GRAVELROAD
thinking beyond consulting

Telecommunications Infrastructure Review

for the

Townsville and North West Queensland Region

Prepared by: Gravelroad

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Regional Development Australia
TOWNSVILLE AND NORTH WEST QUEENSLAND INC

CHARTERS TOWERS REGIONAL COUNCIL

OUTBACK QUEENSLAND
McKINLAY SHIRE COUNCIL

This is a detailed telecommunications infrastructure review supported by GIS mapping able to be overlaid on Councils' planning schemes and infrastructure plans. It will plot existing infrastructure and that proposed infrastructure for the regional network into a series of telecommunications precincts which will identify priority areas and establish appropriate timelines in order to meet regional growth and development.

Paul Stapleton
November 2012

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1 TELECOMMUNICATIONS INFRASTRUCTURE REVIEW

1.1 OVERVIEW

This Telecommunications Infrastructure Review has been prepared to assist RDA Townsville & North-West Queensland to facilitate and expedite the development of broadband infrastructure throughout its region. This project was funded by the Queensland Government, Regional Development Australia Townsville and North West Queensland Inc, Charters Towers Regional Council and McKinlay Shire Council. In-kind support was also provided by all funding organisations and the Palm Island Indigenous Shire Council.

While detailed reviews have been undertaken in McKinlay Shire (Julia Creek), Charters Towers Region (Charters Towers, Greenvale and Ravenswood) and Palm Island, the program is intended to assist in the identification of broadband opportunities for the broader region, involving some fifteen LGAs.

Some opportunities to contribute to the development of telecommunications (broadband) infrastructure are likely to cross more than one council area, while others will be confined to a smaller area within a council region. In either case, the reviews assist in determining the viability for development of business case(s) aimed at gaining access to broadband infrastructure, either provided by NBN, or other sources.

Broadband technology now pervades the telecommunications environment and introduces new ways to deliver current and next generation telecommunications services to communities, and offers significant economic and community benefits where it is widely distributed. In developing its Digital Economy Strategy, the Federal government made the following statement in December 2009[1]:

The digital economy already offers exciting opportunities for all Australians. It is essential to our productivity and improved social wellbeing. The National Broadband Network (NBN) will turbo-charge our digital economy and enable Australia to become a global leader in using the online world - the world of the 21st century. It will make possible new ways of delivering all essential services.

The new infrastructure required to deliver broadband services to business and residential premises is largely comprised of fibre optic cables that will replace the older copper cables and that where that is not possible, due to limited population density or remoteness, using fixed wireless or satellite. Any of these options requires significant investment in the installation of the new infrastructure.

It is widely understood that the telecommunications industry cannot meet the funding requirements of the new infrastructure through the normal evolution of the industry in Australia, and so the Federal Government launched the National Broadband Network Company (NBN Co)[2], backed by up to $37 billion to replace most of the copper cable connections to homes and business premises in Australia.

Similar views are held about the ability of the telecommunications industry to self fund the step to fibre optic technology in other developed countries, and so many countries are following a similar path of industry restructuring and government financial investment to ensure the benefits of the digital revolution are achieved as quickly as possible.

[1] http://www.broadbandfuture.gov.au/
[2] http://www.nbnco.com.au/

The NBN program of work expects to take ten years to roll out the new infrastructure and it is planned that about 93% of premises will be connected with fibre optic cables (100Mbps connection speed), and the remainder (more remote, rural premises) will be connected to the NBN via either fixed wireless or satellite technologies (12Mbps connection speed). Economies of scale mean that the cost per premise to connect fibre optic cables will be lower in high density and metro areas, with regional communities and smaller centres unable to offer the same return on investment.

1.2 USING THE REVIEW

This document is intended to provide a broad understanding of broadband technology, and how councils can contribute to the wider and faster availability of broadband services in the region. The economic and community benefits that result from the widespread availability of broadband services are not covered in any detail in this document, but some references have been noted below for further reading if required[3456].

Figure 1 shows the suggested approach to the use of the Review to identify, evaluate and promote broadband infrastructure development related to council infrastructure investment:

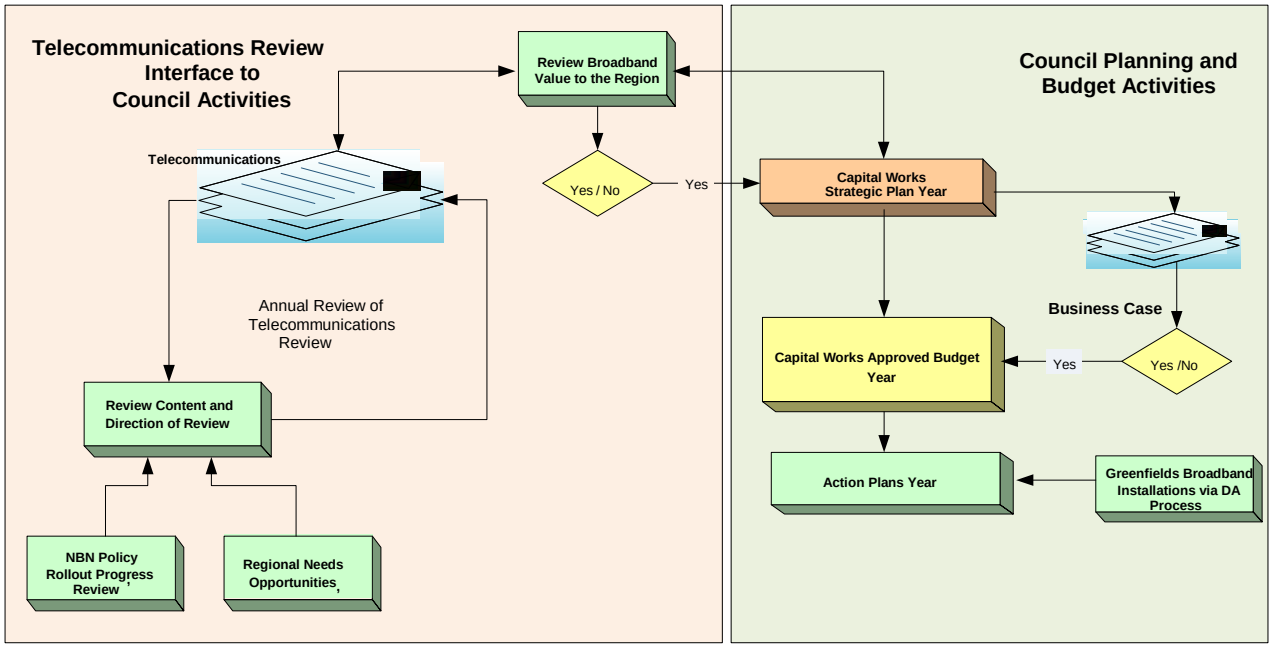

Figure 1: Using the Telecommunications Review

It is recommended that this Telecommunications Infrastructure Review be reviewed regularly through the year against Council capital works plans as they are developed, to identify any opportunities to deploy broadband infrastructure (ducts) cost effectively.

[3] http://www.dbcde.gov.au/__data/assets/pdf_file/0006/117681/DIGITAL_ECONOMY_FUTURE_DIRECTIONS_FINAL_REPORT.pdf
[4] http://www.minister.dbcde.gov.au/media/media_releases/2010/003
[5] http://www.minister.dbcde.gov.au/media/media_releases/2009/043
[6] http://www.oecd.org/dataoecd/29/9/38698062.pdf

It should be noted that all new property developments since 1st July 2010 have to provide mandatory NBN - compliant broadband infrastructure, and so via the Development Application (DA) process, councils will become aware of the installation of infrastructure in these circumstances. It is recommended that the plans for these developments should be recorded along with all other broadband infrastructure plans for the region, to ensure inter regional connectivity is understood and planned.

Where potential projects are identified that may contribute to improved broadband services, they should be reviewed to ensure they do support existing NBN activity, or that of other broadband service providers, and subject to a decision that the project will enhance broadband services, it is passed to the planning area of council where budgetary costs and returns are identified in a business case.

If a positive business case is developed that offers acceptable risk to Council, and which enhances the delivery of broadband services, the project should become part of the approved council capital works budget.

1.3 BROADBAND INFRASTRUCTURE

This section discusses the shape of broadband networks, their various layers and dependencies.

Regional Core Networks

It is possible to consider broadband networks as comprising three layers of connecting infrastructure, as shown in figure 2:

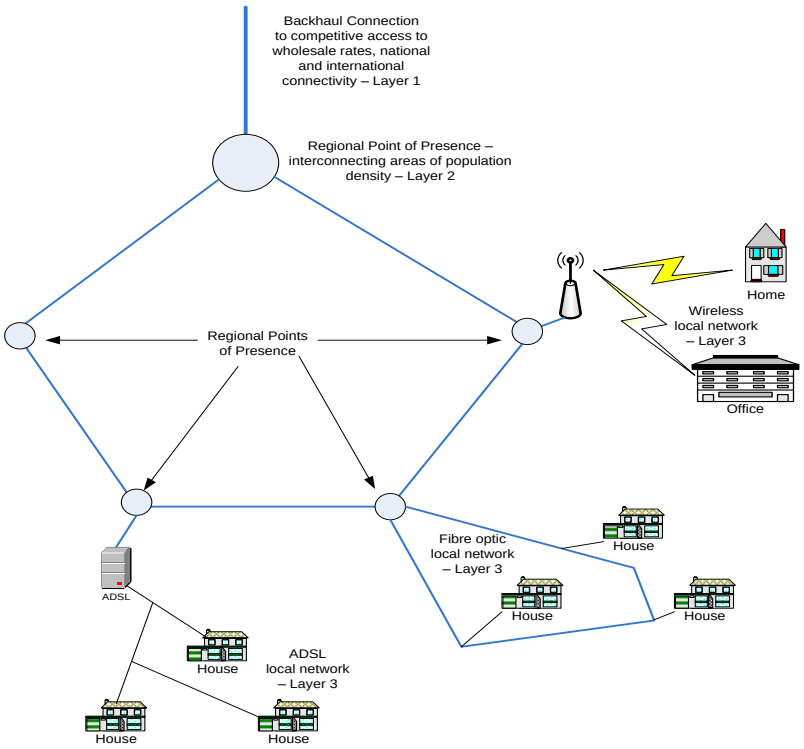

Figure 2: Broadband Connecting Infrastructure

At the top of the diagram, we see one or more connections to the national broadband infrastructure, probably to Brisbane, Sydney and other major centres, and to international connections via regional 'Points of Presence' that feed the region with national and international connectivity.

Within the region, there is a need for interconnected regional points of presence, in locations such as Julia Creek, Charters Towers and Greenvale - creating a resilient local network that can feed the final layer of connecting infrastructure – the business and residential premises, via a local distribution network of fibre optic cables in the street, feeding all available homes and businesses to be connected in this way. These final connections, where they exist for current broadband services, are generally delivered over copper cables using the Asymmetric Digital Subscriber Line (ADSL) technology that will be replaced by much higher speed connections using fibre optic cables.

Where the distance from a point of interconnect is considered to be too great for fibre optic cables to be used economically for premises connections, broadband services can be delivered via fixed wireless technologies which cannot match the connection speed of fibre optic cables, but will generally be an improvement on existing services. However, it is in the interests of the region to minimize the proportion of premises served by wireless because the reduced connection speeds may ultimately reduce the value of the connection for the residents where wireless is used, compared to fibre optic connections.

In relation to the more remote areas, satellite may be the only option. However, based on feedback received from a number of current and past satellite users in the regions, the quality of service, if or when available, can be poor.

Local Distribution

Figure 3 shows how a series of 100mm PVC ducts are used to accommodate fibre optic cables connecting to a local point of presence to business and residential premises:

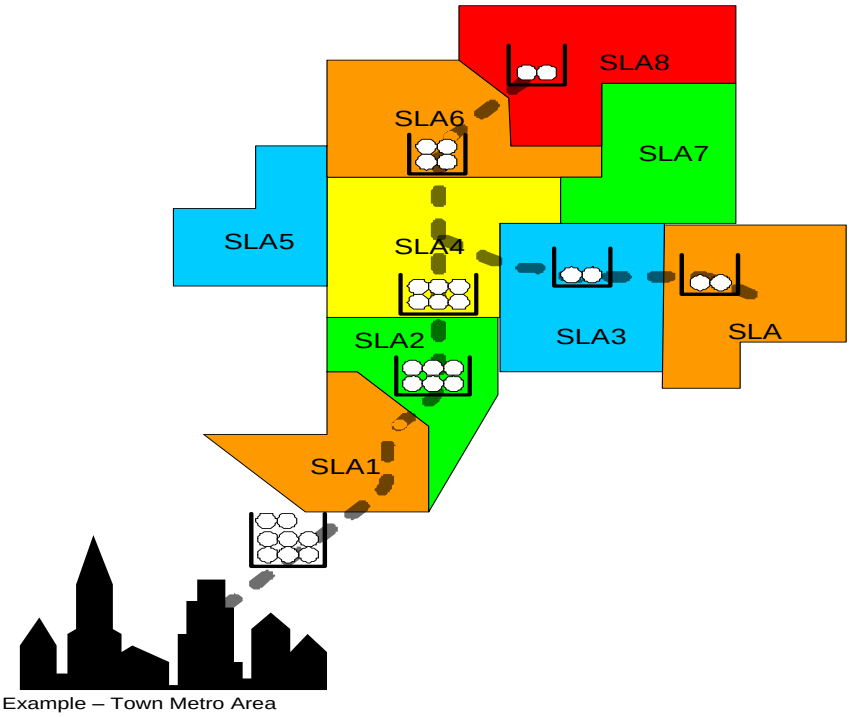

Figure 3: Local Distribution of Fibre Optic Cables in Ducts

The planning of these duct routes is a mature design process that allows multiple fibre optic cables to be installed in any duct, and to permit the delivery of high speed services by multiple service providers – voice, data, internet, video services.

The delineation of passive and active elements of broadband delivery infrastructure is illustrated in figure 4:

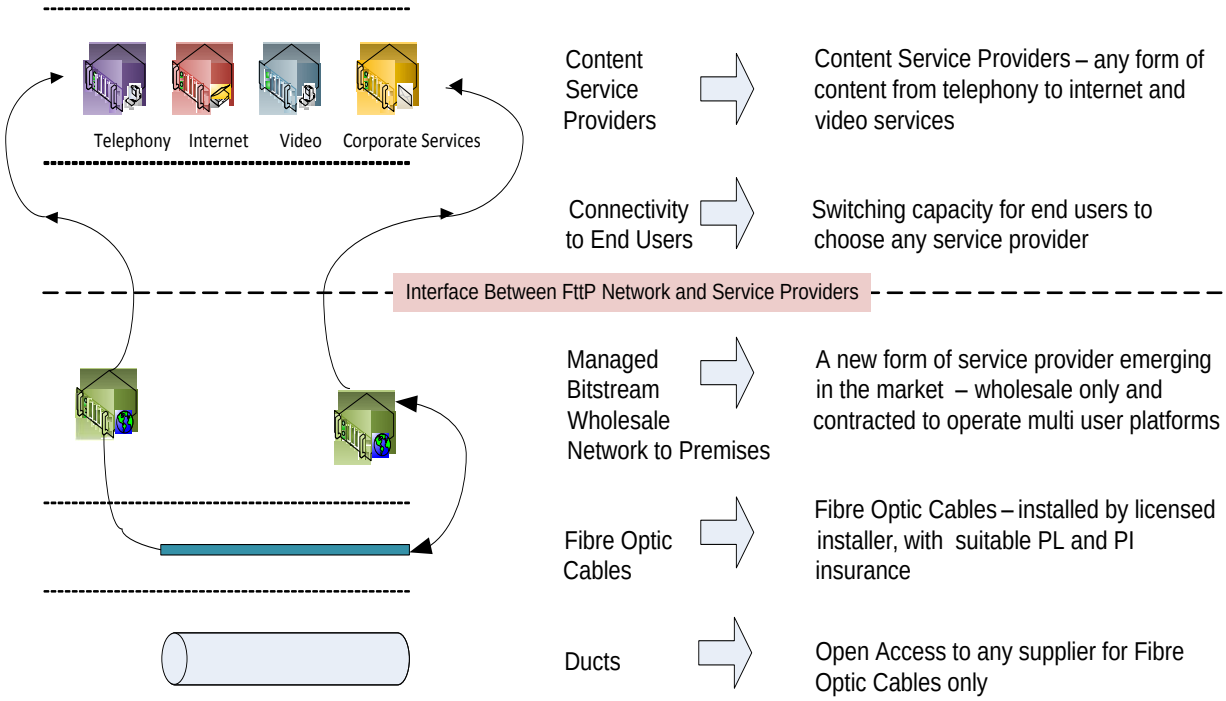

Figure 4: Passive/Active Layers Broadband Service Delivery

In most urban and metropolitan areas, ducts are installed underground to facilitate the easy installation of fibre optic cables, making augmentation and reconfiguration of the cable networks easy and cost effective over the life of the assets (expected to be 30+ years). The ducts and their fibre optic cables are the passive elements of the broadband network, and then transmission electronics are added to drive high speed signals over the fibres to deliver telecommunications services.

There are a number of ways in which local government and others who own and maintain suitable infrastructure can contribute to the installation and maintenance and operation of these passive elements of the network, to drive down costs and speed delivery of broadband services, and these options are discussed in more detail in later sections.

In Australia, the NBN Co will own the three layers of infrastructure shown from the bottom of the diagram, the ducts, cables and the first layer of transmission electronics. This will include terminal equipment in the premises that will allow a variety of content service providers to offer services to the premises.

Backhaul

Backhaul refers to the connections from the region to the rest of Australia and internationally, and a lack of competition in backhaul choice has often been a major contributor to the higher cost of telecommunications services in regional areas in Australia.

In the North-West Queensland region, there are at least five backhaul providers able to connect the region to Brisbane:

- Telstra
- Nextgen
- Ergon
- Powerlink
- Queensland Rail

In the past, even with multiple choices of backhaul provider, it has been difficult to match backhaul costs that compare with national and international connections in Brisbane for example. The NBN acknowledged this problem, and funded the Regional Backbone Blackspots Program[7], to considerably reduce the cost of backhaul connectivity in parts of Australia not considered to be well served by competitive backhaul services.

Construction of backhaul fibre routes shown in figure 5 (red lines) below was undertaken by Nextgen Networks, which now provides cost-effective backhaul over the routes.

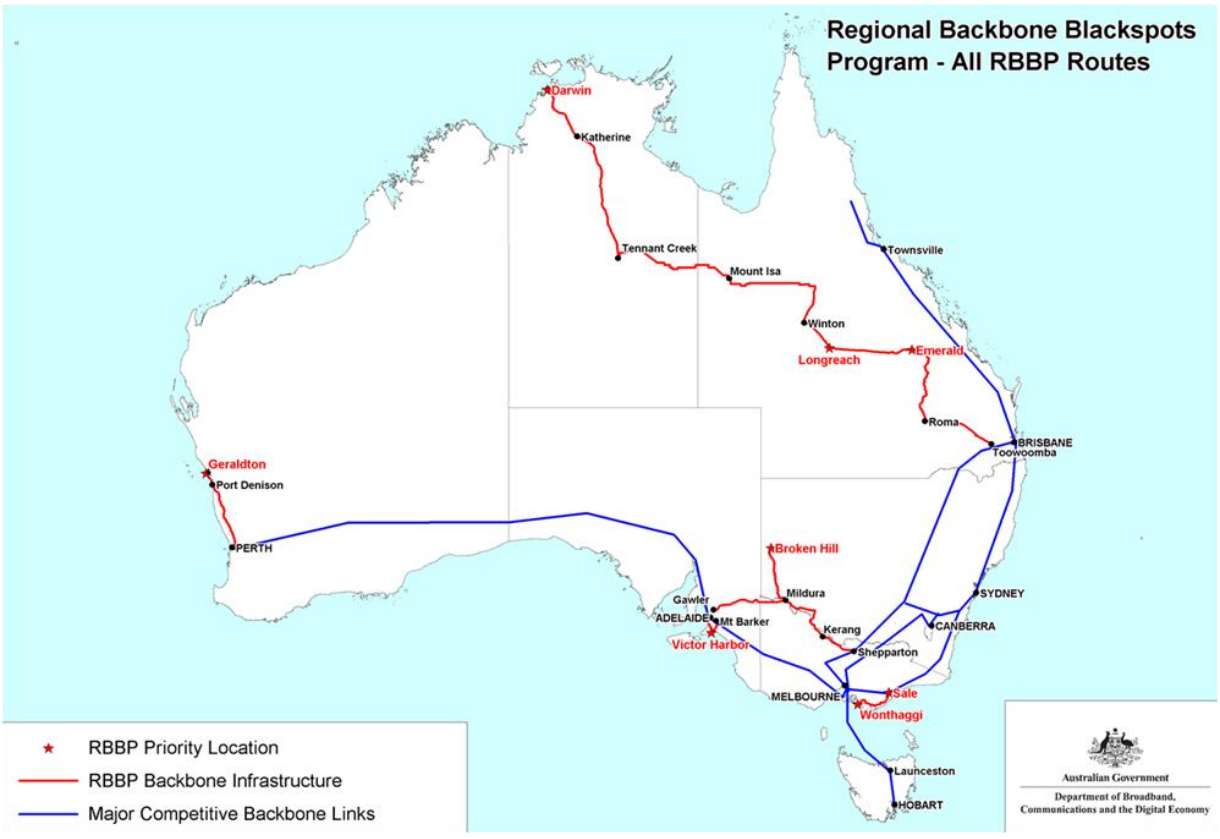

Figure 5: Regional Backbone Blackspot Program

Of key significance is that Julia Creek lies directly on the RBBP and Charters Towers on another fibre route, again developed by Nextgen, but this time running from Mount Isa to Townsville. As such, they have the potential to take advantage of the new backhaul route to Brisbane.

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http://www.dbcde.gov.au/broadband/national_broadband_network/national_broadband_network_Regional_Backbone_Blackspots_Program

Fibre Optic and Wireless Technology

Fibre optic cables offer the greatest capacity for information transmission of any technology available today, or able to be forecast in the immediate future. Using current modern transmission electronics, a single fibre can easily carry in excess of 100Gb/s, or 1,000 times the capacity planned by the NBN Co to be delivered to premises via fibre. This means that for practical purposes, fibre optic cable offers the best way to 'future proof' communications capacity in any community.

Wireless technologies have advanced considerably in recent years in their ability to deliver high capacity communications, and this is evident to many through the advent of high speed services provided over 3G/4G mobile telephones. However, wireless capacity is limited by the finite availability of radio spectrum and the needs of many users to access a variety of wireless services over the radio spectrum, managed in Australia by the Australian Communications and Media Authority (ACMA[8]). The Federal government recently released a paper called the Digital Dividend Green Paper[9] which commits to the release of more radio spectrum, partly as a result of the closure of analogue television services in favour of digital wireless transmission of high definition television signals that will expand the availability of radio spectrum suitable for the delivery of wireless broadband services. This is a highly relevant issue for regional areas where we can expect that a significant number of broadband connections will be via wireless connection due to the lower density of properties in many areas, as discussed earlier.

To date wireless capacity for broadband connection has depended heavily on how many broadband connections shared the same wireless spectrum. The fewer the connections depending on the same wireless capacity, the faster the broadband connection speed for users.

However, with advances in technology has come 'fixed wireless', whereby a transmitter is tasked to provide wireless connectivity to a 'fixed' number of end users. In so doing, it is possible to provide a more consistent level of service.

Figure 6 illustrates the approach of a wireless distribution point providing wireless services to a fixed number of premises to optimize broadband performance.

Figure 6: Fixed wireless distribution topology

[8] http://www.acma.gov.au/WEB/HOMEPAGE/PC=HOME
[9] http://www.dbcde.gov.au/__data/assets/pdf_file/0005/125267/Digital_dividend_green_paper.pdf

The role of local government can be to assist in lowering the cost of network rollout for the NBN, or others planning to deliver regional services, to encourage network extensions that would not otherwise be economically feasible and so improve the delivery of broadband services for the whole community. Later sections discuss how this assistance can be provided within local government capabilities and acceptable risk scenarios.

Open access principles

The telecommunications industry has operated in a competitive manner for many years and has resulted in some cases, in duplication of infrastructure where real wholesale prices are not offered, or more often in regional areas, market dominance by one provider where competitive infrastructure investment by competitors is not viable.

This market behaviour is to be expected and does not encourage investment in duplicated infrastructure that would then be involved in what is referred to as 'infrastructure competition'. This market limitation has been recognized by the Australian Government and has led to the significant market intervention that the NBN Co is planning – the construction of a truly wholesale 'open access' network.

The 'Open Access' concept is that a third party will own and operate the fibre infrastructure and will not be a provider of services to end users, thereby avoiding a conflict of interest as a wholesaler and a retailer. In Australia, the NBN Co will act as the open access service provider to any content service provider, and that their access prices will be as low as possible, to encourage widespread take up of broadband services and stimulate the delivery of the economic and social benefits discussed earlier. Figure 4 showed where the role of an open access service provider and content providers might intersect.

Greenfields developments

Following extensive consultation with stakeholders and consideration of the NBN Implementation Study, the government announced on 20 June 2010 that from 1 January 2011[10]:

- NBN Co Limited would be the wholesale provider of last resort in new developments within or adjacent to its long term fibre footprint and meet the cost of doing so;
- Developers—and on their properties, property owners—would be responsible for trenching and ducting;
- Telstra would not have infrastructure responsibilities but would be retail provider of last resort; and
- Developers could use any fibre provider they want, providing they met NBN specifications and open access requirements.

To assist with the implementation of this national initiative, the Australian Government could work with state, territory and local governments on the development of planning laws, by-laws and planning guidelines. The Australian Government could undertake a range of measures to support the implementation of such requirements, such as:

- assisting with the development of model laws, templates for planning requirements and network and in-building cabling specifications for use by planning authorities
- facilitating the development of national guidelines for network design, and
- developing educational tools for relevant industry participants, builders and consumers on the new requirements.

[10] Fibre in New Developments: Policy Update. 22 June 2011

In addition to assisting local councils and planning authorities, the development of such tools could help provide consistent requirements between local government areas, reducing compliance costs for developers who work across council boundaries.

State and territory planning laws could require developers and builders, as appropriate, to ensure:

- pit and pipe infrastructure is installed that would be appropriate for the deployment of FTTP and which, potentially, would allow competitive infrastructure provision in the future (for example sufficient space for more than one cable)
- appropriate FTTP infrastructure is installed ready for connection to new premises
- appropriate cabling is installed within new premises to allow practical use of FTTP capability
- open access wholesale services are available on a non-discriminatory basis, and
- retail services are available from at least one retail provider.

Large greenfield estates often include commercial centres, schools, medical clinics and other community facilities which may need higher grade services than residential customers. The Australian Government considers e-health and e-education will be important users of superfast broadband. Planning requirements may also need to ensure the FTTP requirements of such users are factored into developers' and service providers' planning.

It is to be expected that some Councils will develop in-house expertise to assess development applications for this new telecommunications infrastructure, and others will contract in these telecoms industry skills to ensure they assess the fibre optic system design correctly. Many of the skills necessary to assess the capability of the ducts, pits and cable runs are not difficult to acquire, and much of the basic knowledge has parallels in the design and installation of other pipe work, such as water and sewer systems.

In any case, it is recommended that Councils acknowledge the development requirements for fibre optic infrastructure in new developments, as set out by the NBN and prepare a Code of Practice that sets design and construction requirements by which development applications can be checked. The latest DBCDE requirements for Greenfields FttP requirements are to be found at their web site[11].

An important part of making the FttP infrastructure in a new development viable is the local backhaul connection from the new development to a local point of presence in the area, as shown in figure 7 below:

[11] http://www.dbcde.gov.au/broadband/national_broadband_network/fibre_in_greenfield_estates

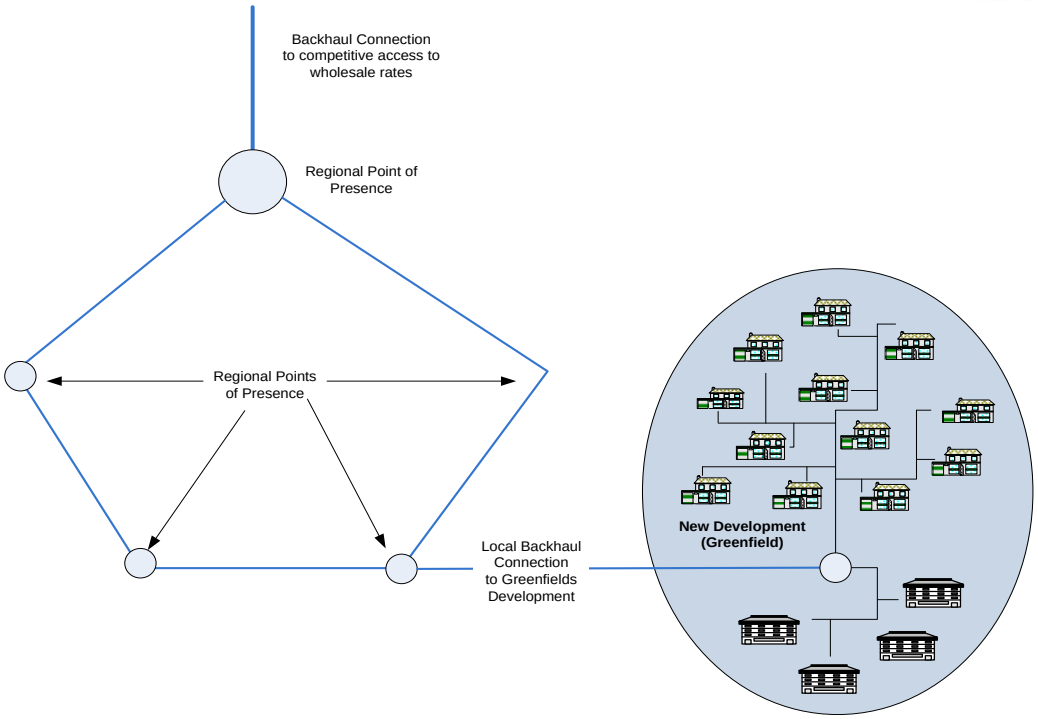


Figure 7: Backhaul Connections to Greenfields FttP Infrastructure

The fibre optic cable route to a planned development area from a local regional point of presence will most likely run through already developed metro and urban areas, and as will be discussed later, the cost of this local backhaul route can be high. There are opportunities to significantly reduce these local backhaul costs through appropriate forward planning, as will be discussed in the next section.

2 COUNCIL INVOLVEMENT AND SUPPORT FOR THE DEVELOPMENT OF BROADBAND INFRASTRUCTURE

When local government seeks to intervene positively in the rollout of broadband infrastructure to increase connectivity and speed the rollout of infrastructure, there are a number of areas where councils have significant advantage and so can be a welcome contributor to the deployment of broadband infrastructure:

2.1 PLANNING

Regional development planning and management are part of council responsibility and so allow for an accurate forecast of changing population density, and the planning of infrastructure to support these changes, such as storm water, water, sewer, and road and footway construction and repair. Almost all of this infrastructure development introduces opportunities for the installation of ducts and fibre optic cables at low cost – often at a fraction of the cost of installation where no other coincident work is taking place. Figure 8 suggests a variation to the usual planning process that considers whether any normal infrastructure activity offers the opportunity to install ducts and cable:

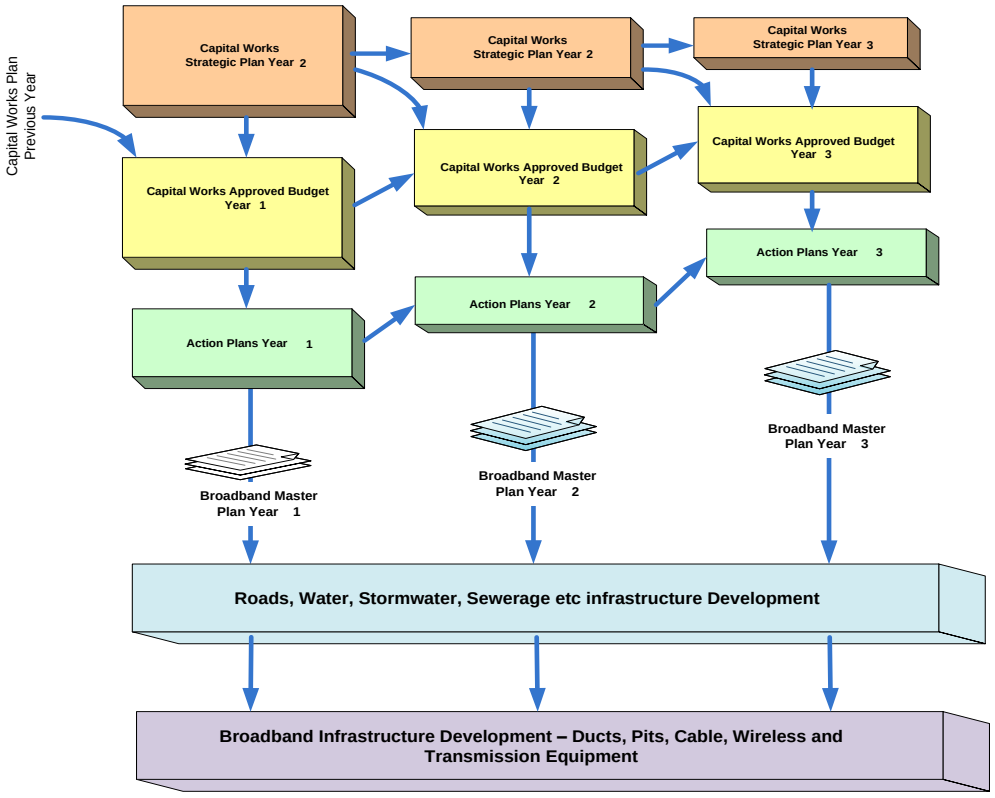


Figure 8: Development of Broadband Infrastructure as an Integral Part of Council Capital Works Activities

Here we show the usual planning cycle where the capital works strategic plan forecasts the next and subsequent years' works from roads, water, power and related construction, to meet the changing needs of the region. Where projects cannot be completed in the following year, they may be moved to subsequent years, and at any time the priority and timing of capital works may change to accommodate new demands.

Now, the process also considers the telecommunications infrastructure review becoming the basis of a regional telecommunications master plan, detailing the way forward for the region to achieve high speed communications delivery as widely and quickly as possible. Where there is an opportunity to install ducts for example, at the time of road or footway works, the installation of new water or sewer reticulation, and so on, then a decision is made whether or not to install the necessary broadband infrastructure.

Figure 9 summarises the 'yes/no' process in deciding whether to install broadband infrastructure:

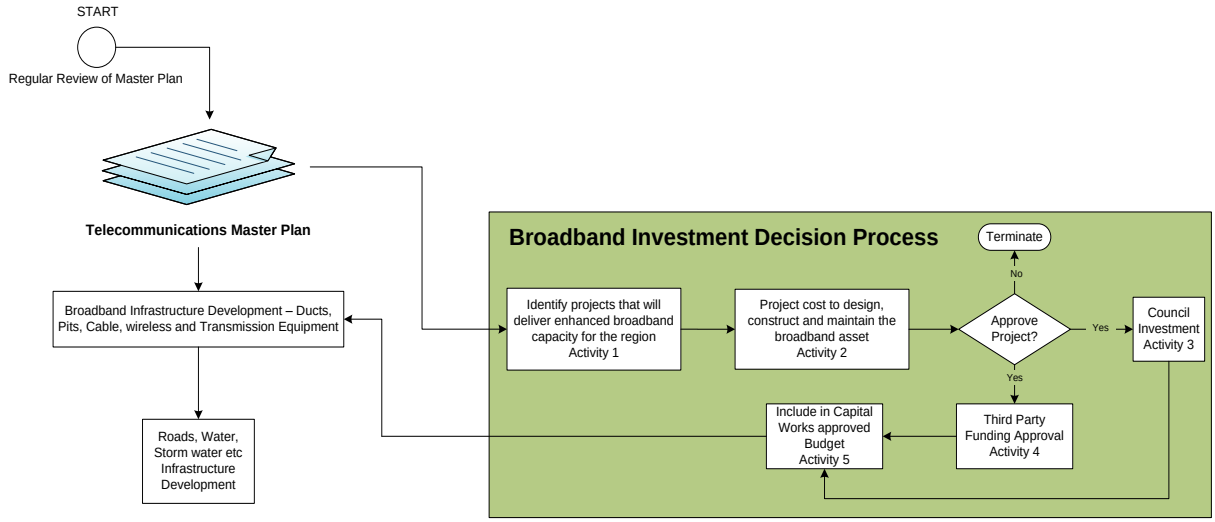


Figure 9: Decision Process for Broadband Investment

Here, we expect that a constant review of the telecommunications master plan during the normal capital works planning process will identify regular opportunities to install ducts, cables, wireless or equipment accommodation arrangements. This will lead to the start of the investment decision process, described below:

Activity 1 – Identify Project. An example might be where 5km of new road works were confirmed, what value would there be to install a duct route suitable for fibre optic cables? The output of this activity is a detailed plan for the broadband infrastructure and how it will contribute to the benefit of the community through the delivery of better broadband services.

Activity 2 – Cost Project. The costs associated with the project to be determined are:

Design cost – review alternatives, fit with other telecoms infrastructure, prepare cost models.

Installation cost – some typical construction costs are included in Appendix 1 for the complete excavation, installation and reinstatement of ducts and cables. It is expected that in many cases, much of these costs will be reduced as a result of the opportunity to install ducts, for example, cheaply during an existing capital works project.

Maintenance cost – if the asset is to be owned by council, the annual costs will be incurred for maintenance and damage repair.

Activity 3 – Council Investment. There will be cases where the marginal cost of installing a new duct line is small in the context of the enabling capital works project that allows for the relatively small additional capital costs that apply. In this case, the additional costs may be absorbed in the cost of the larger project, or a modest additional project allowance will cover the cost of the ducts and associated hardware. In this case, Council will own the broadband asset and may lease access to licensed wholesale (eg the NBN) or retail service providers who wish to deliver services to end user clients. Council may wish to interconnect some of its sites using ducts installed in this way, to reduce its own telecommunications costs.

Activity 4 – Third Party Funding. In this case, Council may find the NBN Co, another infrastructure owner, as previously mentioned, or a local service provider are interested in the planned asset, and so will fund the additional costs on the ducts for example.

Activity 5 – Include in Approved Capital Works Budget. The project can now be included in the normal construction activities for Council.

2.2 DUCT ROUTES AND ALTERNATIVES

Traditional Duct Installation. Over many decades, ducts have been installed in many countries in a similar manner. Where roadway loading is likely, ducts must normally have a minimum of 600mm coverage, and for footways, the minimum coverage is 450mm.

Costs vary considerably, but in urban and metro areas where surface restoration is expensive and other services can obstruct the route, costs of $100 - $400/m are common. In the last few years, there has been considerable research in alternative development of cable routes to lower the costs, driven in part by the considerable savings that may apply to the $37Bn NBN program in Australia.

While councils will be generally familiar with the traditional duct installation described above, a number of new cabling processes are likely to be tested, and in time become commonplace, described below:

Alternative Approaches to Cable Route Development.

Aerial Reticulation. The most attractive alternative to traditional trenching, from a cost savings perspective, is to reticulate the fibre optic cables on pole lines – normally power lines. Sometimes subject to criticism on the grounds of impaired visual amenity, it is likely that the NBN Co will ensure that power authorities (Ergon in the case of the North-West Queensland Region) must comply with a decision to deliver broadband infrastructure over power lines. Much of the first rollout of NBN FttP infrastructure is aerial (ie. in Townsville). It is to be expected that if and when overhead power is placed underground, the fibre optic cables will follow, to their own ducts.

Shallow Trenching. Ducts are installed at around 300mm depth with suitable strengthening material around the ducts to provide the necessary roadway loading. Not widely deployed in Australia yet due to concerns regarding road maintenance problems. (Trials are underway in Australia and New Zealand on shallow trenching to test maintenance issues that may arise).

Micro Trenching. A narrow slot is cut in the road or footway with a rotary saw about 100mm deep and 15mm wide. A 10mm flexible duct or strip of 2-3 10mm ducts are inserted in the trench and backfilled with concrete emulsion. Not widely used yet in Australia, but holds promise for premises connection from the duct route along the street.

Directional Drilling. A well-established technology often used for building entry and road crossings that uses a directional drilling machine creates an up to 100mm diameter hole below the ground at any depth determined by the depth of the starter holes into which the drilling equipment is inserted. For telecoms duct installation, the drill can operate over a horizontal run of 100-200m, depending on ground conditions and is steerable. This approach avoids the need to open a trench.

Table 1 summarises the cable reticulation methods, relative costs and speed of deployment.

Deployment Technology	***Deployment Speed (typical distance in metres per day) #***	***Cost Range per Metre to Install Duct/Cable***
Traditional Trenching (4 x 100mm ducts)	50	$100 - $400
Traditional Trenching (1 x 100mm duct)	50	$50 - $350
Aerial Deployment (1 new fibre cable installed amongst power conductors)	500	$50[12]
Shallow trenching (4 x 32mm ducts)	400	$50 - $100
Micro-trenching (1 x 10mm duct)	500 - 800	$20 - $50
Directional Drilling (2 x 63mm ducts)	100	$30 - $70

Table 1 – Cable Reticulation Methods

Council Contribution to Cost Reduction

Duct routes requiring excavation can be installed for significantly lower cost where council capital approved work will assist in the excavation, backfilling and surface restoration.

Table 2 shows an indication of the potential reduction in cost for the construction of a duct route for a varying percentage of the route already being opened as part of other capital works activities.

Council Coincident Work as a % of the Broadband Route	Duct Install, Backfill Surface Reinstatement	Design, Project Costs Management	Total Cost per Metre	% Saving
100%	$ 4	$ 4	$ 8	83%
80%	$ 8	$ 4	$ 12	75%
60%	$ 16	$ 4	$ 20	58%
50%	$ 20	$ 4	$ 24	50%
40%	$ 24	$ 4	$ 28	42%
30%	$ 28	$ 4	$ 32	33%
20%	$ 32	$ 4	$ 36	25%
10%	$ 36	$ 4	$ 40	17%
0%	$ 44	$ 4	$ 48	0%

Table 2 – Duct Access Costs with Council Coincident Capital works Leverage Compared to Brown Fields Options

[12] Power authorities believe the installation of an additional cable increases maintenance costs and reduces the life of a pole route, so charge an annual fee to install telecoms cables in addition to the installation cost quoted.

As an example, a five km duct route through an urban area might cost $1.0m at $200/m average, but if 60% of the cost can be eliminated because of a planned road works program in the area, then the cost of the duct route can be reduced by 60% saving $600,000 for whoever needs to use the duct route.

With appropriate planning, and in anticipation of a very large construction program underway by the NBN Co, this type of support from Council can widen the coverage of fibre connections and accelerate the delivery of broadband services.

2.3 WIRELESS DISTRIBUTION

As discussed earlier, about 4% of all NBN connections will be via fixed wireless, and while this form of connection is very valuable in comparison with many of today's connection technologies, it will not provide the connection speed of fibre optic cables. It is important that where wireless connections will be used, as many wireless distribution sites as possible are identified for potential connection to the local network via fibre optic cables.

Councils can contribute to the availability of wireless services by plotting their 'high' sites where there is a wireless line of sight connection opportunity to premises that are unlikely to be connected to fibre optic cables. The range of modern broadband wireless systems is up to 30km (line of sight unobstructed). Relevant radio sites are water storage facilities and existing wireless sites used by councils for their own communications needs.

2.4 EQUIPMENT ACCOMMODATION

Broadband systems need to accommodate electronic equipment within 10 – 20km of the cable length feeding customer premises, and this usually incurs a building cost in the road reserve for the provider. Equipment space requirements are approximately 5m x 5m or less, and reliable power, air conditioning and flood resistance are important attributes of the building to accommodate the equipment. In many cases, as a regional design is developed, councils will have spare space in an existing building, or space on council land near the road reserve (to connect to cables in the road) for the necessary building. A number of benefits may arise from council offering access to their buildings and/or land:

- Reduced cost for the service provider
- A rental opportunity for council to accommodate the necessary equipment
- Reduced visual amenity issues because equipment can be located in a less obtrusive location

2.5 COUNCIL TELECOMS DEMAND

Councils are often a relatively large user of telecommunications services in the context of their local community, and so can exercise their buying power to some degree, to influence the investment decisions of service providers.

In planning the information technology needs of council over the next 5 – 10 years, one scenario that will be worth developing is that bandwidth between council sites may be much less cost than currently applies – potentially 1/10th of current cost per unit bandwidth.

This level of change as intended by the NBN initiative opens options for councils that were previously economically impractical. Examples are:

- Data backup and restoration between councils, and/or council sites
- Voice over Internet Protocol (VoIP) telephony and video conferencing across council sites with the intention of reducing travel time and cost

- Hosted applications that can be provided to many sites, including potentially sharing costs between councils to access powerful applications that are otherwise too expensive for one council.

These innovations can reduce costs and provide opportunities for improved operational efficiency in any large and distributed organization, with Council setting the example of how to use the new broadband technologies for the wider community.

2.6 UNDERSTANDING THE OPPORTUNITIES AND BENEFITS OF HIGH SPEED BROADBAND

Understanding the opportunities and benefits of increased use of high speed broadband and digital technology as a business enabler requires an accurate assessment of how economic developments and policies are being influenced by technological trends.

We have begun to enter another stage of the Information Age where ubiquitous high-speed broadband will provide a new utility service that will have a profound effect on the way society functions, communicates, works, shops and creates wealth. This broadband utility provides a platform for innovation that will enable businesses, especially SMEs, to reinvent themselves to enable access to new markets and opportunities, reduce costs and improve service delivery.

Economic potential of high speed broadband
Significant work has already been undertaken to measure the economic potential of high-speed broadband. Some of the key findings include:

- Increased broadband will help grow the economy: An analysis conducted jointly by Ericsson, Arthur D. Little and Chalmers University of Technology in 33 OECD countries concluded that: "*doubling the broadband speed for an economy increases GDP by 0.3%"* and states that "*for every ten percentage point increase in broadband penetration, GDP increases by 1%"*.
- Businesses with higher web usage are likely to grow faster: An analysis by BCG surveyed employees at more than 15,000 companies with fewer than 250 employees in the world's biggest economies, dividing the survey respondents into four groups: high Web, medium Web, low Web, and no Web. The analysis found that: "*in the U.K. the overall sales of high and medium Web businesses grew by 4.1 per cent annually from 2007 through 2010, about seven times faster than the overall sales of low and no Web businesses. In Hong Kong, 79 per cent of high and medium Web businesses reported higher sales over the past five years, compared with 63 per cent of no Web businesses. In the U.S, high and medium Web businesses expected to grow by 17 per cent over the next three years, compared with 12 per cent for their low Web and no Web counterparts. High and medium Web businesses have also increased the size of their workforces to support their Internet operations over the past three years, an otherwise dire period for job growth in the developed economies".*
- High speed broadband is predicted to increase productivity: A recent report from IBISWorld on Australia's Digital Future to 2050 predicts that: in a future enabled by high speed broadband 10% of Australia's 509 industries (accounting for 23% of the nation's revenue) will not function without this new utility; a further 17% of industries (also 23% of the nation's revenue) will use it to drive step-changes in their business; and 70% of the industries (accounting for 54% of revenue) will benefit from generalised productivity gains.

Risks of low uptake

It should be noted that this change will affect all businesses and industries, some of which will not survive unless they embrace and harness the era's technological potential and undertake the transformational change required to enable them to participate effectively in the Digital Economy.

Small Medium Enterprises (SME's) are particularly at risk when business models are in a disruptive state. The challenge and the opportunity facing SMEs and wider society, is to access innovative ways of adopting digital capability, not only to remain competitive in a rapidly changing marketplace but also to create new wealth.

Many of the benefits of broadband services are well known in the business and residential sectors, from email contact, internet research and entertainment to health and education services that had been impossible before.

However, the new high speed capacity can deliver completely new opportunities for business and community to engage in the Digital Economy, and it is recommended that the region develops a planned approach to educating business and community on the benefits of the new age broadband services and the fact that they can start to be delivered, even with moderate broadband capability.

It is recommended that councils prepare an education program to support business take-up of the new broadband technologies as they are rolled out in the region.

3 INTERNATIONAL EXPERIENCE WITH HIGH SPEED BROADBAND

3.1 AUSTRALIAN EXPERIENCE

Australia released its National Digital Economic Strategy (Digital Economy and Convergence Strategy Branch May 2011) in May 2011. It targeted eight Digital Economy goals as catalysts for business and community uptake of high speed broadband delivered under the National Broadband Network (NBN) initiative:

- Online participation by Australian households;
- Online engagement by Australian businesses and not-for-profit organisations (NFPs);
- Smart management of the environment and infrastructure;
- Improved health and aged care;
- Expanded online education;
- Increased teleworking;
- Improved online government service delivery and engagement; and
- **Greater digital engagement in regional Australia**.

In addition to defining the national strategy, the Federal Government is encouraging all local governments to develop their own Digital Economy Strategy to frame and guide their actions in bringing about optimal high speed broadband engagement and uptake by industry, businesses and community within their respective regions.

The locations in Australia that were the first recipients of the NBN and its high speed broadband capacity to enhance Digital Economy engagement are:

- Townsville, Queensland;
- Armidale, New South Wales;
- Kiama, New South Wales;
- Brunswick, Victoria; and
- Willunga, South Australia.

The following provides examples of how these communities are taking advantage of high speed broadband, and the Federal and local Government policies and funding initiatives through the development of targeted local pilot projects.

Townsville

As well as undertaking the Digital Hub and Digital Enterprise funding programs provided for early release sites, Townsville is the location for the NBN Diabetes Tele-health Trial, funded under the Digital Regions Initiative National Partnership Agreement.

The trial takes advantage of the NBN to deliver high quality in-home health services to improve the health outcomes of patients with type 2 diabetes who live in Townsville. The trial initially involves participants in the NBN first-release suburbs of Aitkenvale and Mundingburra, and will extend to include participants in the second-release sites in Townsville.

Armidale

As well as undertaking the Digital Hub and Digital Enterprise programs, Armidale is developing a **Broadband Smart Home**, located in Queen Elizabeth Drive that will demonstrate many of the real-world applications of the NBN, including home automation, remote health monitoring, video-conferencing, rehabilitation, education, remote business, sensor monitoring and environmental sustainability.

Federal Member for New England, Tony Windsor (Windsor n.d.) said that the project will serve as a platform to demonstrate how the NBN will enable innovation in regional areas. As well as the general public, the house will also be used by local TAFE and University students to trial and demonstrate various cutting-edge projects across a range of areas. The house is already being used by NBN Co. and Retail Service Providers to trial and deploy NBN-related equipment and services. The Armidale Broadband Smart Home has already attracted in excess of $50,000 in funding and significant interest from a wide range of groups who are committed to ensuring the success of the project.

Kiama

Kiama's main focus to date has been the implementation of the Digital Hub and Digital Enterprise programs. However, they are planning an iPhone walking tour, which includes historic photos, oral histories and text showcasing the town in that digital medium.

Brunswick

Given that 40% of residents in this area were born overseas and almost 25% are newly arrived in Australia, the Brunswick Neighbourhood House will be the Digital Hub, with the prime aim of increasing assimilation through the development of digital literacy and participation throughout the community.

Willunga

Willunga is located in the City of Onkaparinga. As well as its Digital Hub and Digital enterprise programs, Onkaparinga is utilising the Local Government Digital program to develop an online process to streamline development assessment, including high-definition video conferencing sessions between staff and applicants. Anticipated benefits include reduced development application processing time, reduced administrative costs, reduced customer costs and improved customer service.

The local farmers' market organisation has developed a prototype **'Virtual Farmers' Market'**, which allows people to walk through a virtual market in 3D and visit the tents and stalls as they exist in reality. By profiling the stall holders, people can get to know them, the products they will be selling next weekend and where they are located in the market. In the future it is planned that people will be able to place (and potentially pay for) orders in advance.

Digital Sunshine project

The Sunshine Coast in Queensland is claiming a world-first project that aims to accelerate the regional economy by accessing the untapped business advantages of the digital era. The program is being called 'Digital Sunshine'.

The basis of the program is an online survey that will enable participants to benchmark their existing digital capability against industry peers from a database of some 40,000 businesses. The intention is to use the results to develop and implement a series of information sessions for local businesses focussed on the value of specific ICT products and services for the vertical industries in the region.

The success of the program could offer Australian businesses a unique global advantage, by more rapidly absorbing the full advantages of the 'digital revolution' to accelerate growth, especially in relation to SMEs.

As part of this North West Queensland review businessmen and NFPs in Julia Creek, Charters Towers, Greenvale, Ravenswood and Palm Island have been invited to participate in the some benchmarking survey.

Ipswich Digital Capability Development Project

Despite only a few years ago being considered a city with a low socio-economic population and limited employment opportunities, Ipswich City has became recognised as a leader of the digital economy with its InfoCity Plan, to the extent that for the second year in a row it has been recognised by the international Intelligent Communities.

Underpinned by the implementation of high speed broadband and with the aim to maximize the opportunities for creating jobs and strengthening the Ipswich economy, the InfoCity Plan commits Ipswich to aggressive digital literacy training and support for individuals and local businesses to assist them to engage and participate in the Digital Economy.

The Plan not only focuses on the transformation of the City's business and industry, but also on the opportunities for local businesses to be involved in the implementation and ongoing operation of the high speed broadband network.

In May 2011, Ipswich City Council hosted the City's first Telecommunications Training & Skilling Symposium to discuss and promote the direct opportunities for supply chain networks in relation to the NBN rollout. This was followed by the promotion of the broader benefits of the Digital Economy for business and industry.

Currently, Ipswich City Council is preparing to implement an extensive series of information, training and mentoring sessions for local businesses through the Digital Hub and Digital Enterprise programs (previously described). These sessions will be developed to align to specific industry sectors demonstrating the benefits of uptake of the NBN enabled high speed broadband.

3.2 OVERSEAS EXPERIENCE

Malaysia

Malaysia is focusing strongly on a policy of encouraging 'cloud computing' utilisation as the best way SMEs can adopt technology and become more internationally competitive. The Multimedia Development Corporation (MDeC) launched the MSC Malaysia Cloud Computing Enablement Initiative in October 2011. In it, MDeC is targeting 1,500 Malaysian owned SMEs who will receive free use of technology and services for six months, or up to RM1,500 per company, to adopt cloud-based solutions.

It is also targeting 60 Independent Software Vendors (ISVs) who will receive up to RM30,000 in hosting services and marketing support from three cloud infrastructure providers partnering with MDeC. The program has seen positive results, such as:

- Soft Solvers Technologies, offering Customer Relations Management (CRM) solutions has experienced 300% growth; and
- Mywave, an HR and payroll solutions provider has experienced a six-fold jump in customers.

Canada

As part of its Digital Economy Strategy, Canada's National Research Council (NRC) has implemented its Digital Technology Adoption Pilot Program (DTAPP) (Chandramohan 24 April 2012). The program will provide some 630 SMEs with advisory services and financial assistance to collaborate with colleges, industry groups and other businesses across the country, with expertise in digital technology adoption, involving such areas as cost, benefit and risk analysis, organisational change, training, technology acquisition, adaptation and implementation.

The overall objective is to:

- Improve the rate of digital technology adoption by SMEs;
- Improve understanding of the link between digital technologies and productivity; and
- Raise awareness of the benefits and importance of adopting these technologies.

United Kingdom

In its report on the findings of its 2011 Internet Opportunity Survey, the Communications Management Association (CMA), UK stated, *"UK businesses are constrained to current generation broadband through a significant lack of availability of superfast broadband. Current business planning for superfast broadband is limited, as is the ambition to use the service as a platform to generate new revenue opportunities. A 'safety-first' attitude based upon business efficiency rather than opportunity and innovation."* (Communications Management Association 2011).

Some of the information that they were able to gather from surveying 300 businesses varying in size, industry and location, included the following:

- Reasons for using superfast broadband
  - Web conferencing (53%)
  - Collaboration (53%)
  - Increased efficiencies (36%)
  - Increased speed of communication (27%)
- Business achievements as a direct result of access to superfast broadband
  - Expansion into new markets (29%)
  - Hiring of more staff (12%)
- Requirements for superfast broadband
  - 40% required speeds of 50Mbps and above
  - 28% required speeds of 24Mbps up to 50 Mbps
  - 21% said they didn't need superfast broadband
- Willingness to pay more for superfast broadband
  - 16% said they would pay 1% - 10% more
  - 15% said they would pay 11% - 20%
  - 14% said they would pay 21% - 50% more

According to the Engineering & Physical Sciences Research Council (EPSRC) UK (Engineering and Physical Sciences Research Council n.d.), the risks and challenges to be overcome include:

- Access to fast broadband - particularly true in rural areas where connections are slower and there is less competition between ISPs to improve service and pricing. However, even in suburbs or towns access to fast broadband for SMEs (who aren't willing to pay for a fixed line service, etc.) is limited; and
- Lack of training - SMEs often have lower levels of training for employees than larger organisations which means that businesses may not be aware of the latest opportunities that superfast broadband can bring; and
- Concerns about security, reliability and trust - SMEs may not have dedicated IT departments and therefore may have concerns about their abilities to set up 'virtual' business processes in a secure and reliable way. They may need support and training from external organisations to achieve this.

"In relation to the above, some SMEs may have business development or business planning issues that may impact on their uptake. In this economic climate, businesses may be more risk averse which might impede growth. Paradoxically, however, SMEs are also viewed as being more 'agile' than big organisations and so may be in a better position to capitalise on the benefits of super fast broadband if they are given adequate support and training from business development organisations, knowledge transfer partnerships between universities and SMEs and support from governments to realise the potential for super-fast broadband." (Engineering and Physical Sciences Research Council n.d.).

4 TELECOMMUNICATIONS INFRASTRUCTURE REVIEW

4.1 NORTH-WEST QUEENSLAND - OVERVIEW

Network

As discussed in Section 2, the provision of suitable broadband telecommunication services is dependent on three key factors:

- Availability of competitive and sufficient backhaul capacity
- Suitable access network infrastructure
- A service provider who is willing to invest and operate in the region.

As the incumbent supplier of telecommunication services within Australia, Telstra has the largest backhaul network, access network infrastructure and ability to provide service. The issue has been and remains to be, the lack of alternatives to Telstra. When there are no competitive options there is no impetus for Telstra to provide higher levels of service or lower prices.

Backhaul in North West Queensland

Telstra provides backhaul capacity to its exchanges and wireless radio systems via optic fibre cables which generally follow the major highway routes. From the core fibre backhaul routes microwave systems are often used to extend backhaul capacity to smaller centres. Recent additions to backhaul capacity in Australia have provided competition to many areas.

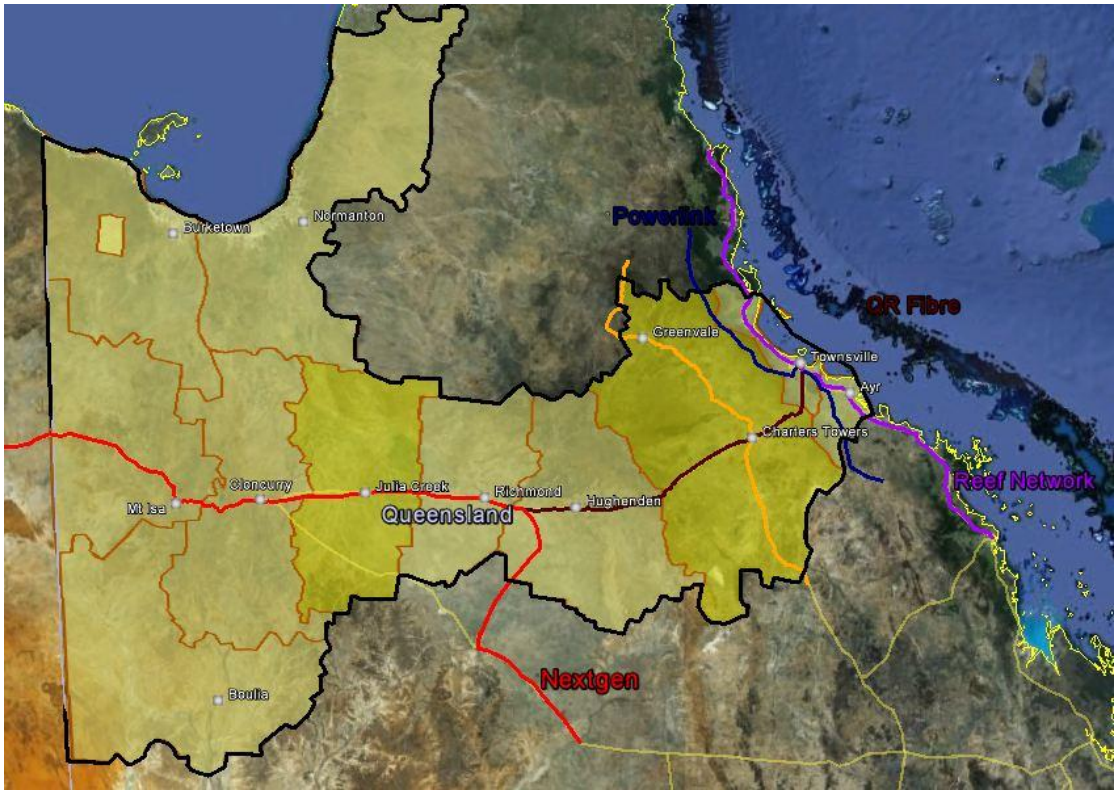


Figure 10: Major Backhaul Routes

As shown in figure 10 above, the coastal area around Townsville has a number of backhaul providers including Telstra, Reef Network, Powerlink and Nextgen. Any prospective suppliers of telecommunication services in Townsville have access to multiple suppliers and competitive backhaul pricing is available. Beyond the coastal strip, additional backhaul has been added in recent years but is still limited. NBN records shows the Telstra backhaul cable running north-south through Charters Towers as part of its core network. The Telstra cable running along the coast provides the other NBN backhaul fibre link.

The red line in figure 10 represents the new backhaul installed as part of the blackspots program. Combined with an additional optic fibre cable installed by Nextgen from Marathon to Townsville, competitive backhaul is now available along the Flinders Highway access effectively eliminating the backhaul issue in townships along the route.

For locations beyond the Flinders Highway the access to competitive backhaul will remain an issue for the foreseeable future.

The access network for fixed services is provided via copper cable in the townships and beyond the townships Telstra uses radio systems to connect properties. As shown in figure 11 there are many Telstra radio sites (Registered with ACMA) within the region. Radio sites include multi customer radio systems and cellular base stations.

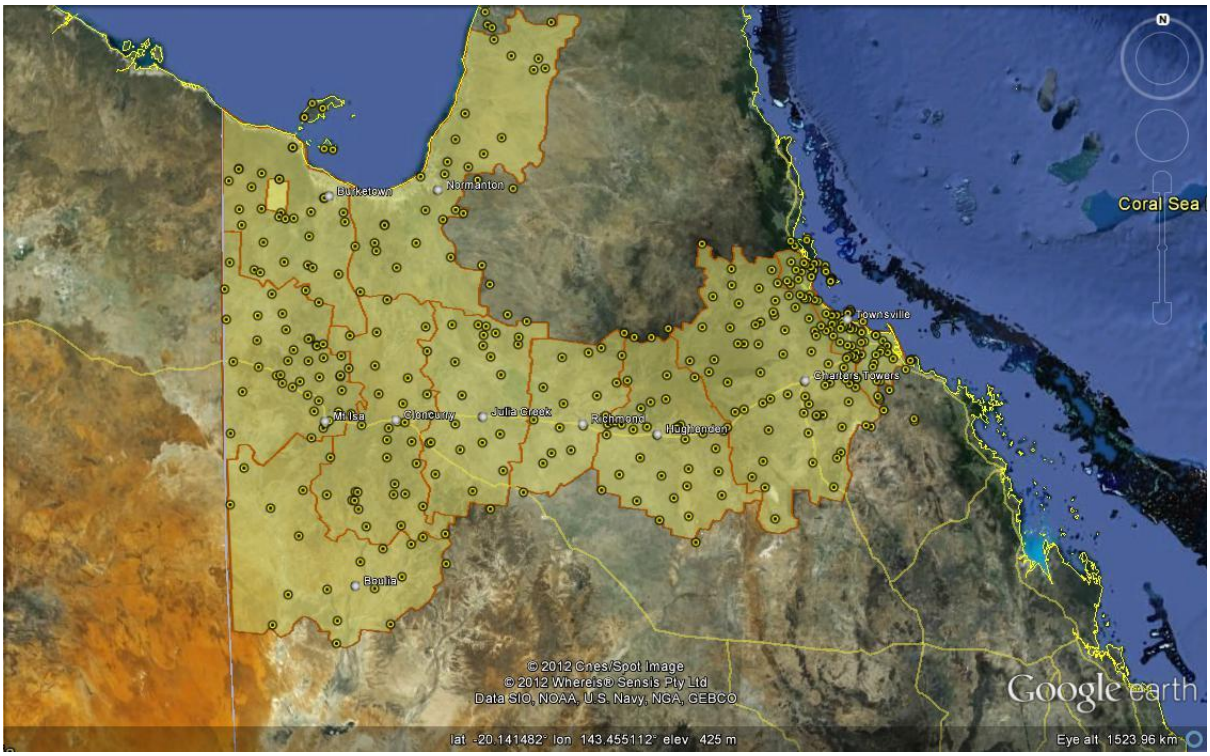


Figure 11: Telstra Radio Sites

Telstra radio infrastructure is much more extensive than other providers such as Optus and Vodafone, shown in figure 12 below.

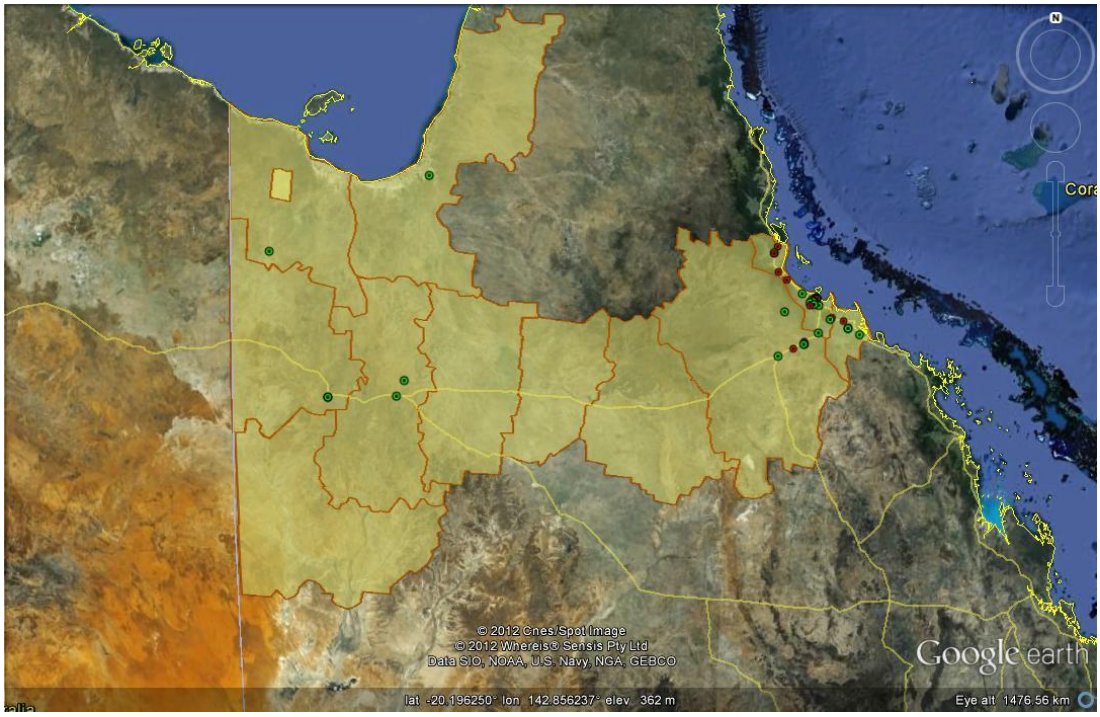


Figure 12: Optus and Vodafone registered radio sites

Other radio infrastructure owners include Optus, electricity industry and Queensland Rail. Utilities own and operate telecommunications systems for the operation of their primary asset and the location of their telecommunication infrastructure aligns accordingly.

As shown in figures 13 and 14, the electricity industry and rail sites tend to follow the main transport corridor and align with the existing carrier broadband infrastructure.

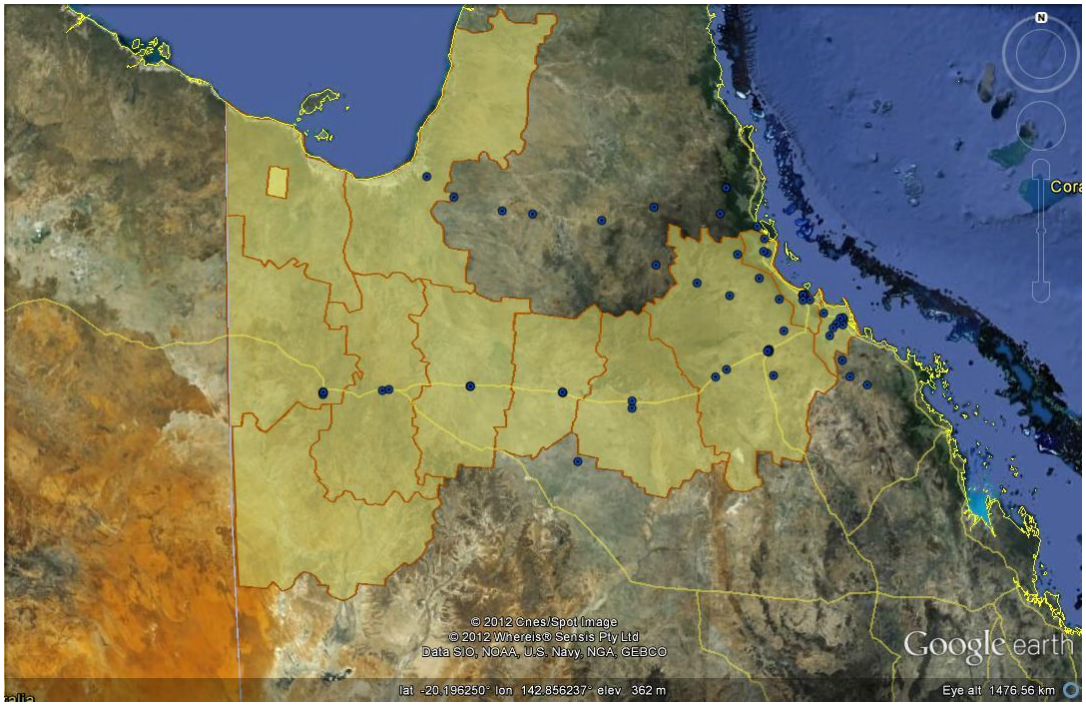


Figure 13: Electricity Industry Radio Sites

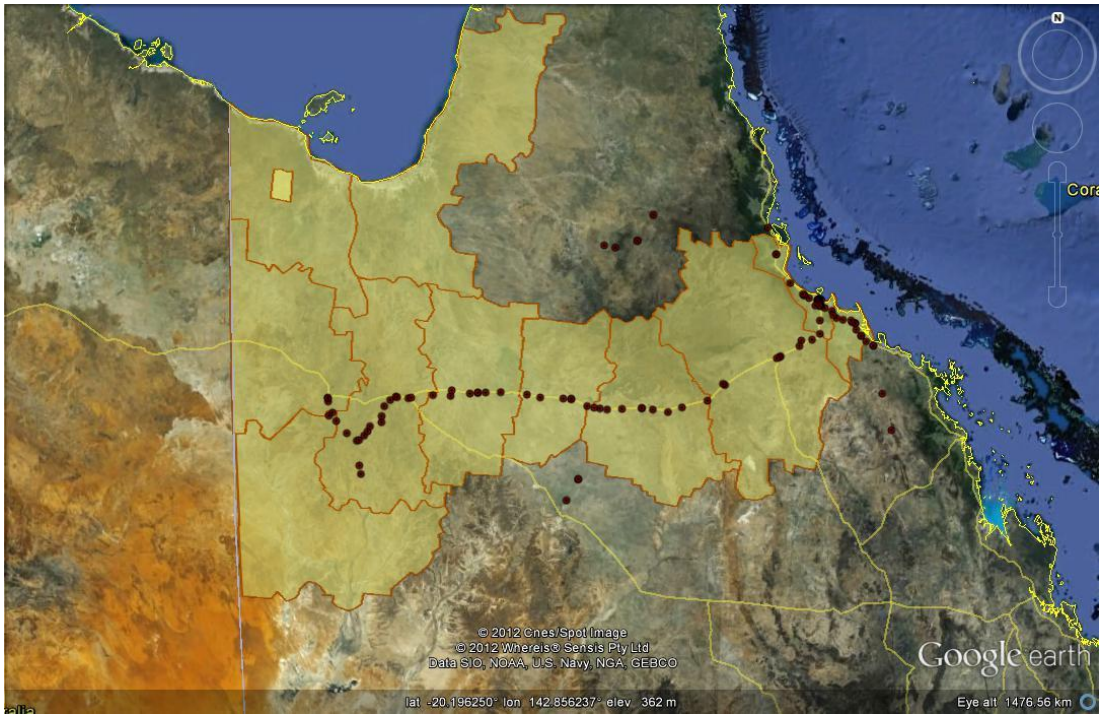


Figure 14: Queensland Rail Radio Sites

Police, ambulance, fire and other emergency service organisations also operate radio networks for communication between central locations and field staff. The registered radio sites for emergency service organisations sourced from the ACMA data base are shown in figure 15.

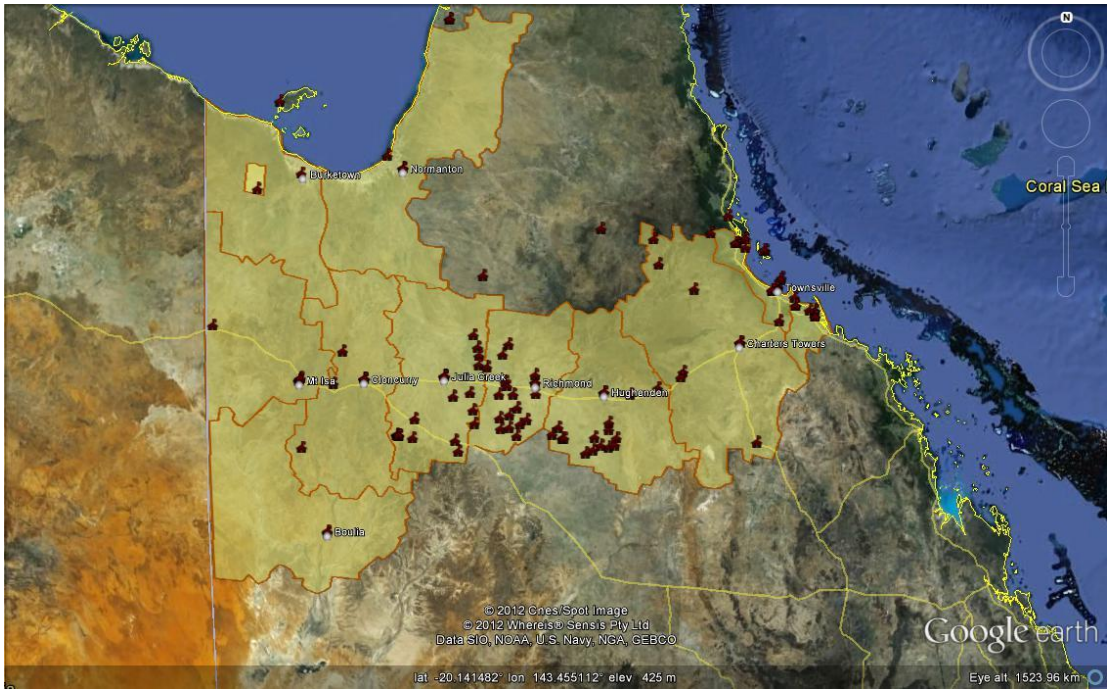


Figure 15: Emergency Services Radio Sites

Due to the nature of the 2-way radio services, structures to support the communication are sometimes low strength and the majority of emergency service radio installations use other party's structures. In summary, the emergency service sites may have limited use for the delivery of broadband services

Cellular mobile coverage is unavailable in many parts of the region with Telstra providing coverage along the Flinders Highway and limited centres. However, we are not aware of any plans for Telstra to expand its cellular mobile coverage beyond the current footprint shown in figure 16.

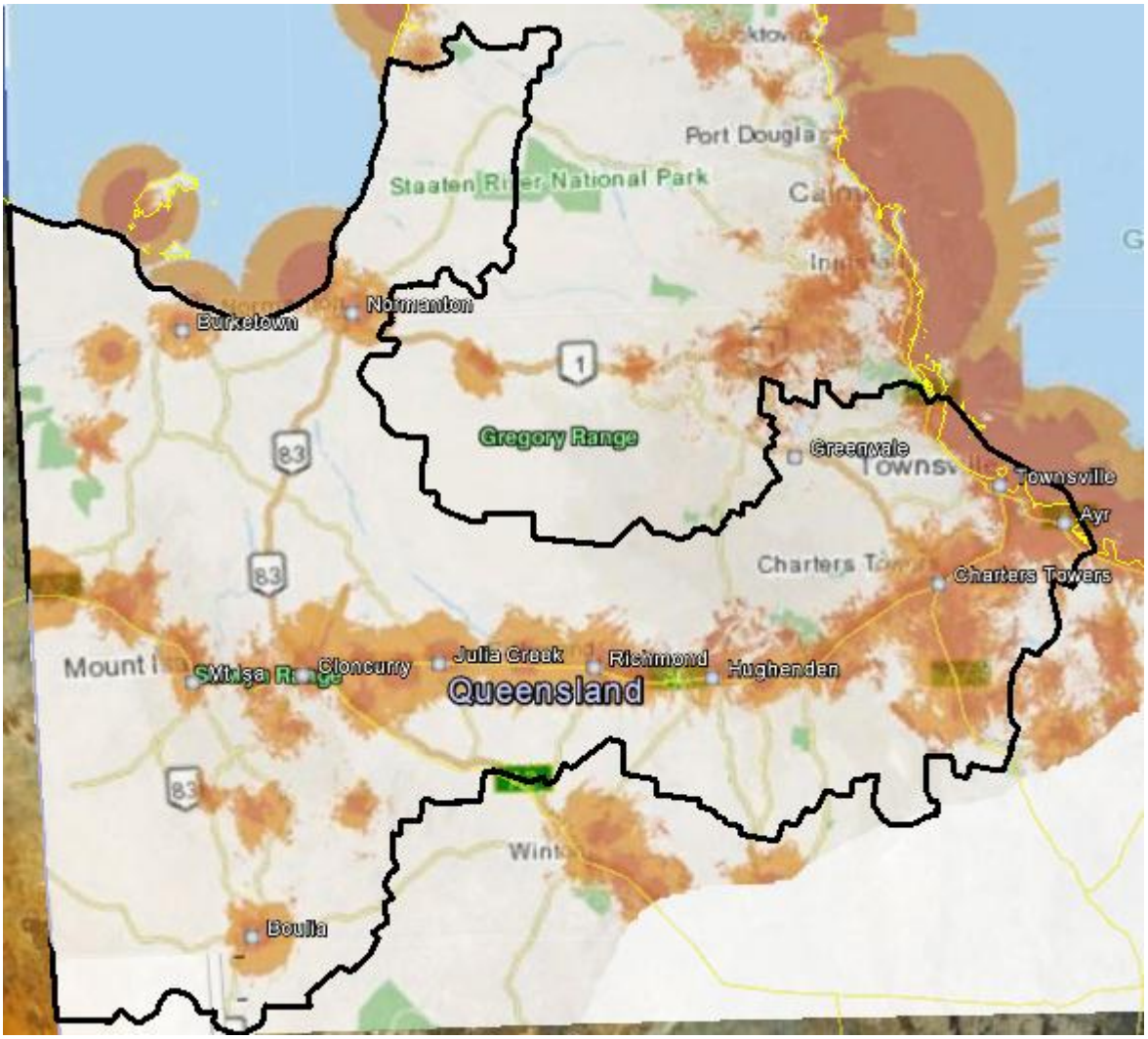


Figure 16: Telstra Cellular Mobile Coverage

Optus's coverage figure 17 is currently significantly less than Telstra although Optus's current maps do show the proposed installation of additional coverage. Even with the investment in additional base sites Telstra will still have the greatest coverage.

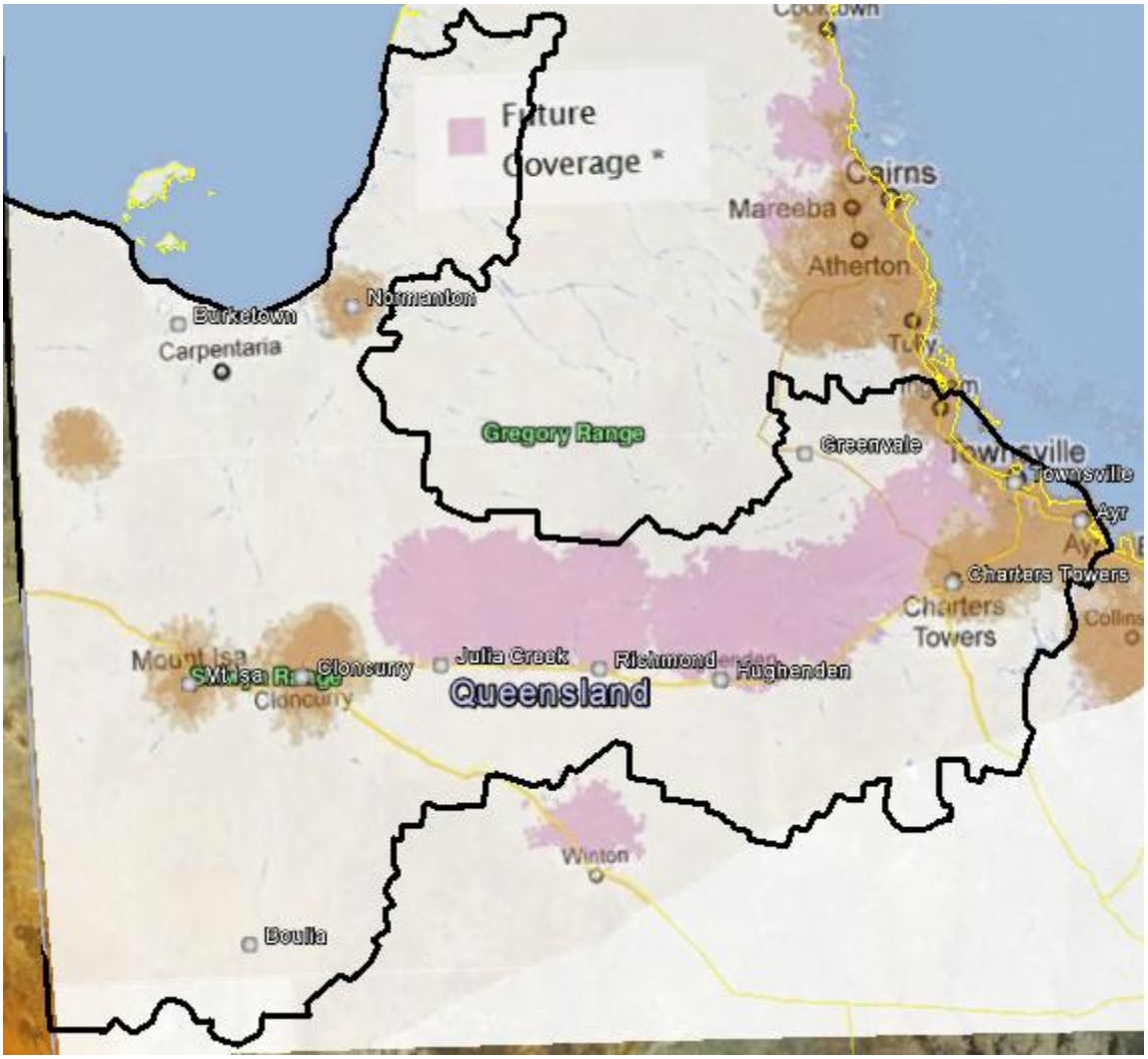


Figure 17: Optus Cellular Coverage (Brown now, Pink proposed)

National Broadband Network (NBN)

Based on the available information from NBN, as shown in figure 18 the eastern coastal strip of the regions north and south of Townsville will be well serviced with NBN fibre installations and wireless coverage. To achieve the 93% fibre coverage, the centres of Charters Towers, Hughenden, Cloncurry and Mt Isa will have a fibre network deployed with wireless coverage also proposed around Mt Isa. The remaining parts of the region are to be serviced via NBN satellite. The selection of technical solutions is subject to ongoing review by NBN and slight modifications may be possible.

It should be noted that whilst the NBN fibre access network is to provide both data (internet) and telephone service, the wireless and satellite solutions are data only services (not telephony) and provide lower data transfer rates than fibre.

Where no fibre is deployed it is expected that the existing Telstra access network, copper or wireless, will continue to provide telephone services for all users.

The rollout of the NBN is planned for a 10 year construction program and the final deployment timeframe of the network is a decision for the NBN. However the expectation of fibre deployment in an area will have the impact of restricting any further investment by carriers in enhancing service capacity as it may be deemed to subsequently be stranded investment.

For example, it may be difficult to encourage carriers to build fibre infrastructure when the potential return period is limited. Telstra is also unlikely to make substantial investments in ADSL equipment using the copper network when it will be replaced when the NBN is deployed.

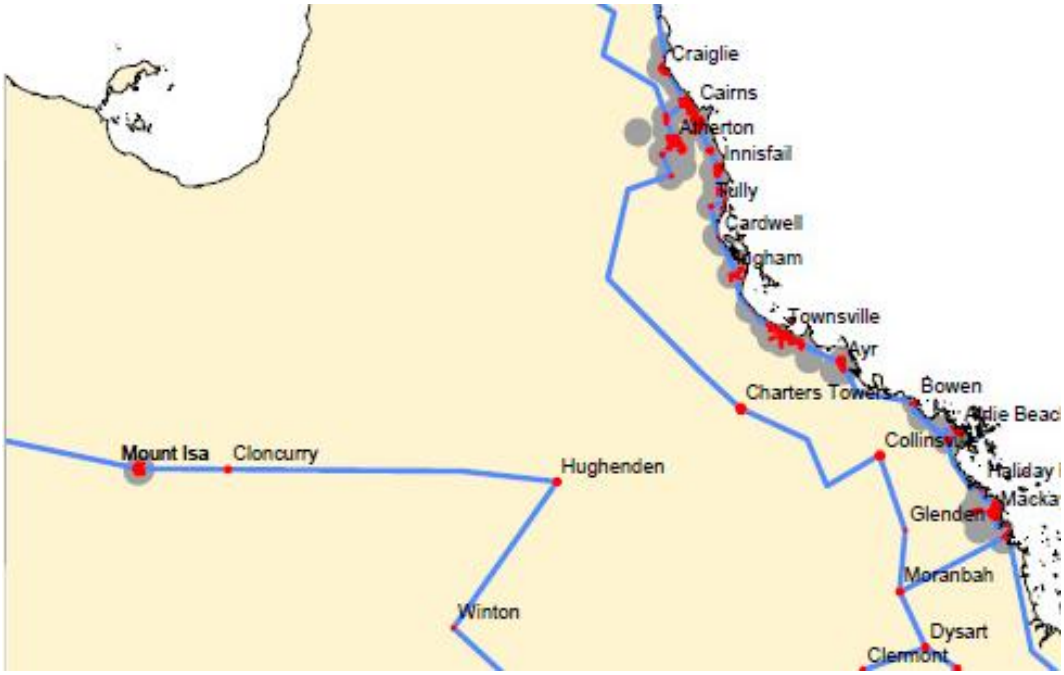


Figure 18 - NBN Coverage Map

4.2 DETAILED REVIEW – M^{C}KINLAY SHIRE (JULIA CREEK)

4.2.1 OVERVIEW

The 2011 census data shows the residential population of McKinlay Shire is 1,050, an increase on the previous figure of 951, showing that the shire's population is on a growth path. In discussions, Council advised that the population of Julia Creek is approximately 600 and is growing from both an economic and social perspective, a situation that sets it apart from other small outback communities who are on a long term economic and social decline path. The remainder of the population is dispersed throughout the region, some in small communities (ie. McKinlay) and the rest in outlying properties.

To meet future growth in Julia Creek, Council is developing a site at the western end of town, fronting onto the Flinders Highway, which will provide 36 commercial and rural residential blocks. The current 3 stage plan is for a medium term development with a 5 year planning horizon. Stage 1 (13 lots) is completed with full services including fibre-ready pit and pipe infrastructure and has already experienced solid sales for the commercial and larger residential lots. Stage 2 is ready to go, depending on certain short and medium economic drivers that Council is aware of (such as existing mining tenements and irrigated agriculture).

There is also the potential for stages 4 & 5 in the longer term 10 year planning horizon based on identified mining and agricultural opportunities.

4.2.2 LOCAL DEMAND

With a view to investigating possibilities to deliver fibre based broadband to Julia Creek due to the absence of any proposal for the NBN to do so in the foreseeable future, Council approached Telstra with a view to investigating an interim FttP solution. In its letter, Council noted 25 facilities as potential sites requiring a fibre connection. Of that number, three were identified as already having fibre connection - the hospital, Police and Telstra itself. The remaining facilities either have ADSL or utilise the 3G mobile network to connect to the internet.

While Council's list only included what they referred to as essential services and a couple of large organisations, it did suggest that there could be approximately five SMEs and a similar number of residences that would wish to be connected.

At a public meeting of some thirty residents, the general consensus was that while ADSL was available in town, speed was slow and there were regular drop-outs.

An online survey is being circulated to businesses and community organisations to gauge their current level of digital understanding and capability, as a major limiting factor to assessing true/potential demand is the current lack of digital awareness.

4.2.3 LOCAL SUPPLY

The McKinlay Shire is bisected by the new backhaul cable installed under the Blackspots program with Julia Creek on the route. This means that Julia Creek now has access to competitive backhaul capacity which enables carriers other than Telstra to provide service options.

Julia Creek is not on the current NBN coverage maps for fibre deployment and there is no listing for wireless coverage. It would be reasonable to expect that an NBN wireless deployment may be considered for the township.

Data services are currently provided using the existing Telstra copper cable and there may be some fibre connectivity. The township of Julia Creek should have sufficient Telstra cellular coverage but this is limited to approximately 30 or 40 km north and south of the highway.

Currently, Telstra is the only provider of telecommunications in Julia Creek. With the exception of the hospital and police, who have fibre connection, the remainder of the town utilises either ADSL or mobile 3G for their telecommunications needs. Council has an ADSL connection to Telstra's exchange (less than 50 metres away), as well as a short fibre run of around 200 metres, providing a point-to-point connection with its Depot Administration Building. Figure 19 below indicates the number and type of ADSL connections in Julia Creek, shown as businesses(16) and residential (137) and compared with the total number of premises (430), shown as GNAFs (Geocoded National Address Files), within in the Exchange Service Area (ESA).

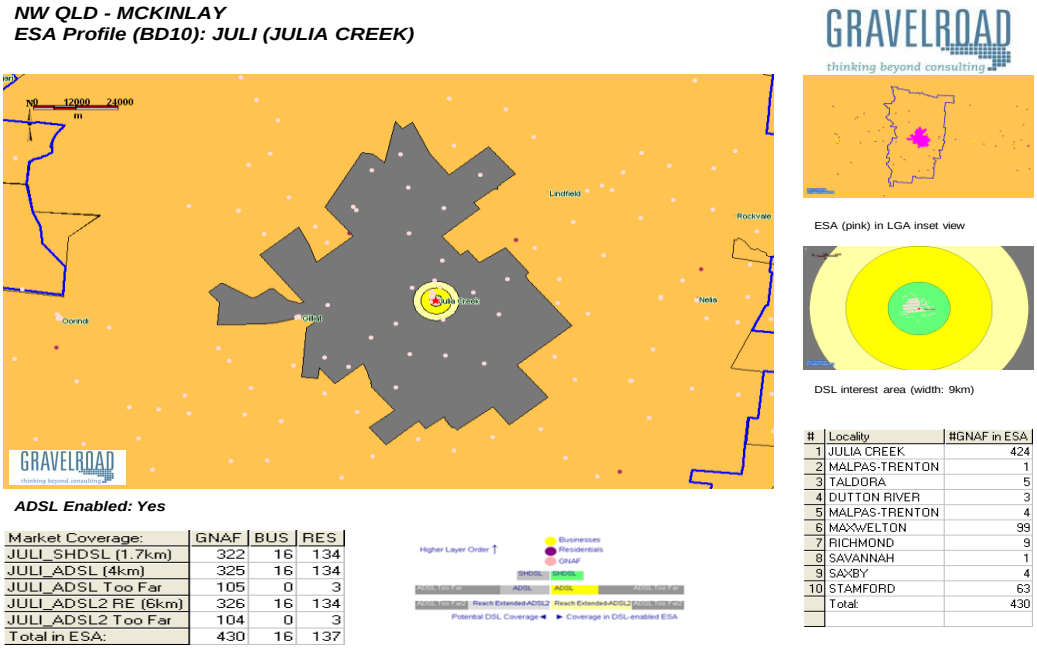


Figure 19: Julia Creek showing ADSL connections

However, as well as Telstra infrastructure, there are other owners of fibre infrastructure, such as Nextgen, with its RBBP as mentioned previously, as well as QRail and Ergon.

While there is currently no indication as to when the NBN plans to deploy fibre into Julia Creek, there could potentially be a number of alternate solutions for the delivery of high speed broadband to the town.

Figure 20 below shows a map of Julia Creek. The red line at the bottom is the RBBP, as mentioned previously and there appears to be several possible points to interconnect.

Figure 20: Julia Creek showing the RBBP fibre route

As well as the possibility of deploying fibre throughout the town, it should also be noted that there is a Telstra tower (figure 21) at the north-west corner of the town, as well as a Council owned water tower (figure 22) within the town. Either of which could house sufficient wireless transmission equipment to service the entire town.

Figure 22: Telstra Tower

Figure 21: Council's Water Tower

The task is to determine which options are achievable and if so, are they viable. From that point it's a matter of determining which local points of presence will enable optimal distribution cabling costs, ensure resilience in case of cable faults or damage, and to cater for anticipated new development requirements in the future.

Local connections between points of presence will be achieved through a combination of the techniques described in section 2.2. When planning connection routes between points of presence, passing schools and medical facilities will allow for relatively easy connection of these important facilities.

4.2.4 LOCAL LEADERSHIP

While currently Council appears to be the sole source of local leadership, the reason for the public meeting mentioned earlier was to investigate the possibility of establishing a local Chamber of Commerce with the assistance of the Mount Isa Chamber. This could provide the 'local champions' with a focus and purpose to establish a local chapter.

In order to plan the development of non-NBN broadband infrastructure, it will require a business case to be prepared.

This would involve:

- further review of existing Council and other local telecoms assets with a view to lessening the 'cost of entry' for potential providers;
- determine the scale of potential demand, including market sounding to assess nature and level of interest;
- assess likely pricing structure for access based on similar market information,
- identification and cost estimation of required infrastructure build which would be required to provide the desired level of access.

This phase would combine the potential revenue and potential cost of sale and an assessment of the relevant risks and impacts leading to a detailed 'Go to Market' strategy.

However, the principles of the design process are set out in this document to assist with infrastructure planning.

4.2.5 BROADBAND OPPORTUNITY

If sufficient demand can be aggregated, then an alternative supplier may be encouraged to provide service to customers in the township of Julia Creek. This could be either fibre or a wireless service, potentially using the water tower as a structure. However, in our opinion it is unlikely that individual customer requests will be sufficient for a carrier to establish a network in a town but multiple services established by an aggregation initiative may be sufficient encouragement for third party investment.

4.3 DETAILED REVIEW – CHARTERS TOWERS REGION (CHARTERS TOWERS, GREENVALE AND RAVENSWOOD)

4.3.1 OVERVIEW

The OESR Population and Dwelling Profile (updated April 2012), the estimated residential population of Charters Towers Region is just under 13,000. In discussions, Council advised that the population of Charters Towers is approximately 9,500, Greenvale is around 150 and Ravenswood around 230. The remainder is dispersed throughout the region, some in small communities (ie. Pentland, Sellheim and Mingela) and the rest on outlying properties.

4.3.2 LOCAL/REGIONAL DEMAND

Given that Charters Towers Region is not yet on NBN's 3 year infrastructure rollout plan, it has decided to investigate alternate methods to deliver reliable high speed broadband to Charters Towers and if possible, Greenvale and Ravenswood.

Charters Towers

Meetings were held with senior Council officers and with business and community representatives at the three locations. The feedback in relation to the level of demand for high speed broadband in Charters Towers was inconclusive as there were only three attendees representing the Chamber of Commerce, Neighborhood Centre and a business providing communications equipment and systems (primarily radio).

However, we have subsequently received emails from residents, which we have summarised below;

"Dear Paul,
I read an article in today's Northern Miner newspaper regarding a review you are conducting into mobile, broadband and other internet services in Charters Towers. The article encouraged community members to contact you to provide feedback.

We are located only 2 – 3 km from the CBD, but we don't have ADSL, so we have no other internet options available to us but to connect via our Mobile Wireless card (connected to our computer via USB) but the internet webpages won't load – it seems to time-out.

Over the past few months, we have had significant trouble using the internet in peak periods (generally after 6 – 6:30pm until approximately 9:30pm every weeknight). My understanding is that the towers become congested during peak periods. A local IT expert has informed me that changing service providers will not necessarily fix or improve the situation as the problem is more widespread and not isolated to a single service provider. Michelle Petersen"

"We use the internet heavily in the promotion of our tourist attraction: Texas Longhorn Wagon Tours & Safaris and also Bethel Saddlery. Because we are unable to access cable broadband we use wireless (mobile) and whilst that does the job it is frustrating to say the least that we have to use a connection that at times can be unreliable and expensive as compared to what people who have access to cable broadband. Michael Bethel"

"With the introduction of access to the internet and the subsequent rapid rise in its use the City area of Charters Towers has had a good ADSL service with speeds close to the telephone exchange of up to 20 Megabits per second. ADSL access is available to most in the City area, there is some just outside with Sellheim to the east having coverage. The rest of the Regional Council area has no ADSL service, their broadband access is necessarily via Satellite or the Mobile Phone systems.

An extra mobile cell was installed at the Exchange in the City two years ago, that is the only increase the Regional Council area has received in service for some years. This has not increased the footprint of the system but has helped with congestion. Ray Barnes, RB Communications"

Greenvale

At Greenvale we met with 11 residents (figure 23) representing the Progress Association, SES, Rural Fire Service, Ambulance, Police, school and Metallica Minerals. While they would prefer to have a fibre connection, their main focus is in mobile coverage, not only for the town that has virtually no mobile coverage and only one public pay phone , but along the Gregory Development Road that carries considerable tourist traffic and when the Bruce Highway is flooded, it becomes the main arterial route providing access to North Queensland.

Figure 23: Greenvale Community Meeting

This lack of mobile communications is not simply an inconvenience. It has critical implications, given that the only police and ambulance for many hundreds of kilometres along the Gregory Development Road are located in Greenvale. There were 13 vehicle rollovers last year and 7 this year to date along this stretch of road, generally involving tourists mostly with no means of communicating their situation.

To add to this situation, Metallica Minerals, if it is successful with its Environmental Impact Study, will be trebling the population when some 500-600 construction workers and their families move into town in 2013-14, to be replaced approximately two years later by 200-300 mine workers, who they plan to domicile in town.

Ravenswood

The Ravenswood situation is different again. Apart from the Carpentaria Gold mine, there appears to be little business apart from the restoration and preservation of the historical town. We met with representatives of Carpentaria Gold, the Restoration and Preservation Association, Police and the local Councilor (figure 24). It appears the Police and the mine and camp, have ADSL, but no one else in the town, (ie. post office and general store). The school uses satellite, which we understand is NBN satellite via 'Activ8Me'.

Figure 24: Ravenswood Community Meeting

Again, like Greenvale, the major concern is mobile telephony, particularly at the Burdekin Dam where there is no mobile coverage at a location where there is considerable boating (ie. Skiing, fishing, etc) activity and has experienced serious accidents with delayed medical response due to lack of mobile communications.

However, the online survey previously mentioned is being circulated to businesses and community organisations to gauge their current level of digital understanding and capability. A limiting factor to assessing true/potential demand is the current lack of digital awareness by businesses and individuals.

4.3.3 LOCAL/REGIONAL SUPPLY

The township of Charters Towers is located at the intersection of the Flinders Highway and the Gregory Development Highway which also places it at the intersection of two major backhaul routes (figure 25).

Any carrier seeking to provide telecommunication services has access to both Telstra and alternative competitive backhaul capacity.

Charters Towers is also listed for NBN fibre rollout with the timing still unknown. Within the council area there is cellular mobile coverage along the Flinders Highway, both east and west. Telstra mobile coverage also extends to the south along the Gregory Development Highway.

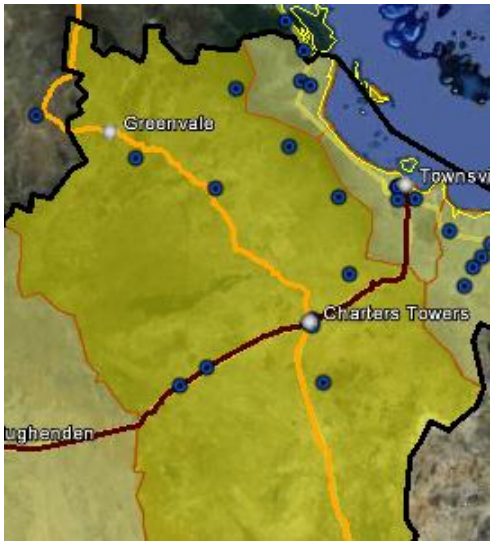


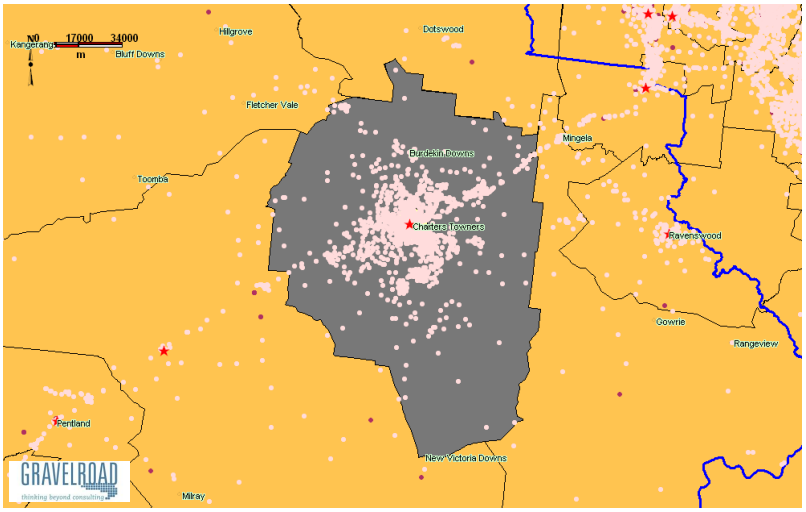
Figure 25: Gregory Development Highway fibre route

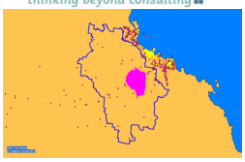
However there is no Telstra coverage north of Charters Towers along the Gregory Development Highway to the northern boundary of the council.

There are Telstra and Power Industry radio sites to the north of Charters Towers but no cellular installations. For the community of Greenvale, an optic fibre route (backhaul) passes through the area but does not appear to be providing any services other than standard telephony.

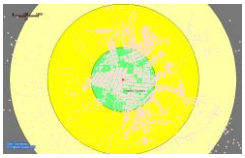
Charters Towers

NW QLD - CHARTERS TOWERS REGIONAL
ESA Profile (BD10): CTRS (CHARTERS TOWERS)





ESA (pink) in LGA inset view



DSL interest area (width: 9km)

ADSL Enabled: Yes

Market Coverage:	GNAF	BUS	RES
CTRS_SHDSL (1.7km)	2224	164	1108
CTRS_ADSL (4km)	4501	206	2467
CTRS_ADSL Too Far	1922	10	655
CTRS_ADSL2 RE (6km)	5175	214	2707
CTRS_ADSL2 Too Far	1248	2	415
Total in ESA:	6423	216	3122

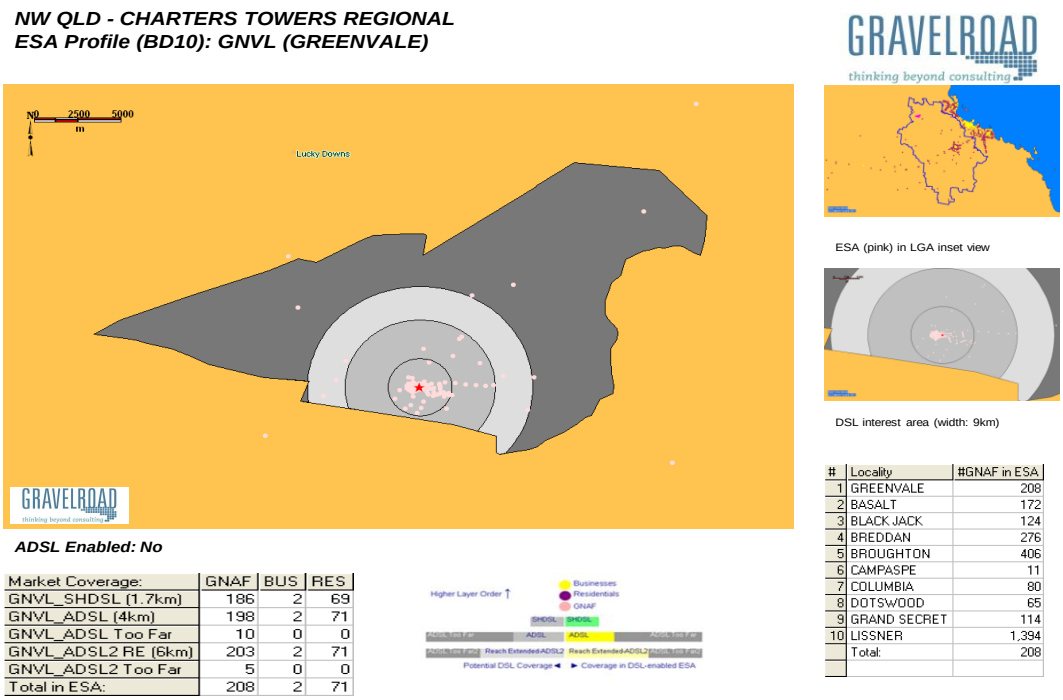
#	Locality	#GNAF in ESA
1	ALABAMA HILL	82
2	BASALT	172
3	BLACK JACK	124
4	BREDDAN	276
5	BROUGHTON	406
6	CAMPASPE	11
7	COLUMBIA	80
8	DOTSWOOD	65
9	GRAND SECRET	114
10	LISSNER	1,394
	Total:	2,724

Figure 26: ADSL connections in Charters Towers

Figure 26 above indicates the number and type of ADSL connections in Charters Towers, shown as business (216) and residential (3122) and compared with the total number of GNAFs (6423) in the ESA. From the figures it would appear that there are a large number of premises without any ADSL broadband. The remainder appears to rely on 3G mobile for the broadband connection. Telstra's 3G seems to have adequate coverage throughout the town, but comments were made that there were a number of dead spots.

Charters Towers community and business representatives confirmed that quite a number of premises were unable to get ADSL due to 'pair gain', having to resort to 3G mobile for their broadband connection. When asked about satellite, the response was that people on the land were disconnecting their satellite service on the grounds that the service was unusable. In fact, they stated that mothers were moving into town with their children due to the lack of any acceptable communications.

Greenvale



Market Coverage:	GNAF	BUS	RES
GNVL_SHDSL (1.7km)	186	2	69
GNVL_ADSL (4km)	198	2	71
GNVL_ADSL Too Far	10	0	0
GNVL_ADSL2 RE (6km)	203	2	71
GNVL_ADSL2 Too Far	5	0	0
Total in ESA:	208	2	71

#	Locality	#GNAF in ESA
1	GREENVALE	208
2	BASALT	172
3	BLACK JACK	124
4	BREDDAN	276
5	BROUGHTON	406
6	CAMPASPE	11
7	COLUMBIA	80
8	DOTSWOOD	65
9	GRAND SECRET	114
10	LISSNER	1,394
	Total:	208

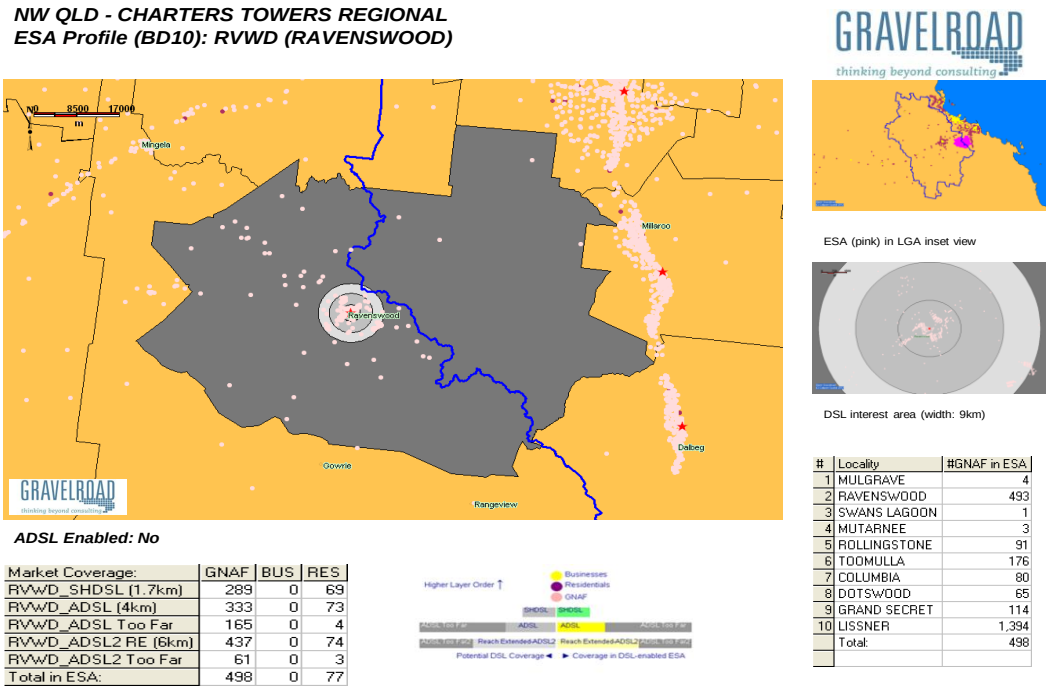
Figure 27: ADSL coverage in Greenvale

Figure 27 above indicates the number and type of ADSL connections in Greenvale, shown as business (2) and residential (71) and compared with the total number of GNAFs (208) within the ESA. These figures, while very low, appear higher than indicated by either the official population estimate of Greenvale of 120, or the feedback from the community consultation referred to earlier. Where they stated:

- The police station and school have the only fibre connections (Telstra), although it only provides 6 Mbps download and 512 Kbps upload.
- There is virtually no other telecommunications access in town. There is only one public telephone and no mobile coverage.
- As noted above, there is Telstra fibre running through the town, with already a breakout point providing access to the police and school. There are also several towers in close proximity to town, as well as a Council-owned water reservoir on the top of a nearby hill with 360^{o} clear line of site for quite some distance. It could house both a mobile repeater and wireless broadband transmitter(s).

Ravenswood

Figure 28 below indicates the number and type of ADSL connections in Ravenswood, shown as business (0) and residential (77) and compared with the total number of GNAFs (498) within the ESA.



Market Coverage:	GNAF	BUS	RES
RVWD_SHDSL (1.7km)	289	0	69
RVWD_ADSL (4km)	333	0	73
RVWD_ADSL Too Far	165	0	4
RVWD_ADSL2 RE (6km)	437	0	74
RVWD_ADSL2 Too Far	61	0	3
Total in ESA:	498	0	77

#	Locality	#GNAF in ESA
1	MULGRAVE	4
2	RAVENSWOOD	493
3	SWANS LAGOON	1
4	MUTARNEE	3
5	ROLLINGSTONE	91
6	TOOMULLA	176
7	COLUMBIA	80
8	DOTSWOOD	65
9	GRAND SECRET	114
10	LISSNER	1,394
	Total:	498

Figure 28: ADSL coverage in Ravenswood

From personal inspection and community consultation in Ravenswood, the following was noted:

- The Ravenswood situation is less severe than that of Greenvale. While their land lines appear to provide adequate telephony, there is no ADSL broadband available with the exception of the police station and the Carpentaria Gold mine and camp located on the outskirts of town. Mobile reception is spasmodic and there is virtually no coverage beyond a 5klm radius of town.
- There is a small Telstra tower at a high point in town attached to the local exchange. There is a water tower at another high point with line of sight to the Telstra tower, but it is unsure whether it is owned by Council or the mine and it may be too close to the blasting radius of the proposed expansion of the mine.
- Most people in town use NextG wireless modems for their internet connection.

4.3.4 LOCAL LEADERSHIP

Local leadership throughout the Charters Towers Region appears to be the Council. In Charters Towers they are supported by the Chamber of Commerce that has 60 members and the Neighborhood Centre that is well supported by a broad range of community organisations. With the addition of a number of respected industry champions such as Ray Barnes of RB Communications and Michael Bethel of Texas Longhorn Wagon Tours & Safaris and Bethel Saddlery, there is the makings of a local leadership group that could play a vital role in the digital transformation of the region.

4.3.5 Broadband Opportunity

There appear to be some opportunities to improve broadband capacity in the Charters Towers Region.
In Charters Towers itself, there is the potential to take advantage of the Nextgen fibre route that runs along the Flinders Highway, as shown in blue in figure 29 below.

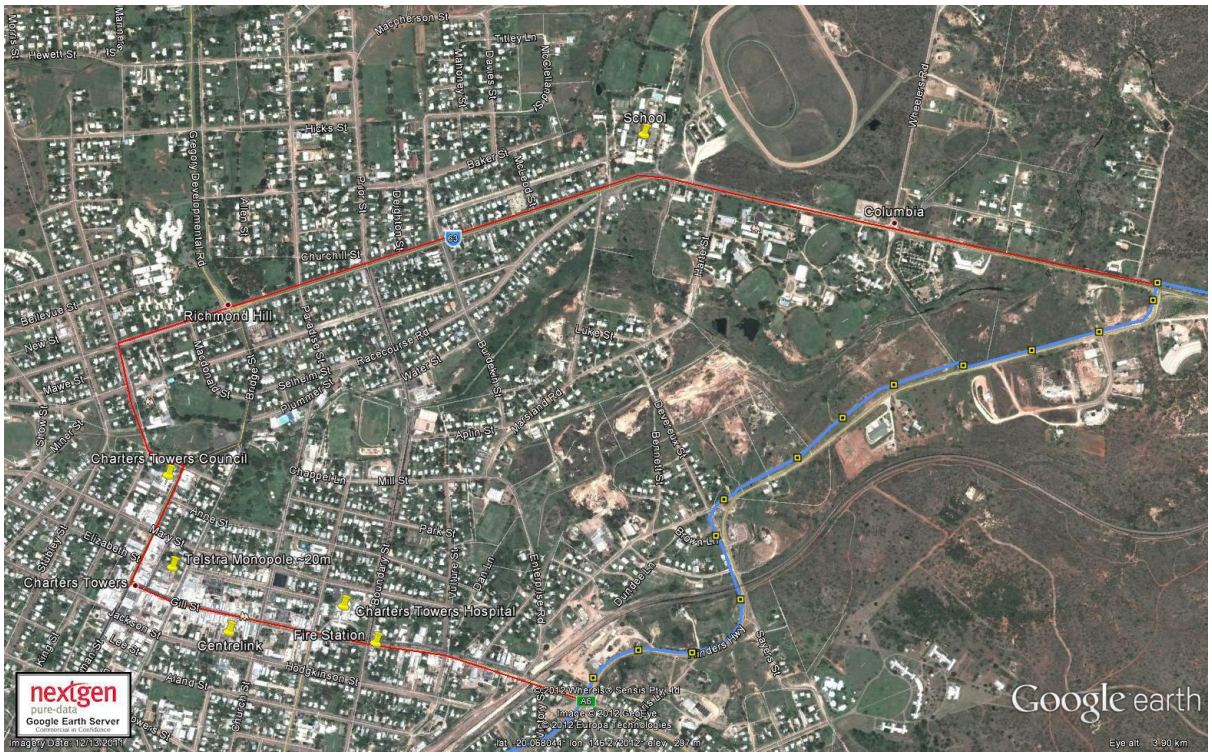


Figure 29: Charters Towers, showing the Nextgen Fibre Route (blue)

Similarly to Julia Creek, due to the fact that there is access to an alternate fibre route providing backhaul, there are potentially a number of options (ie. fibre and/or wireless) available to improve broadband connectivity to Charters Towers and the surrounding area.

However, to encourage service providers to invest in the necessary infrastructure, it will be necessary to aggregate sufficient demand.

To improve telecommunication services in Greenvale several options could be pursued:

1. Encourage Telstra to establish a cellular mobile base in the area (a number of radio sites exist in the vicinity)
   a) Either a capital contribution or guarantee of use (ie. Metallica Minerals)
   b) Establishing that cellular coverage along the highway is a safety prerequisite, as well as the township.
2. Encourage other carriers to establish a network in the township.
   a) They could be constrained by buying capacity from Telstra; or
   b) Encouraging another network owner to extend capacity into the township.

In the case of Ravenswood, it would appear that the only option is to encourage Telstra to improve cellular mobile coverage to include the Burdekin Dam, again as a safety prerequisite. In relation to the township, given that is no viable competition, Telstra is not likely to upgrade its existing services unless there is an economic reason to do so.

4.4 DETAILED REVIEW – PALM ISLAND SHIRE

4.4.1 OVERVIEW

The OESR Population and Dwelling Profile (updated April 2012), the estimated residential population of Palm Island Shire at 30 June 2011 was 2,258. However, in discussions, Council advised that the current population of Palm Island is approximately 4,300. Obviously, this variance is significant and will be clarified.

Council has received funding to build 170 additional homes, with 53 to be constructed in two stages over the next 2 years. This will bring the total number of homes to around 500.

The island currently has little industry apart from servicing the needs of the primarily indigenous population.

4.4.2 LOCAL DEMAND

While the commercial operations and government departments have ADSL, very few residents do. Most residents have to rely on 3G, and while that is quite reasonable in and around the main town centre, connectivity is intermittent elsewhere around the island.

As well as ADSL, Council provides some limited WiFi to its buildings in the town square (figure 30).

Figure 30: Palm Island Town Square

It is also in the process of establishing a computer centre and internet hub at Bwgcolman Indigenous Knowledge Centre, as seen in figure 31.

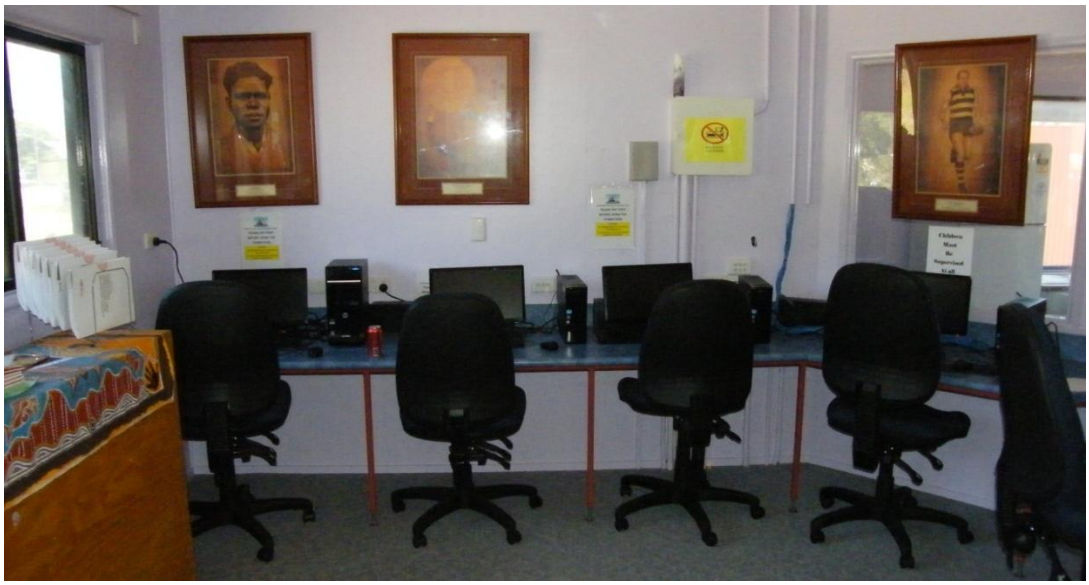
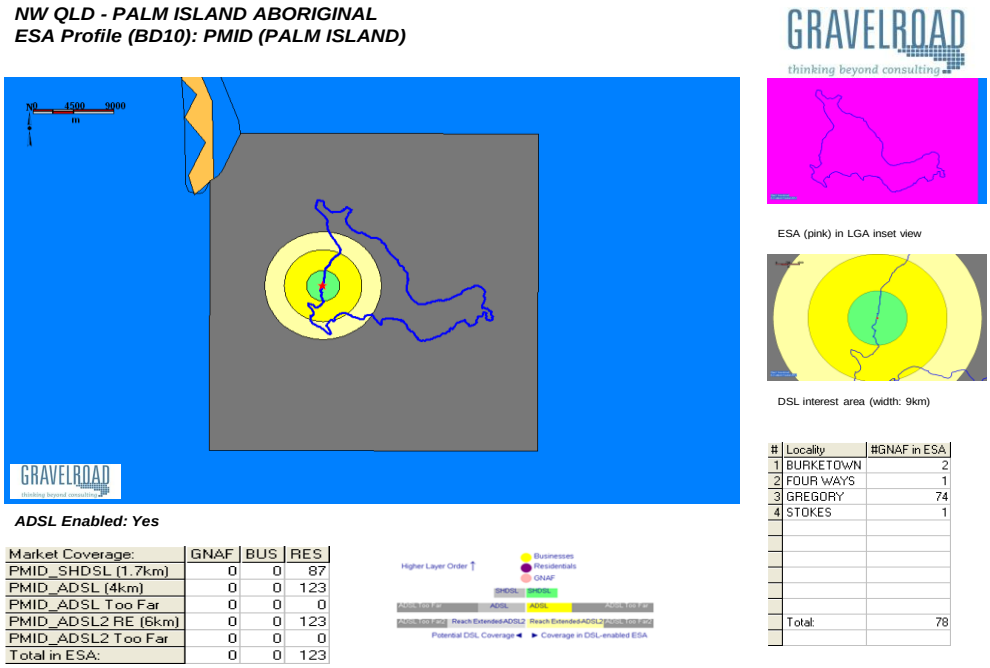


Figure 31: Computer Centre/Internet Hub – Bwgcolman Indigenous Knowledge centre

An online survey is being circulated to businesses and community organisations to gauge their current level of digital understanding and capability, as a major limiting factor to assessing true/potential demand is the current lack of digital awareness.

4.4.3 LOCAL SUPPLY

Figure 32 below indicates the number and type of ADSL connections on Palm Island, shown as business (0) and residential (123) and compared with the total number of GNAFs within the ESA, which appears to be unknown.



Market Coverage:	GNAF	BUS	RES
PMID_SHDSL (1.7km)	0	0	87
PMID_ADSL (4km)	0	0	123
PMID_ADSL Too Far	0	0	0
PMID_ADSL2 RE (6km)	0	0	123
PMID_ADSL2 Too Far	0	0	0
Total in ESA:	0	0	123

#	Locality	#GNAF in ESA
1	BURKETOWN	2
2	FOUR WAYS	1
3	GREGORY	74
4	STOKES	1
	Total:	78

Figure 32: ADSL coverage on Palm Island

Based on our inspection, Palm Island has limited telecommunication services. A microwave link exists from the mainland to a Telstra tower on the island. Residential locations on the island are separated by significant hills making a wireless service delivery difficult.

Based on available coverage maps Telstra cellular coverage should be available to several of the developed areas. Although the area to the east of the runway may not have cellular coverage due to blocking from surrounding hills.

NBN does not currently show any plans for the installation of fibre or wireless on Palm Island.

4.4.4 LOCAL LEADERSHIP

Council appears to be the sole source of local leadership on the island, However, Coolgaree, the largest private operator on the island and would benefit from improved broadband, could take up the role of 'local champion', providing guidance to other smaller operations on the island.

In order to plan the development of non-NBN broadband infrastructure, it will require a business case to be prepared.

This would involve:

- further review of existing Council and other local telecoms assets with a view to lessening the 'cost of entry' for potential providers;
- determine the scale of potential demand, including market sounding to assess nature and level of interest;
- assess likely pricing structure for infrastructure deployment and access based on other non-mainland topology;
- identification and cost estimation of required infrastructure build which would be required to provide the desired level of access.

This phase would combine the potential revenue and cost of sale, along with an assessment of the relevant risks and impacts leading to a detailed 'Go to Market' strategy.

However, the principles of the design process are set out in this document to assist with infrastructure planning.

4.4.5 BROADBAND OPPORTUNITY

If an increase in telecommunication capability was to be pursued for Palm Island, the potential technical solutions include:

- High speed backhaul (microwave) could be installed from the mainland;
- An optic fibre network could be established to each premise but this would be a high cost solution;
- Using three key sites wireless data networks could be established to deliver broadband;
- Standard cellular base stations could be installed to supply voice and data services.

5 KEY ISSUES

With the possible exception of Mount Isa, which was not included in the detailed review, the North-West Queensland Region is poorly serviced with telecommunications. In the three areas (five locations) that were reviewed as part of this program, connectivity is insufficient to meet even current requirements, let alone the future needs of business and community. The following are the key issues as identified.

5.1 NBN Co

Based on NBN Co's currently available information (mapping and rollout tables), neither Mount Isa, not Charters Towers, the only two communities likely to receive fibre, are not listed for deployment within the next three years. The remaining communities should receive either fixed wireless or satellite. Both of which are proposed to be in place by 2015.

However, while these technologies should deliver improved broadband, they fall short of what can be delivered over fibre. At the same time, as has been mentioned earlier, neither technology will provide telephony.

5.1.1 Fixed Wireless

The NBN Co's wireless connectivity is proposed to deliver speeds of 12 Mbps download and 1 Mbps upload, and while these are adequate for file transfer, the upload capacity will limit the ability for videoconferencing and remote working. Both of which are important elements, particularly in regional and remote areas. Another potential limitation is that wireless signals can be impacted by climatic conditions (ie. wind and rain).

However, on the plus side, while in populated urban areas wireless is affected by limited available spectrum due to volume of competing services, in rural communities with smaller populations, there is generally available spectrum, resulting in more consistent bandwidth for individual customers.

5.1.2 Satellite

Current NBN enabled satellite connection is via a non-dedicated satellite being leased by NBN Co until its two purpose designed satellites are launched in 2015. NBN Co notes the current satellite connection as providing speeds of 6Mbps download and 1 Mbps upload and when its own satellites are deployed they will provide 12 Mbps download, but still only 1 Mbps upload.

The details of the technical specifications of the satellites have not been made available. However, a limitation of satellite delivery is latency, the elapsed time between when a message is sent and it is received. This is a situation that cannot be easily overcome due to the distance the signal has to travel. When added to the limited upload capacity, this latency makes videoconferencing, or even VoIP (Voice over IP) subject to performance problems.

While in some areas of the region there is the availability of competitive backhaul capacity, Telstra accounts for almost the entire telecommunications market. As such, access to suitable network infrastructure is likely to be costly unless other service providers are prepared to install their own infrastructure. However for them to be willing to invest and operate in the region, they will need to be convinced that there is sufficient demand to warrant the cost of entry.

5.2 ALTERNATE BROADBAND OPPORTUNITIES

In the absence of NBN Co's connectivity in the near future, what options are available to North-West Queensland for high speed broadband connectivity?

As discussed through this report there are three non-NBN technology options available to the region:

1. Optical fibre
2. Wireless
3. ADSL

5.2.1 Optical Fibre

Optical fibre has been covered in earlier sections of this report. As is well known, Telstra has existing fibre routes throughout the collective region connecting its various exchanges, with the exception of Palm Island that is connected by microwave.

The report also refers to a number of other fibre routes owned by organisations such as QRail, Ergon, Powerlink and Nextgen capable of providing competitive backhaul to much of the region.

However, while it may be possible to gain access to these alternate fibre owners, Telstra will not allow access to its fibre network, apart from possibly leasing space in its exchanges, which in many cases has proved non-viable for other carriers due to costs and roadblocks imposed by Telstra.

As noted in earlier sections of this report, there are potentially 3 of the 5 locations reviewed that could achieve a fibre based solution. From preliminary discussions, it is likely that this could be achieved by gaining access to Nextgen's fibre route, providing competitive backhaul to the capital cities. Nextgen have advised that they would be open to the possibility of allowing access to their infrastructure.

We have been asked to provide examples of councils and communities developing partnerships to leverage access to such fibre backhaul. While there have been a number of commercial examples, to date there are few examples of communities making successful engagement with the telecommunications industry. We have facilitated projects of this type in New Zealand that are just as practical in Australia. This is an area of interest for Nextgen. As the NBN Co's rollout plans are better understood, it has become clearer where the gaps are appearing in relation to both timing and mode of delivery.

5.2.2 Wireless

The benefits and limitations of wireless have previously been discussed, although wireless should not be overlooked. In areas beyond the viable deployment range of fibre, wireless is the next best alternative and in the case of non-NBN wireless, it may be possible to have increased upload capability providing support to advanced services such as videoconferencing and teleworking.

5.2.3 ADSL

Each of the areas reviewed currently has some degree of ADSL access providing their broadband, as shown in the coverage maps. However, there are a number of issues relating to ADSL that should be understood:

- By its own name (Asymmetric Digital Subscriber Line) ADSL has a significant disparity between the level of download and upload.
- ADSL is impacted by distance whereby its capacity decreases rapidly the further the customer is from the active equipment. This is the reason why people living on the outskirts of towns have limited broadband capacity via ADSL.
- ADSL is connect to premises via their existing copper telephone cables, which may be old and degraded, resulting in poor broadband speed.

5.2.4 Mobile

Not having any other means of connection, many people in the region are forced to use their 3G mobile phones to provide their broadband connecting. While speed maybe similar to that of ADSL it is expensive and usage is limited to the overall capacity as per the mobile account package being used.

6 THE WAY FORWARD

The review has identified that based on the overall review of North-West Queensland and the detailed reviews of McKinlay Shire, Charters Towers Region and Palm Island Shire, that despite the fact that the NBN is not likely to be rolling out its infrastructure in the region in the foreseeable future, there are potential opportunities to deliver high speed broadband connectivity to the region, utilizing existing backbone infrastructure.

6.1 BUSINESS CASE

Based on the findings of this Telecommunications Infrastructure Review, we submit the following recommendations for the development of a regional business case for optimal delivery of high speed broadband:

- Further to the locations covered in this review, encourage Councils of the remaining twelve LGAs to join in a collaborative approach to achieving optimal broadband telecommunications for their respective regions.
- Expand this review to include the remaining LGAs to determine the existing telecommunications infrastructure for each region.
- Undertake consultation to identify the 'current state' and determine the 'future state' requirements of the regions (ie. councils, businesses and communities).
- Determine opportunities to access existing infrastructure (backhaul) to provide optimal broadband connectivity to the regions.
- Assess likely costs for access and service delivery based on similar market information.
- Undertake demand assessment to determine the scale of potential demand, including market sounding to determine nature and level of interest from service providers.
- Identification and cost estimation of required processes and procedures which would be required to access opportunity.

The business case would combine the potential opportunities and benefits along with an assessment of the relevant risks and impacts leading to a detailed 'Go to Market' strategy.

6.1 'GO TO MARKET'

Based on the regional business case and the 'Go to Market' strategy, an appropriate approach to the interested parties would be implemented. It is envisaged during this phase of the process our role would be to assist Councils in developing (commercial, operational and technical aspects) documentation to enable the provision of access to available backhaul and services to be delivered.

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