queensland. The site is within a 500m walk of the town of Malanda, although physically separated from the township by the North Johnstone River. The site comprises Lots 1 and 3 on SP179183, which are currently held in single ownership by a private owner. Lot 2 on SP179183 was previously part of the site and was donated by the site owner to OzCare for development of an aged care facility. The facility meets the growing demand for high-care aged accommodation and provides important jobs for the local community.

Malanda North is within the traditional lands of the Ngadjon-Jii people. Due to the freehold tenure of the land and past land uses, Native Title is deemed to be extinguished on the land. However the project team recognise the ongoing connection of the Ngadjon-Jii people to their traditional lands, including the North Johnstone River and surrounding environment. It is intended to work with the Ngadjon-Jii people to identify ways that the proposed development may assist the Traditional Owners to maintain their connection to country, and to pursue community and/or economic development opportunities.

An aerial photo with contour overlay is included at Figure 1. The site is moderately sloping with a general fall from the Malanda-Atherton Road on the western boundary to the North Johnstone River on the eastern boundary and Cleminson Creek on the northern boundary. The slope averages 4 – 5% across much of the site but is steeper near the main road. A gentle ridge runs through the centre of the site from west to east and directs surface water flow from approximately 2/3 of the site to the North Johnstone River and the balance to Cleminson Creek. The site flattens out to a flood plain on the North Johnstone River boundary.

Photograph 1: Site Panorama
(OzCare facility on right hand side, fence to adjoining rural property on left)

The land has previously been used for agriculture, including grazing and agro-forestry. Some cattle are still being grazed on the site. Reforestation of creek frontages is underway along two boundaries (approximately 55m frontage to North Johnstone River and 80 frontage to Cleminson Creek). Current adjoining land uses include:

- conservation reserve and riparian corridor on the North Johnstone River on the south-eastern boundary;
- the town of Malanda, including the show ground and a caravan park beyond the North Johnstone River;
- OzCare high care aged care facility to the south-west;
- Malanda-Atherton Rd to the west, with low density housing on opposite side;
- JCU veterinary school across Malanda-Atherton Rd to the west;
- rural land on the north-western boundary;
- riparian corridor/Cleminson Creek on the north-east boundary;
- low density housing beyond Cleminson Creek; and
- a large lot rural subdivision on the eastern boundary.

Figure 1: Aerial photo of Site with contour overlay

Natural Values

The site is mostly cleared, with the exception of a small area of trial agro-forestry, remnant riparian forest within the banks of the creeks and a 30-50m corridor of revegetation along the boundary to the North Johnstone River. Steeper parts of the site show some signs of erosion consistent with grazing and clearing.

The site is located within the Wet Tropics bioregion and is within the Wet Tropics Authority Planning Boundary, but is 8km outside the physical boundary of the Wet Tropics World Heritage Area. The Wet Tropics bioregion is estimated to contain 26% of all Australia's vascular plant diversity and 32% of terrestrial vertebrate species. It also supports 351 rare or threatened plant species and 98 animal species. Vegetation clearance and habitat fragmentation are considered the principal factors threatening the biodiversity of the region. Other factors include climate change, introduction of pest plant and animal species and changes to natural drainage patterns.

Riparian corridors throughout the Wet Tropics bioregion play a significant role in maintaining ecological connectivity and bio-diversity. The Johnstone River system is one of the more substantial river systems in the southern tablelands and forms an important riparian corridor across the region connecting the Herberton Ranges to the Wet Tropics core area. The North Johnstone River is marked on a number of maps as a wildlife corridor for the tree kangaroo and Queensland Parks and Wildlife Service (QPWS) staff have confirmed that tree kangaroos (listed as rare under the *Nature Conservation Act 1992*) are present in the conservation park adjacent to Malanda North and along the riparian corridor of the North Johnstone River. So whilst the Malanda North site itself does not presently support any protected fauna or flora species, it can play an important role in protecting and enhancing this important wildlife corridor

Local Context (Malanda)

Malanda North is located near Malanda, an existing local service centre on the Atherton Tablelands, approximately 84km south-west of Cairns. Malanda had a population of just over 1,000 people at the 2006 Census and the wider catchment area had a population of 1900 people.

The land around Malanda was cleared in the late 1800s/early 1900s, and dairy and cropping industries established. The climatic conditions of the area underpinned the development of Malanda as the primary dairy production area for North Queensland. Malanda Milk was reputed to have the "longest milk run in the world", supplying milk as far west as Darwin and north into the Torres Straits. The national deregulation of the dairy industry in 2000 delivered significant hardships to the dairy industry in Malanda, with the number of dairy farms and production substantially reduced and the locally owned Malanda Milk being subsumed by Dairy Farmers. This compounded the effects of the closure of timber and forestry industries in the 1980s and earlier changes to regulation of the dairy industry.

The region has now secured a position as a supplier of fresh milk into Asia and northern markets and, although current economic conditions are impacting on overseas prices, this market share is expected to continue into the foreseeable future. Dairy producers have also diversified into a number of specialist products which, although mostly targeting local markets, are developing more widespread reputations. This includes bio-dynamic and gourmet milk, cheese, yoghurt and chocolate products. These enterprises also support a growing food tourism industry, which has developed on the back of long-term scenic tourism attractors in the region. The growing population in North Queensland has also supported an increase in short-stay products in the region.

The climatic and soil conditions of the area are highly fertile and the agricultural industry has diversified to include a range of grains, fruit and vegetables, high quality beef, tea and coffee. It is likely that as irregular rainfall increasingly impacts on food production in southern areas, the food production value of the Tablelands will increase.

The median age of the Malanda community at the 2006 census was 44, substantially higher than the Queensland average of 37. More than 19% of the population is aged over 64 years compared with the State average of 12.4%, however the presence of the district level OzCare facility exaggerates this figure as it provides accommodation for older people from other parts of the region. The data indicates that like many rural communities Malanda is struggling to retain youth, with the 15-24 age group being 4% lower than the State average. Anecdotal evidence suggests that the socio-economic profile of the community is changing, with an increasing number of artistic, creative and 'green' interests moving into the region.

A range of local and district level social infrastructure is provided in Malanda, and residents utilise these services and facilities as well as district and sub-regional level facilities located in other Tablelands service centres. There are relatively few social support services located in the Malanda area itself; and the services that are located there are focused largely on providing health and/or aged care services. A large proportion of support services provided on the Tablelands (including those servicing the Malanda area) are Council or church based services. Essential state government and non-government services are mostly based in the major service centres of Mareeba and Atherton. Key services to the area are listed in Table 1.

Table 1: Summary of social infrastructure

Malanda (Local services)	District services
Education and Training	
2 x child care services	TAFE facilities at Mareeba and Atherton (options for flexible delivery at other centres)
1 x kindergarten	Australian Agricultural College Corporation campus in Mareeba
1 x primary school (406 students)	Mountains Institute at Ravenshoe
1 x secondary school (363 students)	Numerous private service providers deliver training and employment related services across the region
Social support services	*District level services available in Malanda*
Library	Aged care (residential) facility
Limited hours youth program	Cinema
Swimming pool	Community health centre
Churches	Council Services Centre
Pensioner units	Government agency office
Parks	Tourist Information centre
Sport and recreation grounds	Showgrounds
Local shopping	*District level services available elsewhere*
	Hospitals are located in Atherton and Mareeba, as are other higher level personal and family support, medical and retail services

Table 2: Population Snapshot (Source: Census 2006, ABS)

ELEMENT	Malanda	Portion of total	Qld Average (%)
PROFILE			
Total persons (excluding overseas visitors)	1,928	-	
Males	927	48.1%	49.6 %
Females	1,001	51.9%	50.4 %
Indigenous persons	91	4.7%	3.3 %
Australian citizenship	1,776	92.2%	86.1 %
Persons born overseas	222	11.6%	17.9 %
AGE			
0-14 years	394	20.5%	20.7 %
15-24 years	180	9.3%	13.8 %
25-64 years	976	50.6%	53.2 %
65 years and over	375	19.5%	12.4 %
Median age	44	-	36
LABOUR FORCE (15YRS +)			
Total labour force	824	53.7%	61.8%
Employed	782	94.9%	95.3%
Unemployed	42	5.1%	4.7%
Not in the labour force or not stated	710	46.3%	38.2%
OCCUPATION (Employed persons)			
Labourers, technicians and trades	322	41.2%	34.5 %
Professionals and managers	205	26.2%	29.5 %
Clerical, administrative and sales	157	20.1%	25.1%
Community and personal service workers	84	10.8%	9.1%
MAJOR INDUSTRIES OF EMPLOYMENT (75% of workforce)			
Manufacturing (incl: Dairy Product Manufacturing)	101	12.9% (7.1%, incl in above)	10%
Retail trade	87	11.1%	12%
Health care & social assistance	83	10.6%	10%
Education & training	73	9.3%	8%
Public administration & safety	69	8.8%	7%
Accommodation & food services	56	7.2%	7%
Agriculture, forestry & fishing	53	6.8 %	3%
Construction	53	6.8 %	9%
HOUSEHOLD DATA INCOME			
Median individual income ($/weekly)	$370	-	$476
Median household income ($/weekly)	$678	-	$1,033
Median family income ($/weekly)	$868	-	$1,154
Median housing loan repayment	$911		$1,300
Median rent	$137		$200
Average household size	2.4		2.6

Regional Context

The Atherton Tablelands was settled as a result of forestry, mining and agricultural development. The traditional settlement pattern of the Tablelands is rural land use focussed around a network of small towns, such as Malanda. The pattern of development in the Tablelands is being altered by subdivision of rural holdings into rural lifestyle allotments and large lot suburban sprawl on the fringes of the major towns. The Far North Queensland Regional Plan (the Regional Plan) seeks to halt this pattern of development and reinforce the existing towns.

Due to the spread out nature of development, car travel is the predominant mode of travel in North Queensland. In the Cairns region, approximately 3% of all trips are made by public transport, 83% by car travel and 8% on foot or cycle. It is expected that the amount of trips made by car would be even higher on the Tablelands, given the distance between townships and services and limited public transport services. (A bus service runs 2-3 times per day in each direction between the various townships and Cairns. There are no other commuter services between the townships and there are no train services). The Regional Plan predicts that total vehicle kilometres travelled in the region will increase by 147% by 2036 if there are no changes in land use patterns.

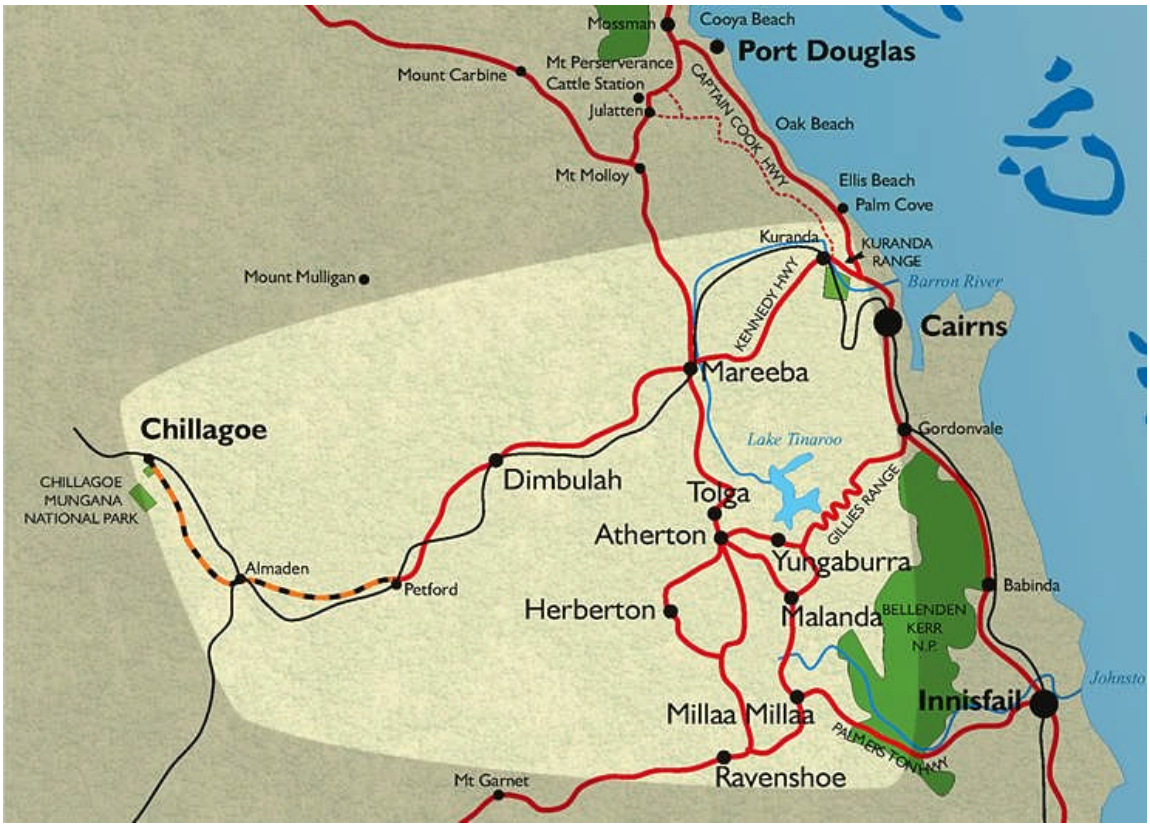


Figure 2: Map of Atherton Tablelands

Source: www.tablelands.org

In response to the steady level of growth on the Tablelands, several residential developments are currently proposed or under development on rural land adjacent to existing towns. Typically these developments mimic suburban subdivisions, although they have larger lot sizes. They are mostly residential and rely on existing economic and social infrastructure to meet the needs of residents. The developments also make little attempt to address issues of sustainable development.

Figure 3: Aerial photo of the site in the regional context

Climate

Generally Malanda has a warm, wet climate as demonstrated by the key climate data in Table 3 (sourced from the nearest weather station at Atherton). Summers are warm-hot, however few days exceed 30 degrees Celsius and nights are, on average, 10 degrees cooler than days. Heavy rains and storms are common. Winter daytime temperatures tend to be in the low 20's and winter nights average about ten degrees, although temperatures can fall close to freezing. Cold winds and drizzling rain can cause discomfort on some winter days although generally winter is drier than summer.

It is understood that climate data more specific to Malanda has been collected by Malanda Landcare. This data was not sourced at the time of writing but will be utilised to inform more detail design. Wind and solar hour data will also be collected to inform design of energy systems.

Table 3 Climatic Data

Data	Annual average
Mean maximum temperature (Degrees C)	**25.6**
January mean maximum	29.0
July mean maximum	21.8
Highest temperature (Degrees C)	36.7
Lowest maximum temperature (Degrees C)	15.7
Mean number of days >= 30 Degrees C	41.1
Mean minimum temperature (Degrees C)	**15.3**
January mean minimum	18.3
July mean minimum	10.4
Lowest temperature (Degrees C)	-0.6
Mean 9am relative humidity (%)	80
Mean 3pm relative humidity (%)	66
Mean rainfall (mm)	1667
Highest rainfall (mm) - 1999	2172.2
Lowest rainfall (mm) - 2002	832.6
Highest daily rainfall (mm)	208
Mean number of days of rain	179.4
Mean number of clear days	37.4
Mean number of cloudy days	107

Source: Bureau of Meteorology

2.2 Planning Framework

Regional Plan

The Far North Queensland Regional Plan 2031 was adopted in February 2009. The Plan provides a framework for an estimated population of 230,000 people by 2031. These figures are predicated on continuing medium-high levels of growth across the region (and are subject to debate).

The Regional Plan seeks to:

- protect regional landscape and rural production values,
- address the causes of climate change and impacts,
- achieve urban consolidation and land use efficiency,
- maintain and enhance the tropical character through land use planning and innovative design, and
- limit growth pressures on the coast.

The plan projects a growth in the Atherton Tablelands over the planning period from 43,507 in 2006 to 55,848 in 2031. The plan identifies Atherton and Mareeba as "major regional activity centres", and Ravenshoe and Malanda as "district regional activity centres". Other towns in the Tablelands are identified as "village or rural activity centres". The plan proposes the following specific strategic direction for Malanda.

> *Malanda will consolidate its role as a district regional activity centre and accommodate modest growth. It is intended that this centre will increase in role and function over the life of the plan to support the population of the southern Tablelands and reduce the need to travel to Atherton.*

The Regional Plan establishes a number of regional land use categories which over-ride existing planning schemes in relation to restricting growth and inappropriate land uses. The regional land use categories are:

- regional landscape and rural production area, in which urban or commercial development is not permissible;
- urban footprint; and
- rural living area.

The Malanda North site is included in the Urban Footprint in the Regional Plan and offers excellent opportunities to assist in meeting increasing demand for housing, employment and community services in the Southern Tableland Region. The proposed Malanda North development is consistent with the vision and strategies of the Regional Plan.

Local government planning scheme

Malanda was previously located within Eacham Shire but following the amalgamation of the four Tablelands shire councils is now within the jurisdiction of the Tablelands Regional Council (TRC). The planning scheme of the previous Eacham Shire prevails until TRC develop a new scheme.

The current planning scheme identifies a portion of the site as Urban (Lot 1) and the balance as Rural (Lot 3). The proposed Malanda North development is not consistent with this current zoning, therefore a Material Change of Use (Impact Assessable) Application to Council will be required. As the proposed form of development described in this report is not generally anticipated in the current Eacham Shire Planning Scheme, Council will be required to assess the MCU application against

the higher order scheme objectives. A preliminary assessment demonstrates the scheme to be consistent with numerous Desired Environmental Outcomes (DEOs) in the Eacham Shire Plan, including:

- location of urban expansion within and immediately adjacent to established townships, including Malanda;
- protection of the natural environment;
- encouragement of new and diversified economic opportunities;
- protection of local character and indigenous and European cultural heritage; and
- efficient and sustainable use of resources and provision of infrastructure.

Given this alignment with the scheme DEOs, and the inclusion of the land in the Urban Footprint within the Regional Plan, it is anticipated that Council will give reasonable consideration to an MCU application.

A summary of town planning matters relevant to the site is included at Appendix A2.

3 Drivers of Change

3.1 Introduction

Planning for this project has been influenced by a number of issues of local, regional, national and global significance that are expected to impact considerably on natural, social and economic structures in the near future. These impacts will necessitate a rethinking of how land and resources are used and how communities and economies are planned and managed. Hence we have termed these issues 'Drivers of Change'. This section summarises the key Drivers of Change that have influenced initial planning of Malanda North and identifies the proposed responses in terms of goals and objectives.

3.2 Climate Change

Issue

The reality of climate change is now widely accepted by government, business and the community. Changes in climate and rainfall are already having an enormous influence in Australia, with the nation recently experiencing one of its worst droughts in modern history. Recent calamitous weather events in North Queensland, Victoria and South Australia suggest what may lie ahead for Australia. The most recent study by the CSIRO on the likely impacts of climate change for North Queensland predicts:

- higher temperatures – average temperature increases of 0.9 to 1.3°C by 2030 and 1.5 to 2.9°C by 2070;
- more extremely hot days – from three days over 35°C per year currently to seven days per year by 2030 and 12.44 days by 2070;
- uncertain rainfall – a potential decrease in overall rainfall but an increase in intensity of individual rain events;
- increase in cyclone intensity, with increased wind speeds and rainfall;
- a rise in global sea level, with an expected increase of at least 15-89cm by 2100; and
- 40cm increase in the height of storm tides for a 1 in 100 year event.

These changes pose a real threat to the biodiversity values of the Wet Tropics World Heritage Area. The changes are also likely to impact significantly on human settlements. Predicted impacts include a change in human comfort due to increasing temperatures, more catastrophic storm events resulting in loss of life, diminishing food and water security, and changes to economic activities.

It is also widely accepted that emissions of carbon and other greenhouse gases from human activity are contributing significantly to climate change. Responding to climate change requires us to dramatically reduce carbon emissions as well as adapt to the changing environment.

However these changes may also present opportunities. For example the Tablelands is likely to play an increasingly role in food production as the productive capacity of other areas declines. Development of alternative technologies and systems may also introduce new economies.

Aim

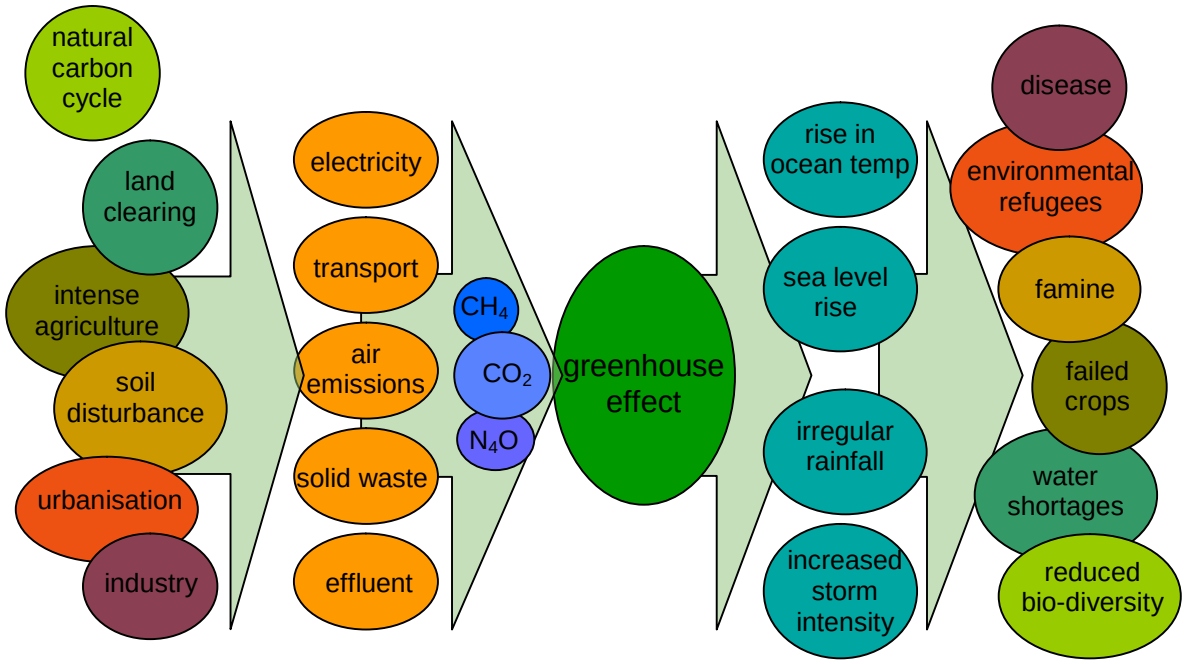
Reduce greenhouse gas emissions and plan for climate change resilience

Proposed objectives

- Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy
- Reduce greenhouse gas emissions associated with energy, vehicle use, refrigerants, waste disposal and other sources
- Reduce reliance on mains water supply
- Design buildings for more extreme climatic conditions
- Protect areas of high ecological significance
- Secure a local supply of fresh food

Figure 4 : Climate change causes and effects

Adapted from Kick the Habit: An UN Guide to Climate Neutrality (www.grida.no/publications/vg/kick/)



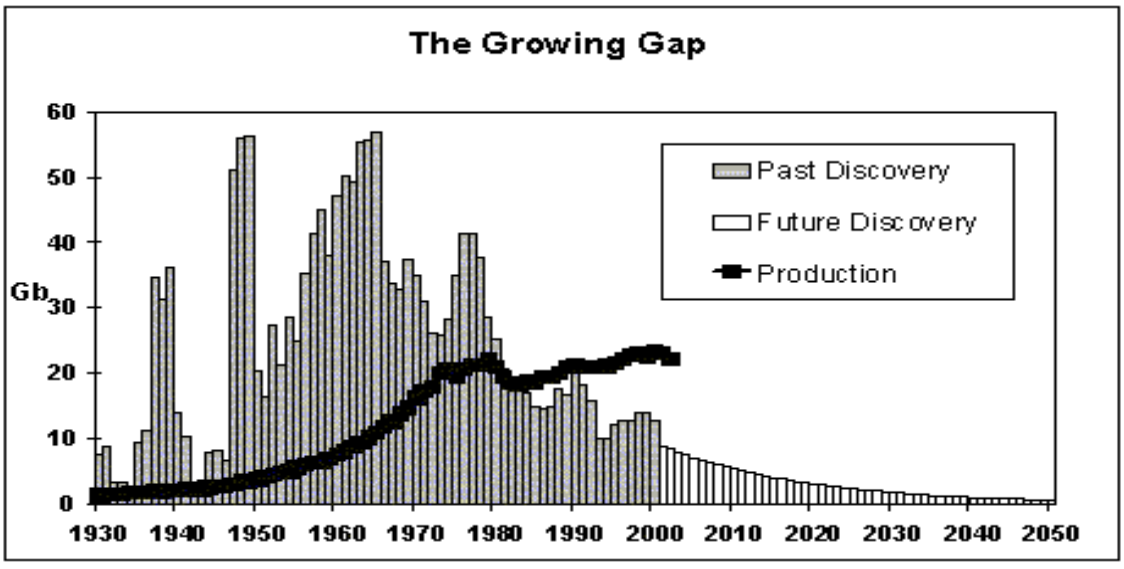
3.3 Peak Oil and Vehicle Dependence

Issue

The North Queensland economy is heavily reliant on oil supplies for energy, food supply, tourism and vehicular transportation (including critical access to employment, education and services). This reliance leaves the economy vulnerable to peak oil, which is defined as the point in time when the maximum rate of global extraction of petroleum is reached and the rate of production begins to decline terminally. In the best case scenario peak oil is expected to result in substantial oil price increases. Less optimistic but entirely possible outcomes include interrupted supply and eventually endemic scarcity.

In 2007 the Queensland Government released a report that reviewed Queensland's vulnerability to rising oil prices and peak oil. The report predicts the peak of world oil production by 2015; other reports suggest this could occur as early as 2011. The report concludes that Queensland, particularly regional Queensland, is vulnerable to peak oil due to its heavy dependence on transport industries. Peak oil also poses a threat to food security because our food supply system involves transport of foods over local distances rather than sourcing of local produce.

Figure 5: Chart of worldwide discovery versus production, D Cambell. www.peakoil.org.au



Future communities will need to explore all options to reduce reliance on fossil fuels, such as reducing car dependence and energy use, finding alternative energy sources and reducing dependence on external supplies by sourcing food, raw materials and other goods locally. Responding to some of these challenges will in fact present new economic opportunities, such as localisation of food.

Australians have become addicted to their cars and the perceived convenience they provide. Our cities are caught in a catch-22: urban planning is largely determined by the need to accommodate cars and this, in turn, creates more car dependence. Peak oil poses a significant threat to the viability of the suburban form of Australian cities, which are a product of affordable mass produced cars and highways, and a perceived endless supply of oil. (Orme: 2007). In recent years as the

price of oil has increased, American and Canadian commentators have been documenting a decline in the prosperity of suburbs as residents actively seek out locations that are walkable and have good public transport services. This trend is also evident in smaller neighbourhoods with walkable centres and mixed use development offering employment options (Leinberger:2008).

Vehicle dependence has a number of impacts for our communities and tax base, including greenhouse gas emissions, air pollution, congestion, road accidents and increasing demand for road infrastructure and maintenance. Secondary impacts include declining personal fitness and health, increasing obesity and a lack of interaction with neighbours and strangers in our community.

Aim

Reduce dependence on fossil fuels

Proposed objectives

- Plan for non-fossil fuel transport options
- Secure a local supply of fresh food
- Source labour, goods and services locally
- Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy

Why the end of cheap oil could spell death to suburbia

The following excerpts are from essay by Michael Orme in the Fleet Street Investor, 2007.

.. if the world is indeed heading down the arc of oil depletion the American suburban lifestyle built round the car will start to destabilise and wobble with deep and wide ramifications.

.. Just ponder this... the average Caesar salad travels 1,500 miles to the supermarket shelf. And those 12,000 mile supply chains of cheap Chinese goods will begin to look uneconomic with a $100 per barrel oil price. Indeed at anything much over $70.

.. Assuming that the era of American suburbia is ending, America will be forced to recalibrate itself... This could yield a lot of opportunities amidst the turmoil. For example, in general terms, 'the local' supplier will bulk larger vs 'the distant'. There will a 'made here' and 'still made here' placards reflecting more home grown businesses.

More small towns will be developed and built. These will be surrounded by farms supplying short haul local markets with fresh produce. There may be widespread strong-arming into 'organics.'

In the cities, expansion will be 'up' rather than 'out.' Retail will have to be re-thought to eliminate those long supply lines. 'Smart' grids of distributed electricity systems will emerge. Massive or otherwise, there'll be a downscaling of America.

3.4 Water Security

Issues

The sourcing and provision of adequate water supplies is becoming an increasing challenge in many parts of Queensland. North Queensland is not immune to this challenge. The gap between water demand and supplies is expected to worsen as a result of climate change with predictions of more frequent and longer lasting droughts.

Queenslanders have long believed that water is an infinite resource and accordingly have over-extracted water from natural systems and used water wastefully. In many parts of Queensland this is now resulting in severely challenged water supplies and degraded waterways, where flows have been reduced to levels that cannot adequately sustain their aquatic ecosystems. The recent record low levels in Tinaroo Dam demonstrated that North Queensland was also susceptible to drought and over extraction from water sources. Available evidence suggests that Malanda's water supplies are also nearing capacity which means that expansion of the town will need to consider alternative water sources.

Whilst there is a clear need to develop alternative models of water supply and use, there is also increasing pressure for consumers to implement more water efficient practices. On average, Australians use around 300L of water per capita every day for household applications (ABS, 2006), one of the highest in the world. The recent water restrictions in Brisbane saw daily usage drop to 140L per capita, which is low by developed world standards but more consistent with usage patterns in the UK and Europe. This reduction demonstrates that urban functions are not detrimentally disrupted if water supplies are more carefully managed.

Of the 300L typically used in Australian households, at least half is used outside of houses for uses that do not require potable quality water. The restrictions in SEQ prohibited the use of mains water externally and people substituted rainwater or recycled greywater for these uses.

Aim

Secure a water supply on site that is largely independent of external sources

Proposed objectives

- Reduce reliance on mains water supply
- Maximise use of water available on site

3.5 Public Health

Issues

The recently released Towards Q2 report by the Queensland Government outlines 5 major challenges for Queensland. One of these is improving the health of Queenslanders who are increasingly suffering from lifestyle related health issues associated with smoking, weight gain, lack of exercise, sun exposure and poor diet. There also appears to be increased evidence of depression and other psychological illnesses in the Australian community.

In the paper '*The Impact of Urban Form on Public Health'* prepared for the Department of the Environment in 2006, public health professor Billie Giles-Corti identifies physical inactivity as being second only to tobacco as the leading cause of death and disability in Australia.[1] Giles-Corti identifies the creation of **obesogenic environments** which discourage physical activity and encourage over consumption of food as contributing to increasing levels of obesity in both adults and children. Giles-Corti writes:

> *... a recent study found that those living in high walkable neighbourhoods spent almost twice as much time weekly (137 minutes) walking for local errands compared with those living in low walkable neighbourhoods, and about half as many residents were overweight (Saelens, Sallis, Black and Chen 2003; and Saelens, Sallis and Frank 2003).*

Giles-Corti's paper also considers the relationship between the urban environment and mental ill health. Her paper finds that high levels of social capital tend to decrease the risk of social isolation and associated poor health. Social capital is discussed further in section 3.7.

Aim

The physical and social environment supports residents to be active and healthy

Proposed objectives

- Plan for non-fossil fuel transport options, including active transport and public transport
- Plan the built environment to be safe and accessible for all
- Provide active recreation options
- Secure a local supply of fresh food

[1] <http://www.deh.gov.au/soe/2006/emerging/publichealth/

3.6 Ecological Footprinting

Issues

An ecological footprint is defined as the land required to support a person in accordance with their lifestyle, including the land needed for shelter, food, water, energy, transport and raw materials and the land required to dispose of waste outputs. It is estimated that the current global footprint would require 1.3 planets to sustain the world's population and if development and consumption continue to grow at current rates, 2 planets will be required by 2030.

The average Queensland resident has an ecological footprint of 7.19ha, more than 2.5 times the global average of 2.7ha and almost 3.5 times the total bio-capacity of the planet of 2.1 global hectares per person. The 2007 Queensland State of the Environment report revealed that for the average Queenslander, goods and services comprised 37% of their ecological footprint, food 23%, shelter 12%, energy 12% and transport 11%.

Planning and design of urban development can contribute to reducing global footprint in the areas of shelter, energy, raw materials and transport, accounting for 1/3 of the footprint. For example: using less land per resident; creating more energy efficient buildings; using materials with low embodied energy; and encouraging use of public transport. Other reductions are largely achieved by lifestyle choices made by residents but these can be fostered by the provision of appropriate community infrastructure, such as food gardens and reducing use of personal transport.

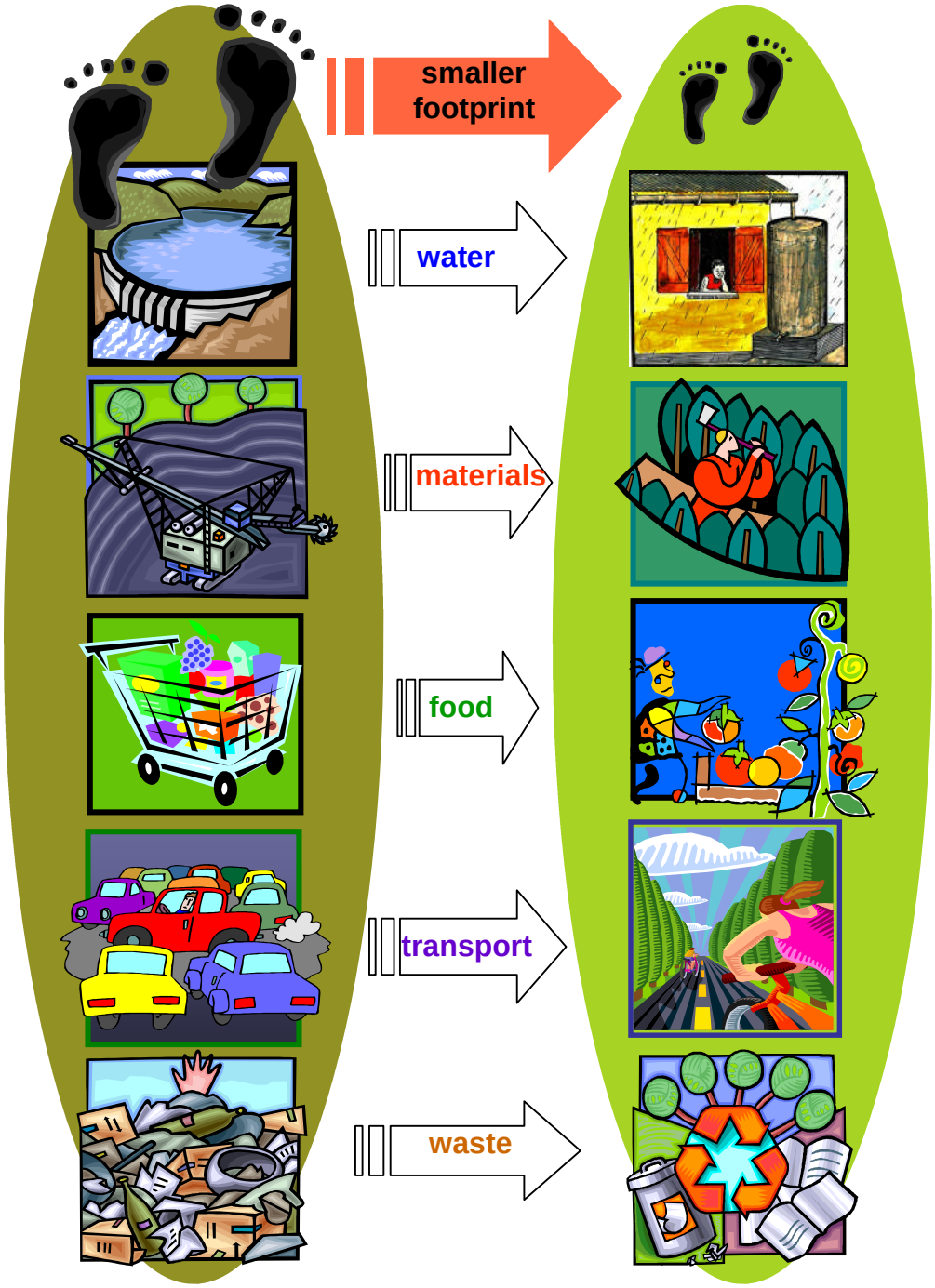
Aim

The ecological footprint of the development is reduced through efficient use of natural resources - land, water, energy, raw materials and waste.

Proposed objectives

- More efficient land use in comparison to typical practices in the Tablelands
- Maximise use of water available on site
- Separate, recycle and/or compost waste products on site
- Undertake life cycle analysis for key aspects of the development
- Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy
- Source labour, goods and services locally

- Figure 6: Ecological Footprint



3.7 Social Sustainability

David Yencken and Debra Wilkinson (2001) define social sustainability as being the continuing capacity of a society to provide for the well being of its citizens and its ability to do so in a fair and equitable way[2]. They identify a broad test for social sustainability that includes such things as adequate income and housing, good health, access to employment, education and training, maintenance of civic, moral and spiritual lives and practices, and protection of people's relationship to the natural environment.

A quick assessment of masterplanned residential communities across Queensland indicates poor performance against many of these measures. Whilst the developments focus on the provision of attractive residential areas, the infrastructure required to foster the other aspects of community well-being and social capital (such as health, affordability, employment, and civic, moral and spiritual activities) appear not to have been considered in the planning phase.

The Key Worker Housing Affordability Survey undertaken for Bankwest found that housing is not affordable for key workers in the majority of local government areas across Australia. (The survey defined affordable housing as being housing that cost less than 5 times the average wage.) The former Eacham Shire was among the 15% rural towns rated as unaffordable with an average house price 5.3 times the average wage. If housing is unaffordable for key workers, communities may struggle to attract and retain residents with these important skills. It is also an indicator that other residents on average or below average incomes will not be able to afford appropriate housing. In these circumstances the sustainability of the community is threatened.

Aim

Malanda North is a diverse and engaged community that contributes to the social well-being of Malanda.

Proposed objectives

- Provide housing and employment options to attract and support a diverse community
- Engage local people and businesses in the project development
- Develop participatory community management structures
- Create physical and economic links between Malanda North and Malanda and avoid duplicating services

Social Capital

Social Capital is defined as the inherent value and resource in social networks and relations that facilitate collective action and the pursuit of shared objectives. Social capital requires and sustains trust, security, shared cultural practices and norm, and a breadth of networks across a community. Social capital is discussed in more detail in Section 7.3.

[2] *Resetting the Compass. Australia's Journey Towards Sustainability*. Yencken and Wilkinson, 2001.

3.8 Local Economy

As described previously, the national deregulation of the dairy industry in 2000 delivered significant hardships to the dairy industry in Malanda. The development of the OzCare aged care facility at this time brought a significant number of new jobs into the community. Although the Malanda economy will continue to be underpinned by agriculture and tourism, there is a need to diversify the economy and to develop new industries that attract and retain people to the region. Such diversification can only benefit the long term viability of existing industries and the community, and confirm Malanda's role as the leading service centre in the south west Tablelands.

Malanda North presents an opportunity to achieve this outcome by providing an alternative form of development that attracts new people, skills and experiences to the region. The development can also provide state of the art infrastructure to support new economic activities that may be more difficult to retrofit into existing infrastructure. The new residents and business activities can bring new patronage and business to existing operations.

Aim

Malanda North contributes to the long term viability of Malanda.

Proposed objectives

- Create physical and economic links between Malanda North and Malanda and avoid duplicating services
- Provide infrastructure and opportunities that attract new businesses to the area
- Capitalise on skills and knowledge acquired in the development phase
- Source labour, goods and services locally

4 Summary of Aims and Objectives

The table below summarises the aims and objectives set out in the previous section, aligned against seven technical themes that are presented in Part B of this report. The table indicates some of the relationships between key issues.

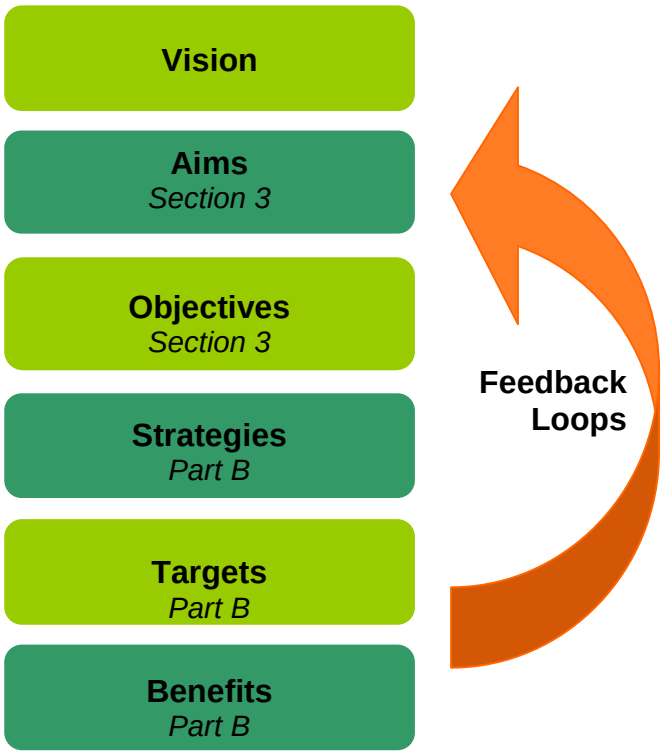
Aims and Objectives	COMMUNITY DEVELOPMENT	ECONOMIC DEVELOPMENT	URBAN DESIGN & BUILT FORM	ENERGY	WATER & WASTEWATER	ACCESS, TRANSPORT & CIRCULATION	LANDSCAPE & ECOLOGY
Reduce greenhouse gas emissions and plan for climate change resilience							
Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy			✱	✱			
Reduce greenhouse gas emissions associated with energy, vehicle use, refrigerants, waste disposal and other sources				✱	✱	✱	
Reduce reliance on mains water supply					✱	✱	
Design buildings for more extreme climatic conditions			✱	✱			
Protect areas of high ecological significance							✱
Secure a local supply of fresh food	✱	✱			✱	✱	✱
Reduce dependence on fossil fuels							
Plan for non-fossil fuel based transport options	✱		✱			✱	
Secure a local supply of fresh food		✱	✱		✱	✱	✱
Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy			✱	✱		✱	
Source labour, goods and services locally							
Secure a water supply on site that is largely independent of external sources							
Reduce reliance on mains water supply					✱	✱	
Maximise use of water available on site					✱		✱
The physical and social environment supports residents to be active and healthy							
Plan the built environment to be safe and accessible for all	✱		✱				
Provide active recreation options	✱		✱				
Secure a local supply of fresh food	✱	✱	✱		✱	✱	✱

Aims and Objectives	COMMUNITY DEVELOPMENT	ECONOMIC DEVELOPMENT	URBAN DESIGN & BUILT FORM	ENERGY	WATER & WASTEWATER	ACCESS, TRANSPORT & CIRCULATION	LANDSCAPE & ECOLOGY
The ecological footprint of the development is reduced through efficient use of natural resources - land, water, energy, raw materials and waste							
More efficient land use in comparison to typical practices in the Tablelands			*				
Maximise use of water available on site					*		*
Separate, recycle and/or compost waste products on site		*		*			
Undertake life cycle analysis for key aspects of the development			*				
Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy			*	*			
Source labour, goods and services locally	*	*				*	
Malanda North is a diverse and engaged community that contributes to the social well-being of Malanda							
Provide housing and employment options to attract and support a diverse community	*	*	*				
Engage local people and businesses in the project development	*						
Develop participatory community management structures							
Create physical and economic links between Malanda North and Malanda and avoid duplicating services	*		*			*	
Foster a rich cultural life	*						
Malanda North contributes to the long term viability of Malanda							
Create physical and economic links between Malanda North and Malanda and avoid duplicating services	*	*	*			*	
Provide infrastructure and opportunities that attract new businesses to the area		*		*			
Capitalise on skills and knowledge acquired in the development phase		*					
Source labour, goods and services locally	*	*	*			*	
Provide housing and employment options to attract and support a diverse community	*	*	*				

5 The Concept

5.1 Sustainability Framework

A sustainability framework has been adopted to guide decision making for Malanda North. The framework can also be used to measure the future success of Malanda North against the vision, aims and objectives. The hierarchy and key components of the framework are illustrated below.

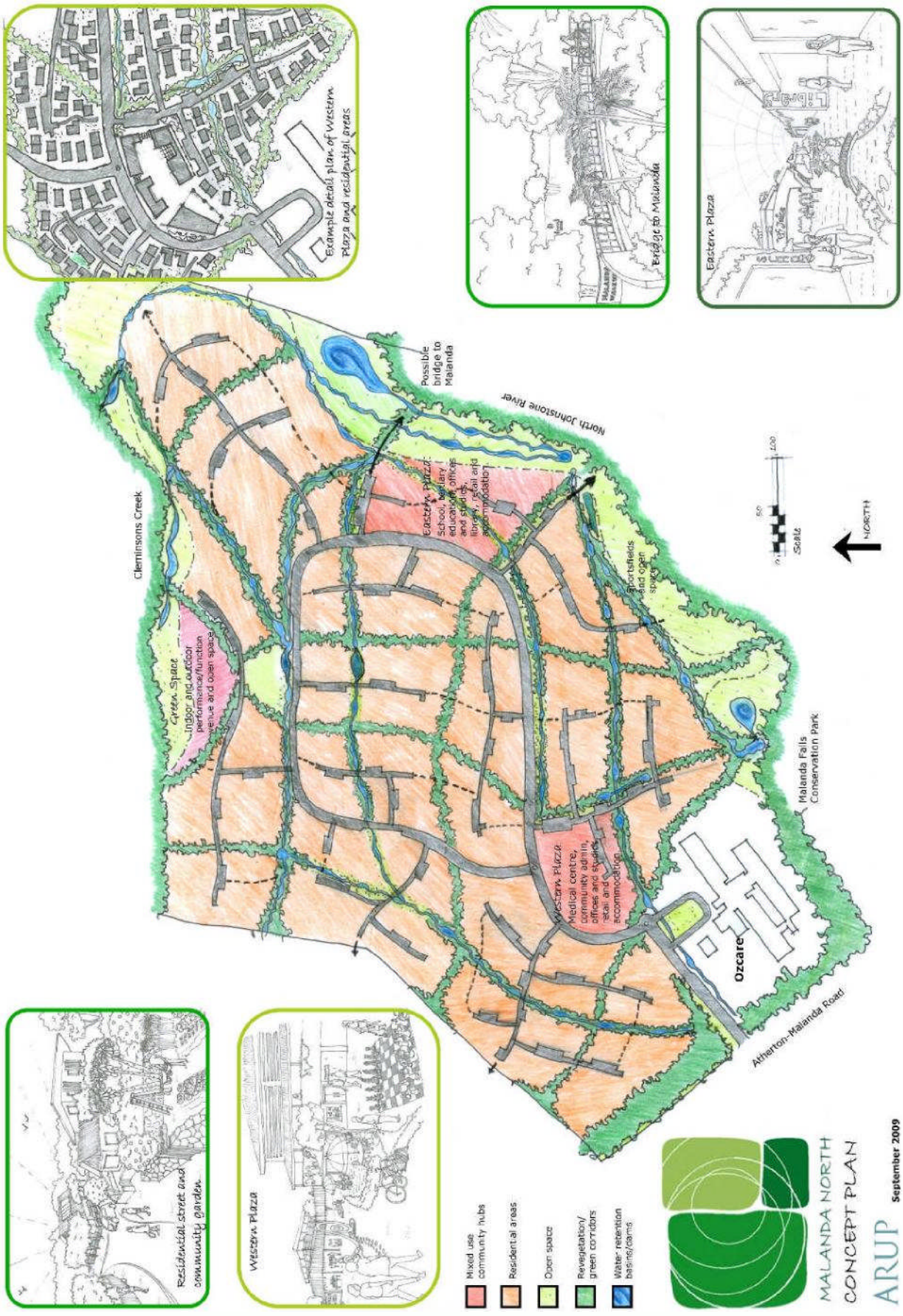


The sustainability framework provides for a staged development model, incorporating continuous feedback and evolution of concepts. In the initial phase proven infrastructure, technologies and design solutions will be configured to achieve outcomes that exceed current standards. Design principles and assumptions will also be tested and outcomes fed-back to inform and influence later stages of development. As Malanda North develops, more innovative solutions will be employed to further minimise dependence on external infrastructure and reduce greenhouse gas emissions.

5.2 Vision

Foster the growth of a vibrant, thriving and creative neighbourhood that integrates with, and adds value to, the Tablelands region and is a highly desirable place to live because of its affordable lifestyle, culture of learning, creativity and innovation, opportunities to work and learn, commitment to sustainability and attractive natural setting.
Malanda North will be acknowledged as a model development because of its sustainability achievements, economic viability and the integration of a community building approach in the development process.

- Figure 7: Draft Concept Plan



5.3 Overview of Concept Plan

A concept plan has been prepared to deliver the vision, aims and objectives for Malanda North. This is shown at Figure 7. The plan has been influenced by the natural topography of the site, Water Sensitive Urban Design measures (such as swales and retention basins) and connections to adjoining sites and features. A network of green corridors is overlaid on these features, weaving the natural landscape into the entire site and creating distinct localities.

Two mixed use activity plazas will support new and existing industries. They are located in walking distance of residential areas and can also be accessed by road. A third community space will include a dance and performance space and landscaped gardens.

Landscaping works will enhance existing ecological values as well as providing shade, shelter and food gardens. The road network has been reduced through the use of shared driveways for groups of dwellings and residential streets designed as shared zones for pedestrian, cycle and car users. Energy and water efficient infrastructure is integrated in the planning, achieving savings of up to 80% for water, wastewater, energy and greenhouse gas emissions in comparison to a 'business as usual' proposal for the site.

Key features of the Malanda North are described below in accordance with the technical themes defined in Part B of the Concepts Report.

Community Development

Malanda North will become a neighbourhood of Malanda - investment in shared services and social infrastructure will benefit the entire community. The development will include a range of housing types and accessible social and recreational infrastructure to meet existing need, and to attract a new, diverse population.

Existing and intending residents will influence development of the site through participation in consultation and planning processes throughout the project.

Economic Development

Malanda North will add to the economy of Malanda, rather than competing with existing businesses. The additional population will enable Malanda to compete more effectively with Atherton and cement its position as the major service centre in the south-east Tablelands.

The development will provide high quality infrastructure and technologies, including high speed broadband, to attract and support the development of new activities that diversify the existing economic base.

Urban Design and Built Form

Malanda North will be planned to use land efficiently by reducing overall road area and providing communal gardens and open space instead of large individual lots. Controls on building footprints and heights will minimise the potential impacts of overshadowing and overlooking.

Building covenants based on sustainable passive design and low carbon development will define the appearance of buildings. Local materials will be investigated for use where possible, further influencing the aesthetics of the community.

Energy

All buildings will meet energy efficient targets and at least 50% of power will be generated on site from renewable resources. This power will be distributed on site via a micro grid and exported at times of peak production.

A carbon footprint and carbon reduction target will be prepared for the project. The combined effect of energy efficient design and solar power will contribute to this target by reducing energy related emissions by at least 60%.

Water and Wastewater

Demand reduction measures will reduce consumption to less than 220 litres/day per person. Rainwater will be collected and treated on site and reticulated for potable uses, and greywater will be treated in small household clusters and reticulated for non-potable uses. Together these measures will reduce per capita consumption of mains water by 80%.

Greywater recycling and stormwater management measures will also reduce the quantity of wastewater emissions from the site.

Access, Transport and Circulation

Transport to and from the site, and related greenhouse gas emissions, will be reduced through the coordination of deliveries, use of web for accessing services, car-pooling and provision of jobs and services on site.

Malanda North will be a walkable community, resulting in less use of cars within the neighbourhood. The design includes speed-controlled shared streets, limited car-parking and an extensive network of walking paths to connect activities across the site.

Land Use and Ecology

The ecological values of waterways and conservation areas adjoining Malanda North will be protected through replanting, buffer zones and preservation of floodways as open space.

A network of green corridors will be a defining feature of the site. They will provide stormwater management, climate control, food growing areas, circulation paths and define clusters of housing. Incorporation of best practice Water Sensitive Urban Design measures in the design of streets and the green corridors will improve the quality of stormwater leaving the site.

6 Precedents

Although Malanda North is a new vision for the Tablelands, the concept is not unique. Many of our ideas are inspired by century old towns and villages, and by the writings of Jane Jacobs and Christopher Alexander, which date back more than thirty years. We have also borrowed ideas from the more recent work of Claude Lewenz and Rod Hopkins. We have looked to real life examples such as Village Homes in Davis, California which was established in 1975. Village Homes remains extremely successful with real estate prices consistently outperforming others in the area. Other examples include the Beddington Zero Emission Development (BedZED) and work by Brenda and Robert Vale such as Hockerton, both in the UK. Closer to home we have learnt from the experience of Currumbin Eco-Village, Aldinga Arts Eco-Village, GreenEdge Developments and the New Urbanist movement. Summaries of two project precedents are provided overleaf.

The collective experience of these projects shows that it is possible and feasible to change the way we undertake residential development and that there is market demand for a more community-oriented and environmentally-focussed model of development. A goal for Malanda North is to demonstrate an economically viable alternative development model for Far North Queensland.

The excerpt below is from an essay by author and planner Christopher B Leinberger published in the Atlantic in March 2008. The essay is indicative of a large body of discourse concerned with changing demographic trends in America. Leinberger's observations are likely to be relevant to Australia in coming years. This is evidenced by the revival and buoyancy of housing markets in inner city areas over the past decade and demographics in these locations broadening out to include families and retirees.

The Next Slum?

Writing in the Atlantic in March 2008, Leinberger describes the decline of suburbs across America and argues this is indicative of a demographic change rather than the sub-prime mortgage crisis. Leinberger foreshadows that without structural change suburbia may become the next slum.

..the story of declining suburban neighbourhoods did not begin with the [subprime] crisis, and will not end with it. A structural change is under way in the housing market - a major shift in the way many Americans want to live and work. Its ultimate impact on the suburbs, and the cities, will be profound.

..The suburban transformation that began in 1946 took almost half a century to complete, as first people, then retail, then jobs moved out of cities and into new subdivisions, malls, and office parks. .. Once-thriving central-city retail districts were killed off by the combination of regional suburban malls and the 1960s riots. By the end of the 1970s, people seeking safety and good schools generally had little alternative but to move to the suburbs.

..Cities, of course, have made a long climb back since then. Many Americans became disillusioned with the sprawl and stupor that sometimes characterize suburban life. ..Pent-up demand for urban living is evident in housing prices. Twenty years ago, urban housing was a bargain in most central cities. Today, it carries an enormous price premium.

.. these premiums have [also arisen] in suburban towns that have walkable urban centres offering a mix of residential and commercial development. People are being drawn to the convenience and culture of walkable urban neighbourhoods across the country—even when those neighbourhoods are small.

Aldina Arts Ecovillage

Community vision:

"Caring for the Earth; caring for people; living creatively together"

Development features:

169 low-density residential lots

Approximately 50% site retained for landscape and food

Communal arts facilities

Location:	40min south of Adelaide, SA, adjacent to town of Aldinga
Site:	33 hectares (ex-farmland)
Stage:	Partially constructed
Title:	Community Title – purchasers own a plot and share common land farm and cultural facilities
Design	A mix of housing types provided (detached, terrace, town houses) Building size limits set so they do not appear overbearing
Waste	On-site WWTP recycles water for irrigation Centralised postal, refuse, and recycling collection Green mulch collected and reused on farm
Energy	Houses must have solar hot water provision & be energy efficient Reticulated natural gas available
Water Quantity	Each house must install 10,000L rainwater tank Storm Water retention in ponds, fed by swales from roads and buildings
Landscape & Food	On-site permaculture education centre and native nursery 16ha organic 'farm' and all road reserves planted with food trees
Community	Community Facility will offer recreational, educational, arts and community activities, 'plaza' areas for markets, festivals, displays, performances and celebrations, a restaurant and an interpretive centre Required to consult neighbours about house design (don't have to agree) Community Development committee established. Have adopted the 'Sociocracy' system of self-government
Access &Traffic	Internal roads are intentionally narrow in construction; promoting slow flow of traffic, and allowing right of way for pedestrians and cyclists

BedZED

Community vision:

Zero (fossil fuel) Energy Development

Development features:

86 residential dwellings

Zero Carbon Design

Zero Heating Homes

Location:	Beddington, 20 km of Central London, UK
Site:	1.6 hectares
Stage:	Constructed and occupied
Design	Duplex Apartments
Waste	100% Wastewater recycling 15% of construction materials were reclaimed or recycled
Energy	Wind cowl heat recovery ventilation Photovoltaic installation Biomass Central Heat and Power (CHP) plant Good natural light penetration 10-15% reduction in embodied energy
Water Quantity	Rainwater used for toilet flushing and irrigation Ecological water treatment Water efficient appliances in all dwellings
Community	Local car pooling – electric rental car available free for carpooling Community led management Mixed tenure, home type and occupiers Internet links between community and local businesses and services
Access &Traffic	Development close to bus and train routes Car parking 30% below conventional development 1.5 lockable bicycle facilities per dwelling

PART B:
DESIGN STRATEGIES, TARGETS AND BENEFITS

7 Introduction

Part A of the Malanda North Concepts Report describes aims and objectives to achieve the desired sustainability outcomes for the development, including ecological, resource, social and economic considerations. Part B describes a number of proposed solutions for seven key technical themes and lists the anticipated benefits that will accrue from the proposed development approach in comparison to a typical or Business as Usual residential development. The targets and benefits set out in this report are based on high level analysis and proven solutions. They are, as such, inherently conservative and it is anticipated that it may be possible to identify further savings and benefits in the design development process.

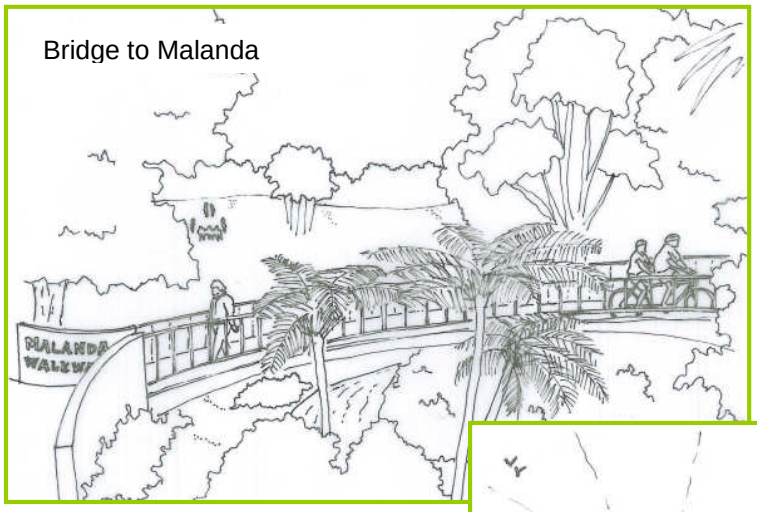
For the purposes of the comparison a typical subdivision layout was developed for the site. It is not proposed as an alternative under consideration by the owner of Malanda North. This layout included some 330 dwellings across the site, including a retirement village of approximately 50 units, 30 townhouse/duplex lots and 250 suburban lots with an average area of approximately 800 m^2. Nominal areas were set aside for landscaped open space and community facilities in accordance with planning scheme requirements. Road networks and parking are also planned in accordance with planning scheme requirements. Mains power supply, mains water and sewer connections to all lots is assumed and average consumption figures from Far North Queensland are used as the basis for comparisons.

A concept plan has been prepared to deliver the vision, aims and objectives for Malanda North. This is attached at Appendix A1. The plan has been influenced by the natural topography of the site, Water Sensitive Urban Design measures (such as swales and retention basins) and connections to adjoining sites and features. A network of green corridors is overlaid on these features, weaving the natural landscape into the entire site and creating distinct localities.

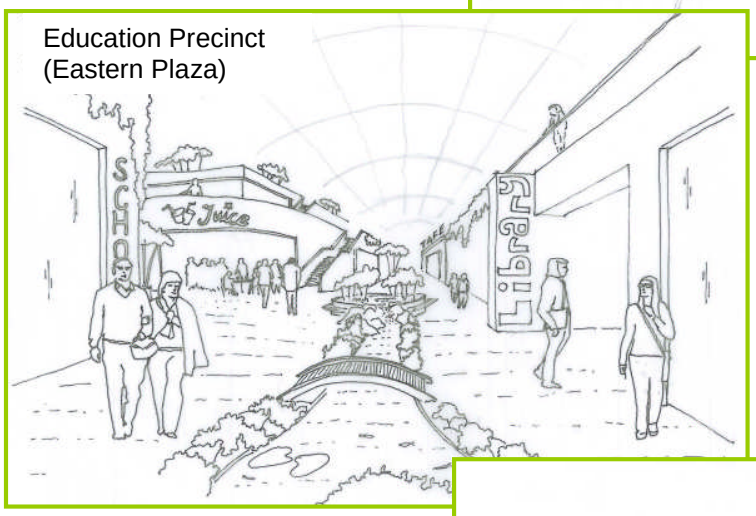
Two mixed use activity plazas will support new and existing industries. They are located in walking distance of residential areas and are can also be accessed by road. A third community space will include a dance and performance space and landscaped gardens.

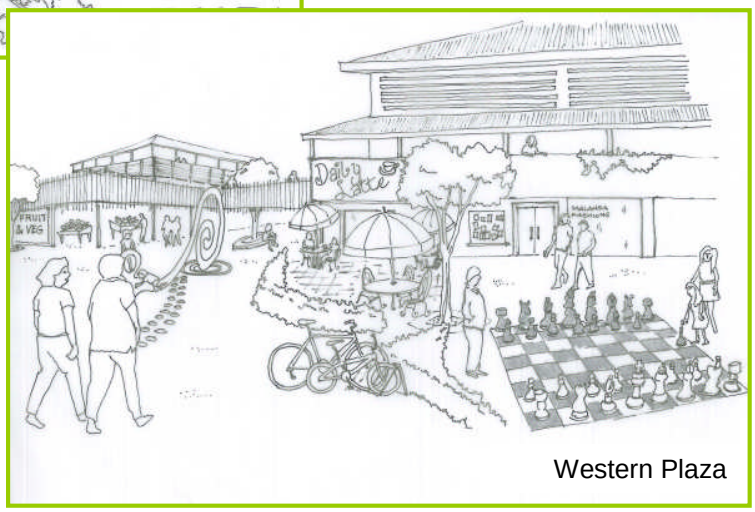
Landscaping works will enhance existing ecological values as well as providing shade, shelter and food gardens. The road network has been reduced through the use of shared driveways for groups of dwellings and residential streets designed as shared zones for pedestrian, cycle and car users. Energy and water efficient infrastructure is integrated in the planning, achieving savings of up to 80% for water, wastewater, energy and greenhouse gas emissions in comparison to a ‘business as usual’ proposal for the site.

The artists impressions on the following page illustrate key features of the development.


Bridge to Malanda


Residential area


Education Precinct
(Eastern Plaza)


Western Plaza

8 Community Development

8.1 Overview

The following is a summary of objectives, strategies and targets relevant to Community Development. The anticipated benefits are also summarised.

Objectives	Strategies	Targets	Benefits
Create physical and economic links between Malanda North and Malanda and avoid duplicating services Source labour, goods and services locally	**Set aside at least 10% of the developed area of the site for economic pursuits** **Provide neighbourhood level infrastructure such that residents can meet their basic needs within a 15 minute walk or ride**	Neighbourhood and local social infrastructure is adequate to meet community need Key district level infrastructure is provided within the local area	**A resilient and socially rich community is sustained at Malanda and Malanda North.** **Residents have fewer lifestyle-related health problems.**
Engage local people and businesses in the project development Develop participatory community management structures	**Adopt a communication and engagement strategy for the project** **Research appropriate land tenure and community governance models.**	Social capital exceeds social capital in Malanda at project commencement	
Foster a rich cultural identity	**Integrate historical and contemporary stories of the place and its people in the public realm** **Provide spaces for observance of cultural and spiritual practices**	Residents identify strongly with Malanda North	
Provide housing and employment options to attract and support a diverse community	**Maintain a stock of affordable rental housing** **Provide independent living units for older people**	At least 10% of housing stock remains affordable At least 10% of housing stock meets universal access standards	
Plan for non-fossil fuel based transport options Provide areas for active recreational options Plan the built environment to be safe and accessible for all Secure a local supply of fresh food	**Incorporate pedestrian/ cycle paths across the site** **Provide recreation facilities across the site** **Incorporate land for food production on site** **Develop supply contracts with local farmers**	Population health statistics for Malanda North exceed average statistics for rural/regional centres At least one-third of the food consumed on site is sourced from the Tablelands region	

8.2 Social Infrastructure

Discussion

The Queensland Government defines social infrastructure as being "the community facilities, services and networks which help individuals, families, groups and communities meet their social needs, maximise their potential for development, and enhance community well being." [3] Social infrastructure plays an important role in bringing people together, developing social capital, maintaining quality of life, and developing the skills and resilience essential to strong communities. The Queensland Government therefore recognises investment in social infrastructure as being essential for the health, well-being and economic prosperity of communities.

The development of Malanda North has the potential to impact on social infrastructure and the provision of community services. In the early project development phase it will be necessary to determine the needs of residents of Malanda and Malanda North and plan investment that will address these needs.

Social infrastructure can be benchmarked to determine the level of community facility infrastructure (hard infrastructure) required to service particular communities. A set of benchmark standards was developed for the SEQ Regional Plan based on a hierarchy of catchments – at the neighbourhood, local, district, local government, and regional/ sub-regional levels. The social infrastructure requirements that will need to be addressed at Malanda North according to this benchmarking are described below.

Table 4: Required Social Infrastructure

Catchment	Definition	Activities / infrastructure
Neighbourhood: **Malanda North**	A neighbourhood is a collection of homes defined by boundaries such as major roads and water courses, by form of development in relation to adjacent areas, and by relationship to neighbourhood facilities. A neighbourhood may include up to 1000 homes (up to 3,000 people). A neighbourhood should be a walkable catchment to its facilities. Neighbourhood infrastructure is primarily provided by the developer and/or local government with recurrent support from residents, body corporate and local government.	- parks, bus stops, post boxes, public telephones and corner stores - support from local governments for organised community action - such as rural fire brigades and environmental restoration - access to churches or halls which support neighbourhood development - some form of community space, such as a hall or local park, as a focus for activity - safe, walkable connections to public transport stops and local facilities

[3] Source: SEQ Regional Plan Implementation Guideline No. 5 (2007)

Catchment	Definition	Activities / infrastructure
Local Community: **Malanda / former Eacham Shire**	A local community is generally in the order of 5,000–10,000 people and within a 5–10km radius. Social infrastructure is provided to meet universal health, learning and support needs, and foster participation and social capital. Local social infrastructure is usually planned in partnership between community organisations and local governments and funded through a combination of funds and in-kind support from stakeholders.	- primary school, possibly secondary school in larger catchment - hall or neighbourhood centre - sport and recreation reserve - access point for family health, income support and home care services - child care centre(s) and/or kindergarten - links to district and regional facilities
District: **Atherton district**	The catchment of district-level social infrastructure generally ranges from 20,000–30,000 people, with a radius of 10–50km, and often encompasses several local centres. The scale of facilities is larger to accommodate a larger population and geographical area, and higher-order services. Services are primarily planned and funded by local, State and Federal Governments, with some local partnerships.	- social infrastructure addresses the range of universal needs, supports people's lifecycle needs (from maternal health to comprehensive in home services for older people) and addresses issues of disadvantage - secondary schools and some post-school training - places for cultural expression District facilities often resource local and neighbourhood social infrastructure
Local Government Areas: **Tablelands Regional Council**	Local Government Areas (LGAs) may not correlate with the above designation and have different sized populations that need to be accommodated.	Essential social infrastructure for each LGA includes: - a civic/community meeting place - major event and disaster recovery capabilities - leadership and advocacy for local and district infrastructure
Regional/ sub-regional: **Cairns/ Tropical North Queensland**	The catchments served by regional and sub-regional facilities may range up to 200km, servicing upward of 300,000 people.	Social infrastructure at the regional level meets most health and community support needs, offers the full range of education, training and employment avenues, fosters community participation and cultural expression, and offers a high level of expertise in supporting quality of life

Source: SEQ Regional Plan Implementation Guideline (No. 5) - Social Infrastructure Planning Queensland Department of Infrastructure & Planning

Strategies

Set aside at least 10% of the developed area of the site for economic pursuits.

Provide neighbourhood level infrastructure such that residents can meet their basic needs within a 15 minute walk or ride.

The concept plan for Malanda North includes two activity plazas and a third community green space. Neighbourhood scale infrastructure will be provided in these plazas, including:

- convenience store and food outlets
- basic postal services, including post box, fax, photocopy and internet
- access to car-pooling arrangements, bicycle hire and future public transport services
- commercial spaces for small businesses
- fresh produce vendors/markets
- meeting spaces for community groups, including outdoor space for public meetings
- spaces for delivery of education and training
- arts studios and venues for performance arts
- short stay accommodation for visitors
- place(s) for religious observance
- informal sitting/recreation areas.

The plazas will be fully accessible for users with a range of abilities. Universal housing will be sited in close proximity to the plazas to improve access for less mobile residents. Under an arrangement with the OzCare facility or other providers on the site, residents will be able to access home care packages to support them to live independently if they chose. This will in effect provide targeted local and district level services for older people on the Tablelands.

In addition large open space areas are proposed within the site that will be developed as both formal and informal recreation areas providing recreational infrastructure for residents.

A community owned smart network will provide high speed data services across the site, available to all residents. It is proposed that a community intranet site will provide residents with access to community resources and relevant news and information.

Current access to Malanda from the site is via the Atherton Road. It is intended to construct a bridge access to provide more direct connection. This is likely to be a pedestrian/cycle bridge, however consideration will also be given to a vehicle link. A bridge link will give residents direct access to the greater range of services on offer in Malanda, including supermarket and other shopping, schools and Government service providers.

Targets

Neighbourhood and local social infrastructure is adequate to meet community need.

Key district level infrastructure is provided within the local area.

8.3 Social Capital

Discussion

Social capital is defined as the inherent value and resource in social relations which facilitates collective action and the pursuit of shared objectives. Residents in communities with a high level of social capital may experience less social isolation and a greater sense of belonging and community participation. Social capital is developed over time via the web of social networks that build as we meet people at workplaces, schools, clubs and societies. There is therefore, a strong relationship between social capital and the cultural life and development of a community. Community resources that are required to build social capital include: trust; security; cultural practices and norms; and a breadth of networks. Social capital is often high in established communities and lower in new greenfields communities. It can also be difficult to build social capital in car based localities, where residents spend much of their time away from home and invest their social capital resources in their workplace or distant sports clubs or schools rather than the residential community.

In new masterplanned communities, social capital may be undermined from project inception because the developer views existing residents as potential opponents rather than resources. Existing residents have little scope to participate in decision making or to negotiate outcomes that meet their needs. They may come to resent the imposed change and project these emotions onto the 'newcomers', forming a barrier to the development of social networks between the new and old and isolating residents in the new development from existing social capital.

Engagement in planning processes can assist to develop social capital within a newer community or can rebuild social capital in a community impacted by change. Recognising and respecting historical and contemporary cultural values and traditions of a place and people are also important elements of building on social capital.

When confronted with a need to accommodate more people within a constrained city area the City of Vancouver in Canada actively engaged residents in the decision-making process. They established a process where residents could negotiate community services and improved amenity as a trade off for increased density in part of their neighbourhood. This approach built social capital, provided needed social infrastructure to the community, and established an environment in which existing residents are more likely to engage with the residents of new developments. The physical and social outcomes of these consultations are widely assessed as being highly successful.

Strategies

Adopt a communication and engagement strategy for the project.

Research appropriate land tenure and community governance models.

The site owner and her project team recognise that in order to achieve true community development and build social capital, it is essential that community stakeholders and future Malanda North residents are engaged in designing, influencing and/or managing the changes that do occur, and that the residents retain longer term ownership, investment and involvement in their own community. It is anticipated that this will be achieved in many different ways, reflective of the different interests in the wider community and the breadth of activities proposed for the site.

A communication and engagement strategy has been developed to foster this outcome. The strategy incorporates the principles of participation as defined by the International Association of Public Participation (IAP2), as illustrated in Figure 8.

Initially the process has involved consultation such as distribution of this report, to provide the community with information about the project. As the project progresses it is intended to develop partnerships, and over time delegate power until residents have control of local decision-making and neighbourhood-level management.

It is envisaged this approach could accelerate the development of social capital, particularly:

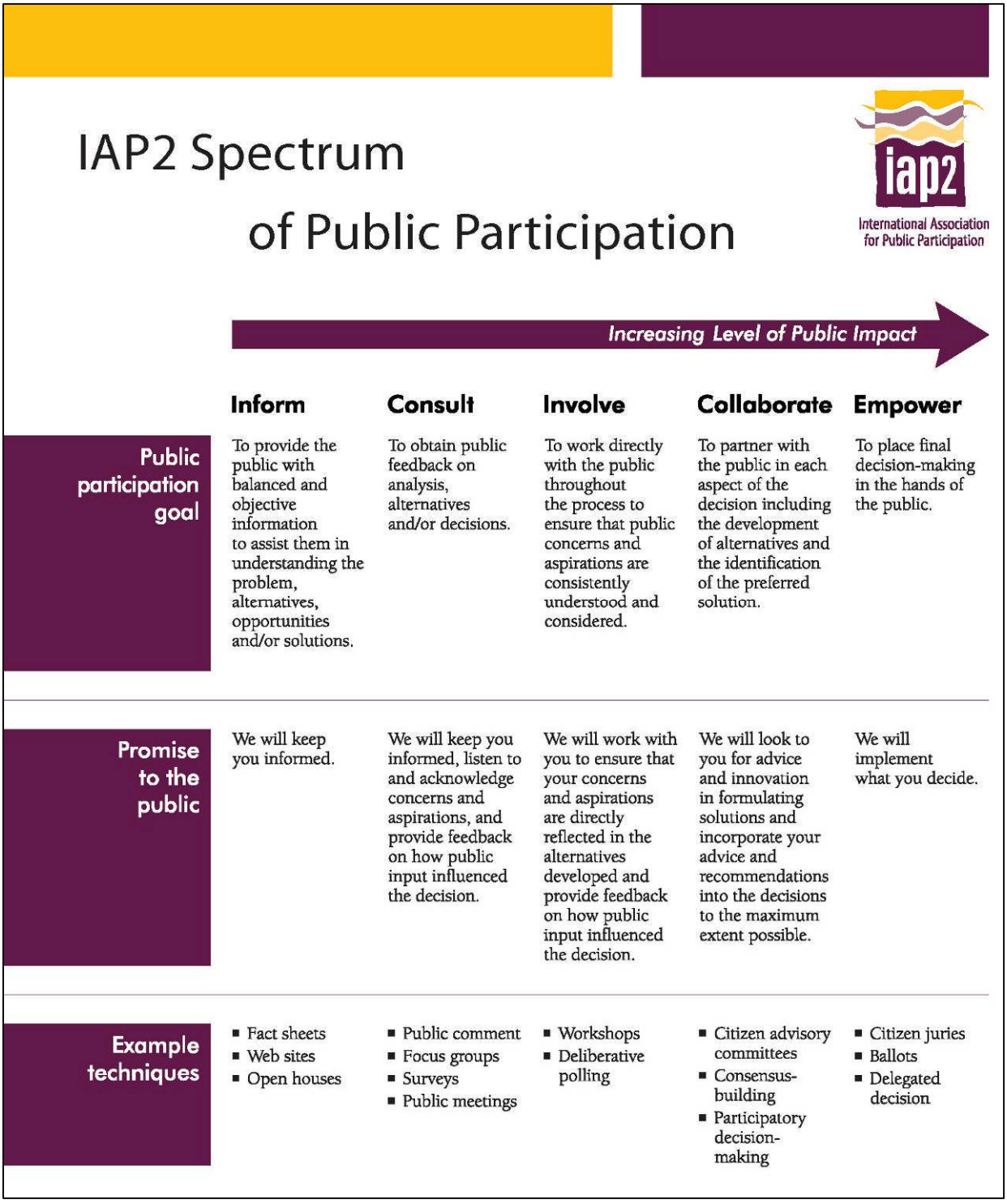
- involvement in decision making will build social networks, trust and shared values among residents;
- the engagement of Malanda residents may reduce negative reactions to new residents and build relationships.

Targets

Social capital exceeds social capital in Malanda at project commencement.

Figure 8: IAP2's Public Participation Spectrum

Source: http://www.iap2.org



8.4 Cultural Identity

Discussion

The preceding discussion about social capital highlights the importance of social networks and social norms in creating social capital. Cultural identity, which is defined as a sense of belonging to a social group, is central to this. Identifying with a cultural group provides a sense of security and access to social networks. Conversely, if expressed in an exclusive way, cultural identity can create barriers and cause people to feel isolated. Members of minority cultures, for example, can feel excluded if the shared values and practices conflict with their cultural practices.

Whilst often narrowly associated with racial or religious origins, culture can be defined as the knowledge and understandings, skills, and values which are shared by a group of people and are perceived by them to be unique and meaningful. In traditional societies cultural identity was often a function of the community into which you were born - an inheritance. Today people participate in a number of social groups, and may adopt a number of cultural identities throughout their life including national, local, ethnographic and religious identities, as well as the culture of work places or social groups. Adopting a new cultural identity does not necessarily cause the loss of others.

Masterplanned residential communities rely on the evolution of cultural identity over time on the basis of shared values. This can be hastened if the development has underlying principles or values, or is embedded into an existing culture. Without these foundations, and without opportunities for social, spiritual and cultural practices, a shallow cultural identity may develop which is unlikely to create a sense of belonging.

Strategies

Integrate historical and contemporary stories of the place and its people in the public realm.

Provide spaces for observance of cultural and spiritual practices.

A distinguishing feature of Malanda North is the focus on developing a strong identity for the community. The sustainability values of the project and the connection to Malanda will form the foundations of this identity. Mechanisms to support the development of a deeper identity include:

- working with the Ngadjon-Jii people to integrate traditional stories for the land and environment into site planning and public spaces;
- identifying non-indigenous cultural heritage values for the site and incorporating these in site planning and public spaces;
- providing opportunities for community stories and values to be represented and celebrated in public spaces over time;
- planning an array of venues, facilities and places for creative arts, performance arts, spiritual observance, personal development and cultural development.

Targets

Residents identify strongly with Malanda North.

8.5 Appropriate and Affordable Housing

Discussion

In 2007 Bankwest undertook a survey of 540 local government areas across Australia to determine housing affordability for 5 groups of key workers – nurses, police officers, ambulance officers, fire fighters and teachers. The survey defined housing affordability as being house prices that were less than 5 times the average wage. The survey found that Malanda (Eacham Shire) was one of the 15% of rural towns that was unaffordable, and Atherton was assessed as being on the threshold of unaffordability.

The results of this study support anecdotal evidence that housing is unaffordable in Malanda. A shortage of affordable rental housing is also reported. A review of census data for Malanda indicates that the median family (household) income is 66% of the Queensland average, yet median housing loan repayments are 70% of the state average and median rents are 68% of the average.

Strategies

Maintain a stock of affordable rental housing stock.

Provide independent living units for older people.

A number of proactive measures proposed to deliver affordable, appropriate housing at Malanda North are described below.

- Retain a pool of affordable rental housing stock that is not available for owner-occupation. This stock could either be owned by a community housing provider, a cooperative jointly owned by all residents, or a private rental housing provider.
- Gift land to government agencies or non-profit social housing providers for construction of low-income social housing stock throughout the site.
- Plan for dwelling units suited to the needs of older people located close to the community plazas.
- Make arrangements for all residents to be able to access home care services if required.
- Include lower cost townhouses, duplexes and units across the site.
- Do not place restrictions on the minimum size of dwellings (beyond minimum sizes set by Council for environmental health purposes), giving residents freedom to build or buy smaller, more affordable houses.
- Plan a variety of lot sizes, including a significant number of smaller lots and townhouse sites.
- Investigate opportunities to develop a revolving fund to support low income owners to buy homes at Malanda North.

In addition to meeting housing need, these measures can contribute to attracting and retaining a diverse community.

Targets

At least 10% of housing stock remains affordable for low income households.

At least 10% of housing stock meets universal access standards.

8.6 Community Health and Well-Being

Discussion

Evidence cited previously in this report indicates that community health and well-being can be affected by the walkability of the community and the amount of social capital that has been developed. It has been suggested that urban design can make a positive contribution to these outcomes.

Other factors likely to contribute to improved health and well-being include work-life balance, sense of personal freedom, access to fresh nutritious foods, and regular exercise. Good urban design can provide infrastructure that support people's ability to meet these needs.

Strategies

Incorporate pedestrian/ cycle paths across the site.

Provide recreation facilities, including the retention of flood prone areas as open space.

Incorporate land for food production on site.

Develop supply contracts with local farmers.

Planning of infrastructure and social services is intended to support and encourage healthy lifestyle choices amongst residents. Design of Malanda North will foster walking, with an extensive network of safe paths and community plazas located within walking distance of the majority of residences. An increase in daily walking has been shown to improve health outcomes.

Recreation facilities will include informal open space, structured sports fields, spaces for exercises classes and possibly some indoor sports facilities, as well as children's play areas.

The landscape strategy will include provision for food growing areas within each residential cluster such that residents can grow fresh food, or access fresh food grown by others. It is also intended to enter into supply arrangements with local food producers. One such service in Brisbane (FoodConnect) provides subscribers with a box of locally grown fruit and vegetables each fortnight. Alternatively, provision could be made for a small farmer's market however there is a regular circuit of such markets in the Tablelands now and it is important not to detract from the viability of these existing markets.

Target

Population health statistics for Malanda North exceed average statistics for rural/regional centres.

At least one-third of the food consumed on site is sourced from the Tablelands region.

9 Economic Development

9.1 Overview

The following is a summary of objectives, strategies and targets relevant to Economic Development. The anticipated benefits are also summarised. Generally the objectives align with existing investment attraction strategies proposed for the sustainable growth of the Tablelands region.

It is noted that section requires further research and each of the themes is only presented briefly in this report.

Objectives	Strategies	Targets	Benefits
Create physical and economic links between Malanda North and Malanda and avoid duplicating services. Source labour, goods and services locally. Secure a local supply of fresh food.	**Maximise the use of local businesses and services during the development phase.** **Undertake a feasibility assessment to identify the needs of businesses that could be established on site without impacting on existing businesses.** **Develop web based supply agreements with existing service providers, including farm producers.**	No business in Malanda fails due to the establishment of Malanda North. Some existing businesses expand as a result of new opportunities arising from Malanda North.	**The project supports a significant number of local jobs in the construction sector during construction.** **The development will strengthen existing businesses with new patrons and staff.** **The development will diversify the economy of Malanda.**
Provide infrastructure and opportunities that attract new businesses to the area. Provide housing and employment options to attract and support a diverse community.	**Identify potential economic development opportunities for the region and determine the infrastructure and labour needs of these activities.**	Attract at least one new major economic activity to the region. Attract at least six new medium size enterprises.	
Explore opportunities to seed new industries during the construction process. Separate, recycle and/or compost waste products on site. Capitalise on skills and knowledge acquired in the development phase.	**Seek expressions of interest for establishment of local materials production or other services that could be utilised in the Malanda North development.** **Foster the development of specialist consulting services based on the development of Malanda North.**	At least one new sustainability or construction related industry is established as a result of the construction of Malanda North. The expertise gained at Malanda North influences other developments in North Queensland.	

9.2 Strengthen Local Businesses

Discussion

There is a risk that a new mixed use development such as Malanda North could attract business away from the existing main street of Malanda. This is not the intention of this project and design responses are proposed to avoid this outcome.

On the other hand the introduction of up to 2000 new residents over time will strengthen the viability and retention of existing services that are marginal on the basis of the current population. These businesses currently compete with (and lose business to) higher order facilities in Atherton (Cummings Economics, 2009). A larger population base in the area will secure existing businesses, support expansion of some businesses, and facilitate the development of more extensive local retail and other commercial facilities in Malanda. This will cement Malanda's role as the prime service provider in the southeast Tablelands.

Strategies

Maximise the use of local businesses and services during the development phase.

Undertake a feasibility assessment to determine the needs of businesses that could be established on site without impacting on existing businesses.

Develop web-based supply agreements with existing service providers, including farm producers.

Targets

No business in Malanda fails due to the establishment of Malanda North.

Some existing businesses expand as a result of new opportunities arising from Malanda North.

9.3 Diversify the Economy

Discussion

Presently, the Malanda economy is heavily reliant on agriculture, tourism, and the service sector (including aged care). Whilst the agriculture sector can be expected to thrive as a result of declining rainfall in other localities, the tourism sector is being impacted by uncertain economic times and rising fuel costs. The future for this industry is uncertain. The service sector is dependant on a viable population to service. There is therefore an evident need to diversify the economy to sustain the community into the future.

A number of potential opportunities have been identified in preliminary research for this project and will be further investigated. They are listed below.

- Site based tertiary or vocational training offered by JCU, TAFE or other providers and relating to agricultural activities, environmental values, tourism industry or other values of the region.
- Aged care training in partnership with TAFE and OzCare attracting students from the Asia-Pacific region due to the growth of aged care in these areas.
- Community development/aid training in partnership with a university and/or aid agency, training workers for tropical regions.
- Bio-science research and training.
- A non-government, alternative education school.
- Collective studios, training and retail outlets for creative industries.
- A medical centre that would bring together practitioners in Malanda (including community health) in a more appropriate facility and potentially free up valuable commercial space in Malanda.
- Shared office space that could be used by sole-operators, small businesses and people who work remotely.

Strategies

Identify potential economic development opportunities for the region and determine the infrastructure and labour needs of these activities.

Targets

Attract at least one new major economic activity to the region.

Attract at least six new medium size enterprises.

9.4 Gain Economic Benefit from the Development Process

Discussion

Any development brings a spike of local jobs in the construction sector. Malanda North will be no different and the potential size of the development could sustain this spike over some time. However Malanda North will also introduce new materials and technologies, design approaches and construction techniques in North Queensland. The scale of the project presents an opportunity to support the development of industries and services that survive beyond the project.

One example is the potential to develop building materials that utilise local materials, such as bamboo products, fibreboard made from cane or banana trash, or rammed earth. The scale of Malanda North may be sufficient for businesses to develop this expertise which then can be used on other projects.

Another set of skills likely to develop as a result of this project is specialist knowledge around the

design and construction of renewable energy technologies, water supply systems, waste management systems and water sensitive urban design. These technologies have had limited uptake in the tropics, and the development of this expertise in a tropical context has commercial potential both in Australia and overseas.

Strategies

Seek expressions of interest for establishment of local materials production or other services that could be utilised in the Malanda North development.

Foster the development of specialist consulting services based on the development of Malanda North.

Targets

At least one new sustainability or construction related industry is established as a result of the construction of Malanda North.

The expertise gained at Malanda North influences other developments in North Queensland.

This summary is informed by preliminary research undertaken by Cummings Economics for Christine Doan. This report is included at Appendix A3. Further research will be commissioned to determine the economic opportunities and feasibility of the project in the coming stages.

10 Urban Design and Built Form

10.1 Overview

The following is a summary of objectives, strategies and targets relevant to Urban Design and Built Form. The anticipated benefits are also summarised.

Objectives	Strategies	Targets	Benefits
More efficient land use in comparison to typical practices in the Tablelands. Provide housing and employment options to attract and support a diverse community.	**Reduce lot sizes and provide communal open space.** **Encourage small-lot housing, double storey housing, townhouses and villas.**	Approximately 75 persons/ha in residential areas (approximately 50% of the site area). Only 50% of housing lots suit detached housing forms.	**Malanda North meets growth targets of the Malanda region, thus reducing development pressure on other parcels of agricultural land.** **A distinctive climatically responsive built form creates character and identity and attracts visitors**
Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy. Design buildings for more extreme climatic conditions.	**Orient lots and nominate building footprints that achieve correct solar orientation.** **Mandate passive solar and low energy design via building covenants.**	Houses require artificial heating or cooling less than 10% of the year.	
Undertake life cycle analysis for key aspects of the development.	**Explore opportunities to source local materials.** **Consider embodied energy when selecting materials.**	(Establish targets following further research of local materials).	
Plan the built environment to be safe and accessible for all. Provide active recreation options.	**Design the public realm in accordance with Crime Prevention Through Environmental Design (CPTED) principles.** **Integrate open space and recreation areas across the site.**	Streets, plazas and open space are regularly used by people of all ages.	
Plan for non-fossil fuel based transport options Create physical and economic links between Malanda North and Malanda and avoid duplicating services		**Refer Access, Transport and Circulation**	

10.2 Efficient land use

Discussion

A common pattern of land development in the Tablelands at present is the subdivision of rural holdings into large lot residential developments. Whilst current growth trends in FNQ make the loss of some agricultural land to urban purposes inevitable, the extent of loss can be reduced by maximising the efficiency of urban development.

In more urbanised parts of Australia there is already a trend towards smaller housing lots in response to rising land costs and smaller household sizes. This trend is not as evident in North Queensland but most new developments do include some smaller lots. However house designs have not changed to suit the alternative lot sizes and houses appear to have increased in size over the past thirty years. To be successful, small lot housing requires alternative design solutions.

Although Malanda North is agricultural land, it also has inherent value for urban development due to its proximity to Malanda. Achieving maximum efficiency of land use on the site will assist in protecting other parcels of agricultural land from encroaching urban sprawl.

A more compact and efficient layout can support a number of other objectives established for this project, including increasing the number of daily needs that can be met on site and reducing the use of personal transport.

Strategies

Reduce lot sizes and provide more communal open space.

Plan for a mix of housing types.

There are a number of ways that residential developments can be designed to increase land use efficiency without reducing amenity. Some proposed responses are outlined below.

- Create shared streets that are also used by pedestrian, cyclists and even playing children. This reduces the overall width required if footpaths and cycle lanes are provided separately.
- Provide shared driveways rather than a single drive per house. This can also enable battle axes blocks and so reduce the overall area roads required per dwelling.
- Reduce the area given over to car-parking by designing to meet typical demand rather than maximum demand, and sharing parking across facilities that have different peak use times.
- Reduce the set-back of houses from streets, as this is usually an under utilised space, or encouraging people to use this area to grow food.
- Provide shared facilities such as pools, veggie gardens, chook sheds and work sheds. When these do not have to be accommodated on site people can have smaller garden areas.
- Similarly guest houses and shared office facilities could reduce the need for additional rooms in houses and so reduce overall building footprint.
- Create multi-purpose buildings and spaces that are used by different people at various

times for different activities, rather than having important infrastructure that is unused for much of the time (as is often the case with halls, playing fields and the like). This has the benefit of increasing activity across the community throughout the day, which improves public safety and the viability of small businesses, such as cafes.

- Encourage double storey buildings to reduce the footprint of buildings.
- Integrate food production into landscaping.

The concept plan includes a number of dwelling clusters across the site. Each cluster is defined by landscaped corridors or other landscape/geographical elements and accessed by a 'shared street' based on the principles of Homezones and Woonerf. Individual clusters might range in size from 20 to 40 dwellings and will all include a range of housing types and sizes. Home businesses, short-term accommodation and small scale mixed use premises will be permitted in residential clusters to increase activity in the clusters during the day.

Each cluster will include shared facilities that are typically found in individual back yards, such as additional parking bays, work and storage sheds, food gardens and play equipment. Clusters may also include swimming pools and guest cottages, although these may be provided as a shared resource amongst a number of clusters. Other shared resources that are proposed at a cluster level include green waste disposal, greywater recycling and irrigation water storage.

Three community plazas are proposed. These will also adopt the cluster approach and each will have a particular theme – one being health care and community services, another having an education and creative industries focus and the third having a focus on personal development. The community plazas will feature a range of community and commercial uses clustered around car-free public open space. It is envisaged that upper floors will incorporate residential spaces to activate the public spaces outside of working hours.

Target

Approximately 75 persons/ha in residential areas which account for approximately 50% of the site area.

10.3 Passive Building Design

Discussion

Designing buildings to suit the climate has a substantial impact on thermal comfort and energy consumption. For example: buildings that are exposed to excessive summer sun and/or do not capture cross-breezes require artificial cooling; buildings that do not capture solar benefit from winter sun require artificial heating; and buildings that do not admit sufficient natural lighting require additional lighting. Malanda has a relatively mild climate and if buildings are designed to respond to the extremes of winter and summer they should require minimal (if any) additional heating or cooling.

The planning of streets and subdivisions can influence the ease with which individual buildings can be oriented to maximise passive design. For example, if a site has a long east-west frontage and narrow north frontage it is difficult to design a house that captures winter sun and excludes hot low angle sun in summer.

Public spaces also need to be designed to suit the climate. Cairns' City Place and the new airport are examples of public infrastructure that are not designed for the realities of climate. In the tropics public spaces need to offer protection from summer sun and from heavy rain, and materials should be selected to reduce glare and heat bank effects. In Malanda additional protection is required from winter winds (east – south-east), and from drizzling rain which is horizontal at times. Residents may seek a sheltered sunny spot early on a clear sunny winter morning, but are likely to seek shade once the day warms up.

Strategies

Orient lots and nominate building footprints that achieve correct solar orientation.

Mandate passive solar design via building covenants.

The shape of clusters, alignment of streets and green corridors, and form of housing allotments, are planned to maximise opportunities for passive design such that all dwellings can be oriented to admit winter sun and summer breezes. Landscaping will be planned to provide a windbreak for winter winds and shade to public spaces and/or walkways in summer.

Design for passive principles will be a covenant for Malanda North. All buildings will need to demonstrate how this is incorporated in the design at the approval stage. This will include consideration of orientation, cross-ventilation, materials (thermal mass), insulation, shading and heat bank effects, natural lighting and colour. Commercial buildings will be required to have mixed mode capability so that air-conditioning loads are reduced. Due to the small lot sizes a footprint will be defined for housing in order to protect the solar access of neighbouring properties.

Targets

Houses require artificial heating or cooling less than 10% of the year.

10.4 Embodied Carbon

Discussion

The embodied carbon of a project describes the carbon-related emissions that can be attributed to the development process. It includes:

- carbon emissions arising from land clearing and soil disturbance;
- energy consumption and carbon emissions due to plant and equipment;
- carbon emissions associated with mining and manufacturing processes;
- non-renewable energy used in the manufacture and transport of materials and equipment;
- transport related emissions to move materials and labour to and from site;
- energy used in the construction of buildings and infrastructure; and
- the transport and disposal of waste materials at all stages of the cycle.

Similarly buildings and infrastructure can be said to have embodied energy, embodied water and embodied waste components, although embodied carbon can be considered a more comprehensive measure. The total embodied carbon in a building may equate to many years of operational outputs; as building designs focus on lowering operational carbon emissions, the relative impact of embodied carbon will increase. (Research undertaken for the Australian Government research indicates that the embodied energy from the construction process can be equivalent to 10-15 years operational energy for houses, and varies between 4-40 years for commercial buildings.)

The embodied carbon of an individual material is determined by the processes involved in manufacturing it. Metals such as steel and aluminium are extremely high in embodied carbon because the raw materials are extracted from deep mines, transported large distances, and processed at extreme heat. Cement is processed at extremely high heat and so has high embodied carbon. Concrete however, has a relatively low embodied carbon because the cement is mixed with other materials that require limited processing and can often be sourced locally. Concrete masonry and compressed board products have a medium-low range embodied carbon, depending on where they are manufactured. Brick in comparison is higher because of the firing process. Timber also has a medium range value, substantially less than metals but higher than concrete masonry. Materials that are manufactured on site using locally sourced materials, such as rammed earth, mud-brick or strawbale, also have a low embodied energy. However the energy associated with labour (such as travel to site) can be relatively high for these products and is often not taken into account.

As outlined above, the total carbon emissions of a building includes the embodied carbon in materials, the embodied carbon in the construction process and the operational energy and carbon requirements. Therefore use of materials with a higher embodied carbon could be justified if they achieve substantial savings in labour time, energy or transport during construction and/or improved durability or thermal performance. Various tools are available to measure and benchmark this, including Life Cycle Analysis (LCA) and Carbon Footprinting.

An example of this process is the Hockerton development in the UK that established a zero emissions target prior to design. Conventional wisdom indicated that the use of concrete, which has a high embodied energy, was not consistent with this goal. However investigations of the thermal performance of various materials indicated that use of concrete as thermal mass would deliver energy benefits across the life of Hockerton that would outweigh the embodied energy in the concrete. The Hockerton development and other zero emissions projects in the UK are interesting

because they are able to achieve zero emissions in a climate that is so much colder and sunless than Malanda. This is achieved through meticulous planning and design.

The building with lowest embodied carbon is, of course, the building that already exists. Therefore design of buildings that are durable and adaptable is an important target in achieving lower carbon outcomes.

Strategies

Reduce disturbance of soils during construction.

Explore opportunities to source local materials and recycled products.

Undertake life cycle assessments of proposed building materials and designs.

The following approaches are proposed to achieve these strategies:

- plan the development to fit with existing land forms and minimise cut and fill requirements;
- plan infrastructure such as road surfaces and underground services to minimise their footprint and the quantity of raw materials required;
- take into account the embodied carbon of all materials;
- take into account the inherent operational energy/carbon arising from material selections (heating, cooling, maintenance);
- explore options to use recycled materials;
- explore opportunities for pre-fabrication (on or off-site) to reduce the vehicle emissions associated with construction;
- source materials locally wherever possible to reduce transport.

In addition, the proposed carbon footprint for the project (Refer Section 11.4) will take into account the embodied energy and carbon of site development, infrastructure, and buildings across the life of the project.

Targets

(Establish targets for embodied carbon following further research).

10.5 Safe Environments

Discussion

There is an increasing public perception that our communities are no longer safe. This perception constrains people from using public spaces to their full potential. It also becomes self-fulfilling, because when less people are using public spaces there is more opportunity for anti-social behaviour. There are some examples where poor design exacerbates this situation, for example narrow paths that are lined by high fences and out of sight.

A side effect of this situation is that children no longer play in the public realm as they did a generation ago. The longer terms impacts of this could include obesity and poor health. In the short term, children miss opportunities for independent and creative play and are likely to have fewer positive interactions with other members of the community.

These concepts are not new. Jane Jacobs wrote in the 1960s about declining public safety and social spirit in New York, and observed that older neighbourhood with active streets, were livelier and apparently safer.

Strategies

Design the public realm in accordance with Crime Prevention Through Environmental Design (CPTED) principles.

Integrate open space and recreation areas across the site.

Crime Prevention Through Environmental Design (CPTED) is a set of design principles that support the development of safer environments. They address passive surveillance, lighting, landscaping and accessibility. They have been endorsed by the Queensland Government and local councils as an effective basis for design of public spaces.

The integration of open space and recreation areas is generally supported by CPTED principles. If open space is highly visible and subject to passive surveillance from streets, paths and buildings, it will be safer to use. Design of open space at Malanda will adhere to these principles.

Targets

Streets, plazas and open space are regularly used by people of all ages.

11 Energy

11.1 Overview

The following is a summary of objectives, strategies and targets relevant to energy. The anticipated benefits are also summarised.

Objectives	Strategies	Targets	Benefits
Design buildings for more extreme climatic conditions. Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy.	**Increased energy efficiency and demand management measures in all buildings.**	20% reduction in stationary energy consumption (per capita) of mixed use development compared to current best practice. (>50% improvement on existing buildings).	**Less demand on existing networks and carbon intensive energy sources.** **Reduced greenhouse gas emissions, thereby contributing to carbon abatement targets.**
Reduce greenhouse gas emissions associated with energy, vehicle use, refrigerants, waste disposal and other sources. Separate, recycle and/or compost waste products on site. Provide infrastructure and opportunities that attract new businesses to the area. Source labour, goods and services locally.	**Include solar energy generation technology in all buildings.** **Explore opportunities to create bio-gas from composting and water treatment.** **Investigate further the viability of wind, methane bio-digesters and hydro.** **Develop a micro-grid across the site to distribute energy generated on site between users.**	At least 50% of electrical energy needs are met by on-site renewables.	
Greenhouse gas emissions are reduced across all aspects of Malanda North. Separate, recycle and/or compost waste products on site.	**Develop a comprehensive carbon footprint for Malanda North to measure the success of the project in achieving a carbon reduction target.** **Investigate opportunities to locally offset carbon emissions that can not be eliminated.**	60% reduction in carbon footprint associated with stationary energy use per capita compared with best practice subdivision. 40% reduction in overall GHG emissions across the site.	

11.2 Demand Reduction and Management

Discussion

Ergon Energy estimates the average consumption of a house in the Cairns-Tablelands region to be 24kWh/day, equating to 8.7MW/year and approximately 8 tonnes of carbon annually[4].

Both the Queensland and Federal Government have introduced regulations to improve the performance of new buildings. The Building Code of Australia focuses on improving the thermal performance of building fabric for both residential and commercial buildings, whilst the Queensland building regulations establish minimum requirements for key energy uses in houses such as lighting and hot water, but excluding heating and cooling. The Queensland Government is currently considering further measures in this regard for both commercial and residential buildings.

These measures assume that artificial cooling and heating will be used to moderate the climate. For example, the Building Code of Australia (BCA) focuses on improving the capacity of the building fabric to retain the benefit of artificial cooling/heating (eg insulation and sealing) thus reducing the energy loss due to loss of conditioned air. An alternative strategy is to design the building to work more effectively in the climate. In the relatively benign climates experienced in much of Queensland, it is possible to design dwellings that require minimal artificial heating or cooling, resulting in substantial energy reductions.

To date the Queensland Government has focussed on residential buildings, and non-residential building types have only been regulated by the requirements of the BCA. Typically this sector of the market is developer driven and design related decisions are driven by short-term profit rather than life cycle considerations. There is little or no incentive for the developer/investor to invest in solutions that will reduce operational costs for tenants. The Queensland Government have begun investigating measures to achieve better outcomes in this sector through regulation. Change is also being driven by tenants who are demanding better outcomes. Voluntary tools such as Greenstar are used by the building industry to measure sustainability outcomes for buildings, including energy efficiency, and market these outcomes to tenants.

Strategies

Increased energy efficiency and demand management measures in all buildings.

A number of measures are proposed to reduce energy consumption in houses at Malanda, these are estimated to achieve a reduction of more than 50% in comparison to existing housing stock. The estimated impact of various measures is summarised in Table 5. The proposed measures exceed the new minimum requirements set by the Queensland Government, and are estimated to achieve an improvement of more than 20% when compared with houses built to these standards.

In the table below emissions caused by heating and cooling are estimated to generate more than one tonne of CO_2 each year per house, almost 30% of the estimated emissions per house for Malanda North. This can be further reduced by the use of passive solar design measures which can

[4] Calculated using a conversion factor of 0.91 kg CO2e per kWh of purchased electricity in Queensland, as cited in the National Greenhouse Accounts (NGA) Factors. This does not take into account transmission losses so the true figure would be higher.

substantially reduce or even eliminate the need for heating and cooling. Such measures include:

- planning the layout and orientation of lots across the whole site such that all dwellings can be oriented to capture winter sun and summer breezes;
- requiring all buildings to be correctly oriented and including appropriate shading and thermal mass for cross-ventilation and convection;
- providing a glazed area to the north to capture winter sun and store it in thermal mass.

As an example, passive designed houses in Hockerton in the UK do not have individual artificial heating, relying on passive measures including a south facing glazed sunroom, high thermal mass augmented by supply of hot water from a combined heat power system.

Table 5: Estimated Residential Greenhouse Gas Emissions

Activity	Existing Dwellings		Dwellings to new Qld standards		Proposed MN Dwellings		Data Source
Heating and Cooling	Wood heating and a/c	1.4	5 star dwelling	1.2	6+ star dwelling	1.0	Your Home Australian Greenhouse Office
Water heating	Electric storage	4.0	Electric heat pump	1.1	Solar (electric boost)	0.6	Improving Sustainable Housing in Queensland
Lighting	Incandescent and strip fluoro	0.3	80% energy efficient	0.1	80% energy efficient + improved natural lighting	0.1	Your Home
Cooking	Electric	0.3	Electric	0.3	Gas or induction	0.15	Your Home
Fridge (600 litres)	No requirement	0.7	No requirement	0.7	Min 4 star + good installation	0.6	Energy rating website
Other	Appliances generally	1.3	No requirement	1.3	Bulk purchasing and education	1.2	Your Home
Total		**8**	**tCO2/yr**	**4.7**	**tCO2/yr**	**3.65**	**tCO2/yr**

Strategies to improve the energy efficiency of non-commercial buildings at Malanda North will include establishing targets such as:

- Minimum 5 Star Greenstar Rating (or equivalent) for all applicable buildings, achieving at least 75% of the energy points available;
- Minimum 6 Star NABERS Rating Energy ratings for all applicable buildings types;
- Inclusion of sub meters and energy displays to facilitate demand management.

Demand management strategies will be implemented to ensure that maximum use if made of energy generated on site. At a residential level this might involve the installation of quality fridges in well insulated and ventilated installation which are programmed to use on-site generated power during the day in preference to accessing grid power. At a neighbourhood wide level infrastructure such as water pumps and water treatment systems will be operated when surplus on-site generated power is available in preference to other times. Surplus day loads could also be used to charge electric cars. This strategy was adopted in Bed ZED, a zero emissions residential development, in England over a decade ago.

Another demand management strategy will be to match uses with sources based on the relative efficiency of the source for that application. This is location specific due to the inherent costs and emissions associated with providing different energy sources to the site, such as gas. An example may be using solar thermal installations to heat water which is then distributed to provide heating for buildings in winter. This is a far less carbon intense energy source for heating than electricity or gas. Use of off-peak power is another demand management strategy, as this utilises surplus energy in the grid and reduces demand at peak periods.

Target

20% reduction in stationary energy consumption/ of mixed use development compared to current best practice (>50% improvement on existing buildings).

11.3 On-site Renewable Power Sources

Discussion

The majority of energy in Far North Queensland is sourced from coal fired power stations, one of the most greenhouse gas intensive methods of generating power. In far North Queensland these impacts are amplified by the transmission losses between power stations in Central Queensland and the end user, which are estimated to be between 12 and 18%. Another downside of this centralised supply approach is the reliance on a single network.

In comparison, renewable energy options typically cause little or no greenhouse gas emissions (after manufacture) and do not deplete precious natural resources. Commonly used renewable resources include wind, solar, hydro and bio-gas. Whilst there is a perception that solar cannot work in cloudier climates, the reality is that solar is being effectively utilised in far more extreme climatic conditions in Europe and that Malanda enjoys a relative high level of solar access annually. Importantly, although photo-voltaic panels work most efficiently when there is direct solar gain, they can also generate some power in overcast conditions.

Renewable sources are well suited to micro-grid solutions where a number of small sources are connected together to create a supply network. This solution allows investment over time as a project develops, builds robustness in the internal network, and insulates against failure in the external network.

Strategies

Include solar energy generation technology in all buildings.

Explore opportunities to create bio-gas from composting and water treatment on site, and from dairy effluent.

Further investigate the viability of wind, methane bio-digesters and hydro.

Develop a micro-grid across the site to distribute energy generated on site between users.

This report primarily considers the benefits of installing solar energy generation systems on site, as these technologies appear viable on the basis of preliminary desktop investigations. A number of other renewable energy options have been identified for further investigation during the design development phase. If viable these technologies could deliver additional benefits.

One such option is a bio-digester which may use outputs from wastewater recycling and green waste composting processes on site, but could also effluent from dairy farms. This is a plentiful resource in the Malanda district and environmental benefits would accrue as a result of treating this waste product. Anecdotal information suggests that large scale wind and hydro appear too unreliable enough for this site, due to irregular wind and water flow respectively. However further investigation will be undertaken to confirm this information and to determine opportunities for micro-installations. Another alternative for investigation is the option to develop a wind or hydro system at a more appropriate site in the locality and bring the power to site.

In regards to solar, there are two methods of solar generation commonly in use in Australia:

1. Photovoltaic (PV) panels which have been in use for several decades; and
2. Solar thermal which has been explored more recently and is typically used in larger installations.

It is proposed to require all dwellings at Malanda North to install photovoltaic (PV) panels at a rate of 1kW for the base dwelling/first bedroom + 0.5kW/ per additional bedroom. This equates to:

- a 1.5kW installation for a 2 bedroom unit, generating an estimated 3MW/year, meeting at least 70% of power needs and reducing GHG emissions by 2.7 tonnes; and
- a 2kW installation on a 3 bedroom house, generating an estimated 4MW/year, meeting at least 75% of the average household needs and reducing GHG emissions by 3.7 tonnes.

If the predicted energy reductions associated with passive solar design of housing (as proposed in the previous section) are realised, the energy produced by domestic PV installations may equate to 100% of a household's energy requirement.

A 1kW solar PV installation requires a roof area of approximately $10m^2$. The proposed installations would therefore take up less than 20% of roof area. Even in multi-unit installations there would be sufficient roof area to accommodate these requirements. The current cost of a 1kW solar installation is approximately $12,000. Costs have reduced in recent years and it is anticipated they will continue to do so as the technology improves and manufacturing costs decline. Costs also do not increase linearly with the size of installation. Current Government rebates of up to $8,000 are available to households with an income of less than $100,000.

Non-residential buildings and infrastructure installations will also be required to generate power from renewable sources. Further investigation is required to ascertain whether PV arrays or solar thermal installations (see below) are the most appropriate for larger building types in this locality.

Individual installations will be connected to the internal power distribution network and excess power generated during the day is exported to commercial or community uses. Power imported to the house at other hours is credited against the exported power. However the Queensland Government currently buys power generated from domestic PV installations at 44c/kWh, approximately three times the domestic retail price for power. Whilst this pricing regime remains in place Malanda North may choose to access to the grid and generate a small income.

The total power requirement of Malanda North, taking into account proposed reduction measures, is likely to be of the order of 1.5 - 2 MW. (To put this in perspective the Windy Hill power station has a 12 MW capacity which is enough energy to supply 3,500 homes.) At least 50% (and up to 75%) of the required load could be met by the proposed solar power installations on buildings. It may be possible to meet some or all of the balance with a small solar thermal power station which would have the effect of generating all power needs on site. However this is to be confirmed and has not been included in the current targets for the project.

Target

At least 50% of electrical energy needs are met by on-site renewables.

Solar Thermal

Solar thermal plants, also called concentrated solar power (CSP) plants, convert solar irradiation energy from the sun into high-temperature heat by using mirror or lens configurations to focus the sunlight onto a receiver. The heat at the receiver is collected, transferred and channelled through a conventional steam turbine generator to produce electricity. CSP plants can potentially be sized anywhere from a building or 'village' supply up to grid connected applications of 200 MW or more.

Solar thermal systems can use fluids or thermal mass to store the heat. This is more efficient than storing electricity in batteries and generates electricity during cloudy weather or at night, an advantage over solar PV. Energy storage systems improve the reliability of electricity generation and make the power plant a more flexible generator. Storage also reduces the amount of import/export between the site and main grid. Solar thermal can also be used as a source of hot water which may be used directly as hot water supply or in district heating systems.

Solar thermal technologies are currently used in Europe and in small installations in southern Australia. Solar thermal is also being investigated for a small office building in Cairns.

Fresnel reflectors at Liddel power station, located in the Hunter Valley, which has an average daily solar exposure of 16.9mJ/m^2 compared to 19. 8mJ/m^2 at Atherton

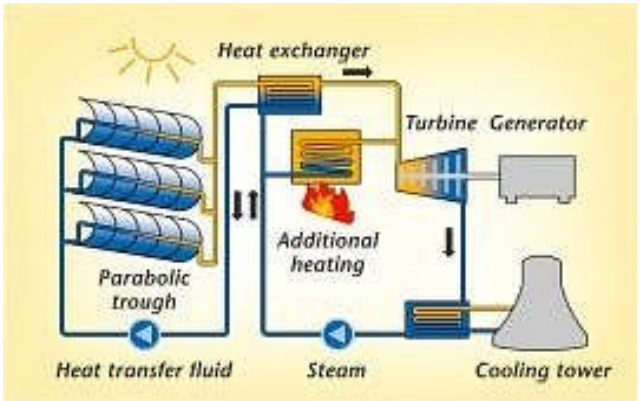


Diagram of parabolic trough solar thermal plant

11.4 Reduced Carbon Footprint

Discussion

The McKinsey Report – An Australian Cost Curve for Greenhouse Gas Reduction (2008) - assessed the economic cost to Australia of meeting the Kyoto targets. The report found that GHG[5] emissions can be reduced using existing or rapidly developing technologies. The report also found that whilst the reductions would require substantial operational changes in many sectors, such as changes in power supply and mix, they could be achieved without major lifestyle changes.

The report estimates that carbon abatement in the buildings sector has a long term cost benefit for the economy of $130 per tonne of Co_2. A projected 60 Mt of carbon-reduction opportunities could be realised in the sector by 2030, and many could be implemented immediately. The key areas for improvement included air handling and conditioning, particularly in commercial buildings, and residential hot water systems. The low level of insulation in existing building was also identified as an opportunity to achieve significant savings. *(McKinsey: 2008)*

Based on available power consumption figures, an average house in the Cairns-Tablelands region produces approximately 8 tonnes of carbon annually[6]. This compares with national estimates of average carbon emission of 7 tonnes per Australian household (Your Home resources). Energy consumption is estimated to account for 35% of greenhouse gas emissions associated with residential activities. Other GHG emission sources directly associated with a residential development include transport and landfill/waste.

Table 6: Estimated potential to reduce residential GHG emissions per source

GHG Source	Typical Tonnes CO_2-e (per yr/person)	Typical %	Target Reduction at MN	Estimated CO2-e at MN (per yr/person)	Reference
Energy	3.20	35%	75%	0.80	Ergon data
Transport and logistics	4.25	48%	10%	3.83	ABS Passenger Cars ABS Transport
Land Use Change	0.90	10%	75%	0.23	AGO estimate
Waste	0.50	5.5%	50%	0.25	ABS Waste
Water and fugitive	0.15	1.5%	0	0.15	ABS and AGO
Total	**9.0**	**100%**	***42% reduction***	**5.26**	

[5] GHG – Greenhouse Gas

[6] Calculated from Ergon data, using a conversion factor of 0.91 kg CO2e per kWh of purchased electricity in Queensland, as cited in the National Greenhouse Accounts (NGA) Factors. This does not take into account transmission losses so the true figure would be higher.

As shown in Table 6, transport and logistics are estimated to account for almost 50% of GHG emissions in a typical development. In the current economic structure, the location of Malanda North restricts opportunities to achieve substantial reductions in this area due to the dependence on vehicle transport for goods and reliance on personal cars. A 'Zero Emission' target would therefore be unrealistic for this project at this time, accordingly we have established a very conservative target of just 10% for emissions reduction in this area. This target could easily be exceeded by use of alternative fuel cars, localising food supply and maximising on site employment and training.

Strategies

Develop a comprehensive carbon footprint for Malanda North to measure the success of the project in achieving a carbon reduction target.

Investigate opportunities to locally offset carbon emissions that can not be eliminated.

Four key areas have been identified for reduction of GHG emissions at Malanda North, being:

- reductions in stationary energy through demand management and on-site generation from renewable sources (refer previous section);
- partially offset emissions due to land use change, with on-site revegetation and minimising soil disturbance;
- reduce landfill related emissions by on-site composting and recycling (at least 50% of a typical residential waste stream is compostable);
- harvesting bio-gas from composting and wastewater treatment.

The success of these measures in achieving a carbon reduction target will be measured by a carbon footprint for the development. Carbon Footprinting is a tool for measuring and benchmarking the greenhouse gas emissions of an activity. It can be used to inform decision-making about the most cost effective means to reduce carbon and to evaluate design solutions to ensure the target is met. The carbon footprint can be validated against empirical information as the project matures, providing valuable research and monitoring data about the real life operation of the neighbourhood. The application of carbon footprinting to masterplanned communities in Australia is still innovative, but as data is accumulated there will be valuable opportunities to benchmark outcomes.

Targets

60% reduction in carbon footprint associated with stationary energy use per capita compared with best practice subdivision (>75% improvement on existing practices).

40% reduction in overall GHG emissions across site.

(Establish targets for embodied carbon following further research).

12 Water and Wastewater

12.1 Overview

The following is a summary of objectives, strategies and targets relevant to Water and Wastewater. The anticipated benefits are also summarised.

Objectives	Strategies	Targets	Benefits
Reduce reliance on mains water supply.	**Implement demand management measures to achieve a reduction target.**	Average daily consumption of less than 220 litres/person.	**Less demand on Malanda's water sources.** **Less wastewater output from site, resulting in less energy use and less discharge to the environment.**
Maximise use of water available on site. Reduce reliance on mains water supply.	**Neighbourhood water treatment system will collect rainwater from all roofs, treat it and return to houses for potable uses.**	80% reduction per capita in mains water consumption.	
Maximise use of water available on site. Reduce greenhouse gas emissions associated with energy, vehicle use, refrigerants, waste disposal and other sources. Reduce reliance on mains water supply.	**Greywater will be treated locally (either at each house or a cluster of houses) and returned to the houses for toilet flushing and in-ground irrigation.** **Limited harvesting of stormwater for external uses.**	80% reduction per capita in wastewater exported from site.	

12.2 Demand Management

Discussion

Reducing consumption is the most cost effective way of improving the water security of Malanda North. On average, Australians use around 300L of water per capita every day for household applications (ABS, 2006). Average use in North Queensland is somewhat higher at about 375 litre/person/day. In comparison the recent water restrictions in Brisbane saw daily usage drop to 140L per capita. The target set by the Queensland Government for South East Queensland is now 220 litres/ person/day. Water reduction targets have also been expanded to commercial properties, public open space and manufacturing industries, with a focus on reducing consumption as well as exploring alternative sources.

Significant savings can be achieved by use of water efficient fittings and appliances - 5 star appliances often use less than half the water of a non-rated alternative. Savings are also achieved by awareness raising and behavioural change. Effective maintenance of infrastructure to reduce losses due to leaks has also been shown to make a substantial difference.

Strategies

Implement demand management measures to achieve a reduction target.

Demand management measures that will be incorporated at Malanda North include:

- install smart meters in all buildings, supported by community education;
- separately meter all dwellings (regardless of tenure), each commercial space and major outdoor uses;
- mandate water efficient appliances and explore options to bulk-buy for inclusion in house and land packages;
- where possible, require commercial buildings to use geo-thermal or air-cooling for heat rejection rather than water cooling;
- use waterless urinals where possible;
- reduce decorative gardens/lawn areas and require use of low-water landscaping;
- reduce water requirements of food gardens by using permaculture principles;
- install car wash bays that collect and recycle water;
- prohibit private pools and install small community pools supplied with rainwater;
- provide non-potable water for external uses.

Targets

Average daily consumption of less than 220 litres/person.

12.3 Rainwater Harvesting

Discussion

A high-level water balance was conducted to evaluate possible water supplies for Malanda North. Several scenarios were compared, each with varying levels of mains water import, sewage export, rainwater and stormwater harvesting and greywater reuse. The scenarios included:

Scenario 1 – Base case/ traditional water supply and use

Scenario 2 – Use recycled water from the proposed Malanda sewerage treatment plant

Scenario 3 – Rainwater harvesting and reuse (with varying levels of greywater reuse)

Scenario 4 – Stormwater harvesting and reuse

This report does not consider the potential of extracting water from the river, or use of underground acquifers for extracting water and/or storing harvested water, as detailed site investigations have not been completed. The potential use of the river or acquifers as a source of water will be investigated and could deliver additional benefits in terms of self-sufficiency on site.

The details and analysis of each scenario are presented in detail in Appendix A4 and summarised below. It is apparent from this summary that the greatest performance in terms of minimising mains water usage is achieved under scenarios 4 and 3b. However scenario 4 is not recommended as it will interrupt environmental water flows. The recommended scenario, 3b, is described in more detail in the Strategies section.

Table 7 Analysis of water supply options

Scenario	Description	Mains Water Usage (L/person/day)	Sewerage Generation (L/person/day)	% per capita demand offset by internal sources
1a	Traditional water supply model and traditional subdivision layout of approximately 350 lots	375	220	0%
1b	Traditional water supply with demand management. Layout according to preliminary concept plan (700 lots)	220	130	0%
2	Recycled water returned from Malanda STP for non-potable uses and site irrigation	77	130	*65%
3a	Rainwater and greywater harvested on site and re-used for non-potable uses	111	130	50%
3b	**Rainwater harvested for potable uses and greywater recycled on site for non-potable uses**	**48**	**26**	**78%**
3c	Rainwater and greywater harvested on site for non-potable uses only	79	26	65%
4	Harvesting stormwater for all applications. No recycling of greywater	0	130	100%

Strategy

Neighbourhood water treatment system will collect rainwater from all roofs, treat it and return to houses for potable uses.

The recommended scenario is to use roof-collected rainwater for potable applications, and re-use greywater for irrigation and non-potable applications (discussed in Section 11.4). A schematic diagram of Scenario 3b is provided in Figure 6.

The proposed centralised tank system will involve a number of large, hydraulically linked rainwater tanks (and/or dams) with a combined capacity of between 4ML (1 months supply without rainfall) and 8ML (2 months supply without rainfall). Small tanks at each house will act as a first stage holding tank to manage flow in large rain events. Final tank size will be subject to site specific rainfall data and a cost-benefit analysis, taking into account options to import mains supplies. The design allows the system to be expanded in stages as the site develops.

The stored rainwater will be pumped from the storage to the top of the site for polishing, treatment to potable standards and distribution to dwellings and other buildings on site

An alternative model was considered involving the installation of storage tanks at each individual dwelling, fitted with small-scale treatment systems and pressure pumps to assure the delivery of high quality water to consumers. This was assessed as likely to be more energy and maintenance intensive. The communal system also provides opportunities to balance water across properties, such that houses with larger roof areas effectively subsidise units and other dwellings with smaller roof areas.

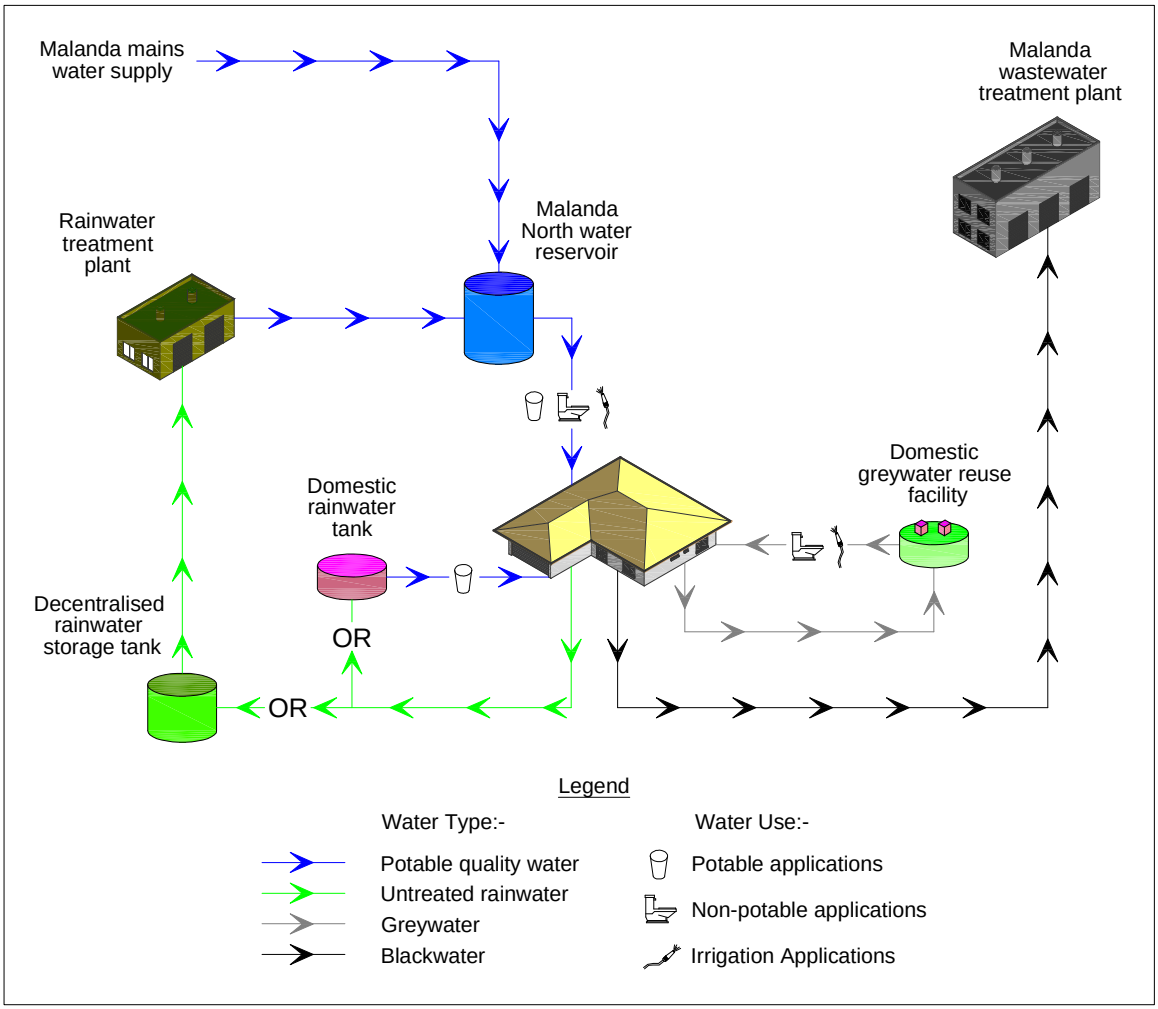
Modelling of this scenario indicates that rainwater harvesting could significantly offset the mains water demand, particularly during the wetter months of the year. Although total independence does not appear feasible during the drier months, it was found that rainwater harvesting could reduce the annual mains water consumption by at least 50% (subject to final tank sizing). When combined with demand management measures and recycling of wastewater as described in the next section, the target of 80% reduction seems possible.

A 50% per capita reduction would have the effect of creating no extra mains water demand from Malanda North in comparison to the Business as Usual subdivision with half the population. An 80% per capita reduction represents a 40% reduction on the Business as Usual subdivision.

Target

80% reduction in mains water consumption per capita.

Figure 9: Schematic diagram of Scenario 3b



12.4 Recycled Wastewater

Discussion

At least 50% of the water used in houses is used in yards and gardens and a further 20% is used for toilet flushing and laundries. On the whole these uses do not require water that is treated to a potable quality and could utilise wastewater products that are available on site. Reuse of wastewater has the added advantage of reducing sewerage and stormwater emissions from the site, both of which will add to the pollutant loads in the North Johnston River.

Strategies

Greywater will be treated locally (either at each house or a cluster of houses) and returned to the houses for toilet flushing and in-ground irrigation.

Limited harvesting of stormwater for external landscaping irrigation.

The water supply scenario 3b described in the previous section includes scope for greywater to be collected from bathrooms and laundries and treated for non-potable and irrigation applications. This may include laundries, toilet flushing, gardens, car-washing, arts and crafts manufacture, construction and external hosing. The reuse of greywater is projected to achieve the desired target of 80% reduction in mains water consumption per capita. Further increases in storage capacity and/or greywater use could have the effect of making Malanda North almost entirely self-sufficient for water.

Greywater reuse has several benefits. One being that it is essentially an infinite resource – as long as potable water is supplied to houses, greywater will be available. Greywater is also less complex and costly to treat than blackwater. Finally, the reuse of greywater reduces sewerage loads exported from site. (It is noted that sufficient flow must be maintained in the sewer and the system will be designed accordingly).

Greywater use will be supported by limited harvesting of stormwater via Water Sensitive Urban Design (WSUD) measures, including swales, detention basins and small check-dams. This is expected to have two benefits for water reduction. Firstly the use of WSUD increases the amount of stormwater that is absorbed by the landscape and environment, reducing demand for irrigation and watering. Secondly water can be extracted from retention basins for irrigation purposes when available. Overall this will have the effect of reducing uncontrolled and untreated stormwater flows from the site.

Target

80% reduction in wastewater exported from site.

13 Access, Transport and Circulation

13.1 Overview

The following is a summary of objectives, strategies and targets relevant to access, transport and circulation. The anticipated benefits are also summarised.

Objectives	Strategies	Targets	Benefits
Plan buildings, infrastructure and systems to reduce consumption of stationary and vehicular energy. Reduce greenhouse gas emissions associated with energy, vehicle use, refrigerants, waste disposal and other sources. Plan for non-fossil fuel based transport options. Secure a local supply of fresh food. Source labour, goods and services locally.	**Provide quality internet services to support web-based service delivery, shopping, work and study.** **Provide a coordinated delivery service to the site.** **Encourage households to have fewer and/or more fuel efficient cars.** **Plan road networks to accommodate buses.**	Minimum 10% reduction in transport related emissions in comparison to average for other Tablelands towns.	**Reduced impact on fauna.** **Reduce potential additional traffic on existing roads and delay demand for additional road infrastructure.** **Reduced transport related greenhouse gas emissions, thereby contributing to carbon abatement targets.**
Residents can meet basic services within a 15 minute walk or ride.	**Compact and walkable neighbourhood with majority of residents within walking distance of community and commercial activities.**	The majority of residents can access neighbourhood level services via a 15 minute walk (600m) and local centre services within a 15 minute bike ride.	
	Minimise parking to discourage short journeys.	20% of daily trips (by number) are made by walking/cycling.	
Environments are safe and accessible for users of all ages and abilities.	**The majority of streets, particularly accesses to dwellings, are designated shared zones.**	Residents regularly use streets for social activities and non-car based journeys.	

13.2 Reduction in Transport Related Emissions

Discussion

The Department of Climate Change estimates that transport contributes to approximately 14% of greenhouse gas emissions nationally. However figures presented previously in this report indicated that transport and logistics could account for almost 50% of greenhouse gas emissions in a residential development, due to the high number of vehicle journeys and the absence of industrial emitters.

Strategies

Provide quality internet services to support web-based service delivery, shopping, work and study.

Provide a coordinated delivery service to the site.

Source goods and services locally, including produce from local farmers.

Encourage households to have fewer and/or more fuel efficient cars.

Plan road networks to accommodate buses.

The Malanda North project team is exploring a number of ways to achieve the proposed strategies. Key options for further investigation include:

- establishing a high quality community web service;
- establishing food supply contracts with local farmers;
- coordinating delivery services so that residents can order goods and food over the phone or by internet which are delivered to site via a daily coordinated delivery service;
- setting up a car pooling/sharing service so that individual households can book a variety of vehicle types when required and so need less cars, smaller cars or even no cars;
- encouraging ownership of alternative fuel vehicles, such as by prioritizing small car parks and/or providing solar powered re-charge facilities for electric vehicles; and
- community ownership of a mini-bus/es to facilitate group travel.

Another effective means to reduce vehicle travel distances is to provide employment and services within close proximity to houses. A preliminary target has been established of at least 30% of residents being able to meet their employment and/or learning needs on site or by foot/cycle journey to Malanda. The inclusion of local shopping services, health care services and café/restaurant will provide further self-containment, thereby reducing the number of short trips that are made by car.

Target

10% reduction in transport related emissions in comparison to average for other Tablelands towns.

13.3 Walkable Community

Discussion

Recent research has shown that the design of cities, towns and neighbourhoods can contribute to, or detract from, the development of social capital and sense of community. Professor Giles-Corti identifies the potential for higher levels of social capital in more walkable neighbourhoods. (DEWHA: 2008). Many theorists argue that social capital has been in decline in urban and suburbanized communities over the past forty years. This aligns with rising levels of car ownership and use, and the trend towards dual-income households and longer working hours.

Traditional English and European towns provide evidence that private vehicle usage can be reduced through the development of compact, walkable communities where it is easier (and sometimes quicker) to walk or ride to the shop, school, park or work. These choices are supported by reducing convenience for cars, including measures such as narrower streets, one-way routes, and fewer car parks. Social commentators in America and Canada have also documented a trend away from suburbia to urban centre, as people seek a more engaged social environment in the form of urban, walkable localities.

Whilst Malanda North will not have the benefit of size and density of a European city, it will have some of the attributes of a European village which are far less car dominated than Australian country towns.

This is not to deny that residents will require a car at times in order to travel to specialised services that are not available locally. The challenge is to reduce the number and length of trips that are made in private cars. This can be influenced by planning and design of the neighbourhood. Research undertaken in Perth for example, demonstrates that residents in older, inner city suburbs are able to walk to a local store to get daily supplies, whereas residents in newer suburbs in Perth often use more than a litre of fuel just to buy a litre of milk.

Strategies

Compact and walkable neighbourhood with majority of residents within walking distance of community and commercial activities.

Minimise parking to discourage short journeys.

The concept plan provides an interconnected network of pedestrian/cycle pathways throughout the proposed development to connect key site destinations and services e.g. school, convenience store, health facilities, parks etc. This can reduce the use of cars for short trips. The compact form of the site and provision of a mix of uses will also reduce the distance required to access these destinations. Together, these will provide residents with the means to travel to key destinations by non-car based transportation modes within 15 minutes (approximately 600m walk for an older person or a child).

The provision of pathways in itself does not guarantee that residents will use them. In urban areas, short car trips (less than 1km in distance) can make up a large number of car trips. In order to promote walking and cycling, pathways will be designed to enhance comfort and using established

principles known to improve safety of the public environment. (Crime Prevention through Environmental Design (CPTED). Such principles include: overlooking, adequate lighting and avoidance of places where people can conceal themselves.)

The location of the site can further encourage non-car based travel due to its close proximity to the main street of Malanda and the facilities and services located there. If a new pedestrian/cycle bridge were constructed over the North Johnstone River it would be approximately a 15 minute walk to the Malanda main street. For many residents this access will be more direct than road access. It is envisaged the link will be particularly well used by children, youth and older people.

Choosing non-car based transport modes can be further encouraged by making it harder to drive, therefore 'convenient' parking will be given over to cycles and small electric buggies with larger cars having to travel further for parking, streets will be narrower with speed restrictions and pedestrians and cyclists will have right of way at intersections between streets and pedestrian/cycle paths. It is also proposed to investigate options for a cycle hire system similar to those pioneered in Paris so that visitors to the site can park their car in a central location and then cycle around the site.

Targets

The majority of residents can access neighbourhood level services via a 15 minute walk (600m) and local centre services within a 15 minute bike ride.

20% of daily trips (by number) are made by walking/cycling.

13.4 Liveable Streets

Until the 1960s, Australians tended to occupy living rooms and verandahs at the front of their houses for their social life. Cars and sheds were relegated to the back of the property. Neighbours had chats over front fences and elderly people with time on their hands were the eyes and ears of the street. Children played on the street and cars navigated around this activity, or the activity navigated around them.

Over the past few decades this pattern of occupation has reversed. We have retreated to family rooms and patios at the rear of our houses, hidden away from the traffic on the street but also from neighbours. The fronts of houses are now dominated by cars and opportunities for informal interaction have diminished. Children play in front of the television or computer and cars reign unchallenged. Instead of being designed for people, our streets are designed for cars; this influences everything from the shape of the street, to the choice and location of landscaping, relationship of buildings to the street, and the isolation of play areas from the streets where we live.

In the 1960's a Dutch traffic engineer, Hans Monderman, began putting into practice his theory that traffic efficiency and safety could be improved by requiring users to negotiate their movements with other users. A practical example of Monderman's ideas is 4-way intersections that have a roundabout but are otherwise unsigned, uncontrolled and unregulated. No mode of transport or stream of traffic has a right of way, therefore all users must make eye contact and negotiate right of way with other users.

Monderman also applied these ideas to residential streets. His ideas which are known as 'shared space' or 'shared streets' have been widely adopted by the Dutch and in some German cities in the form of 'Woonerf' which literally means "residential yard". Initially Woonerf varied immensely based on the needs and preferences of neighbours, although they have now been legislated and tend to follow a formula. Common elements include:

- an absence of curbs and distinction between road and footpath, with pedestrian and playing children able to use the full width of the street;
- tree planting in the street and the creation of green spaces in front of dwellings; and
- limited signage and controls, including over where cars can park.

Shared streets are now being implemented in the UK as 'Homezones' through a Government supported trial, and some American cities have adopted the Woonerf concept. Shared zones have had minimal uptake in Australia.

Strategies

The majority of streets, particularly accesses to dwellings, are designated shared zones.

The concept plan includes a central circuit road that is envisaged as a fairly typical street design. However all other streets will be treated as a public domain shared for a number of activities, of which the driving and parking of cars is just one. This includes all streets and access ways within the residential clusters and community plazas.

Consideration will be given to planning the streets as a 'blank canvas' which allows the detailed form to be developed over time by residents, with more or less space given over to cars, play area, garden beds or sitting spaces depending on the needs of the cluster. The core infrastructure that would be provided would be a sealed or paved strip without kerbs, that drains to swales on one edge. Residents could alter the use of this space in time to suit their needs.

Target

Residents regularly use streets for social activities and non-car based journeys.

14 Landscape and Ecology

14.1 Overview

The following is a summary of objectives, strategies and targets relevant to landscape and ecology. The anticipated benefits are also summarised.

Objective	Strategies	Target	Benefits
Protect areas of high ecological significance.	**Landscaping will incorporate buffers of native vegetation to the existing riparian corridors.** **Existing flood plains will be retained as open space areas.**	At least 10% of the site has native vegetation cover. Flood areas remain unimpeded.	**Protection and expansion of available habitat will benefit regional bio-diversity.** **Health of waterways and associated eco-systems is maintained.**
Design buildings for more extreme climatic conditions. Secure a local supply of fresh food.	**Develop a network of landscaped corridors providing visual amenity, temperature control, food forests and ecological benefit.**	At least 20% of the site is committed to green corridors, including stormwater management, food forests, native vegetation and pedestrian paths.	
Maximise use of water available on site.	**Best practice Water Sensitive Urban Design, measures are included across the site.**	No net worsening of water quality in the adjacent watercourses due to runoff discharged from the site. Environmental flows to the adjacent watercourses are maintained.	

14.2 Ecological Values

Discussion

High level vegetation mapping of the site undertaken by the Queensland Herbarium does not record any significant regional ecosystems on the site but does identify *mesophyll* vine forest adjacent to the site in the Malanda Falls Conservation Park. *Mesophyll* vine forest is classified as a 'Not of Concern' regional ecosystem (7.8.2) under the *Vegetation Management Act* but is identified as essential habitat for species listed as endangered, rare, vulnerable or near threatened under the *Nature Conservation Act 1992*. Whilst this does not impact directly on the proposed development, consideration must be given to negating potential impacts on this habitat.

The EPA's wildlife records show that 17 fauna species have been recorded in the vicinity of the site. The majority of these are common bird species, with the exception of the Tapping Green Eyed Frog *(Litoria genimaculata)* and the Lumholtz's Tree Kangaroo which are listed as Rare in the *Nature Conservation Act 1992.* The Queensland National Parks and Wildlife Service have confirmed that both these species have been observed utilising the waterway corridors bordering the site and the adjacent Malanda Falls Conservation Park, which also provides habitat for possums, over 50 bird species and other insects, amphibians and reptiles.

The North Johnstone River corridor has been identified as a wildlife corridor that supports movement of the tree-kangaroo between remnant habitat areas. This corridor is subject to 'edge effects' which means they have a greater susceptibility to natural and man-made disturbances such as soil erosion, poor water quality, invasion by weed and pest species, disease introductions, fire and encroaching development. This reduces their ability to provide the necessary resources and refuge that fauna species need.

Both of the rare species and the many other fauna species that inhabit the riparian corridor and conservation park may potentially experience adverse impacts from the proposed development if protection measures are not put in place.

Strategies

Landscaping will incorporate buffers of native vegetation to the existing riparian corridors.

Existing flood plains will be retained as open space areas.

Malanda North will make use of, and partially revegetate, a previously cleared site. This can have the benefit of reducing the demand for other sites with higher ecological value, be it agricultural land or important habitat. It is proposed to maximise the use of this land parcel to reduce suburban sprawl and protect the region's remaining green and open spaces.

In terms of ecology, a primary objective is to protect the areas of ecological significance and enhance biodiversity. Malanda North has been planned so as to support the ongoing viability of the wildlife corridor by limiting the impact of edge effects on the North Johnstone River wildlife corridor. This will be supported by additional planting and ongoing maintenance of the vegetated area. The benefits to the wildlife corridor will be a greater area of habitat, reduced erosion, improved water quality and reduced weed and pest species invasion.

However residential development can impact on wildlife species. Strategies to minimise those potential impacts are listed in the table below.

Table 8: Potential fauna impacts and proposed responses

Potential Impact	Response
Domestic animal hunt/ attack native fauna	The Currumbin Eco-village has implemented a ban on cats and dogs. The presence of wallabies and other native fauna around the village is immediate evidence of the success of this policy. However it could be difficult to enforce/realise a ban on pets for the size of population proposed at Malanda North. An alternative may be to place covenants on properties within a defined buffer area of the riparian zones and enforce controls such as fencing and curfews over the remainder of the site. This will be subject to further consultation.
Lighting affects the behaviour and safety of nocturnal species	Design of street lights and a 'night skies policy' across the site that places covenants on buildings to reduce light spill will achieve this outcome. External areas likely to require night lighting shall be located away from the riparian corridors.
Fauna are attracted by roadside growth and at risk of vehicle impacts	The concept plan and landscape strategy retain and expand the existing riparian corridors and include green corridors across the site. However road-side landscaping will be planned to reduce the attraction of fauna. Speed limits can also assist in reducing road kill. Overhead fauna bridges may also be required at key corridors.

Targets

At least 10% of the site has native vegetation cover.

Flood areas remain unimpeded.

14.3 Green Corridors

Strategies

Develop a network of landscaped corridors providing visual amenity, temperature control and ecological benefit.

A network of green corridors is a central element in the concept plan. Some follow contours and provide stormwater drainage paths, others run across the site creating connections and defining space. The corridors will provide shade and relief from winter winds. They will bring the benefits of vegetation and some fauna into residential and community areas and can be used as food forests. They will assist in erosion control. The corridors will also define small residential clusters across the site, creating a sense of identity for residents.

It is also proposed to investigate options to incorporate green roofs in larger buildings across the site. This may be in the form of a planted turf roof, such as in Parliament House, or a trafficable roof used for a container garden. It is expected a green roof will offer some climatic advantages, however the benefits will need to be offset with reduction in collected of potable water and area available for energy generation.

Target

At least 20% of the site is committed to landscaping, including stormwater management, food forests, native vegetation, green corridors and open space.

14.4 Environmental Water Quality

Discussion

It is estimated that in an undisturbed environment as much as 90% of stormwater is absorbed into the soils and water table, transpired by trees or evaporates. Only about 10% makes its way to watercourses. The natural environment plays a significant role in filtering contaminants and managing the flow and quality of water to reduce impacts on watercourses. As land is progressively cleared, less water is retained by the environment and there is less filtering and slowing of the water, resulting in pollution, erosion and turbidity. Agricultural activities and urban development add to the pollutant load. Even low levels of development can have significant impacts on surface and groundwater quality and the health of waterways.

The Malanda North site is largely cleared and used for grazing purposes, surface water leaving the site is likely to contain high levels of nutrients and microbiological contaminants from animal faeces, amongst other things. The lack of substantial vegetation also means that less water is captured on site and there is little capacity to control the velocity of water flows off the site.

Strategy

Best practice Water Sensitive Urban Design measures are implemented across the site.

Water Sensitive Urban Design (WSUD) is a widely accepted technique for improving the quality of stormwater leaving a site by mimicking natural processes. Key to WSUD is the use of open swales rather than underground pipes and inclusion of ponds or basins that detain and store water, allowing pollutants and solids to settle out. The swales and ponds reinstate the connection between stormwater and environment – allowing water to be absorbed by plants and soils, or stored on site for other uses.

The South East Queensland Healthy Waterways Partnerships has established objectives for WSUD that are achievable in South East Queensland using best practice WSUD measures. (Concept Design Guidelines for WSUD: 2009). These objectives are expressed as a reduction in pollutant load when compared to run-off from unmitigated development on the same site. They are:

- 90% reduction in gross pollutants (ie litter etc)
- 80% reduction in total suspended solids (TSS)
- 60% reduction in total phosphates (TP)
- 45% reduction in total nitrates (TN)

The Queensland Water Quality Guidelines (QWQG) include trigger values for pollutants in upland streams in the wet tropics (considered relevant to the North Johnstone River). These are 0.15 for Total Nitrates (TN) and 0.01 for Total Phosphates (TP). Unmitigated stormwater discharge from any level of development on the site would not meet this value, and generic data for run-off from rural sites suggest that the site in its current condition may not even meet these values. It is anticipated that very rigorous WSUD measures will be required to satisfy the requirements of the QWQG.

Detailed analysis of the water quality of receiving catchments and existing site conditions is required in order to design an appropriate WSUD response that will deliver the required quality of water to Cleminson Creek and the North Johnstone River. This process will involve the use of advanced modelling tools for detailed design purposes.

However at this early stage it is envisaged the site will include the following best practice measures:

- education,
- grass swales,
- gravel filters/ retention,
- gross pollutant traps,
- grounds keeping regime,
- porous pavement,
- retention basins and water polishing ponds.

The 'greenfield' nature of the site enables the incorporation of these measures from the outset of the project. Swales and retention areas are shown on the concept plan.

It is noted that maintaining adequate environmental flows to the waterways and to groundwater is also important. WSUD has the benefit of enabling groundwater recharge and, although some harvesting of stormwater is proposed, this will be controlled to maintain environmental flows.

Targets

No net worsening of water quality in the adjacent watercourses due to runoff discharged from the site.

Environmental flows to the adjacent watercourses are maintained.

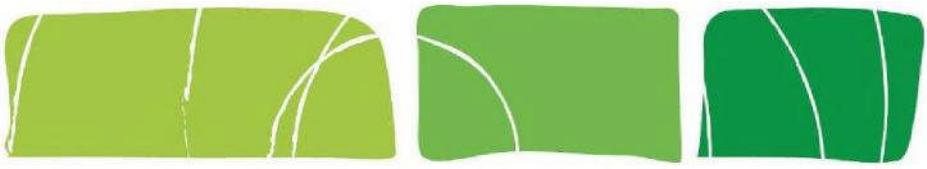
15 Next Steps

This Concepts Report is the first step in communicating the Malanda North concept. The Report will be followed by market research, feasibility analysis and consultation with community and industry stakeholders. A facilitated review process will then held to provide a forum for community members, stakeholders and the project team to comprehensively explore, debate, refine and modify the concept before proceeding with any further design and planning. A purpose of the review will be to marry community aspirations with the strategic framework for the project.

Following development of a revised concept the project team will prepare an application for Preliminary Approval to Council. This will application will involve further community consultation.

The diagram below represents key activities in the coming months.

Stage	Community Participation	Business Development	Planning and Design
Concepts Report *Sep 2009*	Distribute to Council and key stakeholders. Post on web. Media release.	Complete preliminary business feasibility case for project. Market research.	
Review Period *Oct – Nov 2009*	Open invite to facilitate review workshop. Information on web and media about community feedback. Consultation with Malanda Businesses.	Detailed economic opportunities and benefits study. Business prospectus for project partners.	Design team and additional specialists participate in extended review workshop. Develop revised design concept and brief.
Design Development *Dec 2009 – Jan 2010*	Key stakeholder/interest group consultation regarding specific project details. Regular web updates.	Update business feasibility case on basis of design proposals. Consult with potential enterprises.	Developed detailed design documentation for preliminary approval application to Council. Impact assessment.



APPENDICES

A1: Summary of Town Planning Requirements

Legislation/Policy	Constraint	Implication/Response
FNQ Regional Plan	Greenfield development should achieve average housing densities of 12-15 dwellings per hectare or above for urban areas outside Cairns.	Achieved in Concept Plan
	Suggested setbacks from a waterway are 50m of each highbank of stream order 5 or 25m for streams of order 1 to 4.	Achieved in Concept Plan
Eacham Shire Planning Scheme	The land is not currently identified in the urban expansion zone of the Eacham Shire Planning Scheme.	Is included in Urban Footprint in Regional Plan. Requires MCU-Impact Assessable Application
	The development site is mapped as good quality agricultural land - will require response to State Planning Policy 1/92 Planning Guidelines – The Identification of Good Quality Agricultural Land	Inclusion in Urban Footprint in Regional Plan may over-ride GQAL mapping
	Contains small area of remnant vegetation near Lot 320, NR7755 and is adjacent to a protected area (under Nature Conservation Act)	Ecological values are protected in Concept Plan
	Urban Expansion Code: Building height is a maximum of 8.5 metres above natural ground level	Equate to two storey development (possibly 2 storey with loft)
	Business and Retail Code: Front Boundary: buildings and structures are to have zero setbacks to any road frontage.	Consistent with Concept Plan
	Multiple Dwelling Code: Site Dimensions: The site has a minimum area of 800m2 and has a minimum frontage of 20metres. Density: For an Accommodation Building, Multiple Dwelling, Retirement Village or Tourist Accommodation, the development does not exceed a density of one dwelling unit per 300m2 site area. Equates to 1630 dwellings Site Coverage: Site cover of the development is no more than 40%.	Relates to individual development sites and is not yet addressed in the Concept Plan. Compliance to be determined.
	Works, Services and Infrastructure Code Car parking is provided at the following minimum levels: Multiple dwelling: 1 bedroom – 1 covered space 2 bedroom – 1.5 covered space + 0.25 visitor parks 3+ bedroom – 2 covered space + 0.25 visitor parks Retail/Food establishment: 1 space per 40m2 GFA	Relates to individual development sites and is not yet addressed in the Concept Plan. Compliance to be determined, however scheme requirements may be higher than proposal, particularly in regard to covered space.

Legislation/Policy	Constraint	Implication/Response
	Rural Lands Setback: A 2004 letter of advice made the following statement ' while Lot 3 on SP140880 remains within a rural zone, and used for rural purposes, a tree crop shall be planted and maintained within Lot 3 on SP140880 for the full length of the boundary with Lot 1 on SP140880 and at a minimum width of 40m'.	Set back to rural land can be achieved through staging of development. It is noted that the adjacent land is included in the Urban Footprint in the regional plan.
FNQROC	No more than 10 per cent of residents should have to walk in excess of 500 metres to catch a bus.	Not possible at present due to the lack of bus service. Planning of the road network will support this target when public transport is available.
	Open Channels: Generally, open channels will only be permitted where they form part of the trunk drainage system.	This requirement does not reflect best practice WSUD and will be challenged.
	Minimum water Supply: Design of Water Supply Schemes shall be for Average Daily Consumption (AD) 500 litre/person/day	This figure is inconsistent with current practice and will be challenged.
	Sewer: Conventional infrastructure includes gravity sewers, lift stations, area pumping stations and rising mains. The use of unconventional infrastructure shall require special approval and may require extended maintenance periods and a higher value for performance bonds. Proposals will be considered on the basis of good engineering practice and are to be subject to a benefit cost analysis.	Unconventional infrastructure is proposed and the benefits will be demonstrated.
	Street Lighting: All light columns, luminaires and lamps are to be specified from the Electricity Authority's Lighting Construction Manual.	Subject to negotiation – energy efficiency fittings will be required.
	Main Roads require a minimum 40m distance between Malanda Atherton Road Reserve and building alignments. (2001 approval)	Achieved in Concept Plan
Other State Legislation/ Requirements	Only a very small portion of the site is identified in the EPA vegetation mapping, and that area is classified as non-remnant vegetation but as a cassowary and tree kangaroo habitat. The EPA confirm that tree kangaroos exist in the adjoining reserve and that cassowaries could return if corridors/habitat was re-established.	Protected in Concept Plan
	The site is identified as GQAL.	Inclusion in Urban Footprint in Regional Plan may over-ride GQAL mapping

A2: Economic Analysis, Cummings Economics

MALANDA NORTH PROJECT

Economic Aspects

Ref: J2208
May 2009

Table of Contents

1. INTRODUCTION

1.1 General

We were asked by the proponents of the ***Malanda North Project*** to provide a brief report on the economic benefits of the development.

1.2 The Project in Outline

The Malanda North project involves the development of a residential and a limited business and community services precinct that will eventually accommodate about 700 dwellings on the outskirts of Malanda.

The development is on the north western side of Malanda, separated from its core business area by the upper reaches of the North Johnstone River/Malanda Falls area.

It will be linked to the business district via the Atherton Road and by footpaths/walkways over the North Johnstone River.

It is proposed that it will be a leading edge development in relation to environmental impact and incorporate 'village' type features that encourage diversity of types of buildings, at home work places, pedestrianisation, social interaction and community atmosphere.

However, it is not envisaged that the level of retail/commercial development/facilities will be high and that the area will still look to the existing core business area of Malanda for these types of services.

The area of land upon which the Malanda North development is to occur has an aged care facility operated by Ozcare located next to it that is a significant generator of employment.

In economic terms, the Malanda North can be considered as a further development of the township of Malanda but with a special relationship with the Ozcare aged person facility and be developed in a way that is attractive to a new type of resident on the Tablelands who is looking for a special environmentally sensitive and village type lifestyle.

2. ECONOMIC CONTEXT

2.1 General

Malanda has historically existed as the leading service centre for the south eastern portion of the Tablelands, an area traditionally comprising the former Eacham Shire local government area.

The area is about 800 meters above sea level, situated in the higher year-round rainfall 'wet tropics' area with topography ranging from undulating to steeply folded, and with large areas of fertile volcanic soils.

He whole area was originally covered with dense upland tropical rainforest with many clear water streams and waterfalls.

The climate of the area (high year-round rainfall at altitude) is not common across northern Australia and this has given the area a special position in the wider economy of the north.

Much of the area was cleared in the late 1800's/early to mid-1900's, mainly for dairying but with some cropping on the flatter areas, particularly of maize that is heavily used to provide supplementary feed for the dairy industry.

The special climatic conditions of the area (high rainfall and at altitude), have provided the basis for the emergence of the area (along with the Ravenshoe district to the immediate west), as a core dairy products production area based on high yielding European breeds, servicing markets across northern Australia.

Apart from providing milk throughout northern Queensland, the "longest milk run in the world" provides milk across to Darwin.

The industry went through a difficult period in the early 2000's. The introduction of dairy deregulation saw the number of farms and production cut substantially.

Current impacts of the global financial crisis on overseas dairy product prices is of concern once currently contracted prices to farmers run out over a number of years. However, in the longer run, dairy products can be expected to benefit from rising incomes in Asia. The area also has an advantage of proximity to a strongly growing northern market for fresh milk. Almost all production these days goes to fresh milk production.

Cheese production has ceased at the main processing plant at Malanda.

However, diversified speciality production of cheeses, yoghurts and chocolates has been developing in the area to service local markets.

The area's basic underlying climatic conditions are highly favourable for other agricultural and pastoral production. Some of the pastures have for instance, gone over to high quality beef production.

A small tea industry is now well established in the area.

A timber industry in the area based on high value rainforest cabinet timbers declined and has ceased following the declaration of the World Heritage Wet Tropics area.

The area's special climatic regime has also given it a significant place in local tourism.

The area's links by sealed roads to the northern Tablelands area and the coast via the Gillies and Palmerston Highways have facilitated a long standing role in day trip movements from the coast, especially out of Cairns proceeding over circuits that have traditionally included the Kuranda Scenic Rail and Kuranda, as well as the attractions of the southern Tablelands.

The Lake Barrine Cruise, the Curtain Fig, the Crater and the Malanda and Millaa Millaa Falls have long been part of the region's tourism icons.

A strongly expanding population in the Far Northern and Northern regions along with demand from southern Australia has provided the basis for expanding participation in overnight visitation, especially in the area's burgeoning 'homestay'/B&B accommodation.

The area is a major beneficiary of recreational visits from the coast.

Cooler climatic conditions along with year-round rainfall making for ease of gardening have made the area a highly desired place for retirement and for weekender properties for population from the coast.

Within the former Eacham Shire area, Malanda's position as the leading service centre has been consolidated by its traditional role as centre of the Shire's local government and location of the area's main dairy factory/processing works.

The State Government has established a small crown industrial estate on the eastern side of Malanda.

Yungaburra and Millaa Millaa have traditionally been smaller. However, Yungaburra's population has been boosted in more recent years by a more prominent role in tourism including bed and breakfasts and the rise in rural residential in the Tinaburra area.

Millaa Millaa declined under the influence of the closure of its cooperative dairy factory and timber mills.

2.2 Population & Workforce

The following tables give longer and shorter term growth in estimated residential population, Eacham Shire, and the three southern Tableland shires (Atherton, Eacham and Herberton Shires) as a group.

Table #1: Long-Term Estimated Residential Population Growth, Eacham Shire

	Growth	Average Annual Growth
1976 – 1981	3,750 to 4,150	2.0% pa
1981 – 1986	4,150 to 5,180	4.5% pa
1986 – 1991	5,180 to 5,777	2.2% pa
1991 – 1996	5,777 to 6,298	1.7% pa
1996 – 2001	6,298 to 6,318	0.1% pa
2001 – 2006	6,318 to 6,771	1.4% pa
Total 1976 - 2008		**1.9% pa**

Source: Cummings Economics from ABS data.

Table #2: Estimated Residential Population, Eacham Shire, 2001 - 2008			
	No.	**Growth Over Previous Year**	
		No.	**%**
2001	6,318		
2002	6,475	157	2.5%
2003	6,609	134	2.1%
2004	6,704	95	1.4%
2005	6,742	38	0.6%
2006	6,771	29	0.4%
2007	6,804	33	0.5%
2008	6,859	55	0.8%

Source: Cummings Economics from ABS data.

Table #3: Estimated Residential Population, Southern Tablelands (Atherton, Eacham, Herberton Shires Combined)			
	No.	**Growth Over Previous Year**	
		No.	**%**
2001	22,322		
2002	22,709	387	1.7%
2003	23,073	364	1.6%
2004	23,329	256	1.1%
2005	23,584	255	1.1%
2006	24,072	488	2.1%
2007	24,533	461	1.9%
2008	24,957	424	1.7%

Source: Cummings Economics from ABS data.

The following gives intercensal growth 2001 to 2006.

Table #4: Intercensal Growth, Population Census Count by Age Group, Eacham Shire			
Age Group	**2001 No.**	**2006 No.**	**Percent Growth**
0 – 14	1,426	1,359	-4.7%
15 – 24	535	606	+13.3%
25 – 34	599	491	-18.0%
35 – 44	988	909	-8.0%
45 – 54	940	1,033	+9.9%
55 - 65	776	1,001	+29.0%
65+	811	1,020	+25.8%
Overseas Visitors	174	169	
Total	**6,249**	**6,588**	**+5.4%**
Total excl o'seas visitors	**6,075**	**6,419**	**+5.7%**
Age 60 plus No.	**1,164**	**1,504**	**+29.2%**
Percent of Total	**19%**	**23%**	

Source: Cummings Economics from ABS Census data.

Table #5: Intercensal Growth, Population Counts, Eacham Shire – Urban Centres*			
	2001 No.	**2006 No.**	**Percent Growth**
Malanda *			
Residents	939	956	+1.8%
Visitors	85	59	
Total	1,024	**1,015**	
Resident Age 65 plus %	**17.7%**	**18.1%**	
Millaa Millaa			
Residents	264	279	+5.7%
Visitors	45	44	
Total	309	**323**	
Resident Age 65 plus %	**18.7%**	**23.7%**	
Yungaburra			
Residents	833	871	+4.6%
Visitors	176	125	
Total	1,009	**996**	
Resident Age 65 plus %	**17.3%**	**20.7%**	

** Note: Malanda boundary does not include area of Ozcare Home, see Table below.*
Source: Cummings Economics from ABS Census data.

Table #6: Malanda – Urban Area plus Area in which Ozcare Home Located (2001 – CD 3030713, 2006 CD's 3030713 & 716)				
Census Count excl o'seas visitors	**2001 No.**	**2006 No.**	**Growth No.**	**%**
Total	1,676	1,902	226	+13.5%
Age 65 plus No.	264	380	116	+43.9%
Percent	15.8%	20.0%	51.0%	

Source: Cummings Economics from ABS Census data.

The following table shows intercensal changes in the workforce for Eacham Shire.

Table #7: Intercensal Changes in Employed Persons, Eacham Shire, 2001 to 2006			
Industry	**2001**	**2006**	**Change**
Agriculture, forestry & fishing	479	400	-79
Mining	21	46	+23
Manufacturing	214	235	+20
Electricity, gas, water & waste services	18	26	+8
Construction	182	205	+23
Wholesale trade	77	87	+10
Retail trade	241	264	+23
Accommodation & food services	175	229	+54
Transport, postal & warehousing	80	109	+19
Information media & telecommunications	19	18	+3
Financial & insurance services	33	26	-7
Rental, hiring & real estate services	27	41	+14
Professional, scientific & technical services	84	106	+22
Administrative & support services	41	51	+10
Public administration & safety	141	203	+62
Education & training	238	252	+14
Health care & social assistance	192	255	+63
Arts & recreation services	33	26	-7
Other services	64	92	+28
Inadequately described/Not stated	70	65	-5
Total	**2,429**	**2,736**	**+307**

Source: Cummings Economics from ABS Census data.

The following shows changes in male/female numbers in the workforce.

Table #8: Intercensal Changes in Employed Workforce, Eacham Shire, 2001 & 2006				
	2001	2006	Change	
	No.	No.	No.	%
Males	1,323	1,437	114	+8.6%
Females	1,106	1,299	193	+17.5%
Total	**2,429**	**2,736**	**307**	**+12.6%**

Source: Cummings Economics from ABS Census data.

The following comments on the above tables.

Long-term population growth of Eacham Shire 1976 – 2006 is 1.9% per annum.

The indications are that a relatively high rate of growth of residential population being exhibited in the early 2000's of over 2% dwindled off to a low of 0.4% in 2005/06 with total given of 7.2% between 2001 and 2006. The indications were that this growth was a bit slower than that indicated for the combined southern Tablelands area including Atherton and Herberton also of 7.8% over the 2001 to 2006 period.

The indications are that during this period, the area's employment was affected quite heavily by the impacts of dairy deregulation. Workforce recorded in agriculture dropped steeply 2001 to 2006 from 479 to 400, ie. by 16.5%.

However, this was offset by strong growth in other sectors and workforce grew by 307 over the period 2001 to 2006, ie. by 12.6%, a rate substantially faster than population growth.

Persons employed in mining more than doubled from 21 to 46.

Manufacturing employment grew by about 9%. Construction grew by 12.6%.

Employment in accommodation and food services grew by 30.9% reflecting continuing growth in tourism.

Strong growth was recorded in administrative and support services of 62, up 44.0%, and health care and social assistance of 63, up 32.8%, reflecting the establishment of the aged care facilities.

Consistent with the above patterns, many of the additional employment places were for females, up by 193 (17.5%), compared with males up 114 (8.6%).

Age group figures indicate a very sharp increase in population over 45, but also in 15 to 24 age group – a group that is traditionally low in the region. The increase in population 55 to 65 years was very strong at 29% and 65+ at 25.8%. Population 60 plus rose from 19% of total to 23%.

It is clear that the aged persons' facility has added to a general upward trend in the older age profile of the area.

When the urban centre figures for Malanda are adjusted to include the census districts in which the Ozcare facility is located, they illustrate that Malanda represents about 30% of the Shire's population. They indicate that of the Shire's census count population growth 2001 to 2006 (excluding overseas visitors) of 344, some 226 or 65% took place in the Malanda area with 116 being age 65 plus in that area, ie. accounting for about a third of the Shire's population growth.

Thus, the indications are that the strong negative impacts of the dairy deregulation on Eacham Shire were counter balanced by strong growth elsewhere, that much of this growth took place in the Malanda area, and was associated with a sharp rise in employment, especially for females and in older population.

Indications since then are that the dairy deregulation effects have moderated and that the population growth rates are on their way back up again.

2.3 Property Developments

The following tables show building approvals in Eacham Shire 2004/05 to latest available and number of sales and median house prices for Eacham Shire 2003 to 2008.

Table #9: Building Approvals, Eacham Shire (Tablelands – Eacham)

	9 Months to March 2008/09	2007/08	2006/07	2005/06	2004/05	2004/03
Dwellings						
Houses	29	61	32	25	19	12
Non-house	-	2	-	-	-	-
Total	**29**	**63**	**32**	**25**	**19**	**12**
Value						
Dwellings	$9.8 m	$20.1 m	$11.4 m	$6.3 m	$5.0 m	$2.4 m
Other	-	$1.6 m	$2.2 m	$2.0 m	$0.4 m	$0.1 m
Total	**$9.8 m**	**$21.7 m**	**$13.6 m**	**$8.3 m**	**$5.4 m**	**$2.5 m**

Source: Cummings Economics from ABS Census data.

Table #10: Median Sale Values – Houses, Eacham Shire

	No. of Sales	Median Value
2003	124	$104,000
2004	80	$138,000
2005	87	$180,000
2006	63	$250,000
2007	73	$290,000
2008	49	$305,000

Source: Cummings Economics from RP Data.

The tables indicate that from 2003 onwards, sale prices of houses have increased three-fold to end 2008 and numbers of houses approved grew steadily 2004/05 to 2007/08. However, house sales recorded have dwindled off.

There is some evidence of a slowing in approvals in 2008/09 but not back to the 04/05 and 05/06 levels and it is likely that more recent figures will show a plateauing of house sale prices.

Average building approvals over the six years recorded was 31 and home sale numbers 79.

The figures reflect a steady demand for new houses in the area:

a) To accommodate population growth.

b) To accommodate demographic shifts of an ageing population and smaller families.

c) To meet a need for housing relocation, especially a tendency in rural areas for agriculture dependent employment to relocate from farm to district service centres as higher on-farm efficiencies are achieved through use of specialised machinery equipment and service inputs.

d) To meet a need for housing renewal and modernisation.

A feature of the approval figures is an apparent low supply up to the present of non-house dwellings.

3. FUTURE DEMAND

Looking forward, it seems likely that a number of factors will see continuing steady growth occur in the south east Tablelands area.

It will continue to be one of the north's strong areas of agricultural/pastoral production with a continuing trend towards diversification of production and processing.

The area will continue to grow as a tourism/recreation area in the Far North Queensland context with three factors being particularly relevant:

- Growing regional population in the regions of north eastern Australia based on Cairns and Townsville.
- Growing 'grey nomad' drive tourism, but also fly/drive tourism.
- Moves to establish larger more up market tourist accommodation in the area.

The area will continue to be highly attractive to a strongly growing older age demographic for post retirement residence.

The area will continue to be highly attractive as a lifestyle location for persons whose employment is not location specific, eg. mine fly-in/fly-out workers, arts, craft and scientific research workers.

A further factor has become evident as starting to impinge on the area in the future and that relates to education. The past decade has seen development in the international school group visitation seeking environmental and farm education in the area.

James Cook University is increasing its presence strongly in the Far North Queensland region and its veterinary faculty is establishing facilities adjacent to the Malanda North development for students studying procedures for the livestock industries.

While there are a number of short-term threats around due to the current global financial crisis to the dairy product prices and tourism, it can be expected that these will be transitory and that over the duration of the development, more normal growth patterns will resume.

The market strength of the development is its location and its form. It is especially geared to cater for:

- Expected growth of Malanda as the leading urban service centre in the south west Tablelands area.
- Its location in relation to the major new employment generator of the Ozcare facilities and opportunities for employees and providers of the type of services needed by the facility to locate nearby, not just to service the facility to provide services both to it and to a wider Tableland community.
- Its location adjacent to the James Cook University facility.
- The potential attractiveness of the development to persons whose employment is not location specific.

It is thus our expectation that the development will experience a steady demand for allotments for new houses from the general underlying growth of the south east Tablelands area. Previous dwelling approval figures indicate a long-term average for Eacham Shire of the order of 30 per annum and that most will locate in the Malanda area.

Number of dwellings in the Malanda urban area including the adjacent CD's 3030713 and 716 recorded in the 2006 Census was 700.

The proposed development will provide for an approximate doubling of Malanda's population.

Malanda grew by 13.5% in the last intercensal period, ie. an average of 2.6 per annum. At this rate of growth, Malanda would double in population over a 28-year period.

However, two factors are likely to mean that the development will attract demand at a level that would greatly shorten its 'take up' rate:

a) Demand for dwellings seems likely to increase faster than population as dwellings per head of population rise.

b) Its style and location seem likely to attract employment to the area in its own right and over and above that likely to occur in the normal course of events.

This relates especially to the development's role in:

= Attracting medical services that will complement the existing aged care facility in the area but also help provide a level of medical services to attract more of the region's aging population to locate in the area.

= Attract education and research activities to the area in association with the medical facilities but also the new James Cook University veterinary teaching centre.

= Attraction of creative artists.

= Attraction of residents from outside the area who wish to live in an environmentally sensitive village atmosphere.

4. CONSTRUCTION IMPACTS

The development envisages construction activity as follows. (Note: These are preliminary estimates only.)

Site development - 49ha, 700 dwellings

Estimated development costs, including
Development contributions and professional fees - $103m

Dwellings

700 dwellings (town houses – 231, houses - 315, flats/units – 154)

Estimated cost of construction - $164m

Commercial/Community Facilities

- Medical/Wellness Centre – 300 sq m
- Serviced offices/Creative artists – 500 sq m
- Restaurant/Cafés – 500 sq m
- Child Care Centre – 300 sq m
- Non-government school - 1,500 sq m

Total area – 3,200 sq m

Estimated cost of construction - $8 m

Total completed value of construction on the site is estimated at - $275m .

5. OTHER BENEFITS

The development will provide for expected future growth of Malanda as the prime service centre in the south east Tableland's (Eacham) area.

Malanda as a service centre tends to compete with and lose business to higher order facilities in Atherton. A larger population base in the area will facilitate the development of more extensive local retail and other commercial facilities in its main business area.

This will also help strengthen the viability and retention of some existing services already located in the area which would otherwise be in danger of becoming unviable if the town's population base is not expanded.

A3: Preliminary Review of Water Options, Arup

Appendix A3: Analysis of Water Supply Options

Scenario 1 - Base case/ traditional water supply and use

In order to provide a basis for comparison with the range of water sensitive initiatives investigated, a water balance was conducted for a 'base case' scenario, in which a traditional approach to water supply and use was considered. The main assumptions adopted for this scenario include:

- Importation of all water from mains supplies;
- No rainwater/stormwater/greywater harvesting or reuse;
- Exportation of all sewage to the future Malanda sewage treatment plant (STP); and
- Discharge of all rainwater and stormwater to the Johnstone river.

A schematic diagram of Scenario 1 is provided in Figure 1.

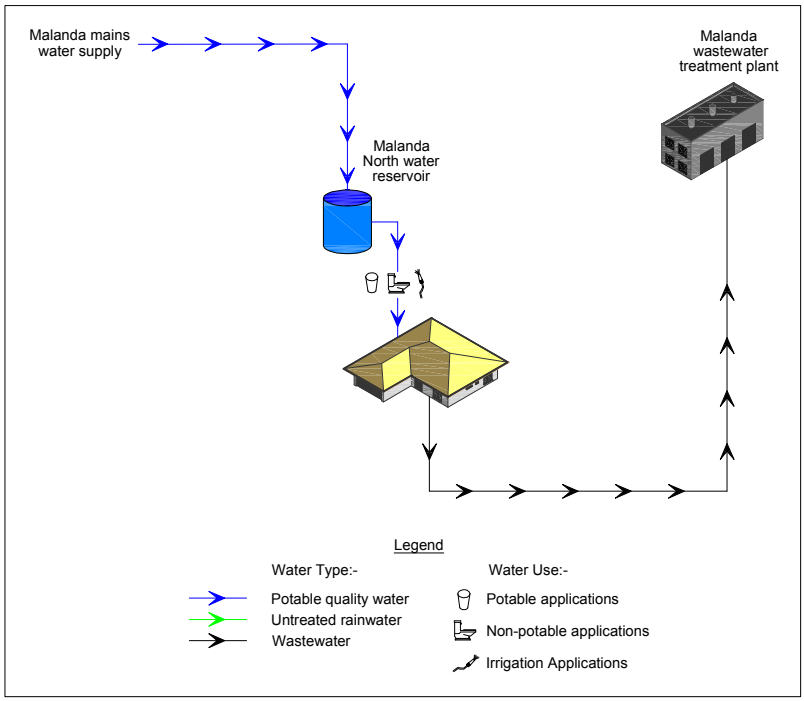


Figure 1. Schematic diagram of Scenario 1

Two sub-scenarios were investigated within this scenario. The first (scenario 1a), considered traditional (BAU) residential development features throughout the entire site. This was achieved by adjusting the population density and per capita water demand to reflect traditional development options. The second (scenario 1b), considered the unique features of the Malanda North development, as prescribed in the current master plan. These unique features, particularly the small lot sizes, high population density, and efficient water use, fixtures and appliances, significantly influence the water consumption and wastewater generation expected from the development. The significant findings of the water balance for scenario 1a and scenario 1b are summarised in Table 1 and Table 2 respectively.

Table 1. Scenario 1a – water balance summary

Aspect	Average Daily Rates	
	Per Capita	Total
Average Mains Water Usage (L/day)	375	234375
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	0	0
Average Greywater Usage (L/day)	0	0
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	222	138984
Required Rainwater Tank Size (decentralised) (L)	0	
Required Rainwater Tank Size (centralised) (L)	0	
% Mains water demand offset by internal sources	0%	

Table 2. Scenario 1b – water balance summary

Aspect	Average Daily Rates	
	Per Capita	Total
Average Mains Water Usage (L/day)	220	440000
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	0	0
Average Greywater Usage (L/day)	0	0
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	130	260920
Required Rainwater Tank Size (decentralised) (L)	0	
Required Rainwater Tank Size (centralised) (L)	0	
% Mains water demand offset by internal sources	0%	

In comparing the two sub-scenarios, it is noted that although the total daily water usage and sewage generation rates of scenario 1b are higher than that of scenario 1a, the 'per capita' rates are significantly less. These scenarios employ no strategies to reduce water consumption or sewage generation and as such, the mains water consumption and sewage export rates associated with them are relatively high. The values determined from these scenarios provide a

useful basis for comparison with the additional scenarios, and highlight the benefits of the strategies that can be employed to reduce water consumption and sewage generation.

Scenario 2 - Municipal recycled water utilisation

In this scenario the option of importing 'class A+' recycled water from the future Malanda STP, for all non-potable and irrigation applications was investigated. The assumptions adopted for this scenario include:

- Importation of mains water for all potable applications;
- Importation of class A+ municipal recycled water from Malanda STP for all non-potable and irrigation applications;
- The use of a dual reticulation system to distribute the recycled water;
- Exportation of all sewage to the future Malanda STP;
- Discharge of all rainwater and stormwater to the Johnstone river; and
- Efficient water use, fixtures and appliances.

A schematic diagram of Scenario 2 is provided in Figure 2.

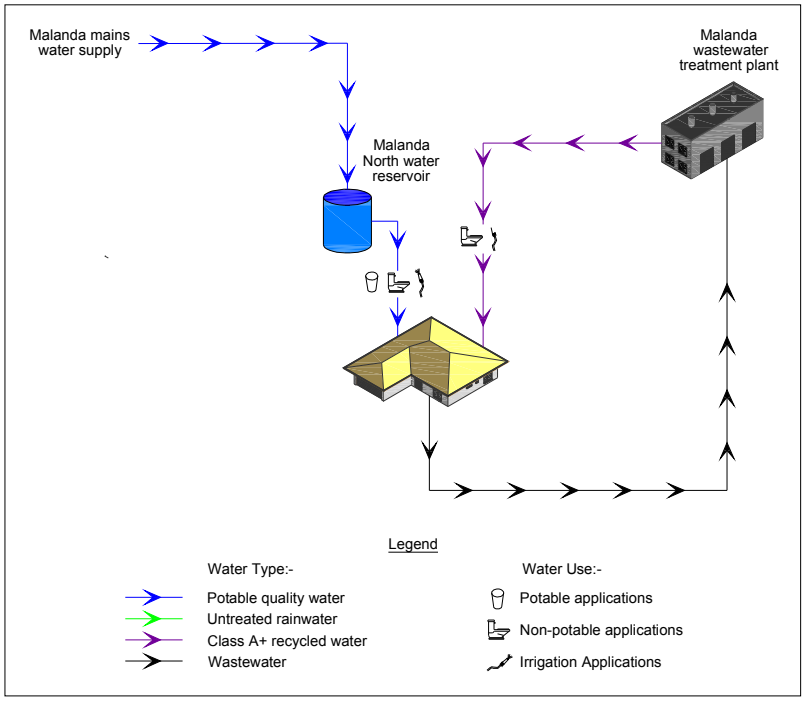


Figure 2. Schematic diagram of Scenario 2

The significant findings of the water balance for scenario 2 are summarised in Table 3.

Table 3. Scenario 2 – water balance summary

Aspect	Average Daily Rates	
	Per Capita	**Total**
Average Mains Water Usage (L/day)	77	153560
Average Recycled Water Usage (L/day)	143	286440
Average Rainwater Usage (L/day)	0	0
Average Greywater Usage (L/day)	0	0
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	130	260920
Required Rainwater Tank Size (decentralised) (L)	0	
Required Rainwater Tank Size (centralised) (L)	0	
% Mains water demand offset by internal sources*	65%	

*mains water demand offset by municipal recycled water rather than internal sources

It is apparent from these results, that a very significant reduction (65%) in the mains water demand can be achieved by importing recycled water for non-potable and irrigation applications. As this scenario does not incorporate any greywater reuse, the level of sewage production is unchanged from the base case scenario.

Scenario 3 - Rainwater and greywater harvesting and reuse

In this scenario the option of harvesting rainwater and greywater for reuse in various applications was investigated. Three sub-scenarios were considered, with the following assumptions adopted.

Scenario 3a:

- Rainwater harvested and used for all domestic applications;
- Any water demand deficit supplemented by mains supplies through tank top-up;
- Exportation of all sewage to the future Malanda STP;
- Discharge of all stormwater to the Johnstone river; and
- Efficient water use, fixtures and appliances.

A schematic diagram of Scenario 3a is provided in Figure 3.

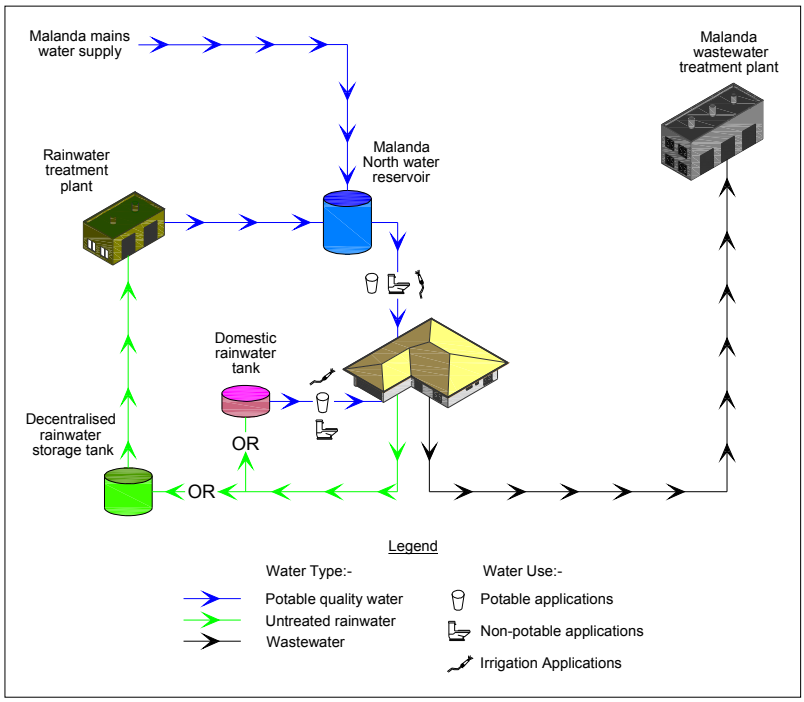


Figure 3. Schematic diagram of Scenario 3a

Scenario 3b:

- Rainwater harvested and used for all potable applications;
- Greywater reused for all irrigation and non-potable applications;
- Any water demand deficit supplemented by mains supplies;
- Exportation of all blackwater and unused greywater to the future Malanda STP;
- Discharge of all stormwater to the Johnstone river; and
- Efficient water use, fixtures and appliances.

A schematic diagram of Scenario 3b is provided in Figure 4.

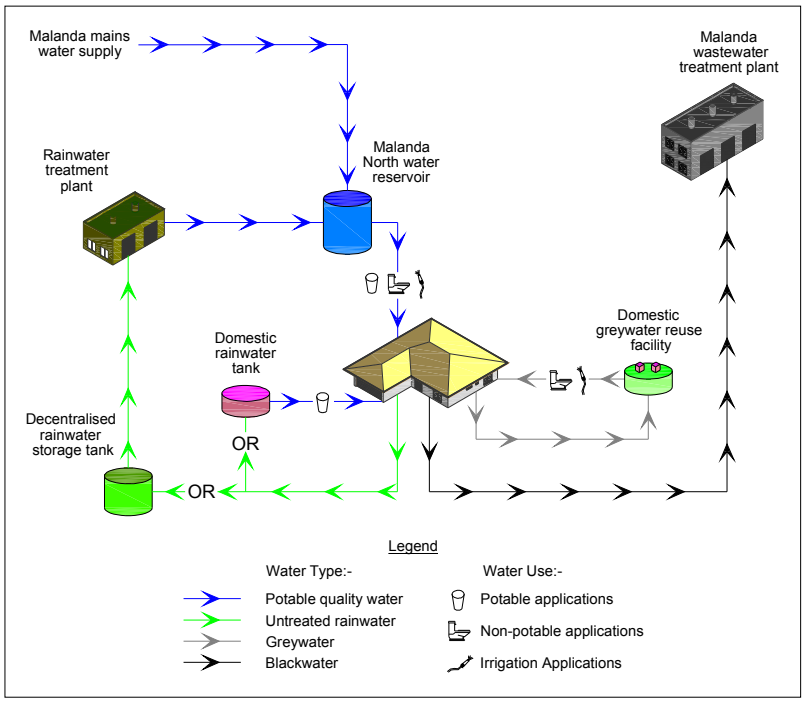


Figure 4. Schematic diagram of Scenario 3b

Scenario 3c:

- Mains water imported for all potable applications;
- Rainwater harvested and used for all non-potable applications;
- Greywater reused for all irrigation and supplementary non-potable applications;
- Any water demand deficit supplemented by mains supplies;
- Exportation of all blackwater and unused greywater to the future Malanda STP;
- Discharge of all stormwater to the Johnstone river; and
- Efficient water use, fixtures and appliances.

A schematic diagram of Scenario 3c is provided in Figure 5.

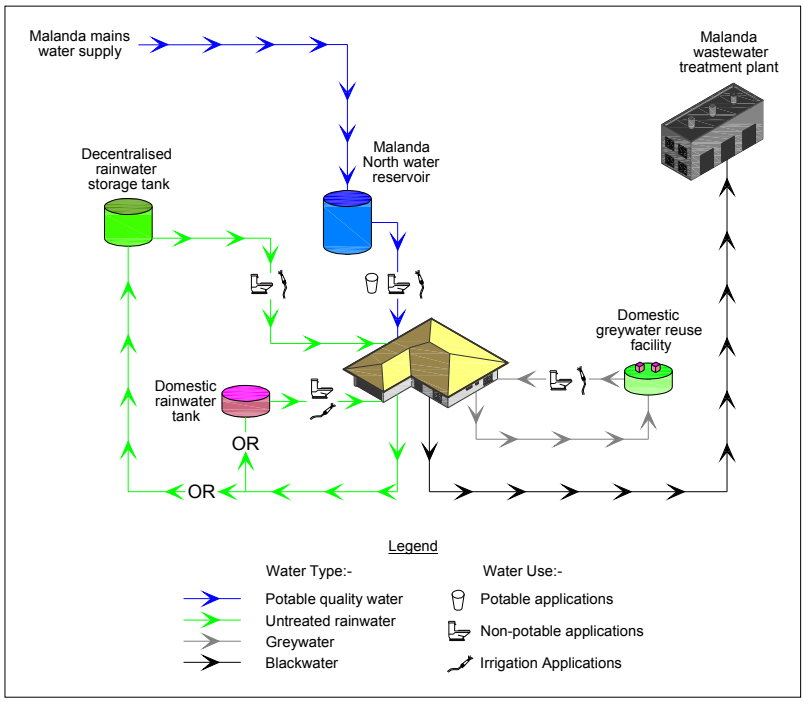


Figure 5. Schematic diagram of Scenario 3c

In each of these sub-scenarios, the options of using centralised and decentralised rainwater tanks were considered. The use of centralised rainwater tanks would involve using four large hydraulically linked rainwater tanks, from which rainwater would be pumped to the top of the development site for polishing treatment and distribution. The use of decentralised rainwater tanks would involve using separate rainwater tanks for each individual dwelling. In cases where the rainwater would be used for potable applications, the decentralised rainwater tanks would be fitted with small-scale treatment systems to assure the delivery of high quality water to consumers.

Four different rainwater storage capacity options were also considered for scenarios 3b and 3c. These included an unlimited storage capacity option, as well as equivalents of 5kL, 10kL and 15kL storage capacity per dwelling. The different storage capacity options were not considered for scenario 3a, as the high water demand (compared to the available supply) in this scenario prevents the need for large a rainwater storage capacity.

The significant findings of the water balances for scenarios 3a – 3d are summarised below.

Table 4. Scenario 3a – water balance summary

Aspect	Average Daily Rates	
	Per Capita	Total
Average Mains Water Usage (L/day)	111	221721
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	109	218279
Average Greywater Usage (L/day)	0	0

Aspect	Average Daily Rates	
	Per Capita	**Total**
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	130	260920
Required Rainwater Tank Size (decentralised) (L)	5178	
Required Rainwater Tank Size (centralised) (L)	1035600	
% Mains water demand offset by internal sources	50%	

It is apparent from the results in Table 4, that rainwater harvesting could significantly offset the mains water demand, particularly during the wetter months of the year. Although the complete use of only rainwater tanks for all applications is not possible due to the limited supply of harvestable rainwater in the drier months, it was found that rainwater harvesting could reduce the annual mains water consumption by 50%. Although an excess of rainwater would be available during the very wet months, the high demand throughout the year would prevent rainwater storage for the drier months. This also limits the storage capacity required of the rainwater tanks. It is further noted that as Scenario 3a does not incorporate any greywater reuse, the level of sewage generation is unchanged from the base case scenario.

Table 5. Scenario 3b – water balance summary

Unlimited Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Mains Water Usage (L/day)	39	78320
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	220	440000
Average Greywater Usage (L/day)	181	361680
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	41600	
Required Rainwater Tank Size (centralised) (L)	8319910	
% Mains water demand offset by internal sources	82%	

5kL/Dwelling Storage Capacity Option		
	Average Daily Rates	
Aspect	**Per Capita**	**Total**
Average Mains Water Usage (L/day)	48	95945
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	211	422375
Average Greywater Usage (L/day)	181	361680
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	5000	
Required Rainwater Tank Size (centralised) (L)	4000000	
% Mains water demand offset by internal sources	78%	

10kL/Dwelling Storage Capacity Option		
	Average Daily Rates	
Aspect	**Per Capita**	**Total**
Average Mains Water Usage (L/day)	44	87834
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	215	430486
Average Greywater Usage (L/day)	181	361680
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	10000	
Required Rainwater Tank Size (centralised) (L)	8000000	
% Mains water demand offset by internal sources	80%	

15kL/Dwelling Storage Capacity Option		
	Average Daily Rates	
Aspect	**Per Capita**	**Total**
Average Mains Water Usage (L/day)	40	79816

15kL/Dwelling Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	219	438504
Average Greywater Usage (L/day)	181	361680
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	15000	
Required Rainwater Tank Size (centralised) (L)	12000000	
% Mains water demand offset by internal sources	82%	

It is apparent from the results in Table 5, that by harvesting rainwater for potable applications, and reusing greywater for non-potable and irrigation applications, a very substantial offset of the mains water demand can be achieved. Depending on the storage capacity of the rainwater tanks, the potable water demand could be completely supplied by rainwater throughout the year. Although under scenario 3b, mains water would be required to supplement the demand deficit, it was found that a reduction in the annual mains water consumption of between 78 and 80% can be achieved, depending on the rainwater storage capacity option adopted. Should this scenario be adopted, it is recommended that further cost/benefit analysis is conducted prior to detailed design, in order to determine the most feasible rainwater storage capacity option. Based on these preliminary results, this report will consider the equivalent of 5kL/dwelling option as the best option for scenario 3b as:

- It would be the cheapest option;
- It has comparable performance to the other options; and
- It would be easiest to incorporate into the small lots planned for Malanda North.

It is further noted that as Scenario 3b incorporates greywater reuse, the level of sewage generation is significantly lower than that of the base case scenario.

Table 6. Scenario 3c – water balance summary

Unlimited Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Mains Water Usage (L/day)	77	153560
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	220	440000

Unlimited Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Greywater Usage (L/day)	104	208120
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	62877	
Required Rainwater Tank Size (centralised) (L)	12575300	
% Mains water demand offset by internal sources	65%	

5kL/Dwelling Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Mains Water Usage (L/day)	79	158375
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	218	435185
Average Greywater Usage (L/day)	104	208120
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	5000	
Required Rainwater Tank Size (centralised) (L)	4000000	
% Mains water demand offset by internal sources	64%	

10kL/Dwelling Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Mains Water Usage (L/day)	77	153560
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	220	440000
Average Greywater Usage (L/day)	104	208120

10kL/Dwelling Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	10000	
Required Rainwater Tank Size (centralised) (L)	8000000	
% Mains water demand offset by internal sources	65%	

15kL/Dwelling Storage Capacity Option		
Aspect	**Average Daily Rates**	
	Per Capita	**Total**
Average Mains Water Usage (L/day)	77	153560
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	220	440000
Average Greywater Usage (L/day)	104	208120
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	26	52800
Required Rainwater Tank Size (decentralised) (L)	15000	
Required Rainwater Tank Size (centralised) (L)	12000000	
% Mains water demand offset by internal sources	65%	

It is apparent from the results in Table 6 that by harvesting rainwater and reusing greywater for non-potable and irrigation applications, a substantial offset of the mains water demand can be achieved. In total it was found that under scenario 3b, a reduction in the annual mains water consumption of between 64 and 65% can be achieved, depending on the rainwater storage capacity option adopted. It is noted that although this is a lower reduction than can be achieved under scenario 3b, a more reliable potable water quality would be provided as mains water would be imported for all potable applications. Should this scenario be adopted, it is recommended that further cost/benefit analysis is conducted prior to detailed design, to determine the most feasible rainwater storage capacity option. Based on these preliminary results, this report will consider the equivalent of 5kL/dwelling option as the best option for scenario 3c, for the same reasons as those discussed for scenario 3b. It is further noted that as

Scenario 3c incorporates greywater reuse, the level of sewage generation is significantly lower than that of the base case scenario.

Scenario 4: Stormwater harvesting and reuse

In this scenario the option of harvesting stormwater for all applications was investigated. It is noted that due to the more complicated nature of stormwater harvesting when compared to rainwater harvesting, the results from this analysis are less accurate than those of scenario 3. It is recommended that prior to adopting this scenario, further analyses should be conducted using more advanced modelling tools to accurately consider factors such as the soil and terrain characteristics, temporal variations in rainfall patterns and stormwater harvesting efficiencies. The assumptions adopted for this scenario include:

- Stormwater harvested and used for all applications;
- 100% harvesting efficiency of all stormwater runoff;
- The use of water sensitive urban design (WSUD) best management practices (BMP's) throughout the site to provide pre-treatment of the stormwater;
- Any water demand deficit supplemented by mains supplies;
- No greywater reuse;
- Exportation of all sewage to the Malanda STP; and
- Efficient water use, fixtures and appliances.

A schematic diagram of Scenario 4 is provided in Figure 6.

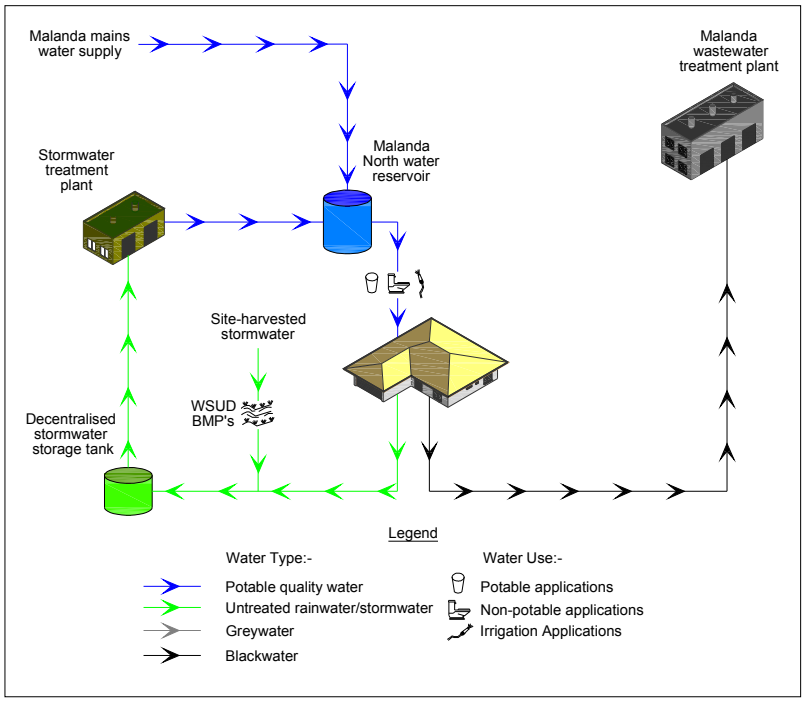


Figure 6. Schematic diagram of Scenario 4

Table 7. Scenario 4 – water balance summary

Aspect	Average Daily Rates	
	Per Capita	Total
Average Mains Water Usage (L/day)	0	0
Average Recycled Water Usage (L/day)	0	0
Average Rainwater Usage (L/day)	220	440000
Average Greywater Usage (L/day)	0	0
Average Stormwater Usage (L/day)	0	0
Average Sewage Generation (L/day)	130	260920
Required Stormwater Storage Capacity (L)	138720178	
% Mains water demand offset by internal sources	100%	

It is apparent from the results in Table 7 that by harvesting and reusing stormwater for all applications, the mains water demand could potentially be completely offset by internal sources. Using this scenario, a total stormwater storage capacity of approximately 139ML would be required across the site. It is noted that as Scenario 4 does not incorporate any greywater reuse, the level of sewage generation is unchanged from the base case scenario.

Contacts

Cairns
Level 1, 137 Collins Avenue
Edge Hill QLD 4870
T +61 (0)7 4032 6000
F +61 (0)7 4032 6001

Malanda North
PO Box 700
Atherton Qld 4883
T +61 (07) 4091 4782
E info@malandanorth.com

www.arup.com

www.malandanorth.com

ARUP